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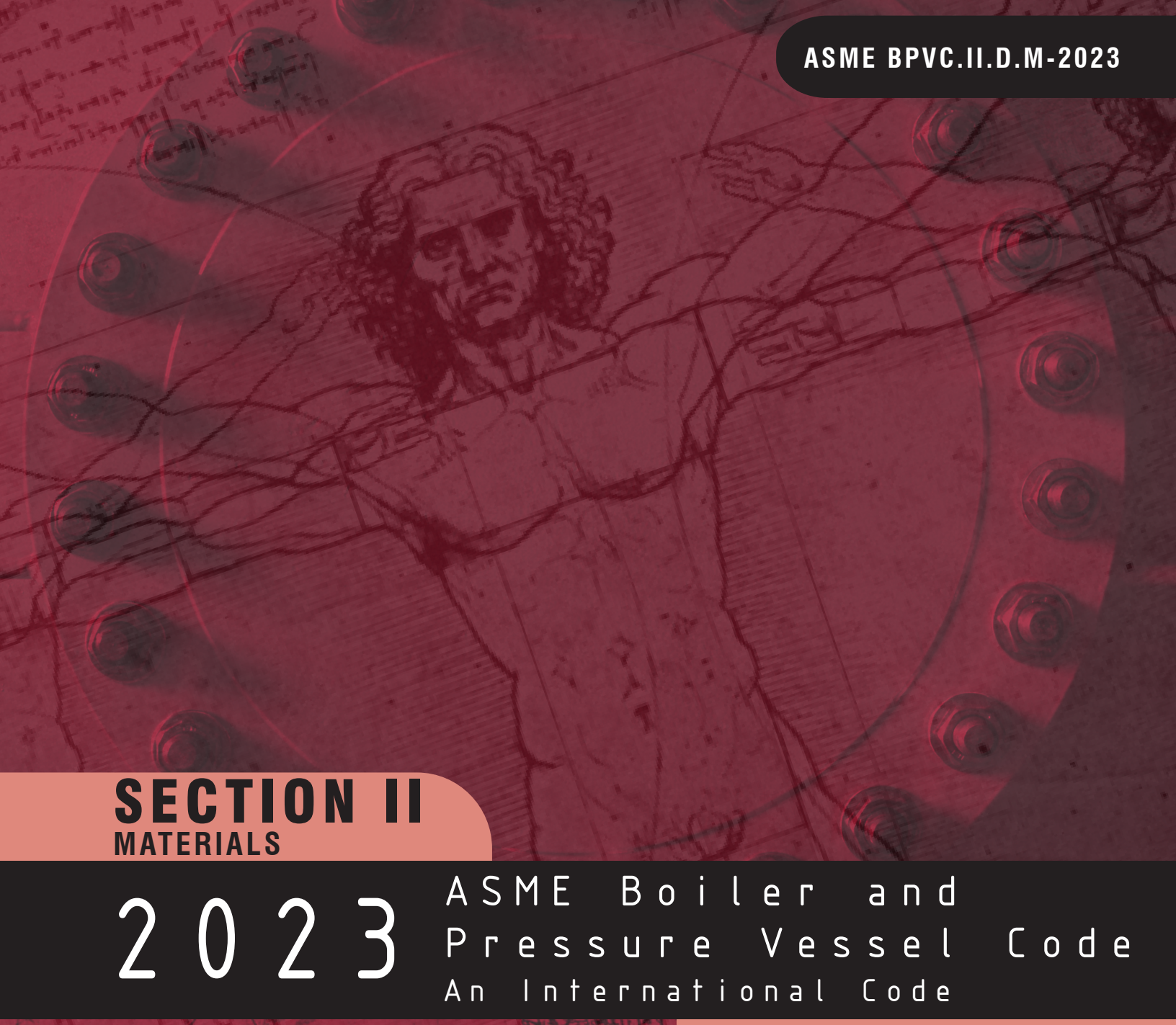
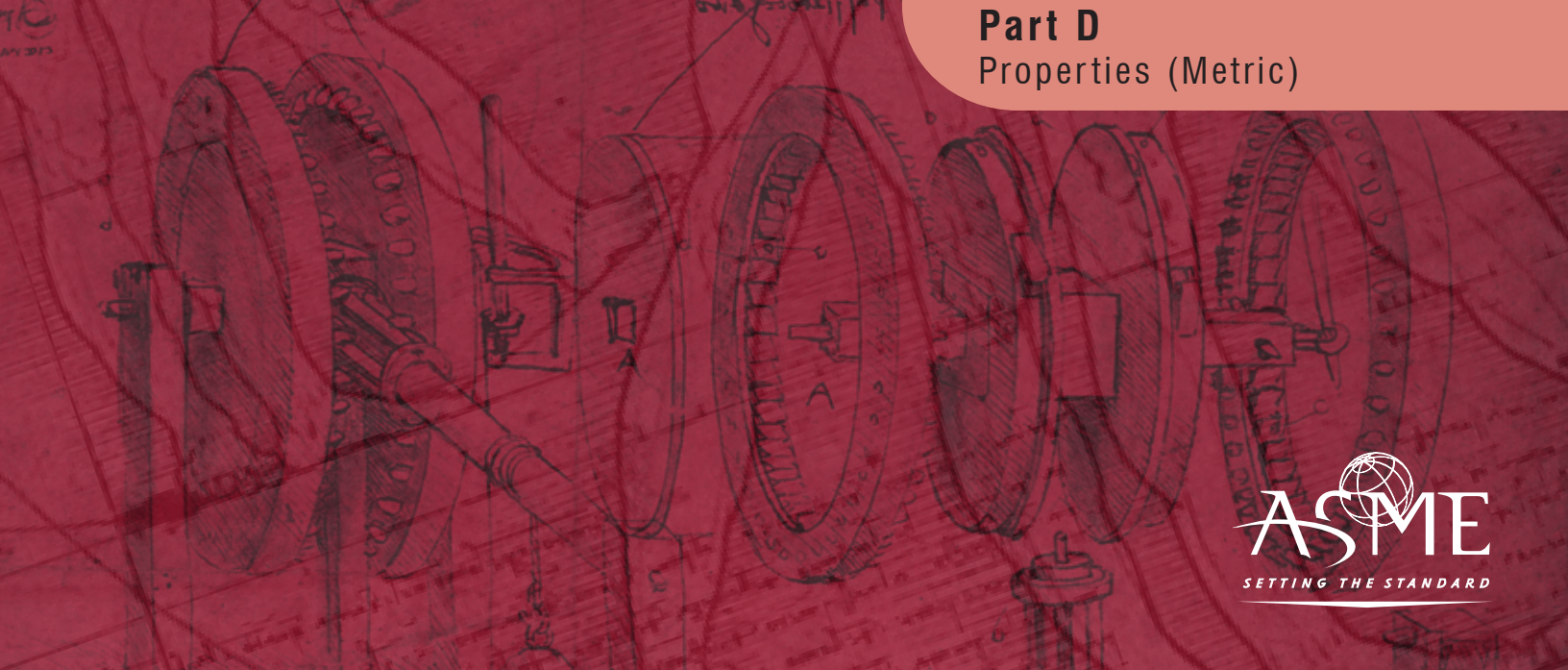


SECTION II
MATERIALS

2023 ASME Boiler and Pressure Vessel Code
An International Code

Part D
Properties (Metric)



ASME
SETTING THE STANDARD

AN INTERNATIONAL CODE

2023 ASME Boiler & Pressure Vessel Code

2023 Edition July 1, 2023

II

MATERIALS

Part D

Properties (Metric)

ASME Boiler and Pressure Vessel Committee
on Materials

The American Society of Mechanical Engineers

Two Park Avenue • New York, NY • 10016 USA

Date of Issuance: July 1, 2023

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ASME Collective Membership Mark

ASME Single Certification Mark

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FOREWORD[*]

In 1911, The American Society of Mechanical Engineers established the Boiler and Pressure Vessel Committee to formulate standard rules for the construction of steam boilers and other pressure vessels. In 2009, the Boiler and Pressure Vessel Committee was superseded by the following committees:

(a) Committee on Power Boilers (I)
(b) Committee on Materials (II)
(c) Committee on Construction of Nuclear Facility Components (III)
(d) Committee on Heating Boilers (IV)
(e) Committee on Nondestructive Examination (V)
(f) Committee on Pressure Vessels (VIII)
(g) Committee on Welding, Brazing, and Fusing (IX)
(h) Committee on Fiber-Reinforced Plastic Pressure Vessels (X)
(i) Committee on Nuclear Inservice Inspection (XI)
(j) Committee on Transport Tanks (XII)
(k) Committee on Overpressure Protection (XIII)
(l) Technical Oversight Management Committee (TOMC)

Where reference is made to "the Committee" in this Foreword, each of these committees is included individually and collectively.

The Committee's function is to establish rules of safety relating only to pressure integrity, which govern the construction[**] of boilers, pressure vessels, transport tanks, and nuclear components, and the inservice inspection of nuclear components and transport tanks. The Committee also interprets these rules when questions arise regarding their intent. The technical consistency of the Sections of the Code and coordination of standards development activities of the Committees is supported and guided by the Technical Oversight Management Committee. This Code does not address other safety issues relating to the construction of boilers, pressure vessels, transport tanks, or nuclear components, or the inservice inspection of nuclear components or transport tanks. Users of the Code should refer to the pertinent codes, standards, laws, regulations, or other relevant documents for safety issues other than those relating to pressure integrity. Except for Sections XI and XII, and with a few other exceptions, the rules do not, of practical necessity, reflect the likelihood and consequences of deterioration in service related to specific service fluids or external operating environments. In formulating the rules, the Committee considers the needs of users, manufacturers, and inspectors of pressure vessels. The objective of the rules is to afford reasonably certain protection of life and property, and to provide a margin for deterioration in service to give a reasonably long, safe period of usefulness. Advancements in design and materials and evidence of experience have been recognized.

This Code contains mandatory requirements, specific prohibitions, and nonmandatory guidance for construction activities and inservice inspection and testing activities. The Code does not address all aspects of these activities and those aspects that are not specifically addressed should not be considered prohibited. The Code is not a handbook and cannot replace education, experience, and the use of engineering judgment. The phrase *engineering judgment* refers to technical judgments made by knowledgeable engineers experienced in the application of the Code. Engineering judgments must be consistent with Code philosophy, and such judgments must never be used to overrule mandatory requirements or specific prohibitions of the Code.

The Committee recognizes that tools and techniques used for design and analysis change as technology progresses and expects engineers to use good judgment in the application of these tools. The designer is responsible for complying with Code rules and demonstrating compliance with Code equations when such equations are mandatory. The Code neither requires nor prohibits the use of computers for the design or analysis of components constructed to the

[*] The information contained in this Foreword is not part of this American National Standard (ANS) and has not been processed in accordance with ANSI's requirements for an ANS. Therefore, this Foreword may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the Code.

[**] *Construction*, as used in this Foreword, is an all-inclusive term comprising materials, design, fabrication, examination, inspection, testing, certification, and overpressure protection.

requirements of the Code. However, designers and engineers using computer programs for design or analysis are cautioned that they are responsible for all technical assumptions inherent in the programs they use and the application of these programs to their design.

The rules established by the Committee are not to be interpreted as approving, recommending, or endorsing any proprietary or specific design, or as limiting in any way the manufacturer's freedom to choose any method of design or any form of construction that conforms to the Code rules.

The Committee meets regularly to consider revisions of the rules, new rules as dictated by technological development, Code Cases, and requests for interpretations. Only the Committee has the authority to provide official interpretations of this Code. Requests for revisions, new rules, Code Cases, or interpretations shall be addressed to the Secretary in writing and shall give full particulars in order to receive consideration and action (see Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees). Proposed revisions to the Code resulting from inquiries will be presented to the Committee for appropriate action. The action of the Committee becomes effective only after confirmation by ballot of the Committee and approval by ASME. Proposed revisions to the Code approved by the Committee are submitted to the American National Standards Institute (ANSI) and published at http://go.asme.org/BPVCPublicReview to invite comments from all interested persons. After public review and final approval by ASME, revisions are published at regular intervals in Editions of the Code.

The Committee does not rule on whether a component shall or shall not be constructed to the provisions of the Code. The scope of each Section has been established to identify the components and parameters considered by the Committee in formulating the Code rules.

Questions or issues regarding compliance of a specific component with the Code rules are to be directed to the ASME Certificate Holder (Manufacturer). Inquiries concerning the interpretation of the Code are to be directed to the Committee. ASME is to be notified should questions arise concerning improper use of the ASME Single Certification Mark.

When required by context in this Section, the singular shall be interpreted as the plural, and vice versa, and the feminine, masculine, or neuter gender shall be treated as such other gender as appropriate.

The words "shall," "should," and "may" are used in this Standard as follows:

- *Shall* is used to denote a requirement.
- *Should* is used to denote a recommendation.
- *May* is used to denote permission, neither a requirement nor a recommendation.

STATEMENT OF POLICY ON THE USE OF THE ASME SINGLE CERTIFICATION MARK AND CODE AUTHORIZATION IN ADVERTISING

ASME has established procedures to authorize qualified organizations to perform various activities in accordance with the requirements of the ASME Boiler and Pressure Vessel Code. It is the aim of the Society to provide recognition of organizations so authorized. An organization holding authorization to perform various activities in accordance with the requirements of the Code may state this capability in its advertising literature.

Organizations that are authorized to use the ASME Single Certification Mark for marking items or constructions that have been constructed and inspected in compliance with the ASME Boiler and Pressure Vessel Code are issued Certificates of Authorization. It is the aim of the Society to maintain the standing of the ASME Single Certification Mark for the benefit of the users, the enforcement jurisdictions, and the holders of the ASME Single Certification Mark who comply with all requirements.

Based on these objectives, the following policy has been established on the usage in advertising of facsimiles of the ASME Single Certification Mark, Certificates of Authorization, and reference to Code construction. The American Society of Mechanical Engineers does not "approve," "certify," "rate," or "endorse" any item, construction, or activity and there shall be no statements or implications that might so indicate. An organization holding the ASME Single Certification Mark and/or a Certificate of Authorization may state in advertising literature that items, constructions, or activities "are built (produced or performed) or activities conducted in accordance with the requirements of the ASME Boiler and Pressure Vessel Code," or "meet the requirements of the ASME Boiler and Pressure Vessel Code." An ASME corporate logo shall not be used by any organization other than ASME.

The ASME Single Certification Mark shall be used only for stamping and nameplates as specifically provided in the Code. However, facsimiles may be used for the purpose of fostering the use of such construction. Such usage may be by an association or a society, or by a holder of the ASME Single Certification Mark who may also use the facsimile in advertising to show that clearly specified items will carry the ASME Single Certification Mark.

STATEMENT OF POLICY ON THE USE OF ASME MARKING TO IDENTIFY MANUFACTURED ITEMS

The ASME Boiler and Pressure Vessel Code provides rules for the construction of boilers, pressure vessels, and nuclear components. This includes requirements for materials, design, fabrication, examination, inspection, and stamping. Items constructed in accordance with all of the applicable rules of the Code are identified with the ASME Single Certification Mark described in the governing Section of the Code.

Markings such as "ASME," "ASME Standard," or any other marking including "ASME" or the ASME Single Certification Mark shall not be used on any item that is not constructed in accordance with all of the applicable requirements of the Code.

Items shall not be described on ASME Data Report Forms nor on similar forms referring to ASME that tend to imply that all Code requirements have been met when, in fact, they have not been. Data Report Forms covering items not fully complying with ASME requirements should not refer to ASME or they should clearly identify all exceptions to the ASME requirements.

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ASME codes and standards are developed and maintained by committees with the intent to represent the consensus of concerned interests. Users of ASME codes and standards may correspond with the committees to propose revisions or cases, report errata, or request interpretations. Correspondence for this Section of the ASME Boiler and Pressure Vessel Code (BPVC) should be sent to the staff secretary noted on the Section's committee web page, accessible at https://go.asme.org/CSCommittees.

NOTE: See ASME BPVC Section II, Part D for guidelines on requesting approval of new materials. See Section II, Part C for guidelines on requesting approval of new welding and brazing materials ("consumables").

Revisions and Errata

The committee processes revisions to this Code on a continuous basis to incorporate changes that appear necessary or desirable as demonstrated by the experience gained from the application of the Code. Approved revisions will be published in the next edition of the Code.

In addition, the committee may post errata and Special Notices at http://go.asme.org/BPVCerrata. Errata and Special Notices become effective on the date posted. Users can register on the committee web page to receive e-mail notifications of posted errata and Special Notices.

This Code is always open for comment, and the committee welcomes proposals for revisions. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent background information and supporting documentation.

Cases

(a) The most common applications for cases are

(1) to permit early implementation of a revision based on an urgent need

(2) to provide alternative requirements

(3) to allow users to gain experience with alternative or potential additional requirements prior to incorporation directly into the Code

(4) to permit use of a new material or process

(b) Users are cautioned that not all jurisdictions or owners automatically accept cases. Cases are not to be considered as approving, recommending, certifying, or endorsing any proprietary or specific design, or as limiting in any way the freedom of manufacturers, constructors, or owners to choose any method of design or any form of construction that conforms to the Code.

(c) The committee will consider proposed cases concerning the following topics only:

(1) equipment to be marked with the ASME Single Certification Mark, or

(2) equipment to be constructed as a repair/replacement activity under the requirements of Section XI

(d) A proposed case shall be written as a question and reply in the same format as existing cases. The proposal shall also include the following information:

(1) a statement of need and background information

(2) the urgency of the case (e.g., the case concerns a project that is underway or imminent)

(3) the Code Section and the paragraph, figure, or table number(s) to which the proposed case applies

(4) the edition(s) of the Code to which the proposed case applies

(e) A case is effective for use when the public review process has been completed and it is approved by the cognizant supervisory board. Cases that have been approved will appear in the next edition or supplement of the Code Cases books, "Boilers and Pressure Vessels" or "Nuclear Components." Each Code Cases book is updated with seven Supplements. Supplements will be sent or made available automatically to the purchasers of the Code Cases books until the next edition of the Code. Annulments of Code Cases become effective six months after the first announcement of the annulment in a Code Case Supplement or Edition of the appropriate Code Case book. The status of any case is available at http://go.asme.org/BPVCCDatabase. An index of the complete list of Boiler and Pressure Vessel Code Cases and Nuclear Code Cases is available at http://go.asme.org/BPVCC.

Interpretations

(a) Interpretations clarify existing Code requirements and are written as a question and reply. Interpretations do not introduce new requirements. If a revision to resolve conflicting or incorrect wording is required to support the interpretation, the committee will issue an intent interpretation in parallel with a revision to the Code.

(b) Upon request, the committee will render an interpretation of any requirement of the Code. An interpretation can be rendered only in response to a request submitted through the online Interpretation Submittal Form at http://go.asme.org/InterpretationRequest. Upon submitting the form, the inquirer will receive an automatic e-mail confirming receipt.

(c) ASME does not act as a consultant for specific engineering problems or for the general application or understanding of the Code requirements. If, based on the information submitted, it is the opinion of the committee that the inquirer should seek assistance, the request will be returned with the recommendation that such assistance be obtained. Inquirers may track the status of their requests at http://go.asme.org/Interpretations.

(d) ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME committee or subcommittee. ASME does not “approve,” “certify,” “rate,” or “endorse” any item, construction, proprietary device, or activity.

(e) Interpretations are published in the ASME Interpretations Database at http://go.asme.org/Interpretations as they are issued.

Committee Meetings

The ASME BPVC committees regularly hold meetings that are open to the public. Persons wishing to attend any meeting should contact the secretary of the applicable committee. Information on future committee meetings can be found at http://go.asme.org/BCW.

SUMMARY OF CHANGES

Changes listed below are identified on the pages by a margin note, **(23)**, placed next to the affected area.

Page	*Location*	*Change*
xiii	List of Sections	*(1)* Under Section III, Division 4 added *(2)* Title of Section XI and subtitle of Section XI, Division 2 revised *(3)* Information on interpretations and Code cases moved to "Correspondence With the Committee"
xvii	Personnel	Updated
xxxix	Correspondence With the Committee	Added (replaces "Submittal of Technical Inquiries to the Boiler and Pressure Vessel Standards Committees")
xlvii	Cross-Referencing in the ASME BPVC	Updated
8–11	Table 1A	Lines 5 and 30 deleted
12–15	Table 1A	*(1)* Line 21 revised *(2)* Lines 24, 28, and 34 corrected by errata
16–19	Table 1A	Lines 29 and 37–40 revised
24–27	Table 1A	Line 43 revised
36–39	Table 1A	Line 25 revised
52–55	Table 1A	Line 1 revised
56–59	Table 1A	Line 4 added
68–71	Table 1A	Lines 16 and 17 revised
72–75	Table 1A	Lines 26–29, 31–36, 38–43, and 45 revised
76–79	Table 1A	Lines 2 and 3 revised
88–91	Table 1A	Lines 38 and 39 revised
92–95	Table 1A	Lines 36 and 37 revised
116–119	Table 1A	Lines 20–25 revised and relocated
128–131	Table 1A	Lines 19 and 20 added
148–151	Table 1A	Lines 19–22 added
156–159	Table 1A	Lines 10 and 11 added
161	Table 1A	Note G33 added
172–175	Table 1B	Lines 25–45 revised
176–179	Table 1B	Lines 1–26 revised
180–183	Table 1B	Lines 1–13 revised
184–187	Table 1B	Lines 30–33 revised
188–191	Table 1B	*(1)* Lines 26, 38, and 39 revised *(2)* Lines 36 and 37 deleted
192–195	Table 1B	*(1)* Lines 6–9 revised

Page	*Location*	*Change*
		(2) Lines 43 and 45 added
196–199	Table 1B	*(1)* Lines 1, 3 and 19–22 revised *(2)* Line 2 added
200–203	Table 1B	*(1)* Lines 21, 22, 25, and 26 deleted *(2)* Lines 23, 27, 29, 43, and 45 revised *(3)* Lines 24, 28, 30, 32, 34, 36, 38, 40, and 44 added *(4)* Line 33 corrected by errata
204–207	Table 1B	*(1)* Lines 1 and 3 added *(2)* Lines 2, 4–6, 29, 30, and 41 revised
208–211	Table 1B	*(1)* Lines 26, 27, and 40 revised *(2)* Line 44 corrected by errata *(3)* Line 45 added
212–215	Table 1B	*(1)* Lines, 1, 3, 5, 31, and 32 revised *(2)* Lines 2, 4, and 6 added
216–219	Table 1B	*(1)* Lines 18–22, 26, 27, 34, and 35 revised *(2)* Lines 21 and 22 corrected by errata
220–223	Table 1B	*(1)* Lines 5, 12, 18, 19, 21, 22, and 32 revised *(2)* Line 23 added by errata
224–227	Table 1B	Lines 9 and 24–42 revised
236–239	Table 1B	Line 22 revised
240–243	Table 1B	*(1)* Lines 12 and 13 added *(2)* Line 24 revised
248–251	Table 1B	Line 2 revised
252–255	Table 1B	Line 27 corrected by errata
256–259	Table 1B	Lines 7 and 25 revised
260–263	Table 1B	Lines 25, 39, and 45 revised
264–267	Table 1B	Line 42 revised
268–271	Table 1B	Line 44 revised
284–287	Table 1B	Lines 25–33 revised
288–291	Table 1B	*(1)* Lines 20–23, 25, and 28–30 revised *(2)* Lines 24 and 31 added *(3)* Lines 26 and 27 deleted by errata
292	Table 1B	Note G17 revised
293	Table 1B	Notes G43 and G44 added
294	Table 1B	Note T23 added by errata
296–298	Table 2A	Line 8 deleted
300–302	Table 2A	Lines 26–29 added
304–306	Table 2A	*(1)* Lines 22–29, 44, and 45 added *(2)* Line 30 revised
308–310	Table 2A	*(1)* Line 8 added *(2)* Line 11 revised *(3)* Line 12 deleted

Page	*Location*	*Change*
312–314	Table 2A	*(1)* Line 14 revised *(2)* Lines 25–32, 34, and 35 added
316–318	Table 2A	Lines 7–9, 17, 26–32, and 42 added
324–326	Table 2A	*(1)* Lines 8 and 20 added *(2)* Lines 39–41 revised
328–330	Table 2A	Lines 30, 32, 33, and 35 added
336–338	Table 2A	*(1)* Lines 9, 10, and 26 revised *(2)* Line 27 added
344–346	Table 2A	Lines 4, 5, 44, and 45 added
348–350	Table 2A	*(1)* Line 35 revised *(2)* Lines 39 and 41 added
352–354	Table 2A	*(1)* Line 9 revised *(2)* Line 42 added
356–358	Table 2A	Lines 42 and 43 added
368–370	Table 2A	Line 4 added
372–374	Table 2A	*(1)* Lines 1–4 revised and relocated *(2)* Lines 32–37 added
376–378	Table 2A	Lines 44 and 45 added
380–382	Table 2A	Lines 1, 2, 37, and 45 added
384–386	Table 2A	Lines 1–6 added
387	Table 2A	Note G22 added
390–416	Table 2B	“Type/Grade” column added
390–392	Table 2B	Lines 21–34 revised
394–396	Table 2B	*(1)* Lines 18, 20, 29, 30, and 39 revised *(2)* Lines 19, 21, 31–38, and 40–45 added
398–400	Table 2B	*(1)* Line 1 added *(2)* Lines 8–13 corrected by errata *(3)* Lines 22 and 31 revised
402–404	Table 2B	Lines 1, 7, and 9 corrected by errata
410–412	Table 2B	Lines 38–45 revised
414–416	Table 2B	Lines 1–37 revised
417	Table 2B	Notes E6 and G11 added
422–425	Table 3	*(1)* Lines 18, 19, 24, 25, 37, 40, and 43 revised *(2)*) Lines 18 and 19 transposed *(3)* Lines 24 and 25 transposed
434–437	Table 3	Lines 9, 10, and 34–39 revised
438–441	Table 3	*(1)* Lines 9–14 corrected by errata *(2)* Line 43 revised
447	Table 3	Note T13 added
456–459	Table 4	Lines 1–8 corrected by errata

Page	*Location*	*Change*
460–463	Table 5A	*(1)* Line 5 deleted *(2)* Lines 6, 37, and 38 revised
464–467	Table 5A	Lines 16, 18, 20, 29, 35–37, 41, 42, and 45 revised
468–471	Table 5A	Lines 1, 22, and 23 revised
472–475	Table 5A	Lines 13 and 28–31 revised
476–479	Table 5A	Lines 7–10 revised
480–483	Table 5A	Lines 10, 34–37, 39, and 40 revised
484–487	Table 5A	Lines 1, 12–14, 16–20, 23, 24, 26, 27, and 31–35 revised
488–491	Table 5A	Lines 20 and 21 revised
492–495	Table 5A	Line 18 revised
496–499	Table 5A	Lines 14, 19, and 26 revised
500–503	Table 5A	Line 29 revised
504–507	Table 5A	Lines 17, 36, and 39 revised
508–511	Table 5A	*(1)* Line 1 revised and relocated *(2)* Lines 14–18 revised
520	Table 5A	Note G17 added
522–545	Table 5B	“Type/Grade” column added
522–525	Table 5B	Lines 7 and 21–34 revised
526–529	Table 5B	*(1)* Lines 36, 37, and 39–42 added *(2)* Line 38 revised
530–533	Table 5B	Lines 8 and 9 revised
538–541	Table 5B	Lines 33–45 revised
542–545	Table 5B	Lines 1–27 revised
546	Table 5B	*(1)* General Note (b) revised *(2)* Note G14 added
550, 551	Table 6A	*(1)* Line 28 corrected by errata *(2)* Line 31 added *(3)* Line 34 deleted
552, 553	Table 6A	*(1)* Lines 8, 10, and 11 added *(2)* Lines 9 and 30–39 revised
558, 559	Table 6B	*(1)* Lines 19–21 revised *(2)* Lines 22 and 37 added
560, 561	Table 6B	*(1)* Lines 3 and 25 added *(2)* Lines 24 and 43–45 revised *(3)* Line 39 corrected by errata
562, 563	Table 6B	*(1)* Lines 1–3 and 13 revised *(2)* Lines 4–9 and 17–20 added
578–580	Table U	Lines 5 and 23 deleted
582–585	Table U	Line 13 corrected by errata
598–600	Table U	Line 2 corrected by errata

Page	*Location*	*Change*
630–632	Table U	Line 34 added
650–652	Table U	Lines 38 and 41 revised
654–656	Table U	*(1)* Lines 1 and 44 revised *(2)* Lines 43 and 45 added
658–660	Table U	*(1)* Line 6 added *(2)* Line 35 revised
662–664	Table U	Line 20 revised
678–680	Table U	*(1)* Lines 8–11 revised and relocated *(2)* Lines 23–26 and 31–34 added
682–684	Table U	Lines 19 and 38–43 added
694–696	Table U	Lines 30 and 31 added
698–700	Table U	Lines 27 and 28 added
722–724	Table U	*(1)* Line 7 added *(2)* Lines 8, 9, and 43 revised
726–728	Table U	Line 20 corrected by errata
730–732	Table U	Lines 15–20 added
734–736	Table U	*(1)* Lines 14 and 15 revised *(2)* Lines 16–21 added *(3)* Lines 34–39 added by errata
738–740	Table U	Lines 32–35 added by errata
742–744	Table U	*(1)* Lines 1, 16, and 17 revised *(2)* Lines 2 and 18 added
746–748	Table U	Lines 15–22 and 31–38 corrected by errata
754–756	Table U	*(1)* Lines 19 and 21 added by errata *(2)* Lines 28, 29, and 31–34 corrected by errata *(3)* Line 43 added
758–760	Table U	Line 5 added by errata
762–764	Table U	Lines 27–33 corrected by errata
766–768	Table U	*(1)* Lines 11–19 and 22–28 corrected by errata *(2)* Lines 29–34 added by errata *(3)* Line 44 revised
770–772	Table U	*(1)* Line 4 revised *(2)* Lines 27–34 corrected by errata
786–788	Table U	Lines 5–11 added
790–794	Table Y-1	Lines 5 and 23 deleted
796–800	Table Y-1	Lines 15, 19, and 25 corrected by errata
802–806	Table Y-1	Lines 23–26 added by errata
868–872	Table Y-1	*(1)* Lines 21 and 22 revised *(2)* Line 40 added
880–884	Table Y-1	Lines 20–22 and 25 deleted
904–908	Table Y-1	Lines 10, 14, and 19 revised

Page	*Location*	*Change*
910–914	Table Y-1	Lines 17, 19, and 25 added
916–920	Table Y-1	Lines 9 and 39 revised
946–950	Table Y-1	*(1)* Lines 1–4 revised and relocated *(2)* Lines 16–19 and 24–27 added
952–956	Table Y-1	Line 14 added
970–974	Table Y-1	Lines 25 and 26 added
976–980	Table Y-1	Lines 22 and 23 added
1006–1010	Table Y-1	*(1)* Line 26 added *(2)* Lines 27 and 28 revised
1012–1016	Table Y-1	Line 17 revised
1018–1022	Table Y-1	Lines 29–34 added
1024–1028	Table Y-1	*(1)* Lines 34 and 35 corrected by errata *(2)* Lines 34–36 and 38–42 revised
1030–1034	Table Y-1	*(1)* Line 3 corrected by errata *(2)* Lines 11–16 revised
1036–1040	Table Y-1	*(1)* Lines 9–12 revised *(2)* Lines 23, 24, and 38–40 added
1042–1046	Table Y-1	Line 8 revised
1054–1058	Table Y-1	Line 45 added by errata
1060–1064	Table Y-1	*(1)* Line 24 added *(2)* Line 25 corrected by errata *(3)* Lines 26 and 33 added by errata
1078–1082	Table Y-1	*(1)* Lines 15, 17, 19, 21, 23, and 25 deleted *(2)* Lines 35 and 40 revised
1108–1112	Table Y-1	Lines 7–13 added
1114	Table Y-2	Title revised
1115	Subpart 2, Introduction	Fifth paragraph added
1116	Table TE-1	*(1)* Under “Coefficients for 7% Nickel Steel, C,” first four entries corrected by errata *(2)* Note (2) revised
1134	Table TCD	Notes (11) and (12) revised
1148	Table TM-1	Notes (6) and (8) revised
1152	Table TM-3	Revised
1332	A-702.1.6	Added

CROSS-REFERENCING IN THE ASME BPVC (23)

Paragraphs within the ASME BPVC may include subparagraph breakdowns, i.e., nested lists. The following is a guide to the designation and cross-referencing of subparagraph breakdowns:

(a) Hierarchy of Subparagraph Breakdowns

(1) First-level breakdowns are designated as (a), (b), (c), etc.

(2) Second-level breakdowns are designated as (1), (2), (3), etc.

(3) Third-level breakdowns are designated as (-a), (-b), (-c), etc.

(4) Fourth-level breakdowns are designated as (-1), (-2), (-3), etc.

(5) Fifth-level breakdowns are designated as (+a), (+b), (+c), etc.

(6) Sixth-level breakdowns are designated as (+1), (+2), etc.

(b) Cross-References to Subparagraph Breakdowns. Cross-references within an alphanumerically designated paragraph (e.g., PG-1, UIG-56.1, NCD-3223) do not include the alphanumerical designator of that paragraph. The cross-references to subparagraph breakdowns follow the hierarchy of the designators under which the breakdown appears. The following examples show the format:

(1) If X.1(c)(1)(-a) is referenced in X.1(c)(1), it will be referenced as (-a).

(2) If X.1(c)(1)(-a) is referenced in X.1(c)(2), it will be referenced as (1)(-a).

(3) If X.1(c)(1)(-a) is referenced in X.1(e)(1), it will be referenced as (c)(1)(-a).

(4) If X.1(c)(1)(-a) is referenced in X.2(c)(2), it will be referenced as X.1(c)(1)(-a).

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SUBPART 1
STRESS TABLES

STATEMENT OF POLICY ON INFORMATION PROVIDED IN THE STRESS TABLES

The purpose of this Statement of Policy is to clarify which information in the stress tables is mandatory and which is not. The information and restrictions provided in the Notes found throughout the various stress tables provided in Section II, Part D, Subpart 1 are mandatory. It is vital to recognize that lines of information in Tables 1A, 1B, 2A, 2B, 3, 4, 5A, 5B, 6A, 6B, 6C, and 6D frequently have essential information referenced in the Notes column. These Notes are organized as follows:

(a) EXX: defining onset of values based on successful experience in service

(b) GXX: general requirements

(c) HXX: heat treatment requirements

(d) SXX: size requirements

(e) TXX: defining onset of time-dependent behavior

(f) WXX: welding requirements

The specifications and grades or types, coupled with the assigned Notes for each line, provide the complete description of material in the context of the allowable stresses or design stress intensities. Additional requirements for particular types of construction must also be obtained from the rules governing the construction.

In Tables 1A, 2A, 5A, 6A, 6C, and 6D, the information in the Nominal Composition column is nonmandatory and is for information only. However, these nominal compositions are the primary sorting used in these six tables. See the Guideline on Locating Materials in Stress Tables, and in Tables of Mechanical and Physical Properties. The information in the Alloy Designation/UNS Number column is nonmandatory for specifications for which a grade or type is provided. This is primarily true for the non-stainless steel alloys in these tables. For specifications for which no type or grade is listed, the UNS number is mandatory. Particularly for the stainless steels, for which no type or grade is listed, the UNS number is the grade.

The only difference between Tables 1A, 2A, 5A, 6A, 6C, and 6D, and Tables 1B, 2B, 5B, and 6B, with regard to the mandatory/nonmandatory nature of the information, is that in Tables 1B, 2B, 5B, and 6B, the UNS number information is used as the basis of the sorting scheme for materials and is almost always mandatory.

Where provided, the information in the columns for Product Form, Specification Number, Type/Grade, Class/Condition/Temper, and External Pressure Chart Number is mandatory. The information in the P-Number and Group Number columns is also mandatory; however, the primary source for this information is Table QW/QB-422 in Section IX. When there is a conflict between the P-number and Group number information in these stress tables and that in Section IX, the numbers in Section IX shall govern.

The information in the Minimum Tensile Strength, Minimum Yield Strength, and Size/Thickness dimension columns is also mandatory; however, the primary source for this information is the material specifications in Section II, Parts A and B. These values are a primary basis for establishing the allowable stresses and design stress intensities. When there is a conflict between the tensile and yield strength values in the stress tables and those in the material specifications in Section II, Parts A and B, the minimum tensile and yield strength values in Parts A and B shall govern. For dual-unit specifications and for product forms for which separate U.S. Customary and Metric specifications are provided, for the Size/Thickness dimensions for size breaks at which the Minimum Specified Yield or Tensile Strengths, or both, decrease with increasing size or thickness, the values in the material specifications in Parts A and B shall govern. When there is a conflict between the maximum size or thickness values in the stress tables and those in the material specifications, the values in the stress tables shall govern.

The information in the Applicability and Maximum Temperature Limits columns is mandatory. Where a material is permitted for use in more than one Construction Code, and in the SI units version of these tables, the maximum use temperature limit in these columns is critical. The temperature to which allowable stress or design stress intensity values are listed is not necessarily the

temperature to which use is permitted by a particular Construction Code. Different Construction Codes often have different use temperature limits for the same material and condition. Further, values may be listed in the stress tables at temperatures above the maximum use temperature limit. These stress values are provided to permit interpolation to be used to determine the allowable stress or design stress intensity at temperatures between the next lowest temperature for which stress values are listed and the maximum-use temperature limit listed in these columns.

GUIDELINE ON LOCATING MATERIALS IN STRESS TABLES, AND IN TABLES OF MECHANICAL AND PHYSICAL PROPERTIES

1 INTRODUCTION

The goal of this Guideline is to assist the users of Section II, Part D in locating materials in stress tables (Tables 1A, 1B, 2A, 2B, 3, 4, 5A, 5B, 6A, 6B, 6C, and 6D), tables of mechanical properties (Tables U and Y-1), and tables of physical properties (Tables TE-1 through TE-5, TCD, TM-1 through TM-5, and PRD). This Guideline defines the logic used to place materials within these tables.

2 STRESS TABLES

Stress tables are all found within Section II, Part D, Subpart 1. Tables 1A, 1B, 3, 5A, 5B, 6A, 6B, 6C, and 6D cover allowable stresses, while Tables 2A, 2B, and 4 cover design stress intensities. The governing allowable stresses for those materials are provided in ASME BPVC, Section IV. Although Subpart 1 also covers ultimate tensile strength and yield strength, the organization of those mechanical property tables will be discussed separately in para. 3. A table-by-table listing of the materials-organization logic used to place materials within the designated tables follows.

2.1 TABLE 1A

Table 1A provides allowable stresses for ferrous[1] materials used in Section I; Section III, Division 1, Classes 2 and 3; Section VIII, Division 1; and Section XII construction. Within Table 1A, the first step in ordering materials is to use their nominal compositions. These nominal compositions are nothing more than accepted compositional fingerprints or widely recognized designators for each alloy or alloy class. These nominal compositions are arranged in Table 1A as follows:

(a) carbon steels

(b) carbon steels with small additions of Cb, Ti, and V (microalloyed steels)

(c) C–$\frac{1}{2}$Mo steels

(d) chromium steels, including ferritic stainless steels, by increasing Cr content [$\frac{1}{2}$Cr, $\frac{3}{4}$Cr, 1Cr, 1$\frac{1}{4}$Cr, 2$\frac{1}{4}$Cr, 3Cr, 5Cr, 9Cr, 11Cr, 12Cr, 13Cr, 15Cr, 17Cr (including 17Cr–4Ni–4Cu and 17Cr–7Ni–1Al), 18Cr, 26Cr, 27Cr, and 29Cr]

(e) manganese steels (Mn–$\frac{1}{4}$Mo, Mn–$\frac{1}{2}$Mo, Mn–$\frac{1}{2}$Ni, and Mn–V)

(f) silicon steel (1$\frac{1}{2}$Si–$\frac{1}{2}$Mo)

(g) nickel steels ($\frac{1}{2}$Ni, $\frac{3}{4}$Ni, 1Ni, 1$\frac{1}{4}$Ni, 2Ni, 2$\frac{1}{2}$Ni, 2$\frac{3}{4}$Ni, 3Ni, 3$\frac{1}{2}$Ni, 4Ni, 5Ni, 8Ni, and 9Ni)

(h) other high nickel steels [25Ni–15Cr–2Ti (Grade 660) and 29Ni–20Cr–3Cu–2Mo (CN7M)]

(i) high alloy steels, including the duplex stainless steels, in order of increasing chromium content [beginning with 14Cr–16Ni–6Si–Cu–Mo, then 16Cr–9Mn–2Ni–N, then 16Cr–12Ni–2Mo (316L), etc.], then by increasing nickel content within a given chromium or other alloy content [18Cr–8Ni, 18Cr–8Ni–N, 18Cr–8Ni–4Si–N, 18Cr–10Ni–Cb (first S34700, then S34709, S34800, and S34809), 18Cr–10Ni–Ti, 18Cr–11Ni, etc., ending with 29Cr–6.5Ni–2Mo–N].

Unfortunately, most specifications for materials do not give nominal compositions — and without that information, one may not know the nominal composition for a particular material in Table 1A. If the specification number and alloy grade or type designation are known, then one can go to Section IX, Table QW/QB-422 and find the corresponding nominal composition.

Now, for a given nominal composition, Table 1A is arranged by increasing strength — first tensile strength and then yield strength. For a given nominal composition, tensile strength, and yield strength, stress listings are provided in order of increasing specification number. Sometimes, for a given nominal composition, tensile strength, yield strength, and specificaiton number/grade or type, there may be more than one line of stresses. At this point, the Notes referenced on the second page of each page set within Table 1A will define why there are two or more lines of stresses and when each applies.

2.2 TABLE 1B

Table 1B provides allowable stresses for nonferrous materials used in Section I; Section III, Division 1, Classes 2 and 3; Section VIII, Division 1; and Section XII construction. Aluminum alloys (UNS AXXXXX materials) are the first materials covered in Table 1B, followed by copper alloys (UNS CXXXXX), nickel alloys (UNS NXXXXX), and the reactive and refractory metals and alloys (UNS RXXXXX). Within this latter category there are the following:

(a) chromium alloys (R2XXXX)

(b) cobalt alloys (R3XXXX)

(c) titanium alloys (R5XXXX)

(d) zirconium alloys (R6XXXX)

Within each of these material class groupings, stress lines are first organized by increasing UNS (Unified Numbering System) number. The nonferrous specifications now show these numbers in association with grade designations. Then, for a given UNS number, stress lines are

next ordered by strength — first tensile strength and then yield strength. Finally, for a given UNS number, tensile strength, and yield strength, stress lines are ordered by increasing specification number. Again, some materials may have two or more stress lines even if their UNS number, tensile strength, yield strength, and specification number are the same. The Notes provide direction for the applicability of each line.

For those material specifications that may not show UNS numbers associated with alloy grades, one again can refer to Section IX, Table QW/QB-422 for that information.

For Table 1B, nominal compositions are shown only for the NXXXXX and RXXXXX materials, but they have no influence on the location of alloys in the table. In this Table, the nominal compositions are simply for information.

2.3 TABLE 2A

Table 2A provides design stress intensities for ferrous materials for Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 construction; and allowable stresses for ferrous materials for Section VIII, Division 2, Class 1 construction. This Table is organized in the same manner as Table 1A. Refer back to para. 2.1 for that description.

2.4 TABLE 2B

Table 2B provides design stress intensities for nonferrous materials for Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 construction; and allowable stresses for nonferrous materials for Section VIII, Division 2, Class 1 construction. Table 2B materials are ordered in the same manner as in Table 1B. Refer back to para. 2.2 for that description.

2.5 TABLE 3

Table 3 provides allowable stresses for bolting materials for use in Section III, Division 1, Classes 2 and 3; Section VIII, Division 1; Section VIII, Division 2 (using Section VIII, Division 2, Part 4.16); and Section XII construction. The table first covers ferrous materials and then nonferrous materials. For the ferrous materials, the ordering logic parallels that used in Tables 1A and 2A — first by nominal composition, then by increasing ultimate tensile strength, then by increasing yield strength, and finally by increasing specification number. Again, refer back to para. 2.1 for a discussion on nominal composition.

Nonferrous materials are presented using the same logic as in Tables 1B and 2B; see para. 2.2 for that discussion.

2.6 TABLE 4

Table 4 provides design stress intensities for bolting materials used in Section III, Division 1, Classes 1 and MC; Section III, Division 3; and Section III, Division 5; and allowable stresses for bolting materials used in Section VIII, Division 2 (using Section VIII, Division 2, Part 5 and Annex 5.F).

Table 4 is organized in the same manner as Table 3 — first covering ferrous materials and then nonferrous materials — except that Table 4 covers far fewer materials. For the ordering logic, again refer to paras. 2.1 and 2.2 for ferrous and nonferrous materials, respectively.

2.7 TABLE 5A

Table 5A provides allowable stresses for ferrous materials for Section VIII, Division 2, Class 2 construction. This table is organized in the same manner as Table 1A. Refer back to para. 2.1 for that description.

2.8 TABLE 5B

Table 5B provides allowable stresses for nonferrous materials for Section VIII, Division 2, Class 2 construction. This table is organized in the same manner as Table 1B. Refer back to para. 2.2 for that description.

2.9 TABLE 6A

Table 6A provides allowable stresses for ferrous materials for Section IV construction. This Table is organized in the same manner as Table 1A. Refer back to para. 2.1 for that description.

2.10 TABLE 6B

Table 6B provides allowable stresses for nonferrous materials for Section IV construction. This Table is organized in the same manner as Table 1B. Refer back to para. 2.2 for that description.

2.11 TABLE 6C

Table 6C provides allowable stresses for Section IV construction of lined water heaters. This Table is organized in the same manner as Table 1A. Refer back to para. 2.1 for that description.

2.12 TABLE 6D

Table 6D provides allowable stresses for Section IV construction of unlined water heaters. This Table is organized in the same manner as Table 1A. Refer back to para. 2.1 for that description.

3 MECHANICAL PROPERTY TABLES

Ultimate tensile strength values and yield strength values are to be used in design calculations according to the rules of the Construction Codes. However, they are not to be construed as minimum strength values at temperature. This is explained in the General Notes to these tables. Paragraphs 3.1 through 3.3 provide a table-by-table listing of the materials-organization logic.

Tensile (Table U) and yield (Table Y-1) strengths at elevated temperatures are based on trend curves determined by statistical curve fitting of submitted mechanical property data. Wrought materials and cast materials are considered different materials. A material has only one trend curve for tensile strengths and one trend curve for yield strengths. Each curve is anchored to the minimum value at room temperature in its set of units. See Nonmandatory Appendix D for more information.

3.1 TABLE U

Table U provides tensile strength values for ferrous and nonferrous materials, in that order. The ordering logic for ferrous materials is the same as used in Table 1A, except yield strength level is not shown. Using the logic described in para. 2.1, stress lines are organized by nominal composition, then by increasing tensile strength level, and then by increasing specification number.

Nonferrous materials coverage begins following the last of the high alloy steels (25Cr–22Ni–2Mo–N). Coverage of nonferrous alloys begins with the UNS AXXXXX alloys, followed by NXXXXX and RXXXXX alloys. The ordering of materials within these three groups has been previously described in para. 2.2.

3.3 TABLE Y-1

Table Y-1 provides yield strength values for ferrous and nonferrous materials, in that order. Again, the ordering of yield strength lines parallels the logic described for ferrous and nonferrous materials in paras. 2.1 and 2.2, respectively. Unlike Table U, for ferrous materials, the tensile strength level does enter into the ordering process, again following nominal composition designation. Table Y-1's nonferrous materials listings begin with the aluminum-base alloys (UNS AXXXXX). These are followed by the copper materials (CXXXXX), nickel-base materials (NXXXXX), and the reactive and refractory metals and alloys (RXXXXX).

4 PHYSICAL PROPERTY TABLES

Since physical properties (thermal conductivity, thermal diffusivity, thermal expansion, and density), Young's modulus, and Poisson's ratio values can be shown for numerous materials with a single set of property values, most of the tables found in Section II, Part D, Subpart 2 are based on nominal composition. Paragraphs 4.1 through 4.4 describe how these tables are organized.

4.1 TABLE TE

Table TE covers thermal expansion behavior, presented in terms of A (instantaneous coefficient of thermal expansion), B (mean coefficient of thermal expansion), and C (linear thermal expansion). This Table is split into five parts as follows:

(a) Table TE-1 covers numerous individual ferrous materials and ferrous material groupings. Notes at the end of Table TE-1 list the nominal compositions covered by the designated groupings. Again, knowledge of the nominal composition for a given material is essential, and it was noted previously that these can be extracted from Section IX, Table QW/QB-422, given the specification number and grade or type designation.

(b) Table TE-2 covers aluminum alloys. One set of A/B/C values covers all of the aluminum-base materials listed in General Note (a) of Table TE-2.

(c) Table TE-3 covers copper alloys, currently in five general groupings: C1XXXX alloys, bronze alloys, brass alloys, 70Cu–30Ni, and 90Cu–10Ni. According to an article in ASM International's "Advanced Materials & Processes" (December 1999), the general terms of bronze and brass cover the following alloys:

(1) wrought copper-base alloys

(-a) C20500–C28580 — brasses (Cu–Zn)

(-b) C31200–C38590 — leaded brasses (Cu–Zn–Pb)

(-c) C40400–C49080 — tin brasses (Cu–Zn–Sn–Pb)

(-d) C60600–C64400 — aluminum bronzes (Cu–Al–Ni–Fe–Si–Sn)

(-e) C64700–C66100 — silicon bronzes (Cu–Si–Sn)

(2) cast copper-base alloys

(-a) C83300–C85800 — red and leaded red brasses (Cu–Zn–Sn–Pb)

(-b) C86100–C86800 — manganese bronzes and leaded manganese bronzes (Cu–Zn–Mn–Fe–Pb)

(-c) C90200–C94500 — tin bronzes and leaded tin bronzes (Cu–Sn–Zn–Pb)

(-d) C95300–C95810 — aluminum bronzes (Cu–Al–Fe–Ni)

This guidance should help define which group of A/B/C values of thermal expansion to select for a given brass or bronze.

(d) Table TE-4 provides thermal expansion values for nickel alloys and refractory alloys. The thermal expansion value sets for the nickel alloys are arranged by increasing UNS NXXXXX numbers.

(e) Table TE-5 provides thermal expansion values for two groupings of titanium-base alloys. One group covers only Grade 9; the other group covers the other alloys. In this Table, there is no reference to the UNS number, just to the grade number.

4.2 TABLE TCD

Table TCD provides both thermal conductivity (TC) and thermal diffusivity (TD) values for numerous ferrous and nonferrous materials and material groupings. The table begins with ferrous materials, split into groups of carbon and low alloy steels, followed by groups of high chromium steels and groups of high alloy steels. For each

of these groups, there is a listing of nominal composition designations found at the end of the table, defining the extent of coverage.

The next series of materials are the nickel-base alloys, covered by TC/TD listings for nickel alloys (arranged by increasing UNS number) and refractory alloys. Then there are TC/TD listings for individual titanium and aluminum alloys (arranged by increasing UNS number). Table TCD does not currently provide values for copper or zirconium alloys.

4.3 TABLE TM

Table TM provides moduli of elasticity for five categories of materials, as follows:

(a) Table TM-1 covers ferrous materials in nine general categories and with additional lines for specific materials. Groups A through G are subdivided by nominal composition; see the Notes at the end of Table TM-1.

(b) Table TM-2 covers aluminum alloys, listed by UNS number designation.

(c) Table TM-3 covers copper alloys, listed by UNS number designation.

(d) Table TM-4 covers nickel alloys, listed by UNS number designation.

(e) Table TM-5 covers titanium alloys, listed by increasing grade numbers, and zirconium-base alloys, listed by increasing UNS number (or grade) designation.

4.4 TABLE PRD

Table PRD provides Poisson's ratio and density for ferrous and nonferrous alloys.

5 REFERENCES

The official reference for UNS numbers is *Metals & Alloys in the Unified Numbering System*, ASTM DS-56. This document is periodically updated as various material specifications are revised, added, or deleted by their sponsoring organizations. Only UNS numbers published in this reference appear in Section II, Part A and Part B specifications, and in the various Section II, Part D stress tables, mechanical property tables, and physical property tables.

Nominal compositions are defined by various groups within the ASME Code committee structure and there are no published guidelines describing how these designations are developed. These designations have the greatest relevance in the arrangement of ferrous materials and, as indicated previously, the simplest way to obtain these designations is to look in Section IX of the ASME Boiler and Pressure Vessel Code and use Table QW/QB-422, which is arranged by increasing specification number. These start with the "SA" specification numbers, followed by the "SB" numbers.

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Table 1A
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
	1	Carbon steel	Sheet	SA–1008	CS–A	...	...	...	1	1
	2	Carbon steel	Sheet	SA–1008	CS–B	...	...	...	1	1
	3	Carbon steel	Bar	SA–675	45	...	...	...	1	1
	4	Carbon steel	Wld. pipe	SA–134	A283A	...	...	...	1	1
(**23**)	5	...	...	...	...	...	...	...	...	...
	6	Carbon steel	Plate	SA–285	A	K01700	...	...	1	1
	7	Carbon steel	Wld. pipe	SA–672	A45	K01700	...	...	1	1
	8	Carbon steel	Sheet	SA–414	A	K01501	...	...	1	1
	9	Carbon steel	Wld. tube	SA–178	A	K01200	...	...	1	1
	10	Carbon steel	Wld. tube	SA–178	A	K01200	...	...	1	1
	11	Carbon steel	Smls. tube	SA–179	...	K01200	...	...	1	1
	12	Carbon steel	Smls. tube	SA–192	...	K01201	...	...	1	1
	13	Carbon steel	Wld. tube	SA–214	...	K01807	...	...	1	1
	14	Carbon steel	Smls. tube	SA–556	A2	K01807	...	...	1	1
	15	Carbon steel	Wld. tube	SA–557	A2	K01807	...	...	1	1
	16	Carbon steel	Wld. pipe	SA–53	E/A	K02504	...	...	1	1
	17	Carbon steel	Wld. pipe	SA–53	E/A	K02504	...	...	1	1
	18	Carbon steel	Wld. pipe	SA–53	E/A	K02504	...	...	1	1
	19	Carbon steel	Wld. pipe	SA–53	F/A	...	...	...	1	1
	20	Carbon steel	Smls. pipe	SA–53	S/A	K02504	...	...	1	1
	21	Carbon steel	Smls. pipe	SA–53	S/A	K02504	...	...	1	1
	22	Carbon steel	Smls. pipe	SA–106	A	K02501	...	...	1	1
	23	Carbon steel	Wld. pipe	SA–135	A	...	...	...	1	1
	24	Carbon steel	Forged pipe	SA–369	FPA	K02501	...	...	1	1
	25	Carbon steel	Wld. pipe	SA–587	...	K11500	...	...	1	1
	26	Carbon steel	Wld. pipe	SA–587	...	K11500	...	...	1	1
	27	Carbon steel	Bar	SA–675	50	...	...	...	1	1
	28	Carbon steel	Bar	SA–675	50	...	...	...	1	1
	29	Carbon steel	Wld. pipe	SA–134	A283B	...	...	...	1	1
(**23**)	30	...	...	...	...	...	...	...	...	...
	31	Carbon steel	Plate	SA–285	B	K02200	...	...	1	1
	32	Carbon steel	Plate	SA–285	B	K02200	...	...	1	1
	33	Carbon steel	Wld. pipe	SA–672	A50	K02200	...	...	1	1
	34	Carbon steel	Sheet	SA–414	B	K02201	...	...	1	1
	35	Carbon steel	Plate	SA/EN 10028–3	P275NH	...	...	150 < *t* ≤ 250	1	1
	36	Carbon steel	Plate	SA/EN 10028–2	P235GH	...	...	≤60	1	1
	37	Carbon steel	Smls. tube	SA/EN 10216–2	P235GH	...	...	40 < *t* ≤ 60	1	1
	38	Carbon steel	Plate	SA/EN 10028–3	P275NH	...	...	100 < *t* ≤ 150	1	1
	39	Carbon steel	Smls. tube	SA/EN 10216–2	P235GH	...	...	16 < *t* ≤ 40	1	1
	40	Carbon steel	Smls. tube	SA/EN 10216–2	P235GH	...	...	*t* ≤ 16	1	1
	41	Carbon steel	Sheet, strip	SA–1011	36	SS	Type 1	*t* ≤ 6	...	...
	42	Carbon steel	Plate	SA/EN 10028–3	P275NH	...	...	60 < *t* ≤ 100	1	1
	43	Carbon steel	Sheet, strip	SA–1011	40	SS	...	*t* ≤ 6	...	...
	44	Carbon steel	Sheet, strip	SA–1011	45	HSLAS	2	...	...	...
	45	Carbon steel	Bar	SA–675	55	...	...	...	1	1

Table 1A
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	275	140	NP	NP	343	NP	CS–6	...
2	275	140	NP	NP	343	NP	CS–6	...
3	310	155	NP	343 (Cl. 3 only)	482	343	CS–6	G10, G22, T10
4	310	165	NP	149 (Cl. 3 only)	NP	NP	CS–1	W12
5	...	...	...	...	...	...	...	...
6	310	165	482	371	482	343	CS–1	G10, T2
7	310	165	NP	371	NP	NP	CS–1	S6, W10, W12
8	310	170	NP	NP	482	343	CS–1	G10, T2
9	325	180	538	NP	NP	NP	CS–1	G4, G10, S1, T2, W13
10	325	180	538	NP	538	343	CS–1	G3, G10, G24, S1, T2, W6
11	325	180	NP	NP	482	343	CS–1	G10, T2
12	325	180	538	NP	538	343	CS–1	G10, S1, T2
13	325	180	NP	NP	538	343	CS–1	G24, T2, W6
14	325	180	NP	NP	538	343	CS–1	G10, T2
15	325	180	NP	NP	538	343	CS–1	G24, T2, W6
16	330	205	482	NP	NP	NP	CS–2	G3, G10, S1, T2
17	330	205	482	149 (Cl. 3 only)	NP	NP	CS–2	G10, S1, T2, W12, W13
18	330	205	NP	NP	482	343	CS–2	G24, T2, W6
19	330	205	399	NP	NP	NP	CS–2	G2, G10, S10, T2, W15
20	330	205	482	149 (Cl. 3 only)	NP	NP	CS–2	G10, S1, T2
21	330	205	NP	371 (SPT)	482	343	CS–2	G10, T2
22	330	205	538	371	538	343	CS–2	G10, S1, T1
23	330	205	NP	NP	482	343	CS–2	G24, T2, W6
24	330	205	538	NP	NP	NP	CS–2	G10, S1, T1
25	330	205	NP	149 (Cl. 3 only)	NP	NP	CS–2	...
26	330	205	NP	NP	454	343	CS–2	G24, T2, W6
27	345	170	NP	343 (Cl. 3 only)	NP	NP	CS–1	...
28	345	170	454	371 (SPT)	482	343	CS–1	G10, G15, G22, S1, T2
29	345	185	NP	149 (Cl. 3 only)	NP	NP	CS–1	W12
30	...	...	...	...	...	...	...	...
31	345	185	482	NP	NP	NP	CS–1	G10, S1, T1
32	345	185	NP	371	482	343	CS–1	G10, T1
33	345	185	NP	371	NP	NP	CS–1	S6, T1, W10, W12
34	345	205	NP	NP	482	343	CS–2	G10, T1
35	350	215	NP	NP	204	NP	CS–2	G10
36	360	215	NP	NP	371	NP	CS–2	T11
37	360	215	538	NP	538	NP	CS–2	G10, S1, T2, W14
38	360	225	NP	NP	204	NP	CS–2	G10
39	360	225	538	NP	538	NP	CS–2	G10, S1, T2, W14
40	360	235	538	NP	538	NP	CS–2	G10, S1, T2, W14
41	365	250	NP	NP	316	316	CS–2	...
42	370	235	NP	NP	204	NP	CS–2	G10
43	380	275	NP	NP	316	316	CS–2	...
44	380	310	NP	NP	316	316	CS–3	...
45	380	190	454	371 (SPT)	482	343	CS–1	G10, G15, G22, S1, T2

Table 1A
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	78.6	78.6	78.6	78.6	78.6	78.6	76.0	71.6	69.6	67.8	...	...	...	...	...
2	78.6	78.6	78.6	78.6	78.6	78.6	76.0	71.6	69.6	67.8	...	...	...	...	...
3	88.9	88.9	88.9	88.9	88.9	88.4	85.0	80.7	78.4	75.8	73.5	71.5	*64.0*	*56.1*	*44.5*
4	88.9	88.9	88.9	88.9	88.9	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	88.9	88.9	88.9	88.9	88.9	88.9	88.9	86.3	83.8	81.4	78.8	*73.4*	*64.0*	*56.1*	*44.5*
7	88.9	88.9	88.9	88.9	88.9	88.9	88.9	86.3	83.8	81.4	78.8	...	...	...	...
8	88.9	88.9	88.9	88.9	88.9	88.9	88.9	88.5	87.5	84.8	81.2	*73.4*	*64.0*	*56.1*	*44.5*
9	92.4	92.4	92.4	92.4	92.4	92.4	92.4	91.9	90.7	87.8	84.3	*73.3*	*63.9*	*56.2*	*44.5*
10	78.6	78.6	78.6	78.6	78.6	78.6	78.6	78.1	77.1	74.7	71.4	*62.3*	*54.2*	*47.6*	*37.7*
11	92.4	92.4	92.4	92.4	92.4	92.4	92.4	91.9	90.7	87.8	84.3	*73.3*	*63.9*	*56.2*	*44.5*
12	92.4	92.4	92.4	92.4	92.4	92.4	92.4	91.9	90.7	87.8	84.3	*73.3*	*63.9*	*56.2*	*44.5*
13	78.6	78.6	78.6	78.6	78.6	78.6	78.6	78.1	77.1	74.7	71.4	*62.3*	*54.2*	*47.6*	*37.7*
14	92.4	92.4	92.4	92.4	92.4	92.4	92.4	91.9	90.7	87.8	84.3	*73.3*	*63.9*	*56.2*	*44.5*
15	78.6	78.6	78.6	78.6	78.6	78.6	78.6	78.1	77.1	74.7	71.4	*62.3*	*54.2*	*47.6*	*37.7*
16	80.7	80.7	80.7	80.7	80.7	80.7	80.7	80.7	80.7	79.8	71.6	*62.3*	*53.7*	*43.9*	*32.9*
17	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	93.5	84.5	*73.3*	*62.8*	*51.2*	*38.3*
18	80.7	80.7	80.7	80.7	80.7	80.7	80.7	80.7	80.7	79.8	71.6	*62.4*	*54.9*	*47.5*	*40.1*
19	56.5	56.5	56.5	56.5	56.5	56.5	56.5	56.5	56.5	56.0	50.7	*43.8*	...	...	...
20	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	93.5	84.5	*73.3*	*62.8*	*51.2*	*38.3*
21	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	93.6	84.4	*73.3*	*64.7*	*56.0*	*47.6*
22	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	93.6	*84.4*	*73.3*	*64.7*	*56.0*	*47.6*
23	80.7	80.7	80.7	80.7	80.7	80.7	80.7	80.7	80.7	79.8	71.6	*62.4*	*54.9*	*47.5*	*40.1*
24	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	93.5	*84.5*	*73.3*	*62.8*	*51.2*	*38.3*
25	94.5	94.5	94.5	94.5	94.5	...	...	...	...	...	...	...	...	...	...
26	80.7	80.7	80.7	80.7	80.7	80.7	80.7	80.7	80.7	79.8	71.6	*62.4*	*54.9*	*47.5*	*40.1*
27	98.6	98.6	98.6	98.6	98.6	98.1	94.7	89.8	87.3	84.9	...	...	...	...	...
28	98.6	98.6	98.6	98.6	98.6	98.1	94.7	89.8	87.3	84.9	81.2	*73.4*	*64.7*	*56.0*	*47.3*
29	98.6	98.6	98.6	98.6	98.6	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	98.6	98.6	98.6	98.6	98.6	98.6	98.6	96.6	94.1	90.7	*85.0*	*75.4*	*65.6*	*52.8*	*38.6*
32	98.6	98.6	98.6	98.6	98.6	98.6	98.6	96.6	94.1	90.6	*85.1*	*76.8*	*66.8*	*57.8*	*44.9*
33	98.6	98.6	98.6	98.6	98.6	98.6	98.6	96.6	94.1	90.6	*85.1*	...	...	...	...
34	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	96.9	*84.5*	*76.8*	*66.8*	*57.7*	*44.9*
35	100	100	100	100	100	100	...	...	...	...	...	...	...	...	...
36	103	103	103	103	103	103	103	103	103	*96.8*	*85.0*	...	...	...	...
37	103	103	103	103	103	103	103	103	103	103	102	*89.1*	*75.4*	*62.6*	*45.5*
38	103	103	103	103	103	103	...	...	...	...	...	...	...	...	...
39	103	103	103	103	103	103	103	103	103	103	102	*89.1*	*75.4*	*62.6*	*45.5*
40	103	103	103	103	103	103	103	103	103	103	102	*89.1*	*75.4*	*62.6*	*45.5*
41	104	104	104	104	104	104	104	104	104	104	...	...	...	...	...
42	105	105	105	105	105	105	...	...	...	...	...	...	...	...	...
43	108	108	108	108	108	108	108	108	108	108	...	...	...	...	...
44	108	108	108	108	108	108	108	108	108	108	...	...	...	...	...
45	108	108	108	108	108	108	104	98.8	96.1	92.9	89.9	*87.3*	*75.4*	*62.5*	*46.0*

Table 1A
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	*31.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
6	*31.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	*31.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	*31.9*	*21.8*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	*27.1*	*18.5*	*10.6*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	*31.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	*31.9*	*21.8*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	*27.1*	*18.5*	*10.6*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	*31.9*	*21.8*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	*27.1*	*18.5*	*10.6*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	*21.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	*25.3*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	*32.6*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	*25.3*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	*36.2*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	*36.2*	*23.5*	*11.2*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	*32.6*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	*25.3*	*14.9*	*5.88*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	*38.6*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
31	*24.3*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	*30.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	*30.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	*28.2*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
	1	Carbon steel	Bar	SA–675	55	...	...	...	1	1
	2	Carbon steel	Wld. pipe	SA–134	A283C	K02401	...	...	1	1
	3	Carbon steel	Plate	SA–283	C	K02401	...	...	1	1
	4	Carbon steel	Plate	SA–285	C	K02801	...	...	1	1
	5	Carbon steel	Smls. & wld. pipe	SA–333	1	K03008	...	...	1	1
	6	Carbon steel	Smls. & wld. tube	SA–334	1	K03008	...	...	1	1
	7	Carbon steel	Wld. tube	SA–334	1	K03008	...	...	1	1
	8	Carbon steel	Plate	SA–516	55	K01800	...	...	1	1
	9	Carbon steel	Smls. pipe	SA–524	II	K02104	...	...	1	1
	10	Carbon steel	Wld. pipe	SA–671	CA55	K02801	...	...	1	1
	11	Carbon steel	Wld. pipe	SA–671	CE55	K02202	...	...	1	1
	12	Carbon steel	Wld. pipe	SA–672	A55	K02801	...	...	1	1
	13	Carbon steel	Wld. pipe	SA–672	B55	K02001	...	...	1	1
	14	Carbon steel	Wld. pipe	SA–672	C55	K01800	...	...	1	1
	15	Carbon steel	Wld. pipe	SA–672	E55	K02202	...	...	1	1
	16	Carbon steel	Sheet	SA–414	C	K02503	...	...	1	1
	17	Carbon steel	Plate	SA/EN 10028–3	P275NH	...	...	≤60	1	1
	18	Carbon steel	Bar	SA–36	...	K02600	...	...	1	1
	19	Carbon steel	Plate, sheet	SA–36	...	K02600	...	...	1	1
	20	Carbon steel	Plate, sheet	SA–662	A	K01701	...	...	1	1
(**23**)	21	Carbon steel	Sheet, strip	SA–1011	36	SS	Type 2	$t \le 6$	...	...
	22	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250A	...	...	$t > 40$	1	1
	23	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250BR	...	...	$t > 40$	1	1
(**23**)	24	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250 B0	...	...	$t > 40$	1	1
	25	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250C	...	...	$t > 40$	1	1
	26	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250A	...	...	$20 < t \le 40$	1	1
	27	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250BR	...	...	$20 < t \le 40$	1	1
(**23**)	28	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250 B0	...	...	$20 < t \le 40$	1	1
	29	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250C	...	...	$20 < t \le 40$	1	1
	30	Carbon steel	Plate	SA/EN 10028–2	P265GH	...	...	≤60	1	1
	31	Carbon steel	Smls. tube	SA/EN 10216–2	P265GH	...	...	$40 < t \le 60$	1	1
	32	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250A	...	...	$t \le 20$	1	1
	33	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250BR	...	...	$t \le 20$	1	1
(**23**)	34	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250 B0	...	...	$t \le 20$	1	1
	35	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250C	...	...	$t \le 20$	1	1
	36	Carbon steel	Smls. tube	SA/EN 10216–2	P265GH	...	...	$16 < t \le 40$	1	1
	37	Carbon steel	Smls. tube	SA/EN 10216–2	P265GH	...	...	$t \le 16$	1	1
	38	Carbon steel	Forgings	SA–181	...	K03502	60	...	1	1
	39	Carbon steel	Castings	SA–216	WCA	J02502	...	...	1	1
	40	Carbon steel	Forgings	SA–266	1	K03506	...	...	1	1
	41	Carbon steel	Forgings	SA–350	LF1	K03009	1	...	1	1
	42	Carbon steel	Castings	SA–352	LCA	J02504	...	...	1	1
	43	Carbon steel	Cast pipe	SA–660	WCA	J02504	...	...	1	1
	44	Carbon steel	Bar	SA–675	60	...	...	...	1	1
	45	Carbon steel	Bar	SA–675	60	...	...	...	1	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	380	190	NP	343 (Cl. 3 only)	NP	NP	CS–1	...
2	380	205	NP	149 (Cl. 3 only)	NP	NP	CS–2	W12
3	380	205	NP	149 (Cl. 3 only)	343	343	CS–2	...
4	380	205	482	371	482	343	CS–2	G10, S1, T2
5	380	205	NP	371	343	343	CS–2	W12, W14
6	380	205	NP	371	343	343	CS–2	W12, W14
7	380	205	NP	NP	343	343	CS–2	G24, W6
8	380	205	454	371	538	343	CS–2	G10, S1, T2
9	380	205	NP	NP	538	343	CS–2	G10, T2
10	380	205	NP	371	NP	NP	CS–2	S6, W10, W12
11	380	205	NP	371	NP	NP	CS–2	S6, W10, W12
12	380	205	NP	371	NP	NP	CS–2	S6, W10, W12
13	380	205	NP	371	NP	NP	CS–2	S6, W10, W12
14	380	205	NP	371	NP	NP	CS–2	S6, W10, W12
15	380	205	NP	371	NP	NP	CS–2	S6, W10, W12
16	380	230	NP	371	482	343	CS–2	G10, T1
17	390	...	NP	NP	204	204	CS–2	G10, G18
18	400	250	343	343 (SPT)	482	343	CS–2	G10, G15, T1
19	400	250	NP	371	343	343	CS–2	G9, G10, T1
20	400	275	NP	NP	371	343	CS–2	T1
21	400	250	NP	NP	316	316	CS–2	...
22	410	230	NP	NP	343	343	CS–2	...
23	410	230	NP	NP	343	343	CS–2	...
24	410	230	NP	NP	343	343	CS–2	...
25	410	230	NP	NP	343	NP	CS–2	...
26	410	240	NP	NP	343	343	CS–2	...
27	410	240	NP	NP	343	343	CS–2	...
28	410	240	NP	NP	343	343	CS–2	...
29	410	240	NP	NP	343	343	CS–2	...
30	410	245	NP	NP	371	NP	CS–2	T1
31	410	245	538	NP	538	NP	CS–2	G10, S1, T1
32	410	250	NP	NP	343	343	CS–2	...
33	410	250	NP	NP	343	343	CS–2	...
34	410	250	NP	NP	343	343	CS–2	...
35	410	250	NP	NP	343	343	CS–2	...
36	410	255	538	NP	538	NP	CS–2	G10, S1, T1
37	410	265	538	NP	538	NP	CS–2	G10, S1, T1
38	415	205	538	371	538	343	CS–2	G10, S1, T2
39	415	205	538	371	538	343	CS–2	G1, G10, G17, S1, T2
40	415	205	538	371	538	343	CS–2	G10, S1, T2
41	415	205	NP	371	538	343	CS–2	G10, T2
42	415	205	NP	371	NP	NP	CS–2	G17
43	415	205	538	371	NP	NP	CS–2	G1, G10, G17, S1, T2
44	415	205	454	371 (SPT)	NP	NP	CS–2	G10, G15, S1, T2
45	415	205	NP	343 (Cl. 3 only)	482	343	CS–2	G10, G22, T2

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	108	108	108	108	108	108	104	98.8	96.1	92.9	...	...	...	...	...
2	108	108	108	108	108	...	...	...	...	...	...	...	...	...	...
3	108	108	108	108	108	108	108	107	104	101	...	...	...	...	...
4	108	108	108	108	108	108	108	107	104	101	97.8	*89.1*	*75.4*	*62.6*	*45.5*
5	108	108	108	108	108	108	108	107	104	101	97.8	...	...	...	...
6	108	108	108	108	108	108	108	107	104	101	97.8	...	...	...	...
7	92.4	92.4	92.4	92.4	92.4	92.4	92.4	90.8	88.7	86.2	...	...	...	...	...
8	108	108	108	108	108	108	108	107	104	101	97.8	*89.1*	*75.4*	*62.6*	*45.5*
9	108	108	108	108	108	108	108	107	104	101	97.8	*89.1*	*75.4*	*62.6*	*45.5*
10	108	108	108	108	108	108	108	107	104	101	97.8	...	...	...	...
11	108	108	108	108	108	108	108	107	104	101	97.8	...	...	...	...
12	108	108	108	108	108	108	108	107	104	101	97.8	...	...	...	...
13	108	108	108	108	108	108	108	107	104	101	97.8	...	...	...	...
14	108	108	108	108	108	108	108	107	104	101	97.8	...	...	...	...
15	108	108	108	108	108	108	108	107	104	101	97.8	...	...	...	...
16	108	108	108	108	108	108	108	108	108	108	*106*	*88.8*	*75.2*	*62.6*	*45.9*
17	111	111	111	111	111	111	...	...	...	...	...	...	...	...	...
18	114	114	114	114	114	114	114	114	114	114	*105*	*88.9*	*75.3*	*62.6*	*45.9*
19	114	114	114	114	114	114	114	114	114	114	*105*	...	...	...	...
20	114	114	114	114	114	114	114	114	114	114	*105*	...	...	...	...
21	114	114	114	114	114	114	114	114	114	114	...	...	...	...	...
22	117	117	117	117	117	117	117	117	116	113	...	...	...	...	...
23	117	117	117	117	117	117	117	117	116	113	...	...	...	...	...
24	117	117	117	117	117	117	117	117	116	113	...	...	...	...	...
25	117	117	117	117	117	117	117	117	116	113	...	...	...	...	...
26	117	117	117	117	117	117	117	117	117	117	...	...	...	...	...
27	117	117	117	117	117	117	117	117	117	117	...	...	...	...	...
28	117	117	117	117	117	117	117	117	117	117	...	...	...	...	...
29	117	117	117	117	117	117	117	117	117	117	...	...	...	...	...
30	117	117	117	117	117	117	117	117	117	117	*106*	...	...	...	...
31	117	117	117	117	117	117	117	117	117	117	*105*	*88.9*	*75.3*	*62.7*	*45.5*
32	117	117	117	117	117	117	117	117	117	117	...	...	...	...	...
33	117	117	117	117	117	117	117	117	117	117	...	...	...	...	...
34	117	117	117	117	117	117	117	117	117	117	...	...	...	...	...
35	117	117	117	117	117	117	117	117	117	117	...	...	...	...	...
36	117	117	117	117	117	117	117	117	117	117	*105*	*88.9*	*75.3*	*62.7*	*45.5*
37	117	117	117	117	117	117	117	117	117	117	*105*	*88.9*	*75.3*	*62.7*	*45.5*
38	118	118	118	118	118	118	114	107	104	101	97.8	*89.1*	*75.4*	*62.6*	*45.5*
39	118	118	118	118	118	118	114	107	104	101	97.8	*89.1*	*75.4*	*62.6*	*45.5*
40	118	118	118	118	118	118	114	107	104	101	97.8	*89.1*	*75.4*	*62.6*	*45.5*
41	118	118	118	118	118	118	114	107	104	101	97.8	*89.1*	*75.4*	*62.6*	*45.5*
42	118	118	118	118	118	118	114	107	104	101	97.8	...	...	...	...
43	118	118	118	118	118	118	114	107	104	101	97.8	*89.1*	*75.4*	*62.6*	*45.5*
44	118	118	118	118	118	118	114	107	104	101	97.8	*89.1*	*75.4*	*62.6*	*45.5*
45	118	118	118	118	118	118	114	107	104	101	97.8	*89.1*	*75.4*	*62.6*	*45.5*

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	*31.6*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	*28.2*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	*28.2*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	*31.6*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
	1	Carbon steel	Forgings	SA–765	I	K03046	...	...	1	1
	2	Carbon steel	Plate	SA–515	60	K02401	...	...	1	1
	3	Carbon steel	Plate	SA–516	60	K02100	...	...	1	1
	4	Carbon steel	Wld. pipe	SA–671	CB60	K02401	...	...	1	1
	5	Carbon steel	Wld. pipe	SA–671	CC60	K02100	...	...	1	1
	6	Carbon steel	Wld. pipe	SA–671	CE60	K02402	...	...	1	1
	7	Carbon steel	Wld. pipe	SA–672	B60	K02401	...	...	1	1
	8	Carbon steel	Wld. pipe	SA–672	C60	K02100	...	...	1	1
	9	Carbon steel	Wld. pipe	SA–672	E60	K02402	...	...	1	1
	10	Carbon steel	Wld. pipe	SA–134	A283D	K02702	...	...	1	1
	11	Carbon steel	Plate	SA–283	D	K02702	...	...	1	1
	12	Carbon steel	Wld. pipe	SA–53	E/B	K03005	...	...	1	1
	13	Carbon steel	Wld. pipe	SA–53	E/B	K03005	...	...	1	1
	14	Carbon steel	Smls. pipe	SA–53	S/B	K03005	...	...	1	1
	15	Carbon steel	Smls. pipe	SA–53	S/B	K03005	...	...	1	1
	16	Carbon steel	Smls. pipe	SA–106	B	K03006	...	...	1	1
	17	Carbon steel	Wld. pipe	SA–135	B	...	...	...	1	1
	18	Carbon steel	Smls. & wld. fittings	SA–234	WPB	K03006	...	...	1	1
	19	Carbon steel	Smls. & wld. pipe	SA–333	6	K03006	...	...	1	1
	20	Carbon steel	Wld. pipe	SA–333	6	K03006	...	...	1	1
	21	Carbon steel	Smls. & wld. tube	SA–334	6	K03006	...	...	1	1
	22	Carbon steel	Wld. tube	SA–334	6	K03006	...	...	1	1
	23	Carbon steel	Forged pipe	SA–369	FPB	K03006	...	...	1	1
	24	Carbon steel	Forgings	SA–372	A	K03002	...	...	1	1
	25	Carbon steel	Sheet	SA–414	D	K02505	...	...	1	1
	26	Carbon steel	Smls. & wld. fittings	SA–420	WPL6	...	...	...	1	1
	27	Carbon steel	Smls. pipe	SA–524	I	K02104	...	...	1	1
	28	Carbon steel	Bar	SA–696	B	K03200	...	...	1	1
(**23**)	29	Carbon steel	Forgings	SA–727	...	K02506	...	...	1	1
	30	Carbon steel	Wld. tube	SA–178	C	K03503	...	...	1	1
	31	Carbon steel	Wld. tube	SA–178	C	K03503	...	...	1	1
	32	Carbon steel	Wld. tube	SA–178	C	K03503	...	...	1	1
	33	Carbon steel	Smls. tube	SA–210	A–1	K02707	...	...	1	1
	34	Carbon steel	Smls. tube	SA–556	B2	K02707	...	...	1	1
	35	Carbon steel	Wld. tube	SA–557	B2	K03007	...	...	1	1
	36	Carbon steel	Plate, bar	SA/CSA–G40.21	38W	...	...	...	1	1
(**23**)	37	Carbon steel	Plate, sheet, bar	SA–572	42	...	...	$t \le 150$	...	...
(**23**)	38	Carbon steel	Sheet, strip	SA–1011	45	HSLAS	1	...	...	...
(**23**)	39	Carbon steel	Sheet, strip	SA–1011	45	SS	...	$t \le 6$	...	...
(**23**)	40	Carbon steel	Sheet, strip	SA–1011	50	HSLAS	2	...	...	...
	41	Carbon steel	Plate	SA/AS 1548	PT430N	...	Normalized	≤150	1	1
	42	Carbon steel	Plate	SA/AS 1548	PT430NR	...	Norm. rld.	≤150	1	1
	43	Carbon steel	Plate	SA/EN 10028–2	P295GH	...	...	$150 < t \le 250$	1	1
	44	Carbon steel	Plate	SA/EN 10028–2	P295GH	...	...	$100 < t \le 150$	1	1
	45	Carbon steel	Bar	SA–675	65	...	...	...	1	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	415	205	NP	NP	538	343	CS-2	G10, T2
2	415	220	538	371	538	343	CS-2	G10, S1, T2
3	415	220	454	371	538	343	CS-2	G10, S1, T2
4	415	220	NP	371	NP	NP	CS-2	S6, W10, W12
5	415	220	NP	371	NP	NP	CS-2	S6, W10, W12
6	415	220	NP	371	NP	NP	CS-2	S6, W10, W12
7	415	220	NP	371	NP	NP	CS-2	S6, W10, W12
8	415	220	NP	371	NP	NP	CS-2	S6, W10, W12
9	415	220	NP	371	NP	NP	CS-2	S6, W10, W12
10	415	230	NP	149 (Cl. 3 only)	NP	NP	CS-2	W12
11	415	230	NP	149 (Cl. 3 only)	343	343	CS-2	...
12	415	240	482	149 (Cl. 3 only)	NP	NP	CS-2	G10, S1, T1, W12, W13
13	415	240	482	NP	482	343	CS-2	G3, G10, G24, S1, T1, W6
14	415	240	482	149 (Cl. 3 only)	NP	NP	CS-2	G10, S1, T1
15	415	240	NP	371 (SPT)	482	343	CS-2	G10, T1
16	415	240	538	371	538	343	CS-2	G10, S1, T1
17	415	240	NP	NP	482	343	CS-2	G24, T1, W6
18	415	240	538	371	538	343	CS-2	G10, S1, T1
19	415	240	371	371	538	343	CS-2	G10, T1, W12, W13, W14
20	415	240	371	NP	NP	NP	CS-2	T1
21	415	240	NP	371	343	343	CS-2	T1, W12, W14
22	415	240	NP	NP	343	343	CS-2	G24, W6
23	415	240	538	NP	NP	NP	CS-2	G10, S1, T1
24	415	240	NP	NP	343	343	CS-2	...
25	415	240	NP	NP	482	343	CS-2	G10, T1
26	415	240	NP	371	454	343	CS-2	G10, T1, W14
27	415	240	NP	NP	538	343	CS-2	G10, T1
28	415	240	NP	371	NP	NP	CS-2	T1
29	415	250	NP	371	538	343	CS-2	G10, T1
30	415	255	538	NP	NP	NP	CS-2	G4, G10, S1, T2
31	415	255	538	371	NP	NP	CS-2	G10, S1, T1, W13
32	415	255	538	NP	538	343	CS-2	G3, G10, G24, S1, T2, W6
33	415	255	538	371	538	343	CS-2	G10, S1, T1
34	415	255	NP	NP	538	343	CS-2	G10, T1
35	415	255	NP	NP	538	343	CS-2	G24, T1, W6
36	415	260	NP	NP	343	343	CS-2	...
37	415	290	NP	NP	316	316	CS-3	...
38	410	310	NP	NP	316	316	CS-3	...
39	410	310	NP	NP	316	316	CS-3	...
40	410	340	NP	NP	316	316	CS-3	...
41	430	...	538	NP	538	NP	CS-2	G10, G18, S1, T1
42	430	...	538	NP	538	NP	CS-2	G10, G18, S1, T1
43	430	220	454	NP	538	NP	CS-2	G10, S1, T2
44	440	235	454	NP	538	NP	CS-2	G10, S1, T2
45	450	225	454	343 (Cl. 3 only)	538	343	CS-2	G10, G15, G22, S1, T2

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
No.	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	118	118	118	118	118	118	114	107	104	101	97.8	*89.1*	*75.4*	*62.6*	*45.5*
2	118	118	118	118	118	118	118	115	112	108	104	*88.9*	*75.3*	*62.7*	*45.5*
3	118	118	118	118	118	118	118	115	112	108	104	*88.9*	*75.3*	*62.7*	*45.5*
4	118	118	118	118	118	118	118	115	112	108	104	...	...	...	...
5	118	118	118	118	118	118	118	115	112	108	104	...	...	...	...
6	118	118	118	118	118	118	118	115	112	108	104	...	...	...	...
7	118	118	118	118	118	118	118	115	112	108	104	...	...	...	...
8	118	118	118	118	118	118	118	115	112	108	104	...	...	...	...
9	118	118	118	118	118	118	118	115	112	108	104	...	...	...	...
10	118	118	118	118	118	...	...	...	...	...	...	...	...	...	...
11	118	118	118	118	118	118	118	118	115	111	...	...	...	...	...
12	118	118	118	118	118	118	118	118	118	117	*105*	*88.9*	*75.3*	*62.7*	*45.5*
13	101	101	101	101	101	101	101	101	101	99.7	*89.7*	*75.9*	*64.1*	*53.3*	*38.6*
14	118	118	118	118	118	118	118	118	118	117	*105*	*88.9*	*75.3*	*62.7*	*45.5*
15	118	118	118	118	118	118	118	118	118	117	*105*	*88.9*	*75.3*	*62.7*	*45.5*
16	118	118	118	118	118	118	118	118	118	117	*105*	*88.9*	*75.3*	*62.7*	*45.5*
17	101	101	101	101	101	101	101	101	101	99.7	*89.7*	*75.9*	*64.1*	*53.3*	*38.6*
18	118	118	118	118	118	118	118	118	118	117	*105*	*88.9*	*75.3*	*62.7*	*45.5*
19	118	118	118	118	118	118	118	118	118	117	*105*	*88.9*	*75.3*	*62.7*	*45.5*
20	101	101	101	101	101	101	101	101	101	99.7	*89.7*	...	...	...	...
21	118	118	118	118	118	118	118	118	118	117	*105*	...	...	...	...
22	101	101	101	101	101	101	101	101	101	101	...	...	...	...	...
23	118	118	118	118	118	118	118	118	118	117	*105*	*88.9*	*75.3*	*62.7*	*45.5*
24	118	118	118	118	118	118	118	118	118	118	...	...	...	...	...
25	118	118	118	118	118	118	118	118	118	117	*105*	*88.9*	*75.3*	*62.7*	*45.5*
26	118	118	118	118	118	118	118	118	118	117	*105*	*88.9*	*75.3*	*62.7*	*45.5*
27	118	118	118	118	118	118	118	118	118	117	*105*	*88.9*	*75.3*	*62.7*	*45.5*
28	118	118	118	118	118	118	118	118	118	117	*105*	...	...	...	...
29	118	118	118	118	118	118	118	118	118	117	*105*	*88.9*	*75.3*	*62.7*	*45.5*
30	118	118	118	118	118	118	118	118	118	117	105	*88.9*	*75.2*	*63.2*	*40.5*
31	118	118	118	118	118	118	118	118	118	117	*105*	*88.9*	*75.3*	*62.7*	*45.5*
32	101	101	101	101	101	101	101	101	101	99.7	89.7	*75.9*	*64.1*	*53.3*	*38.6*
33	118	118	118	118	118	118	118	118	118	117	*105*	*88.9*	*75.3*	*62.7*	*45.5*
34	118	118	118	118	118	118	118	118	118	117	*105*	*88.9*	*75.3*	*62.7*	*45.5*
35	101	101	101	101	101	101	101	101	101	99.7	*89.7*	*75.9*	*64.1*	*53.3*	*38.6*
36	118	118	118	118	118	118	118	118	118	118	...	...	...	...	...
37	118	118	118	118	118	118	118	118	118	...	...	...	...	...	...
38	118	118	118	118	118	118	118	118	118	...	...	...	...	...	...
39	118	118	118	118	118	118	118	118	118	...	...	...	...	...	...
40	118	118	118	118	118	118	118	118	118	...	...	...	...	...	...
41	123	123	123	123	123	123	123	123	123	123	*114*	*95.0*	*79.6*	*63.2*	*45.3*
42	123	123	123	123	123	123	123	123	123	123	*114*	*95.0*	*79.6*	*63.2*	*45.3*
43	123	123	123	123	123	123	121	114	111	108	105	*96.2*	*79.1*	*62.1*	*46.0*
44	126	126	126	126	126	126	126	122	119	115	112	*96.2*	*79.1*	*62.1*	*46.0*
45	128	128	128	128	128	128	123	117	113	110	106	*95.2*	*79.6*	*63.8*	*39.2*

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	*31.6*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	*26.8*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	*31.6*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	*31.6*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	*26.8*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	*31.6*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
30	*26.2*	*18.8*	*10.5*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	*26.8*	*18.6*	*10.5*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	*31.6*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	*26.8*	*18.6*	*10.5*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
41	*31.7*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	*31.7*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	*32.1*	*21.2*	*14.4*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	*32.1*	*21.2*	*14.4*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	*30.1*	*22.4*	*12.5*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	Carbon steel	Castings	SA–352	LCB	J03003	...	...	1	1
2	Carbon steel	Plate	SA–515	65	K02800	...	...	1	1
3	Carbon steel	Plate	SA–516	65	K02403	...	...	1	1
4	Carbon steel	Wld. pipe	SA–671	CB65	K02800	...	...	1	1
5	Carbon steel	Wld. pipe	SA–671	CC65	K02403	...	...	1	1
6	Carbon steel	Wld. pipe	SA–672	B65	K02800	...	...	1	1
7	Carbon steel	Wld. pipe	SA–672	C65	K02403	...	...	1	1
8	Carbon steel	Sheet	SA–414	E	K02704	...	...	1	1
9	Carbon steel	Plate	SA–662	B	K02203	...	...	1	1
10	Carbon steel	Plate	SA–537	...	K12437	1	65 < t ≤ 100	1	2
11	Carbon steel	Wld. pipe	SA–691	CMSH–70	K12437	...	65 < t ≤ 100	1	2
12	Carbon steel	Plate, bar	SA/CSA–G40.21	44W	...	...	t ≤ 200	1	1
13	Carbon steel	Plate, bar	SA/CSA–G40.21	50W	...	...	t ≤ 150	1	1
14	Carbon steel	Plate, sheet, bar	SA–572	50	...	...	t ≤ 100	...	...
15	Carbon steel	Round bar	SA–572	50	...	...	t ≤ 275	...	...
16	Carbon steel	Sheet, strip	SA–1011	50	SS	...	t ≤ 6	...	...
17	Carbon steel	Sheet, strip	SA–1011	50	HSLAS	1	...	...	...
18	Carbon steel	Sheet, strip	SA–1011	55	HSLAS	2	...	...	...
19	Carbon steel	Plate	SA/AS 1548	PT460N	...	Normalized	≤150	1	1
20	Carbon steel	Plate	SA/AS 1548	PT460NR	...	Norm. rld.	≤150	1	1
21	Carbon steel	Forgings	SA/EN 10222–2	P280GH	...	NT or QT	35 < t ≤ 160	1	1
22	Carbon steel	Plate	SA/EN 10028–2	P295GH	...	...	60 < t ≤ 100	1	1
23	Carbon steel	Plate	SA/EN 10028–2	P295GH	...	...	≤60	1	1
24	Carbon steel	Forgings	SA/EN 10222–2	P280GH	...	Normalized	t ≤ 35	1	1
25	Carbon steel	Plate	SA/GB 713	Q345R	...	...	150 < t ≤ 250	1	2
26	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	150 < t ≤ 250	1	2
27	Carbon steel	Plate	SA/GB 713	Q345R	...	...	100 < t ≤ 150	1	2
28	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	100 < t ≤ 150	1	2
29	Carbon steel	Plate	SA–455	...	K03300	...	15 < t ≤ 20	1	2
30	Carbon steel	Bar	SA–675	70	...	...	...	1	2
31	Carbon steel	Forgings	SA–105	...	K03504	...	...	1	2
32	Carbon steel	Forgings	SA–181	...	K03502	70	...	1	2
33	Carbon steel	Castings	SA–216	WCB	J03002	...	...	1	2
34	Carbon steel	Forgings	SA–266	2	K03506	...	...	1	2
35	Carbon steel	Forgings	SA–266	4	K03017	...	...	1	2
36	Carbon steel	Forgings	SA–350	LF2	K03011	1	...	1	2
37	Carbon steel	Forgings	SA–350	LF2	K03011	2	...	1	2
38	Carbon steel	Forgings	SA–508	1	K13502	...	...	1	2
39	Carbon steel	Forgings	SA–508	1A	K13502	...	...	1	2
40	Carbon steel	Forgings	SA–541	1	K03506	...	...	1	2
41	Carbon steel	Forgings	SA–541	1A	K03020	...	...	1	2
42	Carbon steel	Cast pipe	SA–660	WCB	J03003	...	...	1	2
43	Carbon steel	Forgings	SA–765	II	K03047	...	...	1	2
44	Carbon steel	Plate	SA–515	70	K03101	...	...	1	2
45	Carbon steel	Plate	SA–516	70	K02700	...	...	1	2

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	450	240	NP	371	343	343	CS–2	G1, G17
2	450	240	538	371	538	343	CS–2	G10, S1, T2
3	450	240	454	371	538	343	CS–2	G10, S1, T2
4	450	240	NP	371	NP	NP	CS–2	S6, W10, W12
5	450	240	NP	371	NP	NP	CS–2	S6, W10, W12
6	450	240	NP	371	NP	NP	CS–2	S6, W10, W12
7	450	240	NP	371	NP	NP	CS–2	S6, W10, W12
8	450	260	NP	NP	482	343	CS–2	G10, T1
9	450	275	NP	NP	371	343	CS–2	T1
10	450	310	NP	371	343	343	CS–2	T1
11	450	310	NP	371	NP	NP	CS–2	G26, T1, W10, W12
12	450	...	343	NP	343	343	CS–2	G18
13	450	...	343	NP	343	343	CS–2	G18
14	450	345	NP	NP	316	316	CS–3	...
15	450	345	NP	NP	316	316	CS–3	...
16	450	340	NP	NP	316	316	CS–3	...
17	450	340	NP	NP	316	316	CS–3	...
18	450	380	NP	NP	316	316	CS–3	...
19	460	...	538	NP	538	NP	CS–2	G10, G18, S1, T1
20	460	...	538	NP	538	NP	CS–2	G10, G18, S1, T1
21	460	255	538	NP	538	NP	CS–2	G10, S1, T2
22	460	260	454	NP	538	NP	CS–2	G10, S1, T1
23	460	...	454	NP	538	343	CS–2	G10, G18, S1, T1
24	460	280	538	NP	538	NP	CS–2	G10, S1, T2
25	470	265	427	NP	427	NP	CS–2	T1
26	470	280	454	NP	538	NP	CS–2	G10, S1, T1
27	480	285	427	NP	427	NP	CS–2	T1
28	480	295	454	NP	538	NP	CS–2	G10, S1, T1
29	485	240	NP	204 (Cl. 3 only)	343	343	CS–2	...
30	485	240	454	343 (Cl. 3 only)	538	343	CS–2	G10, G15, G22, S1, T2
31	485	250	538	371	538	343	CS–2	G10, S1, T2
32	485	250	538	371	538	343	CS–2	G10, S1, T2
33	485	250	538	371	538	343	CS–2	G1, G10, G17, S1, T2
34	485	250	538	371	538	343	CS–2	G10, S1, T2
35	485	250	NP	NP	538	343	CS–2	G10, T2
36	485	250	454	371	538	343	CS–2	G10, T2
37	485	250	454	371	538	343	CS–2	G10, T2
38	485	250	NP	371	538	343	CS–2	G10, T2
39	485	250	NP	371	538	343	CS–2	G10, T2
40	485	250	NP	371	538	343	CS–2	G10, T2
41	485	250	NP	371	538	343	CS–2	G10, T2
42	485	250	538	371	NP	NP	CS–2	G1, G10, G17, S1, T2
43	485	250	NP	NP	538	343	CS–2	G10, T2
44	485	260	538	371	538	343	CS–2	G10, S1, T2
45	485	260	454	371	538	343	CS–2	G10, S1, T2

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
No.	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	128	128	128	128	128	128	128	125	122	118	114	...	...	...	...
2	128	128	128	128	128	128	128	125	122	118	114	*95.0*	*79.6*	*63.2*	*45.3*
3	128	128	128	128	128	128	128	125	122	118	114	*95.0*	*79.6*	*63.2*	*45.3*
4	128	128	128	128	128	128	128	125	122	118	114	...	...	...	...
5	128	128	128	128	128	128	128	125	122	118	114	...	...	...	...
6	128	128	128	128	128	128	128	125	122	118	114	...	...	...	...
7	128	128	128	128	128	128	128	125	122	118	114	...	...	...	...
8	128	128	128	128	128	128	128	128	128	127	*114*	*95.1*	*79.6*	*63.1*	*45.7*
9	128	128	128	128	128	128	128	128	128	127	*114*	...	...	...	...
10	128	128	128	128	128	128	128	128	128	127	*114*	...	...	...	...
11	128	128	128	128	128	128	128	128	128	127	*114*	...	...	...	...
12	128	128	128	128	128	128	128	128	128	128	...	...	...	...	...
13	128	128	128	128	128	128	128	128	128	128	...	...	...	...	...
14	128	128	128	128	128	128	128	128	128	127	...	...	...	...	...
15	128	128	128	128	128	128	128	128	128	127	...	...	...	...	...
16	128	128	128	128	128	128	128	128	128	127	...	...	...	...	...
17	128	128	128	128	128	128	128	128	128	127	...	...	...	...	...
18	128	128	128	128	128	128	128	128	128	127	...	...	...	...	...
19	131	131	131	131	131	131	131	131	131	129	*114*	*95.1*	*79.6*	*63.2*	*45.3*
20	131	131	131	131	131	131	131	131	131	129	*114*	*95.1*	*79.6*	*63.2*	*45.3*
21	131	131	131	131	131	131	131	131	128	124	120	*101*	*83.9*	*67.0*	*51.1*
22	131	131	131	131	131	131	131	131	131	127	*112*	*96.2*	*79.1*	*62.1*	*46.0*
23	131	131	131	131	131	131	131	131	131	127	*112*	*96.2*	*79.1*	*62.1*	*46.0*
24	131	131	131	131	131	131	131	131	131	131	131	*101*	*83.9*	*67.0*	*51.1*
25	134	134	134	134	134	134	134	134	134	130	*123*	*101*	*83.8*	*67.1*	...
26	134	134	134	134	134	134	134	134	134	134	*123*	*101*	*83.8*	*67.1*	*51.0*
27	137	137	137	137	137	137	137	137	137	137	*123*	*101*	*83.8*	*67.1*	...
28	137	137	137	137	137	137	137	137	137	137	*123*	*101*	*83.8*	*67.1*	*51.0*
29	138	138	138	138	138	137	132	126	122	119	...	...	...	...	...
30	138	138	138	138	138	137	132	126	122	119	114	*101*	*83.9*	*67.0*	*51.1*
31	138	138	138	138	138	138	136	129	125	122	117	*101*	*83.9*	*67.0*	*51.1*
32	138	138	138	138	138	138	136	129	125	122	117	*101*	*83.9*	*67.0*	*51.1*
33	138	138	138	138	138	138	136	129	125	122	117	*101*	*83.9*	*67.0*	*51.1*
34	138	138	138	138	138	138	136	129	125	122	117	*101*	*83.9*	*67.0*	*51.1*
35	138	138	138	138	138	138	136	129	125	122	117	*101*	*83.9*	*67.0*	*51.1*
36	138	138	138	138	138	138	136	129	125	122	117	*101*	*83.9*	*67.0*	*51.1*
37	138	138	138	138	138	138	136	129	125	122	117	*101*	*83.9*	*67.0*	*51.1*
38	138	138	138	138	138	138	136	129	125	122	117	*101*	*83.9*	*67.0*	*51.1*
39	138	138	138	138	138	138	136	129	125	122	117	*101*	*83.9*	*67.0*	*51.1*
40	138	138	138	138	138	138	136	129	125	122	117	*101*	*83.9*	*67.0*	*51.1*
41	138	138	138	138	138	138	136	129	125	122	117	*101*	*83.9*	*67.0*	*51.1*
42	138	138	138	138	138	138	136	129	125	122	117	*101*	*83.9*	*67.0*	*51.1*
43	138	138	138	138	138	138	136	129	125	122	117	*101*	*83.9*	*67.0*	*51.1*
44	138	138	138	138	138	138	138	136	132	128	123	*101*	*83.8*	*67.1*	*51.0*
45	138	138	138	138	138	138	138	136	132	128	123	*101*	*83.8*	*67.1*	*51.0*

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	*31.7*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	*31.7*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	*28.3*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	*31.7*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	*31.7*	*21.9*	*12.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	*32.1*	*21.2*	*14.4*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	*32.1*	*21.2*	*14.4*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	Carbon steel	Wld. pipe	SA–671	CB70	K03101	...	...	1	2
2	Carbon steel	Wld. pipe	SA–671	CC70	K02700	...	...	1	2
3	Carbon steel	Wld. pipe	SA–672	B70	K03101	...	...	1	2
4	Carbon steel	Wld. pipe	SA–672	C70	K02700	...	...	1	2
5	Carbon steel	Plate	SA/JIS G3118	SGV480	...	...	...	1	2
6	Carbon steel	Smls. pipe	SA–106	C	K03501	...	...	1	2
7	Carbon steel	Wld. tube	SA–178	D	...	...	...	1	2
8	Carbon steel	Wld. tube	SA–178	D	...	...	...	1	2
9	Carbon steel	Wld. tube	SA–178	D	...	...	...	1	2
10	Carbon steel	Smls. tube	SA–210	C	K03501	...	...	1	2
11	Carbon steel	Castings	SA–216	WCC	J02503	...	...	1	2
12	Carbon steel	Smls. & wld. fittings	SA–234	WPC	K03501	...	...	1	2
13	Carbon steel	Castings	SA–352	LCC	J02505	...	...	1	2
14	Carbon steel	Castings	SA–487	16	...	A	...	1	2
15	Carbon steel	Plate	SA–537	...	K12437	3	100 < $t \le 150$	1	3
16	Carbon steel	Smls. tube	SA–556	C2	K03006	...	...	1	2
17	Carbon steel	Wld. tube	SA–557	C2	K03505	...	...	1	2
18	Carbon steel	Cast pipe	SA–660	WCC	J02505	...	...	1	2
19	Carbon steel	Bar	SA–696	C	K03200	...	...	1	2
20	Carbon steel	Sheet	SA–414	F	K03102	...	...	1	2
21	Carbon steel	Plate	SA–662	C	K02007	...	...	1	2
22	Carbon steel	Plate	SA–537	...	K12437	2	100 < $t \le 150$	1	3
23	Carbon steel	Plate	SA–738	C	K02008	...	100 < $t \le 150$	1	3
24	Carbon steel	Plate	SA–537	...	K12437	1	≤65	1	2
25	Carbon steel	Wld. pipe	SA–671	CD70	K12437	...	≤65	1	2
26	Carbon steel	Wld. pipe	SA–672	D70	K12437	...	≤65	1	2
27	Carbon steel	Wld. pipe	SA–691	CMSH–70	K12437	...	≤65	1	2
28	Carbon steel	Plate	SA–841	A	...	1	≤100	1	2
29	Carbon steel	Plate, sheet, bar	SA–572	55	...	...	$t \le 50$	...	...
30	Carbon steel	Round bar	SA–572	55	...	...	$t \le 90$	...	...
31	Carbon steel	Sheet, strip	SA–1011	55	HSLAS	1	...	...	...
32	Carbon steel	Sheet, strip	SA–1011	60	HSLAS	2	...	...	...
33	Carbon steel	Forgings	SA/EN 10222–2	P305GH	...	NT	35 < $t \le 160$	1	2
34	Carbon steel	Forgings	SA/EN 10222–2	P305GH	...	Normalized	$t \le 35$	1	2
35	Carbon steel	Plate	SA/GB 713	Q345R	...	...	60 < $t \le 100$	1	2
36	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	60 < $t \le 100$	1	2
37	Carbon steel	Plate	SA/GB 713	Q345R	...	...	36 < $t \le 60$	1	2
38	Carbon steel	Plate	SA/GB 713	Q345R	...	...	16 < $t \le 36$	1	2
39	Carbon steel	Plate	SA–455	...	K03300	...	9.5 < $t \le 15$	1	2
40	Carbon steel	Forgings	SA/EN 10222–2	P305GH	...	QT	$t \le 70$	1	2
41	Carbon steel	Plate	SA/GB 713	Q345R	...	...	$3 \le t \le 16$	1	2
42	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	≤60	1	2
(**23**) 43	Carbon steel	Forgings	SA–266	3	K05001	...	...	1	2
44	Carbon steel	Plate	SA–455	...	K03300	...	≤9.5	1	2
45	Carbon steel	Plate	SA–299	A	K02803	...	>25	1	2

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	485	260	NP	371	NP	NP	CS–2	S5, W10, W12
2	485	260	NP	371	NP	NP	CS–2	S6, W10, W12
3	485	260	NP	371	NP	NP	CS–2	S5, W10, W12
4	485	260	NP	371	NP	NP	CS–2	S6, W10, W12
5	485	260	454	NP	NP	NP	CS–2	G10, S1, T2
6	485	275	538	371	538	343	CS–2	G10, S1, T1
7	485	275	538	NP	NP	NP	CS–2	G10, S1, T1, W13
8	485	275	538	NP	NP	NP	CS–2	G4, G10, S1, T4
9	485	275	538	NP	NP	NP	CS–2	G3, G10, S1, T2
10	485	275	538	NP	538	343	CS–2	G10, S1, T1
11	485	275	538	371	538	343	CS–2	G1, G10, G17, S1, T1
12	485	275	427	371	427	343	CS–2	G10, T1, W14
13	485	275	NP	371	NP	NP	CS–2	G17, T1
14	485	275	NP	371	NP	NP	CS–2	...
15	485	275	NP	NP	371	343	CS–2	G23, W11
16	485	275	NP	NP	427	343	CS–2	G10, T1
17	485	275	NP	NP	538	343	CS–2	G24, T2, W6
18	485	275	538	371	NP	NP	CS–2	G1, G10, G17, S1, T1
19	485	275	NP	371	NP	NP	CS–2	T1
20	485	290	NP	NP	482	343	CS–2	G10, T1
21	485	295	NP	NP	371	343	CS–3	T1
22	485	315	NP	371	371	343	CS–3	G23, T1, W11
23	485	315	NP	343	343	343	CS–3	G23, W11
24	485	345	NP	371	343	343	CS–3	G23, T1
25	485	345	NP	371	NP	NP	CS–3	S6, T1, W10, W12
26	485	345	NP	371	NP	NP	CS–3	S6, T1, W10, W12
27	485	345	NP	371	NP	NP	CS–3	S6, T1, W10, W12
28	485	345	NP	NP	343	NP	CS–3	...
29	485	380	NP	NP	316	316	CS–3	...
30	485	380	NP	NP	316	316	CS–3	...
31	480	380	NP	NP	316	316	CS–3	...
32	480	410	NP	NP	316	316	CS–3	...
33	490	280	538	NP	538	NP	CS–2	G10, S1, T2
34	490	305	538	NP	538	NP	CS–2	G10, S1, T1
35	490	305	427	NP	427	NP	CS–2	T1
36	490	315	454	NP	538	NP	CS–2	G10, S1, T1
37	490	315	427	NP	427	NP	CS–2	T1
38	500	325	427	NP	427	NP	CS–2	T1
39	505	255	NP	204 (Cl. 3 only)	343	343	CS–2	...
40	510	285	538	NP	538	NP	CS–2	G10, S1, T2
41	510	345	427	NP	427	NP	CS–2	T1
42	510	...	454	NP	538	NP	CS–2	G10, G18, S1, T1
43	515	260	538	371	538	NP	CS–2	G10, S1, T2, W11
44	515	260	NP	204 (Cl. 3 only)	343	343	CS–2	...
45	515	275	538	371	538	343	CS–2	G10, S1, T2

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
No.	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	138	138	138	138	138	138	138	136	132	128	123	...	...	...	...
2	138	138	138	138	138	138	138	136	132	128	123	...	...	...	...
3	138	138	138	138	138	138	138	136	132	128	123	...	...	...	...
4	138	138	138	138	138	138	138	136	132	128	123	...	...	...	...
5	138	138	138	138	138	138	138	136	132	128	123	*101*	*83.8*	*67.1*	*51.0*
6	138	138	138	138	138	138	138	138	138	135	*123*	*101*	*83.8*	*67.0*	*51.0*
7	138	138	138	138	138	138	138	138	138	135	*123*	*101*	*83.8*	*67.0*	*51.0*
8	138	138	138	138	138	138	138	138	138	135	123	101	83.7	67.6	45.5
9	117	117	117	117	117	117	117	117	117	115	104	*86.1*	*71.3*	*56.9*	*43.4*
10	138	138	138	138	138	138	138	138	138	135	*123*	*101*	*83.8*	*67.0*	*51.0*
11	138	138	138	138	138	138	138	138	138	135	*123*	*101*	*83.8*	*67.0*	*51.0*
12	138	138	138	138	138	138	138	138	138	135	*123*	*101*	*83.8*	*67.0*	...
13	138	138	138	138	138	138	138	138	138	135	*123*	...	...	...	...
14	138	138	137	133	129	125	123	123	123	123	123	...	...	...	...
15	138	138	138	137	136	135	131	126	123	121	118	...	...	...	...
16	138	138	138	138	138	138	138	138	138	135	*123*	*101*	*83.8*	*67.0*	...
17	117	117	117	117	117	117	117	117	117	115	104	*86.1*	*71.3*	*56.9*	*43.4*
18	138	138	138	138	138	138	138	138	138	135	*123*	*101*	*83.8*	*67.0*	*51.0*
19	138	138	138	138	138	138	138	138	138	135	*123*	...	...	...	...
20	138	138	138	138	138	138	138	138	138	137	*123*	*101*	*83.8*	*67.1*	*50.8*
21	138	138	138	138	138	138	138	138	138	137	*123*	...	...	...	...
22	138	138	138	137	136	134	134	134	134	133	*125*	...	...	...	...
23	138	138	138	137	136	134	134	134	134	133	...	...	...	...	...
24	138	138	138	137	136	134	134	134	134	133	*125*	...	...	...	...
25	138	138	138	137	136	134	134	134	134	133	*125*	...	...	...	...
26	138	138	138	137	136	134	134	134	134	133	*125*	...	...	...	...
27	138	138	138	137	136	134	134	134	134	133	*125*	...	...	...	...
28	138	138	138	138	138	138	138	138	138	138	...	...	...	...	...
29	138	138	138	138	138	138	138	138	138	138	...	...	...	...	...
30	138	138	138	138	138	138	138	138	138	138	...	...	...	...	...
31	138	138	138	138	138	138	138	138	138	138	...	...	...	...	...
32	138	138	138	138	138	138	138	138	138	138	...	...	...	...	...
33	140	140	140	140	140	140	140	140	140	136	132	*101*	*83.9*	*67.0*	*51.1*
34	140	140	140	140	140	140	140	140	140	140	*136*	*101*	*83.9*	*67.0*	*51.1*
35	140	140	140	140	140	140	140	140	140	140	*123*	*101*	*83.8*	*67.1*	...
36	140	140	140	140	140	140	140	140	140	140	*123*	*101*	*83.8*	*67.1*	*51.0*
37	140	140	140	140	140	140	140	140	140	140	*123*	*101*	*83.8*	*67.1*	...
38	143	143	143	143	143	143	143	143	143	143	*123*	*101*	*83.8*	*67.1*	...
39	144	144	144	144	144	144	140	133	129	125	...	...	...	...	...
40	146	146	146	146	146	146	146	146	143	139	134	*101*	*83.9*	*67.0*	*51.1*
41	146	146	146	146	146	146	146	146	146	146	*123*	*101*	*83.8*	*67.1*	...
42	146	146	146	146	146	146	146	146	146	146	*123*	*101*	*83.8*	*67.1*	*51.0*
43	148	148	148	148	148	148	142	135	131	127	122	*107*	*88.3*	*67.5*	*50.9*
44	148	148	148	148	148	148	143	136	132	129	...	...	...	...	...
45	148	148	148	148	148	148	148	143	139	135	130	*107*	*88.1*	*67.5*	*50.8*

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	*27.9*	*18.3*	*10.6*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	*28.6*	*18.1*	*10.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	*28.6*	*18.1*	*10.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	*34.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	*33.7*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	*33.7*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	Carbon steel	Wld. pipe	SA–671	CK75	K02803	...	>25	1	2
2	Carbon steel	Wld. pipe	SA–672	N75	K02803	...	>25	1	2
3	Carbon steel	Wld. pipe	SA–691	CMS–75	K02803	...	>25	1	2
4	Carbon steel	Plate	SA–299	A	K02803	...	≤25	1	2
5	Carbon steel	Wld. pipe	SA–691	CMS–75	K02803	...	≤25	1	2
6	Carbon steel	Forgings	SA–372	B	K04001	...	...	1	2
7	Carbon steel	Sheet	SA–414	G	K03103	...	...	1	2
8	Carbon steel	Plate	SA–738	A	K12447	...	...	1	2
9	Carbon steel	Plate	SA–537	...	K12437	3	65 < t ≤ 100	1	3
10	Carbon steel	Plate	SA–537	...	K12437	2	65 < t ≤ 100	1	3
11	Carbon steel	Wld. pipe	SA–691	CMSH–80	K12437	...	65 < t ≤ 100	1	3
12	Carbon steel	Plate	SA–738	C	K02008	...	65 < t ≤ 100	1	3
13	Carbon steel	Plate, sheet, bar	SA–572	60	...	...	t ≤ 32	...	...
14	Carbon steel	Round bar	SA–572	60	...	...	t ≤ 90	...	...
15	Carbon steel	Sheet, strip	SA–1011	60	HSLAS	1	...	...	...
16	Carbon steel	Plate	SA–299	B	K02803	...	>25	1	3
17	Carbon steel	Plate	SA–299	B	K02803	...	≤25	1	3
18	Carbon steel	Forgings	SA–765	IV	K02009	...	...	1	3
19	Carbon steel	Plate	SA–537	...	K12437	3	≤65	1	3
20	Carbon steel	Plate	SA–537	...	K12437	2	≤65	1	3
21	Carbon steel	Wld. pipe	SA–671	CD80	K12437	...	≤65	1	3
22	Carbon steel	Wld. pipe	SA–672	D80	K12437	...	≤65	1	3
23	Carbon steel	Wld. pipe	SA–691	CMSH–80	K12437	...	≤65	1	3
24	Carbon steel	Plate	SA–738	C	K02008	...	≤65	1	3
25	Carbon steel	Plate	SA–841	B	...	2	≤65	1	3
26	Carbon steel	Plate, sheet, bar	SA–572	65	...	...	t ≤ 32	...	...
27	Carbon steel	Plate	SA–612	...	K02900	...	12.5 < t ≤ 25	10C	1
28	Carbon steel	Plate	SA–612	...	K02900	...	≤12.5	10C	1
29	Carbon steel	Plate	SA–738	B	K12007	...	...	1	3
30	Carbon steel	Forgings	SA–372	C	K04801	...	...	...	...
31	Carbon steel	Plate	SA–724	A	K11831	...	...	1	4
32	Carbon steel	Plate	SA–724	C	K12037	...	...	1	4
33	Carbon steel	Plate	SA–724	B	K12031	...	...	1	4
34	C–Mn–Si–Cb	Plate	SA–737	B	K12001	...	...	1	2
35	C–Mn–Si–Cb	Plate	SA/AS 1548	PT490N	...	Normalized	≤150	1	2
36	C–Mn–Si–Cb	Plate	SA/AS 1548	PT490NR	...	Norm. rld.	≤150	1	2
37	C–Mn–Si–Cb	Plate	SA/GB 713	Q370R	...	Normalized	64 < t ≤ 100	1	2
38	C–Mn–Si–Cb	Plate	SA/GB 713	Q370R	...	Normalized	36 < t ≤ 60	1	2
39	C–Mn–Si–Cb	Plate	SA/GB 713	Q370R	...	Normalized	16 < t ≤ 36	1	2
40	C–Mn–Si–Cb	Plate	SA/GB 713	Q370R	...	Normalized	10 ≤ t ≤ 16	1	2
41	C–Mn–Si–V	Plate	SA–737	C	K12202	...	...	1	3
42	C–Mn–Si–V–Cb	Plate	SA–656	T3	...	...	≤50	1	1
43	C–Mn–Si–V–Cb	Plate	SA–656	T7	...	...	≤50	1	1
44	C–Mn–Si–V–Cb	Plate	SA–656	T3	...	...	≤40	1	2
45	C–Mn–Si–V–Cb	Plate	SA–656	T7	...	...	≤40	1	2

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	515	275	NP	371	NP	NP	CS–2	S6, W10, W12
2	515	275	NP	371	NP	NP	CS–2	S6, W10, W12
3	515	275	NP	371	NP	NP	CS–2	S6, W10, W12
4	515	290	538	371	538	343	CS–2	G10, S1, T1
5	515	290	NP	371	NP	NP	CS–2	T1, W10, W12
6	515	310	NP	NP	343	343	CS–3	W11
7	515	310	NP	NP	482	343	CS–3	G10, T1
8	515	310	NP	NP	371	343	CS–2	T1
9	515	345	NP	NP	371	343	CS–5	G23, T1, W11
10	515	380	NP	371	343	343	CS–5	G23, T1, W11
11	515	380	NP	371	NP	NP	CS–5	G26, T1, W10, W12
12	515	380	NP	343	343	343	CS–5	G23, W11
13	520	415	NP	NP	316	316	CS–3	...
14	520	415	NP	NP	316	316	CS–3	...
15	520	410	NP	NP	316	316	CS–3	...
16	550	310	427	NP	538	343	CS–3	G10, S1, T1
17	550	325	427	NP	538	343	CS–3	G10, S1, T1
18	550	345	NP	NP	371	NP	CS–3	...
19	550	380	NP	NP	371	343	CS–5	G23, T1, W11
20	550	415	NP	371	343	343	CS–5	G23, S6, T1, W10, W11, W12
21	550	415	NP	371	NP	NP	CS–5	S6, T1, W10, W12
22	550	415	NP	371	NP	NP	CS–5	S6, T1, W10, W12
23	550	415	NP	371	NP	NP	CS–5	S6, T1, W10, W12
24	550	415	NP	343	343	343	CS–5	G23, W11
25	550	415	NP	NP	343	NP	CS–3	...
26	550	450	NP	NP	316	316	CS–3	...
27	560	345	NP	371	343	343	CS–3	T1
28	570	345	NP	343	343	343	CS–3	...
29	585	415	NP	343	343	343	CS–5	...
30	620	380	NP	NP	343	343	CS–3	W11
31	620	485	NP	NP	371	343	CS–5	...
32	620	485	NP	NP	371	343	CS–5	...
33	655	515	NP	NP	371	343	CS–5	...
34	485	345	NP	371	371	343	CS–3	T1
35	490	...	538	NP	538	NP	CS–2	G10, G18, S1, T1
36	490	...	538	NP	538	NP	CS–2	G10, G18, S1, T1
37	510	330	427	NP	NP	NP	CS–3	T1
38	520	340	427	NP	NP	NP	CS–3	T1
39	530	360	427	NP	NP	NP	CS–3	T1
40	530	370	427	NP	NP	NP	CS–3	T1
41	550	415	NP	371	371	343	CS–3	...
42	414	345	NP	NP	NP	343	...	...
43	414	345	NP	NP	NP	343	...	...
44	483	414	NP	NP	NP	343	...	...
45	483	414	NP	NP	NP	343	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
No.	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	148	148	148	148	148	148	148	143	139	135	130	...	...	...	...
2	148	148	148	148	148	148	148	143	139	135	130	...	...	...	...
3	148	148	148	148	148	148	148	143	139	135	130	...	...	...	...
4	148	148	148	148	148	148	148	148	147	141	*133*	*107*	*88.1*	*67.6*	*50.8*
5	148	148	148	148	148	148	148	148	147	141	*133*	...	...	...	...
6	148	148	148	148	148	148	148	148	148	148	...	...	...	...	...
7	148	148	148	148	148	148	148	148	148	146	*132*	*107*	*88.2*	*67.6*	*50.6*
8	148	148	148	148	148	148	148	148	148	146	*132*	...	...	...	...
9	148	148	147	147	145	144	144	144	144	142	*123*	...	...	...	...
10	148	148	147	147	145	144	144	144	144	143	*134*	...	...	...	...
11	148	148	147	147	145	144	144	144	144	143	*134*	...	...	...	...
12	148	148	147	147	145	144	144	144	144	143	...	...	...	...	...
13	148	148	147	147	145	144	144	144	144	143	...	...	...	...	...
14	148	148	147	147	145	144	144	144	144	143	...	...	...	...	...
15	148	148	147	147	145	144	144	144	144	143	...	...	...	...	...
16	158	158	158	158	158	158	158	158	157	152	*133*	*107*	*88.1*	*67.6*	*50.8*
17	158	158	158	158	158	158	158	158	158	158	*133*	*107*	*88.1*	*67.6*	*50.8*
18	158	158	158	158	158	156	156	156	156	155	153	...	...	...	...
19	158	158	158	157	156	154	154	154	154	151	*132*	...	...	...	...
20	158	158	158	157	156	154	154	154	154	151	*132*	...	...	...	...
21	158	158	158	157	156	154	154	154	154	151	*132*	...	...	...	...
22	158	158	158	157	156	154	154	154	154	151	*132*	...	...	...	...
23	158	158	158	157	156	154	154	154	154	151	*132*	...	...	...	...
24	158	158	158	157	156	154	154	154	154	151	...	...	...	...	...
25	158	158	158	158	158	158	158	158	158	158	...	...	...	...	...
26	158	158	158	158	158	158	158	158	158	158	...	...	...	...	...
27	159	159	159	158	157	156	156	155	155	149	*133*	...	...	...	...
28	163	163	163	162	161	160	160	157	154	151	...	...	...	...	...
29	168	168	168	168	168	168	168	167	165	163	...	...	...	...	...
30	177	177	177	177	177	177	177	177	175	166	...	...	...	...	...
31	177	177	177	176	175	173	173	173	173	165	148	...	...	...	...
32	177	177	177	176	175	173	173	173	173	165	148	...	...	...	...
33	187	187	187	186	185	183	183	183	179	165	158	...	...	...	...
34	138	138	138	138	138	138	138	138	138	138	*135*	...	...	...	...
35	140	140	140	140	140	140	140	140	140	139	*123*	*101*	*83.8*	*67.0*	*51.0*
36	140	140	140	140	140	140	140	140	140	139	*123*	*101*	*83.8*	*67.0*	*51.0*
37	146	146	146	146	146	146	146	146	146	146	*133*	*107*	*88.1*	*67.6*	...
38	149	149	149	149	149	149	149	149	149	149	*133*	*107*	*88.1*	*67.6*	...
39	151	151	151	151	151	151	151	151	151	151	*133*	*107*	*88.1*	*67.6*	...
40	151	151	151	151	151	151	151	151	151	151	*133*	*107*	*88.1*	*67.6*	...
41	158	158	158	158	158	158	158	158	158	155	135	...	...	...	...
42	118	118	118	118	118	118	118	118	118	118	...	...	...	...	...
43	118	118	118	118	118	118	118	118	118	118	...	...	...	...	...
44	138	138	138	138	138	138	138	138	138	138	...	...	...	...	...
45	138	138	138	138	138	138	138	138	138	138	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	*33.7*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	*34.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	*33.7*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	*33.7*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	*33.6*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	C–Mn–Si–V–Cb	Plate	SA–656	T3	...	...	≤25	1	3
2	C–Mn–Si–V–Cb	Plate	SA–656	T7	...	...	≤25	1	3
3	C–Mn–Si–V–Cb	Plate	SA–656	T3	...	...	≤20	1	4
4	C–Mn–Si–V–Cb	Plate	SA–656	T7	...	...	≤20	1	4
5	C–Mn–Ti	Plate, sheet	SA–562	...	K11224	...	...	1	1
6	C–Si–Ti	Forgings	SA–836	...	...	1	...	1	1
7	C–0.3Mo	Smls. tube	SA/EN 10216–2	16Mo3	...	...	40 < t ≤ 60	3	1
8	C–0.3Mo	Smls. tube	SA/EN 10216–2	16Mo3	...	...	16 < t ≤ 40	3	1
9	C–0.3Mo	Smls. tube	SA/EN 10216–2	16Mo3	...	...	t ≤ 16	3	1
10	C–½Mo	Smls. & wld. fittings	SA–234	WP1	K12821	...	...	3	1
11	C–½Mo	Smls. tube	SA–209	T1b	K11422	...	...	3	1
12	C–½Mo	Wld. tube	SA–250	T1b	K11422	...	...	3	1
13	C–½Mo	Wld. tube	SA–250	T1b	K11422	...	...	3	1
14	C–½Mo	Smls. tube	SA–209	T1	K11522	...	...	3	1
15	C–½Mo	Wld. tube	SA–250	T1	K11522	...	...	3	1
16	C–½Mo	Wld. tube	SA–250	T1	K11522	...	...	3	1
17	C–½Mo	Smls. pipe	SA–335	P1	K11522	...	...	3	1
18	C–½Mo	Forged pipe	SA–369	FP1	K11522	...	...	3	1
19	C–½Mo	Smls. tube	SA–209	T1a	K12023	...	...	3	1
20	C–½Mo	Wld. tube	SA–250	T1a	K12023	...	...	3	1
21	C–½Mo	Wld. tube	SA–250	T1a	K12023	...	...	3	1
22	C–½Mo	Castings	SA–217	WC1	J12524	...	...	3	1
23	C–½Mo	Castings	SA–352	LC1	J12522	...	...	3	1
24	C–½Mo	Cast pipe	SA–426	CP1	J12521	...	...	3	1
25	C–½Mo	Plate	SA–204	A	K11820	...	...	3	1
26	C–½Mo	Wld. pipe	SA–672	L65	K11820	...	...	3	1
27	C–½Mo	Wld. pipe	SA–691	CM–65	K11820	...	...	3	1
28	C–½Mo	Wld. pipe	SA–691	CM–65	K11820	...	...	3	1
29	C–½Mo	Forgings	SA–182	F1	K12822	...	...	3	2
30	C–½Mo	Plate	SA–204	B	K12020	...	...	3	2
31	C–½Mo	Forgings	SA–336	F1	K12520	...	...	3	2
32	C–½Mo	Wld. pipe	SA–672	L70	K12020	...	...	3	2
33	C–½Mo	Wld. pipe	SA–691	CM–70	K12020	...	...	3	2
34	C–½Mo	Wld. pipe	SA–691	CM–70	K12020	...	...	3	2
35	C–½Mo	Plate	SA–204	C	K12320	...	...	3	2
36	C–½Mo	Wld. pipe	SA–672	L75	K12320	...	...	3	2
37	C–½Mo	Wld. pipe	SA–691	CM–75	K12320	...	...	3	2
38	C–½Mo	Wld. pipe	SA–691	CM–75	K12320	...	...	3	2
39	½Cr–⅕Mo	Forgings	SA–372	G	K13049	55	...	...	...
40	½Cr–⅕Mo	Forgings	SA–372	H	K13547	55	...	...	...
41	½Cr–⅕Mo	Forgings	SA–372	G	K13049	65	...	...	...
42	½Cr–⅕Mo	Forgings	SA–372	H	K13547	65	...	...	...
43	½Cr–⅕Mo	Forgings	SA–372	G	K13049	70	...	...	...
44	½Cr–⅕Mo	Forgings	SA–372	H	K13547	70	...	...	...
45	½Cr–⅕Mo–V	Plate	SA–517	B	K11630	...	≤32	11B	4

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	552	483	NP	NP	NP	343	...	...
2	552	483	NP	NP	NP	343	...	...
3	621	552	NP	NP	NP	343	...	...
4	621	552	NP	NP	NP	343	...	...
5	380	205	NP	NP	343	NP	CS–6	G7
6	380	170	NP	NP	343	343	CS–1	...
7	450	260	538	NP	538	NP	CS–2	G11, S2, T3
8	450	270	538	NP	538	NP	CS–2	G11, S2, T3
9	450	280	538	NP	538	NP	CS–2	G11, S2, T3
10	380	205	538	371	538	343	CS–2	G11, T4, W14
11	365	195	538	NP	538	343	CS–1	G11, S3, T5
12	365	195	538	NP	NP	NP	CS–1	G11, S2, T5, W13
13	365	195	538	NP	538	343	CS–1	G3, G11, G24, S2, T5
14	380	205	538	NP	538	343	CS–2	G11, S3, T4
15	380	205	538	NP	NP	NP	CS–2	G11, S2, T4, W13
16	380	205	538	NP	538	343	CS–2	G3, G11, G24, S2, T4
17	380	205	538	371	538	343	CS–2	G11, S2, T4
18	380	205	538	371	538	343	CS–2	G11, S2, T4
19	415	220	538	NP	538	343	CS–2	G11, S3, T4
20	415	220	538	NP	NP	NP	CS–2	G11, S2, T4, W13
21	415	220	538	NP	538	343	CS–2	G3, G11, G24, S2, T4
22	450	240	538	371	538	343	CS–2	G1, G11, G17, S2, T4
23	450	240	NP	371	343	343	CS–2	G1, G17
24	450	240	NP	371	NP	NP	CS–2	G17
25	450	255	538	371	538	343	CS–2	G11, S2, T4
26	450	255	NP	371	NP	NP	CS–2	G26, W10, W12
27	450	255	NP	371	NP	NP	CS–2	G26, W10, W12
28	450	255	NP	149 (Cl. 3 only)	NP	NP	CS–2	G27, W10, W12
29	485	275	538	371	538	343	CS–2	G11, S2, T4
30	485	275	538	371	538	343	CS–2	G11, S2, T4
31	485	275	538	371	538	343	CS–2	G11, S2, T4
32	485	275	NP	371	NP	NP	CS–2	G26, W10, W12
33	485	275	NP	371	NP	NP	CS–2	G26, W10, W12
34	485	275	NP	149 (Cl. 3 only)	NP	NP	CS–2	G27, W10, W12
35	515	295	538	371	538	343	CS–2	G11, S2, T4, W12
36	515	295	NP	371	NP	NP	CS–2	G26, W10, W12
37	515	295	NP	371	NP	NP	CS–2	G26, W10, W12
38	515	295	NP	149 (Cl. 3 only)	NP	NP	CS–2	G27, W10, W12
39	585	380	NP	NP	315	315	CS–3	W11
40	585	380	NP	NP	315	315	CS–3	W11
41	725	450	NP	NP	315	315	CS–3	W11
42	725	450	NP	NP	315	315	CS–3	W11
43	825	485	NP	NP	93	93	CS–3	W11
44	825	485	NP	NP	93	93	CS–3	W11
45	795	690	NP	343 (SPT)	343	343	HT–1	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	158	158	158	158	158	158	158	158	158	158	...	...	...	...	...
2	158	158	158	158	158	158	158	158	158	158	...	...	...	...	...
3	177	177	177	177	177	177	177	177	177	177	...	...	...	...	...
4	177	177	177	177	177	177	177	177	177	177	...	...	...	...	...
5	88.9	84.0	78.3	75.1	73.0	71.7	71.7	71.7	71.7	71.7	...	...	...	...	...
6	108	103	97.6	94.1	91.6	89.7	89.6	89.4	88.5	87.2	...	...	...	...	...
7	129	129	129	129	129	129	129	129	129	129	129	129	129	126	*105*
8	129	129	129	129	129	129	129	129	129	129	129	129	129	126	*105*
9	129	129	129	129	129	129	129	129	129	129	129	129	129	126	*105*
10	108	108	108	108	108	108	108	108	108	108	108	106	103	101	96.1
11	104	104	104	104	104	104	104	104	104	103	101	98.5	96.7	93.6	90.7
12	104	104	104	104	104	104	104	104	104	103	101	98.5	96.7	93.6	90.7
13	88.9	88.9	88.9	88.9	88.9	88.9	88.9	88.9	88.6	87.2	85.9	84.0	82.2	79.7	77.4
14	108	108	108	108	108	108	108	108	108	108	108	106	103	101	96.1
15	108	108	108	108	108	108	108	108	108	108	108	106	103	101	96.1
16	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.4	92.2	90.2	87.7	85.4	81.4
17	108	108	108	108	108	108	108	108	108	108	108	106	103	101	96.1
18	108	108	108	108	108	108	108	108	108	108	108	106	103	101	96.1
19	118	118	118	118	118	118	118	118	118	118	115	113	110	107	100
20	118	118	118	118	118	118	118	118	118	118	115	113	110	107	100
21	101	101	101	101	101	101	101	101	101	100	98.2	95.8	93.9	90.9	84.9
22	128	128	128	128	128	128	128	128	128	128	126	123	120	117	103
23	128	128	128	128	128	128	128	128	128	128	126	...	...	...	...
24	128	128	128	128	128	128	128	128	128	128	126	...	...	...	...
25	128	128	128	128	128	128	128	128	128	128	128	128	127	124	105
26	128	128	128	128	128	128	128	128	128	128	128	...	...	...	...
27	128	128	128	128	128	128	128	128	128	128	128	...	...	...	...
28	128	128	128	128	128	...	...	...	...	...	...	...	...	...	...
29	138	138	138	138	138	138	138	138	138	138	138	138	137	134	107
30	138	138	138	138	138	138	138	138	138	138	138	138	137	134	107
31	138	138	138	138	138	138	138	138	138	138	138	138	137	134	107
32	138	138	138	138	138	138	138	138	138	138	138	...	...	...	...
33	138	138	138	138	138	138	138	138	138	138	138	...	...	...	...
34	138	138	138	138	138	...	...	...	...	...	...	...	...	...	...
35	148	148	148	148	148	148	148	148	148	148	148	148	148	144	109
36	148	148	148	148	148	148	148	148	148	148	148	...	...	...	...
37	148	148	148	148	148	148	148	148	148	148	148	...	...	...	...
38	148	148	148	148	148	...	...	...	...	...	...	...	...	...	...
39	167	167	167	167	167	167	167	167	167	...	...	...	...	...	...
40	167	167	167	167	167	167	167	167	167	...	...	...	...	...	...
41	207	207	207	207	207	207	207	207	207	...	...	...	...	...	...
42	207	207	207	207	207	207	207	207	207	...	...	...	...	...	...
43	236	236	236	...	...	...	...	...	...	...	...	...	...	...	...
44	236	236	236	...	...	...	...	...	...	...	...	...	...	...	...
45	227	227	227	227	227	227	227	227	227	226	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	*68.9*	*42.8*	*23.2*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	*68.9*	*42.8*	*23.2*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	*68.9*	*42.8*	*23.2*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	*72.1*	*41.7*	*23.6*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	70.4	*42.2*	*23.4*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	70.4	*42.2*	*23.4*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	60.2	*36.0*	*20.0*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	*72.1*	*41.7*	*23.6*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	*72.1*	*41.7*	*23.6*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	*61.3*	*35.7*	*20.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	*72.1*	*41.7*	*23.6*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	*72.1*	*41.7*	*23.6*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	*70.4*	*42.3*	*23.4*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	*70.4*	*42.3*	*23.4*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	*59.9*	*36.2*	*19.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	*69.5*	*42.6*	*23.2*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	*68.9*	*42.8*	*23.2*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	*68.1*	*43.1*	*23.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	*68.1*	*43.1*	*23.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	*68.1*	*43.1*	*23.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	*67.2*	*43.3*	*23.0*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	½Cr–¼Mo–Si	Plate	SA–517	A	K11856	...	≤32	11B	1
2	½Cr–¼Mo–Si	Forgings	SA–592	A	K11856	...	≤65	11B	1
3	½Cr–½Mo	Smls. pipe	SA–335	P2	K11547	...	...	3	1
4	½Cr–½Mo	Forged pipe	SA–369	FP2	K11547	...	...	3	1
5	½Cr–½Mo	Plate	SA–387	2	K12143	1	...	3	1
6	½Cr–½Mo	Wld. pipe	SA–691	½CR	K12143	...	...	3	1
7	½Cr–½Mo	Wld. pipe	SA–691	½CR	K12143	...	...	3	1
8	½Cr–½Mo	Smls. tube	SA–213	T2	K11547	...	...	3	1
9	½Cr–½Mo	Wld. tube	SA–250	T2	K11547	...	...	3	1
10	½Cr–½Mo	Wld. tube	SA–250	T2S1	K11547	...	...	3	1
11	½Cr–½Mo	Cast pipe	SA–426	CP2	J11547	...	...	3	1
12	½Cr–½Mo	Forgings	SA–182	F2	K12122	...	...	3	2
13	½Cr–½Mo	Plate	SA–387	2	K12143	2	...	3	2
14	½Cr–½Mo	Wld. pipe	SA–691	½CR	K12143	...	...	3	2
15	¾Cr–½Ni–Cu	Smls. & wld. tube	SA–423	1	K11535	...	...	4	2
16	¾Cr–½Ni–Cu	Wld. tube	SA–423	1	K11535	...	...	4	2
17	¾Cr–¾Ni–Cu–Al	Pipe	SA–333	4	K11267	...	...	4	2
18	1Cr–⅕Mo	Forgings	SA–372	E	K13047	55	...	...	...
19	1Cr–⅕Mo	Forgings	SA–372	F	G41350	55	...	...	...
20	1Cr–⅕Mo	Forgings	SA–372	J	K13548	55	...	...	...
21	1Cr–⅕Mo	Forgings	SA–372	E	K13047	65	...	...	...
22	1Cr–⅕Mo	Forgings	SA–372	F	G41350	65	...	...	...
23	1Cr–⅕Mo	Forgings	SA–372	J	K13548	65	...	...	...
24	1Cr–⅕Mo	Forgings	SA–372	E	K13047	70	...	...	...
(**23**) 25	1Cr–⅕Mo	Forgings	SA–372	F	G41350	70	...	...	...
26	1Cr–⅕Mo	Forgings	SA–372	J	K13548	70	...	...	...
27	1Cr–⅕Mo	Forgings	SA–372	J	G41370	110	...	...	...
28	1Cr–½Mo	Plate	SA–387	12	K11757	1	...	4	1
29	1Cr–½Mo	Wld. pipe	SA–691	1CR	K11757	...	...	4	1
30	1Cr–½Mo	Cast pipe	SA–426	CP12	J11562	...	...	4	1
31	1Cr–½Mo	Forgings	SA–182	F12	K11562	1	...	4	1
32	1Cr–½Mo	Smls. tube	SA–213	T12	K11562	...	...	4	1
33	1Cr–½Mo	Smls. & wld. fittings	SA–234	WP12	K12062	1	...	4	1
34	1Cr–½Mo	Wld. tube	SA–250	T12	K11562	...	...	4	1
35	1Cr–½Mo	Wld. tube	SA–250	T12S1	K11562	...	...	4	1
36	1Cr–½Mo	Smls. pipe	SA–335	P12	K11562	...	...	4	1
37	1Cr–½Mo	Forged pipe	SA–369	FP12	K11562	...	...	4	1
38	1Cr–½Mo	Forgings	SA/EN 10222–2	13CrMo4–5	...	NT or QT	250 < t ≤ 500	4	1
39	1Cr–½Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...	150 < t ≤ 250	4	1
40	1Cr–½Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...	100 < t ≤ 150	4	1
41	1Cr–½Mo	Plate	SA/GB 713	15CrMoR	...	NT	100 < t ≤ 200	4	1
42	1Cr–½Mo	Forgings	SA/EN 10222–2	13CrMo4–5	...	NT or QT	100 < t ≤ 250	4	1
43	1Cr–½Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...	60 < t ≤ 100	4	1
44	1Cr–½Mo	Forgings	SA/EN 10222–2	13CrMo4–5	...	NT or QT	70 < t ≤ 100	4	1
45	1Cr–½Mo	Smls. tube	SA/EN 10216–2	13CrMo4–5	...	...	40 < t ≤ 60	4	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	795	690	NP	343 (SPT)	343	343	HT–1	...
2	795	690	NP	343 (SPT)	343	343	HT–1	...
3	380	205	538	371	538	343	CS–2	T5
4	380	205	538	371	538	343	CS–2	T5
5	380	230	538	371	538	343	CS–2	T5
6	380	230	NP	371	NP	NP	CS–2	G26, W10, W12
7	380	230	NP	149 (Cl. 3 only)	NP	NP	CS–2	G27, W10, W12
8	415	205	538	371	538	343	CS–2	T5
9	415	205	538	NP	NP	NP	CS–2	G3, T5
10	415	205	538	NP	NP	NP	CS–2	T5, W13
11	415	205	NP	371	NP	NP	CS–2	G17
12	485	275	538	NP	538	343	CS–2	T5
13	485	310	NP	371	538	343	CS–3	T5
14	485	310	NP	371	NP	NP	CS–3	G26, W10, W12
15	415	255	371	NP	343	NP	CS–2	W13, W14
16	415	255	371	NP	343	NP	CS–2	G3, G24
17	415	240	NP	371	343	NP	CS–2	...
18	585	380	NP	NP	315	315	CS–3	W11
19	585	380	NP	NP	315	315	CS–3	W11
20	585	380	NP	NP	315	315	CS–3	W11
21	725	450	NP	NP	343	343	CS–2	W11
22	725	450	NP	NP	315	315	CS–3	W11
23	725	450	NP	NP	343	343	CS–2	W11
24	825	485	NP	NP	343	343	CS–5	W11
25	825	485	NP	NP	343	343	CS–5	W11
26	825	485	NP	NP	343	343	CS–5	W11
27	930	760	NP	NP	343	343	HT–1	W11
28	380	230	649	371	649	NP	CS–2	S4, T5
29	380	230	NP	371	NP	NP	CS–2	G26, W10, W12
30	415	205	NP	371	NP	NP	CS–2	G17
31	415	220	649	NP	649	NP	CS–2	T5
32	415	220	649	371	649	NP	CS–2	S4, T5
33	415	220	649	371	649	NP	CS–2	S4, T5, W14
34	415	220	649	NP	NP	NP	CS–2	G3, S4, T5
35	415	220	649	NP	NP	NP	CS–2	S4, T5, W13
36	415	220	649	371	649	NP	CS–2	S4, T5
37	415	220	649	371	649	NP	CS–2	S4, T5
38	420	240	649	NP	649	NP	CS–2	S4, T4
39	420	245	649	NP	649	NP	CS–2	S4, T4
40	430	255	649	NP	649	NP	CS–2	S4, T4
41	440	255	649	NP	NP	NP	CS–2	S4, T4
42	440	265	649	NP	649	NP	CS–2	S4, T4
43	440	270	649	NP	649	NP	CS–2	S4, T4
44	440	275	649	NP	649	NP	CS–2	S4, T4
45	440	280	649	NP	649	NP	CS–2	T4

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	227	227	227	227	227	227	227	227	227	226	...	...	...	...	...
2	227	227	227	227	227	227	227	227	227	226	...	...	...	...	...
3	108	108	108	108	108	108	108	108	108	108	108	106	103	100	97.1
4	108	108	108	108	108	108	108	108	108	108	108	106	103	100	97.1
5	108	108	108	108	108	108	108	108	108	108	108	108	108	106	103
6	108	108	108	108	108	108	108	108	108	108	108	...	...	...	...
7	108	108	108	108	108	...	...	...	...	...	...	...	...	...	...
8	118	118	118	118	118	118	117	114	112	110	108	106	103	100	97.1
9	100	100	100	100	100	100	99.6	96.7	95.5	93.8	91.5	90.2	87.7	85.3	82.4
10	118	118	118	118	118	118	117	114	112	110	108	106	103	100	97.1
11	118	118	118	118	118	118	117	114	112	110	108	...	...	...	...
12	138	138	138	138	138	138	138	138	138	138	138	138	137	134	130
13	138	138	138	138	138	138	138	138	138	138	138	138	138	135	130
14	138	138	138	138	138	138	138	138	138	138	138	...	...	...	...
15	118	118	118	118	118	118	118	118	118	118	118	...	...	...	...
16	101	101	101	101	101	101	101	101	101	101	101	...	...	...	...
17	118	118	118	118	118	118	118	118	118	118	118	...	...	...	...
18	167	167	167	167	167	167	167	167	167	...	...	...	...	...	...
19	167	167	167	167	167	167	167	167	167	...	...	...	...	...	...
20	167	167	167	167	167	167	167	167	167	...	...	...	...	...	...
21	207	207	207	207	207	207	207	207	207	205	...	...	...	...	...
22	207	207	207	207	207	207	207	207	207	...	...	...	...	...	...
23	207	207	207	207	207	207	207	207	207	205	...	...	...	...	...
24	236	236	236	236	236	236	236	236	236	235	...	...	...	...	...
25	236	236	236	236	236	236	236	236	236	235	...	...	...	...	...
26	236	236	236	236	236	236	236	236	236	235	...	...	...	...	...
27	265	260	254	254	253	252	249	248	245	234	...	...	...	...	...
28	108	107	106	105	104	104	104	104	104	104	104	104	104	104	102
29	108	107	106	105	104	104	104	104	104	104	104	...	...	...	...
30	118	117	116	115	114	112	109	106	104	103	102	...	...	...	...
31	118	118	115	114	114	114	114	113	112	110	109	107	106	103	101
32	118	117	116	114	114	114	114	113	112	110	109	107	106	103	101
33	118	117	116	114	114	114	114	113	112	110	109	107	106	103	101
34	100	100	98.2	97.0	96.5	96.5	96.5	95.8	94.7	93.4	92.2	91.0	89.7	87.9	85.7
35	118	118	115	114	114	114	114	113	112	110	109	107	106	103	101
36	118	117	116	114	114	114	114	113	112	110	109	107	106	103	101
37	118	117	116	114	114	114	114	113	112	110	109	107	106	103	101
38	120	120	118	116	115	114	114	114	114	114	114	114	114	113	110
39	120	120	117	116	116	116	115	115	115	115	115	115	115	115	112
40	123	123	120	119	118	118	118	118	118	118	118	118	118	118	116
41	126	126	123	122	121	121	118	115	114	112	111	109	107	105	103
42	126	126	124	122	121	120	120	120	120	120	120	120	120	120	117
43	126	126	123	122	121	121	121	121	121	121	121	121	121	120	119
44	126	126	124	122	121	120	120	120	120	120	120	120	120	120	117
45	126	126	126	126	126	126	126	126	126	126	126	126	126	123	118

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	77.0	*49.5*	*31.3*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	77.0	*49.5*	*31.3*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	76.7	*49.6*	*31.2*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	77.0	*49.5*	*31.3*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	65.3	*42.0*	*26.5*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	77.0	*49.5*	*31.3*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	89.1	*46.0*	*32.5*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	88.9	*46.0*	*32.5*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	88.8	*61.7*	*40.3*	*26.4*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	88.3	*61.9*	*40.3*	*26.4*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
32	88.3	*61.9*	*40.3*	*26.4*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
33	88.3	*61.9*	*40.3*	*26.4*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
34	72.9	*53.2*	*33.7*	*22.5*	*14.8*	*9.71*	*6.34*	...	...	...	...	...	...	...	...	...	...
35	88.3	*61.9*	*40.3*	*26.4*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
36	88.3	*61.9*	*40.3*	*26.4*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
37	88.3	*61.9*	*40.3*	*26.4*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
38	*97.2*	*59.3*	*41.0*	*26.2*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
39	*94.4*	*60.2*	*40.8*	*26.3*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
40	*94.4*	*60.2*	*40.8*	*26.3*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
41	*94.4*	*60.2*	*40.8*	*26.3*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
42	*97.2*	*59.3*	*41.0*	*26.2*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
43	*94.4*	*60.2*	*40.8*	*26.3*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
44	*97.2*	*59.3*	*41.0*	*26.2*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
45	*94.4*	*60.2*	*40.8*	*26.3*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	1Cr–½Mo	Forgings	SA/EN 10222-2	13CrMo4-5	...	NT	35 < *t* ≤ 70	4	1
2	1Cr–½Mo	Smls. tube	SA/EN 10216-2	13CrMo4-5	...	...	*t* ≤ 40	4	1
3	1Cr–½Mo	Forgings	SA/EN 10222-2	13CrMo4-5	...	NT	*t* ≤ 35	4	1
4	1Cr–½Mo	Plate	SA-387	12	K11757	2	...	4	1
5	1Cr–½Mo	Wld. pipe	SA-691	1CR	K11757	...	...	4	1
6	1Cr–½Mo	Plate	SA/GB 713	15CrMoR	...	NT	60 < *t* ≤ 100	4	1
7	1Cr–½Mo	Plate	SA/EN 10028-2	13CrMo4-5	...	...	16 < *t* ≤ 60	4	1
8	1Cr–½Mo	Plate	SA/GB 713	15CrMoR	...	NT	6 ≤ *t* ≤ 60	4	1
9	1Cr–½Mo	Plate	SA/EN 10028-2	13CrMo4-5	...	...	*t* ≤ 16	4	1
10	1Cr–½Mo	Forgings	SA-182	F12	K11564	2	...	4	1
11	1Cr–½Mo	Forgings	SA-336	F12	K11564	...	...	4	1
12	1Cr–V	Smls. tube	SA-213	T17	K12047	...	...	10B	1
13	1¼Cr–½Mo	Castings	SA-217	WC6	J12072	...	...	4	1
14	1¼Cr–½Mo	Cast pipe	SA-426	CP11	J12072	...	...	4	1
15	1¼Cr–½Mo	Bar	SA-739	B11	K11797	...	...	4	1
16	1¼Cr–½Mo–Si	Forgings	SA-182	F11	K11597	1	...	4	1
17	1¼Cr–½Mo–Si	Smls. tube	SA-213	T11	K11597	...	...	4	1
18	1¼Cr–½Mo–Si	Smls. & wld. fittings	SA-234	WP11	...	1	...	4	1
19	1¼Cr–½Mo–Si	Wld. tube	SA-250	T11	K11597	...	...	4	1
20	1¼Cr–½Mo–Si	Wld. tube	SA-250	T11S1	K11597	...	...	4	1
21	1¼Cr–½Mo–Si	Smls. pipe	SA-335	P11	K11597	...	...	4	1
22	1¼Cr–½Mo–Si	Forgings	SA-336	F11	K11597	1	...	4	1
23	1¼Cr–½Mo–Si	Forged pipe	SA-369	FP11	K11597	...	...	4	1
24	1¼Cr–½Mo–Si	Plate	SA-387	11	K11789	1	...	4	1
25	1¼Cr–½Mo–Si	Wld. pipe	SA-691	1¼CR	K11789	...	...	4	1
26	1¼Cr–½Mo–Si	Wld. pipe	SA-691	1¼CR	K11789	...	...	4	1
27	1¼Cr–½Mo–Si	Forgings	SA-182	F11	K11572	2	...	4	1
28	1¼Cr–½Mo–Si	Forgings	SA-336	F11	K11572	2	...	4	1
29	1¼Cr–½Mo–Si	Forgings	SA-336	F11	K11572	3	...	4	1
30	1¼Cr–½Mo–Si	Plate	SA-387	11	K11789	2	...	4	1
31	1¼Cr–½Mo–Si	Wld. pipe	SA-691	1¼CR	K11789	...	...	4	1
32	1¾Cr–½Mo–Cu	Forgings	SA-592	E	K11695	...	65 < *t* ≤ 100	11B	2
33	1¾Cr–½Mo–Cu	Forgings	SA-592	E	K11695	...	≤65	11B	2
34	1¾Cr–½Mo–Ti	Plate	SA-517	E	K21604	...	65 < *t* ≤ 150	11B	2
35	1¾Cr–½Mo–Ti	Plate	SA-517	E	K21604	...	≤65	11B	2
36	2¼Cr–1Mo	Forgings	SA-182	F22	K21590	1	...	5A	1
37	2¼Cr–1Mo	Smls. tube	SA-213	T22	K21590	...	...	5A	1
38	2¼Cr–1Mo	Smls. & wld. fittings	SA-234	WP22	K21590	1	...	5A	1
39	2¼Cr–1Mo	Wld. tube	SA-250	T22	K21590	...	...	5A	1
40	2¼Cr–1Mo	Wld. tube	SA-250	T22S1	K21590	...	...	5A	1
41	2¼Cr–1Mo	Smls. pipe	SA-335	P22	K21590	...	...	5A	1
42	2¼Cr–1Mo	Forgings	SA-336	F22	K21590	1	...	5A	1
43	2¼Cr–1Mo	Forged pipe	SA-369	FP22	K21590	...	...	5A	1
44	2¼Cr–1Mo	Plate	SA-387	22	K21590	1	...	5A	1
45	2¼Cr–1Mo	Wld. pipe	SA-691	2¼CR	K21590	...	...	5A	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	440	285	649	NP	649	NP	CS-2	S4, T4
2	440	290	649	NP	649	NP	CS-2	T4
3	440	295	649	NP	649	NP	CS-2	S4, T4
4	450	275	649	371	649	NP	CS-2	S4, T5
5	450	275	NP	371	NP	NP	CS-2	G26, W10, W12
6	450	275	649	NP	NP	NP	CS-2	S4, T4
7	450	290	649	NP	649	NP	CS-2	S4, T4
8	450	295	649	NP	NP	NP	CS-2	S4, T4
9	450	300	649	NP	649	NP	CS-2	S4, T4
10	485	275	649	371	649	NP	CS-2	S4, T4
11	485	275	649	371	649	NP	CS-2	S4, T4
12	415	205	NP	NP	343	343	CS-2	...
13	485	275	593	371	593	NP	CS-2	G1, G17, T4
14	485	275	NP	371	NP	NP	CS-2	G17
15	485	310	NP	371	649	NP	CS-3	T4
16	415	205	649	NP	649	NP	CS-2	S4, T5
17	415	205	649	371	649	NP	CS-2	S4, T5
18	415	205	649	371	649	NP	CS-2	S4, T5, W14
19	415	205	649	NP	NP	NP	CS-2	G3, S4, T5
20	415	205	649	NP	NP	NP	CS-2	S4, T5, W13
21	415	205	649	371	649	NP	CS-2	S4, T5
22	415	205	649	NP	NP	NP	CS-2	S4, T5
23	415	205	649	371	649	NP	CS-2	S4, T5
24	415	240	649	371	649	NP	CS-2	S4, T4
25	415	240	NP	149 (Cl. 3 only)	NP	NP	CS-2	G27, W10, W12
26	415	240	NP	371	NP	NP	CS-2	G26, W10, W12
27	485	275	649	371	649	NP	CS-2	S4, T4
28	485	275	649	NP	649	NP	CS-2	S4, T4
29	515	310	NP	NP	649	NP	CS-3	T3
30	515	310	649	371	649	NP	CS-3	S4, T3
31	515	310	NP	371	NP	NP	CS-3	G26, W10, W12
32	725	620	NP	343 (SPT)	343	343	CS-5	S7
33	795	690	NP	NP	343	343	HT-1	...
34	725	620	NP	371 (Cl. MC & SPT)	343	343	CS-5	...
35	795	690	NP	371 (Cl. MC & SPT)	343	343	HT-1	...
36	415	205	649	371	649	NP	CS-2	S4, T4, W7, W9
37	415	205	649	371	649	NP	CS-2	S4, T4, W7, W9
38	415	205	649	371	649	NP	CS-2	S4, T4, W7, W9, W14
39	415	205	649	NP	NP	NP	CS-2	G3, S4, T4, W9
40	415	205	649	NP	NP	NP	CS-2	S4, T4, W9, W13
41	415	205	649	371	649	NP	CS-2	S4, T4, W7, W9
42	415	205	649	371	649	NP	CS-2	S4, T4, W7, W9
43	415	205	649	371	649	NP	CS-2	S4, T4, W7, W9
44	415	205	649	371	649	NP	CS-2	S4, T4, W7, W9
45	415	205	NP	371	NP	NP	CS-2	G26, W10, W12

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	126	126	124	122	121	120	120	120	120	120	120	120	120	120	117
2	126	126	126	126	126	126	126	126	126	126	126	126	126	123	118
3	126	126	124	122	121	120	120	120	120	120	120	120	120	120	117
4	128	128	125	124	123	123	123	123	123	123	123	123	123	123	123
5	128	127	125	124	123	123	123	123	123	123	123	...	...	...	...
6	129	129	126	125	124	124	124	123	123	123	123	123	123	123	121
7	129	129	126	125	124	124	124	123	123	123	123	123	123	123	121
8	129	129	126	125	124	124	124	123	123	123	123	123	123	123	121
9	129	129	126	125	124	124	124	123	123	123	123	123	123	123	121
10	138	137	135	133	132	132	132	132	132	132	132	132	132	129	125
11	138	138	134	133	132	132	132	132	132	132	132	132	132	129	125
12	118	118	118	118	118	116	112	109	108	106	...	...	...	...	...
13	138	138	138	138	138	138	138	138	138	138	138	136	133	130	105
14	138	138	138	138	138	138	138	138	138	138	138	...	...	...	...
15	138	138	138	138	138	138	138	138	138	138	138	138	138	135	107
16	118	118	118	118	118	116	112	109	108	106	104	102	99.5	96.9	94.7
17	118	118	118	118	118	116	112	109	108	106	104	102	99.5	96.9	94.7
18	118	118	118	118	118	116	112	109	108	106	104	102	99.5	96.9	94.7
19	100	100	100	100	100	98.8	95.8	92.5	91.3	89.8	88.0	86.8	84.3	82.3	80.7
20	118	118	118	118	118	116	112	109	108	106	104	102	99.5	96.9	94.7
21	118	118	118	118	118	116	112	109	108	106	104	102	99.5	96.9	94.7
22	118	118	118	118	118	116	112	109	108	106	104	102	99.5	96.9	94.7
23	118	118	118	118	118	116	112	109	108	106	104	102	99.5	96.9	94.7
24	118	118	118	118	118	118	118	118	118	118	118	118	116	114	101
25	118	118	118	118	118	...	...	...	...	...	...	...	...	...	...
26	118	118	118	118	118	118	118	118	118	118	118	...	...	...	...
27	138	138	138	138	138	138	138	138	138	138	138	136	133	130	105
28	138	138	138	138	138	138	138	138	138	138	138	136	133	130	105
29	148	148	148	148	148	148	148	148	148	148	148	148	148	143	*107*
30	148	148	148	148	148	148	148	148	148	148	148	148	148	143	*107*
31	148	148	148	148	148	148	148	148	148	148	148	...	...	...	...
32	207	207	207	207	207	207	207	207	207	207	...	...	...	...	...
33	227	227	227	227	227	227	227	227	227	227	...	...	...	...	...
34	207	207	207	207	207	207	207	207	207	207	206	...	...	...	...
35	227	227	227	227	227	227	227	227	227	227	221	...	...	...	...
36	118	118	118	116	114	114	114	114	114	114	114	114	114	114	100
37	118	118	118	116	114	114	114	114	114	114	114	114	114	114	100
38	118	118	118	116	114	114	114	114	114	114	114	114	114	114	100
39	100	100	99.8	98.3	97.2	97.2	97.2	97.2	97.2	97.2	97.2	97.2	97.2	97.2	85.5
40	118	118	118	116	114	114	114	114	114	114	114	114	114	114	100
41	118	118	118	116	114	114	114	114	114	114	114	114	114	114	100
42	118	118	118	116	114	114	114	114	114	114	114	114	114	114	100
43	118	118	118	116	114	114	114	114	114	114	114	114	114	114	100
44	118	118	118	116	114	114	114	114	114	114	114	114	114	114	100
45	118	118	118	116	114	114	114	114	114	114	114	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	*97.2*	*59.3*	*41.0*	*26.2*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
2	*94.4*	*60.2*	*40.8*	*26.3*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
3	*97.2*	*59.3*	*41.0*	*26.2*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
4	94.4	*60.2*	*40.8*	*26.3*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	*94.4*	*60.2*	*40.8*	*26.3*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
7	*94.4*	*60.2*	*40.8*	*26.3*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
8	*94.4*	*60.2*	*40.8*	*26.3*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
9	*94.4*	*60.2*	*40.8*	*26.3*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
10	*97.2*	*59.3*	*41.0*	*26.2*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
11	*97.2*	*59.3*	*41.0*	*26.2*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	*73.3*	*52.1*	*36.4*	*25.2*	*17.6*	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	*72.9*	*52.3*	*36.3*	*25.2*	*17.6*	*12.4*	*8.08*	...	...	...	...	...	...	...	...	...	...
16	72.9	*51.0*	*36.7*	*25.1*	*17.6*	*12.4*	*8.08*	...	...	...	...	...	...	...	...	...	...
17	72.9	*51.0*	*36.7*	*25.1*	*17.6*	*12.4*	*8.08*	...	...	...	...	...	...	...	...	...	...
18	72.9	*51.0*	*36.7*	*25.1*	*17.6*	*12.4*	*8.08*	...	...	...	...	...	...	...	...	...	...
19	62.8	*43.5*	*31.5*	*21.5*	*15.0*	*10.4*	*6.73*	...	...	...	...	...	...	...	...	...	...
20	72.9	*51.0*	*36.7*	*25.1*	*17.6*	*12.4*	*8.08*	...	...	...	...	...	...	...	...	...	...
21	72.9	*51.0*	*36.7*	*25.1*	*17.6*	*12.4*	*8.08*	...	...	...	...	...	...	...	...	...	...
22	72.9	*51.0*	*36.7*	*25.1*	*17.6*	*12.4*	*8.08*	...	...	...	...	...	...	...	...	...	...
23	72.9	*51.0*	*36.7*	*25.1*	*17.6*	*12.4*	*8.08*	...	...	...	...	...	...	...	...	...	...
24	*72.9*	*51.7*	*36.5*	*25.2*	*17.6*	*12.4*	*8.08*	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	*72.9*	*52.1*	*36.4*	*25.2*	*17.6*	*12.4*	*8.08*	...	...	...	...	...	...	...	...	...	...
28	*72.9*	*52.1*	*36.4*	*25.2*	*17.6*	*12.4*	*8.08*	...	...	...	...	...	...	...	...	...	...
29	*72.9*	*52.3*	*36.3*	*25.2*	*17.6*	*12.4*	*8.08*	...	...	...	...	...	...	...	...	...	...
30	*72.9*	*52.3*	*36.3*	*25.2*	*17.6*	*12.4*	*8.08*	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	*80.9*	*64.0*	*47.7*	*34.5*	*23.5*	*15.5*	*9.39*	...	...	...	...	...	...	...	...	...	...
37	*80.9*	*64.0*	*47.7*	*34.5*	*23.5*	*15.5*	*9.39*	...	...	...	...	...	...	...	...	...	...
38	*80.9*	*64.0*	*47.7*	*34.5*	*23.5*	*15.5*	*9.39*	...	...	...	...	...	...	...	...	...	...
39	*69.0*	*54.5*	*40.4*	*29.1*	*19.8*	*12.9*	*8.06*	...	...	...	...	...	...	...	...	...	...
40	*80.9*	*64.0*	*47.7*	*34.5*	*23.5*	*15.5*	*9.39*	...	...	...	...	...	...	...	...	...	...
41	*80.9*	*64.0*	*47.7*	*34.5*	*23.5*	*15.5*	*9.39*	...	...	...	...	...	...	...	...	...	...
42	*80.9*	*64.0*	*47.7*	*34.5*	*23.5*	*15.5*	*9.39*	...	...	...	...	...	...	...	...	...	...
43	*80.9*	*64.0*	*47.7*	*34.5*	*23.5*	*15.5*	*9.39*	...	...	...	...	...	...	...	...	...	...
44	*80.9*	*64.0*	*47.7*	*34.5*	*23.5*	*15.5*	*9.39*	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...	150 < *t* ≤ 250	5A	1
2	2¼Cr–1Mo	Forgings	SA/EN 10222–2	11CrMo9–10	...	NT or QT	200 < *t* ≤ 500	5A	1
3	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...	100 < *t* ≤ 150	5A	1
4	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...	60 < *t* ≤ 100	5A	1
5	2¼Cr–1Mo	Smls. tube	SA/EN 10216–2	10CrMo9–10	...	...	40 < *t* ≤ 60	5A	1
6	2¼Cr–1Mo	Smls. tube	SA/EN 10216–2	10CrMo9–10	...	...	*t* ≤ 40	5A	1
7	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...	*t* ≤ 60	5A	1
8	2¼Cr–1Mo	Castings	SA–217	WC9	J21890	...	...	5A	1
9	2¼Cr–1Mo	Cast pipe	SA–426	CP22	J21890	...	...	5A	1
10	2¼Cr–1Mo	Forgings	SA–182	F22	K21590	3	...	5A	1
11	2¼Cr–1Mo	Forgings	SA–336	F22	K21590	3	...	5A	1
12	2¼Cr–1Mo	Plate	SA–387	22	K21590	2	...	5A	1
13	2¼Cr–1Mo	Wld. pipe	SA–691	2¼CR	K21590	...	...	5A	1
14	2¼Cr–1Mo	Bar	SA–739	B22	K21390	...	...	5A	1
15	2¼Cr–1Mo	Forgings	SA/EN 10222–2	11CrMo9–10	...	NT	*t* ≤ 200	5A	1
16	2¼Cr–1Mo	Castings	SA–487	8	J22091	A	...	5C	1
17	2¼Cr–1Mo	Forgings	SA–508	22	K21590	3	...	5C	1
18	2¼Cr–1Mo	Forgings	SA–541	22	K21390	3	...	5C	1
19	2¼Cr–1Mo	Plate	SA–542	B	K21590	4	...	5C	1
20	2¼Cr–1Mo–V	Forgings	SA–182	F22V	K31835	...	...	5C	1
21	2¼Cr–1Mo–V	Forgings	SA–336	F22V	K31835	...	...	5C	1
22	2¼Cr–1Mo–V	Forgings	SA–541	22V	K31835	...	...	5C	1
23	2¼Cr–1Mo–V	Plate	SA–542	D	K31835	4a	...	5C	1
24	2¼Cr–1Mo–V	Plate	SA–832	22V	K31835	...	...	5C	1
25	3Cr–1Mo	Smls. tube	SA–213	T21	K31545	...	...	5A	1
26	3Cr–1Mo	Smls. pipe	SA–335	P21	K31545	...	...	5A	1
27	3Cr–1Mo	Forgings	SA–336	F21	K31545	1	...	5A	1
28	3Cr–1Mo	Forged pipe	SA–369	FP21	K31545	...	...	5A	1
29	3Cr–1Mo	Plate	SA–387	21	K31545	1	...	5A	1
30	3Cr–1Mo	Cast pipe	SA–426	CP21	J31545	...	...	5A	1
31	3Cr–1Mo	Forgings	SA–182	F21	K31545	...	...	5A	1
32	3Cr–1Mo	Forgings	SA–336	F21	K31545	3	...	5A	1
33	3Cr–1Mo	Plate	SA–387	21	K31545	2	...	5A	1
34	3Cr–1Mo–¼V–Ti–B	Forgings	SA–182	F3V	K31830	...	...	5C	1
35	3Cr–1Mo–¼V–Ti–B	Forgings	SA–336	F3V	K31830	...	...	5C	1
36	3Cr–1Mo–¼V–Ti–B	Forgings	SA–508	3V	K31830	...	...	5C	1
37	3Cr–1Mo–¼V–Ti–B	Forgings	SA–541	3V	K31830	...	...	5C	1
38	3Cr–1Mo–¼V–Ti–B	Plate	SA–542	C	K31830	4a	...	5C	1
39	3Cr–1Mo–¼V–Ti–B	Plate	SA–832	21V	K31830	...	...	5C	1
40	3Cr–1Mo–¼V–Cb–Ca	Forgings	SA–182	F3VCb	...	...	...	5C	1
41	3Cr–1Mo–¼V–Cb–Ca	Forgings	SA–336	F3VCb	...	...	...	5C	1
42	3Cr–1Mo–¼V–Cb–Ca	Forgings	SA–508	3VCb	...	...	...	5C	1
43	3Cr–1Mo–¼V–Cb–Ca	Forgings	SA–541	3VCb	...	...	...	5C	1
44	3Cr–1Mo–¼V–Cb–Ca	Plate	SA–542	E	...	4a	...	5C	1
45	3Cr–1Mo–¼V–Cb–Ca	Plate	SA–832	23V	...	...	...	5C	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	450	250	593	NP	593	NP	CS–3	S4, T4, W7, W9
2	450	265	649	NP	649	NP	CS–3	S4, T4, W7, W9
3	460	260	593	NP	593	NP	CS–3	S4, T4, W7, W9
4	470	280	593	NP	593	NP	CS–3	S4, T4, W7, W9
5	480	270	649	NP	649	NP	CS–2	T4, W7, W9
6	480	280	649	NP	649	NP	CS–2	T4, W7, W9
7	480	...	593	NP	593	NP	CS–3	G18, S4, T4, W7, W9
8	485	275	649	371	649	NP	CS–2	G1, G17, S4, T4, W7, W9
9	485	275	NP	371	NP	NP	CS–2	G17
10	515	310	649	371	649	NP	CS–3	S4, T4, W7, W9
11	515	310	649	371	649	NP	CS–3	S4, T4, W7, W9
12	515	310	649	371	649	NP	CS–3	S4, T4, W7, W9
13	515	310	NP	371	NP	NP	CS–3	G26, W10, W12
14	515	310	NP	371	649	NP	CS–3	T4, W7
15	520	310	649	NP	649	NP	CS–3	S4, T3, W7, W9
16	585	380	NP	NP	538	NP	CS–3	G1, T4, W7
17	585	380	NP	NP	454	NP	CS–2	...
18	585	380	NP	NP	454	NP	CS–2	...
19	585	380	NP	NP	454	NP	CS–2	...
20	585	415	NP	NP	482	NP	CS–2	...
21	585	415	NP	NP	482	NP	CS–2	...
22	585	415	NP	NP	482	NP	CS–2	...
23	585	415	NP	NP	482	NP	CS–2	...
24	585	415	NP	NP	482	NP	CS–2	...
25	415	205	649	371	649	NP	CS–2	S4, T3
26	415	205	649	371	649	NP	CS–2	S4, T3
27	415	205	649	371	649	NP	CS–2	S4, T3
28	415	205	649	371	649	NP	CS–2	S4, T3
29	415	205	649	371	649	NP	CS–2	S4, T3
30	415	205	NP	371	NP	NP	CS–2	G17
31	515	310	649	371	649	NP	CS–3	S4, T3
32	515	310	649	371	649	NP	CS–3	S4, T3
33	515	310	649	371	649	NP	CS–3	S4, T3
34	585	415	NP	NP	482	NP	CS–3	...
35	585	415	NP	NP	482	NP	CS–3	...
36	585	415	NP	NP	482	NP	CS–3	...
37	585	415	NP	NP	482	NP	CS–3	...
38	585	415	NP	NP	482	NP	CS–3	...
39	585	415	NP	NP	482	NP	CS–3	...
40	585	415	NP	NP	482	NP	CS–3	...
41	585	415	NP	NP	482	NP	CS–3	...
42	585	415	NP	NP	482	NP	CS–3	...
43	585	415	NP	NP	482	NP	CS–3	...
44	585	415	NP	NP	482	NP	CS–3	...
45	585	415	NP	NP	482	NP	CS–3	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
No.	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	129	129	128	126	125	124	123	123	122	121	120	118	116	113	109
2	129	129	129	128	126	124	124	123	123	122	121	119	116	113	109
3	131	131	131	129	128	127	126	125	125	124	123	121	119	116	112
4	134	134	134	132	131	129	129	128	127	127	125	123	121	118	114
5	137	137	137	137	135	133	132	132	132	131	129	126	123	119	113
6	137	137	137	137	135	133	132	132	132	131	129	126	123	119	113
7	137	137	137	135	133	132	132	131	130	129	128	126	124	121	117
8	138	138	138	137	136	134	133	133	132	131	129	127	124	119	113
9	138	138	138	137	136	134	133	133	132	131	129	...	...	...	...
10	148	148	147	146	144	142	141	141	140	139	138	136	133	130	116
11	148	148	147	146	144	142	141	141	140	139	138	136	133	130	116
12	148	148	147	146	144	142	141	141	140	139	138	136	133	130	116
13	148	148	147	146	144	142	141	141	140	139	138	...	...	...	...
14	148	148	147	146	144	142	141	141	140	139	138	136	133	130	116
15	149	149	149	148	146	143	143	142	142	141	139	137	135	131	*116*
16	168	168	167	165	163	162	162	161	160	160	157	154	150	145	120
17	168	168	168	168	168	168	165	161	160	159	158	156	151	142	133
18	168	168	168	168	168	168	165	161	160	159	158	156	151	142	133
19	168	168	168	168	168	168	165	161	160	159	158	156	151	142	133
20	168	168	168	168	168	168	168	165	162	159	157	153	149	145	141
21	168	168	168	168	168	168	168	165	162	159	157	153	149	145	141
22	168	168	168	168	168	168	168	165	162	159	157	153	149	145	141
23	168	168	168	168	168	168	168	165	162	159	157	153	149	145	141
24	168	168	168	168	168	168	168	165	162	159	157	153	149	145	141
25	118	118	118	116	114	114	114	114	114	114	114	114	114	113	*90.5*
26	118	118	118	116	114	114	114	114	114	114	114	114	114	113	*90.5*
27	118	118	118	116	114	114	114	114	114	114	114	114	114	113	*90.5*
28	118	118	118	116	114	114	114	114	114	114	114	114	114	113	*90.5*
29	118	118	118	116	114	114	114	114	114	114	114	114	114	113	*90.5*
30	118	118	118	116	114	114	114	114	114	114	114	...	...	...	...
31	148	148	147	146	144	142	141	141	140	139	138	136	133	127	*100*
32	148	148	147	146	144	142	141	141	140	139	138	136	133	127	*100*
33	148	148	147	146	144	142	141	141	140	139	138	136	133	127	*100*
34	168	168	167	164	161	156	154	151	150	149	147	145	144	141	139
35	168	168	167	164	161	156	154	151	150	149	147	145	144	141	139
36	168	168	167	164	161	156	154	151	150	149	147	145	144	141	139
37	168	168	167	164	161	156	154	151	150	149	147	145	144	141	139
38	168	168	167	164	161	156	154	151	150	149	147	145	144	141	139
39	168	168	167	164	161	156	154	151	150	149	147	145	144	141	139
40	168	168	167	164	161	156	154	151	150	149	147	145	144	141	139
41	168	168	167	164	161	156	154	151	150	149	147	145	144	141	139
42	168	168	167	164	161	156	154	151	150	149	147	145	144	141	139
43	168	168	167	164	161	156	154	151	150	149	147	145	144	141	139
44	168	168	167	164	161	156	154	151	150	149	147	145	144	141	139
45	168	168	167	164	161	156	154	151	150	149	147	145	144	141	139

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	*88.4*	*64.0*	*44.6*	*30.0*	*19.7*	...	...	...	...	...	...	...	...	...	...	...	...
2	*89.4*	*64.3*	*44.9*	*30.1*	*19.7*	*12.9*	*8.06*	...	...	...	...	...	...	...	...	...	...
3	*88.4*	*64.0*	*44.6*	*30.0*	*19.7*	...	...	...	...	...	...	...	...	...	...	...	...
4	*88.4*	*64.0*	*44.6*	*30.0*	*19.7*	...	...	...	...	...	...	...	...	...	...	...	...
5	*89.4*	*64.3*	*44.9*	*30.1*	*19.7*	*12.9*	*8.06*	...	...	...	...	...	...	...	...	...	...
6	*89.4*	*64.3*	*44.9*	*30.1*	*19.7*	*12.9*	*8.06*	...	...	...	...	...	...	...	...	...	...
7	*88.4*	*64.0*	*44.6*	*30.0*	*19.7*	...	...	...	...	...	...	...	...	...	...	...	...
8	*90.4*	*64.0*	*45.0*	*30.1*	*19.7*	*12.9*	*8.06*	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	*89.4*	*64.3*	*44.9*	*30.1*	*19.7*	*12.9*	*8.06*	...	...	...	...	...	...	...	...	...	...
11	*89.4*	*64.3*	*44.9*	*30.1*	*19.7*	*12.9*	*8.06*	...	...	...	...	...	...	...	...	...	...
12	*89.4*	*64.3*	*44.9*	*30.1*	*19.7*	*12.9*	*8.06*	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	*89.4*	*64.3*	*44.9*	*30.1*	*19.7*	*12.9*	*8.06*	...	...	...	...	...	...	...	...	...	...
15	*89.4*	*64.3*	*44.9*	*30.1*	*19.7*	*12.9*	*8.06*	...	...	...	...	...	...	...	...	...	...
16	*88.1*	*65.1*	*42.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	137	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	137	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	137	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	137	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	137	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	*68.2*	*54.1*	*43.5*	*34.4*	*25.3*	*17.4*	*10.0*	...	...	...	...	...	...	...	...	...	...
26	*68.2*	*54.1*	*43.5*	*34.4*	*25.3*	*17.4*	*10.0*	...	...	...	...	...	...	...	...	...	...
27	*68.2*	*54.1*	*43.5*	*34.4*	*25.3*	*17.4*	*10.0*	...	...	...	...	...	...	...	...	...	...
28	*68.2*	*54.1*	*43.5*	*34.4*	*25.3*	*17.4*	*10.0*	...	...	...	...	...	...	...	...	...	...
29	*68.2*	*54.1*	*43.5*	*34.4*	*25.3*	*17.4*	*10.0*	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	*72.8*	*54.9*	*40.7*	*29.4*	*20.4*	*15.7*	*8.64*	...	...	...	...	...	...	...	...	...	...
32	*72.8*	*54.9*	*40.7*	*29.4*	*20.4*	*15.7*	*8.64*	...	...	...	...	...	...	...	...	...	...
33	*72.8*	*54.9*	*40.7*	*29.4*	*20.4*	*15.7*	*8.64*	...	...	...	...	...	...	...	...	...	...
34	136	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	136	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	136	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	136	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	136	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	136	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	136	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	136	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	136	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	136	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	136	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	136	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	5Cr–½Mo	Smls. tube	SA–213	T5	K41545	...	...	5B	1
2	5Cr–½Mo	Smls. & wld. fittings	SA–234	WP5	K41545	...	...	5B	1
3	5Cr–½Mo	Smls. pipe	SA–335	P5	K41545	...	...	5B	1
4	5Cr–½Mo	Forged pipe	SA–369	FP5	K41545	...	...	5B	1
5	5Cr–½Mo	Plate	SA–387	5	K41545	1	...	5B	1
6	5Cr–½Mo	Wld. pipe	SA–691	5CR	K41545	...	...	5B	1
7	5Cr–½Mo	Forgings	SA–336	F5	K41545	...	...	5B	1
8	5Cr–½Mo	Forgings	SA–182	F5	K41545	...	...	5B	1
9	5Cr–½Mo	Plate	SA–387	5	K41545	2	...	5B	1
10	5Cr–½Mo	Forgings	SA–336	F5A	K42544	...	...	5B	1
11	5Cr–½Mo	Castings	SA–217	C5	J42045	...	...	5B	1
12	5Cr–½Mo	Cast pipe	SA–426	CP5	J42045	...	...	5B	1
13	5Cr–½Mo	Forgings	SA–182	F5a	K42544	...	...	5B	1
14	5Cr–½Mo–Si	Smls. tube	SA–213	T5b	K51545	...	...	5B	1
15	5Cr–½Mo–Si	Smls. pipe	SA–335	P5b	K51545	...	...	5B	1
16	5Cr–½Mo–Ti	Smls. tube	SA–213	T5c	K41245	...	...	5B	1
17	5Cr–½Mo–Ti	Smls. pipe	SA–335	P5c	K41245	...	...	5B	1
18	9Cr–1Mo	Smls. tube	SA–213	T9	K90941	...	...	5B	1
19	9Cr–1Mo	Fittings	SA–234	WP9	K90941	...	...	5B	1
20	9Cr–1Mo	Smls. pipe	SA–335	P9	K90941	...	...	5B	1
21	9Cr–1Mo	Forged pipe	SA–369	FP9	K90941	...	...	5B	1
22	9Cr–1Mo	Forgings	SA–182	F9	K90941	...	...	5B	1
23	9Cr–1Mo	Forgings	SA–336	F9	K90941	...	...	5B	1
24	9Cr–1Mo	Castings	SA–217	C12	J82090	...	...	5B	1
25	9Cr–1Mo	Cast pipe	SA–426	CP9	J82090	...	...	5B	1
26	9Cr–1Mo–V	Smls. tube	SA–213	T91 Type 1	K90901	...	...	15E	1
27	9Cr–1Mo–V	Fittings	SA–234	WP91 Type 1	K90901	...	...	15E	1
28	9Cr–1Mo–V	Smls. pipe	SA–335	P91 Type 1	K90901	...	$t \le 75$	15E	1
29	9Cr–1Mo–V	Smls. pipe	SA–335	P91 Type 1	K90901	...	$t > 75$	15E	1
30	9Cr–1Mo–V	Forged pipe	SA–369	FP91 Type 1	K90901	...	...	15E	1
31	9Cr–1Mo–V	Plate	SA–387	91 Type 1	K90901	2	$t \le 75$	15E	1
32	9Cr–1Mo–V	Plate	SA–387	91 Type 1	K90901	2	$t > 75$	15E	1
33	9Cr–1Mo–V	Forgings	SA–182	F91 Type 1	K90901	...	$t \le 75$	15E	1
34	9Cr–1Mo–V	Forgings	SA–182	F91 Type 1	K90901	...	$t > 75$	15E	1
35	9Cr–1Mo–V	Forgings	SA–336	F91 Type 1	K90901	...	...	15E	1
36	9Cr–1Mo–V	Smls. tube	SA–213	T91 Type 2	K90901	...	...	15E	1
37	9Cr–1Mo–V	Fittings	SA–234	WP91 Type 2	K90901	...	...	15E	1
38	9Cr–1Mo–V	Smls. pipe	SA–335	P91 Type 2	K90901	...	...	15E	1
39	9Cr–1Mo–V	Forged pipe	SA–369	FP91 Type 2	K90901	...	...	15E	1
40	9Cr–1Mo–V	Plate	SA–387	91 Type 2	K90901	2	...	15E	1
41	9Cr–1Mo–V	Forgings	SA–182	F91 Type 2	K90901	...	...	15E	1
42	9Cr–1Mo–V	Forgings	SA–336	F91 Type 2	K90901	...	...	15E	1
43	11Cr–Ti	Plate	SA–240	...	S40910	...	...	7	1
44	11Cr–Ti	Plate	SA–240	...	S40920	...	...	7	1
45	11Cr–Ti	Plate	SA–240	...	S40930	...	...	7	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	415	205	649	371	649	NP	CS–2	T4
2	415	205	649	371	649	NP	CS–2	T4, W14
3	415	205	649	371	649	NP	CS–2	T4
4	415	205	649	371	649	NP	CS–2	T4
5	415	205	649	371	649	NP	CS–2	T4
6	415	205	NP	371	NP	NP	CS–2	G26, W10, W12
7	415	250	649	NP	649	NP	CS–2	T4
8	485	275	649	371	649	NP	CS–2	T3
9	515	310	NP	371	649	NP	CS–3	T3
10	550	345	649	NP	649	NP	CS–3	T3
11	620	415	649	371	649	NP	CS–3	G1, G17, T3
12	620	415	NP	371	NP	NP	CS–3	G17
13	620	450	649	NP	649	NP	CS–5	T3
14	415	205	649	NP	649	NP	CS–2	T4
15	415	205	649	NP	649	NP	CS–2	T4
16	415	205	649	NP	649	NP	CS–2	T4
17	415	205	649	NP	649	NP	CS–2	T4
18	415	205	649	371	649	NP	CS–2	T5
19	415	205	649	NP	649	NP	CS–2	T5
20	415	205	649	371	649	NP	CS–2	T5
21	415	205	649	371	649	NP	CS–2	T5
22	585	380	649	NP	649	NP	CS–3	T4
23	585	380	NP	NP	649	NP	CS–3	T4
24	620	415	649	371 (SPT)	649	NP	CS–3	G1, T4
25	620	415	NP	371	NP	NP	CS–3	G17
26	585	415	649	371	649	NP	CS–3	T6
27	620	415	649	NP	NP	NP	CS–3	T6
28	585	415	649	371	649	NP	CS–3	T6
29	585	415	649	NP	649	NP	CS–3	T6
30	585	415	649	NP	NP	NP	CS–3	T6
31	585	415	649	371	649	NP	CS–3	T6
32	585	415	649	NP	649	NP	CS–3	T6
33	620	415	649	371	649	NP	CS–3	T6
34	620	415	649	NP	649	NP	CS–3	T6
35	620	415	649	NP	649	NP	CS–3	T6
36	585	415	649	NP	NP	NP	CS–3	T6
37	620	415	649	NP	NP	NP	CS–3	T6
38	585	415	649	NP	NP	NP	CS–3	T6
39	585	415	649	NP	NP	NP	CS–3	T6
40	585	415	649	NP	NP	NP	CS–3	T6
41	620	415	649	NP	NP	NP	CS–3	T6
42	620	415	649	NP	NP	NP	CS–3	T6
43	380	170	NP	NP	427	NP	CS–1	...
44	380	170	NP	NP	427	NP	CS–1	...
45	380	170	NP	NP	427	NP	CS–1	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	118	118	118	116	114	114	113	112	111	109	107	104	100	96.1	81.4
2	118	118	118	116	114	114	113	112	111	109	107	104	100	96.1	81.4
3	118	118	118	116	114	114	113	112	111	109	107	104	100	96.1	81.4
4	118	118	118	116	114	114	113	112	111	109	107	104	100	96.1	81.4
5	118	118	118	116	114	114	113	112	111	109	107	104	100	96.1	81.4
6	118	118	118	116	114	114	113	112	111	109	107	...	...	...	...
7	118	118	118	116	114	114	113	112	111	109	107	104	100	96.1	81.4
8	138	138	138	136	134	132	132	131	130	128	125	121	118	102	*81.1*
9	148	148	147	146	143	142	142	140	139	137	134	130	126	104	*80.5*
10	158	158	157	154	152	152	151	150	148	146	143	139	133	104	*80.3*
11	177	177	177	174	172	170	170	169	167	164	161	156	134	103	*80.6*
12	177	177	177	174	172	170	170	169	167	164	161	...	...	...	...
13	177	177	177	174	172	170	170	169	167	164	161	156	134	103	*80.6*
14	118	118	118	116	114	114	113	112	111	109	107	104	100	96.1	81.4
15	118	118	118	116	114	114	113	112	111	109	107	104	100	96.1	81.4
16	118	118	118	116	114	114	113	112	111	109	107	104	100	96.1	81.4
17	118	118	118	116	114	114	113	112	111	109	107	104	100	96.1	81.4
18	118	118	118	116	114	114	113	112	111	109	107	104	100	95.8	91.8
19	118	118	118	116	114	114	113	112	111	109	107	104	100	95.8	91.8
20	118	118	118	116	114	114	113	112	111	109	107	104	100	95.8	91.8
21	118	118	118	116	114	114	113	112	111	109	107	104	100	95.8	91.8
22	168	167	166	164	162	161	161	159	157	155	152	147	142	137	121
23	168	167	166	164	162	161	161	159	157	155	152	147	142	137	121
24	177	177	177	174	172	170	170	169	167	164	161	156	151	145	123
25	177	177	177	174	172	170	170	169	167	164	161	...	...	...	...
26	168	168	168	168	168	167	166	164	163	161	157	153	147	141	134
27	177	177	177	177	177	177	176	175	172	170	166	162	156	149	142
28	168	168	168	168	168	167	166	164	163	161	157	153	147	141	134
29	168	168	168	168	168	167	166	164	163	161	157	153	147	141	134
30	168	168	168	168	168	167	166	164	163	161	157	153	147	141	134
31	168	168	168	168	168	167	166	164	163	161	157	153	147	141	134
32	168	168	168	168	168	167	166	164	163	161	157	153	147	141	134
33	177	177	177	177	177	177	176	175	172	170	166	162	156	149	142
34	177	177	177	177	177	177	176	175	172	170	166	162	156	149	142
35	177	177	177	177	177	177	176	175	172	170	166	162	156	149	142
36	168	168	168	168	168	167	166	164	163	161	157	153	147	141	134
37	177	177	177	177	177	177	176	175	172	170	166	162	156	149	142
38	168	168	168	168	168	167	166	164	163	161	157	153	147	141	134
39	168	168	168	168	168	167	166	164	163	161	157	153	147	141	134
40	168	168	168	168	168	167	166	164	163	161	157	153	147	141	134
41	177	177	177	177	177	177	176	175	172	170	166	162	156	149	142
42	177	177	177	177	177	177	176	175	172	170	166	162	156	149	142
43	108	104	98.8	94.4	90.1	83.8	80.5	78.2	77.9	77.9	77.9	77.2	76.6	76.0	...
44	108	104	98.8	94.4	90.1	83.8	80.5	78.2	77.9	77.9	77.9	77.2	76.6	76.0	...
45	108	104	98.8	94.4	90.1	83.8	80.5	78.2	77.9	77.9	77.9	77.2	76.6	76.0	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	*61.7*	*46.4*	*34.7*	*25.8*	*18.0*	*11.5*	*6.68*	...	...	...	...	...	...	...	...	...	...
2	*61.7*	*46.4*	*34.7*	*25.8*	*18.0*	*11.5*	*6.68*	...	...	...	...	...	...	...	...	...	...
3	*61.7*	*46.4*	*34.7*	*25.8*	*18.0*	*11.5*	*6.68*	...	...	...	...	...	...	...	...	...	...
4	*61.7*	*46.4*	*34.7*	*25.8*	*18.0*	*11.5*	*6.68*	...	...	...	...	...	...	...	...	...	...
5	*61.7*	*46.4*	*34.7*	*25.8*	*18.0*	*11.5*	*6.68*	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	*61.7*	*46.4*	*34.7*	*25.8*	*18.0*	*11.5*	*6.68*	...	...	...	...	...	...	...	...	...	...
8	*61.8*	*46.4*	*34.7*	*25.8*	*18.0*	*11.5*	*6.68*	...	...	...	...	...	...	...	...	...	...
9	*62.0*	*46.3*	*34.8*	*25.8*	*18.0*	*11.5*	*6.68*	...	...	...	...	...	...	...	...	...	...
10	*62.1*	*46.3*	*34.8*	*25.8*	*18.0*	*11.5*	*6.68*	...	...	...	...	...	...	...	...	...	...
11	*62.0*	*46.3*	*34.8*	*25.8*	*18.0*	*11.5*	*6.68*	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	*62.0*	*46.3*	*34.8*	*25.8*	*18.0*	*11.5*	*6.68*	...	...	...	...	...	...	...	...	...	...
14	*61.7*	*46.4*	*34.7*	*25.8*	*18.0*	*11.5*	*6.68*	...	...	...	...	...	...	...	...	...	...
15	*61.7*	*46.4*	*34.7*	*25.8*	*18.0*	*11.5*	*6.68*	...	...	...	...	...	...	...	...	...	...
16	*61.7*	*46.4*	*34.7*	*25.8*	*18.0*	*11.5*	*6.68*	...	...	...	...	...	...	...	...	...	...
17	*61.7*	*46.4*	*34.7*	*25.8*	*18.0*	*11.5*	*6.68*	...	...	...	...	...	...	...	...	...	...
18	80.3	*61.0*	*42.9*	*30.0*	*20.6*	*14.4*	*10.2*	...	...	...	...	...	...	...	...	...	...
19	80.3	*61.0*	*42.9*	*30.0*	*20.6*	*14.4*	*10.2*	...	...	...	...	...	...	...	...	...	...
20	80.3	*61.0*	*42.9*	*30.0*	*20.6*	*14.4*	*10.2*	...	...	...	...	...	...	...	...	...	...
21	80.3	*61.0*	*42.9*	*30.0*	*20.6*	*14.4*	*10.2*	...	...	...	...	...	...	...	...	...	...
22	*89.0*	*60.7*	*43.1*	*30.0*	*20.6*	*14.4*	*10.2*	...	...	...	...	...	...	...	...	...	...
23	*89.0*	*60.7*	*43.1*	*30.0*	*20.6*	*14.4*	*10.2*	...	...	...	...	...	...	...	...	...	...
24	*88.2*	*61.0*	*43.0*	*30.0*	*20.6*	*14.4*	*10.2*	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	126	117	*98.5*	*75.5*	*54.3*	*36.8*	*24.0*	...	...	...	...	...	...	...	...	...	...
27	133	124	*98.5*	*75.5*	*54.3*	*36.8*	*24.0*	...	...	...	...	...	...	...	...	...	...
28	126	117	*98.5*	*75.5*	*54.3*	*36.8*	*24.0*	...	...	...	...	...	...	...	...	...	...
29	126	117	*98.5*	*75.5*	*54.3*	*36.8*	*24.0*	...	...	...	...	...	...	...	...	...	...
30	126	117	*98.5*	*75.5*	*54.3*	*36.8*	*24.0*	...	...	...	...	...	...	...	...	...	...
31	126	117	*98.5*	*75.5*	*54.3*	*36.8*	*24.0*	...	...	...	...	...	...	...	...	...	...
32	126	117	*98.5*	*75.5*	*54.3*	*36.8*	*24.0*	...	...	...	...	...	...	...	...	...	...
33	133	124	*98.5*	*75.5*	*54.3*	*36.8*	*24.0*	...	...	...	...	...	...	...	...	...	...
34	133	124	*98.5*	*75.5*	*54.3*	*36.8*	*24.0*	...	...	...	...	...	...	...	...	...	...
35	133	124	*98.5*	*75.5*	*54.3*	*36.8*	*24.0*	...	...	...	...	...	...	...	...	...	...
36	126	117	*102*	*78.2*	*57.6*	*39.2*	*25.1*	...	...	...	...	...	...	...	...	...	...
37	133	124	*102*	*78.2*	*57.6*	*39.2*	*25.1*	...	...	...	...	...	...	...	...	...	...
38	126	117	*102*	*78.2*	*57.6*	*39.2*	*25.1*	...	...	...	...	...	...	...	...	...	...
39	126	117	*102*	*78.2*	*57.6*	*39.2*	*25.1*	...	...	...	...	...	...	...	...	...	...
40	126	117	*102*	*78.2*	*57.6*	*39.2*	*25.1*	...	...	...	...	...	...	...	...	...	...
41	133	124	*102*	*78.2*	*57.6*	*39.2*	*25.1*	...	...	...	...	...	...	...	...	...	...
42	133	124	*102*	*78.2*	*57.6*	*39.2*	*25.1*	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
(**23**)	1	11Cr–Ti	Wld. tube	SA–268	TP409	S40900	...	...	7	1
	2	11Cr–Ti	Smls. tube	SA–268	TP409	S40900	...	...	7	1
	3	12Cr	Plate	SA–1010	40	S41003	...	$t \le 19$	7	1
	4	12Cr	Bar	SA–479	403	S40300	A	...	6	1
	5	12Cr	Bar	SA–479	403	S40300	1	...	6	1
	6	12Cr	Plate	SA–1010	50	S41003	...	$t \le 19$	7	1
	7	12Cr–Al	Bar	SA/JIS G4303	SUS405	...	...	...	7	1
	8	12Cr–Al	Plate	SA–240	405	S40500	...	...	7	1
	9	12Cr–Al	Plate	SA–240	405	S40500	...	...	7	1
	10	12Cr–Al	Bar	SA–479	405	S40500	...	...	7	1
	11	12Cr–Al	Smls. & wld. tube	SA–268	TP405	S40500	...	...	7	1
	12	12Cr–Al	Wld. tube	SA–268	TP405	S40500	...	...	7	1
	13	12Cr–Ti	Wld. tube	SA–268	...	S40800	...	...	7	1
	14	12Cr–Ti	Smls. tube	SA–268	...	S40800	...	...	7	1
	15	13Cr	Plate	SA–240	410S	S41008	...	...	7	1
	16	13Cr	Smls. & wld. tube	SA–268	TP410	S41000	...	...	6	1
	17	13Cr	Wld. tube	SA–268	TP410	S41000	...	...	6	1
	18	13Cr	Plate	SA–240	410	S41000	...	...	6	1
	19	13Cr	Forgings	SA–182	F6a	S41000	1	...	6	1
	20	13Cr	Bar	SA–479	410	S41000	...	...	6	1
	21	13Cr	Bar	SA–479	410	S41000	A	...	6	1
	22	13Cr	Bar	SA–479	410	S41000	1	...	6	1
	23	13Cr	Forgings	SA–182	F6a	S41000	2	...	6	3
	24	13Cr	Castings	SA–217	CA15	J91150	...	...	6	3
	25	13Cr	Cast pipe	SA–426	CPCA15	J91150	...	...	6	3
	26	13Cr	Bar	SA/EN 10088–3	X12Cr13	...	QT650	$t \le 160$	...	...
	27	13Cr–4Ni	Castings	SA–487	CA6NM	J91540	A	...	6	4
	28	13Cr–4Ni	Forgings	SA–182	F6NM	S41500	...	...	6	4
	29	15Cr	Wld. tube	SA–268	TP429	S42900	...	...	6	2
	30	15Cr	Smls. & wld. tube	SA–268	TP429	S42900	...	...	6	2
	31	15Cr	Plate	SA–240	429	S42900	...	...	6	2
	32	17Cr	Wld. tube	SA–268	TP430	S43000	...	...	7	2
	33	17Cr	Smls. & wld. tube	SA–268	TP430	S43000	...	...	7	2
	34	17Cr	Plate	SA–240	430	S43000	...	...	7	2
	35	17Cr	Bar	SA–479	430	S43000	...	...	7	2
	36	17Cr–4Ni–3Cu	Castings	SA–747	CB7Cu–1	J92180	...	...	...	...
	37	17Cr–4Ni–4Cu	Bar	SA–564	630	S17400	H1150	...	...	...
	38	17Cr–4Ni–4Cu	Plate	SA–693	630	S17400	H1150	...	...	...
	39	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H1150	...	...	...
	40	17Cr–4Ni–4Cu	Bar	SA–564	630	S17400	H1100	...	...	...
	41	17Cr–4Ni–4Cu	Plate	SA–693	630	S17400	H1100	...	...	...
	42	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H1100	...	...	...
	43	17Cr–4Ni–4Cu	Bar	SA–564	630	S17400	H1075	...	...	...
	44	17Cr–4Ni–4Cu	Plate	SA–693	630	S17400	H1075	...	...	...
	45	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H1075	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	380	170	NP	NP	427	343	CS–1	G24
2	380	170	NP	NP	427	343	CS–1	...
3	455	275	NP	NP	316	316	CS–2	...
4	485	275	NP	371	NP	NP	...	...
5	485	275	NP	371	NP	NP	...	...
6	485	345	NP	NP	316	316	CS–3	...
7	410	174	NP	371	538	NP	CS–1	G19, T5
8	415	170	371	NP	538	343	CS–1	G19, T5
9	415	170	NP	371	NP	NP	CS–1	G19
10	415	170	NP	371	538	343	CS–1	G19, T5
11	415	205	371	NP	538	343	CS–2	G19, T5, W13, W14
12	415	205	371	NP	538	343	CS–2	G3, G19, G24, T5
13	380	205	NP	NP	427	343	CS–2	G19, W14
14	380	205	NP	NP	427	343	CS–2	G19
15	415	205	NP	371	649	343	CS–2	T4
16	415	205	371	NP	649	343	CS–2	T4, W13, W14
17	415	205	371	NP	649	343	CS–2	G3, G24, T4
18	450	205	NP	NP	649	343	CS–2	T4
19	485	275	NP	371	538	343	CS–2	T4
20	485	275	NP	NP	538	343	CS–2	G22, T4
21	485	275	NP	371	NP	NP	CS–2	...
22	485	275	371	371	NP	NP	CS–2	...
23	585	380	NP	371	649	343	CS–3	T3
24	620	450	NP	371	649	343	CS–5	G1, G17, T3
25	620	450	NP	371	NP	NP	CS–5	G17
26	650	450	NP	371 (SPT)	NP	NP	...	H3, W1
27	760	550	NP	371	427	343	CS–5	G1, G17
28	795	620	NP	371	NP	NP	CS–3	G17
29	415	240	371	NP	371	343	CS–2	G3, G19, W14
30	415	240	371	NP	649	343	CS–2	G19, T4, W13, W14
31	450	205	NP	NP	649	343	CS–2	G19, T4
32	415	240	371	NP	649	343	CS–2	G3, G19, G24, T4
33	415	240	371	371	649	343	CS–2	G19, T4, W12, W13, W14
34	450	205	NP	NP	649	343	CS–2	G19, T4
35	485	275	371	371	538	343	CS–2	G19, G22, T4
36	1035	965	NP	NP	93	NP	HT–1	G1, G28, W1
37	930	725	NP	343	343	NP	HT–1	G8, G19, W1
38	930	725	NP	343	NP	NP	HT–1	G19, W1
39	930	725	NP	343	NP	NP	HT–1	G19, W1
40	965	795	NP	343	343	NP	HT–1	G8, G19, W1
41	965	795	NP	343	NP	NP	HT–1	G19, W1
42	965	795	NP	343	NP	NP	HT–1	G19, W1
43	1000	860	NP	343	NP	NP	HT–1	G19, W1
44	1000	860	NP	343	NP	NP	HT–1	G19, W1
45	1000	860	NP	343	NP	NP	HT–1	G19, W1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	92.4	88.4	84.0	80.2	76.6	71.2	68.4	66.5	66.2	66.2	66.2	65.6	65.1	64.6	...
2	108	104	98.8	94.4	90.1	83.8	80.5	78.2	77.9	77.9	77.9	77.2	76.6	76.0	...
3	130	130	130	130	130	127	123	119	117	...	...	...	...	...	...
4	138	138	138	137	135	133	131	129	127	124	122	...	...	...	...
5	138	138	138	137	135	133	131	129	127	124	122	...	...	...	...
6	138	138	138	138	138	135	131	126	124	...	...	...	...	...	...
7	115	110	105	103	102	100	98.9	97.2	96.1	94.7	92.7	90.2	87.1	83.5	79.2
8	115	110	105	103	102	100	98.9	97.2	96.1	94.7	92.7	90.2	87.1	83.5	79.2
9	115	110	105	103	102	100	98.9	97.2	96.1	94.7	92.7	...	...	...	...
10	115	110	105	103	102	100	98.9	97.2	96.1	94.7	92.7	90.2	87.1	83.5	79.2
11	118	118	118	117	116	114	113	111	109	107	104	101	97.5	93.2	88.4
12	101	101	101	99.7	98.5	96.7	95.4	93.9	92.4	90.5	88.6	86.1	83.0	79.3	75.2
13	92.4	92.4	92.3	91.4	90.3	89.0	87.8	86.3	84.8	82.9	81.0	78.5	76.0	73.5	...
14	108	108	108	107	106	104	103	101	99.6	98.0	95.5	92.9	89.2	85.5	...
15	118	118	118	117	116	114	113	111	109	107	104	101	97.5	93.0	88.3
16	118	118	118	117	116	114	113	111	109	107	104	101	97.5	93.0	88.3
17	101	101	101	99.7	98.5	96.7	95.4	93.9	92.4	90.5	88.6	86.1	82.9	79.4	74.1
18	128	128	126	125	123	120	119	117	115	114	111	108	104	100	89.9
19	138	138	138	137	135	133	131	129	127	124	122	118	113	109	92.1
20	138	138	138	137	135	133	131	129	127	124	122	118	113	109	92.1
21	138	138	138	137	135	133	131	129	127	124	122	...	...	...	...
22	138	138	138	137	135	133	131	129	127	124	122	...	...	...	...
23	168	168	167	166	164	162	159	157	154	151	148	143	138	123	*93.5*
24	177	177	177	176	174	171	169	166	163	160	156	151	146	117	*83.3*
25	177	177	177	176	174	171	169	166	163	160	156	...	...	...	...
26	186	186	186	184	182	179	177	173	171	168	164	...	...	...	...
27	216	216	216	215	212	208	204	200	198	195	192	189	184	180	...
28	227	227	227	227	227	225	217	209	205	202	197	...	...	...	...
29	101	101	101	99.7	98.5	96.7	95.4	93.9	92.4	90.5	88.6	...	...	...	...
30	118	118	118	117	116	114	113	111	109	107	104	101	97.5	93.3	86.2
31	128	128	126	125	123	120	119	117	115	114	111	108	104	101	87.8
32	101	101	101	99.7	98.5	96.7	95.4	93.9	92.4	90.5	88.6	86.1	83.0	79.4	73.3
33	118	118	118	117	116	114	113	111	109	107	104	101	97.5	93.3	86.2
34	128	128	126	125	123	120	119	117	115	114	111	108	104	101	87.8
35	138	138	138	137	135	133	131	129	127	124	122	118	113	109	90.1
36	221	221	221	...	...	...	...	...	...	...	...	...	...	...	...
37	266	266	266	266	266	259	254	251	249	247	...	...	...	...	...
38	266	266	266	266	266	259	254	251	249	247	...	...	...	...	...
39	266	266	266	266	266	259	254	251	249	247	...	...	...	...	...
40	276	276	276	276	276	269	263	260	258	256	...	...	...	...	...
41	276	276	276	276	276	269	263	260	258	256	...	...	...	...	...
42	276	276	276	276	276	269	263	260	258	256	...	...	...	...	...
43	285	285	285	285	285	279	273	270	267	265	...	...	...	...	...
44	285	285	285	285	285	279	273	270	267	265	...	...	...	...	...
45	285	285	285	285	285	279	273	270	267	265	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	67.3	*41.9*	*14.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	67.3	*41.9*	*14.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	67.3	*41.9*	*14.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	70.6	*40.9*	*14.5*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	59.8	*34.6*	*12.4*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	*69.7*	*50.7*	*37.9*	*26.4*	*18.0*	*11.6*	*6.68*	...	...	...	...	...	...	...	...	...	...	
16	*69.7*	*50.7*	*37.9*	*26.4*	*18.0*	*11.6*	*6.68*	...	...	...	...	...	...	...	...	...	...	
17	*60.0*	*42.8*	*31.9*	*22.4*	*15.5*	*9.59*	*5.69*	...	...	...	...	...	...	...	...	...	...	
18	*69.2*	*50.9*	*37.8*	*26.4*	*18.0*	*11.6*	*6.68*	...	...	...	...	...	...	...	...	...	...	
19	*68.4*	*51.3*	*37.0*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	*68.4*	*51.3*	*37.0*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	*68.0*	*51.3*	*37.7*	*26.4*	*17.9*	*11.6*	*6.68*	...	...	...	...	...	...	...	...	...	...	
24	*60.1*	*42.0*	*28.6*	*19.8*	*13.8*	*9.81*	*6.76*	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	*70.9*	*52.8*	*38.1*	*27.5*	*20.5*	*15.9*	*12.2*	...	...	...	...	...	...	...	...	...	...	
31	*70.4*	*53.0*	*38.1*	*27.5*	*20.5*	*15.9*	*12.2*	...	...	...	...	...	...	...	...	...	...	
32	*60.2*	*44.8*	*32.2*	*23.2*	*17.3*	*13.3*	*10.2*	...	...	...	...	...	...	...	...	...	...	
33	*70.9*	*52.8*	*38.1*	*27.5*	*20.5*	*15.9*	*12.2*	...	...	...	...	...	...	...	...	...	...	
34	*70.4*	*53.0*	*38.1*	*27.5*	*20.5*	*15.9*	*12.2*	...	...	...	...	...	...	...	...	...	...	
35	*69.5*	*53.6*	*36.5*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	18Cr–2Mo	Plate	SA–240	...	S44400	...	...	7	2
2	18Cr–2Mo	Wld. tube	SA–268	...	S44400	...	...	7	2
3	18Cr–2Mo	Smls. tube	SA–268	...	S44400	...	...	7	2
(**23**) 4	18Cr–Ti	Plate	SA–240	...	S43932	...	...	7	2
5	18Cr–Ti	Wld. tube	SA–268	TP439	S43035	...	...	7	2
6	18Cr–Ti	Smls. tube	SA–268	TP439	S43035	...	...	7	2
7	18Cr–Ti	Wld. pipe	SA–731	TP439	S43035	...	...	7	2
8	18Cr–Ti	Smls. pipe	SA–731	TP439	S43035	...	...	7	2
9	18Cr–Ti	Wld. tube	SA–803	TP439	S43035	...	...	7	2
10	18Cr–Ti	Smls. tube	SA–268	TP430 Ti	S43036	...	...	7	2
11	18Cr–Ti	Wld. tube	SA–268	TP430 Ti	S43036	...	...	7	2
12	18Cr–Ti	Bar	SA–479	439	S43035	...	...	7	2
13	26Cr–3Ni–3Mo	Plate	SA–240	26–3–3	S44660	...	≤5	10K	1
14	26Cr–3Ni–3Mo	Smls. tube	SA–268	26–3–3	S44660	...	≤5	10K	1
15	26Cr–3Ni–3Mo	Wld. tube	SA–268	26–3–3	S44660	...	≤5	10K	1
16	26Cr–3Ni–3Mo	Wld. tube	SA–268	26–3–3	S44660	...	≤5	10K	1
17	26Cr–3Ni–3Mo	Wld. tube	SA–803	26–3–3	S44660	...	≤5	10K	1
18	27Cr	Smls. tube	SA–268	TP446–1	S44600	...	...	10I	1
19	27Cr–1Mo	Forgings	SA–182	FXM–27Cb	S44627	...	...	10I	1
20	27Cr–1Mo	Plate	SA–240	XM–27	S44627	...	...	10I	1
21	27Cr–1Mo	Wld. tube	SA–268	TPXM–27	S44627	...	...	10I	1
22	27Cr–1Mo	Smls. tube	SA–268	TPXM–27	S44627	...	...	10I	1
23	27Cr–1Mo	Bar	SA–479	XM–27	S44627	...	...	10I	1
24	27Cr–1Mo	Smls. pipe	SA–731	TPXM–27	S44627	...	...	10I	1
25	27Cr–1Mo	Wld. pipe	SA–731	TPXM–27	S44627	...	...	10I	1
26	27Cr–1Mo–Ti	Smls. pipe	SA–731	TPXM–33	S44626	...	...	10I	1
27	27Cr–1Mo–Ti	Wld. pipe	SA–731	TPXM–33	S44626	...	...	10I	1
28	27Cr–1Mo–Ti	Plate	SA–240	XM–33	S44626	...	...	10I	1
29	27Cr–1Mo–Ti	Smls. tube	SA–268	TPXM–33	S44626	...	...	10I	1
30	27Cr–1Mo–Ti	Wld. tube	SA–268	TPXM–33	S44626	...	...	10I	1
31	29Cr–4Mo	Bar	SA–479	...	S44700	...	...	10J	1
32	29Cr–4Mo	Plate	SA–240	...	S44700	...	...	10J	1
33	29Cr–4Mo	Smls. tube	SA–268	29–4	S44700	...	...	10J	1
34	29Cr–4Mo	Wld. tube	SA–268	29–4	S44700	...	...	10J	1
35	29Cr–4Mo–2Ni	Bar	SA–479	...	S44800	...	...	10K	1
36	29Cr–4Mo–2Ni	Plate	SA–240	...	S44800	...	...	10K	1
37	29Cr–4Mo–2Ni	Smls. tube	SA–268	29–4–2	S44800	...	...	10K	1
38	29Cr–4Mo–2Ni	Wld. tube	SA–268	29–4–2	S44800	...	...	10K	1
39	29Cr–4Mo–Ti	Smls. tube	SA–268	...	S44735	...	...	10J	1
40	29Cr–4Mo–Ti	Wld. tube	SA–268	...	S44735	...	...	10J	1
41	Mn–$^1/_4$Mo	Forgings	SA–372	D	K14508	...	...	...	...
42	Mn–$^1/_4$Mo–V	Castings	SA–487	2	J13005	A	...	3	3
43	Mn–$^1/_4$Mo–V	Castings	SA–487	2	J13005	B	...	3	3
44	Mn–$^1/_2$Mo	Plate	SA–302	A	K12021	...	...	3	2
45	Mn–$^1/_2$Mo	Wld. pipe	SA–672	H75	K12021	...	...	3	2

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	415	275	NP	NP	343	343	CS–2	G19
2	415	275	NP	NP	343	343	CS–2	G19, G24
3	415	275	NP	NP	343	343	CS–2	G19
4	415	205	NP	NP	316	316	CS–2	G19
5	415	205	427	NP	427	343	CS–2	G19, G24
6	415	205	427	NP	427	343	CS–2	G19
7	415	205	427	NP	NP	NP	CS–2	G19, G24
8	415	205	427	NP	NP	NP	CS–2	G19
9	415	205	NP	NP	316	316	CS–2	G19, G24
10	415	240	NP	NP	427	NP	CS–2	G19
11	415	240	NP	NP	427	NP	CS–2	G19, G24
12	485	275	NP	NP	538	343	CS–2	G19, G22, T4
13	585	450	NP	NP	371	343	HA–5	G19
14	585	450	NP	371	371	343	HA–5	G19, H5
15	585	450	NP	371	NP	NP	HA–5	G19, H5, W12
16	585	450	NP	NP	371	343	HA–5	G19, G24
17	585	450	NP	NP	316	316	HA–5	G19, G24
18	485	275	371	NP	343	343	CS–2	G19
19	415	240	NP	NP	343	343	HA–2	G19
20	450	275	NP	343	343	343	HA–2	G19
21	450	275	NP	NP	343	343	HA–2	G19, G24
22	450	275	NP	343	343	343	HA–2	G19
23	450	275	NP	371	343	343	HA–2	G19, G22
24	450	275	NP	NP	343	343	HA–2	G19
25	450	275	NP	NP	343	343	HA–2	G19, G24
26	450	275	NP	NP	343	343	HA–2	G19
27	450	275	NP	NP	343	343	HA–2	G19, G24
28	470	310	NP	NP	343	343	HA–6	G19
29	470	310	NP	NP	343	343	HA–6	G19
30	470	310	NP	NP	343	343	HA–6	G19, G24
31	485	380	NP	NP	316	316	HA–6	G19, G22
32	550	415	NP	NP	316	316	HA–6	G19
33	550	415	NP	NP	316	316	HA–6	G19
34	550	415	NP	NP	316	316	HA–6	G19, G24
35	485	380	NP	NP	316	316	HA–6	G19, G22
36	550	415	NP	NP	316	316	HA–6	G19
37	550	415	NP	NP	316	316	HA–6	G19
38	550	415	NP	NP	316	316	HA–6	G19, G24
39	515	415	NP	NP	316	316	HA–6	G19
40	515	415	NP	NP	316	316	HA–6	G19, G24
41	725	450	NP	343	343	343	CS–5	G25, W2, W11
42	585	365	NP	371 (SPT)	343	343	CS–3	G1
43	620	450	NP	NP	343	343	CS–5	G1
44	515	310	538	371	538	343	CS–3	G11, S2, T3
45	515	310	NP	371	NP	NP	CS–3	S6, W10, W12

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
No.	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	118	118	118	116	114	112	110	107	105	104	...	...	...	...	...
2	101	101	101	99.0	97.1	95.3	93.5	91.3	89.7	87.7	...	...	...	...	...
3	118	118	118	116	114	112	110	107	105	104	...	...	...	...	...
4	118	118	118	113	108	101	96.6	94.0	93.8	...	...	...	...	...	...
5	101	101	100	96.5	91.5	85.9	81.9	80.3	79.7	79.3	79.2	78.6	77.3	76.1	...
6	118	118	118	113	108	101	96.6	94.0	93.8	93.7	93.0	92.3	91.1	89.8	...
7	101	101	100	96.5	91.5	85.9	81.9	80.3	79.7	79.3	79.2	78.6	77.3	76.1	...
8	118	118	118	113	108	101	96.6	94.0	93.8	93.7	93.0	92.3	91.1	89.8	...
9	101	101	100	96.5	91.5	85.9	81.9	80.3	79.7	...	...	...	...	...	...
10	118	118	118	116	114	111	109	107	105	104	102	99.7	97.0	93.8	...
11	100	100	100	98.5	97.0	94.6	92.8	90.8	89.7	88.3	86.7	84.8	82.5	79.7	...
12	138	138	138	136	133	130	127	124	123	121	119	116	113	110	91.7
13	168	168	168	167	167	165	164	163	162	162	161	...	...	...	...
14	168	168	168	167	167	165	164	163	162	162	161	...	...	...	...
15	168	168	168	167	167	165	164	163	162	162	161	...	...	...	...
16	142	142	142	142	142	140	139	139	138	138	137	...	...	...	...
17	142	142	142	142	142	140	139	139	138	...	...	...	...	...	...
18	138	138	138	136	133	130	127	124	123	121	119	...	...	...	...
19	118	118	118	116	114	111	111	111	111	111	...	...	...	...	...
20	128	128	128	127	126	125	125	125	125	125	...	...	...	...	...
21	109	109	109	108	107	106	106	106	106	106	...	...	...	...	...
22	128	128	128	127	126	125	125	125	125	125	...	...	...	...	...
23	128	128	128	127	126	125	125	125	125	125	125	...	...	...	...
24	128	128	128	127	126	125	125	125	125	125	...	...	...	...	...
25	109	109	109	108	107	106	106	106	106	106	...	...	...	...	...
26	128	128	128	128	127	126	124	122	121	119	...	...	...	...	...
27	109	109	109	109	108	106	106	104	103	101	...	...	...	...	...
28	134	134	134	134	133	131	130	128	126	124	...	...	...	...	...
29	134	134	134	134	133	131	130	128	126	124	...	...	...	...	...
30	114	114	114	113	113	112	111	109	108	106	...	...	...	...	...
31	138	138	138	135	133	132	132	132	132	...	...	...	...	...	...
32	158	158	157	155	152	151	151	151	151	...	...	...	...	...	...
33	158	158	157	155	152	151	151	151	151	...	...	...	...	...	...
34	134	134	134	132	130	128	128	128	128	...	...	...	...	...	...
35	138	137	135	134	133	132	131	129	128	...	...	...	...	...	...
36	158	156	154	153	152	151	149	147	147	...	...	...	...	...	...
37	158	156	154	153	152	151	149	147	147	...	...	...	...	...	...
38	134	133	131	130	130	128	127	125	124	...	...	...	...	...	...
39	148	146	144	144	143	141	140	139	138	...	...	...	...	...	...
40	125	125	123	122	121	121	119	118	117	...	...	...	...	...	...
41	207	207	207	207	207	207	207	207	207	207	...	...	...	...	...
42	168	168	168	168	168	167	167	167	167	166	166	...	...	...	...
43	177	177	177	177	177	177	177	177	177	177	...	...	...	...	...
44	148	148	148	148	148	148	148	148	148	148	148	148	148	142	*107*
45	148	148	148	148	148	148	148	148	148	148	148	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	*69.9*	*53.5*	*36.6*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	*68.1*	*43.1*	*23.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	Mn–½Mo	Plate	SA–302	B	K12022	...	...	3	3
2	Mn–½Mo	Plate	SA–533	A	K12521	1	...	3	3
3	Mn–½Mo	Plate	SA–533	A	K12521	2	...	3	3
4	Mn–½Mo	Plate	SA–533	A	K12521	3	...	11A	4
5	Mn–½Mo–¼Ni	Plate	SA–533	D	K12529	1	...	3	3
6	Mn–½Mo–¼Ni	Plate	SA–533	D	K12529	2	...	3	3
7	Mn–½Mo–¼Ni	Plate	SA–533	D	K12529	3	...	11A	4
8	Mn–½Mo–½Ni	Plate	SA–302	C	K12039	...	...	3	3
9	Mn–½Mo–½Ni	Plate	SA–533	B	K12539	1	...	3	3
10	Mn–½Mo–½Ni	Wld. pipe	SA–672	H80	K12039	...	...	3	3
11	Mn–½Mo–½Ni	Wld. pipe	SA–672	J80	K12539	...	...	3	3
12	Mn–½Mo–½Ni	Plate	SA–533	B	K12539	2	...	3	3
13	Mn–½Mo–½Ni	Wld. pipe	SA–672	J90	K12539	...	...	3	3
14	Mn–½Mo–½Ni	Plate	SA–533	B	K12539	3	...	11A	4
15	Mn–½Mo–½Ni	Wld. pipe	SA–672	J100	K12539	...	...	11A	4
16	Mn–½Mo–¾Ni	Plate	SA–302	D	K12054	...	...	3	3
17	Mn–½Mo–¾Ni	Plate	SA–533	C	K12554	1	...	3	3
18	Mn–½Mo–¾Ni	Plate	SA–533	E	K12554	1	...	3	3
19	Mn–½Mo–¾Ni	Plate	SA–533	C	K12554	2	...	3	3
20	Mn–½Mo–¾Ni	Plate	SA–533	E	K12554	2	...	3	3
21	Mn–½Mo–¾Ni	Plate	SA–533	C	K12554	3	...	11A	4
22	Mn–½Ni–V	Plate	SA–225	C	K12524	...	...	10A	1
23	Mn–V	Castings	SA–487	1	J13002	A	...	10A	1
24	Mn–V	Castings	SA–487	1	J13002	A	...	10A	1
25	Mn–V	Castings	SA–487	1	J13002	B	...	10A	1
26	1½Si–½Mo	Smls. pipe	SA–335	P15	K11578	...	...	3	1
27	½Ni–½Cr–¼Mo–V	Castings	SA–487	4	J13047	A	...	3	3
28	½Ni–½Cr–¼Mo–V	Castings	SA–487	4	J13047	B	...	11A	3
29	½Ni–½Cr–¼Mo–V	Castings	SA–487	4	J13047	E	...	11A	3
30	½Ni–½Mo–V	Forgings	SA–541	3	K12045	1	...	3	3
31	½Ni–½Mo–V	Forgings	SA–541	3	K12045	2	...	3	3
32	¾Ni–½Cr–½Mo–V	Forgings	SA–592	F	K11576	...	65 < t ≤ 100	11B	3
33	¾Ni–½Cr–½Mo–V	Plate	SA–517	F	K11576	...	≤65	11B	3
34	¾Ni–½Cr–½Mo–V	Forgings	SA–592	F	K11576	...	≤65	11B	3
35	¾Ni–½Cu–Mo	Smls. & wld. tube	SA–423	2	K11540	...	...	4	2
36	¾Ni–½Cu–Mo	Wld. tube	SA–423	2	K11540	...	...	4	2
37	¾Ni–½Mo–⅓Cr–V	Forgings	SA–508	2	K12766	1	...	3	3
38	¾Ni–½Mo–⅓Cr–V	Forgings	SA–541	2	K12765	1	...	3	3
39	¾Ni–½Mo–⅓Cr–V	Forgings	SA–508	2	K12766	2	...	3	3
40	¾Ni–½Mo–⅓Cr–V	Forgings	SA–541	2	K12765	2	...	3	3
41	¾Ni–½Mo–Cr–V	Forgings	SA–508	3	K12042	1	...	3	3
42	¾Ni–½Mo–Cr–V	Forgings	SA–508	3	K12042	2	...	3	3
43	¾Ni–1Mo–¾Cr	Castings	SA–217	WC5	J22000	...	...	4	1
44	1Ni–½Cr–½Mo	Castings	SA–217	WC4	J12082	...	...	4	1
45	1¼Ni–1Cr–½Mo	Plate	SA–517	P	K21650	...	65 < t ≤ 100	11B	8

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	550	345	538	371	538	343	CS–3	G11, S2, T3
2	550	345	NP	371	538	NP	CS–5	G23, T4
3	620	485	NP	371	427	NP	CS–5	...
4	690	570	NP	371	NP	NP	CS–5	...
5	550	345	NP	371	NP	NP	CS–5	...
6	620	485	NP	371	427	NP	CS–5	...
7	690	570	NP	371	399	343	CS–5	...
8	550	345	538	371	538	343	CS–3	G11, S2, T3
9	550	345	NP	371	427	NP	CS–5	G23
10	550	345	NP	371	NP	NP	CS–3	G26, W10, W12
11	550	345	NP	371	NP	NP	CS–5	G26, W10, W12
12	620	485	NP	371	427	NP	CS–5	...
13	620	485	NP	371	NP	NP	CS–5	G26, W10, W12
14	690	570	NP	371	399	343	CS–5	...
15	690	570	NP	371	NP	NP	CS–5	G26, W10, W12
16	550	345	538	371	538	343	CS–3	G11, S2, T3
17	550	345	NP	371	427	NP	CS–5	G23
18	550	345	NP	NP	427	NP	CS–5	G23
19	620	485	NP	371	427	NP	CS–5	...
20	620	485	NP	NP	427	NP	CS–5	...
21	690	570	NP	371	NP	NP	CS–5	...
22	725	485	NP	NP	371	343	CS–5	...
23	585	380	NP	371 (SPT)	NP	NP	CS–3	...
24	585	380	NP	NP	343	343	CS–3	G1
25	620	450	NP	NP	343	343	CS–5	G1
26	415	205	NP	NP	538	343	CS–2	T3
27	620	415	NP	343	343	343	CS–3	G1
28	725	585	NP	NP	371	343	CS–5	G1
29	795	655	NP	NP	371	343	CS–5	G1
30	550	345	NP	371	427	343	CS–5	G23
31	620	450	NP	371	371	NP	CS–5	...
32	725	620	NP	343 (SPT)	343	343	CS–5	S7
33	795	690	NP	343 (SPT)	343	343	HT–1	...
34	795	690	NP	NP	343	343	HT–1	...
35	415	255	343	NP	343	NP	CS–2	W13, W14
36	415	255	343	NP	343	NP	CS–2	G3, G24
37	550	345	NP	371	427	343	CS–5	G23
38	550	345	NP	371	427	343	CS–5	G23
39	620	450	NP	371	371	NP	CS–5	...
40	620	450	NP	371	371	NP	CS–5	...
41	550	345	NP	371	427	343	CS–5	G23
42	620	450	NP	371	371	NP	CS–5	...
43	485	275	593	371	593	NP	CS–2	G1, G17, T4
44	485	275	538	371	538	NP	CS–2	G1, G17, T4
45	725	620	NP	371 (SPT)	343	343	CS–5	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	158	158	158	158	158	158	158	158	158	158	158	158	158	143	*106*
2	158	158	158	158	158	158	158	158	158	158	158	158	158	154	106
3	177	177	177	177	177	177	177	177	177	177	177	177	177	177	...
4	197	197	197	197	197	197	197	197	197	197	197	...	...	...	...
5	158	158	158	158	158	158	158	158	158	158	158	...	...	...	...
6	177	177	177	177	177	177	177	177	177	177	177	177	177	177	...
7	197	197	197	197	197	197	197	197	197	197	197	197	...	...	...
8	158	158	158	158	158	158	158	158	158	158	158	158	158	143	*106*
9	158	158	158	158	158	158	158	158	158	158	158	158	158	158	...
10	158	158	158	158	158	158	158	158	158	158	158	...	...	...	...
11	158	158	158	158	158	158	158	158	158	158	158	...	...	...	...
12	177	177	177	177	177	177	177	177	177	177	177	177	177	177	...
13	177	177	177	177	177	177	177	177	177	177	177	...	...	...	...
14	197	197	197	197	197	197	197	197	197	197	197	197	...	...	...
15	197	197	197	197	197	197	197	197	197	197	197	...	...	...	...
16	158	158	158	158	158	158	158	158	158	158	158	158	158	143	*106*
17	158	158	158	158	158	158	158	158	158	158	158	158	158	158	...
18	158	158	158	158	158	158	158	158	158	158	158	158	158	158	...
19	177	177	177	177	177	177	177	177	177	177	177	177	177	177	...
20	177	177	177	177	177	177	177	177	177	177	177	177	177	177	...
21	197	197	197	197	197	197	197	197	197	197	197	...	...	...	...
22	207	207	207	207	207	207	207	207	207	207	207	...	...	...	...
23	168	163	158	155	154	154	154	152	150	147	143	...	...	...	...
24	168	163	158	156	155	155	155	153	150	148	...	...	...	...	...
25	177	173	169	168	167	166	166	166	164	160	...	...	...	...	...
26	118	118	118	118	118	118	118	117	115	114	112	110	107	96.9	*88.8*
27	177	177	177	177	177	177	177	177	177	177	...	...	...	...	...
28	207	207	207	207	207	207	207	207	207	207	207	...	...	...	...
29	227	227	227	227	227	227	227	227	227	227	227	...	...	...	...
30	158	158	158	158	158	158	158	158	158	158	158	158	158	158	...
31	177	177	177	177	177	177	177	177	177	177	177	...	...	...	...
32	207	207	207	207	207	207	207	207	207	207	...	...	...	...	...
33	227	227	227	227	227	227	227	227	227	226	...	...	...	...	...
34	227	227	227	227	227	227	227	227	227	226	...	...	...	...	...
35	118	118	118	118	118	118	118	118	118	118	...	...	...	...	...
36	101	101	101	101	101	101	101	101	101	101	...	...	...	...	...
37	158	158	158	158	158	158	158	158	158	158	158	158	158	158	...
38	158	158	158	158	158	158	158	158	158	158	158	158	158	158	...
39	177	177	177	177	177	177	177	177	177	177	177	...	...	...	...
40	177	177	177	177	177	177	177	177	177	177	177	...	...	...	...
41	158	158	158	158	158	158	158	158	158	158	158	158	158	158	...
42	177	177	177	177	177	177	177	177	177	177	177	...	...	...	...
43	138	138	138	138	138	138	138	138	138	138	138	138	138	135	120
44	138	138	138	138	138	138	138	138	138	138	138	138	138	135	113
45	207	207	207	207	207	207	207	207	207	206	202	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	*68.4*	*43.0*	*23.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	*77.2*	*55.6*	*32.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	*68.4*	*43.0*	*23.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	*68.4*	*43.0*	*23.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	*76.4*	*55.6*	*32.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	*89.3*	*58.8*	*39.6*	*27.4*	*16.3*	...	...	...	...	...	...	...	...	...	...	...	...
44	*76.6*	*49.7*	*31.2*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	1¼Ni–1Cr–½Mo	Plate	SA–517	P	K21650	...	≤65	11B	8
2	1½Ni	Forgings	SA–350	LF5	K13050	1	...	9A	1
3	1½Ni	Forgings	SA–350	LF5	K13050	2	...	9A	1
4	1¾Ni–¾Cr–Mo	Forgings	SA–372	L	K24055	...	...	...	...
5	2Ni–1Cu	Forgings	SA–182	FR	K22035	...	...	9A	1
6	2Ni–1Cu	Fittings	SA–234	WPR	K22035	...	...	9A	1
7	2Ni–1Cu	Pipe	SA–333	9	K22035	...	...	9A	1
8	2Ni–1Cu	Smls. pipe	SA–333	9	K22035	...	...	9A	1
9	2Ni–1Cu	Wld. pipe	SA–333	9	K22035	...	...	9A	1
10	2Ni–1Cu	Tube	SA–334	9	K22035	...	...	9A	1
11	2Ni–1Cu	Forgings	SA–350	LF9	K22036	...	...	9A	1
12	2Ni–1Cu	Smls. & wld. fittings	SA–420	WPL9	K22035	...	...	9A	1
13	2Ni–1½Cr–¼Mo–V	Forgings	SA–723	1	K23550	1	...	...	...
14	2Ni–1½Cr–¼Mo–V	Forgings	SA–723	1	K23550	2	...	...	...
15	2Ni–1½Cr–¼Mo–V	Forgings	SA–723	1	K23550	3	...	...	...
16	2Ni–1½Cr–¼Mo–V	Forgings	SA–723	1	K23550	4	...	...	...
17	2Ni–1½Cr–¼Mo–V	Forgings	SA–723	1	K23550	5	...	...	...
18	2½Ni	Pipe	SA–333	7	K21903	...	...	9A	1
19	2½Ni	Wld. pipe	SA–333	7	K21903	...	...	9A	1
20	2½Ni	Tube	SA–334	7	K21903	...	...	9A	1
21	2½Ni	Wld. tube	SA–334	7	K21903	...	...	9A	1
22	2½Ni	Plate	SA–203	A	K21703	...	...	9A	1
23	2½Ni	Plate	SA–203	B	K22103	...	...	9A	1
24	2½Ni	Castings	SA–352	LC2	J22500	...	...	9A	1
25	2¾Ni–1½Cr–½Mo	Plate	SA–543	C	...	3	...	3	3
26	2¾Ni–1½Cr–½Mo	Plate	SA–543	C	...	1	...	11A	5
27	2¾Ni–1½Cr–½Mo	Plate	SA–543	C	...	2	...	11B	10
28	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	1	...	...	...
29	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	2	...	...	...
30	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	3	...	...	...
31	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	4	...	...	...
32	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	5	...	...	...
33	3Ni–1¾Cr–½Mo	Plate	SA–543	B	K42339	3	...	3	3
34	3Ni–1¾Cr–½Mo	Forgings	SA–372	M	K42365	85	...	...	...
35	3Ni–1¾Cr–½Mo	Plate	SA–543	B	K42339	1	...	11A	5
36	3Ni–1¾Cr–½Mo	Plate	SA–543	B	K42339	2	...	11B	10
37	3Ni–1¾Cr–½Mo	Forgings	SA–372	M	K42365	100	...	...	...
38	3½Ni	Pipe	SA–333	3	K31918	...	...	9B	1
39	3½Ni	Wld. pipe	SA–333	3	K31918	...	...	9B	1
40	3½Ni	Tube	SA–334	3	K31918	...	...	9B	1
41	3½Ni	Wld. tube	SA–334	3	K31918	...	...	9B	1
42	3½Ni	Fittings	SA–420	WPL3	...	...	...	9B	1
43	3½Ni	Plate	SA–203	D	K31718	...	...	9B	1
44	3½Ni	Forgings	SA–350	LF3	K32025	1	...	9B	1
45	3½Ni	Forgings	SA–350	LF3	K32025	2	...	9B	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	795	690	NP	343 (SPT)	343	343	HT–1	...
2	415	205	NP	NP	260	260	CS–2	...
3	485	260	NP	NP	260	260	CS–2	...
4	1070	930	NP	NP	343	343	...	W11
5	435	315	NP	NP	38	38	CS–3	...
6	435	315	NP	NP	38	NP	CS–3	...
7	435	315	NP	NP	38	38	CS–3	...
8	435	315	NP	38	NP	NP	CS–3	...
9	435	315	NP	NP	38	38	CS–3	G24
10	435	315	NP	NP	38	38	CS–3	...
11	435	315	NP	NP	38	38	CS–3	...
12	435	315	NP	38	38	38	CS–3	W14
13	795	690	NP	371 (SPT)	NP	NP	HT–1	W1
14	930	825	NP	371 (SPT)	NP	NP	HT–1	W1
15	1070	965	NP	371 (SPT)	NP	NP	HT–1	W1
16	1205	1105	NP	371 (SPT)	NP	NP	HT–1	W1
17	1310	1240	NP	371 (SPT)	NP	NP	HT–1	W1
18	450	240	NP	NP	343	343	CS–2	...
19	450	240	NP	NP	343	343	CS–2	G24
20	450	240	NP	NP	343	343	CS–2	...
21	450	240	NP	NP	343	343	CS–2	G24
22	450	255	NP	371	538	343	CS–2	T2
23	485	275	NP	343	538	343	CS–2	T2
24	485	275	NP	38	343	343	CS–2	G1
25	620	485	NP	NP	343	NP	CS–5	...
26	725	585	NP	NP	343	NP	CS–5	...
27	795	690	NP	NP	343	NP	HT–1	...
28	795	690	NP	371 (SPT)	NP	NP	HT–1	W1
29	930	825	NP	371 (SPT)	NP	NP	HT–1	W1
30	1070	965	NP	371 (SPT)	NP	NP	HT–1	W1
31	1205	1105	NP	371 (SPT)	NP	NP	HT–1	W1
32	1310	1240	NP	371 (SPT)	NP	NP	HT–1	W1
33	620	485	NP	NP	343	NP	CS–5	...
34	725	585	NP	NP	343	343	...	W11
35	725	585	NP	NP	343	NP	CS–5	...
36	795	690	NP	NP	343	NP	HT–1	...
37	825	690	NP	NP	343	343	...	W11
38	450	240	NP	NP	343	343	CS–2	...
39	450	240	NP	NP	343	343	CS–2	G24
40	450	240	NP	NP	343	343	CS–2	...
41	450	240	NP	NP	343	343	CS–2	G24
42	450	240	NP	NP	343	343	CS–2	...
43	450	255	NP	371	538	343	CS–2	T2
44	485	260	NP	343	343	343	CS–2	...
45	485	260	NP	343	343	343	CS–2	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
No.	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	227	227	227	227	227	227	227	227	227	226	...	...	...	...	...
2	118	116	113	111	108	106	105	...	...	...	...	...	...	...	...
3	138	135	132	129	126	123	123	...	...	...	...	...	...	...	...
4	305	305	305	305	305	305	305	305	302	294	...	...	...	...	...
5	125	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	125	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	125	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	123	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	105	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	125	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	125	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	125	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	227	227	227	227	227	227	227	227	226	222	217	...	...	...	...
14	266	266	266	266	266	266	266	266	265	261	255	...	...	...	...
15	305	305	305	305	305	305	305	305	305	299	293	...	...	...	...
16	345	345	345	345	345	345	345	345	343	337	330	...	...	...	...
17	374	374	374	374	374	374	374	374	373	367	359	...	...	...	...
18	128	128	128	128	128	128	128	124	119	114	...	...	...	...	...
19	109	109	109	109	109	109	109	105	101	96.7	...	...	...	...	...
20	128	128	128	128	128	128	128	124	119	114	...	...	...	...	...
21	109	109	109	109	109	109	109	105	101	96.7	...	...	...	...	...
22	128	128	128	128	128	128	128	128	126	120	112	*95.1*	*79.6*	*64.8*	*49.1*
23	138	138	138	138	138	138	138	138	136	129	122	*101*	*83.8*	*67.3*	*49.4*
24	138	138	138	138	138	138	138	138	136	129	...	...	...	...	...
25	177	177	177	177	177	176	175	173	172	169	...	...	...	...	...
26	207	207	207	207	207	205	204	202	200	197	...	...	...	...	...
27	227	227	227	227	227	224	223	221	219	217	...	...	...	...	...
28	227	227	227	227	227	227	227	227	226	222	217	...	...	...	...
29	266	266	266	266	266	266	266	266	265	261	255	...	...	...	...
30	305	305	305	305	305	305	305	305	305	299	293	...	...	...	...
31	345	345	345	345	345	345	345	345	343	337	330	...	...	...	...
32	374	374	374	374	374	374	374	374	373	367	359	...	...	...	...
33	177	177	177	177	177	176	175	173	172	169	...	...	...	...	...
34	207	207	207	207	207	205	204	202	200	197	...	...	...	...	...
35	207	207	207	207	207	205	204	202	200	197	...	...	...	...	...
36	227	227	227	227	227	224	223	221	219	217	...	...	...	...	...
37	236	236	236	236	236	234	233	231	229	226	...	...	...	...	...
38	128	128	128	128	128	128	128	124	119	114	...	...	...	...	...
39	109	109	109	109	109	109	109	105	101	96.7	...	...	...	...	...
40	128	128	128	128	128	128	128	124	119	114	...	...	...	...	...
41	109	109	109	109	109	109	109	105	101	96.7	...	...	...	...	...
42	128	128	128	128	128	128	128	124	119	114	...	...	...	...	...
43	128	128	128	128	128	128	128	128	126	120	112	*95.1*	*79.6*	*64.8*	*49.1*
44	138	138	138	138	138	138	138	133	128	122	...	...	...	...	...
45	138	138	138	138	138	138	138	133	128	122	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	*35.8*	*23.7*	*11.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	*35.6*	*23.7*	*11.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	*35.8*	*23.7*	*11.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	3½Ni	Forgings	SA–765	III	K32026	...	...	9B	1
2	3½Ni	Plate	SA–203	E	K32018	...	...	9B	1
3	3½Ni	Plate	SA–203	E	K32018	...	...	9B	1
4	3½Ni	Castings	SA–352	LC3	J31550	...	...	9B	1
5	3½Ni	Plate	SA–203	F	...	...	>50	9B	1
6	3½Ni	Plate	SA–203	F	...	...	≤50	9B	1
7	3½Ni–1¾Cr–½Mo–V	Forgings	SA–508	4N	K22375	3	...	3	3
8	3½Ni–1¾Cr–½Mo–V	Forgings	SA–508	4N	K22375	1	...	11A	5
9	3½Ni–1¾Cr–½Mo–V	Forgings	SA–508	4N	K22375	2	...	11B	10
10	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	1	...	...	...
11	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	2	...	...	...
12	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	3	...	...	...
13	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	4	...	...	...
14	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	5	...	...	...
15	5Ni–¼Mo	Plate	SA–645	A	K41583	...	...	11A	2
(**23**) 16	7Ni	Plate	SA–553	III	K61365	...	≤50	11A	1
(**23**) 17	7Ni	Plate	SA–553	III	K61365	...	≤50	11A	1
18	8Ni	Forgings	SA–522	II	K71340	...	...	11A	1
19	8Ni	Plate	SA–553	II	K71340	...	...	11A	1
20	8Ni	Plate	SA–553	II	K71340	...	...	11A	1
21	9Ni	Plate	SA/EN 10028–4	X8Ni9	...	NNT640	≤50	11A	1
22	9Ni	Plate	SA/EN 10028–4	X8Ni9	...	QT640	≤50	11A	1
23	9Ni	Plate	SA/EN 10028–4	X7Ni9	...	QT	≤50	11A	1
24	9Ni	Plate	SA/EN 10028–4	X7Ni9	...	QT	≤50	11A	1
25	9Ni	Plate	SA/EN 10028–4	X8Ni9	...	QT680	≤50	11A	1
26	9Ni	Plate	SA/EN 10028–4	X8Ni9	...	QT680	≤50	11A	1
27	9Ni	Smls. & wld. pipe	SA–333	8	K81340	...	...	11A	1
28	9Ni	Smls. & wld. pipe	SA–333	8	K81340	...	...	11A	1
29	9Ni	Smls. pipe	SA–333	8	K81340	...	...	11A	1
30	9Ni	Smls. pipe	SA–333	8	K81340	...	...	11A	1
31	9Ni	Wld. pipe	SA–333	8	K81340	...	...	11A	1
32	9Ni	Wld. tube	SA–334	8	K81340	...	...	11A	1
33	9Ni	Smls. & wld. tube	SA–334	8	K81340	...	...	11A	1
34	9Ni	Smls. tube	SA–334	8	K81340	...	...	11A	1
35	9Ni	Smls. tube	SA–334	8	K81340	...	...	11A	1
36	9Ni	Wld. tube	SA–334	8	K81340	...	...	11A	1
37	9Ni	Plate	SA–353	...	K81340	...	...	11A	1
38	9Ni	Plate	SA–353	...	K81340	...	...	11A	1
39	9Ni	Plate	SA–353	...	K81340	...	...	11A	1
40	9Ni	Smls. & wld. fittings	SA–420	WPL8	K81340	...	...	11A	1
41	9Ni	Smls. & wld. fittings	SA–420	WPL8	K81340	...	...	11A	1
42	9Ni	Forgings	SA–522	I	K81340	...	...	11A	1
43	9Ni	Forgings	SA–522	I	K81340	...	...	11A	1
44	9Ni	Plate	SA–553	I	K81340	...	...	11A	1
45	9Ni	Plate	SA–553	I	K81340	...	...	11A	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	485	260	NP	NP	343	343	CS–2	...
2	485	275	NP	149 (SPT)	NP	NP	CS–2	...
3	485	275	NP	343	538	343	CS–2	T2
4	485	275	NP	38	343	343	CS–2	G1
5	515	345	NP	NP	343	343	CS–3	...
6	550	380	NP	NP	343	343	CS–3	...
7	620	485	NP	NP	343	343	CS–5	...
8	725	585	NP	316 (SPT)	343	NP	CS–5	...
9	795	690	NP	NP	343	NP	HT–1	...
10	795	690	NP	371 (SPT)	NP	NP	HT–1	W1
11	930	825	NP	371 (SPT)	NP	NP	HT–1	W1
12	1070	965	NP	371 (SPT)	NP	NP	HT–1	W1
13	1205	1105	NP	371 (SPT)	NP	NP	HT–1	W1
14	1310	1240	NP	371 (SPT)	NP	NP	HT–1	W1
15	655	450	NP	NP	121	121	CS–3	...
16	690	585	NP	NP	66	NP	CS–3	G20, G33, W4
17	690	585	NP	NP	66	NP	CS–3	G20, G33, W5
18	690	515	NP	93 (Cl. 3 only)	NP	NP	CS–3	G20, W5
19	690	585	NP	93 (Cl. 3 only)	121	121	CS–3	G20, W5
20	690	585	NP	93 (Cl. 3 only)	121	121	CS–3	G20, W4
21	640	480	NP	NP	121	121	CS–3	G20
22	640	480	NP	NP	121	121	CS–3	G20
23	680	575	NP	NP	121	121	CS–3	G20, W4
24	680	575	NP	NP	121	121	CS–3	G20, W5
25	680	575	NP	NP	121	121	CS–3	G20, W4
26	680	575	NP	NP	121	121	CS–3	G20, W5
27	690	515	NP	93 (Cl. 3 only)	NP	NP	CS–3	G20, W12
28	690	515	NP	93 (Cl. 3 only)	NP	NP	CS–3	G20, W5, W12
29	690	515	NP	NP	121	121	CS–3	G20, W4
30	690	515	NP	NP	121	121	CS–3	G20, W5
31	690	515	NP	NP	121	121	CS–3	G20, G24, W3
32	690	515	NP	93 (Cl. 3 only)	NP	NP	CS–3	G20, W12
33	690	515	NP	93 (Cl. 3 only)	NP	NP	CS–3	G20, W5, W12
34	690	515	NP	NP	121	121	CS–3	G20, W4
35	690	515	NP	NP	121	121	CS–3	G20, W5
36	690	515	NP	NP	121	121	CS–3	G20, G24, W3
37	690	515	NP	93 (Cl. 3 only)	121	121	CS–3	G20, W4
38	690	515	NP	NP	121	121	CS–3	G20, W5
39	690	515	NP	93 (Cl. 3 only)	NP	NP	CS–3	G20, W5
40	690	515	NP	NP	121	121	CS–3	G20, W4
41	690	515	NP	NP	121	121	CS–3	G20, W3
42	690	515	NP	93 (Cl. 3 only)	121	121	CS–3	G20, S8, W4
43	690	515	NP	NP	121	121	CS–3	G20, S8, W5
44	690	585	NP	93 (Cl. 3 only)	121	121	CS–3	G20, W4
45	690	585	NP	93 (Cl. 3 only)	121	121	CS–3	G20, W5

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
No.	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	138	138	138	138	138	138	138	133	128	122	...	...	...	...	...
2	138	138	138	138	138	...	...	...	...	...	...	...	...	...	...
3	138	138	138	138	138	138	138	138	136	129	122	*101*	*83.8*	*67.3*	*49.4*
4	138	138	138	138	138	138	138	138	136	129	...	...	...	...	...
5	148	148	148	148	148	148	148	148	146	140	...	...	...	...	...
6	158	158	158	158	158	158	158	158	152	137	...	...	...	...	...
7	177	177	177	177	177	176	175	173	172	169	...	...	...	...	...
8	207	207	207	207	207	205	204	202	200	197	...	...	...	...	...
9	227	227	227	227	227	224	223	221	219	217	...	...	...	...	...
10	227	227	227	227	227	227	227	227	226	222	217	...	...	...	...
11	266	266	266	266	266	266	266	266	265	261	255	...	...	...	...
12	305	305	305	305	305	305	305	305	305	299	293	...	...	...	...
13	345	345	345	345	345	345	345	345	343	337	330	...	...	...	...
14	374	374	374	374	374	374	374	374	373	367	359	...	...	...	...
15	187	187	186	183	...	...	...	...	...	...	...	...	...	...	...
16	197	197	...	...	...	...	...	...	...	...	...	...	...	...	...
17	187	187	...	...	...	...	...	...	...	...	...	...	...	...	...
18	187	187	173	...	...	...	...	...	...	...	...	...	...	...	...
19	187	187	173	169	...	...	...	...	...	...	...	...	...	...	...
20	197	197	182	178	...	...	...	...	...	...	...	...	...	...	...
21	183	183	183	183	...	...	...	...	...	...	...	...	...	...	...
22	183	183	183	183	...	...	...	...	...	...	...	...	...	...	...
23	194	194	194	194	...	...	...	...	...	...	...	...	...	...	...
24	187	187	187	187	...	...	...	...	...	...	...	...	...	...	...
25	194	194	194	194	...	...	...	...	...	...	...	...	...	...	...
26	187	187	187	187	...	...	...	...	...	...	...	...	...	...	...
27	197	197	182	...	...	...	...	...	...	...	...	...	...	...	...
28	187	187	173	...	...	...	...	...	...	...	...	...	...	...	...
29	197	197	182	178	...	...	...	...	...	...	...	...	...	...	...
30	187	187	173	169	...	...	...	...	...	...	...	...	...	...	...
31	168	168	155	152	...	...	...	...	...	...	...	...	...	...	...
32	197	197	182	...	...	...	...	...	...	...	...	...	...	...	...
33	187	187	173	...	...	...	...	...	...	...	...	...	...	...	...
34	197	197	182	178	...	...	...	...	...	...	...	...	...	...	...
35	187	187	173	169	...	...	...	...	...	...	...	...	...	...	...
36	168	168	155	152	...	...	...	...	...	...	...	...	...	...	...
37	197	197	182	178	...	...	...	...	...	...	...	...	...	...	...
38	187	187	173	169	...	...	...	...	...	...	...	...	...	...	...
39	187	187	173	...	...	...	...	...	...	...	...	...	...	...	...
40	197	197	182	178	...	...	...	...	...	...	...	...	...	...	...
41	187	187	173	169	...	...	...	...	...	...	...	...	...	...	...
42	197	197	182	178	...	...	...	...	...	...	...	...	...	...	...
43	187	187	173	169	...	...	...	...	...	...	...	...	...	...	...
44	197	197	182	178	...	...	...	...	...	...	...	...	...	...	...
45	187	187	173	169	...	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	*35.6*	*23.7*	*11.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
	1	25Ni–15Cr–2Ti	Forgings, bar	SA–638	660	S66286	...	...	...	...
	2	27Ni–22Cr–7Mo–Mn–Cu–N	Smls. tube	SA–213	...	S31277	...	...	45	...
	3	27Ni–22Cr–7Mo–Mn–Cu–N	Smls. tube	SA–213	...	S31277	...	...	45	...
	4	27Ni–22Cr–7Mo–Mn–Cu–N	Plate	SA–240	...	S31277	...	...	45	...
	5	27Ni–22Cr–7Mo–Mn–Cu–N	Plate	SA–240	...	S31277	...	...	45	...
	6	27Ni–22Cr–7Mo–Mn–Cu–N	Wld. tube	SA–249	...	S31277	...	...	45	...
	7	27Ni–22Cr–7Mo–Mn–Cu–N	Wld. tube	SA–249	...	S31277	...	...	45	...
	8	29Ni–20Cr–3Cu–2Mo	Castings	SA–351	CN7M	J95150	...	...	45	...
	9	29Ni–20Cr–3Cu–2Mo	Castings	SA–351	CN7M	J95150	...	...	45	...
	10	14Cr–16Ni–6Si–Cu–Mo	Smls. tube	SA–213	...	S38815	...	...	8	1
	11	14Cr–16Ni–6Si–Cu–Mo	Smls. tube	SA–213	...	S38815	...	...	8	1
	12	14Cr–16Ni–6Si–Cu–Mo	Plate	SA–240	...	S38815	...	...	8	1
	13	14Cr–16Ni–6Si–Cu–Mo	Plate	SA–240	...	S38815	...	...	8	1
	14	14Cr–16Ni–6Si–Cu–Mo	Wld. tube	SA–249	...	S38815	...	...	8	1
	15	14Cr–16Ni–6Si–Cu–Mo	Wld. tube	SA–249	...	S38815	...	...	8	1
	16	14Cr–16Ni–6Si–Cu–Mo	Wld. pipe	SA–312	...	S38815	...	...	8	1
	17	14Cr–16Ni–6Si–Cu–Mo	Wld. pipe	SA–312	...	S38815	...	...	8	1
	18	14Cr–16Ni–6Si–Cu–Mo	Smls. & wld. fittings	SA–403	...	S38815	...	...	8	1
	19	14Cr–16Ni–6Si–Cu–Mo	Smls. & wld. fittings	SA–403	...	S38815	...	...	8	1
	20	14Cr–16Ni–6Si–Cu–Mo	Bar	SA–479	...	S38815	...	...	8	1
	21	14Cr–16Ni–6Si–Cu–Mo	Bar	SA–479	...	S38815	...	...	8	1
	22	16Cr–4Ni–6Mn	Plate	SA–240	201LN	S20153	...	...	8	3
	23	16Cr–4Ni–6Mn	Plate	SA–240	201LN	S20153	...	...	8	3
	24	16Cr–9Mn–2Ni–N	Plate	SA–240	204	S20400	...	...	8	3
	25	16Cr–9Mn–2Ni–N	Plate	SA–240	204	S20400	...	...	8	3
(**23**)	26	16Cr–12Ni–2Mo	Forgings	SA–182	F316L	S31603	...	>130	8	1
(**23**)	27	16Cr–12Ni–2Mo	Forgings	SA–182	F316L	S31603	...	>130	8	1
(**23**)	28	16Cr–12Ni–2Mo	Forgings	SA–965	F316L	S31603	...	...	8	1
(**23**)	29	16Cr–12Ni–2Mo	Forgings	SA–965	F316L	S31603	...	...	8	1
	30	16Cr–12Ni–2Mo	Bar	SA/JIS G4303	SUS316L	...	...	...	8	1
(**23**)	31	16Cr–12Ni–2Mo	Forgings	SA–182	F316L	S31603	...	≤130	8	1
(**23**)	32	16Cr–12Ni–2Mo	Forgings	SA–182	F316L	S31603	...	≤130	8	1
(**23**)	33	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316L	S31603	...	...	8	1
(**23**)	34	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316L	S31603	...	...	8	1
(**23**)	35	16Cr–12Ni–2Mo	Plate	SA–240	316L	S31603	...	...	8	1
(**23**)	36	16Cr–12Ni–2Mo	Plate	SA–240	316L	S31603	...	...	8	1
	37	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316L	S31603	...	...	8	1
(**23**)	38	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316L	S31603	...	...	8	1
(**23**)	39	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316L	S31603	...	...	8	1
(**23**)	40	16Cr–12Ni–2Mo	Smls. & wld. pipe	SA–312	TP316L	S31603	...	...	8	1
(**23**)	41	16Cr–12Ni–2Mo	Smls. pipe	SA–312	TP316L	S31603	...	...	8	1
(**23**)	42	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316L	S31603	...	...	8	1
(**23**)	43	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316L	S31603	...	...	8	1
	44	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316L	S31603	1	...	8	1
(**23**)	45	16Cr–12Ni–2Mo	Smls. & wld. fittings	SA–403	316L	S31603	...	...	8	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	895	585	NP	371	371	NP	HA–5	W1
2	772	359	NP	NP	427	NP	NFN–26	G5
3	772	359	NP	NP	427	NP	NFN–26	...
4	772	359	NP	NP	427	NP	NFN–26	G5
5	772	359	NP	NP	427	NP	NFN–26	...
6	772	359	NP	NP	427	NP	NFN–26	G3, G5
7	772	359	NP	NP	427	NP	NFN–26	...
8	425	170	316	316 (Cl. 3 only)	316	NP	NFN–9	G1, G5
9	425	170	316	NP	316	NP	NFN–9	G1
10	540	255	NP	NP	427	NP	HA–2	G5
11	540	255	NP	NP	427	NP	HA–2	...
12	540	255	NP	NP	427	NP	HA–2	G5
13	540	255	NP	NP	427	NP	HA–2	...
14	540	255	NP	NP	427	NP	HA–2	G5
15	540	255	NP	NP	427	NP	HA–2	...
16	540	255	NP	NP	427	NP	HA–2	G5
17	540	255	NP	NP	427	NP	HA–2	...
18	540	255	NP	NP	427	NP	HA–2	G5, W14
19	540	255	NP	NP	427	NP	HA–2	W14
20	540	255	NP	NP	427	NP	HA–2	G5
21	540	255	NP	NP	427	NP	HA–2	...
22	655	310	NP	NP	427	343	HA–6	G5
23	655	310	NP	NP	427	343	HA–6	...
24	655	330	NP	NP	482	343	HA–6	G5
25	655	330	NP	NP	482	343	HA–6	...
26	450	170	454	427	649	343	HA–4	G5, T12
27	450	170	454	NP	649	343	HA–4	G21, T12
28	450	170	454	427	649	343	HA–4	G5, T12
29	450	170	454	NP	649	343	HA–4	G21, T12
30	480	175	454	427	454	NP	HA–4	G5, G21, G22
31	485	170	454	427	649	343	HA–4	G5, T12
32	485	170	454	NP	649	343	HA–4	G21, T12
33	485	170	454	427	649	NP	HA–4	G5, T12
34	485	170	454	NP	649	NP	HA–4	G21, T12
35	485	170	454	427	649	343	HA–4	G5, T12
36	485	170	454	NP	649	343	HA–4	G21, T12
37	485	170	NP	427	NP	NP	HA–4	G5, W12
38	485	170	454	NP	649	343	HA–4	G5, G21, G24, T12
39	485	170	454	NP	649	343	HA–4	G21, G24, T12
40	485	170	454	427	649	343	HA–4	G5, G21, T12, W12, W14
41	485	170	454	NP	649	343	HA–4	G21, T12
42	485	170	454	NP	649	343	HA–4	G5, G21, G24, T12
43	485	170	454	NP	649	343	HA–4	G21, G24, T12
44	485	170	NP	427	NP	NP	HA–4	G5
45	485	170	NP	427	649	343	HA–4	G5, T12, W12, W14

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	256	256	256	256	256	256	253	248	246	243	241	...	...	...	...
2	221	221	220	...	212	203	197	191	189	186	185	183	181	181	...
3	221	221	219	...	198	184	177	175	175	175	175	173	172	172	...
4	221	221	220	...	212	203	197	191	189	186	185	183	181	181	...
5	221	221	219	...	198	184	177	175	175	175	175	173	172	172	...
6	188	188	187	...	180	173	167	162	160	158	157	155	154	154	...
7	188	188	186	...	169	156	150	149	149	149	149	147	146	146	...
8	115	114	109	101	93.5	88.5	84.3	80.9	79.4	...	...	...	...	...	...
9	115	107	97.7	92.8	88.8	81.9	75.6	70.4	68.0	...	...	...	...	...	...
10	154	154	154	154	153	149	145	143	142	142	142	142	142	141	...
11	154	153	141	134	127	118	113	111	110	110	110	110	110	110	...
12	154	154	154	154	153	149	145	143	142	142	142	142	142	141	...
13	154	153	141	134	127	118	113	111	110	110	110	110	110	110	...
14	131	131	131	131	130	126	124	122	121	121	121	121	120	120	...
15	131	130	120	114	108	100	96.0	94.1	93.8	93.8	93.8	93.8	93.8	93.8	...
16	131	131	131	131	130	126	124	122	121	121	121	121	120	120	...
17	131	130	120	114	108	100	96.0	94.1	93.8	93.8	93.8	93.8	93.8	93.8	...
18	154	154	154	154	153	149	145	143	142	142	142	142	142	141	...
19	154	153	141	134	127	118	113	111	110	110	110	110	110	110	...
20	154	154	154	154	153	149	145	143	142	142	142	142	142	141	...
21	154	153	141	134	127	118	113	111	110	110	110	110	110	110	...
22	187	177	164	152	146	139	136	136	135	135	134	132	130	128	...
23	187	177	161	152	146	139	136	134	131	127	124	120	115	112	...
24	187	175	160	150	142	131	125	124	123	123	123	123	122	120	117
25	187	175	160	149	140	124	115	110	108	107	107	105	104	102	99.5
26	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	86.6
27	115	106	96.3	91.3	87.4	81.2	76.0	72.5	71.2	70.0	68.8	67.5	66.3	65.0	63.8
28	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	86.6
29	115	106	96.3	91.3	87.4	81.2	76.0	72.5	71.2	70.0	68.8	67.5	66.3	65.0	63.8
30	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	86.6
31	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	86.6
32	115	106	96.3	91.3	87.4	81.2	76.0	72.5	71.2	70.0	68.8	67.5	66.3	65.0	63.8
33	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	86.6
34	115	106	96.3	91.3	87.4	81.2	76.0	72.5	71.2	70.0	68.8	67.5	66.3	65.0	63.8
35	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	86.6
36	115	106	96.3	91.3	87.4	81.2	76.0	72.5	71.2	70.0	68.8	67.5	66.3	65.0	63.8
37	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...
38	97.9	97.9	97.9	97.9	97.9	93.0	87.2	82.9	81.6	80.2	78.4	77.2	75.9	74.7	73.4
39	97.9	90.3	82.1	77.8	74.3	68.7	64.8	61.4	60.4	59.7	58.4	57.2	55.9	55.2	54.7
40	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	86.6
41	115	106	96.3	91.3	87.4	81.2	76.0	72.5	71.2	70.0	68.8	67.5	66.3	65.0	63.8
42	97.9	97.9	97.9	97.9	97.9	93.0	87.2	82.9	81.6	80.2	78.4	77.2	75.9	74.7	73.4
43	97.9	90.3	82.1	77.8	74.3	68.7	64.8	61.4	60.4	59.7	58.4	57.2	55.9	55.2	54.7
44	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...
45	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	86.6

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	114	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	96.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	84.4	82.6	80.9	79.4	76.5	58.5	*43.4*	...	...	...	...	...	...	...	...	...	...	(**23**)
27	62.8	61.2	59.9	58.8	57.8	57.0	*43.4*	...	...	...	...	...	...	...	...	...	...	(**23**)
28	84.4	82.6	80.9	79.4	76.5	58.5	*43.4*	...	...	...	...	...	...	...	...	...	...	(**23**)
29	62.8	61.2	59.9	58.8	57.8	57.0	*43.4*	...	...	...	...	...	...	...	...	...	...	(**23**)
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	84.4	82.6	80.9	79.4	76.5	58.5	*43.4*	...	...	...	...	...	...	...	...	...	...	(**23**)
32	62.8	61.2	59.9	58.8	57.8	57.0	*43.4*	...	...	...	...	...	...	...	...	...	...	(**23**)
33	84.4	82.6	80.9	79.4	76.5	58.5	*43.4*	...	...	...	...	...	...	...	...	...	...	(**23**)
34	62.8	61.2	59.9	58.8	57.8	57.0	*43.4*	...	...	...	...	...	...	...	...	...	...	(**23**)
35	84.4	82.6	80.9	79.4	76.5	58.5	*43.4*	...	...	...	...	...	...	...	...	...	...	(**23**)
36	62.8	61.2	59.9	58.8	57.8	57.0	*43.4*	...	...	...	...	...	...	...	...	...	...	(**23**)
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	71.7	70.2	68.8	67.5	65.0	49.7	*36.9*	...	...	...	...	...	...	...	...	...	...	(**23**)
39	53.4	52.0	50.9	50.0	49.1	48.5	*36.9*	...	...	...	...	...	...	...	...	...	...	(**23**)
40	84.4	82.6	80.9	79.4	76.5	58.5	*43.4*	...	...	...	...	...	...	...	...	...	...	(**23**)
41	62.8	61.2	59.9	58.8	57.8	57.0	*43.4*	...	...	...	...	...	...	...	...	...	...	(**23**)
42	71.7	70.2	68.8	67.5	65.0	49.7	*36.9*	...	...	...	...	...	...	...	...	...	...	(**23**)
43	53.4	52.0	50.9	50.0	49.1	48.5	*36.9*	...	...	...	...	...	...	...	...	...	...	(**23**)
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	84.4	82.6	80.9	79.4	76.5	58.5	*43.4*	...	...	...	...	...	...	...	...	...	...	(**23**)

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
	1	16Cr–12Ni–2Mo	Wld. pipe	SA–409	TP316L	S31603	...	...	8	1
(**23**)	2	16Cr–12Ni–2Mo	Bar	SA–479	316L	S31603	...	...	8	1
(**23**)	3	16Cr–12Ni–2Mo	Bar	SA–479	316L	S31603	...	...	8	1
	4	16Cr–12Ni–2Mo	Wld. tube	SA–688	TP316L	S31603	...	...	8	1
	5	16Cr–12Ni–2Mo	Wld. tube	SA–688	TP316L	S31603	...	...	8	1
	6	16Cr–12Ni–2Mo	Wld. tube	SA–688	TP316L	S31603	...	...	8	1
	7	16Cr–12Ni–2Mo	Wld. pipe	SA–813	TP316L	S31603	...	...	8	1
	8	16Cr–12Ni–2Mo	Wld. pipe	SA–814	TP316L	S31603	...	...	8	1
	9	16Cr–12Ni–2Mo	Forgings	SA–182	F316	S31600	...	>130	8	1
	10	16Cr–12Ni–2Mo	Forgings	SA–182	F316	S31600	...	>130	8	1
	11	16Cr–12Ni–2Mo	Forgings	SA–965	F316	S31600	...	...	8	1
	12	16Cr–12Ni–2Mo	Forgings	SA–965	F316	S31600	...	...	8	1
	13	16Cr–12Ni–2Mo	Forgings	SA–182	F316H	S31609	...	>130	8	1
	14	16Cr–12Ni–2Mo	Forgings	SA–182	F316H	S31609	...	>130	8	1
	15	16Cr–12Ni–2Mo	Forgings	SA–965	F316H	S31609	...	...	8	1
	16	16Cr–12Ni–2Mo	Forgings	SA–965	F316H	S31609	...	...	8	1
	17	16Cr–12Ni–2Mo	Forgings	SA–182	F316	S31600	...	≤130	8	1
	18	16Cr–12Ni–2Mo	Forgings	SA–182	F316	S31600	...	≤130	8	1
	19	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316	S31600	...	...	8	1
	20	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316	S31600	...	...	8	1
	21	16Cr–12Ni–2Mo	Plate	SA–240	316	S31600	...	...	8	1
	22	16Cr–12Ni–2Mo	Plate	SA–240	316	S31600	...	...	8	1
	23	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316	S31600	...	...	8	1
	24	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316	S31600	...	...	8	1
	25	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316	S31600	...	...	8	1
	26	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316	S31600	...	...	8	1
	27	16Cr–12Ni–2Mo	Smls. & wld. pipe	SA–312	TP316	S31600	...	...	8	1
	28	16Cr–12Ni–2Mo	Smls. & wld. pipe	SA–312	TP316	S31600	...	...	8	1
	29	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316	S31600	...	...	8	1
	30	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316	S31600	...	...	8	1
	31	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316	S31600	1	...	8	1
	32	16Cr–12Ni–2Mo	Smls. pipe	SA–376	TP316	S31600	...	...	8	1
	33	16Cr–12Ni–2Mo	Smls. pipe	SA–376	TP316	S31600	...	...	8	1
	34	16Cr–12Ni–2Mo	Smls. & wld. fittings	SA–403	316	S31600	...	...	8	1
	35	16Cr–12Ni–2Mo	Wld. pipe	SA–409	TP316	S31600	...	...	8	1
	36	16Cr–12Ni–2Mo	Bar	SA–479	316	S31600	...	...	8	1
	37	16Cr–12Ni–2Mo	Bar	SA–479	316	S31600	...	...	8	1
	38	16Cr–12Ni–2Mo	Wld. tube	SA–688	TP316	S31600	...	...	8	1
	39	16Cr–12Ni–2Mo	Wld. tube	SA–688	TP316	S31600	...	...	8	1
	40	16Cr–12Ni–2Mo	Wld. tube	SA–688	TP316	S31600	...	...	8	1
	41	16Cr–12Ni–2Mo	Wld. pipe	SA–813	TP316	S31600	...	...	8	1
	42	16Cr–12Ni–2Mo	Wld. pipe	SA–814	TP316	S31600	...	...	8	1
	43	16Cr–12Ni–2Mo	Forgings	SA–182	F316H	S31609	...	≤130	8	1
	44	16Cr–12Ni–2Mo	Forgings	SA–182	F316H	S31609	...	≤130	8	1
	45	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316H	S31609	...	...	8	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	485	170	NP	427	NP	NP	HA–4	G5
2	485	170	454	427	649	343	HA–4	G5, G21, G22, T12
3	485	170	454	NP	649	343	HA–4	G21, G22, T12
4	485	170	NP	427	NP	NP	HA–4	G5, W12
5	485	170	NP	NP	454	343	HA–4	G5, G24
6	485	170	NP	NP	454	343	HA–4	G24
7	485	170	NP	427	NP	NP	HA–4	G5, W12
8	485	170	NP	427	NP	NP	HA–4	G5, W12
9	485	205	816	427	816	343	HA–2	G5, G12, T8
10	485	205	816	NP	816	343	HA–2	G12, T9
11	485	205	816	427	816	343	HA–2	G5, G12, T8
12	485	205	816	NP	816	343	HA–2	G12, T9
13	485	205	816	427	816	NP	HA–2	G5, G12, T8
14	485	205	816	NP	816	NP	HA–2	T9
15	485	205	NP	427	816	NP	HA–2	G5, T8
16	485	205	NP	NP	816	NP	HA–2	T9
17	515	205	816	427	816	NP	HA–2	G5, G12, T8
18	515	205	816	NP	816	NP	HA–2	G12, T9
19	515	205	816	427	816	NP	HA–2	G5, G12, T8
20	515	205	816	NP	816	NP	HA–2	G12, T9
21	515	205	816	427	816	343	HA–2	G5, G12, T8
22	515	205	816	NP	816	343	HA–2	G12, T9
23	515	205	816	NP	NP	NP	HA–2	G12, T9, W13
24	515	205	816	427	NP	NP	HA–2	G5, G12, T8, W12, W13
25	515	205	816	NP	816	343	HA–2	G3, G5, G12, G24, T7
26	515	205	816	NP	816	343	HA–2	G3, G12, G24, T9
27	515	205	816	427	816	343	HA–2	G5, G12, T8, W12, W13, W14
28	515	205	816	NP	816	343	HA–2	G12, T9, W13, W14
29	515	205	816	NP	816	343	HA–2	G3, G5, G12, G24, T7
30	515	205	816	NP	816	343	HA–2	G3, G12, G24, T9
31	515	205	NP	427	NP	NP	HA–2	G5, W12
32	515	205	816	427	816	343	HA–2	G5, G12, H1, T8, W12
33	515	205	816	NP	816	343	HA–2	G12, H1, T9
34	515	205	NP	427	816	343	HA–2	G5, G12, T8, W12, W14
35	515	205	NP	427	NP	NP	HA–2	G5, W12
36	515	205	816	427	816	343	HA–2	G5, G12, G22, H1, T8
37	515	205	816	NP	816	343	HA–2	G12, G22, H1, T9
38	515	205	NP	427	NP	NP	HA–2	G5, W12
39	515	205	NP	NP	816	343	HA–2	G5, G12, G24, T7
40	515	205	NP	NP	816	343	HA–2	G12, G24, T9
41	515	205	NP	427	NP	NP	HA–2	G5, W12
42	515	205	NP	427	NP	NP	HA–2	G5, W12
43	515	205	816	427	816	NP	HA–2	G5, T8
44	515	205	816	NP	816	NP	HA–2	T9
45	515	205	816	427	816	NP	HA–2	G5, T8

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...
2	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	86.6
3	115	106	96.3	91.3	87.4	81.2	76.0	72.5	71.2	70.0	68.8	67.5	66.3	65.0	63.8
4	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...
5	97.9	97.9	97.9	97.9	97.9	93.0	87.2	82.9	81.6	80.2	78.4	77.2	75.9	74.7	73.4
6	97.9	90.3	82.1	77.8	74.3	68.7	64.8	61.4	60.4	59.7	58.4	57.2	55.9	55.2	54.7
7	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...
8	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...
9	138	138	138	136	134	133	126	119	116	114	112	111	110	108	108
10	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
11	138	138	138	136	134	133	126	119	116	114	112	111	110	108	108
12	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
13	138	138	138	136	134	133	126	119	116	114	112	111	110	108	108
14	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
15	138	138	138	136	134	133	126	119	116	114	112	111	110	108	108
16	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
17	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108
18	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
19	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108
20	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
21	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108
22	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
23	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
24	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108
25	117	117	117	117	117	114	107	101	99.0	96.8	95.7	94.4	93.1	92.5	91.4
26	117	109	99.8	94.9	90.8	84.0	78.8	74.7	73.3	72.1	70.8	69.6	69.0	68.4	67.7
27	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108
28	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
29	117	117	117	117	117	114	107	101	99.0	96.8	95.7	94.4	93.1	92.5	91.4
30	117	109	99.8	94.9	90.8	84.0	78.8	74.7	73.3	72.1	70.8	69.6	69.0	68.4	67.7
31	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...
32	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108
33	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
34	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108
35	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...
36	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108
37	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
38	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...
39	117	117	117	117	117	114	107	101	99.0	96.8	95.7	94.4	93.1	92.5	91.4
40	117	109	99.8	94.9	90.8	84.0	78.8	74.7	73.3	72.1	70.8	69.6	69.0	68.4	67.7
41	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...
42	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...
43	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108
44	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
45	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	84.4	82.6	80.9	79.4	76.5	58.5	*43.4*	...	...	...	...	...	...	...	...	...	...	(**23**)
3	62.8	61.2	59.9	58.8	57.8	57.0	*43.4*	...	...	...	...	...	...	...	...	...	...	(**23**)
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
10	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
11	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
12	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
13	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
14	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
15	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
16	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
17	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
18	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
19	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
20	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
21	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
22	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
23	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
24	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
25	90.5	89.9	89.3	*85.3*	*68.1*	*55.6*	*42.9*	*33.0*	*25.3*	*19.4*	*14.7*	*11.3*	*8.90*	*6.77*	...	...	...	
26	67.1	66.5	65.9	65.3	64.0	*55.6*	*42.9*	*33.0*	*25.3*	*19.4*	*14.7*	*11.3*	*8.90*	*6.77*	...	...	...	
27	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
28	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
29	90.5	89.9	89.3	*85.3*	*68.1*	*55.6*	*42.9*	*33.0*	*25.3*	*19.4*	*14.7*	*11.3*	*8.90*	*6.77*	...	...	...	
30	67.1	66.5	65.9	65.3	64.0	*55.6*	*42.9*	*33.0*	*25.3*	*19.4*	*14.7*	*11.3*	*8.90*	*6.77*	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
33	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
34	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
37	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	90.5	89.9	89.3	*85.3*	*68.1*	*55.6*	*42.9*	*33.0*	*25.3*	*19.4*	*14.7*	*11.3*	*8.90*	*6.77*	...	...	...	
40	67.1	66.5	65.9	65.3	64.0	*55.6*	*42.9*	*33.0*	*25.3*	*19.4*	*14.7*	*11.3*	*8.90*	*6.77*	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
44	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
45	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316H	S31609	...	...	8	1
2	16Cr–12Ni–2Mo	Plate	SA–240	316H	S31609	...	...	8	1
3	16Cr–12Ni–2Mo	Plate	SA–240	316H	S31609	...	...	8	1
4	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316H	S31609	...	...	8	1
5	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316H	S31609	...	...	8	1
6	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316H	S31609	...	...	8	1
7	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316H	S31609	...	...	8	1
8	16Cr–12Ni–2Mo	Smls. & wld. pipe	SA–312	TP316H	S31609	...	...	8	1
9	16Cr–12Ni–2Mo	Smls. & wld. pipe	SA–312	TP316H	S31609	...	...	8	1
10	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316H	S31609	...	...	8	1
11	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316H	S31609	...	...	8	1
12	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316H	S31609	1	...	8	1
13	16Cr–12Ni–2Mo	Smls. pipe	SA–376	TP316H	S31609	...	...	8	1
14	16Cr–12Ni–2Mo	Smls. pipe	SA–376	TP316H	S31609	...	...	8	1
15	16Cr–12Ni–2Mo	Smls. & wld. fittings	SA–403	316H	S31609	...	...	8	1
16	16Cr–12Ni–2Mo	Bar	SA–479	316H	S31609	...	...	8	1
17	16Cr–12Ni–2Mo	Bar	SA–479	316H	S31609	...	...	8	1
18	16Cr–12Ni–2Mo	Wld. pipe	SA–813	TP316H	S31609	...	...	8	1
19	16Cr–12Ni–2Mo	Wld. pipe	SA–814	TP316H	S31609	...	...	8	1
20	16Cr–12Ni–2Mo	Bar	SA/JIS G4303	SUS316	...	...	...	8	1
21	16Cr–12Ni–2Mo	Plate	SA/EN 10028–7	X2CrNiMo17–12–2	...	...	≤75	8	1
22	16Cr–12Ni–2Mo	Plate	SA/EN 10028–7	X2CrNiMo17–12–2	...	...	≤75	8	1
23	16Cr–12Ni–2Mo	Plate	SA/EN 10028–7	X5CrNiMo17–12–2	...	...	≤75	8	1
24	16Cr–12Ni–2Mo	Plate	SA/EN 10028–7	X5CrNiMo17–12–2	...	...	≤75	8	1
25	16Cr–12Ni–2Mo–Cb	Plate	SA–240	316Cb	S31640	...	...	8	1
26	16Cr–12Ni–2Mo–Cb	Plate	SA–240	316Cb	S31640	...	...	8	1
27	16Cr–12Ni–2Mo–N	Forgings	SA–182	F316LN	S31653	...	>130	8	1
28	16Cr–12Ni–2Mo–N	Forgings	SA–965	F316LN	S31653	...	...	8	1
29	16Cr–12Ni–2Mo–N	Forgings	SA–182	F316LN	S31653	...	≤130	8	1
30	16Cr–12Ni–2Mo–N	Smls. tube	SA–213	TP316LN	S31653	...	...	8	1
31	16Cr–12Ni–2Mo–N	Plate	SA–240	316LN	S31653	...	...	8	1
32	16Cr–12Ni–2Mo–N	Wld. tube	SA–249	TP316LN	S31653	...	...	8	1
33	16Cr–12Ni–2Mo–N	Smls. & wld. pipe	SA–312	TP316LN	S31653	...	...	8	1
34	16Cr–12Ni–2Mo–N	Wld. pipe	SA–358	316LN	S31653	1	...	8	1
35	16Cr–12Ni–2Mo–N	Smls. pipe	SA–376	TP316LN	S31653	...	...	8	1
36	16Cr–12Ni–2Mo–N	Fittings	SA–403	316LN	S31653	...	...	8	1
37	16Cr–12Ni–2Mo–N	Bar	SA–479	316LN	S31653	...	...	8	1
38	16Cr–12Ni–2Mo–N	Wld. tube	SA–688	TP316LN	S31653	...	...	8	1
39	16Cr–12Ni–2Mo–N	Forgings	SA–182	F316N	S31651	...	...	8	1
40	16Cr–12Ni–2Mo–N	Smls. tube	SA–213	TP316N	S31651	...	...	8	1
41	16Cr–12Ni–2Mo–N	Smls. tube	SA–213	TP316N	S31651	...	...	8	1
42	16Cr–12Ni–2Mo–N	Plate	SA–240	316N	S31651	...	...	8	1
43	16Cr–12Ni–2Mo–N	Plate	SA–240	316N	S31651	...	...	8	1
44	16Cr–12Ni–2Mo–N	Wld. tube	SA–249	TP316N	S31651	...	...	8	1
45	16Cr–12Ni–2Mo–N	Wld. tube	SA–249	TP316N	S31651	...	...	8	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	515	205	816	NP	816	NP	HA–2	T9
2	515	205	816	427	816	NP	HA–2	G5, T8
3	515	205	816	NP	816	NP	HA–2	T9
4	515	205	816	NP	816	NP	HA–2	G3, G5, G24, T7
5	515	205	816	NP	816	NP	HA–2	G3, G24, T9
6	515	205	816	NP	NP	NP	HA–2	T9, W13
7	515	205	816	427	NP	NP	HA–2	G5, T8, W12, W13
8	515	205	816	427	816	NP	HA–2	G5, T8, W12, W13
9	515	205	816	NP	816	NP	HA–2	T9, W13
10	515	205	816	NP	816	NP	HA–2	G3, G5, G24, T7
11	515	205	816	NP	816	NP	HA–2	G3, G24, T9
12	515	205	NP	427	NP	NP	HA–2	G5, W12
13	515	205	816	427	816	NP	HA–2	G5, H1, T8
14	515	205	816	NP	816	NP	HA–2	H1, T9
15	515	205	NP	427	816	NP	HA–2	G5, G12, T8, W12, W14
16	515	205	816	427	NP	NP	HA–2	G5, H1, T8
17	515	205	816	NP	NP	NP	HA–2	H1, T9
18	515	205	NP	427	NP	NP	HA–2	G5, W12
19	515	205	NP	427	NP	NP	HA–2	G5, W12
20	520	205	816	427	816	NP	HA–2	G5, G12, G22, H1, T8
21	520	220	NP	NP	454	343	HA–4	G5, G30
22	520	220	NP	NP	454	343	HA–4	G30
23	520	220	NP	NP	550	343	HA–2	G5, G12, G30
24	520	220	NP	NP	550	343	HA–2	G12, G30
25	515	205	NP	NP	816	343	HA–2	G5, G12, T8
26	515	205	NP	NP	816	343	HA–2	G12, T9
27	485	205	NP	427	NP	NP	HA–2	G5
28	485	205	NP	427	NP	NP	HA–2	G5
29	515	205	NP	427	NP	NP	HA–2	G5
30	515	205	NP	427	NP	NP	HA–2	G5
31	515	205	NP	427	NP	NP	HA–2	G5
32	515	205	NP	427	NP	NP	HA–2	G5, W12
33	515	205	NP	427	NP	NP	HA–2	G5, W12
34	515	205	NP	427	NP	NP	HA–2	G5, W12
35	515	205	NP	427	NP	NP	HA–2	G5
36	515	205	NP	427	NP	NP	HA–2	G5, W12
37	515	205	NP	427	NP	NP	HA–2	G5
38	515	205	NP	427	NP	NP	HA–2	G5, W12
39	550	240	NP	427	NP	NP	HA–2	G5
40	550	240	649	427	649	NP	HA–2	G5, G12, T7
41	550	240	649	NP	649	NP	HA–2	G12, T8
42	550	240	NP	427	649	343	HA–2	G5, G12, T7
43	550	240	NP	NP	649	343	HA–2	G12, T8
44	550	240	649	NP	NP	NP	HA–2	G5, G12, T7, W13
45	550	240	649	NP	NP	NP	HA–2	G12, T8, W13

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
No.	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
2	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108
3	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
4	117	117	117	117	117	114	107	101	99.0	96.8	95.7	94.4	93.1	92.5	91.4
5	117	109	99.8	94.9	90.8	84.0	78.8	74.7	73.3	72.1	70.8	69.6	69.0	68.4	67.7
6	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
7	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108
8	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108
9	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
10	117	117	117	117	117	114	107	101	99.0	96.8	95.7	94.4	93.1	92.5	91.4
11	117	109	99.8	94.9	90.8	84.0	78.8	74.7	73.3	72.1	70.8	69.6	69.0	68.4	67.7
12	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...
13	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108
14	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
15	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108
16	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108
17	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
18	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...
19	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...
20	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108
21	147	147	147	147	147	139	131	125	123	121	119	116	114	112	110
22	147	133	123	117	112	103	97.0	93.0	91.0	89.0	88.0	86.0	85.0	83.0	81.0
23	147	147	147	147	147	142	133	127	124	122	120	118	117	116	114
24	147	134	125	119	114	105	98.7	93.7	91.8	90.1	88.7	87.5	86.5	85.6	84.8
25	138	138	138	138	138	134	125	117	116	114	112	111	110	109	108
26	138	130	120	114	109	99.3	92.2	86.7	85.0	84.1	82.9	82.0	81.4	80.6	79.8
27	138	138	138	134	130	124	119	115	113	110	107	105	102	99.7	...
28	138	138	138	134	130	124	119	115	113	110	107	105	102	99.7	...
29	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...
30	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...
31	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...
32	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...
33	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...
34	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...
35	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...
36	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...
37	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...
38	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...
39	158	158	158	155	152	148	146	145	144	140	137	135	133	130	...
40	158	158	158	155	152	148	146	145	144	140	137	135	133	130	128
41	158	150	141	136	131	122	115	109	107	104	102	99.9	98.0	96.1	94.9
42	158	158	158	155	152	148	146	145	144	140	137	135	133	130	128
43	158	150	141	136	131	122	115	109	107	104	102	99.9	98.0	96.1	94.9
44	158	158	158	155	152	148	146	145	144	140	137	135	133	130	128
45	158	150	141	136	131	122	115	109	107	104	102	99.9	98.0	96.1	94.9

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...
2	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...
3	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...
4	90.5	89.9	89.3	*85.3*	*68.1*	*55.6*	*42.9*	*33.0*	*25.3*	*19.4*	*14.7*	*11.3*	*8.90*	*6.77*	...	...	...
5	67.1	66.5	65.9	65.3	64.0	*55.6*	*42.9*	*33.0*	*25.3*	*19.4*	*14.7*	*11.3*	*8.90*	*6.77*	...	...	...
6	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...
7	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...
8	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...
9	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...
10	90.5	89.9	89.3	*85.3*	*68.1*	*55.6*	*42.9*	*33.0*	*25.3*	*19.4*	*14.7*	*11.3*	*8.90*	*6.77*	...	...	...
11	67.1	66.5	65.9	65.3	64.0	*55.6*	*42.9*	*33.0*	*25.3*	*19.4*	*14.7*	*11.3*	*8.90*	*6.77*	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...
14	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...
15	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...
16	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...
17	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	113	113	112	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	84.0	83.4	82.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...
26	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	126	124	119	*101*	*81.6*	*65.3*	*50.4*	...	...	...	...	...	...	...	...	...	...
41	93.1	91.7	90.1	88.5	*81.6*	*65.3*	*50.4*	...	...	...	...	...	...	...	...	...	...
42	126	124	119	*101*	*81.6*	*65.3*	*50.4*	...	...	...	...	...	...	...	...	...	...
43	93.1	91.7	90.1	88.5	*81.6*	*65.3*	*50.4*	...	...	...	...	...	...	...	...	...	...
44	126	124	119	*101*	*81.6*	*65.3*	*50.4*	...	...	...	...	...	...	...	...	...	...
45	93.1	91.7	90.1	88.5	*81.6*	*65.3*	*50.4*	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	16Cr–12Ni–2Mo–N	Wld. tube	SA–249	TP316N	S31651	...	...	8	1
2	16Cr–12Ni–2Mo–N	Wld. tube	SA–249	TP316N	S31651	...	...	8	1
3	16Cr–12Ni–2Mo–N	Smls. & wld. pipe	SA–312	TP316N	S31651	...	...	8	1
4	16Cr–12Ni–2Mo–N	Smls. & wld. pipe	SA–312	TP316N	S31651	...	...	8	1
5	16Cr–12Ni–2Mo–N	Wld. pipe	SA–312	TP316N	S31651	...	...	8	1
6	16Cr–12Ni–2Mo–N	Wld. pipe	SA–312	TP316N	S31651	...	...	8	1
7	16Cr–12Ni–2Mo–N	Wld. pipe	SA–358	316N	S31651	1	...	8	1
8	16Cr–12Ni–2Mo–N	Smls. pipe	SA–376	TP316N	S31651	...	...	8	1
9	16Cr–12Ni–2Mo–N	Smls. pipe	SA–376	TP316N	S31651	...	...	8	1
10	16Cr–12Ni–2Mo–N	Smls. & wld. fittings	SA–403	316N	S31651	...	...	8	1
11	16Cr–12Ni–2Mo–N	Bar	SA–479	316N	S31651	...	...	8	1
12	16Cr–12Ni–2Mo–N	Bar	SA–479	316N	S31651	...	...	8	1
13	16Cr–12Ni–2Mo–N	Wld. tube	SA–688	TP316N	S31651	...	...	8	1
14	16Cr–12Ni–2Mo–N	Wld. pipe	SA–813	TP316N	S31651	...	...	8	1
15	16Cr–12Ni–2Mo–N	Wld. pipe	SA–814	TP316N	S31651	...	...	8	1
16	16Cr–12Ni–2Mo–N	Forgings	SA–965	F316N	S31651	...	...	8	1
17	16Cr–12Ni–2Mo–N	Forgings	SA–965	F316N	S31651	...	...	8	1
18	16Cr–12Ni–2Mo–N	Plate	SA/EN 10028–7	X2CrNiMoN17–11–2	...	...	≤75	8	1
19	16Cr–12Ni–2Mo–N	Plate	SA/EN 10028–7	X2CrNiMoN17–13–3	...	...	≤75	8	1
20	16Cr–12Ni–2Mo–Ti	Plate	SA–240	316Ti	S31635	...	...	8	1
21	16Cr–12Ni–2Mo–Ti	Plate	SA–240	316Ti	S31635	...	...	8	1
22	17Cr–4Ni–6Mn	Plate	SA–240	201–1	S20100	...	...	8	3
23	17Cr–4Ni–6Mn	Plate	SA–240	201–1	S20100	...	...	8	3
24	17Cr–4Ni–6Mn	Plate	SA–666	201–1	S20100	...	...	8	3
25	17Cr–4Ni–6Mn	Plate	SA–666	201–1	S20100	...	...	8	3
26	17Cr–4Ni–6Mn	Plate	SA–240	201–2	S20100	...	...	8	3
27	17Cr–4Ni–6Mn	Plate	SA–666	201–2	S20100	...	...	8	3
28	17Cr–7Ni	Plate, sheet, strip	SA–240	301	S30100	...	...	8	1
29	17Cr–7Ni	Plate, sheet, strip	SA–240	301	S30100	...	...	8	1
30	17.5Cr–17.5Ni–5.3Si	Plate	SA–240	...	S30601	Sol. ann.	...	8	1
31	17.5Cr–17.5Ni–5.3Si	Plate	SA–240	...	S30601	Sol. ann.	...	8	1
32	18Cr–3Ni–12Mn	Plate	SA–240	XM–29	S24000	...	...	8	3
33	18Cr–3Ni–12Mn	Plate	SA–240	XM–29	S24000	...	...	8	3
34	18Cr–3Ni–12Mn	Wld. tube	SA–249	XM–29	S24000	...	...	8	3
35	18Cr–3Ni–12Mn	Wld. tube	SA–249	XM–29	S24000	...	...	8	3
36	18Cr–3Ni–12Mn	Wld. pipe	SA–312	XM–29	S24000	...	...	8	3
37	18Cr–3Ni–12Mn	Wld. pipe	SA–312	XM–29	S24000	...	...	8	3
38	18Cr–3Ni–12Mn	Bar	SA–479	XM–29	S24000	...	...	8	3
39	18Cr–3Ni–12Mn	Bar	SA–479	XM–29	S24000	...	...	8	3
40	18Cr–3Ni–12Mn	Wld. tube	SA–688	TPXM–29	S24000	...	...	8	3
41	18Cr–3Ni–12Mn	Wld. tube	SA–688	TPXM–29	S24000	...	...	8	3
42	18Cr–5Ni–3Mo	Smls. tube	SA–789	...	S31500	...	...	10H	1
43	18Cr–5Ni–3Mo	Wld. tube	SA–789	...	S31500	...	...	10H	1
44	18Cr–5Ni–3Mo	Smls. pipe	SA–790	...	S31500	...	...	10H	1
45	18Cr–5Ni–3Mo	Wld. pipe	SA–790	...	S31500	...	...	10H	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	550	240	649	NP	649	343	HA–2	G3, G12, G24, T8
2	550	240	649	NP	649	343	HA–2	G3, G5, G12, G24, T7
3	550	240	649	427	649	343	HA–2	G5, G12, T7, W12, W13, W14
4	550	240	649	NP	649	343	HA–2	G12, T8, W13, W14
5	550	240	649	NP	649	343	HA–2	G3, G12, G24, T8
6	550	240	649	NP	649	343	HA–2	G3, G5, G12, G24, T7
7	550	240	NP	427	NP	NP	HA–2	G5, W12
8	550	240	649	427	649	343	HA–2	G5, G12, H1, T7
9	550	240	649	NP	649	343	HA–2	G12, H1, T8
10	550	240	NP	427	649	343	HA–2	G5, G12, T7, W12, W14
11	550	240	649	427	NP	NP	HA–2	G5, G12, H1, T7
12	550	240	649	NP	NP	NP	HA–2	G12, H1, T8
13	550	240	NP	427	NP	NP	HA–2	G5, W12
14	550	240	NP	427	NP	NP	HA–2	G5, W12
15	550	240	NP	427	NP	NP	HA–2	G5, W12
16	550	240	NP	427	649	343	HA–2	G5, G12, T7
17	550	240	NP	NP	649	343	HA–2	G12, T8
18	580	280	NP	NP	427	343	HA–2	G5, G30
19	580	280	NP	NP	427	343	HA–2	G5, G30
20	515	205	NP	NP	816	343	HA–2	G5, G12, T8
21	515	205	NP	NP	816	343	HA–2	G12, T9
22	515	260	NP	NP	149	149	HA–2	...
23	515	260	NP	NP	149	149	HA–2	G5
24	515	260	NP	NP	149	149	HA–2	...
25	515	260	NP	NP	149	149	HA–2	G5
26	655	310	NP	NP	149	149	HA–6	...
27	655	310	NP	NP	149	149	HA–6	...
28	515	205	NP	NP	427	NP	HA–1	G5
29	515	205	NP	NP	427	NP	HA–1	...
30	540	255	NP	NP	260	NP	HA–1	G5, G31, H6
31	540	255	NP	NP	260	NP	HA–1	G31, H6
32	690	380	NP	NP	427	343	HA–6	G5
33	690	380	NP	NP	427	343	HA–6	...
34	690	380	NP	NP	427	343	HA–6	G5, G24
35	690	380	NP	NP	427	343	HA–6	G24
36	690	380	NP	NP	427	343	HA–6	G5, G24
37	690	380	NP	NP	427	343	HA–6	G24
38	690	380	NP	NP	427	343	HA–6	G5, G22
39	690	380	NP	NP	427	343	HA–6	G22
40	690	380	NP	NP	427	343	HA–6	G5, G24
41	690	380	NP	NP	427	343	HA–6	G24
42	635	440	NP	NP	399	343	HA–5	G19
43	635	440	NP	NP	399	343	HA–5	G19, G24
44	635	440	NP	NP	399	343	HA–5	G19
45	635	440	NP	NP	399	343	HA–5	G19, G24

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	134	128	120	115	111	104	97.6	93.1	90.7	88.4	86.6	84.7	83.5	82.3	80.5
2	134	134	133	131	129	126	125	124	122	119	117	115	113	111	109
3	158	158	158	155	152	148	146	145	144	140	137	135	133	130	128
4	158	150	141	136	131	122	115	109	107	104	102	99.9	98.0	96.1	94.9
5	134	128	120	115	111	104	97.6	93.1	90.7	88.4	86.6	84.7	83.5	82.3	80.5
6	134	134	133	131	129	126	125	124	122	119	117	115	113	111	109
7	158	158	158	155	152	148	146	145	144	140	137	135	133	130	...
8	158	158	158	155	152	148	146	145	144	140	137	135	133	130	128
9	158	150	141	136	131	122	115	109	107	104	102	99.9	98.0	96.1	94.9
10	158	158	158	155	152	148	146	145	144	140	137	135	133	130	128
11	158	158	158	155	152	148	146	145	144	140	137	135	133	130	128
12	158	150	141	136	131	122	115	109	107	104	102	99.9	98.0	96.1	94.9
13	158	158	158	155	152	148	146	145	144	140	137	135	133	130	...
14	158	158	158	155	152	148	146	145	144	140	137	135	133	130	...
15	158	158	158	155	152	148	146	145	144	140	137	135	133	130	...
16	158	158	158	155	152	148	146	145	144	140	137	135	133	130	128
17	158	150	141	136	131	122	115	109	107	104	102	99.9	98.0	96.1	94.9
18	166	166	166	166	166	164	158	154	152	149	145	142	139	136	...
19	166	166	166	166	166	164	158	154	152	149	145	142	139	136	...
20	138	138	138	138	138	134	125	117	116	114	112	111	110	109	108
21	138	130	120	114	109	99.3	92.2	86.7	85.0	84.1	82.9	82.0	81.4	80.6	79.8
22	147	147	130	121	114	...	...	...	...	...	...	...	...	...	...
23	147	147	140	134	130	...	...	...	...	...	...	...	...	...	...
24	147	147	130	121	114	...	...	...	...	...	...	...	...	...	...
25	147	147	140	134	130	...	...	...	...	...	...	...	...	...	...
26	187	171	154	145	135	...	...	...	...	...	...	...	...	...	...
27	187	171	154	145	135	...	...	...	...	...	...	...	...	...	...
28	138	133	118	112	108	106	106	106	106	106	105	103	101	98.7	...
29	138	120	109	104	99.3	93.4	90.0	87.2	85.6	83.8	81.7	79.3	76.9	74.7	...
30	154	...	154	...	145	138	130	...	...	...	...	...	...	...	...
31	154	...	140	...	121	113	104	...	...	...	...	...	...	...	...
32	197	196	191	185	179	172	168	165	163	161	158	154	151	147	...
33	197	196	191	182	172	152	140	134	131	129	127	125	123	120	...
34	168	166	162	157	152	146	143	140	139	137	134	132	128	124	...
35	168	167	162	155	146	130	119	114	112	110	108	106	104	102	...
36	168	166	162	157	152	146	143	140	139	137	134	132	128	124	...
37	168	167	162	155	146	130	119	114	112	110	108	106	104	102	...
38	197	196	191	185	179	172	168	165	163	161	158	154	151	147	...
39	197	196	191	182	172	152	140	134	131	129	127	125	123	120	...
40	168	166	162	157	152	146	143	140	139	137	134	132	128	124	...
41	168	167	162	155	146	130	119	114	112	110	108	106	104	102	...
42	181	178	174	171	168	167	167	167	167	167	167	167	...	...	...
43	154	152	148	145	143	142	142	142	142	142	142	142	...	...	...
44	181	178	174	171	168	167	167	167	167	167	167	167	...	...	...
45	154	152	148	145	143	142	142	142	142	142	142	142	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	79.1	77.8	76.8	74.7	*70.0*	*55.3*	*42.9*	...	...	...	...	...	...	...	...	...	...
2	107	105	101	*85.7*	*70.0*	*55.3*	*42.9*	...	...	...	...	...	...	...	...	...	...
3	126	124	119	*101*	*81.6*	*65.3*	*50.4*	...	...	...	...	...	...	...	...	...	...
4	93.1	91.7	90.1	88.5	*81.6*	*65.3*	*50.4*	...	...	...	...	...	...	...	...	...	...
5	79.1	77.8	76.8	74.7	*70.0*	*55.3*	*42.9*	...	...	...	...	...	...	...	...	...	...
6	107	105	101	*85.7*	*70.0*	*55.3*	*42.9*	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	126	124	119	*101*	*81.6*	*65.3*	*50.4*	...	...	...	...	...	...	...	...	...	...
9	93.1	91.7	90.1	88.5	*81.6*	*65.3*	*50.4*	...	...	...	...	...	...	...	...	...	...
10	126	124	119	*101*	*81.6*	*65.3*	*50.4*	...	...	...	...	...	...	...	...	...	...
11	126	124	119	*101*	*81.6*	*65.3*	*50.4*	...	...	...	...	...	...	...	...	...	...
12	93.1	91.7	90.1	88.5	*81.6*	*65.3*	*50.4*	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	126	124	119	*101*	*81.6*	*65.3*	*50.4*	...	...	...	...	...	...	...	...	...	...
17	93.1	91.7	90.1	88.5	*81.6*	*65.3*	*50.4*	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...
21	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	18Cr–8Ni	Forgings	SA–182	F304L	S30403	...	>130	8	1
2	18Cr–8Ni	Forgings	SA–182	F304L	S30403	...	>130	8	1
3	18Cr–8Ni	Forgings	SA–965	F304L	S30403	...	...	8	1
4	18Cr–8Ni	Forgings	SA–965	F304L	S30403	...	...	8	1
5	18Cr–8Ni	Bar	SA/JIS G4303	SUS304L	...	...	...	8	1
6	18Cr–8Ni	Forgings	SA–182	F304L	S30403	...	≤130	8	1
7	18Cr–8Ni	Forgings	SA–182	F304L	S30403	...	≤130	8	1
8	18Cr–8Ni	Smls. tube	SA–213	TP304L	S30403	...	...	8	1
9	18Cr–8Ni	Smls. tube	SA–213	TP304L	S30403	...	...	8	1
10	18Cr–8Ni	Plate	SA–240	304L	S30403	...	...	8	1
11	18Cr–8Ni	Plate	SA–240	304L	S30403	...	...	8	1
12	18Cr–8Ni	Wld. tube	SA–249	TP304L	S30403	...	...	8	1
13	18Cr–8Ni	Wld. tube	SA–249	TP304L	S30403	...	...	8	1
14	18Cr–8Ni	Wld. tube	SA–249	TP304L	S30403	...	...	8	1
15	18Cr–8Ni	Smls. & wld. pipe	SA–312	TP304L	S30403	...	...	8	1
16	18Cr–8Ni	Smls. pipe	SA–312	TP304L	S30403	...	...	8	1
17	18Cr–8Ni	Wld. pipe	SA–312	TP304L	S30403	...	...	8	1
18	18Cr–8Ni	Wld. pipe	SA–312	TP304L	S30403	...	...	8	1
19	18Cr–8Ni	Wld. pipe	SA–358	304L	S30403	1	...	8	1
20	18Cr–8Ni	Smls. & wld. fittings	SA–403	304L	S30403	...	...	8	1
21	18Cr–8Ni	Wld. pipe	SA–409	TP304L	S30403	...	...	8	1
22	18Cr–8Ni	Bar	SA–479	304L	S30403	...	...	8	1
23	18Cr–8Ni	Bar	SA–479	304L	S30403	...	...	8	1
24	18Cr–8Ni	Wld. tube	SA–688	TP304L	S30403	...	...	8	1
25	18Cr–8Ni	Wld. tube	SA–688	TP304L	S30403	...	...	8	1
26	18Cr–8Ni	Wld. tube	SA–688	TP304L	S30403	...	...	8	1
27	18Cr–8Ni	Wld. pipe	SA–813	TP304L	S30403	...	...	8	1
28	18Cr–8Ni	Wld. pipe	SA–814	TP304L	S30403	...	...	8	1
29	18Cr–8Ni	Forgings	SA–182	F304	S30400	...	>130	8	1
30	18Cr–8Ni	Forgings	SA–182	F304	S30400	...	>130	8	1
31	18Cr–8Ni	Forgings	SA–182	F304H	S30409	...	>130	8	1
32	18Cr–8Ni	Forgings	SA–182	F304H	S30409	...	>130	8	1
33	18Cr–8Ni	Castings	SA–351	CF3	J92500	...	...	8	1
34	18Cr–8Ni	Castings	SA–351	CF3	J92500	...	...	8	1
35	18Cr–8Ni	Castings	SA–351	CF8	J92600	...	...	8	1
36	18Cr–8Ni	Castings	SA–351	CF8	J92600	...	...	8	1
37	18Cr–8Ni	Castings	SA–351	CF8	J92600	...	...	8	1
(**23**) 38	18Cr–8Ni	Smls. pipe	SA–376	TP304	S30400	...	≥200	8	1
(**23**) 39	18Cr–8Ni	Smls. pipe	SA–376	TP304	S30400	...	≥200	8	1
40	18Cr–8Ni	Cast pipe	SA–451	CPF3	J92500	...	...	8	1
41	18Cr–8Ni	Cast pipe	SA–451	CPF8	J92600	...	...	8	1
42	18Cr–8Ni	Forgings	SA–965	F304	S30400	...	...	8	1
43	18Cr–8Ni	Forgings	SA–965	F304	S30400	...	...	8	1
44	18Cr–8Ni	Forgings	SA–965	F304H	S30409	...	...	8	1
45	18Cr–8Ni	Forgings	SA–965	F304H	S30409	...	...	8	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	450	170	427	427	649	343	HA–3	G5, G21, T4
2	450	170	427	NP	649	343	HA–3	G21, T5
3	450	170	427	427	649	343	HA–3	G5, G21, T4
4	450	170	427	NP	649	343	HA–3	G21, T5
5	480	175	427	427	649	NP	HA–3	G5, G21, G22, T4
6	485	170	427	427	649	343	HA–3	G5, G21, T4
7	485	170	427	NP	649	343	HA–3	G21, T5
8	485	170	427	427	649	NP	HA–3	G5, G21, T4
9	485	170	427	NP	649	NP	HA–3	G21, T5
10	485	170	427	427	649	343	HA–3	G5, G21, T4
11	485	170	427	NP	649	343	HA–3	G21, T5
12	485	170	NP	427	NP	NP	HA–3	G5, W12
13	485	170	427	NP	649	343	HA–3	G5, G21, G24, T4
14	485	170	427	NP	649	343	HA–3	G21, G24, T5
15	485	170	427	427	649	343	HA–3	G5, G21, T4, W12, W14
16	485	170	427	NP	649	343	HA–3	G21, T5
17	485	170	427	NP	649	343	HA–3	G5, G21, G24, T4
18	485	170	427	NP	649	343	HA–3	G21, G24, T5
19	485	170	NP	427	NP	NP	HA–3	G5, W12
20	485	170	NP	427	649	343	HA–3	G5, T4, W12, W14
21	485	170	NP	427	NP	NP	HA–3	G5, W12
22	485	170	427	427	649	343	HA–3	G5, G21, G22, T4
23	485	170	427	NP	649	343	HA–3	G21, G22, T5
24	485	170	NP	427	NP	NP	HA–3	G5, W12
25	485	170	NP	NP	649	343	HA–3	G5, G24, T4
26	485	170	NP	NP	649	343	HA–3	G24, T5
27	485	170	NP	427	NP	NP	HA–3	G5, W12
28	485	170	NP	427	NP	NP	HA–3	G5, W12
29	485	205	816	427	816	343	HA–1	G5, G12, T7
30	485	205	816	NP	816	343	HA–1	G12, T8
31	485	205	816	427	816	NP	HA–1	G5, T7
32	485	205	816	NP	816	NP	HA–1	T8
33	485	205	NP	427	427	343	HA–3	G1, G5, G16, G17, G19
34	485	205	NP	NP	427	343	HA–3	G1, G19
35	485	205	816	427	NP	NP	HA–1	G1, G5, G12, G16, G17, G19, H1, T6
36	485	205	816	NP	816	343	HA–1	G1, G12, G19, H1, T7
37	485	205	NP	NP	816	343	HA–1	G1, G5, G12, G19, T6
38	485	205	NP	427	816	343	HA–1	G5, G12, S9, T7
39	485	205	NP	NP	816	343	HA–1	G12, S9, T8
40	485	205	NP	427	NP	NP	HA–3	G5, G16, G17, G19
41	485	205	NP	427	NP	NP	HA–1	G5, G16, G17, G19
42	485	205	816	427	816	343	HA–1	G5, G12, T7
43	485	205	816	NP	816	343	HA–1	G12, T8
44	485	205	NP	427	816	NP	HA–1	G5, T7
45	485	205	NP	NP	816	NP	HA–1	T8

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	115	115	115	115	115	110	103	97.7	95.7	94.1	92.6	91.3	90.0	88.7	86.6
2	115	105	97.0	92.3	88.1	81.2	76.0	72.3	70.9	69.7	68.6	67.6	66.7	65.7	64.6
3	115	115	115	115	115	110	103	97.7	95.7	94.1	92.6	91.3	90.0	88.7	86.6
4	115	105	97.0	92.3	88.1	81.2	76.0	72.3	70.9	69.7	68.6	67.6	66.7	65.7	64.6
5	115	115	115	115	115	110	103	97.7	95.7	94.1	92.6	91.3	90.0	88.7	86.6
6	115	115	115	115	115	110	103	97.7	95.7	94.1	92.6	91.3	90.0	88.7	86.6
7	115	105	97.0	92.3	88.1	81.2	76.0	72.3	70.9	69.7	68.6	67.6	66.7	65.7	64.6
8	115	115	115	115	115	110	103	97.7	95.7	94.1	92.6	91.3	90.0	88.7	86.6
9	115	105	97.0	92.3	88.1	81.2	76.0	72.3	70.9	69.7	68.6	67.6	66.7	65.7	64.6
10	115	115	115	115	115	110	103	97.7	95.7	94.1	92.6	91.3	90.0	88.7	86.6
11	115	105	97.0	92.3	88.1	81.2	76.0	72.3	70.9	69.7	68.6	67.6	66.7	65.7	64.6
12	115	115	115	115	115	110	103	97.7	95.7	94.1	92.6	91.3	90.0	88.7	...
13	97.8	97.8	97.8	97.8	97.8	93.2	87.2	83.0	81.4	80.0	78.7	77.6	76.5	75.4	73.6
14	97.8	88.9	82.5	78.4	74.9	69.0	64.6	61.5	60.3	59.2	58.3	57.5	56.7	55.8	54.9
15	115	115	115	115	115	110	103	97.7	95.7	94.1	92.6	91.3	90.0	88.7	86.6
16	115	105	97.0	92.3	88.1	81.2	76.0	72.3	70.9	69.7	68.6	67.6	66.7	65.7	64.6
17	97.8	97.8	97.8	97.8	97.8	93.2	87.2	83.0	81.4	80.0	78.7	77.6	76.5	75.4	73.6
18	97.8	88.9	82.5	78.4	74.9	69.0	64.6	61.5	60.3	59.2	58.3	57.5	56.7	55.8	54.9
19	115	115	115	115	115	110	103	97.7	95.7	94.1	92.6	91.3	90.0	88.7	...
20	115	115	115	115	115	110	103	97.7	95.7	94.1	92.6	91.3	90.0	88.7	86.6
21	115	115	115	115	115	110	103	97.7	95.7	94.1	92.6	91.3	90.0	88.7	...
22	115	115	115	115	115	110	103	97.7	95.7	94.1	92.6	91.3	90.0	88.7	86.6
23	115	105	97.0	92.3	88.1	81.2	76.0	72.3	70.9	69.7	68.6	67.6	66.7	65.7	64.6
24	115	115	115	115	115	110	103	97.7	95.7	94.1	92.6	91.3	90.0	88.7	...
25	97.8	97.8	97.8	97.8	97.8	93.2	87.2	83.0	81.4	80.0	78.7	77.6	76.5	75.4	73.6
26	97.8	88.9	82.5	78.4	74.9	69.0	64.6	61.5	60.3	59.2	58.3	57.5	56.7	55.8	54.9
27	115	115	115	115	115	110	103	97.7	95.7	94.1	92.6	91.3	90.0	88.7	...
28	115	115	115	115	115	110	103	97.7	95.7	94.1	92.6	91.3	90.0	88.7	...
29	138	134	130	126	122	119	118	115	114	111	109	107	105	103	101
30	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8
31	138	134	130	126	122	119	118	115	114	111	109	107	105	103	101
32	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8
33	138	134	130	126	122	119	118	115	114	111	109	107	105	103	...
34	138	126	113	107	103	95.7	90.0	85.6	83.9	82.3	80.5	79.2	77.7	76.4	...
35	138	134	130	126	122	119	118	115	114	111	109	107	105	103	101
36	138	126	113	107	103	95.7	90.0	85.6	83.9	82.3	80.5	79.2	77.7	76.4	74.9
37	138	134	130	126	122	119	118	115	114	111	109	107	105	103	101
38	138	134	130	126	122	119	118	115	114	111	109	107	105	103	101
39	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8
40	138	134	130	126	122	119	118	115	114	111	109	107	105	103	...
41	138	134	130	126	122	119	118	115	114	111	109	107	105	103	...
42	138	134	130	126	122	119	118	115	114	111	109	107	105	103	101
43	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8
44	138	134	130	126	122	119	118	115	114	111	109	107	105	103	101
45	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	*72.5*	*60.2*	*49.5*	*40.4*	*32.9*	*26.7*	*22.0*	...	...	...	...	...	...	...	...	...	...	
2	63.4	*60.2*	*49.5*	*40.4*	*32.9*	*26.7*	*22.0*	...	...	...	...	...	...	...	...	...	...	
3	*72.5*	*60.2*	*49.5*	*40.4*	*32.9*	*26.7*	*22.0*	...	...	...	...	...	...	...	...	...	...	
4	63.4	*60.2*	*49.5*	*40.4*	*32.9*	*26.7*	*22.0*	...	...	...	...	...	...	...	...	...	...	
5	*72.5*	*60.2*	*49.5*	*40.4*	*32.9*	*26.7*	*22.0*	...	...	...	...	...	...	...	...	...	...	
6	*72.5*	*60.2*	*49.5*	*40.4*	*32.9*	*26.7*	*22.0*	...	...	...	...	...	...	...	...	...	...	
7	63.4	*60.2*	*49.5*	*40.4*	*32.9*	*26.7*	*22.0*	...	...	...	...	...	...	...	...	...	...	
8	*72.5*	*60.2*	*49.5*	*40.4*	*32.9*	*26.7*	*22.0*	...	...	...	...	...	...	...	...	...	...	
9	63.4	*60.2*	*49.5*	*40.4*	*32.9*	*26.7*	*22.0*	...	...	...	...	...	...	...	...	...	...	
10	*72.5*	*60.2*	*49.5*	*40.4*	*32.9*	*26.7*	*22.0*	...	...	...	...	...	...	...	...	...	...	
11	63.4	*60.2*	*49.5*	*40.4*	*32.9*	*26.7*	*22.0*	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	*61.6*	*51.2*	*42.1*	*34.3*	*28.0*	*22.7*	*18.7*	...	...	...	...	...	...	...	...	...	...	
14	53.9	*51.2*	*42.1*	*34.3*	*28.0*	*22.7*	*18.7*	...	...	...	...	...	...	...	...	...	...	
15	*72.5*	*60.2*	*49.5*	*40.4*	*32.9*	*26.7*	*22.0*	...	...	...	...	...	...	...	...	...	...	
16	63.4	*60.2*	*49.5*	*40.4*	*32.9*	*26.7*	*22.0*	...	...	...	...	...	...	...	...	...	...	
17	*61.6*	*51.2*	*42.1*	*34.3*	*28.0*	*22.7*	*18.7*	...	...	...	...	...	...	...	...	...	...	
18	53.9	*51.2*	*42.1*	*34.3*	*28.0*	*22.7*	*18.7*	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	*72.5*	*60.2*	*49.5*	*40.4*	*32.9*	*26.7*	*22.0*	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	*72.5*	*60.2*	*49.5*	*40.4*	*32.9*	*26.7*	*22.0*	...	...	...	...	...	...	...	...	...	...	
23	63.4	*60.2*	*49.5*	*40.4*	*32.9*	*26.7*	*22.0*	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	*61.6*	*51.2*	*42.1*	*34.3*	*28.0*	*22.7*	*18.7*	...	...	...	...	...	...	...	...	...	...	
26	53.9	*51.2*	*42.1*	*34.3*	*28.0*	*22.7*	*18.7*	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
30	73.6	72.4	70.8	68.9	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
31	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
32	73.6	72.4	70.8	68.9	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	99.5	92.8	*75.6*	*61.2*	*49.0*	*40.1*	*32.8*	*27.2*	*23.4*	*19.6*	*16.7*	*14.7*	*12.9*	*11.0*	...	...	...	
36	73.6	72.6	70.0	*61.2*	*49.0*	*40.1*	*32.8*	*27.2*	*23.4*	*19.6*	*16.7*	*14.7*	*12.9*	*11.0*	...	...	...	
37	99.5	92.8	*75.6*	*61.2*	*49.0*	*40.1*	*32.8*	*27.2*	*23.4*	*19.6*	*16.7*	*14.7*	*12.9*	*11.0*	...	...	...	
38	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	(**23**)
39	73.6	72.4	70.8	68.9	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	(**23**)
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
43	73.6	72.4	70.8	68.9	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
44	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
45	73.6	72.4	70.8	68.9	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	18Cr–8Ni	Plate	SA/EN 10028-7	X2CrNi18-9	...	...	≤75	8	1
2	18Cr–8Ni	Plate	SA/EN 10028-7	X2CrNi18-9	...	...	≤75	8	1
3	18Cr–8Ni	Forgings	SA–182	F304	S30400	...	≤130	8	1
4	18Cr–8Ni	Forgings	SA–182	F304	S30400	...	≤130	8	1
5	18Cr–8Ni	Forgings	SA–182	F304H	S30409	...	≤130	8	1
6	18Cr–8Ni	Forgings	SA–182	F304H	S30409	...	≤130	8	1
7	18Cr–8Ni	Smls. tube	SA–213	TP304	S30400	...	...	8	1
8	18Cr–8Ni	Smls. tube	SA–213	TP304	S30400	...	...	8	1
9	18Cr–8Ni	Smls. tube	SA–213	TP304H	S30409	...	...	8	1
10	18Cr–8Ni	Smls. tube	SA–213	TP304H	S30409	...	...	8	1
11	18Cr–8Ni	Plate	SA–240	302	S30200	...	...	8	1
12	18Cr–8Ni	Plate	SA–240	302	S30200	...	...	8	1
13	18Cr–8Ni	Plate	SA–240	304	S30400	...	...	8	1
14	18Cr–8Ni	Plate	SA–240	304	S30400	...	...	8	1
15	18Cr–8Ni	Plate	SA–240	304H	S30409	...	...	8	1
16	18Cr–8Ni	Plate	SA–240	304H	S30409	...	...	8	1
17	18Cr–8Ni	Wld. tube	SA–249	TP304	S30400	...	...	8	1
18	18Cr–8Ni	Wld. tube	SA–249	TP304	S30400	...	...	8	1
19	18Cr–8Ni	Wld. tube	SA–249	TP304	S30400	...	...	8	1
20	18Cr–8Ni	Wld. tube	SA–249	TP304	S30400	...	...	8	1
21	18Cr–8Ni	Wld. tube	SA–249	TP304H	S30409	...	...	8	1
22	18Cr–8Ni	Wld. tube	SA–249	TP304H	S30409	...	...	8	1
23	18Cr–8Ni	Wld. tube	SA–249	TP304H	S30409	...	...	8	1
24	18Cr–8Ni	Wld. tube	SA–249	TP304H	S30409	...	...	8	1
25	18Cr–8Ni	Smls. & wld. pipe	SA–312	TP304	S30400	...	...	8	1
26	18Cr–8Ni	Smls. & wld. pipe	SA–312	TP304	S30400	...	...	8	1
27	18Cr–8Ni	Wld. pipe	SA–312	TP304	S30400	...	...	8	1
28	18Cr–8Ni	Wld. pipe	SA–312	TP304	S30400	...	...	8	1
29	18Cr–8Ni	Smls. & wld. pipe	SA–312	TP304H	S30409	...	...	8	1
30	18Cr–8Ni	Smls. & wld. pipe	SA–312	TP304H	S30409	...	...	8	1
31	18Cr–8Ni	Wld. pipe	SA–312	TP304H	S30409	...	...	8	1
32	18Cr–8Ni	Wld. pipe	SA–312	TP304H	S30409	...	...	8	1
33	18Cr–8Ni	Wld. pipe	SA–358	304	S30400	1	...	8	1
34	18Cr–8Ni	Wld. pipe	SA–358	304H	S30409	1	...	8	1
35	18Cr–8Ni	Wld. pipe	SA–358	304LN	S30453	1	...	8	1
(**23**) 36	18Cr–8Ni	Smls. pipe	SA–376	TP304	S30400	...	<200	8	1
(**23**) 37	18Cr–8Ni	Smls. pipe	SA–376	TP304	S30400	...	<200	8	1
38	18Cr–8Ni	Smls. pipe	SA–376	TP304H	S30409	...	...	8	1
39	18Cr–8Ni	Smls. pipe	SA–376	TP304H	S30409	...	...	8	1
40	18Cr–8Ni	Smls. & wld. fittings	SA–403	304	S30400	...	...	8	1
41	18Cr–8Ni	Smls. & wld. fittings	SA–403	304H	S30409	...	...	8	1
42	18Cr–8Ni	Wld. pipe	SA–409	TP304	S30400	...	...	8	1
43	18Cr–8Ni	Bar	SA–479	302	S30200	...	...	8	1
44	18Cr–8Ni	Bar	SA–479	302	S30200	...	...	8	1
45	18Cr–8Ni	Bar	SA–479	304	S30400	...	...	8	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	500	200	NP	NP	550	343	HA–3	G5, G30, T4
2	500	200	NP	NP	550	343	HA–3	G30, T5
3	515	205	816	NP	816	NP	HA–1	G12, T8
4	515	205	816	427	816	NP	HA–1	G5, G12, T7
5	515	205	816	NP	816	NP	HA–1	T8
6	515	205	816	427	816	NP	HA–1	G5, T7
7	515	205	816	NP	816	NP	HA–1	G12, T8
8	515	205	816	427	816	NP	HA–1	G5, G12, T7
9	515	205	816	NP	816	NP	HA–1	T8
10	515	205	816	427	816	NP	HA–1	G5, T7
11	515	205	NP	NP	399	343	HA–1	G5
12	515	205	NP	NP	399	343	HA–1	...
13	515	205	816	NP	816	343	HA–1	G12, T8
14	515	205	816	427	816	343	HA–1	G5, G12, H1, T7
15	515	205	816	427	816	NP	HA–1	G5, T7
16	515	205	816	NP	816	NP	HA–1	T8
17	515	205	816	NP	NP	NP	HA–1	G12, T8, W13
18	515	205	816	427	NP	NP	HA–1	G5, G12, T7, W12, W13
19	515	205	816	NP	816	343	HA–1	G3, G5, G12, G24, T7
20	515	205	816	NP	816	343	HA–1	G3, G12, G24, T8
21	515	205	816	NP	NP	NP	HA–1	T8, W13
22	515	205	816	427	NP	NP	HA–1	G5, T7, W12, W13
23	515	205	816	NP	816	NP	HA–1	G3, G5, G24, T7
24	515	205	816	NP	816	NP	HA–1	G3, G24, T8
25	515	205	816	427	816	343	HA–1	G5, G12, T7, W12, W13, W14
26	515	205	816	NP	816	343	HA–1	G12, T8, W13, W14
27	515	205	816	NP	816	343	HA–1	G3, G5, G12, G24, T7
28	515	205	816	NP	816	343	HA–1	G3, G12, G24, T8
29	515	205	816	427	816	NP	HA–1	G5, T7, W12, W13, W14
30	515	205	816	NP	816	NP	HA–1	T8, W13, W14
31	515	205	816	NP	816	NP	HA–1	G3, G5, G24, T7
32	515	205	816	NP	816	NP	HA–1	G3, G24, T8
33	515	205	NP	427	NP	NP	HA–1	G5, W12
34	515	205	NP	427	NP	NP	HA–1	G5, W12
35	515	205	NP	427	NP	NP	HA–1	G5, W12
36	515	205	816	427	816	343	HA–1	G5, G12, H1, S11, T7
37	515	205	816	NP	816	343	HA–1	G12, H1, S11, T8
38	515	205	816	427	816	NP	HA–1	G5, H1, T7
39	515	205	816	NP	816	NP	HA–1	H1, T8
40	515	205	NP	427	816	343	HA–1	G5, G12, T7, W12, W14
41	515	205	NP	427	816	NP	HA–1	G5, T7, W12, W14
42	515	205	NP	427	NP	NP	HA–1	G5, W12
43	515	205	NP	427	399	343	HA–1	G5, G24
44	515	205	NP	NP	399	343	HA–1	G22
45	515	205	816	427	816	343	HA–1	G5, G12, G22, T7

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	133	133	133	133	133	127	119	113	111	109	107	106	105	103	101
2	133	121	113	107	102	94.1	88.1	83.8	82.2	80.8	79.6	78.5	77.5	76.3	75.1
3	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8
4	138	138	137	134	130	126	122	116	114	111	109	107	105	103	101
5	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8
6	138	138	137	134	130	126	122	116	114	111	109	107	105	103	101
7	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8
8	138	138	137	134	130	126	122	116	114	111	109	107	105	103	101
9	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8
10	138	138	137	134	130	126	122	116	114	111	109	107	105	103	101
11	138	138	137	134	130	126	122	116	114	111	109	107	...	...	...
12	138	126	113	107	103	95.7	90.0	85.6	83.9	82.3	80.5	79.2	...	...	...
13	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8
14	138	138	137	134	130	126	122	116	114	111	109	107	105	103	101
15	138	138	137	134	130	126	122	116	114	111	109	107	105	103	101
16	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8
17	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8
18	138	138	137	134	130	126	122	116	114	111	109	107	105	103	101
19	117	117	117	114	111	107	103	98.5	96.5	94.7	92.8	90.9	89.1	87.1	85.9
20	117	107	96.2	91.2	87.4	81.1	76.6	72.7	71.2	70.0	68.8	67.5	66.3	65.0	63.8
21	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8
22	138	138	137	134	130	126	122	116	114	111	109	107	105	103	101
23	117	117	117	114	111	107	103	98.5	96.5	94.7	92.8	90.9	89.1	87.1	85.9
24	117	107	96.2	91.2	87.4	81.1	76.6	72.7	71.2	70.0	68.8	67.5	66.3	65.0	63.8
25	138	138	137	134	130	126	122	116	114	111	109	107	105	103	101
26	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8
27	117	117	117	114	111	107	103	98.5	96.5	94.7	92.8	90.9	89.1	87.1	85.9
28	117	107	96.2	91.2	87.4	81.1	76.6	72.7	71.2	70.0	68.8	67.5	66.3	65.0	63.8
29	138	138	137	134	130	126	122	116	114	111	109	107	105	103	101
30	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8
31	117	117	117	114	111	107	103	98.5	96.5	94.7	92.8	90.9	89.1	87.1	85.9
32	117	107	96.2	91.2	87.4	81.1	76.6	72.7	71.2	70.0	68.8	67.5	66.3	65.0	63.8
33	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
34	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
35	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
36	138	138	137	134	130	126	122	116	114	111	109	107	105	103	101
37	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8
38	138	138	137	134	130	126	122	116	114	111	109	107	105	103	101
39	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8
40	138	138	137	134	130	126	122	116	114	111	109	107	105	103	101
41	138	138	137	134	130	126	122	116	114	111	109	107	105	103	101
42	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
43	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
44	138	126	113	107	103	95.7	90.0	85.6	83.9	82.3	80.5	79.2	...	...	...
45	138	138	137	134	130	126	122	116	114	111	109	107	105	103	101

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	*72.5*	*60.2*	*49.5*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	73.7	*60.2*	*49.5*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	73.6	72.4	70.8	68.9	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
4	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
5	73.6	72.4	70.8	68.9	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
6	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
7	73.6	72.4	70.8	68.9	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
8	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
9	73.6	72.4	70.8	68.9	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
10	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	73.6	72.4	70.8	68.9	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
14	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
15	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
16	73.6	72.4	70.8	68.9	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
17	73.6	72.4	70.8	68.9	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
18	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
19	84.0	83.2	79.0	*67.3*	*55.4*	*44.1*	*35.5*	*28.0*	*22.2*	*18.2*	*15.0*	*12.3*	*9.83*	*7.33*	...	...	...	
20	62.6	61.3	60.1	58.6	*55.4*	*44.1*	*35.5*	*28.0*	*22.2*	*18.2*	*15.0*	*12.3*	*9.83*	*7.33*	...	...	...	
21	73.6	72.4	70.8	68.9	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
22	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
23	84.0	83.2	79.0	*67.3*	*55.4*	*44.1*	*35.5*	*28.0*	*22.2*	*18.2*	*15.0*	*12.3*	*9.83*	*7.33*	...	...	...	
24	62.6	61.3	60.1	58.6	*55.4*	*44.1*	*35.5*	*28.0*	*22.2*	*18.2*	*15.0*	*12.3*	*9.83*	*7.33*	...	...	...	
25	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
26	73.6	72.4	70.8	68.9	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
27	84.0	83.2	79.0	*67.3*	*55.4*	*44.1*	*35.5*	*28.0*	*22.2*	*18.2*	*15.0*	*12.3*	*9.83*	*7.33*	...	...	...	
28	62.6	61.3	60.1	58.6	*55.4*	*44.1*	*35.5*	*28.0*	*22.2*	*18.2*	*15.0*	*12.3*	*9.83*	*7.33*	...	...	...	
29	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
30	73.6	72.4	70.8	68.9	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
31	84.0	83.2	79.0	*67.3*	*55.4*	*44.1*	*35.5*	*28.0*	*22.2*	*18.2*	*15.0*	*12.3*	*9.83*	*7.33*	...	...	...	
32	62.6	61.3	60.1	58.6	*55.4*	*44.1*	*35.5*	*28.0*	*22.2*	*18.2*	*15.0*	*12.3*	*9.83*	*7.33*	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	(**23**)
37	73.6	72.4	70.8	68.9	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	(**23**)
38	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
39	73.6	72.4	70.8	68.9	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
40	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
41	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...	

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	18Cr–8Ni	Bar	SA–479	304	S30400	...	...	8	1
2	18Cr–8Ni	Bar	SA–479	304H	S30409	...	...	8	1
3	18Cr–8Ni	Bar	SA–479	304H	S30409	...	...	8	1
4	18Cr–8Ni	Wld. tube	SA–688	TP304	S30400	...	...	8	1
5	18Cr–8Ni	Wld. tube	SA–688	TP304	S30400	...	...	8	1
6	18Cr–8Ni	Wld. tube	SA–688	TP304	S30400	...	...	8	1
7	18Cr–8Ni	Wld. pipe	SA–813	TP304	S30400	...	...	8	1
8	18Cr–8Ni	Wld. pipe	SA–813	TP304H	S30409	...	...	8	1
9	18Cr–8Ni	Wld. pipe	SA–814	TP304	S30400	...	...	8	1
10	18Cr–8Ni	Wld. pipe	SA–814	TP304H	S30409	...	...	8	1
11	18Cr–8Ni	Bar	SA/JIS G4303	SUS302	...	...	...	8	1
12	18Cr–8Ni	Bar	SA/JIS G4303	SUS304	...	...	...	8	1
13	18Cr–8Ni	Plate	SA/EN 10028–7	X5CrNi18–10	...	...	≤75	8	1
14	18Cr–8Ni	Plate	SA/EN 10028–7	X5CrNi18–10	...	...	≤75	8	1
15	18Cr–8Ni	Castings	SA–351	CF3A	J92500	...	...	8	1
16	18Cr–8Ni	Castings	SA–351	CF3A	J92500	...	...	8	1
17	18Cr–8Ni	Castings	SA–351	CF8A	J92600	...	...	8	1
18	18Cr–8Ni	Castings	SA–351	CF8A	J92600	...	...	8	1
19	18Cr–8Ni	Cast pipe	SA–451	CPF3A	J92500	...	...	8	1
20	18Cr–8Ni	Cast pipe	SA–451	CPF8A	J92600	...	...	8	1
21	18Cr–8Ni–N	Forgings	SA–182	F304LN	S30453	...	>130	8	1
22	18Cr–8Ni–N	Forgings	SA–965	F304LN	S30453	...	...	8	1
23	18Cr–8Ni–N	Forgings	SA–182	F304LN	S30453	...	≤130	8	1
24	18Cr–8Ni–N	Smls. tube	SA–213	TP304LN	S30453	...	...	8	1
25	18Cr–8Ni–N	Plate	SA–240	304LN	S30453	...	...	8	1
26	18Cr–8Ni–N	Wld. tube	SA–249	TP304LN	S30453	...	...	8	1
27	18Cr–8Ni–N	Smls. & wld. pipe	SA–312	TP304LN	S30453	...	...	8	1
28	18Cr–8Ni–N	Smls. pipe	SA–376	TP304LN	S30453	...	...	8	1
29	18Cr–8Ni–N	Smls. & wld. fittings	SA–403	304LN	S30453	WP	...	8	1
30	18Cr–8Ni–N	Bar	SA–479	304LN	S30453	...	...	8	1
31	18Cr–8Ni–N	Wld. tube	SA–688	TP304LN	S30453	...	...	8	1
32	18Cr–8Ni–N	Wld. pipe	SA–813	TP304LN	S30453	...	...	8	1
33	18Cr–8Ni–N	Wld. pipe	SA–814	TP304LN	S30453	...	...	8	1
34	18Cr–8Ni–N	Forgings	SA–182	F304N	S30451	...	...	8	1
35	18Cr–8Ni–N	Smls. tube	SA–213	TP304N	S30451	...	...	8	1
36	18Cr–8Ni–N	Smls. tube	SA–213	TP304N	S30451	...	...	8	1
37	18Cr–8Ni–N	Plate	SA–240	304N	S30451	...	...	8	1
38	18Cr–8Ni–N	Plate	SA–240	304N	S30451	...	...	8	1
39	18Cr–8Ni–N	Wld. tube	SA–249	TP304N	S30451	...	...	8	1
40	18Cr–8Ni–N	Wld. tube	SA–249	TP304N	S30451	...	...	8	1
41	18Cr–8Ni–N	Wld. tube	SA–249	TP304N	S30451	...	...	8	1
42	18Cr–8Ni–N	Wld. tube	SA–249	TP304N	S30451	...	...	8	1
43	18Cr–8Ni–N	Wld. tube	SA–249	TP304N	S30451	...	...	8	1
44	18Cr–8Ni–N	Smls. & wld. pipe	SA–312	TP304N	S30451	...	...	8	1
45	18Cr–8Ni–N	Smls. & wld. pipe	SA–312	TP304N	S30451	...	...	8	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	515	205	816	NP	816	343	HA–1	G12, G22, T8
2	515	205	816	427	816	NP	HA–1	G5, G22, T7
3	515	205	816	NP	816	NP	HA–1	G22, T8
4	515	205	NP	427	NP	NP	HA–1	G5, W12
5	515	205	NP	NP	816	343	HA–1	G5, G12, G24, T7
6	515	205	NP	NP	816	343	HA–1	G12, G24, T8
7	515	205	NP	427	NP	NP	HA–1	G5, W12
8	515	205	NP	427	NP	NP	HA–1	G5, W12
9	515	205	NP	427	NP	NP	HA–1	G5, W12
10	515	205	NP	427	NP	NP	HA–1	G5, W12
11	520	205	NP	427	399	NP	HA–1	G5, G24
12	520	205	816	427	816	NP	HA–1	G5, G12, G22, T7
13	520	210	NP	NP	550	343	HA–1	G5, G12, G30, H1
14	520	210	NP	NP	550	343	HA–1	G12, G30
15	530	240	NP	343	371	343	HA–3	G1, G5, G16, G17, G19
16	530	240	NP	NP	371	343	HA–3	G1, G19
17	530	240	NP	343	343	343	HA–1	G1, G5, G16, G17, G19
18	530	240	NP	NP	343	343	HA–1	G1, G19
19	530	240	NP	343	NP	NP	HA–3	G5, G16, G17, G19
20	530	240	NP	343	NP	NP	HA–1	G5, G16, G17, G19
21	485	205	NP	427	427	NP	HA–1	G5
22	485	205	NP	427	427	NP	HA–1	G5
23	515	205	NP	427	427	NP	HA–1	G5
24	515	205	NP	427	427	NP	HA–1	G5
25	515	205	NP	427	427	NP	HA–1	G5
26	515	205	NP	427	427	NP	HA–1	G5, W12, W14
27	515	205	NP	427	427	NP	HA–1	G5, W12, W14
28	515	205	NP	427	427	NP	HA–1	G5
29	515	205	NP	427	427	NP	HA–1	G5, W12, W14
30	515	205	NP	427	427	NP	HA–1	G5
31	515	205	NP	427	427	NP	HA–1	G5, W12, W14
32	515	205	NP	427	427	NP	HA–1	G5, W12, W14
33	515	205	NP	427	427	NP	HA–1	G5, W12, W14
34	550	240	NP	427	NP	NP	HA–1	G5
35	550	240	649	427	649	NP	HA–1	G5, G12, T7
36	550	240	649	NP	649	NP	HA–1	G12, T8
37	550	240	NP	427	649	343	HA–1	G5, G12, T7
38	550	240	NP	NP	649	343	HA–1	G12, T8
39	550	240	649	NP	NP	NP	HA–1	G5, G12, T7, W13
40	550	240	649	NP	NP	NP	HA–1	G12, T8, W13
41	550	240	649	NP	NP	NP	HA–1	G3, G5, G12, T5
42	550	240	649	NP	649	343	HA–1	G3, G12, G24, T8
43	550	240	NP	NP	649	343	HA–1	G5, G12, G24, T5
44	550	240	649	427	649	343	HA–1	G5, G12, T7, W12, W13, W14
45	550	240	649	NP	649	343	HA–1	G12, T8, W13, W14

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8
2	138	138	137	134	130	126	122	116	114	111	109	107	105	103	101
3	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8
4	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
5	117	117	117	114	111	107	103	98.5	96.5	94.7	92.8	90.9	89.1	87.1	85.9
6	117	107	96.2	91.2	87.4	81.1	76.6	72.7	71.2	70.0	68.8	67.5	66.3	65.0	63.8
7	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
8	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
9	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
10	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
11	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
12	138	138	137	134	130	126	122	116	114	111	109	107	105	103	101
13	140	140	140	140	140	131	123	118	115	113	111	108	106	105	103
14	140	124	115	109	105	97.1	91.5	87.1	85.2	83.5	81.9	80.3	78.9	77.4	76.0
15	152	148	142	138	134	130	128	128	128	128	127	...	...	...	...
16	152	143	133	126	120	112	105	100	97.9	96.0	94.2	...	...	...	...
17	152	148	142	138	134	130	128	128	128	128	...	...	...	...	...
18	152	143	133	126	120	112	105	100	97.9	96.0	...	...	...	...	...
19	152	148	142	138	134	130	128	128	128	128	...	...	...	...	...
20	152	148	142	138	134	130	128	128	128	128	...	...	...	...	...
21	138	134	130	126	122	119	118	115	114	111	109	107	105	103	...
22	138	134	130	126	122	119	118	115	114	111	109	107	105	103	...
23	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
24	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
25	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
26	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
27	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
28	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
29	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
30	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
31	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
32	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
33	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
34	158	158	158	154	149	141	132	125	122	120	118	116	115	113	...
35	158	158	158	154	149	141	132	125	122	120	118	116	115	113	111
36	158	144	129	121	115	105	97.6	92.9	90.9	89.3	88.0	86.1	84.9	83.7	81.8
37	158	158	158	154	149	141	132	125	122	120	118	116	115	113	111
38	158	144	129	121	115	105	97.6	92.9	90.9	89.3	88.0	86.1	84.9	83.7	81.8
39	158	158	158	154	149	141	132	125	122	120	118	116	115	113	111
40	158	144	129	121	115	105	97.6	92.9	90.9	89.3	88.0	86.1	84.9	83.7	81.8
41	134	134	133	131	127	120	112	106	104	102	100	99.2	97.4	95.4	94.2
42	134	122	110	103	97.7	88.9	82.9	79.1	77.2	75.5	74.3	73.0	72.4	71.3	69.4
43	134	134	133	131	127	120	112	106	104	102	100	99.2	97.4	95.4	94.2
44	158	158	158	154	149	141	132	125	122	120	118	116	115	113	111
45	158	144	129	121	115	105	97.6	92.9	90.9	89.3	88.0	86.1	84.9	83.7	81.8

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	73.6	72.4	70.8	68.9	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...
2	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...
3	73.6	72.4	70.8	68.9	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	84.0	83.2	79.0	*67.3*	*55.4*	*44.1*	*35.5*	*28.0*	*22.2*	*18.2*	*15.0*	*12.3*	*9.83*	*7.33*	...	...	...
6	62.6	61.3	60.1	58.6	*55.4*	*44.1*	*35.5*	*28.0*	*22.2*	*18.2*	*15.0*	*12.3*	*9.83*	*7.33*	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	99.3	98.0	93.3	*79.6*	*65.4*	*51.4*	*41.7*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...
13	101	98.8	96.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	74.6	73.2	71.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	109	106	98.3	*78.6*	*64.3*	*51.4*	*41.6*	...	...	...	...	...	...	...	...	...	...
36	80.5	78.8	77.3	74.0	*64.3*	*51.4*	*41.6*	...	...	...	...	...	...	...	...	...	...
37	109	106	98.3	*78.6*	*64.3*	*51.4*	*41.6*	...	...	...	...	...	...	...	...	...	...
38	80.5	78.8	77.3	74.0	*64.3*	*51.4*	*41.6*	...	...	...	...	...	...	...	...	...	...
39	109	106	98.3	*78.6*	*64.3*	*51.4*	*41.6*	...	...	...	...	...	...	...	...	...	...
40	80.5	78.8	77.3	74.0	*64.3*	*51.4*	*41.6*	...	...	...	...	...	...	...	...	...	...
41	92.5	*90.5*	*83.9*	*66.4*	*54.5*	*44.1*	*35.5*	...	...	...	...	...	...	...	...	...	...
42	68.0	66.7	65.9	63.0	*54.5*	*44.1*	*35.5*	...	...	...	...	...	...	...	...	...	...
43	92.5	*90.5*	*83.9*	*66.4*	*54.5*	*44.1*	*35.5*	...	...	...	...	...	...	...	...	...	...
44	109	106	98.3	*78.6*	*64.3*	*51.4*	*41.6*	...	...	...	...	...	...	...	...	...	...
45	80.5	78.8	77.3	74.0	*64.3*	*51.4*	*41.6*	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	18Cr–8Ni–N	Wld. pipe	SA–312	TP304N	S30451	...	...	8	1
2	18Cr–8Ni–N	Wld. pipe	SA–312	TP304N	S30451	...	...	8	1
3	18Cr–8Ni–N	Wld. pipe	SA–358	304N	S30451	1	...	8	1
4	18Cr–8Ni–N	Smls. pipe	SA–376	TP304N	S30451	...	...	8	1
5	18Cr–8Ni–N	Smls. pipe	SA–376	TP304N	S30451	...	...	8	1
6	18Cr–8Ni–N	Smls. & wld. fittings	SA–403	304N	S30451	...	...	8	1
7	18Cr–8Ni–N	Bar	SA–479	304N	S30451	...	...	8	1
8	18Cr–8Ni–N	Bar	SA–479	304N	S30451	...	...	8	1
9	18Cr–8Ni–N	Wld. tube	SA–688	TP304N	S30451	...	...	8	1
10	18Cr–8Ni–N	Wld. tube	SA–688	TP304N	S30451	...	...	8	1
11	18Cr–8Ni–N	Wld. tube	SA–688	TP304N	S30451	...	...	8	1
12	18Cr–8Ni–N	Wld. pipe	SA–813	TP304N	S30451	...	...	8	1
13	18Cr–8Ni–N	Wld. pipe	SA–814	TP304N	S30451	...	...	8	1
14	18Cr–8Ni–N	Forgings	SA–965	F304N	S30451	...	...	8	1
15	18Cr–8Ni–N	Forgings	SA–965	F304N	S30451	...	...	8	1
16	18Cr–8Ni–N	Plate	SA/EN 10028–7	X2CrNiN18–10	...	...	≤75	8	1
17	18Cr–8Ni–N	Plate	SA/EN 10028–7	X5CrNiN19–9	...	...	≤75	8	1
18	18Cr–8Ni–N	Plate	SA/EN 10028–7	X5CrNiN19–9	...	...	≤75	8	1
19	18Cr–8Ni–4Si–N	Bar	SA–479	...	S21800	...	...	8	3
20	18Cr–9Ni–3Cu–Cb–N	Smls. tube	SA–213	...	S30432	...	...	8	1
21	18Cr–9Ni–3Cu–Cb–N	Smls. tube	SA–213	...	S30432	...	...	8	1
22	18Cr–10Ni–Cb	Forgings	SA–965	F348H	S34809	...	...	8	1
23	18Cr–10Ni–Cb	Forgings	SA–965	F348H	S34809	...	...	8	1
24	18Cr–10Ni–Cb	Castings	SA–351	CF8C	J92710	...	...	8	1
25	18Cr–10Ni–Cb	Castings	SA–351	CF8C	J92710	...	...	8	1
26	18Cr–10Ni–Cb	Castings	SA–351	CF8C	J92710	...	...	8	1
27	18Cr–10Ni–Cb	Cast pipe	SA–451	CPF8C	J92710	...	...	8	1
28	18Cr–10Ni–Cb	Forgings	SA–182	F347	S34700	...	>130	8	1
29	18Cr–10Ni–Cb	Forgings	SA–965	F347	S34700	...	...	8	1
30	18Cr–10Ni–Cb	Forgings	SA–965	F347	S34700	...	...	8	1
31	18Cr–10Ni–Cb	Forgings	SA–182	F347H	S34709	...	>130	8	1
32	18Cr–10Ni–Cb	Forgings	SA–182	F347H	S34709	...	>130	8	1
33	18Cr–10Ni–Cb	Forgings	SA–965	F347H	S34709	...	...	8	1
34	18Cr–10Ni–Cb	Forgings	SA–965	F347H	S34709	...	...	8	1
35	18Cr–10Ni–Cb	Forgings	SA–182	F348	S34800	...	>130	8	1
36	18Cr–10Ni–Cb	Forgings	SA–182	F348	S34800	...	>130	8	1
37	18Cr–10Ni–Cb	Forgings	SA–965	F348	S34800	...	...	8	1
38	18Cr–10Ni–Cb	Forgings	SA–965	F348	S34800	...	...	8	1
39	18Cr–10Ni–Cb	Forgings	SA–182	F348H	S34809	...	>130	8	1
40	18Cr–10Ni–Cb	Forgings	SA–182	F348H	S34809	...	>130	8	1
41	18Cr–10Ni–Cb	Forgings	SA–182	F347	S34700	...	≤130	8	1
42	18Cr–10Ni–Cb	Forgings	SA–182	F347	S34700	...	≤130	8	1
43	18Cr–10Ni–Cb	Smls. tube	SA–213	TP347	S34700	...	...	8	1
44	18Cr–10Ni–Cb	Smls. tube	SA–213	TP347	S34700	...	...	8	1
45	18Cr–10Ni–Cb	Plate	SA–240	347	S34700	...	...	8	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	550	240	649	NP	649	343	HA–1	G3, G5, G12, G24, T5
2	550	240	649	NP	649	343	HA–1	G3, G12, G24, T8
3	550	240	NP	427	NP	NP	HA–1	G5, W12
4	550	240	649	427	649	343	HA–1	G5, G12, H1, T7
5	550	240	649	NP	649	343	HA–1	G12, H1, T8
6	550	240	NP	427	649	343	HA–1	G5, T7, W12, W14
7	550	240	649	NP	NP	NP	HA–1	G12, T8
8	550	240	649	427	NP	NP	HA–1	G5, G12, T7
9	550	240	NP	427	NP	NP	HA–1	G5, W12
10	550	240	NP	NP	649	343	HA–1	G5, G12, G24, T7
11	550	240	NP	NP	649	343	HA–1	G12, G24, T8
12	550	240	NP	427	NP	NP	HA–1	G5, W12
13	550	240	NP	427	NP	NP	HA–1	G5, W12
14	550	240	NP	427	649	343	HA–1	G5, G12, T7
15	550	240	NP	NP	649	343	HA–1	G12, T8
16	550	270	NP	NP	427	343	HA–1	G5, G30
17	550	270	NP	NP	550	343	HA–1	G5, G12, G30
18	550	270	NP	NP	550	343	HA–1	G12, G30
19	655	345	NP	427	NP	NP	HA–6	...
20	590	235	816	NP	816	NP	HA–2	G5, T12
21	590	235	816	NP	816	NP	HA–2	T12
22	450	170	NP	NP	816	NP	HA–2	G5, H2, T9
23	450	170	NP	NP	816	NP	HA–2	H2, T9
24	485	205	NP	427	NP	NP	HA–2	G5, G16, G17, G19
25	485	205	NP	NP	816	343	HA–2	G1, G5, G12, G19, T7
26	485	205	NP	NP	816	343	HA–2	G1, G12, G19, T7
27	485	205	NP	427	NP	NP	HA–2	G5, G16, G17, G19
28	485	205	816	427	816	343	HA–2	G5, G12, T7
29	485	205	816	427	816	343	HA–2	G5, G12, H1, T7
30	485	205	816	NP	816	343	HA–2	G12, H1, T7
31	485	205	816	NP	NP	NP	HA–2	H2, T9
32	485	205	816	427	816	NP	HA–2	G5, H2, T8
33	485	205	NP	NP	816	NP	HA–2	H2, T9
34	485	205	NP	427	816	NP	HA–2	G5, H2, T8
35	485	205	816	NP	NP	NP	HA–2	T7
36	485	205	816	427	816	343	HA–2	G5, G12, T7
37	485	205	NP	NP	816	343	HA–2	G5, G12, H1, T7
38	485	205	NP	NP	816	343	HA–2	G12, H1, T7
39	485	205	816	NP	NP	NP	HA–2	T9
40	485	205	816	427	816	NP	HA–2	G5, T8
41	515	205	816	427	816	NP	HA–2	G5, G12, H1, T6
42	515	205	816	NP	816	NP	HA–2	G12, H1, T7
43	515	205	816	427	816	NP	HA–2	G5, G12, H1, T6
44	515	205	816	NP	816	NP	HA–2	G12, H1, T7
45	515	205	816	427	816	343	HA–2	G5, G12, T6

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
No.	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	134	134	133	131	127	120	112	106	104	102	100	99.2	97.4	95.4	94.2
2	134	122	110	103	97.7	88.9	82.9	79.1	77.2	75.5	74.3	73.0	72.4	71.3	69.4
3	158	158	158	154	149	141	132	125	122	120	118	116	115	113	...
4	158	158	158	154	149	141	132	125	122	120	118	116	115	113	111
5	158	144	129	121	115	105	97.6	92.9	90.9	89.3	88.0	86.1	84.9	83.7	81.8
6	158	158	158	154	149	141	132	125	122	120	118	116	115	113	111
7	158	144	129	121	115	105	97.6	92.9	90.9	89.3	88.0	86.1	84.9	83.7	81.8
8	158	158	158	154	149	141	132	125	122	120	118	116	115	113	111
9	158	158	158	154	149	141	132	125	122	120	118	116	115	113	...
10	134	134	133	131	127	120	112	106	104	102	100	99.2	97.4	95.4	94.2
11	134	122	110	103	97.7	88.9	82.9	79.1	77.2	75.5	74.3	73.0	72.4	71.3	69.4
12	158	158	158	154	149	141	132	125	122	120	118	116	115	113	...
13	158	158	158	154	149	141	132	125	122	120	118	116	115	113	...
14	158	158	158	154	149	141	132	125	122	120	118	116	115	113	111
15	158	144	129	121	115	105	97.6	92.9	90.9	89.3	88.0	86.1	84.9	83.7	81.8
16	157	157	157	157	154	148	145	145	145	145	142	139	137	134	...
17	157	157	157	157	157	157	147	140	137	135	133	130	128	126	124
18	157	157	145	136	129	117	109	104	102	100	98.2	96.7	95.1	93.4	91.6
19	187	185	176	164	152	137	128	123	121	119	118	116	116	115	...
20	157	157	157	157	157	157	153	147	145	143	140	139	137	135	133
21	157	144	135	130	126	119	113	109	107	106	104	103	101	99.9	98.5
22	115	115	115	114	112	107	103	101	101	101	101	101	101	100	100
23	115	110	105	101	98.5	92.2	87.1	83.0	81.6	80.3	79.2	78.6	78.0	77.3	77.2
24	138	135	131	126	121	115	111	108	108	108	108	108	108	108	...
25	138	135	131	126	121	115	111	109	109	108	108	108	108	108	108
26	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
27	138	135	131	126	121	115	111	108	108	108	108	108	108	108	...
28	138	135	131	126	121	115	111	109	109	108	108	108	108	108	108
29	138	135	131	126	121	115	111	109	109	108	108	108	108	108	108
30	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
31	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
32	138	135	131	126	121	115	111	108	108	108	108	108	108	108	108
33	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
34	138	135	131	126	121	115	111	108	108	108	108	108	108	108	108
35	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
36	138	135	131	126	121	115	111	109	109	108	108	108	108	108	108
37	138	135	131	126	121	115	111	109	109	108	108	108	108	108	108
38	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
39	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
40	138	135	131	126	121	115	111	108	108	108	108	108	108	108	108
41	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
42	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
43	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
44	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
45	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	92.5	*90.5*	*83.9*	*66.4*	*54.5*	*44.1*	*35.5*	...	...	...	...	...	...	...	...	...	...
2	68.0	66.7	65.9	63.0	*54.5*	*44.1*	*35.5*	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	109	106	98.3	*78.6*	*64.3*	*51.4*	*41.6*	...	...	...	...	...	...	...	...	...	...
5	80.5	78.8	77.3	74.0	*64.3*	*51.4*	*41.6*	...	...	...	...	...	...	...	...	...	...
6	109	106	98.3	*78.6*	*64.3*	*51.4*	*41.6*	...	...	...	...	...	...	...	...	...	...
7	80.5	78.8	77.3	74.0	*64.3*	*51.4*	*41.6*	...	...	...	...	...	...	...	...	...	...
8	109	106	98.3	*78.6*	*64.3*	*51.4*	*41.6*	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	92.5	90.5	83.9	*66.4*	*54.5*	*44.1*	*35.5*	...	...	...	...	...	...	...	...	...	...
11	68.0	66.7	65.9	63.0	*54.5*	*44.1*	*35.5*	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	109	106	98.3	*78.6*	*64.3*	*51.4*	*41.6*	...	...	...	...	...	...	...	...	...	...
15	80.5	78.8	77.3	74.0	*64.3*	*51.4*	*41.6*	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	121	119	116	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	89.7	87.9	86.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	131	129	128	126	121	97.9	*78.0*	*61.1*	*46.9*	*35.3*	*25.9*	*18.5*	*12.9*	*8.9*	...	...	...
21	97.2	95.9	94.6	93.4	92.3	91.3	*78.0*	*61.1*	*46.9*	*35.3*	*25.9*	*18.5*	*12.9*	*8.9*	...	...	...
22	99.7	98.6	97.3	95.8	91.3	*70.9*	*53.9*	*41.4*	*31.9*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
23	77.2	77.2	76.9	76.5	75.6	*70.9*	*53.9*	*41.4*	*31.9*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	107	106	98.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
26	92.4	92.4	90.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	107	106	98.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
29	107	106	98.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
30	92.4	92.4	90.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
31	92.4	92.4	92.4	92.2	89.1	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
32	107	106	105	103	*92.3*	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
33	92.4	92.4	92.4	92.2	89.1	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
34	107	106	105	103	*92.3*	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
35	92.4	92.4	90.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
36	107	106	98.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
37	107	106	98.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
38	92.4	92.4	90.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
39	92.4	92.4	92.4	92.2	89.1	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
40	107	106	105	103	*92.3*	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
41	115	113	*99.8*	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
42	92.4	92.4	90.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
43	115	113	*99.8*	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
44	92.4	92.4	90.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
45	115	113	*99.8*	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	18Cr–10Ni–Cb	Plate	SA–240	347	S34700	...	...	8	1
2	18Cr–10Ni–Cb	Wld. tube	SA–249	TP347	S34700	...	...	8	1
3	18Cr–10Ni–Cb	Wld. tube	SA–249	TP347	S34700	...	...	8	1
4	18Cr–10Ni–Cb	Wld. tube	SA–249	TP347	S34700	...	...	8	1
5	18Cr–10Ni–Cb	Wld. tube	SA–249	TP347	S34700	...	...	8	1
6	18Cr–10Ni–Cb	Smls. & wld. pipe	SA–312	TP347	S34700	...	...	8	1
7	18Cr–10Ni–Cb	Smls. & wld. pipe	SA–312	TP347	S34700	...	...	8	1
8	18Cr–10Ni–Cb	Wld. pipe	SA–312	TP347	S34700	...	...	8	1
9	18Cr–10Ni–Cb	Wld. pipe	SA–312	TP347	S34700	...	...	8	1
10	18Cr–10Ni–Cb	Wld. pipe	SA–358	347	S34700	1	...	8	1
11	18Cr–10Ni–Cb	Smls. pipe	SA–376	TP347	S34700	...	...	8	1
12	18Cr–10Ni–Cb	Smls. pipe	SA–376	TP347	S34700	...	...	8	1
13	18Cr–10Ni–Cb	Smls. & wld. fittings	SA–403	347	S34700	...	...	8	1
14	18Cr–10Ni–Cb	Wld. pipe	SA–409	TP347	S34700	...	...	8	1
15	18Cr–10Ni–Cb	Bar	SA–479	347	S34700	...	...	8	1
16	18Cr–10Ni–Cb	Bar	SA–479	347	S34700	...	...	8	1
17	18Cr–10Ni–Cb	Wld. pipe	SA–813	TP347	S34700	...	...	8	1
18	18Cr–10Ni–Cb	Forgings	SA–182	F347H	S34709	...	≤130	8	1
19	18Cr–10Ni–Cb	Forgings	SA–182	F347H	S34709	...	≤130	8	1
20	18Cr–10Ni–Cb	Smls. tube	SA–213	TP347H	S34709	...	...	8	1
21	18Cr–10Ni–Cb	Smls. tube	SA–213	TP347H	S34709	...	...	8	1
22	18Cr–10Ni–Cb	Plate	SA–240	347H	S34709	...	...	8	1
23	18Cr–10Ni–Cb	Plate	SA–240	347H	S34709	...	...	8	1
24	18Cr–10Ni–Cb	Wld. tube	SA–249	TP347H	S34709	...	...	8	1
25	18Cr–10Ni–Cb	Wld. tube	SA–249	TP347H	S34709	...	...	8	1
26	18Cr–10Ni–Cb	Wld. tube	SA–249	TP347H	S34709	...	...	8	1
27	18Cr–10Ni–Cb	Wld. tube	SA–249	TP347H	S34709	...	...	8	1
28	18Cr–10Ni–Cb	Smls. & wld. pipe	SA–312	TP347H	S34709	...	...	8	1
29	18Cr–10Ni–Cb	Smls. & wld. pipe	SA–312	TP347H	S34709	...	...	8	1
30	18Cr–10Ni–Cb	Wld. pipe	SA–312	TP347H	S34709	...	...	8	1
31	18Cr–10Ni–Cb	Wld. pipe	SA–312	TP347H	S34709	...	...	8	1
32	18Cr–10Ni–Cb	Smls. pipe	SA–376	TP347H	S34709	...	...	8	1
33	18Cr–10Ni–Cb	Smls. pipe	SA–376	TP347H	S34709	...	...	8	1
34	18Cr–10Ni–Cb	Smls. & wld. fittings	SA–403	347H	S34709	...	...	8	1
35	18Cr–10Ni–Cb	Bar	SA–479	347H	S34709	...	...	8	1
36	18Cr–10Ni–Cb	Bar	SA–479	347H	S34709	...	...	8	1
37	18Cr–10Ni–Cb	Wld. pipe	SA–813	TP347H	S34709	...	...	8	1
38	18Cr–10Ni–Cb	Wld. pipe	SA–814	TP347H	S34709	...	...	8	1
39	18Cr–10Ni–Cb	Smls. tube	SA–213	TP347LN	S34751	...	...	8	1
40	18Cr–10Ni–Cb	Smls. tube	SA–213	TP347LN	S34751	...	...	8	1
41	18Cr–10Ni–Cb	Smls. pipe	SA–312	TP347LN	S34751	...	...	8	1
42	18Cr–10Ni–Cb	Smls. pipe	SA–312	TP347LN	S34751	...	...	8	1
43	18Cr–10Ni–Cb	Forgings	SA–182	F348	S34800	...	≤130	8	1
44	18Cr–10Ni–Cb	Forgings	SA–182	F348	S34800	...	≤130	8	1
45	18Cr–10Ni–Cb	Smls. tube	SA–213	TP348	S34800	...	...	8	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	515	205	816	NP	816	343	HA–2	G12, T7
2	515	205	816	NP	NP	NP	HA–2	G12, T7, W13
3	515	205	816	427	NP	NP	HA–2	G5, G12, T6, W12, W13
4	515	205	816	NP	816	343	HA–2	G3, G5, G12, G24, T6
5	515	205	816	NP	816	343	HA–2	G3, G12, G24, T7
6	515	205	816	427	816	343	HA–2	G5, G12, T6, W12, W13, W14
7	515	205	816	NP	816	343	HA–2	G12, T7, W13, W14
8	515	205	816	NP	816	343	HA–2	G3, G5, G12, G24, T6
9	515	205	816	NP	816	343	HA–2	G3, G12, G24, T7
10	515	205	NP	427	NP	NP	HA–2	G5, H1, W12
11	515	205	816	427	816	343	HA–2	G5, G12, H1, T6
12	515	205	816	NP	816	343	HA–2	G12, H1, T7
13	515	205	NP	427	816	343	HA–2	G5, G12, T6, W12, W14
14	515	205	NP	427	NP	NP	HA–2	G5, H1, W12
15	515	205	816	427	816	343	HA–2	G5, G12, G22, T6
16	515	205	816	NP	816	343	HA–2	G12, G22, T7
17	515	205	NP	427	NP	NP	HA–2	G5, H1, W12
18	515	205	816	427	816	NP	HA–2	G5, H2, T8
19	515	205	816	NP	816	NP	HA–2	H2, T9
20	515	205	816	427	816	NP	HA–2	G5, H2, T8
21	515	205	816	NP	816	NP	HA–2	H2, T9
22	515	205	816	427	816	NP	HA–2	G5, H2, T8
23	515	205	816	NP	816	NP	HA–2	H2, T9
24	515	205	816	427	NP	NP	HA–2	G5, T8, W12, W13
25	515	205	816	NP	NP	NP	HA–2	T9, W13
26	515	205	816	NP	816	NP	HA–2	G3, G5, G24, T8
27	515	205	816	NP	816	NP	HA–2	G3, G24, T9
28	515	205	816	427	816	NP	HA–2	G5, H2, T8, W12, W13, W14
29	515	205	816	NP	816	NP	HA–2	H2, T9, W13, W14
30	515	205	816	NP	816	NP	HA–2	G3, G5, G24, H2, T8
31	515	205	816	NP	816	NP	HA–2	G3, G24, H2, T9
32	515	205	816	427	816	NP	HA–2	G5, H2, T8
33	515	205	816	NP	816	NP	HA–2	H2, T9
34	515	205	NP	427	816	NP	HA–2	G5, H2, T8, W12, W14
35	515	205	816	427	NP	NP	HA–2	G5, H2, T8
36	515	205	816	NP	NP	NP	HA–2	H2, T9
37	515	205	NP	427	NP	NP	HA–2	G5, H2, W12
38	515	205	NP	427	NP	NP	HA–2	G5, W12
39	515	205	NP	NP	593	NP	HA–2	G5, T8
40	515	205	NP	NP	593	NP	HA–2	...
41	515	205	NP	NP	593	NP	HA–2	G5, T8
42	515	205	NP	NP	593	NP	HA–2	...
43	515	205	816	427	816	NP	HA–2	G5, G12, T6
44	515	205	816	NP	816	NP	HA–2	G12, T7
45	515	205	816	427	816	NP	HA–2	G5, G12, T6

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
No.	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
2	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
3	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
4	117	117	117	114	110	104	101	98.9	98.6	98.6	98.6	98.6	98.6	98.6	98.1
5	117	112	107	103	101	94.3	89.1	85.3	83.3	81.8	81.2	79.9	79.3	79.3	78.7
6	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
7	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
8	117	117	117	114	110	104	101	98.9	98.6	98.6	98.6	98.6	98.6	98.6	98.1
9	117	112	107	103	101	94.3	89.1	85.3	83.3	81.8	81.2	79.9	79.3	79.3	78.7
10	138	138	137	134	129	123	119	117	116	116	116	116	116	116	...
11	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
12	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
13	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
14	138	138	137	134	129	123	119	117	116	116	116	116	116	116	...
15	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
16	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
17	138	138	137	134	129	123	119	117	116	116	116	116	116	116	...
18	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
19	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
20	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
21	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
22	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
23	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
24	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
25	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
26	117	117	117	114	110	104	101	98.9	98.6	98.6	98.6	98.6	98.6	98.6	98.1
27	117	112	107	103	101	94.3	89.1	85.3	83.3	81.8	81.2	79.9	79.3	79.3	78.7
28	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
29	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
30	117	117	117	114	110	104	101	98.9	98.6	98.6	98.6	98.6	98.6	98.6	98.1
31	117	112	107	103	101	94.3	89.1	85.3	83.3	81.8	81.2	79.9	79.3	79.3	78.7
32	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
33	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
34	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
35	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
36	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
37	138	138	137	134	129	123	119	117	116	116	116	116	116	116	...
38	138	138	137	134	129	123	119	117	116	116	116	116	116	116	...
39	138	137	137	136	131	123	117	114	113	112	112	112	112	112	111
40	138	128	120	115	110	101	94.7	90.2	88.6	87.5	86.7	86.2	85.9	85.7	85.7
41	138	137	137	136	131	123	117	114	113	112	112	112	112	112	111
42	138	128	120	115	110	101	94.7	90.2	88.6	87.5	86.7	86.2	85.9	85.7	85.7
43	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
44	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
45	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	92.4	92.4	90.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
2	92.4	92.4	90.3	*77.2*	*57.3*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
3	115	113	*99.8*	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
4	97.6	95.4	*85.5*	*65.9*	*49.5*	*34.0*	*25.9*	*19.7*	*14.0*	*9.80*	*7.53*	*5.95*	*4.96*	*4.50*	...	...	...
5	78.6	78.6	76.8	*65.9*	*49.5*	*34.0*	*25.9*	*19.7*	*14.0*	*9.80*	*7.53*	*5.95*	*4.96*	*4.50*	...	...	...
6	115	113	*99.8*	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
7	92.4	92.4	90.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
8	97.6	95.4	*85.5*	*65.9*	*49.5*	*34.0*	*25.9*	*19.7*	*14.0*	*9.80*	*7.53*	*5.95*	*4.96*	*4.50*	...	...	...
9	78.6	78.6	76.8	*65.9*	*49.5*	*34.0*	*25.9*	*19.7*	*14.0*	*9.80*	*7.53*	*5.95*	*4.96*	*4.50*	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	115	113	*99.8*	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
12	92.4	92.4	90.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
13	115	113	*99.8*	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	115	113	*99.8*	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
16	92.4	92.4	90.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	115	114	113	109	*92.3*	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
19	92.4	92.4	92.4	92.2	89.1	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
20	115	114	113	109	*92.3*	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
21	92.4	92.4	92.4	92.2	89.1	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
22	115	114	113	109	*92.3*	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
23	92.4	92.4	92.4	92.2	89.1	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
24	115	114	113	109	*92.3*	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
25	92.4	92.4	92.4	92.2	89.1	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
26	97.5	96.8	96.2	91.9	*77.9*	*58.8*	*45.7*	*35.1*	*26.8*	*20.1*	*15.8*	*12.6*	*9.52*	*6.41*	...	...	...
27	78.6	78.6	78.6	78.4	75.7	*58.8*	*45.7*	*35.1*	*26.8*	*20.1*	*15.8*	*12.6*	*9.52*	*6.41*	...	...	...
28	115	114	113	109	*92.3*	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
29	92.4	92.4	92.4	92.2	89.1	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
30	97.5	96.8	96.2	91.9	*77.9*	*58.8*	*45.7*	*35.1*	*26.8*	*20.1*	*15.8*	*12.6*	*9.52*	*6.41*	...	...	...
31	78.6	78.6	78.6	78.4	75.7	*58.8*	*45.7*	*35.1*	*26.8*	*20.1*	*15.8*	*12.6*	*9.52*	*6.41*	...	...	...
32	115	114	113	109	*92.3*	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
33	92.4	92.4	92.4	92.2	89.1	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
34	115	114	113	109	*92.3*	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
35	115	114	113	109	*92.3*	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
36	92.4	92.4	92.4	92.2	89.1	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	111	110	108	106	*84.5*	...	...	...	...	...	...	...	...	...	...	...	...
40	85.6	85.4	85.1	84.7	83.2	...	...	...	...	...	...	...	...	...	...	...	...
41	111	110	108	106	*84.5*	...	...	...	...	...	...	...	...	...	...	...	...
42	85.6	85.4	85.1	84.7	83.2	...	...	...	...	...	...	...	...	...	...	...	...
43	115	113	*99.8*	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
44	92.4	92.4	90.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
45	115	113	*99.8*	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	18Cr–10Ni–Cb	Smls. tube	SA–213	TP348	S34800	...	...	8	1
2	18Cr–10Ni–Cb	Plate	SA–240	348	S34800	...	...	8	1
3	18Cr–10Ni–Cb	Plate	SA–240	348	S34800	...	...	8	1
4	18Cr–10Ni–Cb	Wld. tube	SA–249	TP348	S34800	...	...	8	1
5	18Cr–10Ni–Cb	Wld. tube	SA–249	TP348	S34800	...	...	8	1
6	18Cr–10Ni–Cb	Wld. tube	SA–249	TP348	S34800	...	...	8	1
7	18Cr–10Ni–Cb	Wld. tube	SA–249	TP348	S34800	...	...	8	1
8	18Cr–10Ni–Cb	Smls. & wld. pipe	SA–312	TP348	S34800	...	...	8	1
9	18Cr–10Ni–Cb	Smls. pipe	SA–312	TP348	S34800	...	...	8	1
10	18Cr–10Ni–Cb	Wld. pipe	SA–312	TP348	S34800	...	...	8	1
11	18Cr–10Ni–Cb	Wld. pipe	SA–312	TP348	S34800	...	...	8	1
12	18Cr–10Ni–Cb	Wld. pipe	SA–358	348	S34800	1	...	8	1
13	18Cr–10Ni–Cb	Smls. pipe	SA–376	TP348	S34800	...	...	8	1
14	18Cr–10Ni–Cb	Smls. pipe	SA–376	TP348	S34800	...	...	8	1
15	18Cr–10Ni–Cb	Smls. & wld. fittings	SA–403	348	S34800	...	...	8	1
16	18Cr–10Ni–Cb	Wld. pipe	SA–409	TP348	S34800	...	...	8	1
17	18Cr–10Ni–Cb	Bar	SA–479	348	S34800	...	...	8	1
18	18Cr–10Ni–Cb	Bar	SA–479	348	S34800	...	...	8	1
19	18Cr–10Ni–Cb	Wld. pipe	SA–813	TP348	S34800	...	...	8	1
20	18Cr–10Ni–Cb	Wld. pipe	SA–814	TP348	S34800	...	...	8	1
21	18Cr–10Ni–Cb	Forgings	SA–182	F348H	S34809	...	≤130	8	1
22	18Cr–10Ni–Cb	Forgings	SA–182	F348H	S34809	...	≤130	8	1
23	18Cr–10Ni–Cb	Smls. tube	SA–213	TP348H	S34809	...	...	8	1
24	18Cr–10Ni–Cb	Smls. tube	SA–213	TP348H	S34809	...	...	8	1
25	18Cr–10Ni–Cb	Plate	SA–240	348H	S34809	...	...	8	1
26	18Cr–10Ni–Cb	Wld. tube	SA–249	TP348H	S34809	...	...	8	1
27	18Cr–10Ni–Cb	Wld. tube	SA–249	TP348H	S34809	...	...	8	1
28	18Cr–10Ni–Cb	Wld. tube	SA–249	TP348H	S34809	...	...	8	1
29	18Cr–10Ni–Cb	Wld. tube	SA–249	TP348H	S34809	...	...	8	1
30	18Cr–10Ni–Cb	Smls. & wld. pipe	SA–312	TP348H	S34809	...	...	8	1
31	18Cr–10Ni–Cb	Smls. pipe	SA–312	TP348H	S34809	...	...	8	1
32	18Cr–10Ni–Cb	Wld. pipe	SA–312	TP348H	S34809	...	...	8	1
33	18Cr–10Ni–Cb	Wld. pipe	SA–312	TP348H	S34809	...	...	8	1
34	18Cr–10Ni–Cb	Smls. & wld. fittings	SA–403	348H	S34809	...	...	8	1
35	18Cr–10Ni–Cb	Bar	SA–479	348H	S34809	...	...	8	1
36	18Cr–10Ni–Cb	Bar	SA–479	348H	S34809	...	...	8	1
37	18Cr–10Ni–Cb	Wld. pipe	SA–813	TP348H	S34809	...	...	8	1
38	18Cr–10Ni–Cb	Wld. pipe	SA–814	TP348H	S34809	...	...	8	1
39	18Cr–10Ni–Cb	Bar	SA/JIS G4303	SUS347	...	...	...	8	1
40	18Cr–10Ni–Cb	Smls. tube	SA–213	TP347HFG	S34710	...	...	8	1
41	18Cr–10Ni–Cb	Smls. tube	SA–213	TP347HFG	S34710	...	...	8	1
42	18Cr–10Ni–Ti	Smls. pipe	SA–312	TP321	S32100	...	>9.5	8	1
43	18Cr–10Ni–Ti	Smls. pipe	SA–312	TP321	S32100	...	>9.5	8	1
44	18Cr–10Ni–Ti	Wld. pipe	SA–312	TP321	S32100	...	>9.5	8	1
45	18Cr–10Ni–Ti	Wld. pipe	SA–312	TP321	S32100	...	>9.5	8	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	515	205	816	NP	816	NP	HA–2	G12, T7
2	515	205	NP	427	816	343	HA–2	G5, G12, T6
3	515	205	NP	NP	816	343	HA–2	G12, T7
4	515	205	816	NP	NP	NP	HA–2	G12, T7, W13
5	515	205	816	427	NP	NP	HA–2	G5, G12, T6, W12, W13
6	515	205	816	NP	816	343	HA–2	G3, G5, G12, G24, T6
7	515	205	816	NP	816	343	HA–2	G3, G12, G24, T7
8	515	205	816	427	816	343	HA–2	G5, G12, T6, W12, W14
9	515	205	816	NP	816	343	HA–2	G12, T7
10	515	205	NP	NP	816	343	HA–2	G5, G12, G24, T6
11	515	205	NP	NP	816	343	HA–2	G12, G24, T7
12	515	205	NP	427	NP	NP	HA–2	G5, W12
13	515	205	816	427	816	343	HA–2	G5, G12, H1, T6
14	515	205	816	NP	816	343	HA–2	G12, H1, T7
15	515	205	NP	427	816	343	HA–2	G5, G12, H2, T6, W12, W14
16	515	205	NP	427	NP	NP	HA–2	G5, W12
17	515	205	816	427	816	343	HA–2	G5, G12, G22, H1, T6
18	515	205	816	NP	816	343	HA–2	G12, G22, H1, T7
19	515	205	NP	427	NP	NP	HA–2	G5, H1, W12
20	515	205	NP	427	NP	NP	HA–2	G5, W12
21	515	205	816	427	816	NP	HA–2	G5, T8
22	515	205	816	NP	816	NP	HA–2	T9
23	515	205	816	427	816	NP	HA–2	G5, H2, T8
24	515	205	816	NP	816	NP	HA–2	H2, T9
25	515	205	NP	427	NP	NP	HA–2	G5, H2
26	515	205	816	427	NP	NP	HA–2	G5, T8, W12, W13
27	515	205	816	NP	NP	NP	HA–2	T9, W13
28	515	205	816	NP	816	NP	HA–2	G3, G5, G24, T8
29	515	205	816	NP	816	NP	HA–2	G3, G24, T9
30	515	205	816	427	816	NP	HA–2	G5, H2, T8, W12, W14
31	515	205	816	NP	816	NP	HA–2	H2, T9
32	515	205	NP	NP	816	NP	HA–2	G5, G24, H2, T8
33	515	205	NP	NP	816	NP	HA–2	G24, H2, T9
34	515	205	NP	427	816	NP	HA–2	G5, H2, T8, W12, W14
35	515	205	816	427	NP	NP	HA–2	G5, H2, T8
36	515	205	816	NP	NP	NP	HA–2	H2, T9
37	515	205	NP	427	NP	NP	HA–2	G5, H2, W12
38	515	205	NP	427	NP	NP	HA–2	G5, W12
39	520	205	816	427	816	NP	HA–2	G5, G12, G22, T6
40	550	205	732	NP	NP	NP	HA–2	G5, T8
41	550	205	732	NP	NP	NP	HA–2	T9
42	485	170	816	427	816	NP	HA–2	G5, G12, T7
43	485	170	816	NP	816	NP	HA–2	G12, T7
44	485	170	816	427	816	NP	HA–2	G5, G12, T7, W12, W13, W14
45	485	170	816	NP	816	NP	HA–2	G12, T7, W13, W14

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
No.	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
2	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
3	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
4	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
5	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
6	117	117	117	114	110	104	101	98.9	98.6	98.6	98.6	98.6	98.6	98.6	98.1
7	117	112	107	103	101	94.3	89.1	85.3	83.3	81.8	81.2	79.9	79.3	79.3	78.7
8	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
9	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
10	117	117	117	114	110	104	101	98.9	98.6	98.6	98.6	98.6	98.6	98.6	98.1
11	117	112	107	103	101	94.3	89.1	85.3	83.3	81.8	81.2	79.9	79.3	79.3	78.7
12	138	138	137	134	129	123	119	117	116	116	116	116	116	116	...
13	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
14	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
15	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
16	138	138	137	134	129	123	119	117	116	116	116	116	116	116	...
17	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
18	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
19	138	138	137	134	129	123	119	117	116	116	116	116	116	116	...
20	138	138	137	134	129	123	119	117	116	116	116	116	116	116	...
21	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
22	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
23	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
24	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
25	138	138	137	134	129	123	119	117	116	116	116	116	116	116	...
26	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
27	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
28	117	117	117	114	110	104	101	98.9	98.6	98.6	98.6	98.6	98.6	98.6	98.1
29	117	112	107	103	101	94.3	89.1	85.3	83.3	81.8	81.2	79.9	79.3	79.3	78.7
30	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
31	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
32	117	117	117	114	110	104	101	98.9	98.6	98.6	98.6	98.6	98.6	98.6	98.1
33	117	112	107	103	101	94.3	89.1	85.3	83.3	81.8	81.2	79.9	79.3	79.3	78.7
34	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
35	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
36	138	132	126	122	118	111	105	99.8	97.9	96.1	95.0	94.4	93.8	93.2	92.5
37	138	138	137	134	129	123	119	117	116	116	116	116	116	116	...
38	138	138	137	134	129	123	119	117	116	116	116	116	116	116	...
39	138	138	137	134	129	123	119	117	116	116	116	116	116	116	115
40	138	138	138	138	138	138	134	132	131	131	130	130	128	127	125
41	138	129	123	120	116	110	105	102	100	98.5	97.2	96.0	94.9	93.9	92.9
42	115	115	115	115	115	115	112	106	104	102	100	98.5	97.3	96.0	95.4
43	115	109	102	98.7	95.0	88.8	83.0	79.0	77.2	75.5	74.3	73.0	72.5	71.2	70.5
44	115	115	115	115	115	115	112	106	104	102	100	98.5	97.3	96.0	95.4
45	115	109	102	98.7	95.0	88.8	83.0	79.0	77.2	75.5	74.3	73.0	72.5	71.2	70.5

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	92.4	92.4	90.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
2	115	113	*99.8*	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
3	92.4	92.4	90.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
4	92.4	92.4	90.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
5	115	113	*99.8*	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
6	97.6	95.4	*85.5*	*65.9*	*49.5*	*34.0*	*25.9*	*19.7*	*14.0*	*9.80*	*7.53*	*5.95*	*4.96*	*4.50*	...	...	...
7	78.6	78.6	76.8	*65.9*	*49.5*	*34.0*	*25.9*	*19.7*	*14.0*	*9.80*	*7.53*	*5.95*	*4.96*	*4.50*	...	...	...
8	115	113	*99.8*	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
9	92.4	92.4	90.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
10	97.6	95.4	*85.5*	*65.9*	*49.5*	*34.0*	*25.9*	*19.7*	*14.0*	*9.80*	*7.53*	*5.95*	*4.96*	*4.50*	...	...	...
11	78.6	78.6	76.8	*65.9*	*49.5*	*34.0*	*25.9*	*19.7*	*14.0*	*9.80*	*7.53*	*5.95*	*4.96*	*4.50*	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	115	113	*99.8*	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
14	92.4	92.4	90.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
15	115	113	*99.8*	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	115	113	*99.8*	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
18	92.4	92.4	90.3	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	115	114	113	109	*92.3*	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
22	92.4	92.4	92.4	92.2	89.1	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
23	115	114	113	109	*92.3*	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
24	92.4	92.4	92.4	92.2	89.1	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	115	114	113	109	*92.3*	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
27	92.4	92.4	92.4	92.2	89.1	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
28	97.5	96.8	96.2	91.9	*77.9*	*58.8*	*45.7*	*35.1*	*26.8*	*20.1*	*15.8*	*12.6*	*9.52*	*6.41*	...	...	...
29	78.6	78.6	78.6	78.4	75.7	*58.8*	*45.7*	*35.1*	*26.8*	*20.1*	*15.8*	*12.6*	*9.52*	*6.41*	...	...	...
30	115	114	113	109	*92.3*	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
31	92.4	92.4	92.4	92.2	89.1	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
32	97.5	96.8	96.2	91.9	*77.9*	*58.8*	*45.7*	*35.1*	*26.8*	*20.1*	*15.8*	*12.6*	*9.52*	*6.41*	...	...	...
33	78.6	78.6	78.6	78.4	75.7	*58.8*	*45.7*	*35.1*	*26.8*	*20.1*	*15.8*	*12.6*	*9.52*	*6.41*	...	...	...
34	115	114	113	109	*92.3*	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
35	115	114	113	109	*92.3*	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
36	92.4	92.4	92.4	92.2	89.1	*69.3*	*53.9*	*41.4*	*31.8*	*23.9*	*18.8*	*14.6*	*10.8*	*7.83*	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	115	113	*99.8*	*77.2*	*57.7*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
40	124	123	122	120	*107*	*85.4*	*67.0*	*51.7*	*39.3*	*29.4*	*21.7*	...	...	...	...	...	...
41	92.0	91.0	90.1	89.0	88.0	*85.4*	*67.0*	*51.7*	*39.3*	*29.4*	*21.7*	...	...	...	...	...	...
42	94.2	93.3	84.1	*61.6*	*44.3*	*33.1*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
43	69.8	69.5	67.7	*61.6*	*44.3*	*33.1*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
44	94.2	93.3	84.1	*61.6*	*44.3*	*33.1*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
45	69.8	69.5	67.7	*61.6*	*44.3*	*33.1*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321	S32100	...	>9.5	8	1
2	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321	S32100	...	>9.5	8	1
3	18Cr–10Ni–Ti	Smls. pipe	SA–312	TP321H	S32109	...	>9.5	8	1
4	18Cr–10Ni–Ti	Smls. pipe	SA–312	TP321H	S32109	...	>9.5	8	1
5	18Cr–10Ni–Ti	Wld. pipe	SA–312	TP321H	S32109	...	>9.5	8	1
6	18Cr–10Ni–Ti	Wld. pipe	SA–312	TP321H	S32109	...	>9.5	8	1
7	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321H	S32109	...	>9.5	8	1
8	18Cr–10Ni–Ti	Forgings	SA–182	F321	S32100	...	>130	8	1
9	18Cr–10Ni–Ti	Forgings	SA–182	F321	S32100	...	>130	8	1
10	18Cr–10Ni–Ti	Forgings	SA–965	F321	S32100	...	...	8	1
11	18Cr–10Ni–Ti	Forgings	SA–965	F321	S32100	...	...	8	1
12	18Cr–10Ni–Ti	Forgings	SA–182	F321H	S32109	...	>130	8	1
13	18Cr–10Ni–Ti	Forgings	SA–182	F321H	S32109	...	>130	8	1
14	18Cr–10Ni–Ti	Forgings	SA–965	F321H	S32109	...	...	8	1
15	18Cr–10Ni–Ti	Forgings	SA–965	F321H	S32109	...	...	8	1
16	18Cr–10Ni–Ti	Plate	SA/EN 10028–7	X6CrNiTi18–10	...	...	≤75	8	1
17	18Cr–10Ni–Ti	Plate	SA/EN 10028–7	X6CrNiTi18–10	...	...	≤75	8	1
18	18Cr–10Ni–Ti	Forgings	SA–182	F321	S32100	...	≤130	8	1
19	18Cr–10Ni–Ti	Forgings	SA–182	F321	S32100	...	≤130	8	1
20	18Cr–10Ni–Ti	Forgings	SA–182	F321	S32100	...	≤130	8	1
21	18Cr–10Ni–Ti	Smls. tube	SA–213	TP321	S32100	...	...	8	1
22	18Cr–10Ni–Ti	Smls. tube	SA–213	TP321	S32100	...	...	8	1
23	18Cr–10Ni–Ti	Smls. tube	SA–213	TP321	S32100	...	...	8	1
24	18Cr–10Ni–Ti	Plate	SA–240	321	S32100	...	...	8	1
25	18Cr–10Ni–Ti	Plate	SA–240	321	S32100	...	...	8	1
26	18Cr–10Ni–Ti	Plate	SA–240	321	S32100	...	...	8	1
27	18Cr–10Ni–Ti	Wld. tube	SA–249	TP321	S32100	...	...	8	1
28	18Cr–10Ni–Ti	Wld. tube	SA–249	TP321	S32100	...	...	8	1
29	18Cr–10Ni–Ti	Wld. tube	SA–249	TP321	S32100	...	...	8	1
30	18Cr–10Ni–Ti	Wld. tube	SA–249	TP321	S32100	...	...	8	1
31	18Cr–10Ni–Ti	Smls. pipe	SA–312	TP321	S32100	...	≤9.5	8	1
32	18Cr–10Ni–Ti	Smls. pipe	SA–312	TP321	S32100	...	≤9.5	8	1
33	18Cr–10Ni–Ti	Wld. pipe	SA–312	TP321	S32100	...	≤9.5	8	1
34	18Cr–10Ni–Ti	Wld. pipe	SA–312	TP321	S32100	...	≤9.5	8	1
35	18Cr–10Ni–Ti	Wld. pipe	SA–358	321	S32100	1	...	8	1
36	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321	S32100	...	≤9.5	8	1
37	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321	S32100	...	≤9.5	8	1
38	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321	S32100	...	≤9.5	8	1
39	18Cr–10Ni–Ti	Smls. & wld. fittings	SA–403	321	S32100	...	...	8	1
40	18Cr–10Ni–Ti	Wld. pipe	SA–409	TP321	S32100	...	...	8	1
41	18Cr–10Ni–Ti	Bar	SA–479	321	S32100	...	...	8	1
42	18Cr–10Ni–Ti	Bar	SA–479	321	S32100	...	...	8	1
43	18Cr–10Ni–Ti	Bar	SA–479	321	S32100	...	...	8	1
44	18Cr–10Ni–Ti	Wld. pipe	SA–813	TP321	S32100	...	...	8	1
45	18Cr–10Ni–Ti	Wld. pipe	SA–814	TP321	S32100	...	...	8	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	485	170	NP	427	816	343	HA–2	G5, G12, H1, T7
2	485	170	NP	NP	816	343	HA–2	G12, H1, T7
3	485	170	816	427	816	NP	HA–2	G5, T8
4	485	170	816	NP	816	NP	HA–2	T8
5	485	170	816	427	816	NP	HA–2	G5, T8, W12, W13, W14
6	485	170	816	NP	816	NP	HA–2	T8, W13, W14
7	485	170	NP	427	816	NP	HA–2	G5, H2, T8
8	485	205	816	427	816	NP	HA–2	G5, G12, T6
9	485	205	816	NP	816	NP	HA–2	G12, T7
10	485	205	816	427	816	343	HA–2	G5, G12, H1, T6
11	485	205	816	NP	816	343	HA–2	G12, H1, T7
12	485	205	816	427	816	NP	HA–2	G5, H2, T8
13	485	205	816	NP	816	NP	HA–2	H2, T8
14	485	205	NP	427	816	NP	HA–2	G5, H2, T8
15	485	205	NP	NP	816	NP	HA–2	H2, T8
16	500	200	NP	NP	550	343	HA–2	G12, G30
17	500	200	NP	NP	550	343	HA–2	G5, G12, G30, T6
18	515	205	816	NP	NP	NP	HA–2	G5, G12, T7
19	515	205	816	NP	816	343	HA–2	G12, T7
20	515	205	NP	427	816	343	HA–2	G5, G12, T6
21	515	205	816	NP	NP	NP	HA–2	G5, G12, T7
22	515	205	816	NP	816	NP	HA–2	G12, T7
23	515	205	NP	427	816	NP	HA–2	G5, G12, T6
24	515	205	816	NP	NP	NP	HA–2	G5, G12, T7
25	515	205	816	NP	816	343	HA–2	G12, T7
26	515	205	NP	427	816	343	HA–2	G5, G12, T6
27	515	205	816	NP	NP	NP	HA–2	G12, T7, W13
28	515	205	816	427	NP	NP	HA–2	G5, G12, T7, W12, W13
29	515	205	816	NP	816	343	HA–2	G3, G5, G12, G24, T7
30	515	205	816	NP	816	343	HA–2	G3, G12, G24, T7
31	515	205	816	427	816	343	HA–2	G5, G12, T7
32	515	205	816	NP	816	343	HA–2	G12, T7
33	515	205	816	427	816	343	HA–2	G5, G12, T7, W12, W13, W14
34	515	205	816	NP	816	343	HA–2	T7, W13, W14
35	515	205	NP	427	NP	NP	HA–2	G5, H1, W12
36	515	205	816	NP	NP	NP	HA–2	G5, G12, H1, T7
37	515	205	816	NP	816	NP	HA–2	G12, H1, T7
38	515	205	NP	427	816	NP	HA–2	G5, G12, T6
39	515	205	NP	427	816	343	HA–2	G5, G12, T6, W12, W14
40	515	205	NP	427	NP	NP	HA–2	G5, W12
41	515	205	816	NP	NP	NP	HA–2	G5, G12, H1, T7
42	515	205	816	NP	816	343	HA–2	G12, G22, H1, T7
43	515	205	NP	427	816	343	HA–2	G5, G12, G22, H1, T6
44	515	205	NP	427	NP	NP	HA–2	G5, H1, W12
45	515	205	NP	427	NP	NP	HA–2	G5, W12

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	115	115	115	115	115	115	112	106	104	102	100	98.5	97.3	96.0	95.4
2	115	109	102	98.7	95.0	88.8	83.0	79.0	77.2	75.5	74.3	73.0	72.5	71.2	70.5
3	115	115	115	115	115	115	112	106	104	102	100	98.5	97.3	96.0	95.4
4	115	108	102	98.7	95.0	88.8	83.0	79.0	77.2	75.5	74.3	73.0	72.5	71.2	70.5
5	115	115	115	115	115	115	112	106	104	102	100	98.5	97.3	96.0	95.4
6	115	108	102	98.7	95.0	88.8	83.0	79.0	77.2	75.5	74.3	73.0	72.5	71.2	70.5
7	115	115	115	115	115	115	112	106	104	102	100	98.5	97.3	96.0	95.4
8	138	135	130	126	123	121	121	121	121	121	121	119	117	115	114
9	138	130	123	118	114	106	99.7	94.5	92.3	90.7	89.4	87.5	86.9	85.7	85.0
10	138	135	130	126	123	121	121	121	121	121	121	119	117	115	114
11	138	130	123	118	114	106	99.7	94.5	92.3	90.7	89.4	87.5	86.9	85.7	85.0
12	138	135	130	126	123	121	121	121	121	121	121	119	117	115	114
13	138	131	123	118	114	106	99.7	94.5	92.3	90.7	89.4	87.5	86.9	85.7	85.0
14	138	135	130	126	123	121	121	121	121	121	121	119	117	115	114
15	138	131	123	118	114	106	99.7	94.5	92.3	90.7	89.4	87.5	86.9	85.7	85.0
16	133	125	119	114	110	103	96.5	91.5	89.4	87.6	86.1	84.8	83.7	82.8	81.9
17	133	133	133	133	133	133	130	124	121	118	116	114	113	112	111
18	138	138	138	135	132	129	129	127	125	123	120	119	117	115	114
19	138	130	123	118	114	106	99.7	94.5	92.3	90.7	89.4	87.5	86.9	85.7	85.0
20	138	138	138	135	132	129	129	127	125	123	121	119	117	115	114
21	138	138	138	135	132	129	129	127	125	123	120	119	117	115	114
22	138	130	123	118	114	106	99.7	94.5	92.3	90.7	89.4	87.5	86.9	85.7	85.0
23	138	138	138	135	132	129	129	127	125	123	121	119	117	115	114
24	138	138	138	135	132	129	129	127	125	123	120	119	117	115	114
25	138	130	123	118	114	106	99.7	94.5	92.3	90.7	89.4	87.5	86.9	85.7	85.0
26	138	138	138	135	132	129	129	127	125	123	121	119	117	115	114
27	138	130	123	118	114	106	99.7	94.5	92.3	90.7	89.4	87.5	86.9	85.7	85.0
28	138	138	138	135	132	129	129	127	125	123	120	119	117	115	114
29	117	117	117	114	112	110	110	108	106	104	102	101	99.4	98.1	97.5
30	117	111	104	101	97.1	90.2	85.0	80.6	78.5	76.9	75.6	74.4	73.8	72.6	71.9
31	138	138	138	135	132	129	129	127	125	123	120	119	117	115	114
32	138	130	123	118	114	106	99.7	94.5	92.3	90.7	89.4	87.5	86.9	85.7	85.0
33	138	138	138	135	132	129	129	127	125	123	120	119	117	115	114
34	138	130	123	118	114	106	99.7	94.5	92.3	90.7	89.4	87.5	86.9	85.7	85.0
35	138	138	138	135	132	129	129	127	125	123	120	119	117	115	...
36	138	138	138	135	132	129	129	127	125	123	120	119	117	115	114
37	138	130	123	118	114	106	99.7	94.5	92.3	90.7	89.4	87.5	86.9	85.7	85.0
38	138	138	138	135	132	129	129	127	125	123	121	119	117	115	114
39	138	138	138	135	132	129	129	127	125	123	121	119	117	115	114
40	138	138	138	135	132	129	129	127	125	123	120	119	117	115	...
41	138	138	138	135	132	129	129	127	125	123	120	119	117	115	114
42	138	130	123	118	114	106	99.7	94.5	92.3	90.7	89.4	87.5	86.9	85.7	85.0
43	138	138	138	135	132	129	129	127	125	123	121	119	117	115	114
44	138	138	138	135	132	129	129	127	125	123	120	119	117	115	...
45	138	138	138	135	132	129	129	127	125	123	120	119	117	115	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	94.2	93.3	84.1	*61.6*	*44.3*	*33.1*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
2	69.8	69.5	67.7	*61.6*	*44.3*	*33.1*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
3	94.2	93.6	91.2	78.0	*59.5*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...
4	69.9	69.2	68.8	67.4	*59.5*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...
5	94.2	93.6	91.2	78.0	*59.5*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...
6	69.9	69.2	68.8	67.4	*59.5*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...
7	94.2	93.6	91.2	78.0	*59.5*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...
8	113	111	*87.4*	*57.5*	*44.4*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
9	83.9	83.0	77.6	*59.2*	*44.8*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
10	113	111	*87.4*	*57.5*	*44.4*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
11	83.9	83.0	77.6	*59.2*	*44.8*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
12	113	112	103	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...
13	83.9	83.0	82.4	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...
14	113	112	103	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...
15	83.9	83.0	82.4	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...
16	81.2	80.4	79.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	110	109	*87.4*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	113	112	94.6	*59.2*	*44.8*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
19	83.9	83.0	77.6	*59.2*	*44.8*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
20	113	111	*87.4*	*57.5*	*44.4*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
21	113	112	94.6	*59.2*	*44.8*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
22	83.9	83.0	77.6	*59.2*	*44.8*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
23	113	111	*87.4*	*57.5*	*44.4*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
24	113	112	94.6	*59.2*	*44.8*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
25	83.9	83.0	77.6	*59.2*	*44.8*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
26	113	111	*87.4*	*57.5*	*44.4*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
27	83.9	83.0	77.6	*59.2*	*44.8*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
28	113	112	94.6	*59.2*	*44.8*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
29	96.3	95.2	78.7	*51.2*	*38.0*	*28.4*	*21.1*	*15.5*	*10.4*	*6.86*	*5.18*	*3.76*	*2.39*	*1.41*	...	...	...
30	71.2	70.5	64.2	*51.2*	*38.0*	*28.4*	*21.1*	*15.5*	*10.4*	*6.86*	*5.18*	*3.76*	*2.39*	*1.41*	...	...	...
31	113	112	94.6	*59.2*	*44.8*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
32	83.9	83.0	77.6	*59.2*	*44.8*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
33	113	112	94.6	*59.2*	*44.8*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
34	83.9	83.0	77.6	*59.2*	*44.8*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	113	112	94.6	*59.2*	*44.8*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
37	83.9	83.0	77.6	*59.2*	*44.8*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
38	113	111	*87.4*	*57.5*	*44.4*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
39	113	111	*87.4*	*57.5*	*44.4*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	113	112	94.6	*59.2*	*44.8*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
42	83.9	83.0	77.6	*59.2*	*44.8*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
43	113	111	*87.4*	*57.5*	*44.4*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
	1	18Cr–10Ni–Ti	Forgings	SA–182	F321H	S32109	...	≤130	8	1
	2	18Cr–10Ni–Ti	Forgings	SA–182	F321H	S32109	...	≤130	8	1
	3	18Cr–10Ni–Ti	Smls. tube	SA–213	TP321H	S32109	...	...	8	1
	4	18Cr–10Ni–Ti	Smls. tube	SA–213	TP321H	S32109	...	...	8	1
	5	18Cr–10Ni–Ti	Plate	SA–240	321H	S32109	...	...	8	1
	6	18Cr–10Ni–Ti	Plate	SA–240	321H	S32109	...	...	8	1
	7	18Cr–10Ni–Ti	Wld. tube	SA–249	TP321H	S32109	...	...	8	1
	8	18Cr–10Ni–Ti	Wld. tube	SA–249	TP321H	S32109	...	...	8	1
	9	18Cr–10Ni–Ti	Wld. tube	SA–249	TP321H	S32109	...	...	8	1
	10	18Cr–10Ni–Ti	Wld. tube	SA–249	TP321H	S32109	...	...	8	1
	11	18Cr–10Ni–Ti	Smls. pipe	SA–312	TP321H	S32109	...	≤9.5	8	1
	12	18Cr–10Ni–Ti	Smls. pipe	SA–312	TP321H	S32109	...	≤9.5	8	1
	13	18Cr–10Ni–Ti	Wld. pipe	SA–312	TP321H	S32109	...	≤9.5	8	1
	14	18Cr–10Ni–Ti	Wld. pipe	SA–312	TP321H	S32109	...	≤9.5	8	1
	15	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321H	S32109	...	≤9.5	8	1
	16	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321H	S32109	...	≤9.5	8	1
	17	18Cr–10Ni–Ti	Smls. & wld. fittings	SA–403	321H	S32109	...	...	8	1
	18	18Cr–10Ni–Ti	Bar	SA–479	321H	S32109	...	...	8	1
	19	18Cr–10Ni–Ti	Bar	SA–479	321H	S32109	...	...	8	1
(**23**)	20	18Cr–12Ni–2Mo	Castings	SA–351	CF3M	J92800	...	...	8	1
(**23**)	21	18Cr–12Ni–2Mo	Castings	SA–351	CF3M	J92800	...	...	8	1
(**23**)	22	18Cr–12Ni–2Mo	Cast pipe	SA–451	CPF3M	J92800	...	...	8	1
(**23**)	23	18Cr–12Ni–2Mo	Castings	SA–351	CF8M	J92900	...	...	8	1
(**23**)	24	18Cr–12Ni–2Mo	Castings	SA–351	CF8M	J92900	...	...	8	1
(**23**)	25	18Cr–12Ni–2Mo	Cast pipe	SA–451	CPF8M	J92900	...	...	8	1
	26	18Cr–10Ni–Ti	Wld. pipe	SA–813	TP321H	S32109	...	...	8	1
	27	18Cr–10Ni–Ti	Wld. pipe	SA–814	TP321H	S32109	...	...	8	1
	28	18Cr–10Ni–Ti	Bar	SA/JIS G4303	SUS321	...	...	...	8	1
	29	18Cr–11Ni	Plate	SA–240	305	S30500	...	...	8	1
	30	18Cr–13Ni–3Mo	Forgings	SA–182	F317L	S31703	...	>130	8	1
	31	18Cr–13Ni–3Mo	Forgings	SA–182	F317L	S31703	...	>130	8	1
	32	18Cr–13Ni–3Mo	Forgings	SA–182	F317L	S31703	...	≤130	8	1
	33	18Cr–13Ni–3Mo	Forgings	SA–182	F317L	S31703	...	≤130	8	1
	34	18Cr–13Ni–3Mo	Forgings	SA–182	F317	S31700	...	≤130	8	1
	35	18Cr–13Ni–3Mo	Forgings	SA–182	F317	S31700	...	≤130	8	1
	36	18Cr–13Ni–3Mo	Plate	SA–240	317	S31700	...	...	8	1
	37	18Cr–13Ni–3Mo	Plate	SA–240	317	S31700	...	...	8	1
	38	18Cr–13Ni–3Mo	Plate	SA–240	317L	S31703	...	...	8	1
	39	18Cr–13Ni–3Mo	Plate	SA–240	317L	S31703	...	...	8	1
	40	18Cr–13Ni–3Mo	Wld. tube	SA–249	TP317	S31700	...	...	8	1
	41	18Cr–13Ni–3Mo	Wld. tube	SA–249	TP317	S31700	...	...	8	1
	42	18Cr–13Ni–3Mo	Wld. tube	SA–249	TP317	S31700	...	...	8	1
	43	18Cr–13Ni–3Mo	Wld. tube	SA–249	TP317L	S31703	...	...	8	1
	44	18Cr–13Ni–3Mo	Wld. tube	SA–249	TP317L	S31703	...	...	8	1
	45	18Cr–13Ni–3Mo	Smls. & wld. pipe	SA–312	TP317	S31700	...	...	8	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	515	205	816	427	816	NP	HA–2	G5, H2, T8
2	515	205	816	NP	816	NP	HA–2	H2, T8
3	515	205	816	427	816	NP	HA–2	G5, H2, T8
4	515	205	816	NP	816	NP	HA–2	H2, T8
5	515	205	816	427	816	NP	HA–2	G5, H2, T8
6	515	205	816	NP	816	NP	HA–2	H2, T8
7	515	205	816	NP	NP	NP	HA–2	T8, W13
8	515	205	816	427	NP	NP	HA–2	G5, T8, W12, W13
9	515	205	816	NP	816	NP	HA–2	G3, G5, G24, T8
10	515	205	816	NP	816	NP	HA–2	G3, G24, T8
11	515	205	816	427	816	NP	HA–2	G5, T8
12	515	205	816	NP	816	NP	HA–2	T8
13	515	205	816	427	816	NP	HA–2	G5, T8, W12, W13, W14
14	515	205	816	NP	816	NP	HA–2	T8, W13, W14
15	515	205	816	427	816	NP	HA–2	G5, H2, T8
16	515	205	816	NP	816	NP	HA–2	H2, T8
17	515	205	NP	427	816	NP	HA–2	G5, H2, T8, W12, W14
18	515	205	816	NP	816	NP	HA–2	H2, T8
19	515	205	816	427	816	NP	HA–2	G5, H2, T8
20	485	205	NP	427	454	343	HA–4	G1, G5, G16, G17, G19
21	485	205	NP	NP	454	343	HA–4	G1, G19
22	485	205	NP	427	427	NP	HA–4	G1, G5, G16, G17, G19
23	485	205	816	427	816	343	HA–2	G1, G5, G12, G16, G17, G19, H1, T6
24	485	205	816	NP	816	343	HA–2	G1, G12, G19, H1, T8
25	485	205	NP	427	427	NP	HA–2	G1, G5, G16, G17, G19
26	515	205	NP	427	NP	NP	HA–2	G5, H2, W12
27	515	205	NP	427	NP	NP	HA–2	G5, W12
28	520	205	NP	427	816	NP	HA–2	G5, G12, G22, H1, T6
29	515	205	NP	427	NP	NP	HA–1	G5
30	450	170	NP	NP	454	343	HA–4	G5
31	450	170	NP	NP	454	343	HA–4	...
32	485	170	NP	NP	454	343	HA–4	G5
33	485	170	NP	NP	454	343	HA–4	...
34	515	205	NP	NP	816	343	HA–2	G5, G12, T8
35	515	205	NP	NP	816	343	HA–2	G12, T9
36	515	205	NP	NP	816	343	HA–2	G5, G12, T8
37	515	205	NP	NP	816	343	HA–2	G12, T9
38	515	205	NP	NP	454	343	HA–4	G5
39	515	205	NP	NP	454	343	HA–4	...
40	515	205	NP	427	NP	NP	HA–2	G5, W12
41	515	205	NP	NP	816	343	HA–2	G5, G12, G24, T8
42	515	205	NP	NP	816	343	HA–2	G12, G24, T9
43	515	205	NP	NP	454	343	HA–4	G5, G24
44	515	205	NP	NP	454	343	HA–4	G24
45	515	205	NP	427	816	343	HA–2	G5, G12, T8, W12, W14

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
No.	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	138	138	138	135	132	129	129	127	125	123	121	119	117	115	114
2	138	131	123	118	114	106	99.7	94.5	92.3	90.7	89.4	87.5	86.9	85.7	85.0
3	138	138	138	135	132	129	129	127	125	123	121	119	117	115	114
4	138	131	123	118	114	106	99.7	94.5	92.3	90.7	89.4	87.5	86.9	85.7	85.0
5	138	138	138	135	132	129	129	127	125	123	121	119	117	115	114
6	138	131	123	118	114	106	99.7	94.5	92.3	90.7	89.4	87.5	86.9	85.7	85.0
7	138	131	123	118	114	106	99.7	94.5	92.3	90.7	89.4	87.5	86.9	85.7	85.0
8	138	138	138	135	132	129	129	127	125	123	121	119	117	115	114
9	117	117	117	114	112	110	110	108	106	104	102	101	99.4	98.1	97.4
10	117	111	104	101	97.1	90.2	85.0	80.6	78.5	76.9	75.6	74.4	73.8	72.6	71.8
11	138	138	138	135	132	129	129	127	125	123	121	119	117	115	114
12	138	131	123	118	114	106	99.7	94.5	92.3	90.7	89.4	87.5	86.9	85.7	85.0
13	138	138	138	135	132	129	129	127	125	123	121	119	117	115	114
14	138	131	123	118	114	106	99.7	94.5	92.3	90.7	89.4	87.5	86.9	85.7	85.0
15	138	138	138	135	132	129	129	127	125	123	121	119	117	115	114
16	138	131	123	118	114	106	99.7	94.5	92.3	90.7	89.4	87.5	86.9	85.7	85.0
17	138	138	138	135	132	129	129	127	125	123	121	119	117	115	114
18	138	131	123	118	114	106	99.7	94.5	92.3	90.7	89.4	87.5	86.9	85.7	85.0
19	138	138	138	135	132	129	129	127	125	123	121	119	117	115	114
20	138	138	138	136	134	133	125	119	116	114	112	111	110	108	107
21	138	128	117	111	107	98.5	92.7	88.2	86.1	84.4	83.2	82.0	81.1	80.2	79.5
22	138	138	138	136	134	133	125	119	116	114	112	111	110	108	...
23	138	138	138	136	134	133	125	119	116	114	112	111	110	108	107
24	138	128	117	111	107	98.5	92.7	88.2	86.1	84.4	83.2	82.0	81.1	80.2	79.5
25	138	138	138	136	134	133	125	119	116	114	112	111	110	108	...
26	138	138	138	135	132	129	129	127	125	123	120	119	117	115	...
27	138	138	138	135	132	129	129	127	125	123	120	119	117	115	...
28	138	138	138	135	132	129	129	127	125	123	121	119	117	115	114
29	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
30	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	86.6
31	115	106	96.3	91.3	87.4	81.2	76.0	72.5	71.2	70.0	68.8	67.5	66.3	65.0	63.8
32	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	86.6
33	115	106	96.3	91.3	87.4	81.2	76.0	72.5	71.2	70.0	68.8	67.5	66.3	65.0	63.8
34	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108
35	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
36	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108
37	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
38	138	138	138	137	135	131	123	118	116	113	111	109	107	105	103
39	138	127	115	109	105	97.1	91.2	87.3	85.4	83.8	82.5	80.6	79.4	78.1	76.9
40	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...
41	117	117	117	117	117	114	107	101	99.0	96.8	95.7	94.4	93.1	92.5	91.4
42	117	109	99.8	94.9	90.8	84.0	78.8	74.7	73.3	72.1	70.8	69.6	69.0	68.4	67.7
43	117	117	117	116	115	111	105	99.9	97.9	96.0	94.2	93.0	91.1	89.3	87.4
44	117	108	98.3	93.0	88.8	82.5	78.0	74.1	72.6	71.4	70.1	68.9	67.7	66.4	65.2
45	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	113	112	103	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...	
2	83.9	83.0	82.4	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...	
3	113	112	103	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...	
4	83.9	83.0	82.4	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...	
5	113	112	103	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...	
6	83.9	83.0	82.4	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...	
7	83.9	83.0	82.4	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...	
8	113	112	103	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...	
9	96.3	95.4	87.8	64.4	*49.7*	*39.3*	*31.4*	*24.5*	*19.4*	*15.5*	*12.1*	*9.85*	*7.93*	*5.62*	...	...	...	
10	71.3	70.6	69.9	64.0	*49.7*	*39.3*	*31.4*	*24.5*	*19.4*	*15.5*	*12.1*	*9.85*	*7.93*	*5.62*	...	...	...	
11	113	112	103	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...	
12	83.9	83.0	82.4	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...	
13	113	112	103	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...	
14	83.9	83.0	82.4	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...	
15	113	112	103	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...	
16	83.9	83.0	82.4	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...	
17	113	112	103	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...	
18	83.9	83.0	82.4	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...	
19	113	112	103	77.7	*58.7*	*46.0*	*36.9*	*28.7*	*22.9*	*18.4*	*14.4*	*11.5*	*9.16*	*6.64*	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
23	107	104	*94.7*	*73.7*	*57.9*	*46.0*	*36.9*	*30.1*	*24.3*	*20.3*	*17.0*	*14.3*	*12.1*	*10.3*	...	...	...	(**23**)
24	78.9	78.2	77.6	73.7	*57.9*	*46.0*	*36.9*	*30.1*	*24.3*	*20.3*	*17.0*	*14.3*	*12.1*	*10.3*	...	...	...	(**23**)
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	113	111	*87.4*	*57.5*	*44.4*	*32.9*	*24.5*	*18.3*	*12.6*	*8.41*	*6.18*	*4.37*	*2.77*	*1.62*	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
35	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
36	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
37	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	90.5	89.9	89.3	85.3	*68.1*	*55.6*	*42.9*	*33.0*	*25.3*	*19.4*	*14.7*	*11.3*	*8.90*	*6.77*	...	...	...	
42	67.1	66.5	65.9	65.3	64.0	*55.6*	*42.9*	*33.0*	*25.3*	*19.4*	*14.7*	*11.3*	*8.90*	*6.77*	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	18Cr–13Ni–3Mo	Smls. pipe	SA–312	TP317	S31700	...	...	8	1
2	18Cr–13Ni–3Mo	Wld. pipe	SA–312	TP317	S31700	...	...	8	1
3	18Cr–13Ni–3Mo	Wld. pipe	SA–312	TP317	S31700	...	...	8	1
4	18Cr–13Ni–3Mo	Smls. pipe	SA–312	TP317L	S31703	...	...	8	1
5	18Cr–13Ni–3Mo	Smls. pipe	SA–312	TP317L	S31703	...	...	8	1
6	18Cr–13Ni–3Mo	Wld. pipe	SA–312	TP317L	S31703	...	...	8	1
7	18Cr–13Ni–3Mo	Wld. pipe	SA–312	TP317L	S31703	...	...	8	1
8	18Cr–13Ni–3Mo	Smls. & wld. fittings	SA–403	317	S31700	...	...	8	1
9	18Cr–13Ni–3Mo	Fittings	SA–403	317L	S31703	CR	...	8	1
10	18Cr–13Ni–3Mo	Fittings	SA–403	317L	S31703	CR	...	8	1
11	18Cr–13Ni–3Mo	Fittings	SA–403	317L	S31703	WP–S	...	8	1
12	18Cr–13Ni–3Mo	Fittings	SA–403	317L	S31703	WP–S	...	8	1
13	18Cr–13Ni–3Mo	Fittings	SA–403	317L	S31703	WP–W	...	8	1
14	18Cr–13Ni–3Mo	Fittings	SA–403	317L	S31703	WP–W	...	8	1
15	18Cr–13Ni–3Mo	Fittings	SA–403	317L	S31703	WP–WU	...	8	1
16	18Cr–13Ni–3Mo	Fittings	SA–403	317L	S31703	WP–WU	...	8	1
17	18Cr–13Ni–3Mo	Fittings	SA–403	317L	S31703	WP–WX	...	8	1
18	18Cr–13Ni–3Mo	Fittings	SA–403	317L	S31703	WP–WX	...	8	1
19	18Cr–15Ni–4Si	Forgings	SA–182	...	S30600	Sol. ann.	...	8	1
20	18Cr–15Ni–4Si	Forgings	SA–182	...	S30600	Sol. ann.	...	8	1
21	18Cr–15Ni–4Si	Plate	SA–240	...	S30600	Sol. ann.	≤50	8	1
22	18Cr–15Ni–4Si	Plate	SA–240	...	S30600	Sol. ann.	≤50	8	1
23	18Cr–15Ni–4Si	Smls. & wld. pipe	SA–312	...	S30600	Sol. ann.	...	8	1
24	18Cr–15Ni–4Si	Smls. & wld. pipe	SA–312	...	S30600	Sol. ann.	...	8	1
25	18Cr–15Ni–4Si	Wld. pipe	SA–312	...	S30600	Sol. ann.	...	8	1
26	18Cr–15Ni–4Si	Wld. pipe	SA–312	...	S30600	Sol. ann.	...	8	1
27	18Cr–15Ni–4Si	Bar	SA–479	...	S30600	Sol. ann.	≤100	8	1
28	18Cr–15Ni–4Si	Bar	SA–479	...	S30600	Sol. ann.	≤100	8	1
29	18Cr–18Ni–2Si	Smls. tube	SA–213	XM–15	S38100	...	...	8	1
30	18Cr–18Ni–2Si	Smls. tube	SA–213	XM–15	S38100	...	...	8	1
31	18Cr–18Ni–2Si	Plate	SA–240	XM–15	S38100	...	...	8	1
32	18Cr–18Ni–2Si	Plate	SA–240	XM–15	S38100	...	...	8	1
33	18Cr–18Ni–2Si	Wld. tube	SA–249	TPXM–15	S38100	...	...	8	1
34	18Cr–18Ni–2Si	Wld. tube	SA–249	TPXM–15	S38100	...	...	8	1
35	18Cr–18Ni–2Si	Wld. pipe	SA–312	TPXM–15	S38100	...	...	8	1
36	18Cr–18Ni–2Si	Wld. pipe	SA–312	TPXM–15	S38100	...	...	8	1
37	18Cr–20Ni–5.5Si	Smls. tube	SA–213	...	S32615	Sol. ann.	...	8	1
38	18Cr–20Ni–5.5Si	Smls. tube	SA–213	...	S32615	Sol. ann.	...	8	1
39	18Cr–20Ni–5.5Si	Plate	SA–240	...	S32615	Sol. ann.	...	8	1
40	18Cr–20Ni–5.5Si	Plate	SA–240	...	S32615	Sol. ann.	...	8	1
41	18Cr–20Ni–5.5Si	Smls. & wld. pipe	SA–312	...	S32615	Sol. ann.	...	8	1
42	18Cr–20Ni–5.5Si	Smls. & wld. pipe	SA–312	...	S32615	Sol. ann.	...	8	1
43	18Cr–20Ni–5.5Si	Wld. pipe	SA–312	...	S32615	Sol. ann.	...	8	1
44	18Cr–20Ni–5.5Si	Wld. pipe	SA–312	...	S32615	Sol. ann.	...	8	1
45	18Cr–20Ni–5.5Si	Bar	SA–479	...	S32615	Sol. ann.	...	8	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	515	205	NP	NP	816	343	HA–2	G12, T9
2	515	205	NP	NP	816	343	HA–2	G5, G12, G24, T8
3	515	205	NP	NP	816	343	HA–2	G12, G24, T9
4	515	205	NP	NP	454	343	HA–4	G5
5	515	205	NP	NP	454	343	HA–4	...
6	515	205	NP	NP	454	343	HA–4	G5, G24
7	515	205	NP	NP	454	343	HA–4	G24
8	515	205	NP	NP	816	343	HA–2	G5, G12, T8, W14
9	515	205	NP	NP	454	343	HA–4	G5, G24
10	515	205	NP	NP	454	343	HA–4	G24
11	515	205	NP	NP	454	343	HA–4	G5
12	515	205	NP	NP	454	343	HA–4	...
13	515	205	NP	NP	454	343	HA–4	G5, G24
14	515	205	NP	NP	454	343	HA–4	G24
15	515	205	NP	NP	454	343	HA–4	G5, G24
16	515	205	NP	NP	454	343	HA–4	G24
17	515	205	NP	NP	454	343	HA–4	G5, G24
18	515	205	NP	NP	454	343	HA–4	G24
19	540	240	NP	NP	149	NP	HA–2	G5, G32, H6
20	540	240	NP	NP	149	NP	HA–2	G32, H6
21	540	240	NP	NP	149	NP	HA–2	G5, G32, H6
22	540	240	NP	NP	149	NP	HA–2	G32, H6
23	540	240	NP	NP	149	NP	HA–2	G5, G32, H6
24	540	240	NP	NP	149	NP	HA–2	G32, H6
25	540	240	NP	NP	149	NP	HA–2	G5, G24, G32, H6
26	540	240	NP	NP	149	NP	HA–2	G24, G32, H6
27	540	240	NP	NP	149	NP	HA–2	G5, G32, H6
28	540	240	NP	NP	149	NP	HA–2	G32, H6
29	515	205	NP	NP	538	343	HA–2	G5
30	515	205	NP	NP	538	343	HA–2	...
31	515	205	NP	NP	538	343	HA–2	G5
32	515	205	NP	NP	538	343	HA–2	...
33	515	205	NP	NP	538	343	HA–2	G5, G24
34	515	205	NP	NP	538	343	HA–2	G24
35	515	205	NP	NP	510	343	HA–2	G5, G24
36	515	205	NP	NP	538	343	HA–2	G24
37	540	220	NP	NP	204	NP	HA–2	G5, G32, H6
38	540	220	NP	NP	204	NP	HA–2	G32, H6
39	540	220	NP	NP	204	NP	HA–2	G5, G32, H6
40	540	220	NP	NP	204	NP	HA–2	G32, H6
41	550	220	NP	NP	204	NP	HA–2	G5, G32, H6
42	550	220	NP	NP	204	NP	HA–2	G32, H6
43	550	220	NP	NP	204	NP	HA–2	G5, G24, G32, H6
44	550	220	NP	NP	204	NP	HA–2	G24, G32, H6
45	550	220	NP	NP	204	NP	HA–2	G5, G32, H6

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
No.	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	138	128	118	112	107	99.2	92.8	88.1	86.1	84.1	82.9	82.0	81.4	80.6	79.8
2	117	117	117	117	117	114	107	101	99.0	96.8	95.7	94.4	93.1	92.5	91.4
3	117	109	99.8	94.9	90.8	84.0	78.8	74.7	73.3	72.1	70.8	69.6	69.0	68.4	67.7
4	138	138	138	138	135	131	123	118	116	113	111	109	107	105	103
5	138	126	115	109	105	97.1	91.3	87.3	85.4	83.8	82.5	80.6	79.4	78.1	76.9
6	117	117	117	117	115	111	105	99.9	97.9	96.0	94.2	93.0	91.1	89.3	87.4
7	117	107	98.5	93.0	88.8	82.5	78.0	74.1	72.6	71.4	70.1	68.9	67.7	66.4	65.2
8	138	138	138	138	138	134	126	119	116	114	112	111	110	108	108
9	117	117	117	116	115	111	105	99.9	97.9	96.0	94.2	93.0	91.1	89.3	87.4
10	117	108	98.3	93.0	88.8	82.5	78.0	74.1	72.6	71.4	70.1	68.9	67.7	66.4	65.2
11	138	138	138	137	135	131	123	118	116	113	111	109	107	105	103
12	138	127	115	109	105	97.1	91.2	87.3	85.4	83.8	82.5	80.6	79.4	78.1	76.9
13	117	117	117	116	115	111	105	99.9	97.9	96.0	94.2	93.0	91.1	89.3	87.4
14	117	108	98.3	93.0	88.8	82.5	78.0	74.1	72.6	71.4	70.1	68.9	67.7	66.4	65.2
15	117	117	117	116	115	111	105	99.9	97.9	96.0	94.2	93.0	91.1	89.3	87.4
16	117	108	98.3	93.0	88.8	82.5	78.0	74.1	72.6	71.4	70.1	68.9	67.7	66.4	65.2
17	117	117	117	116	115	111	105	99.9	97.9	96.0	94.2	93.0	91.1	89.3	87.4
18	117	108	98.3	93.0	88.8	82.5	78.0	74.1	72.6	71.4	70.1	68.9	67.7	66.4	65.2
19	153	...	147	...	135	...	...	...	...	...	...	...	...	...	...
20	153	...	124	...	111	...	...	...	...	...	...	...	...	...	...
21	153	...	147	...	135	...	...	...	...	...	...	...	...	...	...
22	153	...	124	...	111	...	...	...	...	...	...	...	...	...	...
23	153	...	147	...	135	...	...	...	...	...	...	...	...	...	...
24	153	...	124	...	111	...	...	...	...	...	...	...	...	...	...
25	130	...	125	...	116	...	...	...	...	...	...	...	...	...	...
26	130	...	105	...	94.4	...	...	...	...	...	...	...	...	...	...
27	153	...	147	...	135	...	...	...	...	...	...	...	...	...	...
28	153	...	124	...	111	...	...	...	...	...	...	...	...	...	...
29	138	138	137	134	130	126	122	116	114	111	109	107	105	103	101
30	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8
31	138	138	137	134	130	126	122	116	114	111	109	107	105	103	101
32	138	126	113	107	103	95.7	89.9	85.9	84.1	82.2	80.5	79.2	77.3	76.0	74.8
33	117	117	117	114	111	107	103	98.5	96.5	94.7	92.8	90.9	89.1	87.1	85.9
34	117	107	96.2	91.2	87.4	81.1	76.6	72.7	71.2	70.0	68.8	67.5	66.3	65.0	63.8
35	117	117	117	114	111	107	103	98.5	96.5	94.7	92.8	90.9	89.1	87.1	85.9
36	117	107	96.2	91.2	87.4	81.1	76.6	72.7	71.2	70.0	68.8	67.5	66.3	65.0	63.8
37	147	...	147	...	147	145	...	...	...	...	...	...	...	...	...
38	147	...	121	...	113	107	...	...	...	...	...	...	...	...	...
39	147	...	147	...	147	145	...	...	...	...	...	...	...	...	...
40	147	...	121	...	113	107	...	...	...	...	...	...	...	...	...
41	147	...	147	...	147	145	...	...	...	...	...	...	...	...	...
42	147	...	121	...	114	106	...	...	...	...	...	...	...	...	...
43	125	...	125	...	125	124	...	...	...	...	...	...	...	...	...
44	125	...	103	...	97.2	90.4	...	...	...	...	...	...	...	...	...
45	147	...	147	...	147	145	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	79.2	78.7	77.8	77.1	75.0	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...
2	90.5	89.9	89.3	85.3	*68.1*	*55.6*	*42.9*	*33.0*	*25.3*	*19.4*	*14.7*	*11.3*	*8.90*	*6.77*	...	...	...
3	67.1	66.5	65.9	65.3	64.0	*55.6*	*42.9*	*33.0*	*25.3*	*19.4*	*14.7*	*11.3*	*8.90*	*6.77*	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	107	106	105	99.8	*80.3*	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	99.3	98.0	93.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	73.6	72.4	70.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	99.3	98.0	93.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	73.6	72.4	70.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	84.0	83.2	79.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	62.6	61.3	60.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	84.0	83.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	62.6	61.3	60.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	18Cr–20Ni–5.5Si	Bar	SA–479	...	S32615	Sol. ann.	...	8	1
2	19Cr–9Ni–½Mo	Castings	SA–351	CF10	J92590	...	...	8	1
3	19Cr–9Ni–½Mo	Castings	SA–351	CF10	J92590	...	...	8	1
4	19Cr–9Ni–2Mo	Castings	SA–351	CF10M	...	...	...	8	1
5	19Cr–9Ni–2Mo	Castings	SA–351	CF10M	...	...	...	8	1
6	19Cr–10Ni–3Mo	Castings	SA–351	CG8M	J93000	...	...	8	1
7	19Cr–10Ni–3Mo	Castings	SA–351	CG8M	J93000	...	...	8	1
8	19Cr–15Ni–4Mo	Smls. tube	SA–213	...	S31725	...	...	8	4
9	19Cr–15Ni–4Mo	Smls. tube	SA–213	...	S31725	...	...	8	4
10	19Cr–15Ni–4Mo	Plate	SA–240	...	S31725	...	...	8	4
11	19Cr–15Ni–4Mo	Plate	SA–240	...	S31725	...	...	8	4
12	19Cr–15Ni–4Mo	Wld. tube	SA–249	...	S31725	...	...	8	4
13	19Cr–15Ni–4Mo	Wld. tube	SA–249	...	S31725	...	...	8	4
14	19Cr–15Ni–4Mo	Smls. pipe	SA–312	...	S31725	...	...	8	4
15	19Cr–15Ni–4Mo	Smls. pipe	SA–312	...	S31725	...	...	8	4
16	19Cr–15Ni–4Mo	Wld. pipe	SA–312	...	S31725	...	...	8	4
17	19Cr–15Ni–4Mo	Wld. pipe	SA–312	...	S31725	...	...	8	4
18	19Cr–15Ni–4Mo	Wld. pipe	SA–358	...	S31725	...	...	8	4
19	19Cr–15Ni–4Mo	Wld. pipe	SA–358	...	S31725	...	...	8	4
20	19Cr–15Ni–4Mo	Smls. pipe	SA–376	...	S31725	...	...	8	4
21	19Cr–15Ni–4Mo	Smls. pipe	SA–376	...	S31725	...	...	8	4
22	19Cr–15Ni–4Mo	Fittings	SA–403	...	S31725	...	...	8	4
23	19Cr–15Ni–4Mo	Wld. pipe	SA–409	...	S31725	...	...	8	4
24	19Cr–15Ni–4Mo	Wld. pipe	SA–409	...	S31725	...	...	8	4
25	19Cr–15Ni–4Mo	Bar	SA–479	...	S31725	...	...	8	4
26	19Cr–15Ni–4Mo	Bar	SA–479	...	S31725	...	...	8	4
27	20Cr–3Ni–1.5Mo–N	Plate	SA–240	...	S32003	...	$t > 5$	10H	1
28	20Cr–3Ni–1.5Mo–N	Wld. pipe	SA–790	...	S32003	...	...	10H	1
29	20Cr–3Ni–1.5Mo–N	Sheet	SA–240	...	S32003	...	$t \le 5$	10H	1
30	20Cr–3Ni–1.5Mo–N	Smls. tube	SA–789	...	S32003	...	$t \le 5$	10H	1
31	20Cr–3Ni–1.5Mo–N	Wld. tube	SA–789	...	S32003	...	$t \le 5$	10H	1
32	20Cr–3Ni–1.5Mo–N	Smls. tube	SA–789	...	S32003	...	$t > 5$	10H	1
33	20Cr–3Ni–1.5Mo–N	Wld. tube	SA–789	...	S32003	...	$t > 5$	10H	1
34	20Cr–10Ni	Bar	SA–479	ER308	S30880	...	...	...	...
35	20Cr–18Ni–6Mo	Castings	SA–351	CK3MCuN	J93254	...	...	8	4
36	20Cr–18Ni–6Mo	Castings	SA–351	CK3MCuN	J93254	...	...	8	4
37	20Cr–18Ni–6Mo	Forgings	SA–182	F44	S31254	...	...	8	4
38	20Cr–18Ni–6Mo	Forgings	SA–182	F44	S31254	...	...	8	4
39	20Cr–18Ni–6Mo	Fittings	SA–403	...	S31254	...	...	8	4
40	20Cr–18Ni–6Mo	Smls. tube	SA–213	...	S31254	...	$t > 5$	8	4
41	20Cr–18Ni–6Mo	Smls. tube	SA–213	...	S31254	...	$t > 5$	8	4
42	20Cr–18Ni–6Mo	Plate	SA–240	...	S31254	...	>5	8	4
43	20Cr–18Ni–6Mo	Plate	SA–240	...	S31254	...	>5	8	4
44	20Cr–18Ni–6Mo	Wld. tube	SA–249	...	S31254	...	$t > 5$	8	4
45	20Cr–18Ni–6Mo	Wld. tube	SA–249	...	S31254	...	$t > 5$	8	4

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	550	220	NP	NP	204	NP	HA–2	G32, H6
2	485	205	NP	NP	816	343	HA–1	G1, G5, G19, T6
3	485	205	NP	NP	816	343	HA–1	G1, G19, T7
4	485	205	NP	NP	816	NP	HA–2	G1, G5, G19, T6
5	485	205	NP	NP	816	NP	HA–2	G1, G19, T8
6	515	240	NP	NP	538	343	HA–2	G1, G5, G19
7	515	240	NP	NP	538	343	HA–2	G1, G19
8	515	205	NP	NP	204	204	HA–4	G5, G32
9	515	205	NP	NP	204	204	HA–4	G32
10	515	205	NP	NP	204	204	HA–4	G5, G32
11	515	205	NP	NP	204	204	HA–4	G32
12	515	205	NP	NP	204	204	HA–4	G5, G24, G32
13	515	205	NP	NP	204	204	HA–4	G24, G32
14	515	205	NP	NP	204	NP	HA–4	G5, G32
15	515	205	NP	NP	204	NP	HA–4	G32
16	515	205	NP	NP	204	NP	HA–4	G5, G24, G32
17	515	205	NP	NP	204	NP	HA–4	G24, G32
18	515	205	NP	NP	204	204	HA–4	G5, G24, G32
19	515	205	NP	NP	204	204	HA–4	G24, G32
20	515	205	NP	NP	204	204	HA–4	G5, G32
21	515	205	NP	NP	204	204	HA–4	G32
22	515	205	NP	NP	204	204	HA–4	G5, G32, W14
23	515	205	NP	NP	204	204	HA–4	G5, G24, G32
24	515	205	NP	NP	204	204	HA–4	G24, G32
25	515	205	NP	NP	204	204	HA–4	G5, G32
26	515	205	NP	NP	204	204	HA–4	G32
27	655	450	NP	NP	343	NP	HA–5	G19
28	655	450	NP	NP	343	NP	HA–5	G19, G24
29	690	485	NP	NP	343	NP	HA–5	G19
30	690	485	NP	NP	343	NP	HA–5	G19
31	690	485	NP	NP	343	NP	HA–5	G19, G24
32	655	450	NP	NP	343	NP	HA–5	G19
33	655	450	NP	NP	343	NP	HA–5	G19, G24
34	515	205	NP	427	NP	NP	HA–2	G5
35	550	260	NP	399	399	343	HA–2	G1, G5
36	550	260	NP	NP	399	343	HA–2	G1
37	650	300	NP	399	399	343	HA–2	G5
38	650	300	NP	NP	399	343	HA–2	...
39	650	305	NP	399	NP	NP	HA–2	G5, W12
40	655	310	NP	NP	399	NP	HA–2	G5
41	655	310	NP	NP	399	NP	HA–2	...
42	655	310	NP	399	399	343	HA–2	G5
43	655	310	NP	NP	399	343	HA–2	...
44	655	310	NP	399	399	343	HA–2	G5, G24
45	655	310	NP	NP	399	343	HA–2	G24

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
No.	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	147	...	121	...	114	106	...	...	...	...	...	...	...	...	...
2	138	134	130	126	122	119	118	115	114	111	109	107	105	103	101
3	138	126	113	107	103	95.7	90.0	85.6	83.9	82.3	80.5	79.2	77.7	76.4	74.9
4	138	138	138	136	134	133	125	119	116	114	112	111	110	108	107
5	138	129	119	113	108	99.3	92.7	88.1	86.1	84.4	83.2	82.0	81.1	80.2	79.5
6	148	146	143	139	135	132	128	122	120	117	116	114	113	112	111
7	148	139	127	120	113	102	94.9	90.0	88.4	87.2	86.0	84.7	83.5	82.9	81.7
8	138	138	138	137	135	131	...	...	...	...	...	...	...	...	...
9	138	127	115	109	105	97.2	...	...	...	...	...	...	...	...	...
10	138	138	138	137	135	131	...	...	...	...	...	...	...	...	...
11	138	127	115	109	105	97.2	...	...	...	...	...	...	...	...	...
12	117	117	117	116	114	111	...	...	...	...	...	...	...	...	...
13	117	108	97.6	92.6	88.8	82.6	...	...	...	...	...	...	...	...	...
14	138	138	138	137	135	131	...	...	...	...	...	...	...	...	...
15	138	127	115	109	105	97.2	...	...	...	...	...	...	...	...	...
16	117	117	117	116	114	111	...	...	...	...	...	...	...	...	...
17	117	108	97.6	92.6	88.8	82.6	...	...	...	...	...	...	...	...	...
18	117	117	117	116	114	111	...	...	...	...	...	...	...	...	...
19	117	108	97.6	92.6	88.8	82.6	...	...	...	...	...	...	...	...	...
20	138	138	138	137	135	131	...	...	...	...	...	...	...	...	...
21	138	127	115	109	105	97.2	...	...	...	...	...	...	...	...	...
22	138	...	138	...	135	131	...	...	...	...	...	...	...	...	...
23	117	117	117	116	114	111	...	...	...	...	...	...	...	...	...
24	117	108	97.6	92.6	88.8	82.6	...	...	...	...	...	...	...	...	...
25	138	138	138	137	135	131	...	...	...	...	...	...	...	...	...
26	138	127	115	109	105	97.2	...	...	...	...	...	...	...	...	...
27	187	187	180	174	171	169	169	169	169	169	...	...	...	...	...
28	159	159	153	148	145	144	144	144	144	144	...	...	...	...	...
29	197	197	189	183	180	178	178	178	178	178	...	...	...	...	...
30	197	197	189	183	180	178	178	178	178	178	...	...	...	...	...
31	167	167	161	156	153	151	151	151	151	151	...	...	...	...	...
32	187	187	180	174	171	169	169	169	169	169	...	...	...	...	...
33	159	159	153	148	145	144	144	144	144	144	...	...	...	...	...
34	138	138	137	134	130	126	122	116	114	111	109	107	105	103	...
35	158	158	158	154	149	143	139	136	135	134	133	132	...	...	...
36	158	151	141	134	127	119	112	107	106	105	104	103	...	...	...
37	185	185	185	181	176	168	163	159	158	157	156	156	...	...	...
38	185	175	162	154	147	137	129	125	123	121	120	119	...	...	...
39	185	185	185	181	176	168	163	159	158	157	156	156	...	...	...
40	187	187	187	182	178	170	165	161	160	159	158	158	...	...	...
41	187	181	166	157	151	140	133	127	125	124	123	122	...	...	...
42	187	187	186	183	178	170	164	161	160	159	158	158	...	...	...
43	187	178	167	158	151	140	133	128	125	124	123	122	...	...	...
44	159	159	159	155	151	145	140	137	136	135	135	134	...	...	...
45	159	154	141	134	128	119	113	108	107	105	104	104	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	99.5	92.8	*75.6*	*61.2*	*49.0*	*40.1*	*32.8*	*27.2*	*23.4*	*19.6*	*16.7*	*14.7*	*12.9*	*11.0*	...	...	...
3	73.6	72.6	70.0	*61.2*	*49.0*	*40.1*	*32.8*	*27.2*	*23.4*	*19.6*	*16.7*	*14.7*	*12.9*	*11.0*	...	...	...
4	107	104	*94.7*	*73.7*	*57.9*	*46.0*	*36.9*	*30.1*	*24.3*	*20.3*	*17.0*	*14.3*	*12.1*	*10.3*	...	...	...
5	78.9	78.2	77.6	73.7	*57.9*	*46.0*	*36.9*	*30.1*	*24.3*	*20.3*	*17.0*	*14.3*	*12.1*	*10.3*	...	...	...
6	109	97.7	72.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	80.5	78.9	77.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	20Cr–18Ni–6Mo	Smls. pipe	SA–312	...	S31254	...	$t > 5$	8	4
2	20Cr–18Ni–6Mo	Smls. pipe	SA–312	...	S31254	...	$t > 5$	8	4
3	20Cr–18Ni–6Mo	Wld. pipe	SA–312	...	S31254	...	$t > 5$	8	4
4	20Cr–18Ni–6Mo	Wld. pipe	SA–312	...	S31254	...	$t > 5$	8	4
5	20Cr–18Ni–6Mo	Wld. pipe	SA–358	...	S31254	...	$t \geq 5$	8	4
6	20Cr–18Ni–6Mo	Wld. pipe	SA–358	...	S31254	...	$t \geq 5$	8	4
7	20Cr–18Ni–6Mo	Smls. tube	SA–213	...	S31254	...	$t \leq 5$	8	4
8	20Cr–18Ni–6Mo	Smls. tube	SA–213	...	S31254	...	$t \leq 5$	8	4
9	20Cr–18Ni–6Mo	Wld. tube	SA–249	...	S31254	...	$t \leq 5$	8	4
10	20Cr–18Ni–6Mo	Wld. tube	SA–249	...	S31254	...	$t \leq 5$	8	4
11	20Cr–18Ni–6Mo	Smls. pipe	SA–312	...	S31254	...	$t \leq 5$	8	4
12	20Cr–18Ni–6Mo	Smls. pipe	SA–312	...	S31254	...	$t \leq 5$	8	4
13	20Cr–18Ni–6Mo	Wld. pipe	SA–312	...	S31254	...	$t \leq 5$	8	4
14	20Cr–18Ni–6Mo	Wld. pipe	SA–312	...	S31254	...	$t \leq 5$	8	4
15	20Cr–18Ni–6Mo	Plate	SA–240	...	S31254	...	≤5	8	4
16	20Cr–18Ni–6Mo	Plate	SA–240	...	S31254	...	≤5	8	4
17	20Cr–18Ni–6Mo	Wld. pipe	SA–358	...	S31254	...	$t < 5$	8	4
18	20Cr–18Ni–6Mo	Wld. pipe	SA–358	...	S31254	...	$t < 5$	8	4
(**23**) 19	20.5Cr–8.8Ni–Mo–N	Plate	SA–240	...	S31655	...	...	8	3
(**23**) 20	20.5Cr–8.8Ni–Mo–N	Plate	SA–240	...	S31655	...	...	8	3
21	21Cr–5Mn–1.5Ni–Cu–N	Plate	SA–240	...	S32101	...	>5	10H	1
22	21Cr–5Mn–1.5Ni–Cu–N	Bar	SA–479	...	S32101	...	...	10H	1
23	21Cr–5Mn–1.5Ni–Cu–N	Smls. tube	SA–789	...	S32101	...	>5	10H	1
24	21Cr–5Mn–1.5Ni–Cu–N	Wld. tube	SA–789	...	S32101	...	>5	10H	1
25	21Cr–5Mn–1.5Ni–Cu–N	Smls. pipe	SA–790	...	S32101	...	>5	10H	1
26	21Cr–5Mn–1.5Ni–Cu–N	Wld. pipe	SA–790	...	S32101	...	>5	10H	1
27	21Cr–5Mn–1.5Ni–Cu–N	Fittings	SA–815	...	S32101	...	...	10H	1
28	21Cr–5Mn–1.5Ni–Cu–N	Sheet, strip	SA–240	...	S32101	...	≤5	10H	1
29	21Cr–5Mn–1.5Ni–Cu–N	Smls. tube	SA–789	...	S32101	...	≤5	10H	1
30	21Cr–5Mn–1.5Ni–Cu–N	Wld. tube	SA–789	...	S32101	...	≤5	10H	1
31	21Cr–5Mn–1.5Ni–Cu–N	Smls. pipe	SA–790	...	S32101	...	≤5	10H	1
32	21Cr–5Mn–1.5Ni–Cu–N	Wld. pipe	SA–790	...	S32101	...	≤5	10H	1
33	21Cr–6Ni–9Mn	Forgings	SA–182	FXM–11	S21904	...	...	8	3
34	21Cr–6Ni–9Mn	Smls. pipe	SA–312	TPXM–11	S21904	...	...	8	3
35	21Cr–6Ni–9Mn	Smls. pipe	SA–312	TPXM–11	S21904	...	...	8	3
36	21Cr–6Ni–9Mn	Wld. pipe	SA–312	TPXM–11	S21904	...	...	8	3
37	21Cr–6Ni–9Mn	Wld. pipe	SA–312	TPXM–11	S21904	...	...	8	3
38	21Cr–6Ni–9Mn	Plate	SA–666	XM–11	S21904	...	...	8	3
39	21Cr–6Ni–9Mn	Plate	SA–666	XM–11	S21904	...	...	8	3
40	21Cr–6Ni–9Mn	Forgings	SA–965	FXM–11	S21904	...	...	8	3
41	21Cr–6Ni–9Mn	Forgings	SA–965	FXM–11	S21904	...	...	8	3
42	21Cr–11Ni–N	Forgings	SA–182	F45	S30815	...	...	8	2
43	21Cr–11Ni–N	Forgings	SA–182	F45	S30815	...	...	8	2
44	21Cr–11Ni–N	Smls. tube	SA–213	...	S30815	...	...	8	2
45	21Cr–11Ni–N	Smls. tube	SA–213	...	S30815	...	...	8	2

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	655	310	NP	399	399	NP	HA–2	G5
2	655	310	NP	NP	399	NP	HA–2	...
3	655	310	NP	399	399	NP	HA–2	G5, G24
4	655	310	NP	NP	399	NP	HA–2	G24
5	655	310	NP	399	399	343	HA–2	G5, G24
6	655	310	NP	NP	399	343	HA–2	G24
7	675	310	NP	NP	399	NP	HA–2	G5
8	675	310	NP	NP	399	NP	HA–2	...
9	675	310	NP	399	399	343	HA–2	G5, G24
10	675	310	NP	NP	399	343	HA–2	G24
11	675	310	NP	399	399	NP	HA–2	G5
12	675	310	NP	NP	399	NP	HA–2	...
13	675	310	NP	399	399	NP	HA–2	G5, G24
14	675	310	NP	NP	399	NP	HA–2	G24
15	690	310	NP	399	399	343	HA–2	G5
16	690	310	NP	NP	399	343	HA–2	...
17	690	310	NP	399	399	343	HA–2	G5
18	690	310	NP	NP	399	343	HA–2	...
19	635	310	NP	NP	454	NP	HA–2	G5
20	635	310	NP	NP	454	NP	HA–2	...
21	650	450	NP	NP	316	NP	HA–5	G19
22	650	450	NP	NP	316	NP	HA–5	G19
23	650	450	NP	NP	316	NP	HA–5	G19
24	650	450	NP	NP	316	NP	HA–5	G19, G24
25	650	450	NP	NP	316	NP	HA–5	G19
26	650	450	NP	NP	316	NP	HA–5	G19, G24
27	650	450	NP	NP	316	NP	HA–5	G19, W14
28	700	530	NP	NP	316	NP	HA–5	G19
29	700	530	NP	NP	316	NP	HA–5	G19
30	700	530	NP	NP	316	NP	HA–5	G19, G24
31	700	530	NP	NP	316	NP	HA–5	G19
32	700	530	NP	NP	316	NP	HA–5	G19, G24
33	620	345	NP	NP	316	316	HA–6	...
34	620	345	NP	NP	316	316	HA–6	G5
35	620	345	NP	NP	316	316	HA–6	...
36	620	345	NP	NP	316	316	HA–6	G5, G24
37	620	345	NP	NP	316	316	HA–6	G24
38	620	345	NP	NP	316	316	HA–6	G5
39	620	345	NP	NP	316	316	HA–6	...
40	620	345	NP	NP	316	316	HA–6	G5
41	620	345	NP	NP	316	316	HA–6	...
42	600	310	899	NP	899	343	HA–6	G5, G6, T5
43	600	310	899	NP	899	343	HA–6	G6, T6
44	600	310	899	NP	899	343	HA–6	G5, G6, T5
45	600	310	899	NP	899	343	HA–6	G6, T6

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	187	187	187	182	178	170	165	161	160	159	158	158	...	...	...
2	187	181	166	157	151	140	133	127	125	124	123	122	...	...	...
3	159	159	159	155	151	145	140	137	136	135	135	134	...	...	...
4	159	154	141	134	128	119	113	108	107	105	104	104	...	...	...
5	159	159	159	155	151	145	140	137	136	135	135	134	...	...	...
6	159	154	141	134	128	119	113	108	107	105	104	104	...	...	...
7	193	193	192	188	183	175	170	166	165	164	163	162	...	...	...
8	193	181	166	157	151	140	133	127	125	124	123	122	...	...	...
9	164	164	163	160	156	149	144	141	140	139	139	138	...	...	...
10	164	154	141	134	128	119	113	108	107	105	104	104	...	...	...
11	193	193	192	188	183	175	170	166	165	164	163	162	...	...	...
12	193	181	166	157	151	140	133	127	125	124	123	122	...	...	...
13	164	164	163	160	156	149	144	141	140	139	139	138	...	...	...
14	164	154	141	134	128	119	113	108	107	105	104	104	...	...	...
15	197	197	197	193	187	179	173	169	168	167	166	165	...	...	...
16	197	182	166	158	151	140	133	128	125	124	123	122	...	...	...
17	167	167	167	163	159	150	147	144	143	142	141	140	...	...	...
18	167	154	141	134	128	116	113	108	107	105	104	104	...	...	...
19	181	181	177	172	168	161	156	153	152	151	150	148	147	145	143
20	181	179	162	153	145	134	127	121	119	117	115	113	111	109	107
21	186	186	186	...	177	171	170	170	170	...	...	...	...	...	...
22	186	186	186	...	177	171	170	170	170	...	...	...	...	...	...
23	186	186	186	...	177	171	170	170	170	...	...	...	...	...	...
24	158	158	158	...	150	145	145	145	145	...	...	...	...	...	...
25	186	186	186	...	177	171	170	170	170	...	...	...	...	...	...
26	158	158	158	...	150	145	145	145	145	...	...	...	...	...	...
27	186	186	186	...	177	171	170	170	170	...	...	...	...	...	...
28	200	200	200	...	190	184	183	183	183	...	...	...	...	...	...
29	200	200	200	...	190	184	183	183	183	...	...	...	...	...	...
30	170	170	170	...	162	157	156	156	156	...	...	...	...	...	...
31	200	200	200	...	190	184	183	183	183	...	...	...	...	...	...
32	170	170	170	...	162	157	156	156	156	...	...	...	...	...	...
33	177	177	176	165	151	136	126	120	117	...	...	...	...	...	...
34	177	177	177	172	165	158	153	149	148	...	...	...	...	...	...
35	177	177	176	165	151	136	126	120	117	...	...	...	...	...	...
36	151	151	151	146	140	134	130	127	126	...	...	...	...	...	...
37	151	151	150	140	128	115	107	102	99.9	...	...	...	...	...	...
38	177	177	177	172	165	158	153	149	148	...	...	...	...	...	...
39	177	177	176	165	151	136	126	120	117	...	...	...	...	...	...
40	177	177	177	172	165	158	153	149	148	...	...	...	...	...	...
41	177	177	176	165	151	136	126	120	117	...	...	...	...	...	...
42	172	171	170	165	160	155	151	148	147	146	145	143	142	140	138
43	172	171	169	161	151	138	129	123	121	120	118	117	116	115	113
44	172	171	170	165	160	155	151	148	147	146	145	143	142	140	138
45	172	171	169	161	151	138	129	123	121	120	118	117	116	115	113

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	136	*117*	*93.4*	*73.6*	*58.4*	*45.8*	*35.5*	*28.0*	*22.3*	*17.7*	*14.2*	*11.9*	*10.2*	*8.19*	*6.58*	*5.80*	*4.85*	
43	112	109	*93.4*	*73.6*	*58.4*	*45.8*	*35.5*	*28.0*	*22.3*	*17.7*	*14.2*	*11.9*	*10.2*	*8.19*	*6.58*	*5.80*	*4.85*	
44	136	*117*	*93.4*	*73.6*	*58.4*	*45.8*	*35.5*	*28.0*	*22.3*	*17.7*	*14.2*	*11.9*	*10.2*	*8.19*	*6.58*	*5.80*	*4.85*	
45	112	109	*93.4*	*73.6*	*58.4*	*45.8*	*35.5*	*28.0*	*22.3*	*17.7*	*14.2*	*11.9*	*10.2*	*8.19*	*6.58*	*5.80*	*4.85*	

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	21Cr–11Ni–N	Plate	SA–240	...	S30815	...	...	8	2
2	21Cr–11Ni–N	Plate	SA–240	...	S30815	...	...	8	2
3	21Cr–11Ni–N	Wld. tube	SA–249	...	S30815	...	...	8	2
4	21Cr–11Ni–N	Wld. tube	SA–249	...	S30815	...	...	8	2
5	21Cr–11Ni–N	Smls. pipe	SA–312	...	S30815	...	...	8	2
6	21Cr–11Ni–N	Smls. pipe	SA–312	...	S30815	...	...	8	2
7	21Cr–11Ni–N	Wld. pipe	SA–312	...	S30815	...	...	8	2
8	21Cr–11Ni–N	Wld. pipe	SA–312	...	S30815	...	...	8	2
9	21Cr–11Ni–N	Bar	SA–479	...	S30815	...	...	8	2
10	21Cr–11Ni–N	Bar	SA–479	...	S30815	...	...	8	2
11	22Cr–2Ni–Mo–N	Forgings	SA–182	F66	S32202	...	...	10H	1
12	22Cr–2Ni–Mo–N	Plate	SA–240	...	S32202	...	...	10H	1
13	22Cr–2Ni–Mo–N	Bar	SA–479	...	S32202	...	...	10H	1
14	22Cr–2Ni–Mo–N	Smls. tube	SA–789	...	S32202	...	...	10H	1
15	22Cr–2Ni–Mo–N	Wld. tube	SA–789	...	S32202	...	...	10H	1
16	22Cr–2Ni–Mo–N	Smls. pipe	SA–790	...	S32202	...	...	10H	1
17	22Cr–2Ni–Mo–N	Wld. pipe	SA–790	...	S32202	...	...	10H	1
18	22Cr–2Ni–Mo–N	Smls. fittings	SA–815	...	S32202	...	...	10H	1
19	22Cr–2Ni–Mo–N	Wld. fittings	SA–815	...	S32202	...	...	10H	1
20	22Cr–5Ni–3Mo–N	Castings	SA–995	4A	J92205	...	...	10H	1
21	22Cr–5Ni–3Mo–N	Forgings	SA–182	F51	S31803	...	...	10H	1
22	22Cr–5Ni–3Mo–N	Plate	SA–240	...	S31803	...	...	10H	1
23	22Cr–5Ni–3Mo–N	Bar	SA–479	...	S31803	...	...	10H	1
24	22Cr–5Ni–3Mo–N	Smls. tube	SA–789	...	S31803	...	...	10H	1
25	22Cr–5Ni–3Mo–N	Wld. tube	SA–789	...	S31803	...	...	10H	1
26	22Cr–5Ni–3Mo–N	Smls. pipe	SA–790	...	S31803	...	...	10H	1
27	22Cr–5Ni–3Mo–N	Wld. pipe	SA–790	...	S31803	...	...	10H	1
28	22Cr–5Ni–3Mo–N	Smls. fittings	SA–815	...	S31803	...	...	10H	1
29	22Cr–5Ni–3Mo–N	Wld. fittings	SA–815	...	S31803	...	...	10H	1
30	22Cr–5Ni–3Mo–N	Smls. & wld. fittings	SA–815	...	S31803	...	...	10H	1
31	22Cr–5Ni–3Mo–N	Plate	SA–240	...	S32205	...	...	10H	1
32	22Cr–5Ni–3Mo–N	Bar	SA–479	...	S32205	...	...	10H	1
33	22Cr–5Ni–3Mo–N	Smls. & wld. pipe	SA–790	...	S32205	...	...	10H	1
34	22Cr–5Ni–3Mo–N	Smls. pipe	SA–790	...	S32205	...	...	10H	1
35	22Cr–5Ni–3Mo–N	Wld. pipe	SA–790	...	S32205	...	...	10H	1
36	22Cr–5Ni–3Mo–N	Smls. & wld. fittings	SA–815	...	S32205	...	...	10H	1
37	22Cr–5Ni–3Mo–N	Smls. fittings	SA–815	...	S32205	...	...	10H	1
38	22Cr–5Ni–3Mo–N	Wld. fittings	SA–815	...	S32205	...	...	10H	1
39	22Cr–5Ni–3Mo–N	Forgings	SA–182	F60	S32205	...	...	10H	1
40	22Cr–5Ni–3Mo–N	Smls. & wld. tube	SA–789	...	S32205	...	...	10H	1
41	22Cr–5Ni–3Mo–N	Smls. tube	SA–789	...	S32205	...	...	10H	1
42	22Cr–5Ni–3Mo–N	Wld. tube	SA–789	...	S32205	...	...	10H	1
43	22Cr–13Ni–5Mn	Castings	SA–351	CG6MMN	J93790	...	...	8	3
44	22Cr–13Ni–5Mn	Forgings	SA–182	FXM–19	S20910	...	...	8	3
45	22Cr–13Ni–5Mn	Smls. tube	SA–213	XM–19	S20910	...	...	8	3

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	600	310	899	NP	899	343	HA–6	G5, G6, T5
2	600	310	899	NP	899	343	HA–6	G6, T6
3	600	310	899	NP	899	343	HA–6	G5, G6, G24, T5
4	600	310	899	NP	899	343	HA–6	G6, G24, T6
5	600	310	899	NP	899	343	HA–6	G5, G6, T5
6	600	310	899	NP	899	343	HA–6	G6, T6
7	600	310	899	NP	899	343	HA–6	G5, G6, G24, T5
8	600	310	899	NP	899	343	HA–6	G6, G24, T6
9	600	310	899	NP	899	343	HA–6	G5, G6, T5
10	600	310	899	NP	899	343	HA–6	G6, T6
11	648	448	NP	NP	316	NP	HA–5	G19
12	648	448	NP	NP	316	NP	HA–5	G19
13	648	448	NP	NP	316	NP	HA–5	G19
14	648	448	NP	NP	316	NP	HA–5	G19
15	648	448	NP	NP	316	NP	HA–5	G19, G24
16	648	448	NP	NP	316	NP	HA–5	G19
17	648	448	NP	NP	316	NP	HA–5	G19, G24
18	648	448	NP	NP	316	NP	HA–5	G19
19	648	448	NP	NP	316	NP	HA–5	G3, G19
20	620	415	NP	NP	260	NP	HA–5	G1, G19
21	620	450	316	NP	316	316	HA–5	G19
22	620	450	316	NP	316	316	HA–5	G19
23	620	450	316	NP	316	NP	HA–5	G19
24	620	450	316	NP	316	316	HA–5	G19
25	620	450	316	NP	316	316	HA–5	G19, G24
26	620	450	316	NP	316	316	HA–5	G19
27	620	450	316	NP	316	316	HA–5	G19, G24
28	620	450	316	NP	NP	NP	HA–5	G19
29	620	450	316	NP	NP	NP	HA–5	G19, G24
30	620	450	NP	NP	316	316	HA–5	G19, W14
31	655	450	NP	316	316	316	HA–5	G19
32	655	450	NP	316	316	NP	HA–5	G19
33	655	450	NP	316	NP	NP	HA–5	G19, W12
34	655	450	NP	NP	316	316	HA–5	G19
35	655	450	NP	NP	316	316	HA–5	G19, G24
36	655	450	NP	316	NP	NP	HA–5	G19, W12
37	655	450	NP	NP	316	316	HA–5	G19
38	655	450	NP	NP	316	316	HA–5	G19, G24
39	655	480	NP	316	316	316	HA–5	G19
40	655	480	NP	316	NP	NP	HA–5	G19, W12
41	655	480	NP	NP	316	316	HA–5	G19
42	655	480	NP	NP	316	316	HA–5	G19, G24
43	585	295	NP	NP	566	343	HA–2	G1
44	690	380	NP	427	649	343	HA–6	G5, T8
45	690	380	NP	NP	649	NP	HA–6	T8

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	172	171	170	165	160	155	151	148	147	146	145	143	142	140	138
2	172	171	169	161	151	138	129	123	121	120	118	117	116	115	113
3	145	145	144	141	136	132	128	126	125	124	123	122	121	119	118
4	145	145	144	137	129	117	110	105	103	102	101	99.9	98.7	98.0	96.9
5	172	171	170	165	160	155	151	148	147	146	145	143	142	140	138
6	172	171	169	161	151	138	129	123	121	120	118	117	116	115	113
7	145	145	144	141	136	132	128	126	125	124	123	122	121	119	118
8	145	145	144	137	129	117	110	105	103	102	101	99.9	98.7	98.0	96.9
9	172	171	170	165	160	155	151	148	147	146	145	143	142	140	138
10	172	171	169	161	151	138	129	123	121	120	118	117	116	115	113
11	185	185	182	175	171	170	170	170	170	...	...	...	...	...	...
12	185	185	182	175	171	170	170	170	170	...	...	...	...	...	...
13	185	185	182	175	171	170	170	170	170	...	...	...	...	...	...
14	185	185	182	175	171	170	170	170	170	...	...	...	...	...	...
15	157	157	154	149	146	144	144	144	144	...	...	...	...	...	...
16	185	185	182	175	171	170	170	170	170	...	...	...	...	...	...
17	157	157	154	149	146	144	144	144	144	...	...	...	...	...	...
18	185	185	182	175	171	170	170	170	170	...	...	...	...	...	...
19	157	157	154	149	146	144	144	144	144	...	...	...	...	...	...
20	177	177	177	173	170	168	168	168	...	...	...	...	...	...	...
21	177	177	177	174	171	165	161	160	159	...	...	...	...	...	...
22	177	177	177	174	171	165	161	160	159	...	...	...	...	...	...
23	177	177	177	174	171	165	161	160	159	...	...	...	...	...	...
24	177	177	177	174	171	165	161	160	159	...	...	...	...	...	...
25	151	151	151	148	145	140	137	135	135	...	...	...	...	...	...
26	177	177	177	174	171	165	161	160	159	...	...	...	...	...	...
27	151	151	151	148	145	140	137	135	135	...	...	...	...	...	...
28	177	177	177	174	171	165	161	160	159	...	...	...	...	...	...
29	151	151	151	148	145	140	137	135	135	...	...	...	...	...	...
30	177	177	177	174	171	165	161	160	159	...	...	...	...	...	...
31	187	187	187	184	180	174	170	168	168	...	...	...	...	...	...
32	187	187	187	184	180	174	170	168	168	...	...	...	...	...	...
33	187	187	187	184	180	174	170	168	168	...	...	...	...	...	...
34	187	187	187	184	180	174	170	168	168	...	...	...	...	...	...
35	159	159	159	156	153	148	145	143	143	...	...	...	...	...	...
36	187	187	187	184	180	174	170	168	168	...	...	...	...	...	...
37	187	187	187	184	180	174	170	168	168	...	...	...	...	...	...
38	159	159	159	156	153	148	145	143	143	...	...	...	...	...	...
39	187	187	187	184	180	174	170	168	168	...	...	...	...	...	...
40	187	187	187	184	180	174	170	168	168	...	...	...	...	...	...
41	187	187	187	184	180	174	170	168	168	...	...	...	...	...	...
42	159	159	159	156	153	148	145	143	143	...	...	...	...	...	...
43	134	133	132	128	123	116	111	107	106	104	102	101	101	99.5	98.2
44	197	196	195	191	185	180	176	174	173	171	170	169	167	165	163
45	197	196	195	191	185	180	176	174	172	169	167	165	162	161	159

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	136	*117*	*93.4*	*73.6*	*58.4*	*45.8*	*35.5*	*28.0*	*22.3*	*17.7*	*14.2*	*11.9*	*10.2*	*8.19*	*6.58*	*5.80*	*4.85*
2	112	109	*93.4*	*73.6*	*58.4*	*45.8*	*35.5*	*28.0*	*22.3*	*17.7*	*14.2*	*11.9*	*10.2*	*8.19*	*6.58*	*5.80*	*4.85*
3	114	*101*	*79.6*	*62.9*	*50.0*	*39.1*	*30.0*	*23.8*	*18.7*	*14.7*	*11.8*	*10.3*	*8.82*	*6.89*	*5.61*	*4.92*	*4.10*
4	95.6	92.7	*79.6*	*62.9*	*50.0*	*39.1*	*30.0*	*23.8*	*18.7*	*14.7*	*11.8*	*10.3*	*8.82*	*6.89*	*5.61*	*4.92*	*4.10*
5	136	*117*	*93.4*	*73.6*	*58.4*	*45.8*	*35.5*	*28.0*	*22.3*	*17.7*	*14.2*	*11.9*	*10.2*	*8.19*	*6.58*	*5.80*	*4.85*
6	112	109	*93.4*	*73.6*	*58.4*	*45.8*	*35.5*	*28.0*	*22.3*	*17.7*	*14.2*	*11.9*	*10.2*	*8.19*	*6.58*	*5.80*	*4.85*
7	114	*101*	*79.6*	*62.9*	*50.0*	*39.1*	*30.0*	*23.8*	*18.7*	*14.7*	*11.8*	*10.3*	*8.82*	*6.89*	*5.61*	*4.92*	*4.10*
8	95.6	92.7	*79.6*	*62.9*	*50.0*	*39.1*	*30.0*	*23.8*	*18.7*	*14.7*	*11.8*	*10.3*	*8.82*	*6.89*	*5.61*	*4.92*	*4.10*
9	136	*117*	*93.4*	*73.6*	*58.4*	*45.8*	*35.5*	*28.0*	*22.3*	*17.7*	*14.2*	*11.9*	*10.2*	*8.19*	*6.58*	*5.80*	*4.85*
10	112	109	*93.4*	*73.6*	*58.4*	*45.8*	*35.5*	*28.0*	*22.3*	*17.7*	*14.2*	*11.9*	*10.2*	*8.19*	*6.58*	*5.80*	*4.85*
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	97.5	96.6	95.0	93.1	...	...	...	...	...	...	...	...	...	...	...	...	...
44	161	158	157	152	*132*	*83.6*	*56.1*	...	...	...	...	...	...	...	...	...	...
45	157	156	154	152	*132*	*83.6*	*56.1*	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	22Cr–13Ni–5Mn	Plate	SA–240	XM–19	S20910	...	...	8	3
2	22Cr–13Ni–5Mn	Wld. tube	SA–249	TPXM–19	S20910	...	...	8	3
3	22Cr–13Ni–5Mn	Wld. tube	SA–249	TPXM–19	S20910	...	...	8	3
4	22Cr–13Ni–5Mn	Smls. & wld. pipe	SA–312	TPXM–19	S20910	...	...	8	3
5	22Cr–13Ni–5Mn	Smls. pipe	SA–312	TPXM–19	S20910	...	...	8	3
6	22Cr–13Ni–5Mn	Wld. pipe	SA–312	TPXM–19	S20910	...	...	8	3
7	22Cr–13Ni–5Mn	Wld. pipe	SA–358	XM–19	S20910	1	...	8	3
8	22Cr–13Ni–5Mn	Smls. & wld. fittings	SA–403	XM–19	S20910	...	...	8	3
9	22Cr–13Ni–5Mn	Bar	SA–479	XM–19	S20910	...	...	8	3
10	22Cr–13Ni–5Mn	Wld. pipe	SA–813	TPXM–19	S20910	...	...	8	3
11	22Cr–13Ni–5Mn	Wld. pipe	SA–814	TPXM–19	S20910	...	...	8	3
12	23Cr–4Ni–Mo–Cu–N	Plate	SA–240	...	S32304	...	...	10H	1
13	23Cr–4Ni–Mo–Cu–N	Smls. tube	SA–789	...	S32304	...	>25	10H	1
14	23Cr–4Ni–Mo–Cu–N	Wld. tube	SA–789	...	S32304	...	>25	10H	1
15	23Cr–4Ni–Mo–Cu–N	Smls. pipe	SA–790	...	S32304	...	...	10H	1
16	23Cr–4Ni–Mo–Cu–N	Wld. pipe	SA–790	...	S32304	...	...	10H	1
17	23Cr–4Ni–Mo–Cu–N	Smls. tube	SA–789	...	S32304	...	≤25	10H	1
18	23Cr–4Ni–Mo–Cu–N	Wld. tube	SA–789	...	S32304	...	≤25	10H	1
19	23Cr–12Ni	Smls. & wld. fittings	SA–403	309	S30900	...	...	8	2
20	23Cr–12Ni	Smls. tube	SA–213	TP309S	S30908	...	...	8	2
21	23Cr–12Ni	Smls. tube	SA–213	TP309S	S30908	...	...	8	2
22	23Cr–12Ni	Plate	SA–240	309S	S30908	...	...	8	2
23	23Cr–12Ni	Plate	SA–240	309S	S30908	...	...	8	2
24	23Cr–12Ni	Wld. tube	SA–249	TP309S	S30908	...	...	8	2
25	23Cr–12Ni	Wld. tube	SA–249	TP309S	S30908	...	...	8	2
26	23Cr–12Ni	Smls. & wld. pipe	SA–312	TP309S	S30908	...	...	8	2
27	23Cr–12Ni	Smls. pipe	SA–312	TP309S	S30908	...	...	8	2
28	23Cr–12Ni	Wld. pipe	SA–312	TP309S	S30908	...	...	8	2
29	23Cr–12Ni	Wld. pipe	SA–312	TP309S	S30908	...	...	8	2
30	23Cr–12Ni	Wld. pipe	SA–312	TP309S	S30908	...	...	8	2
31	23Cr–12Ni	Wld. pipe	SA–312	TP309S	S30908	...	...	8	2
32	23Cr–12Ni	Wld. pipe	SA–358	309S	S30908	1	...	8	2
33	23Cr–12Ni	Bar	SA–479	309S	S30908	...	...	8	2
34	23Cr–12Ni	Bar	SA–479	309S	S30908	...	...	8	2
35	23Cr–12Ni	Wld. pipe	SA–813	TP309S	S30908	...	...	8	2
36	23Cr–12Ni	Wld. pipe	SA–813	TP309S	S30908	...	...	8	2
37	23Cr–12Ni	Wld. pipe	SA–814	TP309S	S30908	...	...	8	2
38	23Cr–12Ni	Wld. pipe	SA–814	TP309S	S30908	...	...	8	2
39	23Cr–12Ni	Smls. tube	SA–213	TP309H	S30909	...	...	8	2
40	23Cr–12Ni	Smls. tube	SA–213	TP309H	S30909	...	...	8	2
41	23Cr–12Ni	Plate	SA–240	309H	S30909	...	...	8	2
42	23Cr–12Ni	Plate	SA–240	309H	S30909	...	...	8	2
43	23Cr–12Ni	Wld. tube	SA–249	TP309H	S30909	...	...	8	2
44	23Cr–12Ni	Wld. tube	SA–249	TP309H	S30909	...	...	8	2
45	23Cr–12Ni	Wld. tube	SA–249	TP309H	S30909	...	...	8	2

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	690	380	NP	427	649	343	HA–6	G5, T8
2	690	380	NP	427	NP	NP	HA–6	G5, W12
3	690	380	NP	NP	649	343	HA–6	G24, T8
4	690	380	NP	427	NP	NP	HA–6	G5, W12
5	690	380	NP	NP	649	343	HA–6	T8
6	690	380	NP	NP	649	343	HA–6	G24, T8
7	690	380	NP	427	NP	NP	HA–6	G5, W12
8	690	380	NP	427	649	343	HA–6	G5, T8, W12, W14
9	690	380	NP	427	649	343	HA–6	G5, G22, T8
10	690	380	NP	427	NP	NP	HA–6	G5, W12
11	690	380	NP	427	NP	NP	HA–6	G5, W12
12	600	400	NP	NP	316	316	HA–6	G19
13	600	400	NP	NP	316	316	HA–6	G19
14	600	400	NP	NP	316	316	HA–6	G19, G24
15	600	400	NP	NP	316	316	HA–6	G19
16	600	400	NP	NP	316	316	HA–6	G19, G24
17	690	450	NP	NP	316	316	HA–5	G19
18	690	450	NP	NP	316	316	HA–5	G19, G24
19	515	205	NP	427	816	343	HA–2	G5, G12, T5, W12, W14
20	515	205	816	NP	816	343	HA–2	G5, G12, T5
21	515	205	816	NP	816	343	HA–2	G12, T6
22	515	205	816	427	816	343	HA–2	G5, G12, T5
23	515	205	816	NP	816	343	HA–2	G12, T6
24	515	205	NP	NP	816	343	HA–2	G5, G12, G24, T5
25	515	205	NP	NP	816	343	HA–2	G12, G24, T6
26	515	205	816	427	816	343	HA–2	G5, G12, T5, W12, W14
27	515	205	816	NP	816	343	HA–2	G12, T6
28	515	205	816	NP	NP	NP	HA–2	G5, G12, T5, W13
29	515	205	816	NP	NP	NP	HA–2	G12, T6, W13
30	515	205	816	NP	816	343	HA–2	G3, G5, G12, G24, T5
31	515	205	816	NP	816	343	HA–2	G3, G12, G24, T6
32	515	205	NP	427	NP	NP	HA–2	G5, W12
33	515	205	538	NP	538	343	HA–2	G5, G12, G22, T5
34	515	205	538	NP	538	343	HA–2	G12, G22, T6
35	515	205	NP	NP	816	343	HA–2	G5, G12, G24, T5
36	515	205	NP	NP	816	343	HA–2	G12, G24, T6
37	515	205	NP	NP	816	343	HA–2	G5, G12, G24, T5
38	515	205	NP	NP	816	343	HA–2	G12, G24, T6
39	515	205	816	NP	816	NP	HA–2	G5, T6
40	515	205	816	NP	816	NP	HA–2	T7
41	515	205	816	NP	816	NP	HA–2	G5, H1, T6
42	515	205	816	NP	816	NP	HA–2	H1, T7
43	515	205	NP	427	NP	NP	HA–2	G5, W12
44	515	205	NP	NP	816	NP	HA–2	G5, G24, T6
45	515	205	NP	NP	816	NP	HA–2	G24, T7

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	197	196	195	191	185	180	176	174	173	171	170	169	167	165	163
2	197	196	195	191	185	180	176	174	173	171	170	169	167	165	...
3	168	167	165	162	158	153	149	147	146	144	142	140	138	137	135
4	197	196	195	191	185	180	176	174	173	171	170	169	167	165	...
5	197	196	195	191	185	180	176	174	172	169	167	165	162	161	159
6	168	167	165	162	158	153	149	147	146	144	142	140	138	137	135
7	197	196	195	191	185	180	176	174	173	171	170	169	167	165	...
8	197	196	195	191	185	180	176	174	173	171	170	169	167	165	163
9	197	196	195	191	185	180	176	174	173	171	170	169	167	165	163
10	197	196	195	191	185	180	176	174	173	171	170	169	167	165	...
11	197	196	195	191	185	180	176	174	173	171	170	169	167	165	...
12	172	169	164	159	155	150	147	145	144	...	...	...	...	...	...
13	172	169	164	159	155	150	147	145	144	...	...	...	...	...	...
14	145	144	140	135	132	128	125	124	123	...	...	...	...	...	...
15	172	169	164	159	155	150	147	145	144	...	...	...	...	...	...
16	145	144	140	135	132	128	125	124	123	...	...	...	...	...	...
17	197	194	189	184	178	173	170	168	167	...	...	...	...	...	...
18	168	165	160	156	152	147	145	143	142	...	...	...	...	...	...
19	138	138	138	138	138	138	135	131	129	127	125	124	122	121	119
20	138	138	138	138	138	138	135	131	129	127	125	124	122	121	119
21	138	129	120	115	111	105	100	96.7	95.4	94.1	92.9	91.6	90.4	89.2	87.9
22	138	138	138	138	138	138	135	131	129	127	125	124	122	121	119
23	138	129	120	115	111	105	100	96.7	95.4	94.1	92.9	91.6	90.4	89.2	87.9
24	117	117	117	117	117	117	115	111	109	108	107	105	104	102	101
25	117	110	101	97.5	94.3	88.7	84.7	82.1	80.8	79.8	79.1	77.9	77.3	76.1	74.8
26	138	138	138	138	138	138	135	131	129	127	125	124	122	121	119
27	138	129	120	115	111	105	100	96.7	95.4	94.1	92.9	91.6	90.4	89.2	87.9
28	138	138	138	138	138	138	135	131	129	127	125	124	122	121	119
29	138	129	120	115	111	105	100	96.7	95.4	94.1	92.9	91.6	90.4	89.2	87.9
30	117	117	117	117	117	117	115	111	109	108	107	105	104	102	101
31	117	110	101	97.5	94.3	88.7	84.7	82.1	80.8	79.8	79.1	77.9	77.3	76.1	74.8
32	138	138	138	138	138	138	135	131	129	127	125	124	122	121	...
33	138	138	138	138	138	138	135	131	129	127	125	124	122	121	119
34	138	129	120	115	111	105	100	96.7	95.4	94.1	92.9	91.6	90.4	89.2	87.9
35	117	117	117	117	117	117	115	111	109	108	107	105	104	102	101
36	117	110	101	97.5	94.3	88.7	84.7	82.1	80.8	79.8	79.1	77.9	77.3	76.1	74.8
37	117	117	117	117	117	117	115	111	109	108	107	105	104	102	101
38	117	110	101	97.5	94.3	88.7	84.7	82.1	80.8	79.8	79.1	77.9	77.3	76.1	74.8
39	138	138	138	138	138	138	135	131	129	127	125	124	122	121	119
40	138	129	119	114	111	105	100	96.7	95.4	94.1	92.9	91.6	90.4	89.2	87.9
41	138	138	138	138	138	138	135	131	129	127	125	124	122	121	119
42	138	129	119	114	111	105	100	96.7	95.4	94.1	92.9	91.6	90.4	89.2	87.9
43	138	138	138	138	138	138	135	131	129	127	125	124	122	121	...
44	117	117	117	117	117	117	115	111	109	108	107	105	104	102	101
45	117	110	101	97.5	94.3	88.7	84.7	82.1	80.8	79.8	79.1	77.9	77.3	76.1	74.8

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	161	158	157	152	*132*	*83.6*	*56.1*	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	134	132	131	129	*111*	*71.4*	*48.0*	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	157	156	154	152	*132*	*83.6*	*56.1*	...	...	...	...	...	...	...	...	...	...
6	134	132	131	129	*111*	*71.4*	*48.0*	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	161	158	157	152	*132*	*83.6*	*56.1*	...	...	...	...	...	...	...	...	...	...
9	161	158	157	152	*132*	*83.6*	*56.1*	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	115	*89.4*	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
20	115	*89.4*	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
21	86.7	78.5	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
22	115	*89.4*	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
23	86.7	78.5	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
24	98.9	*74.7*	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
25	73.5	64.8	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
26	115	*89.4*	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
27	86.7	78.5	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
28	115	*89.4*	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
29	86.7	78.5	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
30	98.9	*74.7*	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
31	73.5	64.8	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	115	*89.4*	*59.2*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	86.7	78.5	*59.2*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	98.9	*74.7*	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
36	73.5	64.8	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
37	98.9	*74.7*	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
38	73.5	64.8	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
39	117	107	*83.8*	*65.2*	*48.6*	*36.3*	*27.3*	*21.1*	*15.9*	*12.5*	*9.89*	*7.77*	*6.12*	*4.59*	...	...	...
40	86.7	85.4	78.9	*65.2*	*48.6*	*36.3*	*27.3*	*21.1*	*15.9*	*12.5*	*9.89*	*7.77*	*6.12*	*4.59*	...	...	...
41	117	107	*83.8*	*65.2*	*48.6*	*36.3*	*27.3*	*21.1*	*15.9*	*12.5*	*9.89*	*7.77*	*6.12*	*4.59*	...	...	...
42	86.7	85.4	78.9	*65.2*	*48.6*	*36.3*	*27.3*	*21.1*	*15.9*	*12.5*	*9.89*	*7.77*	*6.12*	*4.59*	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	99.8	91.3	*71.2*	*55.8*	*41.5*	*31.0*	*23.2*	*18.2*	*13.8*	*10.4*	*8.27*	*6.50*	*5.05*	*4.01*	...	...	...
45	73.6	72.3	66.8	*55.7*	*41.5*	*31.0*	*23.2*	*18.2*	*13.8*	*10.4*	*8.27*	*6.50*	*5.05*	*4.01*	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	23Cr–12Ni	Smls. pipe	SA–312	TP309H	S30909	...	...	8	2
2	23Cr–12Ni	Smls. pipe	SA–312	TP309H	S30909	...	...	8	2
3	23Cr–12Ni	Wld. pipe	SA–312	TP309H	S30909	...	...	8	2
4	23Cr–12Ni	Wld. pipe	SA–312	TP309H	S30909	...	...	8	2
5	23Cr–12Ni	Bar	SA–479	309H	S30909	...	...	8	2
6	23Cr–12Ni	Bar	SA–479	309H	S30909	...	...	8	2
7	23Cr–12Ni–Cb	Smls. tube	SA–213	TP309Cb	S30940	...	...	8	2
8	23Cr–12Ni–Cb	Smls. tube	SA–213	TP309Cb	S30940	...	...	8	2
9	23Cr–12Ni–Cb	Plate	SA–240	309Cb	S30940	...	...	8	2
10	23Cr–12Ni–Cb	Plate	SA–240	309Cb	S30940	...	...	8	2
11	23Cr–12Ni–Cb	Wld. tube	SA–249	TP309Cb	S30940	...	...	8	2
12	23Cr–12Ni–Cb	Wld. tube	SA–249	TP309Cb	S30940	...	...	8	2
13	23Cr–12Ni–Cb	Smls. & wld. pipe	SA–312	TP309Cb	S30940	...	...	8	2
14	23Cr–12Ni–Cb	Smls. pipe	SA–312	TP309Cb	S30940	...	...	8	2
15	23Cr–12Ni–Cb	Wld. pipe	SA–312	TP309Cb	S30940	...	...	8	2
16	23Cr–12Ni–Cb	Wld. pipe	SA–312	TP309Cb	S30940	...	...	8	2
17	23Cr–12Ni–Cb	Bar	SA–479	309Cb	S30940	...	...	8	2
18	23Cr–12Ni–Cb	Bar	SA–479	309Cb	S30940	...	...	8	2
19	23Cr–12Ni–Cb	Wld. pipe	SA–813	TP309Cb	S30940	...	...	8	2
20	23Cr–12Ni–Cb	Wld. pipe	SA–813	TP309Cb	S30940	...	...	8	2
21	23Cr–12Ni–Cb	Wld. pipe	SA–814	TP309Cb	S30940	...	...	8	2
22	23Cr–12Ni–Cb	Wld. pipe	SA–814	TP309Cb	S30940	...	...	8	2
23	23Cr–25Ni–5.5Mo–N	Forgings	SA–182	...	S32053	...	...	8	4
24	23Cr–25Ni–5.5Mo–N	Forgings	SA–182	...	S32053	...	...	8	4
25	23Cr–25Ni–5.5Mo–N	Plate	SA–240	...	S32053	...	...	8	4
26	23Cr–25Ni–5.5Mo–N	Plate	SA–240	...	S32053	...	...	8	4
27	23Cr–25Ni–5.5Mo–N	Wld. tube	SA–249	...	S32053	...	...	8	4
28	23Cr–25Ni–5.5Mo–N	Wld. tube	SA–249	...	S32053	...	...	8	4
29	23Cr–25Ni–5.5Mo–N	Smls. & wld. pipe	SA–312	...	S32053	...	...	8	4
30	23Cr–25Ni–5.5Mo–N	Smls. & wld. pipe	SA–312	...	S32053	...	...	8	4
31	23Cr–25Ni–5.5Mo–N	Wld. pipe	SA–358	...	S32053	...	...	8	4
32	23Cr–25Ni–5.5Mo–N	Wld. pipe	SA–358	...	S32053	...	...	8	4
33	23Cr–25Ni–5.5Mo–N	Fittings	SA–403	...	S32053	...	...	8	4
34	23Cr–25Ni–5.5Mo–N	Fittings	SA–403	...	S32053	...	...	8	4
35	23Cr–25Ni–5.5Mo–N	Wld. pipe	SA–409	...	S32053	...	...	8	4
36	23Cr–25Ni–5.5Mo–N	Wld. pipe	SA–409	...	S32053	...	...	8	4
37	23Cr–25Ni–5.5Mo–N	Bar	SA–479	...	S32053	...	...	8	4
38	23Cr–25Ni–5.5Mo–N	Bar	SA–479	...	S32053	...	...	8	4
39	23Cr–25Ni–5.5Mo–N	Wld. pipe	SA–813	...	S32053	...	...	8	4
40	23Cr–25Ni–5.5Mo–N	Wld. pipe	SA–813	...	S32053	...	...	8	4
41	23Cr–25Ni–5.5Mo–N	Wld. pipe	SA–814	...	S32053	...	...	8	4
42	23Cr–25Ni–5.5Mo–N	Wld. pipe	SA–814	...	S32053	...	...	8	4
43	24Cr–10Ni–4Mo–N	Castings	SA–995	2A	J93345	...	...	10H	1
44	24Cr–22Ni–6Mo–2W–Cu–N	Forgings	SA–182	F58	S31266	...	...	45	...
45	24Cr–22Ni–6Mo–2W–Cu–N	Smls. tube	SA–213	...	S31266	...	...	45	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	515	205	816	NP	816	NP	HA–2	G5, T6
2	515	205	816	NP	816	NP	HA–2	T7
3	515	205	816	NP	816	NP	HA–2	G3, G5, G24, T6
4	515	205	816	NP	816	NP	HA–2	G3, G24, T7
5	515	205	816	NP	816	NP	HA–2	G5, T6
6	515	205	816	NP	816	NP	HA–2	T7
7	515	205	NP	NP	816	343	HA–2	G5, G12, T5
8	515	205	NP	NP	816	343	HA–2	G12, T6
9	515	205	NP	NP	816	343	HA–2	G5, G12, T5
10	515	205	NP	NP	816	343	HA–2	G12, T6
11	515	205	NP	NP	816	343	HA–2	G5, G12, G24, T5
12	515	205	NP	NP	816	343	HA–2	G12, G24, T6
13	515	205	NP	427	816	343	HA–2	G5, G12, T5, W12
14	515	205	NP	NP	816	343	HA–2	G12, T6
15	515	205	NP	NP	816	343	HA–2	G5, G12, G24, T5
16	515	205	NP	NP	816	343	HA–2	G12, G24, T6
17	515	205	NP	NP	538	343	HA–2	G5, G12, G22
18	515	205	NP	NP	538	343	HA–2	G12, G22
19	515	205	NP	NP	816	343	HA–2	G5, G12, G24, T5
20	515	205	NP	NP	816	343	HA–2	G12, G24, T6
21	515	205	NP	NP	816	343	HA–2	G5, G12, G13, G24, T5
22	515	205	NP	NP	816	343	HA–2	G12, G24, T6
23	640	295	NP	NP	350	NP	NFN–12	G5
24	640	295	NP	NP	350	NP	NFN–12	...
25	640	295	NP	NP	350	NP	NFN–12	G5
26	640	295	NP	NP	350	NP	NFN–12	...
27	640	295	NP	NP	350	NP	NFN–12	G5, W12
28	640	295	NP	NP	350	NP	NFN–12	W12
29	640	295	NP	NP	350	NP	NFN–12	G5, W12
30	640	295	NP	NP	350	NP	NFN–12	W12
31	640	295	NP	NP	350	NP	NFN–12	G5, W12
32	640	295	NP	NP	350	NP	NFN–12	W12
33	640	295	NP	NP	350	NP	NFN–12	G5
34	640	295	NP	NP	350	NP	NFN–12	...
35	640	295	NP	NP	350	NP	NFN–12	G5, W12
36	640	295	NP	NP	350	NP	NFN–12	W12
37	640	295	NP	NP	350	NP	NFN–12	G5
38	640	295	NP	NP	350	NP	NFN–12	...
39	640	295	NP	NP	350	NP	NFN–12	G5, G12, W12
40	640	295	NP	NP	350	NP	NFN–12	G12, W12
41	640	295	NP	NP	350	NP	NFN–12	G5, G12, W12
42	640	295	NP	NP	350	NP	NFN–12	G12, W12
43	655	450	NP	NP	316	316	HA–5	G1, G19
44	752	421	NP	NP	426	NP	HA–10	G5, G19
45	752	421	NP	NP	426	NP	HA–10	G5, G19

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	138	138	138	138	138	138	135	131	129	127	125	124	122	121	119
2	138	129	119	114	111	105	100	96.7	95.4	94.1	92.9	91.6	90.4	89.2	87.9
3	117	117	117	117	117	117	115	111	109	108	107	105	104	102	101
4	117	110	101	97.5	94.3	88.7	84.7	82.1	80.8	79.8	79.1	77.9	77.3	76.1	74.8
5	138	138	138	138	138	138	135	131	129	127	125	124	122	121	119
6	138	129	119	114	111	105	100	96.7	95.4	94.1	92.9	91.6	90.4	89.2	87.9
7	138	138	138	138	138	138	135	131	129	127	125	124	122	121	119
8	138	129	120	115	111	105	100	96.7	95.4	94.1	92.9	91.6	90.4	89.2	87.9
9	138	138	138	138	138	138	135	131	129	127	125	124	122	121	119
10	138	129	120	115	111	105	100	96.7	95.4	94.1	92.9	91.6	90.4	89.2	87.9
11	117	117	117	117	117	117	115	111	109	108	107	105	104	102	101
12	117	110	101	97.5	94.3	88.7	84.7	82.1	80.8	79.8	79.1	77.9	77.3	76.1	74.8
13	138	138	138	138	138	138	135	131	129	127	125	124	122	121	119
14	138	129	120	115	111	105	100	96.7	95.4	94.1	92.9	91.6	90.4	89.2	87.9
15	117	117	117	117	117	117	115	111	109	108	107	105	104	102	101
16	117	110	101	97.5	94.3	88.7	84.7	82.1	80.8	79.8	79.1	77.9	77.3	76.1	74.8
17	138	138	138	138	138	138	135	131	129	127	125	124	122	121	119
18	138	129	120	115	111	105	100	96.7	95.4	94.1	92.9	91.6	90.4	89.2	87.9
19	117	117	117	117	117	117	115	111	109	108	107	105	104	102	101
20	117	110	101	97.5	94.3	88.7	84.7	82.1	80.8	79.8	79.1	77.9	77.3	76.1	74.8
21	117	117	117	117	117	117	115	111	109	108	107	105	104	102	101
22	117	110	101	97.5	94.3	88.7	84.7	82.1	80.8	79.8	79.1	77.9	77.3	76.1	74.8
23	183	183	182	...	173	165	160	155	153	152	...	...	...	...	...
24	183	177	164	...	151	141	134	129	127	125	...	...	...	...	...
25	183	183	182	...	173	165	160	155	153	152	...	...	...	...	...
26	183	177	164	...	151	141	134	129	127	125	...	...	...	...	...
27	183	183	182	...	173	165	160	155	153	152	...	...	...	...	...
28	183	177	164	...	151	141	134	129	127	125	...	...	...	...	...
29	183	183	182	...	173	165	160	155	153	152	...	...	...	...	...
30	183	177	164	...	151	141	134	129	127	125	...	...	...	...	...
31	183	183	182	...	173	165	160	155	153	152	...	...	...	...	...
32	183	177	164	...	151	141	134	129	127	125	...	...	...	...	...
33	183	183	182	...	173	165	160	155	153	152	...	...	...	...	...
34	183	177	164	...	151	141	134	129	127	125	...	...	...	...	...
35	183	183	182	...	173	165	160	155	153	152	...	...	...	...	...
36	183	177	164	...	151	141	134	129	127	125	...	...	...	...	...
37	183	183	182	...	173	165	160	155	153	152	...	...	...	...	...
38	183	177	164	...	151	141	134	129	127	125	...	...	...	...	...
39	183	183	182	...	173	165	160	155	153	152	...	...	...	...	...
40	183	177	164	...	151	141	134	129	127	125	...	...	...	...	...
41	183	183	182	...	173	165	160	155	153	152	...	...	...	...	...
42	183	177	164	...	151	141	134	129	127	125	...	...	...	...	...
43	187	187	186	180	173	167	167	167	167	...	...	...	...	...	...
44	215	215	210	204	199	191	186	182	181	179	178	177	175	174	...
45	215	215	210	204	199	191	186	182	181	179	178	177	175	174	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	117	107	*83.8*	*65.2*	*48.6*	*36.3*	*27.3*	*21.1*	*15.9*	*12.5*	*9.89*	*7.77*	*6.12*	*4.59*	...	...	...
2	86.7	85.4	78.9	*65.2*	*48.6*	*36.3*	*27.3*	*21.1*	*15.9*	*12.5*	*9.89*	*7.77*	*6.12*	*4.59*	...	...	...
3	99.8	91.3	*71.2*	*55.8*	*41.5*	*31.0*	*23.2*	*18.2*	*13.8*	*10.4*	*8.27*	*6.50*	*5.05*	*4.01*	...	...	...
4	73.6	72.3	66.8	*55.7*	*41.5*	*31.0*	*23.2*	*18.2*	*13.8*	*10.4*	*8.27*	*6.50*	*5.05*	*4.01*	...	...	...
5	117	107	*83.8*	*65.2*	*48.6*	*36.3*	*27.3*	*21.1*	*15.9*	*12.5*	*9.89*	*7.77*	*6.12*	*4.59*	...	...	...
6	86.7	85.4	78.9	*65.2*	*48.6*	*36.3*	*27.3*	*21.1*	*15.9*	*12.5*	*9.89*	*7.77*	*6.12*	*4.59*	...	...	...
7	115	*89.4*	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
8	86.7	78.5	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
9	115	*89.4*	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
10	86.7	78.5	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
11	98.9	*74.7*	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
12	73.5	64.8	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
13	115	*89.4*	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
14	86.7	78.5	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
15	98.9	*74.7*	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
16	73.5	64.8	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
17	115	89.4	59.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	86.7	78.5	59.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	98.9	*74.7*	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
20	73.5	64.8	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
21	98.9	*74.7*	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
22	73.5	64.8	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	24Cr–22Ni–6Mo–2W–Cu–N	Plate	SA–240	...	S31266	...	...	45	...
2	24Cr–22Ni–6Mo–2W–Cu–N	Wld. tube	SA–249	...	S31266	...	...	45	...
3	24Cr–22Ni–6Mo–2W–Cu–N	Smls. pipe	SA–312	...	S31266	...	...	45	...
4	24Cr–22Ni–6Mo–2W–Cu–N	Wld. pipe	SA–312	...	S31266	...	...	45	...
5	24Cr–22Ni–6Mo–2W–Cu–N	Wld. pipe	SA–358	...	S31266	...	...	45	...
6	24Cr–22Ni–6Mo–2W–Cu–N	Smls. fittings	SA–403	...	S31266	...	...	45	...
7	24Cr–22Ni–6Mo–2W–Cu–N	Wld. fittings	SA–403	...	S31266	...	...	45	...
8	24Cr–22Ni–6Mo–2W–Cu–N	Bar, shapes	SA–479	...	S31266	...	...	45	...
9	24Cr–22Ni–6Mo–2W–Cu–N	Wld. pipe	SA–813	...	S31266	...	...	45	...
10	25Cr–4Ni–4Mo–Ti	Plate	SA–240	...	S44635	...	...	10I	1
11	25Cr–4Ni–4Mo–Ti	Wld. tube	SA–268	...	S44635	...	...	10I	1
12	25Cr–5Ni–3Mo–2Cu	Castings	SA–995	1B	J93372	...	...	10H	1
13	25Cr–5Ni–3Mo–2Cu	Plate	SA–240	...	S32550	...	...	10H	1
14	25Cr–5Ni–3Mo–2Cu	Bar	SA–479	...	S32550	...	...	10H	1
15	25Cr–5Ni–3Mo–2Cu	Smls. tube	SA–789	...	S32550	...	...	10H	1
16	25Cr–5Ni–3Mo–2Cu	Wld. tube	SA–789	...	S32550	...	...	10H	1
17	25Cr–5Ni–3Mo–2Cu	Smls. pipe	SA–790	...	S32550	...	...	10H	1
18	25Cr–5Ni–3Mo–2Cu	Wld. pipe	SA–790	...	S32550	...	...	10H	1
19	25Cr–6Ni–Mo–N	Forgings	SA–182	...	S32506	...	...	10H	1
20	25Cr–6Ni–Mo–N	Plate, sheet	SA–240	...	S32506	...	...	10H	1
21	25Cr–6Ni–Mo–N	Bar	SA–479	...	S32506	...	...	10H	1
22	25Cr–6Ni–Mo–N	Smls. tube	SA–789	...	S32506	...	...	10H	1
23	25Cr–6Ni–Mo–N	Wld. tube	SA–789	...	S32506	...	...	10H	1
24	25Cr–6Ni–Mo–N	Smls. pipe	SA–790	...	S32506	...	...	10H	1
25	25Cr–6Ni–Mo–N	Wld. pipe	SA–790	...	S32506	...	...	10H	1
26	25Cr–6Ni–Mo–N	Plate	SA–240	...	S31200	...	...	10H	1
27	25Cr–6.5Ni–3Mo–N	Smls. tube	SA–789	...	S31260	...	...	10H	1
28	25Cr–6.5Ni–3Mo–N	Wld. tube	SA–789	...	S31260	...	...	10H	1
29	25Cr–6.5Ni–3Mo–N	Smls. pipe	SA–790	...	S31260	...	...	10H	1
30	25Cr–6.5Ni–3Mo–N	Wld. pipe	SA–790	...	S31260	...	...	10H	1
31	25Cr–6.5Ni–3Mo–N	Plate	SA–240	...	S31260	...	...	10H	1
32	25Cr–7Ni–3Mo–W–Cu–N	Forgings	SA–182	F54	S39274	...	...	10H	1
33	25Cr–7Ni–3Mo–W–Cu–N	Smls. tube	SA–789	...	S39274	...	...	10H	1
34	25Cr–7Ni–3Mo–W–Cu–N	Wld. tube	SA–789	...	S39274	...	...	10H	1
35	25Cr–7Ni–3Mo–W–Cu–N	Smls. pipe	SA–790	...	S39274	...	...	10H	1
36	25Cr–7Ni–3Mo–W–Cu–N	Wld. pipe	SA–790	...	S39274	...	...	10H	1
37	25Cr–7Ni–4Mo–N	Forgings	SA–182	F53	S32750	...	...	10H	1
38	25Cr–7Ni–4Mo–N	Plate, sheet	SA–240	...	S32750	...	...	10H	1
39	25Cr–7Ni–4Mo–N	Smls. tube	SA–789	...	S32750	...	...	10H	1
40	25Cr–7Ni–4Mo–N	Wld. tube	SA–789	...	S32750	...	...	10H	1
41	25Cr–7Ni–4Mo–N	Smls. pipe	SA–790	...	S32750	...	...	10H	1
42	25Cr–7Ni–4Mo–N	Wld. pipe	SA–790	...	S32750	...	...	10H	1
43	25Cr–7.5Ni–3.5Mo–N–Cu–W	Castings	SA–995	CD3MWCuN	J93380	...	...	10H	1
44	25Cr–7.5Ni–3.5Mo–N–Cu–W	Forgings	SA–182	F55	S32760	...	...	10H	1
45	25Cr–7.5Ni–3.5Mo–N–Cu–W	Plate	SA–240	...	S32760	...	...	10H	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	752	421	NP	NP	426	NP	HA–10	G5, G19
2	752	421	NP	NP	426	NP	HA–10	G3, G5, G19
3	752	421	NP	NP	426	NP	HA–10	G5, G19
4	752	421	NP	NP	426	NP	HA–10	G3, G5, G19
5	752	421	NP	NP	426	NP	HA–10	G3, G5, G19
6	752	421	NP	NP	426	NP	HA–10	G5, G19
7	752	421	NP	NP	426	NP	HA–10	G3, G5, G19
8	752	421	NP	NP	426	NP	HA–10	G5, G19
9	752	421	NP	NP	426	NP	HA–10	G3, G5, G19
10	620	515	NP	NP	260	260	HA–5	G19
11	620	515	NP	NP	260	260	HA–5	G19, G24
12	690	485	NP	316	NP	NP	HA–5	G19, G29
13	760	550	NP	NP	260	260	HA–5	G19
14	760	550	NP	NP	260	260	HA–5	G19
15	760	550	NP	NP	260	260	HA–5	G19
16	760	550	NP	NP	260	260	HA–5	G19, G24
17	760	550	NP	NP	260	260	HA–5	G19
18	760	550	NP	NP	260	260	HA–5	G19, G24
19	620	450	NP	NP	316	NP	HA–5	G19
20	620	450	NP	NP	316	NP	HA–5	G19
21	620	450	NP	NP	316	NP	HA–5	G19
22	620	450	NP	NP	316	NP	HA–5	G19
23	620	450	NP	NP	316	NP	HA–5	G19, G24
24	620	450	NP	NP	316	NP	HA–5	G19
25	620	450	NP	NP	316	NP	HA–5	G19, G24
26	690	450	NP	NP	316	316	HA–5	G19
27	690	450	NP	NP	343	343	HA–5	G19
28	690	450	NP	NP	343	343	HA–5	G19, G24
29	690	450	NP	NP	343	343	HA–5	G19
30	690	450	NP	NP	343	343	HA–5	G19, G24
31	690	485	NP	NP	343	343	HA–5	G19
32	800	550	NP	NP	329	329	HA–8	G19
33	800	550	NP	NP	329	329	HA–8	G19
34	800	550	NP	NP	329	329	HA–8	G19, G24
35	800	550	NP	NP	329	329	HA–8	G19
36	800	550	NP	NP	329	329	HA–8	G19, G24
37	800	550	NP	NP	316	NP	HA–5	G19
38	800	550	NP	NP	316	NP	HA–5	G19
39	800	550	NP	NP	316	316	HA–5	G19
40	800	550	NP	NP	316	316	HA–5	G19, G24
41	800	550	NP	NP	316	316	HA–5	G19
42	800	550	NP	NP	316	316	HA–5	G19, G24
43	690	450	NP	NP	316	NP	HA–5	G19, H4
44	750	550	NP	NP	316	NP	HA–9	G19, H4
45	750	550	NP	NP	316	NP	HA–9	G19

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	215	215	210	204	199	191	186	182	181	179	178	177	175	174	...
2	183	183	179	174	169	163	158	155	154	153	151	150	149	148	...
3	215	215	210	204	199	191	186	182	181	179	178	177	175	174	...
4	183	183	179	174	169	163	158	155	154	153	151	150	149	148	...
5	183	183	179	174	169	163	158	155	154	153	151	150	149	148	...
6	215	215	210	204	199	191	186	182	181	179	178	177	175	174	...
7	183	183	179	174	169	163	158	155	154	153	151	150	149	148	...
8	215	215	210	204	199	191	186	182	181	179	178	177	175	174	...
9	183	183	179	174	169	163	158	155	154	153	151	150	149	148	...
10	177	175	171	166	162	156	152	...	...	...	...	...	...	...	...
11	151	149	145	141	137	132	129	...	...	...	...	...	...	...	...
12	197	197	197	195	192	190	190	189	189	...	...	...	...	...	...
13	216	216	215	209	203	198	195	...	...	...	...	...	...	...	...
14	216	216	215	209	203	198	195	...	...	...	...	...	...	...	...
15	216	216	215	209	203	198	195	...	...	...	...	...	...	...	...
16	184	184	183	178	173	168	166	...	...	...	...	...	...	...	...
17	216	216	215	209	203	198	195	...	...	...	...	...	...	...	...
18	184	184	183	178	173	168	166	...	...	...	...	...	...	...	...
19	177	177	...	175	171	166	166	166	166	...	...	...	...	...	...
20	177	177	...	175	171	166	166	166	166	...	...	...	...	...	...
21	177	177	...	175	171	166	166	166	166	...	...	...	...	...	...
22	177	177	...	175	171	166	166	166	166	...	...	...	...	...	...
23	177	177	...	175	171	166	166	166	166	...	...	...	...	...	...
24	177	177	...	175	171	166	166	166	166	...	...	...	...	...	...
25	177	177	...	175	171	166	166	166	166	...	...	...	...	...	...
26	197	197	197	192	187	182	180	180	180	...	...	...	...	...	...
27	197	197	196	192	187	182	181	181	181	181	...	...	...	...	...
28	168	168	167	163	158	155	155	154	154	154	...	...	...	...	...
29	197	197	196	192	187	182	181	181	181	181	...	...	...	...	...
30	168	168	167	163	158	155	155	154	154	154	...	...	...	...	...
31	197	197	196	192	187	182	181	181	181	181	...	...	...	...	...
32	229	229	227	221	218	216	216	216	216	216	...	...	...	...	...
33	229	229	227	221	218	216	216	216	216	216	...	...	...	...	...
34	194	194	193	188	185	184	184	184	184	184	...	...	...	...	...
35	229	229	227	221	218	216	216	216	216	216	...	...	...	...	...
36	194	194	193	188	185	184	184	184	184	184	...	...	...	...	...
37	228	228	227	221	215	208	205	203	202	...	...	...	...	...	...
38	228	228	227	221	215	208	205	203	202	...	...	...	...	...	...
39	228	228	227	221	215	208	205	203	202	...	...	...	...	...	...
40	194	194	192	188	183	177	174	173	172	...	...	...	...	...	...
41	228	228	227	221	215	208	205	203	202	...	...	...	...	...	...
42	194	194	192	188	183	177	174	173	172	...	...	...	...	...	...
43	184	184	184	184	184	183	183	183	183	...	...	...	...	...	...
44	214	214	211	206	203	201	201	201	201	...	...	...	...	...	...
45	214	214	211	206	203	201	201	201	201	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	25Cr–7.5Ni–3.5Mo–N–Cu–W	Bar	SA–479	...	S32760	Annealed	...	10H	1
2	25Cr–7.5Ni–3.5Mo–N–Cu–W	Smls. tube	SA–789	...	S32760	...	...	10H	1
3	25Cr–7.5Ni–3.5Mo–N–Cu–W	Wld. tube	SA–789	...	S32760	...	...	10H	1
4	25Cr–7.5Ni–3.5Mo–N–Cu–W	Smls. pipe	SA–790	...	S32760	...	...	10H	1
5	25Cr–7.5Ni–3.5Mo–N–Cu–W	Wld. pipe	SA–790	...	S32760	...	...	10H	1
6	25Cr–7.5Ni–3.5Mo–N–Cu–W	Smls. & wld. fittings	SA–815	...	S32760	...	...	10H	1
7	25Cr–12Ni	Castings	SA–351	CH8	J93400	...	...	8	2
8	25Cr–12Ni	Castings	SA–351	CH8	J93400	...	...	8	2
9	25Cr–12Ni	Cast pipe	SA–451	CPH8	J93400	...	...	8	2
10	25Cr–12Ni	Castings	SA–351	CH20	J93402	...	...	8	2
11	25Cr–12Ni	Castings	SA–351	CH20	J93402	...	...	8	2
12	25Cr–12Ni	Cast pipe	SA–451	CPH20	J93402	...	...	8	2
13	25Cr–20Ni	Castings	SA–351	CK20	J94202	...	...	8	2
14	25Cr–20Ni	Castings	SA–351	CK20	J94202	...	...	8	2
15	25Cr–20Ni	Cast pipe	SA–451	CPK20	J94202	...	...	8	2
16	25Cr–20Ni	Forgings	SA–182	F310	S31000	...	>130	8	2
17	25Cr–20Ni	Forgings	SA–182	F310	S31000	...	≤130	8	2
18	25Cr–20Ni	Forgings	SA–965	F310	S31000	...	...	8	2
(**23**) 19	25Cr–20Ni	Smls. tube	SA–213	...	S31002	...	...	8	2
(**23**) 20	25Cr–20Ni	Smls. tube	SA–213	...	S31002	...	...	8	2
(**23**) 21	25Cr–20Ni	Smls. pipe	SA–312	...	S31002	...	...	8	2
(**23**) 22	25Cr–20Ni	Smls. pipe	SA–312	...	S31002	...	...	8	2
23	25Cr–20Ni	Smls. tube	SA–213	TP310S	S31008	...	...	8	2
24	25Cr–20Ni	Smls. tube	SA–213	TP310S	S31008	...	...	8	2
25	25Cr–20Ni	Plate	SA–240	310S	S31008	...	...	8	2
26	25Cr–20Ni	Plate	SA–240	310S	S31008	...	...	8	2
27	25Cr–20Ni	Wld. tube	SA–249	TP310S	S31008	...	...	8	2
28	25Cr–20Ni	Wld. tube	SA–249	TP310S	S31008	...	...	8	2
29	25Cr–20Ni	Smls. & wld. pipe	SA–312	TP310S	S31008	...	...	8	2
30	25Cr–20Ni	Smls. pipe	SA–312	TP310S	S31008	...	...	8	2
31	25Cr–20Ni	Wld. pipe	SA–312	TP310S	S31008	...	...	8	2
32	25Cr–20Ni	Wld. pipe	SA–312	TP310S	S31008	...	...	8	2
33	25Cr–20Ni	Wld. pipe	SA–358	310S	S31008	1	...	8	2
34	25Cr–20Ni	Smls. & wld. fittings	SA–403	310S	S31008	...	...	8	2
35	25Cr–20Ni	Bar	SA–479	310S	S31008	...	...	8	2
36	25Cr–20Ni	Bar	SA–479	310S	S31008	...	...	8	2
37	25Cr–20Ni	Wld. pipe	SA–813	TP310S	S31008	...	...	8	2
38	25Cr–20Ni	Wld. pipe	SA–813	TP310S	S31008	...	...	8	2
39	25Cr–20Ni	Wld. pipe	SA–814	TP310S	S31008	...	...	8	2
40	25Cr–20Ni	Wld. pipe	SA–814	TP310S	S31008	...	...	8	2
41	25Cr–20Ni	Smls. tube	SA–213	TP310H	S31009	...	...	8	2
42	25Cr–20Ni	Plate	SA–240	310H	S31009	...	...	8	2
43	25Cr–20Ni	Plate	SA–240	310H	S31009	...	...	8	2
44	25Cr–20Ni	Wld. tube	SA–249	TP310H	S31009	...	...	8	2
45	25Cr–20Ni	Wld. tube	SA–249	TP310H	S31009	...	...	8	2

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	750	550	NP	NP	316	NP	HA–9	G19
2	750	550	NP	NP	316	NP	HA–9	G19
3	750	550	NP	NP	316	NP	HA–9	G19, G24
4	750	550	NP	NP	316	NP	HA–9	G19
5	750	550	NP	NP	316	NP	HA–9	G19, G24
6	750	550	NP	NP	316	NP	HA–9	G19, W14
7	450	195	NP	427	816	343	HA–3	G1, G5, G12, G16, G17, G19, T6
8	450	195	NP	NP	816	343	HA–3	G1, G12, G19, T7
9	450	195	NP	427	NP	NP	HA–3	G5, G16, G17, G19
10	485	205	NP	427	816	343	HA–2	G1, G5, G12, G16, G17, T6
11	485	205	NP	NP	816	343	HA–2	G1, G12, T7
12	485	205	NP	427	NP	NP	HA–2	G5, G16, G17
13	450	195	NP	427	816	343	HA–3	G1, G5, G12, G16, G17, T6
14	450	195	NP	NP	816	343	HA–3	G1, G12, T8
15	450	195	NP	427	NP	NP	HA–3	G5, G16, G17
16	485	205	NP	427	NP	NP	HA–2	G5
17	515	205	NP	427	816	343	HA–2	G5, G12, G14, T5
18	515	205	NP	427	816	343	HA–2	G5, G12, T5
19	500	205	NP	NP	450	NP	HA–2	G5
20	500	205	NP	NP	450	NP	HA–2	...
21	500	205	NP	NP	450	NP	HA–2	G5
22	500	205	NP	NP	450	NP	HA–2	...
23	515	205	816	NP	816	343	HA–2	G5, G12, T5
24	515	205	816	NP	816	343	HA–2	G12, T6
25	515	205	816	427	816	343	HA–2	G5, G12, T5
26	515	205	816	NP	816	343	HA–2	G12, T6
27	515	205	NP	NP	816	343	HA–2	G5, G12, G24, T5
28	515	205	NP	NP	816	343	HA–2	G12, G24, T6
29	515	205	816	427	816	343	HA–2	G5, G12, T5, W12, W14
30	515	205	816	NP	816	343	HA–2	G12, T6
31	515	205	816	NP	816	343	HA–2	G3, G5, G12, G14, G24, T5
32	515	205	816	NP	816	343	HA–2	G3, G12, G14, G24, T6
33	515	205	NP	427	NP	NP	HA–2	G5, W12
34	515	205	NP	427	816	343	HA–2	G5, G12, T5, W12, W14
35	515	205	538	NP	538	343	HA–2	G12, G22, T6
36	515	205	538	427	538	343	HA–2	G5, G12, G22, T5
37	515	205	NP	NP	816	343	HA–2	G5, G12, G24, T5
38	515	205	NP	NP	816	343	HA–2	G12, G24, T6
39	515	205	NP	NP	816	343	HA–2	G5, G12, G24, T5
40	515	205	NP	NP	816	343	HA–2	G12, G24, T6
41	515	205	816	427	816	NP	HA–2	G5, T6
42	515	205	816	NP	816	NP	HA–2	G5, T6
43	515	205	816	NP	816	NP	HA–2	T7
44	515	205	NP	427	NP	NP	HA–2	G5, W12
45	515	205	NP	NP	816	NP	HA–2	G5, G12, G24, T6

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	214	214	211	206	203	201	201	201	201	...	...	...	...	...	...
2	214	214	211	206	203	201	201	201	201	...	...	...	...	...	...
3	182	182	179	175	173	171	170	170	170	...	...	...	...	...	...
4	214	214	211	206	203	201	201	201	201	...	...	...	...	...	...
5	182	182	179	175	173	171	170	170	170	...	...	...	...	...	...
6	214	214	211	206	203	201	201	201	201	...	...	...	...	...	...
7	128	123	116	112	109	106	106	106	106	105	105	103	102	99.8	96.9
8	128	116	104	99.5	97.1	93.4	90.7	88.5	86.9	85.0	83.2	81.3	78.8	76.2	74.3
9	128	123	116	112	109	106	106	106	106	105	105	103	102	99.8	...
10	138	132	125	120	117	114	114	114	114	114	113	112	110	107	104
11	138	124	111	106	104	100	97.1	94.6	93.2	91.0	88.6	86.8	84.3	81.8	79.3
12	138	132	125	120	117	114	114	114	114	114	113	112	110	107	...
13	128	123	116	112	109	106	106	106	106	105	105	103	102	99.8	96.9
14	128	116	104	99.5	97.1	93.4	90.7	88.5	86.9	85.0	83.2	81.3	78.8	76.2	74.3
15	128	123	116	112	109	106	106	106	106	105	105	103	102	99.8	...
16	138	138	136	133	130	128	128	128	127	125	123	122	120	118	...
17	138	138	138	138	138	138	135	129	127	125	123	122	120	119	117
18	138	138	138	138	138	138	135	129	127	125	123	122	120	119	117
19	138	138	138	138	138	134	130	127	126	125	123	120	117	115	...
20	138	129	122	118	115	109	104	98.5	96.0	93.5	91.0	88.7	86.7	85.2	...
21	138	138	138	138	138	134	130	127	126	125	123	120	117	115	...
22	138	129	122	118	115	109	104	98.5	96.0	93.5	91.0	88.7	86.7	85.2	...
23	138	138	138	138	138	138	135	129	127	125	123	122	120	119	117
24	138	129	120	115	111	105	100	95.4	94.0	92.8	91.5	90.3	89.0	87.8	86.5
25	138	138	138	138	138	138	135	129	127	125	123	122	120	119	117
26	138	129	120	115	111	105	100	95.4	94.0	92.8	91.5	90.3	89.0	87.8	86.5
27	117	117	117	117	117	117	114	109	108	106	105	103	102	101	99.3
28	117	110	102	97.8	94.3	88.7	84.1	81.4	80.2	79.0	77.7	76.5	75.9	74.7	74.0
29	138	138	138	138	138	138	135	129	127	125	123	122	120	119	117
30	138	129	120	115	111	105	100	95.4	94.0	92.8	91.5	90.3	89.0	87.8	86.5
31	117	117	117	117	117	117	114	109	108	106	105	103	102	101	99.3
32	117	110	102	97.8	94.3	88.7	84.1	81.4	80.2	79.0	77.7	76.5	75.9	74.7	74.0
33	138	138	138	138	138	138	135	129	127	125	123	122	120	119	...
34	138	138	138	138	138	138	135	129	127	125	123	122	120	119	117
35	138	129	120	115	111	105	100	95.4	94.0	92.8	91.5	90.3	89.0	87.8	86.5
36	138	138	138	138	138	138	135	129	127	125	123	122	120	119	117
37	117	117	117	117	117	117	114	109	108	106	105	103	102	101	99.3
38	117	110	102	97.8	94.3	88.7	84.1	81.4	80.2	79.0	77.7	76.5	75.9	74.7	74.0
39	117	117	117	117	117	117	114	109	108	106	105	103	102	101	99.3
40	117	110	102	97.8	94.3	88.7	84.1	81.4	80.2	79.0	77.7	76.5	75.9	74.7	74.0
41	138	138	138	138	138	137	134	129	127	125	123	122	120	119	117
42	138	138	138	138	138	137	134	129	127	125	123	122	120	119	117
43	138	129	120	115	111	105	99.5	95.4	94.0	92.8	91.5	90.3	89.0	87.8	86.5
44	138	138	138	138	138	138	135	129	127	125	123	122	120	119	...
45	117	117	117	117	117	117	114	109	108	106	105	103	102	101	99.6

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	92.7	84.6	*68.4*	*54.3*	*42.1*	*33.2*	*25.9*	*20.3*	*16.4*	*13.3*	*10.2*	*7.25*	*5.74*	*5.33*	...	...	...	
8	72.0	69.5	63.9	*54.3*	*42.1*	*33.2*	*25.9*	*20.3*	*16.4*	*13.3*	*10.2*	*7.25*	*5.74*	*5.33*	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	100	88.5	*68.2*	*53.7*	*42.1*	*33.2*	*25.9*	*20.3*	*16.4*	*13.3*	*10.2*	*7.25*	*5.74*	*5.33*	...	...	...	
11	76.8	74.3	68.2	*53.7*	*42.1*	*33.2*	*25.9*	*20.3*	*16.4*	*13.3*	*10.2*	*7.25*	*5.74*	*5.33*	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	92.7	84.7	*72.8*	*64.5*	*56.8*	*49.1*	*41.0*	*33.6*	*25.5*	*18.3*	*12.8*	*8.93*	*6.59*	*4.84*	...	...	...	
14	72.1	69.5	67.0	63.2	*56.8*	*49.1*	*41.0*	*33.6*	*25.5*	*18.3*	*12.8*	*8.93*	*6.59*	*4.84*	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	112	*87.2*	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...	
18	112	*87.2*	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
23	112	*87.2*	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...	
24	85.3	77.8	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...	
25	112	*87.2*	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...	
26	85.3	77.8	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...	
27	98.5	*74.7*	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...	
28	72.8	64.5	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...	
29	112	*87.2*	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...	
30	85.3	77.8	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...	
31	98.5	*74.7*	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...	
32	72.8	64.5	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	112	*87.2*	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...	
35	85.3	77.8	*59.2*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	112	*87.2*	*59.2*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	98.5	*74.7*	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...	
38	72.8	64.5	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...	
39	98.5	*74.7*	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...	
40	72.8	64.5	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...	
41	116	104	*84.7*	*64.7*	*48.6*	*36.2*	*27.3*	*21.1*	*15.9*	*12.5*	*9.92*	*7.64*	*5.97*	*4.67*	...	...	...	
42	116	104	*84.7*	*64.7*	*48.6*	*36.2*	*27.3*	*21.1*	*15.9*	*12.5*	*9.92*	*7.64*	*5.97*	*4.67*	...	...	...	
43	85.3	84.0	79.8	*64.7*	*48.6*	*36.2*	*27.3*	*21.1*	*15.9*	*12.5*	*9.92*	*7.64*	*5.97*	*4.67*	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	98.4	90.6	*71.3*	*55.7*	*41.5*	*31.0*	*23.2*	*18.2*	*13.8*	*10.4*	*8.27*	*6.50*	*5.05*	*4.01*	...	...	...	

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	25Cr–20Ni	Wld. tube	SA–249	TP310H	S31009	...	...	8	2
2	25Cr–20Ni	Smls. pipe	SA–312	TP310H	S31009	...	...	8	2
3	25Cr–20Ni	Smls. pipe	SA–312	TP310H	S31009	...	...	8	2
4	25Cr–20Ni	Wld. pipe	SA–312	TP310H	S31009	...	...	8	2
5	25Cr–20Ni	Wld. pipe	SA–312	TP310H	S31009	...	...	8	2
6	25Cr–20Ni	Bar	SA–479	310H	S31009	...	...	8	2
7	25Cr–20Ni	Bar	SA–479	310H	S31009	...	...	8	2
8	25Cr–20Ni	Bar	SA/JIS G4303	SUS310S	...	...	...	8	2
9	25Cr–20Ni–Cb	Smls. tube	SA–213	TP310Cb	S31040	...	...	8	2
10	25Cr–20Ni–Cb	Smls. tube	SA–213	TP310Cb	S31040	...	...	8	2
11	25Cr–20Ni–Cb	Plate	SA–240	310Cb	S31040	...	...	8	2
12	25Cr–20Ni–Cb	Plate	SA–240	310Cb	S31040	...	...	8	2
13	25Cr–20Ni–Cb	Wld. tube	SA–249	TP310Cb	S31040	...	...	8	2
14	25Cr–20Ni–Cb	Wld. tube	SA–249	TP310Cb	S31040	...	...	8	2
15	25Cr–20Ni–Cb	Smls. & wld. pipe	SA–312	TP310Cb	S31040	...	...	8	2
16	25Cr–20Ni–Cb	Smls. pipe	SA–312	TP310Cb	S31040	...	...	8	2
17	25Cr–20Ni–Cb	Wld. pipe	SA–312	TP310Cb	S31040	...	...	8	2
18	25Cr–20Ni–Cb	Wld. pipe	SA–312	TP310Cb	S31040	...	...	8	2
19	25Cr–20Ni–Cb	Bar	SA–479	310Cb	S31040	...	...	8	2
20	25Cr–20Ni–Cb	Bar	SA–479	310Cb	S31040	...	...	8	2
21	25Cr–20Ni–Cb	Wld. pipe	SA–813	TP310Cb	S31040	...	...	8	2
22	25Cr–20Ni–Cb	Wld. pipe	SA–813	TP310Cb	S31040	...	...	8	2
23	25Cr–20Ni–Cb	Wld. pipe	SA–814	TP310Cb	S31040	...	...	8	2
24	25Cr–20Ni–Cb	Wld. pipe	SA–814	TP310Cb	S31040	...	...	8	2
25	25Cr–20Ni–Cb–N	Smls. tube	SA–213	TP310HCbN	S31042	...	...	8	3
26	25Cr–20Ni–Cb–N	Smls. tube	SA–213	TP310HCbN	S31042	...	...	8	3
27	25Cr–22Ni–2Mo–N	Forgings	SA–182	F310MoLN	S31050	...	...	8	2
28	25Cr–22Ni–2Mo–N	Forgings	SA–182	F310MoLN	S31050	...	...	8	2
29	25Cr–22Ni–2Mo–N	Smls. tube	SA–213	TP310MoLN	S31050	...	$6 < t \le 32$	8	2
30	25Cr–22Ni–2Mo–N	Smls. tube	SA–213	TP310MoLN	S31050	...	$6 < t \le 32$	8	2
31	25Cr–22Ni–2Mo–N	Plate	SA–240	310MoLN	S31050	...	$t > 6$	8	2
32	25Cr–22Ni–2Mo–N	Plate	SA–240	310MoLN	S31050	...	$t > 6$	8	2
33	25Cr–22Ni–2Mo–N	Wld. tube	SA–249	TP310MoLN	S31050	...	$6 < t \le 32$	8	2
34	25Cr–22Ni–2Mo–N	Wld. tube	SA–249	TP310MoLN	S31050	...	$6 < t \le 32$	8	2
35	25Cr–22Ni–2Mo–N	Wld. pipe	SA–312	TP310MoLN	S31050	...	$6 < t \le 32$	8	2
36	25Cr–22Ni–2Mo–N	Wld. pipe	SA–312	TP310MoLN	S31050	...	$6 < t \le 32$	8	2
37	25Cr–22Ni–2Mo–N	Smls. tube	SA–213	TP310MoLN	S31050	...	≤6	8	2
38	25Cr–22Ni–2Mo–N	Smls. tube	SA–213	TP310MoLN	S31050	...	≤6	8	2
39	25Cr–22Ni–2Mo–N	Plate	SA–240	310MoLN	S31050	...	$t \le 6$	8	2
40	25Cr–22Ni–2Mo–N	Plate	SA–240	310MoLN	S31050	...	$t \le 6$	8	2
41	25Cr–22Ni–2Mo–N	Wld. tube	SA–249	TP310MoLN	S31050	...	≤6	8	2
42	25Cr–22Ni–2Mo–N	Wld. tube	SA–249	TP310MoLN	S31050	...	≤6	8	2
43	25Cr–22Ni–2Mo–N	Wld. pipe	SA–312	TP310MoLN	S31050	...	≤6	8	2
44	25Cr–22Ni–2Mo–N	Wld. pipe	SA–312	TP310MoLN	S31050	...	≤6	8	2
45	26Cr–4Ni–Mo	Plate	SA–240	329	S32900	...	...	10H	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	515	205	NP	NP	816	NP	HA–2	G12, G24, T7
2	515	205	816	NP	816	NP	HA–2	G5, T6
3	515	205	816	NP	816	NP	HA–2	T7
4	515	205	816	NP	816	NP	HA–2	G3, G5, G24, T6
5	515	205	816	NP	816	NP	HA–2	G3, G24, T7
6	515	205	816	NP	816	NP	HA–2	G5, T6
7	515	205	816	NP	816	NP	HA–2	T7
8	520	205	538	427	538	NP	HA–2	G5, G12, G22, T5
9	515	205	NP	NP	816	343	HA–2	G5, G12, T5
10	515	205	NP	NP	816	343	HA–2	G12, T6
11	515	205	NP	NP	816	343	HA–2	G5, G12, T5
12	515	205	NP	NP	816	343	HA–2	G12, T6
13	515	205	NP	NP	816	343	HA–2	G5, G12, G24, T5
14	515	205	NP	NP	816	343	HA–2	G12, G24, T6
15	515	205	NP	427	816	343	HA–2	G5, G12, T5, W12, W14
16	515	205	NP	NP	816	343	HA–2	G12, T6
17	515	205	NP	NP	816	343	HA–2	G5, G12, G24, T5
18	515	205	NP	NP	816	343	HA–2	G12, G14, G24, T6
19	515	205	NP	NP	538	343	HA–2	G5, G12, G22, T5
20	515	205	NP	NP	538	343	HA–2	G12, G22, T6
21	515	205	NP	NP	816	343	HA–2	G5, G12, G24, T5
22	515	205	NP	NP	816	343	HA–2	G12, G24, T6
23	515	205	NP	NP	816	343	HA–2	G5, G12, G24, T5
24	515	205	NP	NP	816	343	HA–2	G12, G24, T6
25	655	295	732	NP	NP	NP	HA–2	G5, G12, S4, T8
26	655	295	732	NP	NP	NP	HA–2	G12, S4, T9
27	540	255	NP	NP	316	316	HA–2	G5
28	540	255	NP	NP	316	316	HA–2	...
29	540	255	NP	NP	482	343	HA–2	G5
30	540	255	NP	NP	482	343	HA–2	...
31	540	255	NP	NP	316	316	HA–2	G5
32	540	255	NP	NP	316	316	HA–2	...
33	540	255	NP	NP	482	343	HA–2	G5, G24
34	540	255	NP	NP	482	343	HA–2	G24
35	540	255	NP	NP	482	343	HA–2	G5, G24
36	540	255	NP	NP	482	343	HA–2	G24
37	580	270	NP	NP	482	343	HA–2	G5
38	580	270	NP	NP	482	343	HA–2	...
39	580	270	NP	NP	316	316	HA–2	G5
40	580	270	NP	NP	316	316	HA–2	...
41	580	270	NP	NP	482	343	HA–2	G5, G24
42	580	270	NP	NP	482	343	HA–2	G24
43	580	270	NP	NP	482	343	HA–2	G5, G24
44	580	270	NP	NP	482	343	HA–2	G24
45	620	485	NP	NP	260	260	HA–5	G19

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	117	110	102	97.8	94.3	88.7	84.1	81.4	80.2	79.0	77.7	76.5	75.9	74.7	74.0
2	138	138	138	138	138	137	134	129	127	125	123	122	120	119	117
3	138	129	120	115	111	105	99.5	95.4	94.0	92.8	91.5	90.3	89.0	87.8	86.5
4	117	117	117	117	117	117	114	109	108	106	105	103	102	101	99.6
5	117	110	102	97.8	94.3	88.7	84.1	81.4	80.2	79.0	77.7	76.5	75.9	74.7	74.0
6	138	138	138	138	138	137	134	129	127	125	123	122	120	119	117
7	138	129	120	115	111	105	99.5	95.4	94.0	92.8	91.5	90.3	89.0	87.8	86.5
8	138	138	138	138	138	138	135	129	127	125	123	122	120	119	117
9	138	138	138	138	138	138	135	129	127	125	123	122	120	119	117
10	138	129	120	115	111	105	100	95.4	94.0	92.8	91.5	90.3	89.0	87.8	86.5
11	138	138	138	138	138	138	135	129	127	125	123	122	120	119	117
12	138	129	120	115	111	105	100	95.4	94.0	92.8	91.5	90.3	89.0	87.8	86.5
13	117	117	117	117	117	117	114	109	108	106	105	103	102	101	99.3
14	117	110	102	97.8	94.3	88.7	84.1	81.4	80.2	79.0	77.7	76.5	75.9	74.7	74.0
15	138	138	138	138	138	138	135	129	127	125	123	122	120	119	117
16	138	129	120	115	111	105	100	95.4	94.0	92.8	91.5	90.3	89.0	87.8	86.5
17	117	117	117	117	117	117	114	109	108	106	105	103	102	101	99.3
18	117	110	102	97.8	94.3	88.7	84.1	81.4	80.2	79.0	77.7	76.5	75.9	74.7	74.0
19	138	138	138	138	138	138	135	129	127	125	123	122	120	119	117
20	138	129	120	115	111	105	100	95.4	94.0	92.8	91.5	90.3	89.0	87.8	86.5
21	117	117	117	117	117	117	114	109	108	106	105	103	102	101	99.3
22	117	110	102	97.8	94.3	88.7	84.1	81.4	80.2	79.0	77.7	76.5	75.9	74.7	74.0
23	117	117	117	117	117	117	114	109	108	106	105	103	102	101	99.3
24	117	110	102	97.8	94.3	88.7	84.1	81.4	80.2	79.0	77.7	76.5	75.9	74.7	74.0
25	187	187	184	179	175	170	167	165	165	165	164	164	163	162	160
26	187	177	163	156	149	140	133	129	127	126	124	123	121	120	119
27	154	153	151	147	143	138	135	132	130	...	...	...	...	...	...
28	154	150	143	137	131	123	117	111	109	...	...	...	...	...	...
29	154	153	151	147	143	138	135	132	130	129	129	128	127	126	124
30	154	150	143	137	131	123	117	111	109	106	104	102	99.5	96.9	95.0
31	154	153	151	147	143	138	135	132	130	...	...	...	...	...	...
32	154	150	143	137	131	123	117	111	109	...	...	...	...	...	...
33	130	130	128	125	122	118	114	112	111	110	110	109	108	107	105
34	130	127	121	116	111	105	99.6	94.5	92.3	90.6	88.6	86.1	84.2	82.3	81.0
35	130	130	128	125	122	118	114	112	111	110	110	109	108	107	105
36	130	127	121	116	111	105	99.6	94.5	92.3	90.6	88.6	86.1	84.2	82.3	81.0
37	165	165	163	158	154	149	146	142	141	140	138	138	137	135	134
38	165	159	151	144	138	130	123	117	115	112	110	107	105	102	100
39	165	165	163	158	154	149	146	142	141	...	...	...	...	...	...
40	165	159	151	144	138	130	123	117	115	...	...	...	...	...	...
41	141	141	139	135	132	126	123	121	120	119	118	117	116	115	113
42	141	135	128	123	118	110	104	100	97.6	95.3	93.4	90.9	89.1	87.2	85.3
43	141	141	139	135	132	126	123	121	120	119	118	117	116	115	113
44	141	135	128	123	118	110	104	100	97.6	95.3	93.4	90.9	89.1	87.2	85.3
45	177	177	177	174	171	168	168	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	72.9	71.6	66.5	*55.8*	*41.5*	*31.0*	*23.2*	*18.2*	*13.8*	*10.4*	*8.27*	*6.50*	*5.05*	*4.01*	...	...	...
2	116	104	*84.7*	*64.7*	*48.6*	*36.2*	*27.3*	*21.1*	*15.9*	*12.5*	*9.92*	*7.64*	*5.97*	*4.67*	...	...	...
3	85.3	84.0	79.8	*64.7*	*48.6*	*36.2*	*27.3*	*21.1*	*15.9*	*12.5*	*9.92*	*7.64*	*5.97*	*4.67*	...	...	...
4	98.4	90.6	*71.3*	*55.7*	*41.5*	*31.0*	*23.2*	*18.2*	*13.8*	*10.4*	*8.27*	*6.50*	*5.05*	*4.01*	...	...	...
5	72.9	71.6	66.5	*55.8*	*41.5*	*31.0*	*23.2*	*18.2*	*13.8*	*10.4*	*8.27*	*6.50*	*5.05*	*4.01*	...	...	...
6	116	104	*84.7*	*64.7*	*48.6*	*36.2*	*27.3*	*21.1*	*15.9*	*12.5*	*9.92*	*7.64*	*5.97*	*4.67*	...	...	...
7	85.3	84.0	79.8	*64.7*	*48.6*	*36.2*	*27.3*	*21.1*	*15.9*	*12.5*	*9.92*	*7.64*	*5.97*	*4.67*	...	...	...
8	112	*87.2*	*59.2*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	112	*87.2*	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
10	85.3	77.8	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
11	112	*87.2*	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
12	85.3	77.8	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
13	98.5	*74.7*	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
14	72.8	64.5	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
15	112	*87.2*	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
16	85.3	77.8	*59.2*	*44.2*	*31.8*	*23.7*	*16.9*	*10.7*	*6.10*	*3.78*	*2.96*	*2.40*	*1.76*	*1.15*	...	...	...
17	98.5	*74.7*	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
18	72.8	64.5	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
19	112	*87.2*	*59.2*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	85.3	77.8	*59.2*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	98.5	*74.7*	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
22	72.8	64.5	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
23	98.5	*74.7*	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
24	72.8	64.5	*50.6*	*37.4*	*27.5*	*20.4*	*14.2*	*9.27*	*5.22*	*3.23*	*2.53*	*2.06*	*1.52*	*0.960*	...	...	...
25	158	156	153	150	*118*	*90.2*	*68.9*	*52.9*	*41.1*	*32.2*	*25.2*	...	...	...	...	...	...
26	117	115	114	112	110	*90.2*	*68.9*	*52.9*	*41.1*	*32.2*	*25.2*	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	122	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	93.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	103	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	79.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	103	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	79.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	132	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	98.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	112	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	83.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	112	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	83.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
	1	26Cr–4Ni–Mo	Wld. tube	SA–789	...	S32900	...	...	10H	1
	2	26Cr–4Ni–Mo	Smls. tube	SA–789	...	S32900	...	...	10H	1
	3	26Cr–4Ni–Mo	Wld. pipe	SA–790	...	S32900	...	...	10H	1
	4	26Cr–4Ni–Mo	Smls. pipe	SA–790	...	S32900	...	...	10H	1
	5	26Cr–4Ni–Mo–N	Plate	SA–240	...	S32950	...	...	10H	1
	6	26Cr–4Ni–Mo–N	Wld. tube	SA–789	...	S32950	...	...	10H	1
	7	26Cr–4Ni–Mo–N	Smls. tube	SA–789	...	S32950	...	...	10H	1
	8	26Cr–4Ni–Mo–N	Wld. pipe	SA–790	...	S32950	...	...	10H	1
	9	26Cr–4Ni–Mo–N	Smls. pipe	SA–790	...	S32950	...	...	10H	1
(**23**)	10	27Cr–7.5Ni–4.5Mo–Co–N	Smls. tube	SA–789	...	S32707	...	...	10H	1
(**23**)	11	27Cr–7.5Ni–4.5Mo–Co–N	Smls. pipe	SA–790	...	S32707	...	...	10H	1
	12	29Cr–6.5Ni–2Mo–N	Plate, sheet, strip	SA–240	...	S32906	...	≥10	10H	1
	13	29Cr–6.5Ni–2Mo–N	Bar	SA–479	...	S32906	...	...	10H	1
	14	29Cr–6.5Ni–2Mo–N	Smls. tube	SA–789	...	S32906	...	≥10	10H	1
	15	29Cr–6.5Ni–2Mo–N	Smls. pipe	SA–790	...	S32906	...	≥10	10H	1
	16	29Cr–6.5Ni–2Mo–N	Plate, sheet, strip	SA–240	...	S32906	...	<10	10H	1
	17	29Cr–6.5Ni–2Mo–N	Smls. tube	SA–789	...	S32906	...	<10	10H	1
	18	29Cr–6.5Ni–2Mo–N	Smls. pipe	SA–790	...	S32906	...	<10	10H	1

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	620	485	NP	NP	260	260	HA–5	G19, G24
2	620	485	NP	NP	260	260	HA–5	G19
3	620	485	NP	NP	260	260	HA–5	G19, G24
4	620	485	NP	NP	260	260	HA–5	G19
5	690	485	NP	NP	316	316	HA–5	G19
6	690	485	NP	NP	316	316	HA–5	G19, G24
7	690	485	NP	NP	316	316	HA–5	G19
8	690	485	NP	NP	316	316	HA–5	G19, G24
9	690	485	NP	NP	316	316	HA–5	G19
10	920	700	NP	NP	260	NP	HA–5	G19
11	920	700	NP	NP	260	NP	HA–5	G19
12	750	550	NP	NP	316	316	HA–5	G19
13	750	550	NP	NP	316	316	HA–5	G19
14	750	550	NP	NP	316	316	HA–5	G19
15	750	550	NP	NP	316	316	HA–5	G19
16	800	650	NP	NP	316	316	HA–5	G19
17	800	650	NP	NP	316	316	HA–5	G19
18	800	650	NP	NP	316	316	HA–5	G19

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475
1	151	151	151	148	145	142	142	...	...	...	...	...	...	...	...
2	177	177	177	174	171	168	168	...	...	...	...	...	...	...	...
3	151	151	151	148	145	142	142	...	...	...	...	...	...	...	...
4	177	177	177	174	171	168	168	...	...	...	...	...	...	...	...
5	197	197	196	191	186	182	182	182	182	...	...	...	...	...	...
6	168	167	166	163	158	155	155	155	155	...	...	...	...	...	...
7	197	197	196	191	186	182	182	182	182	...	...	...	...	...	...
8	168	167	166	163	158	155	155	155	155	...	...	...	...	...	...
9	197	197	196	191	186	182	182	182	182	...	...	...	...	...	...
10	262	262	262	262	260	255	245	243	...	...	...	...	...	...	...
11	262	262	262	262	260	255	245	243	...	...	...	...	...	...	...
12	215	215	213	208	204	198	196	195	195	...	...	...	...	...	...
13	215	215	213	208	204	198	196	195	195	...	...	...	...	...	...
14	215	215	213	208	204	198	196	195	195	...	...	...	...	...	...
15	215	215	213	208	204	198	196	195	195	...	...	...	...	...	...
16	229	229	227	221	217	211	208	207	207	...	...	...	...	...	...
17	229	229	227	221	217	211	208	207	207	...	...	...	...	...	...
18	229	229	227	221	217	211	208	207	207	...	...	...	...	...	...

Table 1A (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Ferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

NOTES TO TABLE 1A

GENERAL NOTES

(a) The following abbreviations are used: Norm. rld., Normalized rolled; NT, Normalized and tempered; QT, Quenched and tempered; Smls., Seamless; and Wld., Welded.

(b) The stress values in this Table may be interpolated to determine values for intermediate temperatures. The values at intermediate temperatures shall be rounded to the same number of decimal places as the value at the higher temperature between which values are being interpolated. The rounding rule is: when the next digit beyond the last place to be retained is less than 5, retain unchanged the digit in the last place retained; when the digit next beyond the last place to be retained is 5 or greater, increase by 1 the digit in the last place retained.

(c) The properties of steels are influenced by the processing history, heat treatment, melting practice, and level of residual elements. See Nonmandatory Appendix A for more information.

(d) Where a size limit appears in the Size/Thickness column, the limit applies to the dimension appropriate to the product form: wall thickness of tubing, pipe, pipe fittings, and hollow forgings; thickness of plate, flat bar and forgings, and polygonal bar; diameter of solid bar and bolting; and thickest cross–section of other pressure parts, e.g., castings and forgings.

(e) Stress values for 40°C are applicable for colder temperatures when the toughness requirements of Section III, VIII, or XII are met.

(f) An alternative typeface is used for stress values obtained from time–dependent properties (see Notes T1 through T12).

(g) Where specifications, grades, classes, and types are listed in this Table, and where the material specification in Section II, Part A or Part B is a dual–unit specification (e.g., SA–516/SA–516M), the values listed in this Table shall be applicable to either the customary U.S. version of the material specification or the SI units version of the material specification. For example, the values listed for SA–516 Grade 70 shall be used when SA–516M Grade 485 is used in construction.

NOTES – GENERAL REQUIREMENTS

G1 To these stress values a casting quality factor as specified in PG–25 of Section I; UG–24 of Section VIII, Division 1; or TM–190 of Section XII shall be applied.

G2 These stress values include a joint efficiency factor of 0.60.

G3 These stress values include a joint efficiency factor of 0.85.

G4 For Section I applications, these stresses apply when used for boiler, water wall, superheater, and economizer tubes that are enclosed within a setting. A joint efficiency factor of 0.85 is included in values above 450°C.

G5 Due to the relatively low yield strength of these materials, these higher stress values were established at temperatures where the short–time tensile properties govern to permit the use of these alloys where slightly greater deformation is acceptable. The stress values in this range exceed $66\frac{2}{3}$% but do not exceed 90% of the yield strength at temperature. Use of these stresses may result in dimensional changes due to permanent strain. These stress values are not recommended for the flanges of gasketed joints or other applications where slight amounts of distortion can cause leakage or malfunction. For Section III applications, Table Y–2 lists multiplying factors that, when applied to the yield strength values shown in Table Y–1, will give allowable stress values that will result in lower levels of permanent strain.

G6 Creep–fatigue, thermal ratcheting, and environmental effects are increasingly significant failure modes at temperatures in excess of 825°C and shall be considered in the design.

G7 For Section VIII applications, these stress values are based on expected minimum values of 310 MPa tensile strength and yield strength of 140 MPa resulting from loss of strength due to thermal treatment required for the glass coating operation. UG–85 does not apply.

G8 These stress values are established from a consideration of strength only and will be satisfactory for average service. For bolted joints where freedom from leakage over a long period of time without retightening is required, lower stress values may be necessary as determined from the flexibility of the flange and bolts and corresponding relaxation properties.

G9 For Section III applications, the use of these materials shall be limited to materials for tanks covered in Subsections NC and ND, component supports, and for nonpressure–retaining attachments (NC/ND–2190).

G10 Upon prolonged exposure to temperatures above 425°C, the carbide phase of carbon steel may be converted to graphite. See Nonmandatory Appendix A, A–201 and A–202.

G11 Upon prolonged exposure to temperatures above 475°C, the carbide phase of carbon–molybdenum steel may be converted to graphite. See Nonmandatory Appendix A, A–201 and A–202.

G12 At temperatures above 550°C, these stress values apply only when the carbon is 0.04% or higher on heat analysis.

G13 These stress values at 575°C and above shall be used only when the grain size is ASTM No. 6 or coarser.

G14 These stress values shall be used when the grain size is not determined or is determined to be finer than ASTM No. 6.

G15 For Section I applications, use is limited to stays as defined in PG–13 except as permitted by PG–11.

G16 For Section III Class 3 applications, these *S* values do not include a casting quality factor. Statically and centrifugally cast products meeting the requirements of NC–2570 shall receive a casting quality factor of 1.00.

G17 For Section III Class 3 applications, statically and centrifugally cast products meeting the requirements of NC–2571(a) and (b), and cast pipe fittings, pumps, and valves with inlet piping connections of DN 50 and less, shall receive a casting quality factor of 1.00. Other casting quality factors shall be in accordance with the following:

(a) for visual examination, 0.80
(b) for magnetic particle examination, 0.85
(c) for liquid penetrant examination, 0.85
(d) for radiography, 1.00
(e) for ultrasonic examination, 1.00
(f) for magnetic particle or liquid penetrant plus ultrasonic examination or radiography, 1.00

G18 See Table Y–1 for yield strength values as a function of thickness over this range. Allowable stresses are independent of yield strength in this thickness range.

NOTES TO TABLE 1A (CONT'D)

NOTES – GENERAL REQUIREMENTS (CONT'D)

G19 This steel may be expected to develop embrittlement after service at moderately elevated temperature. See Nonmandatory Appendix A, A–207 and A–208.

G20 These stresses are based on weld metal properties.

G21 For Section I, use is limited to PEB–5.3. See PG–5.5 for cautionary note.

G22 For Section I applications, use of external pressure charts for material in the form of bar stock is permitted for stiffening rings only.

G23 For temperatures above the maximum temperature shown on the external pressure chart for this material, Figure CS–2 may be used for the design using this material.

G24 A factor of 0.85 has been applied in arriving at the maximum allowable stress values in tension for this material. Divide tabulated values by 0.85 for maximum allowable longitudinal tensile stress.

G25 For Section III applications, for both Class 2 and Class 3, the completed vessel after final heat treatment shall be examined by the ultrasonic method in accordance with NB–2542 except that angle beam examination in both the circumferential and the axial directions may be performed in lieu of the straight beam examination in the axial direction. The tensile strength shall not exceed 860 MPa.

G26 Material that conforms to Class 10, 11, or 12 is not permitted.

G27 Material that conforms to Class 11 or 12 is not permitted.

G28 Supplementary Requirement S15 of SA–781, Alternate Mechanical Test Coupons and Specimen Locations for Castings, is mandatory.

G29 For Section III applications, impact testing in accordance with the requirements of NC–2300 is required for Class 2 components and in accordance with ND–2300 for Class 3 components.

G30 These stresses apply to all product forms (C, H, and P) as defined in SA/EN 10028–7.

G31 The allowable stress value given for 250°C can be used up to the temperature of 260°C.

G32 The allowable stress value given for 200°C can be used up to the temperature of 204°C.

(**23**) G33 The allowable stress value at 65°C shall be used at 66°C.

NOTES – HEAT TREATMENT REQUIREMENTS

H1 For temperatures above 550°C, these stress values may be used only if the material is heat treated by heating to the minimum temperature specified in the material specification, but not lower than 1040°C, and quenching in water or rapidly cooling by other means.

H2 For temperatures above 550°C, these stress values may be used only if the material is heat treated by heating to a minimum temperature of 1095°C, and quenching in water or rapidly cooling by other means.

H3 Quenched and tempered at 650°C.

H4 Solution treated and quenched.

H5 For Section III applications, if heat treatment is performed after forming or fabrication, it shall be performed at 825°C to 1000°C for a period of time not to exceed 10 min at temperature, followed by rapid cooling.

H6 Material shall be solution annealed at 1100°C to 1170°C, followed by a rapid cooling in water or air.

NOTES – SIZE REQUIREMENTS

S1 For Section I applications, stress values at temperatures of 450°C and above are permissible but, except for tubular products 75 mm O.D. or less enclosed within the boiler setting, use of these materials at these temperatures is not current practice.

S2 For Section I applications, stress values at temperatures of 475°C and above are permissible but, except for tubular products 75 mm O.D. or less enclosed within the boiler setting, use of these materials at these temperatures is not current practice.

S3 For Section I applications, stress values at temperatures of 550°C and above are permissible but, except for tubular products 75 mm O.D. or less enclosed within the boiler setting, use of these materials at these temperatures is not current practice.

S4 For Section I applications, stress values at temperatures of 625°C and above are permissible but, except for tubular products 75 mm O.D. or less enclosed within the boiler setting, use of these materials at these temperatures is not current practice.

S5 Material that conforms to Class 10, 11, or 12 is not permitted when the nominal thickness of the material exceeds 19 mm.

S6 Material that conforms to Class 10, 11, or 12 is not permitted when the nominal thickness of the material exceeds 32 mm.

S7 The maximum thickness of unheat–treated forgings shall not exceed 95 mm. The maximum thickness as–heat–treated may be 100 mm.

S8 The maximum section thickness shall not exceed 75 mm for double–normalized–and–tempered forgings, or 125 mm for quenched–and–tempered forgings.

S9 Both DN 200 and larger, and schedule 140 and heavier.

S10 The maximum pipe size shall be DN 100 and the maximum thickness in any pipe size shall be Schedule 80.

S11 Either DN 200 and larger and less than schedule 140 wall, or less than DN 200 and all wall thicknesses.

NOTES – TIME–DEPENDENT PROPERTIES [See General Note (f)]

T1 Allowable stresses for temperatures of 370°C and above are values obtained from time–dependent properties.

T2 Allowable stresses for temperatures of 400°C and above are values obtained from time–dependent properties.

T3 Allowable stresses for temperatures of 455°C and above are values obtained from time–dependent properties.

T4 Allowable stresses for temperatures of 480°C and above are values obtained from time–dependent properties.

T5 Allowable stresses for temperatures of 510°C and above are values obtained from time–dependent properties.

T6 Allowable stresses for temperatures of 540°C and above are values obtained from time–dependent properties.

T7 Allowable stresses for temperatures of 565°C and above are values obtained from time–dependent properties.

T8 Allowable stresses for temperatures of 595°C and above are values obtained from time–dependent properties.

T9 Allowable stresses for temperatures of 620°C and above are values obtained from time–dependent properties.

T10 Allowable stresses for temperatures of 425°C and above are values obtained from time–dependent properties.

T11 Allowable stresses for temperatures of 350°C and above are values obtained from time–dependent properties.

T12 Allowable stresses for temperatures of 650°C and above are values obtained from time–dependent properties.

NOTES TO TABLE 1A (CONT'D)

NOTES – WELDING REQUIREMENTS

W1 Not for welded construction.

W2 Not for welded construction in Section III.

W3 Welded.

W4 Nonwelded, or welded if the tensile strength of the Section IX reduced section tension test is not less than 690 MPa.

W5 Welded, with the tensile strength of the Section IX reduced tension test less than 690 MPa but not less than 655 MPa.

W6 This material may be welded by the resistance technique.

W7 In welded construction for temperatures above 450°C, the weld metal shall have a carbon content of greater than 0.05%.

W8 Welding and oxygen or other thermal cutting processes are not permitted when carbon content exceeds 0.35% by heat analysis.

W9 For Section I applications, for pressure retaining welds in $2\frac{1}{4}$Cr–1Mo materials, other than circumferential butt welds less than or equal to 89 mm in outside diameter, when the design metal temperatures exceed 450°C, the weld metal shall have a carbon content greater than 0.05%.

W10 For Section III applications, material that conforms to Class 10, 13, 20, 23, 30, 33, 40, 43, 50, or 53 is not permitted for Class 2 and Class 3 construction when a weld efficiency factor of 1.00 is used in accordance with Note W12.

W11 For Section VIII applications, Section IX, QW–250 Variables QW–404.12, QW–406.3, QW–407.2, and QW–409.1 shall also apply to this material. These variables shall be applied in accordance with the rules for welding of Part UF.

W12 These *S* values do not include a longitudinal weld efficiency factor. For Section III applications, for materials welded without filler metal, ultrasonic examination, radiographic examination, or eddy current examination, in accordance with NC–2550, shall provide a longitudinal weld efficiency factor of 1.00. Materials welded with filler metal meeting the requirements of NC–2560 shall receive a longitudinal weld efficiency factor of 1.00. Other longitudinal weld efficiency factors shall be in accordance with the following:

(a) for single butt weld, with filler metal, 0.80

(b) for single or double butt weld, without filler metal, 0.85

(c) for double butt weld, with filler metal, 0.90

(d) for single or double butt weld, with radiography, 1.00

W13 For Section I applications, electric resistance and autogenous welded tubing may be used with these stresses, provided the following additional restrictions and requirements are met:

(a) The tubing shall be used for boiler, waterwall, superheater, and economizer tubes that are enclosed within the setting.

(b) The maximum outside diameter shall be 89 mm.

(c) The weld seam of each tube shall be subjected to an angle beam ultrasonic inspection per SA–450/SA–1016M.

(d) A complete volumetric inspection of the entire length of each tube shall be performed in accordance with SA–450/SA–1016M.

(e) Material test reports shall be supplied.

W14 These *S* values do not include a weld factor. For Section VIII, Division 1, and Section XII applications using welds made without filler metal, the tabulated tensile stress values shall be multiplied by 0.85. For welds made with filler metal, consult UW–12 for Section VIII, Division 1, or TW–130.4 for Section XII, as applicable.

W15 The Nondestructive Electric Test requirements of SA–53 Type E pipe are required for all sizes. The pipe shall be additionally marked "NDE" and so noted on the material specification.

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Table 1B
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
1	...	Plate, sheet	SB–209	...	Alclad 3003	O
2	...	Plate, sheet	SB–209	...	Alclad 3003	O
3	...	Plate, sheet	SB–209	...	Alclad 3003	H112
4	...	Plate, sheet	SB–209	...	Alclad 3003	H112
5	...	Plate, sheet	SB–209	...	Alclad 3003	H112
6	...	Plate, sheet	SB–209	...	Alclad 3003	H12
7	...	Plate, sheet	SB–209	...	Alclad 3003	H12
8	...	Plate, sheet	SB–209	...	Alclad 3003	H14
9	...	Plate, sheet	SB–209	...	Alclad 3003	H14
10	...	Drawn smls. tube	SB–210	...	Alclad 3003	O
11	...	Drawn smls. tube	SB–210	...	Alclad 3003	H113
12	...	Drawn smls. tube	SB–210	...	Alclad 3003	H14
13	...	Drawn smls. tube	SB–210	...	Alclad 3003	H18
14	...	Cond. & heat exch. tubes	SB–234	...	Alclad 3003	H14
15	...	Cond. & heat exch. tubes	SB–234	...	Alclad 3003	H25
16	...	Smls. extr. tube	SB–241	...	Alclad 3003	O
17	...	Smls. extr. tube	SB–241	...	Alclad 3003	H112
18	...	Plate, sheet	SB–209	...	Alclad 3004	O
19	...	Plate, sheet	SB–209	...	Alclad 3004	O
20	...	Plate, sheet	SB–209	...	Alclad 3004	H112
21	...	Plate, sheet	SB–209	...	Alclad 3004	H112
22	...	Plate, sheet	SB–209	...	Alclad 3004	H32
23	...	Plate, sheet	SB–209	...	Alclad 3004	H32
24	...	Plate, sheet	SB–209	...	Alclad 3004	H34
25	...	Plate, sheet	SB–209	...	Alclad 3004	H34
26	...	Plate, sheet	SB–209	...	Alclad 6061	T4
27	...	Plate, sheet	SB–209	...	Alclad 6061	T451
28	...	Plate, sheet	SB–209	...	Alclad 6061	T451
29	...	Plate, sheet	SB–209	...	Alclad 6061	T4 wld.
30	...	Plate, sheet	SB–209	...	Alclad 6061	T451 wld.
31	...	Plate, sheet	SB–209	...	Alclad 6061	T6
32	...	Plate, sheet	SB–209	...	Alclad 6061	T651
33	...	Plate, sheet	SB–209	...	Alclad 6061	T651
34	...	Plate, sheet	SB–209	...	Alclad 6061	T651
35	...	Plate, sheet	SB–209	...	Alclad 6061	T6 wld.
36	...	Plate, sheet	SB–209	...	Alclad 6061	T651 wld.
37	...	Castings	SB–26	...	A02040	T4
38	...	Castings	SB–108	...	A02040	T4
39	...	Castings	SB–26	...	A03560	T71
40	...	Castings	SB–26	...	A03560	T6
41	...	Castings	SB–108	...	A03560	T6
42	...	Castings	SB/EN 1706	...	AC–42000–S	T6
43	...	Castings	SB–26	...	A24430	F
44	...	Plate, sheet	SB–209	...	A91060	O
45	...	Plate, sheet	SB–209	...	A91060	H112

Table 1B
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	0.15–12.67	21	90	30	NP	121 (Cl. 3 only)	204	204	NFA–7	G16
2	12.70–76.20	21	95	35	NP	121 (Cl. 3 only)	204	204	NFA–7	G25
3	6.35–12.67	21	110	60	NP	148 (Cl. 3 only)	204	204	NFA–7	G16, W3
4	12.70–50.80	21	105	40	NP	93 (Cl. 3 only)	204	204	NFA–7	G26, W3
5	50.83–76.20	21	100	40	NP	93 (Cl. 3 only)	204	204	NFA–7	G26, W3
6	0.43–12.67	21	110	75	NP	148 (Cl. 3 only)	204	204	NFA–7	G16, W3
7	12.70–50.80	21	115	85	NP	148 (Cl. 3 only)	204	204	NFA–7	G25, W3
8	0.23–12.67	21	130	110	NP	121 (Cl. 3 only)	204	204	NFA–7	G16, W3
9	12.70–25.40	21	140	115	NP	121 (Cl. 3 only)	204	204	NFA–7	G25, W3
10	0.25–12.70	21	90	30	NP	121 (Cl. 3 only)	204	204	NFA–7	G16
11	1.27–12.70	21	90	30	NP	121 (Cl. 3 only)	204	204	NFA–7	G16, W3
12	0.25–12.70	21	130	110	NP	121 (Cl. 3 only)	204	204	NFA–1	G16, W3
13	0.25–12.70	21	180	160	NP	121 (Cl. 3 only)	204	204	NFA–1	G16, W3
14	0.25–5.08	21	130	110	NP	121 (Cl. 3 only)	204	204	NFA–1	G16, W4
15	0.25–5.08	21	145	125	NP	121 (Cl. 3 only)	204	204	NFA–1	G16, W4
16	...	21	90	30	NP	121 (Cl. 3 only)	204	204	NFA–7	G16
17	...	21	90	30	NP	121 (Cl. 3 only)	204	204	NFA–7	G16, W3
18	0.15–12.67	22	145	55	NP	148 (Cl. 3 only)	204	204	NFA–7	G16
19	12.70–76.20	22	150	60	NP	148 (Cl. 3 only)	204	204	NFA–7	G25
20	6.35–12.67	22	150	60	NP	148 (Cl. 3 only)	204	204	NFA–7	G16, W3
21	12.70–76.20	22	160	60	NP	148 (Cl. 3 only)	204	204	NFA–7	G25, W3
22	0.43–12.67	22	185	140	NP	121 (Cl. 3 only)	204	204	NFA–7	G16, W3
23	12.70–50.80	22	195	145	NP	121 (Cl. 3 only)	204	204	NFA–7	G25, W3
24	0.23–12.67	22	215	165	NP	121 (Cl. 3 only)	204	204	NFA–7	G16, W3
25	12.70–25.40	22	220	170	NP	121 (Cl. 3 only)	204	204	NFA–7	G25, W3
26	0.25–6.34	23	185	95	NP	204 (Cl. 3 only)	204	204	NFA–12	G16, G24, W4
27	6.35–12.69	23	185	95	NP	204 (Cl. 3 only)	204	204	NFA–12	G16, G24, W4
28	12.70–76.20	23	205	110	NP	204 (Cl. 3 only)	204	204	NFA–12	G24, G25, W4
29	0.25–6.34	23	165	...	NP	204 (Cl. 3 only)	204	204	NFA–12	G24, W7
30	6.35–76.20	23	165	...	NP	204 (Cl. 3 only)	204	204	NFA–12	G24, W7
31	0.25–6.34	23	260	220	NP	204 (Cl. 3 only)	204	204	NFA–12	G16, G24, W4
32	6.35–12.69	23	260	220	NP	204 (Cl. 3 only)	204	204	NFA–12	G16, G24, W4
33	12.70–101.60	23	290	240	NP	204 (Cl. 3 only)	204	204	NFA–12	G24, G25, W4
34	101.61–127	23	275	240	NP	204 (Cl. 3 only)	204	204	NFA–12	G24, G26, W4
35	0.25–6.34	23	165	...	NP	204 (Cl. 3 only)	204	204	NFA–12	G24, W7
36	6.35–127	23	165	...	NP	204 (Cl. 3 only)	204	204	NFA–12	G24, W7
37	≤50.8	...	310	195	NP	NP	66	66	NFA–12	G15, W4
38	≤50.8	...	330	200	NP	NP	66	66	NFA–12	G15, W4
39	...	...	170	125	NP	177 (Cl. 3 only)	204	204	NFA–1	G15, W4
40	...	...	205	140	NP	121 (Cl. 3 only)	121	121	NFA–12	G15, W4
41	...	...	230	150	NP	NP	121	121	NFA–12	G15, W4
42	...	...	220	180	NP	NP	121	NP	NFA–12	G15, W4
43	...	...	120	41	NP	204 (Cl. 3 only)	204	204	NFA–1	G15, W4
44	0.15–76.2	21	55	15	NP	149 (Cl. 3 only)	204	204	NFA–7	T3
45	6.35–12.7	21	75	50	NP	149 (Cl. 3 only)	204	204	NFA–7	T3, W3

Table 1B
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	20.7	19.9	19.3	18.4	15.0	11.2	9.4	7.7	...	...	...	...	...	...	...	...	...	...
2	23.0	22.1	21.4	20.5	15.0	11.2	9.4	7.7	...	...	...	...	...	...	...	...	...	...
3	31.5	31.0	28.2	26.1	22.6	18.8	15.0	12.0	...	...	...	...	...	...	...	...	...	...
4	27.6	26.6	25.6	24.5	15.0	11.2	9.4	7.7	...	...	...	...	...	...	...	...	...	...
5	27.6	26.6	25.6	24.0	15.0	11.2	9.4	7.7	...	...	...	...	...	...	...	...	...	...
6	31.5	31.5	30.6	28.7	22.6	18.8	15.0	12.0	...	...	...	...	...	...	...	...	...	...
7	33.5	33.5	32.5	30.5	22.6	18.8	15.0	12.0	...	...	...	...	...	...	...	...	...	...
8	37.4	37.4	37.4	35.9	26.5	19.0	15.4	12.0	...	...	...	...	...	...	...	...	...	...
9	39.4	39.4	39.4	37.8	26.5	19.0	15.4	12.0	...	...	...	...	...	...	...	...	...	...
10	20.7	19.9	19.3	18.4	15.0	11.2	9.4	7.7	...	...	...	...	...	...	...	...	...	...
11	20.7	19.9	19.3	18.4	15.0	11.2	9.4	7.7	...	...	...	...	...	...	...	...	...	...
12	37.4	37.4	37.4	35.9	26.5	19.0	15.4	12.0	...	...	...	...	...	...	...	...	...	...
13	51.2	51.2	48.5	45.1	32.6	22.6	16.9	12.4	...	...	...	...	...	...	...	...	...	...
14	37.4	37.4	37.4	35.9	26.5	19.0	15.4	12.0	...	...	...	...	...	...	...	...	...	...
15	41.4	41.4	41.4	39.4	26.5	19.0	15.4	12.0	...	...	...	...	...	...	...	...	...	...
16	20.7	19.9	19.3	18.4	15.0	11.2	8.7	6.7	...	...	...	...	...	...	...	...	...	...
17	20.7	19.9	19.3	18.4	15.0	11.2	8.7	6.7	...	...	...	...	...	...	...	...	...	...
18	36.8	36.8	36.8	36.8	30.7	23.8	15.1	10.1	...	...	...	...	...	...	...	...	...	...
19	39.1	39.1	39.1	39.1	30.7	23.8	15.1	10.1	...	...	...	...	...	...	...	...	...	...
20	39.1	39.1	39.1	39.1	31.3	23.9	15.2	10.1	...	...	...	...	...	...	...	...	...	...
21	41.4	41.2	41.2	41.2	31.3	23.9	15.2	10.1	...	...	...	...	...	...	...	...	...	...
22	53.2	53.2	53.2	53.2	35.2	24.0	15.5	10.1	...	...	...	...	...	...	...	...	...	...
23	55.2	55.2	55.2	55.2	35.2	24.0	15.5	10.1	...	...	...	...	...	...	...	...	...	...
24	61.1	61.1	61.1	61.1	35.2	24.0	15.5	10.1	...	...	...	...	...	...	...	...	...	...
25	63.0	63.0	63.0	63.0	35.2	24.0	15.5	10.1	...	...	...	...	...	...	...	...	...	...
26	53.2	53.2	53.2	52.9	42.6	39.5	28.0	21.2	...	...	...	...	...	...	...	...	...	...
27	53.2	53.2	53.2	52.9	42.6	39.5	28.0	21.2	...	...	...	...	...	...	...	...	...	...
28	59.1	59.1	59.1	58.5	42.6	39.5	28.0	21.2	...	...	...	...	...	...	...	...	...	...
29	47.3	47.3	47.3	46.8	37.7	32.1	24.8	19.7	...	...	...	...	...	...	...	...	...	...
30	47.3	47.3	47.3	46.8	37.7	32.1	24.8	19.7	...	...	...	...	...	...	...	...	...	...
31	74.9	74.9	74.9	71.3	51.8	40.0	28.9	21.2	...	...	...	...	...	...	...	...	...	...
32	74.9	74.9	74.9	71.3	51.8	40.0	28.9	21.2	...	...	...	...	...	...	...	...	...	...
33	82.7	82.7	82.7	79.2	51.8	40.0	28.9	21.2	...	...	...	...	...	...	...	...	...	...
34	78.8	78.8	78.8	75.5	50.5	39.9	28.8	21.2	...	...	...	...	...	...	...	...	...	...
35	47.3	47.3	47.3	47.1	37.7	32.1	24.8	19.7	...	...	...	...	...	...	...	...	...	...
36	47.3	47.3	47.3	47.1	37.7	32.1	24.8	19.7	...	...	...	...	...	...	...	...	...	...
37	57.9	49.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	71.0	59.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	49.6	49.6	48.8	42.5	37.0	28.9	18.5	7.84	...	...	...	...	...	...	...	...	...	...
40	59.3	59.3	57.3	40.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	65.5	64.2	55.7	42.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	63.0	63.0	62.8	62.8	56.4	...	...	...	...	...	...	...	...	...	...	...	...	...
43	27.6	27.6	27.4	25.9	24.0	21.5	19.6	17.8	...	...	...	...	...	...	...	...	...	...
44	11.5	11.3	10.6	9.39	8.19	*7.37*	*5.67*	*4.40*	...	...	...	...	...	...	...	...	...	...
45	21.7	20.7	18.2	16.2	12.4	*11.1*	*7.03*	*4.87*	...	...	...	...	...	...	...	...	...	...

Table 1B
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
1	...	Plate, sheet	SB–209	...	A91060	H112
2	...	Plate, sheet	SB–209	...	A91060	H112
3	...	Plate, sheet	SB–209	...	A91060	H12
4	...	Plate, sheet	SB–209	...	A91060	H14
5	...	Drawn smls. tube	SB–210	...	A91060	O
6	...	Drawn smls. tube	SB–210	...	A91060	H14
7	...	Drawn smls. tube	SB–210	...	A91060	H113
8	...	Bar, rod, shapes	SB–221	...	A91060	O
9	...	Bar, rod, shapes	SB–221	...	A91060	H112
10	...	Cond. & heat exch. tubes	SB–234	...	A91060	H14
11	...	Smls. extr. tube	SB–241	...	A91060	O
12	...	Smls. extr. tube	SB–241	...	A91060	H112
13	...	Plate, sheet	SB–209	...	A91100	O
14	...	Plate, sheet	SB–209	...	A91100	H112
15	...	Plate, sheet	SB–209	...	A91100	H112
16	...	Plate, sheet	SB–209	...	A91100	H112
17	...	Plate, sheet	SB–209	...	A91100	H12
18	...	Plate, sheet	SB–209	...	A91100	H14
19	...	Bar, rod, shapes	SB–221	...	A91100	O
20	...	Bar, rod, shapes	SB–221	...	A91100	H112
21	...	Smls. extr. tube	SB–241	...	A91100	O
22	...	Smls. extr. tube	SB–241	...	A91100	H112
23	...	Die forgings	SB–247	...	A92014	T4
24	...	Die forgings	SB–247	...	A92014	T6
25	...	Die forgings	SB–247	...	A92014	T6
26	...	Bar, rod, wire	SB–211	...	A92024	T4
27	...	Bar, rod, wire	SB–211	...	A92024	T4
28	...	Bar, rod, wire	SB–211	...	A92024	T4
29	...	Bar, rod, wire	SB–211	...	A92024	T4
30	...	Bar, rod, shapes	SB–221	...	A92024	T3
31	...	Bar, rod, shapes	SB–221	...	A92024	T3
32	...	Bar, rod, shapes	SB–221	...	A92024	T3
33	...	Bar, rod, shapes	SB–221	...	A92024	T3
34	...	Plate, sheet	SB–209	...	A93003	O
35	...	Plate, sheet	SB–209	...	A93003	H112
36	...	Plate, sheet	SB–209	...	A93003	H112
37	...	Plate, sheet	SB–209	...	A93003	H112
38	...	Plate, sheet	SB–209	...	A93003	H12
39	...	Plate, sheet	SB–209	...	A93003	H14
40	...	Drawn smls. tube	SB–210	...	A93003	O
41	...	Drawn smls. tube	SB–210	...	A93003	H113
42	...	Drawn smls. tube	SB–210	...	A93003	H12
43	...	Drawn smls. tube	SB–210	...	A93003	H14
44	...	Drawn smls. tube	SB–210	...	A93003	H18
45	...	Bar, rod, shapes	SB–221	...	A93003	O

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	12.70–25.4	21	70	35	NP	149 (Cl. 3 only)	204	204	NFA–7	T4, W3
2	25.43–76.2	21	60	30	NP	121 (Cl. 3 only)	204	204	NFA–7	T3, W3
3	0.43–50.8	21	75	60	NP	149 (Cl. 3 only)	204	204	NFA–7	T3, W3
4	0.23–25.4	21	85	70	NP	149 (Cl. 3 only)	204	204	NFA–7	T3, W3
5	0.46–12.7	21	60	15	NP	149 (Cl. 3 only)	204	204	NFA–7	T3
6	0.46–12.7	...	85	70	NP	149 (Cl. 3 only)	204	204	NFA–7	T3, W3
7	0.46–12.7	21	60	15	NP	149 (Cl. 3 only)	204	204	NFA–7	T3, W3
8	...	21	60	15	NP	149 (Cl. 3 only)	204	204	NFA–7	G13, T3
9	...	21	60	15	NP	149 (Cl. 3 only)	204	204	NFA–7	G13, T3, W3
10	0.25–5.08	21	85	70	NP	149 (Cl. 3 only)	204	204	NFA–7	T3, W4
11	...	21	60	15	NP	149 (Cl. 3 only)	204	204	NFA–7	T3
12	...	21	60	15	NP	149 (Cl. 3 only)	204	204	NFA–7	T3, W3
13	0.15–76.2	21	75	25	NP	121 (Cl. 3 only)	204	204	NFA–7	T4
14	6.35–12.7	21	90	50	NP	121 (Cl. 3 only)	204	204	NFA–7	T4, W3
15	12.7–50.8	21	85	35	NP	121 (Cl. 3 only)	204	204	NFA–7	T4, W3
16	50.8–76.2	21	80	30	NP	121 (Cl. 3 only)	204	204	NFA–7	T4, W3
17	0.43–50.8	21	95	75	NP	121 (Cl. 3 only)	204	204	NFA–7	T4, W3
18	0.23–25.4	21	110	95	NP	121 (Cl. 3 only)	204	204	NFA–7	T4, W3
19	...	21	75	20	NP	121 (Cl. 3 only)	204	204	NFA–7	T4
20	...	21	75	20	NP	121 (Cl. 3 only)	204	204	NFA–7	T4, W3
21	...	21	75	20	NP	121 (Cl. 3 only)	204	204	NFA–7	T4
22	...	21	75	20	NP	121 (Cl. 3 only)	204	204	NFA–7	T4, W3
23	≤101.6	...	380	205	NP	204 (Cl. 3 only)	204	204	NFA–6	T3, W4
24	≤50.8	...	450	385	NP	204 (Cl. 3 only)	204	204	NFA–6	T2, W4
25	50.81–101.6	...	435	370	NP	204 (Cl. 3 only)	204	204	NFA–6	T2, W4
26	3.18–12.69	...	425	310	NP	204 (Cl. 3 only)	204	204	NFA–6	T2, W4
27	12.70–114.30	...	425	290	NP	204 (Cl. 3 only)	204	204	NFA–6	T2, W4
28	114.31–165.10	...	425	275	NP	204 (Cl. 3 only)	204	204	NFA–6	T2, W4
29	165.11–203.2	...	400	260	NP	204 (Cl. 3 only)	204	204	NFA–6	T2, W4
30	≤6.34	...	395	290	NP	204 (Cl. 3 only)	204	204	NFA–6	G24, T2, W4
31	6.35–19.04	...	415	305	NP	204 (Cl. 3 only)	204	204	NFA–6	G24, T2, W4
32	19.05–38.09	...	450	315	NP	204 (Cl. 3 only)	204	204	NFA–6	G24, T2, W4
33	≥38.10	...	470	330	NP	204 (Cl. 3 only)	204	204	NFA–6	G24, T2, W4
34	0.15–76.20	21	95	35	NP	121 (Cl. 3 only)	204	204	NFA–1	T3
35	6.35–12.67	21	115	70	NP	148 (Cl. 3 only)	204	204	NFA–1	T4, W3
36	12.70–50.80	21	105	40	NP	93 (Cl. 3 only)	204	204	NFA–1	T3, W3
37	50.83–76.20	21	100	40	NP	93 (Cl. 3 only)	204	204	NFA–1	T3, W3
38	0.43–50.80	21	115	85	NP	148 (Cl. 3 only)	204	204	NFA–1	T4, W3
39	0.23–25.40	21	140	115	NP	121 (Cl. 3 only)	204	204	NFA–2	T4, W3
40	0.25–12.70	21	95	35	NP	121 (Cl. 3 only)	204	204	NFA–1	T3
41	0.25–12.70	21	95	35	NP	121 (Cl. 3 only)	204	204	NFA–1	T3, W3
42	0.25–12.70	21	115	85	NP	148 (Cl. 3 only)	204	204	NFA–1	T4, W3
43	0.25–12.70	21	140	115	NP	121 (Cl. 3 only)	204	204	NFA–2	T4, W3
44	0.25–12.70	21	185	165	NP	121 (Cl. 3 only)	204	204	NFA–2	T4, W3
45	...	21	95	35	NP	121 (Cl. 3 only)	204	204	NFA–1	T3

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	19.7	18.7	16.4	14.7	11.6	9.77	6.70	*5.40*	...	...	...	...	...	...	...	...	...	...
2	17.7	16.8	14.8	13.2	10.2	*7.73*	*5.80*	*4.36*	...	...	...	...	...	...	...	...	...	...
3	21.7	21.7	19.9	18.0	14.4	*12.5*	*7.77*	*5.27*	...	...	...	...	...	...	...	...	...	...
4	23.6	23.6	23.6	23.6	17.7	*12.7*	*8.78*	*6.10*	...	...	...	...	...	...	...	...	...	...
5	11.5	11.3	10.6	9.39	8.19	*7.37*	*5.67*	*4.36*	...	...	...	...	...	...	...	...	...	...
6	23.6	23.6	23.6	23.6	17.7	*12.7*	*8.78*	*6.13*	...	...	...	...	...	...	...	...	...	...
7	11.5	11.3	10.6	9.39	8.19	*7.37*	*5.67*	*4.36*	...	...	...	...	...	...	...	...	...	...
8	11.5	11.3	10.6	9.39	8.19	*7.37*	*5.67*	*4.36*	...	...	...	...	...	...	...	...	...	...
9	11.5	11.3	10.6	9.39	8.19	*7.37*	*5.67*	*4.36*	...	...	...	...	...	...	...	...	...	...
10	23.6	23.6	23.6	23.6	17.7	*12.7*	*8.78*	*6.13*	...	...	...	...	...	...	...	...	...	...
11	11.5	11.3	10.6	9.39	8.19	*7.37*	*5.67*	*4.36*	...	...	...	...	...	...	...	...	...	...
12	11.5	11.3	10.6	9.39	8.19	*6.97*	*5.68*	*4.68*	...	...	...	...	...	...	...	...	...	...
13	16.1	16.1	16.0	15.6	12.3	9.80	7.18	*5.38*	...	...	...	...	...	...	...	...	...	...
14	25.6	25.6	23.3	21.0	16.3	12.0	7.29	*4.66*	...	...	...	...	...	...	...	...	...	...
15	23.0	23.0	21.5	19.4	15.0	11.9	7.19	*4.66*	...	...	...	...	...	...	...	...	...	...
16	18.4	18.4	18.0	17.4	12.3	9.80	7.18	*5.38*	...	...	...	...	...	...	...	...	...	...
17	27.6	27.6	26.7	24.7	19.0	14.1	8.73	*5.67*	...	...	...	...	...	...	...	...	...	...
18	31.5	31.5	30.9	28.3	19.0	14.1	8.73	*5.67*	...	...	...	...	...	...	...	...	...	...
19	13.8	13.8	13.7	13.4	12.3	9.80	7.18	*5.38*	...	...	...	...	...	...	...	...	...	...
20	13.8	13.8	13.7	13.4	12.3	9.80	7.18	*5.38*	...	...	...	...	...	...	...	...	...	...
21	13.8	13.8	13.7	13.4	12.3	9.80	7.18	*5.38*	...	...	...	...	...	...	...	...	...	...
22	13.8	13.8	13.7	13.4	12.3	9.80	7.18	*5.38*	...	...	...	...	...	...	...	...	...	...
23	108	108	89.2	85.3	78.7	*48.8*	*29.5*	*12.5*	...	...	...	...	...	...	...	...	...	...
24	128	128	125	98.4	*78.2*	*48.6*	*29.7*	*12.4*	...	...	...	...	...	...	...	...	...	...
25	124	124	121	95.1	*78.1*	*48.6*	*29.7*	*12.4*	...	...	...	...	...	...	...	...	...	...
26	122	122	118	90.6	*70.7*	*46.3*	*32.7*	*21.2*	...	...	...	...	...	...	...	...	...	...
27	122	122	118	90.6	*70.7*	*46.3*	*32.7*	*21.2*	...	...	...	...	...	...	...	...	...	...
28	122	122	118	90.6	*70.7*	*46.3*	*32.7*	*21.2*	...	...	...	...	...	...	...	...	...	...
29	114	114	111	84.6	*66.0*	*43.3*	*30.7*	*19.5*	...	...	...	...	...	...	...	...	...	...
30	112	112	109	83.2	*64.6*	*42.6*	*30.6*	*20.0*	...	...	...	...	...	...	...	...	...	...
31	118	118	114	87.2	*68.0*	*44.7*	*32.0*	*20.9*	...	...	...	...	...	...	...	...	...	...
32	128	128	124	94.4	*73.4*	*48.3*	*34.3*	*22.0*	...	...	...	...	...	...	...	...	...	...
33	134	134	130	99.1	*76.8*	*50.4*	*36.3*	*24.0*	...	...	...	...	...	...	...	...	...	...
34	23.0	22.9	22.9	22.3	16.4	*12.6*	*10.1*	*8.0*	...	...	...	...	...	...	...	...	...	...
35	33.5	32.9	29.9	27.7	24.6	20.9	17.0	*14.0*	...	...	...	...	...	...	...	...	...	...
36	27.6	26.6	25.6	24.5	16.4	*12.6*	*10.1*	*8.0*	...	...	...	...	...	...	...	...	...	...
37	27.6	26.6	25.6	24.1	16.4	*12.6*	*10.1*	*8.0*	...	...	...	...	...	...	...	...	...	...
38	33.5	33.5	32.5	30.5	24.6	20.9	17.0	*14.0*	...	...	...	...	...	...	...	...	...	...
39	39.4	39.4	39.4	37.8	29.2	21.1	17.5	*14.0*	...	...	...	...	...	...	...	...	...	...
40	23.0	22.9	22.9	22.3	16.4	*12.6*	*10.1*	*8.0*	...	...	...	...	...	...	...	...	...	...
41	23.0	22.9	22.9	22.3	16.4	*12.6*	*10.1*	*8.0*	...	...	...	...	...	...	...	...	...	...
42	33.5	33.5	32.5	30.5	24.6	20.9	17.0	*14.0*	...	...	...	...	...	...	...	...	...	...
43	39.4	39.4	39.4	37.8	29.2	21.1	17.5	*14.0*	...	...	...	...	...	...	...	...	...	...
44	53.2	53.2	50.4	46.9	36.6	24.8	18.5	*13.4*	...	...	...	...	...	...	...	...	...	...
45	23.0	22.9	22.9	22.3	16.4	*12.6*	*10.1*	*8.0*	...	...	...	...	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	1	...	Bar, rod, shapes	SB–221	...	A93003	H112
	2	...	Cond. & heat exch. tubes	SB–234	...	A93003	H14
	3	...	Cond. & heat exch. tubes	SB–234	...	A93003	H25
	4	...	Smls. extr. tube	SB–241	...	A93003	O
	5	...	Smls. extr. tube	SB–241	...	A93003	H112
	6	...	Smls. pipe	SB–241	...	A93003	H112
	7	...	Smls. pipe	SB–241	...	A93003	H18
	8	...	Die forgings	SB–247	...	A93003	H112
	9	...	Die forgings	SB–247	...	A93003	H112 wld.
	10	...	Plate, sheet	SB–209	...	A93004	O
	11	...	Plate, sheet	SB–209	...	A93004	H112
	12	...	Plate, sheet	SB–209	...	A93004	H32
	13	...	Plate, sheet	SB–209	...	A93004	H34
	14	...	Plate, sheet	SB–209	...	A95052	O
	15	...	Plate, sheet	SB–209	...	A95052	H112
	16	...	Plate, sheet	SB–209	...	A95052	H112
	17	...	Plate, sheet	SB–209	...	A95052	H32
	18	...	Plate, sheet	SB–209	...	A95052	H34
	19	...	Drawn smls. tube	SB–210	...	A95052	O
	20	...	Drawn smls. tube	SB–210	...	A95052	H32
	21	...	Drawn smls. tube	SB–210	...	A95052	H34
	22	...	Cond. & heat exch. tubes	SB–234	...	A95052	H32
	23	...	Cond. & heat exch. tubes	SB–234	...	A95052	H34
	24	...	Smls. extr. tube	SB–241	...	A95052	O
(**23**)	25	...	Plate, sheet	SB–209	...	A95083	O
(**23**)	26	...	Plate, sheet	SB–209	...	A95083	O
(**23**)	27	...	Plate, sheet	SB–209	...	A95083	O
(**23**)	28	...	Plate, sheet	SB–209	...	A95083	O
(**23**)	29	...	Plate, sheet	SB–209	...	A95083	O
(**23**)	30	...	Plate, sheet	SB–209	...	A95083	H112
(**23**)	31	...	Plate, sheet	SB–209	...	A95083	H112
(**23**)	32	...	Plate, sheet	SB–209	...	A95083	H32
(**23**)	33	...	Plate, sheet	SB–209	...	A95083	H32
(**23**)	34	...	Bar, rod, shapes	SB–221	...	A95083	O
(**23**)	35	...	Bar, rod, shapes	SB–221	...	A95083	H111
(**23**)	36	...	Bar, rod, shapes	SB–221	...	A95083	H112
(**23**)	37	...	Smls. extr. tube	SB–241	...	A95083	O
(**23**)	38	...	Smls. extr. tube	SB–241	...	A95083	H111
(**23**)	39	...	Smls. extr. tube	SB–241	...	A95083	H112
(**23**)	40	...	Die & hand forgings	SB–247	...	A95083	H111
(**23**)	41	...	Die & hand forgings	SB–247	...	A95083	H112
(**23**)	42	...	Die & hand forgings	SB–247	...	A95083	H111 wld.
(**23**)	43	...	Die & hand forgings	SB–247	...	A95083	H112 wld.
(**23**)	44	...	Plate, sheet	SB–928	...	A95083	H321
(**23**)	45	...	Plate, sheet	SB–928	...	A95083	H321

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	...	21	95	35	NP	121 (Cl. 3 only)	204	204	NFA–1	T3, W3
2	0.25–5.08	21	140	115	NP	121 (Cl. 3 only)	204	204	NFA–2	T4, W4
3	0.25–5.08	21	150	130	NP	121 (Cl. 3 only)	204	204	NFA–2	T4, W4
4	...	21	95	35	NP	121 (Cl. 3 only)	204	204	NFA–1	T3
5	...	21	95	35	NP	121 (Cl. 3 only)	204	204	NFA–1	T3, W3
6	≥25.40	21	95	35	NP	121 (Cl. 3 only)	204	204	NFA–1	T3, W4
7	<25.40	21	185	165	NP	121 (Cl. 3 only)	204	204	NFA–1	T4, W4
8	≤101.60	21	95	35	NP	121 (Cl. 3 only)	204	204	NFA–1	T3
9	≤101.60	21	95	35	NP	121 (Cl. 3 only)	204	204	NFA–1	T3, W7
10	0.15–76.20	22	150	60	NP	148 (Cl. 3 only)	204	204	NFA–3	...
11	6.35–76.20	22	160	60	NP	148 (Cl. 3 only)	204	204	NFA–3	W3
12	0.43–50.80	22	195	145	NP	121 (Cl. 3 only)	204	204	NFA–3	W3
13	0.23–25.40	22	220	170	NP	121 (Cl. 3 only)	204	204	NFA–4	W3
14	0.15–76.20	22	170	65	NP	121 (Cl. 3 only)	204	204	NFA–8	...
15	6.35–12.69	22	195	110	NP	121 (Cl. 3 only)	204	204	NFA–8	W3
16	12.70–76.20	22	170	65	NP	121 (Cl. 3 only)	204	204	NFA–8	W3
17	0.43–50.80	22	215	160	NP	93 (Cl. 3 only)	204	204	NFA–3	W3
18	0.23–25.40	22	235	180	NP	93 (Cl. 3 only)	204	204	NFA–4	W3
19	0.25–11.43	22	170	70	NP	148 (Cl. 3 only)	204	204	NFA–8	...
20	0.25–11.43	22	215	160	NP	93 (Cl. 3 only)	204	204	NFA–8	W4
21	0.25–11.43	22	235	180	NP	93 (Cl. 3 only)	204	204	NFA–8	W4
22	0.25–5.08	22	215	160	NP	93 (Cl. 3 only)	204	204	NFA–8	W4
23	0.25–5.08	22	235	180	NP	93 (Cl. 3 only)	204	204	NFA–8	W4
24	...	22	170	70	NP	121 (Cl. 3 only)	204	204	NFA–8	...
25	1.30–38.10	25	275	125	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43
26	38.11–76.20	25	270	115	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43
27	76.21–127.00	25	260	110	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43
28	127.01–177.80	25	255	105	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43
29	177.81–203.20	25	250	95	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43
30	6.35–38.10	25	275	125	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W3
31	38.11–76.20	25	270	115	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W3
32	3.18–38.10	25	305	215	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W3
33	38.11–76.20	25	285	200	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W3
34	≤127.00	25	270	110	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43
35	≤127.00	25	275	165	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W3
36	≤127.00	25	270	110	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W3
37	...	25	270	110	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43
38	...	25	275	165	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W3
39	...	25	270	110	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W3
40	≤101.60	25	270	140	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W4
41	≤101.60	25	270	110	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W4
42	≤101.60	25	260	...	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W7
43	≤101.60	25	260	...	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W7
44	$3.20 < t \le 40.00$	25	305	215	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W3
45	$40.00 < t \le 80.00$	25	285	200	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W3

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	23.0	22.9	22.9	22.3	16.4	*12.6*	*10.1*	*8.0*	...	...	...	...	...	...	...	...	...	...
2	39.4	39.4	39.4	37.8	29.2	21.1	17.5	*14.0*	...	...	...	...	...	...	...	...	...	...
3	43.3	43.3	43.3	41.3	29.2	21.1	17.5	*14.0*	...	...	...	...	...	...	...	...	...	...
4	23.0	22.9	22.9	22.3	16.4	*12.6*	*10.1*	*8.0*	...	...	...	...	...	...	...	...	...	...
5	23.0	22.9	22.9	22.3	16.4	*12.6*	*10.1*	*8.0*	...	...	...	...	...	...	...	...	...	...
6	23.0	22.9	22.9	22.3	16.4	*12.6*	*10.1*	*8.0*	...	...	...	...	...	...	...	...	...	...
7	53.2	53.2	50.4	46.9	36.6	24.8	18.5	*13.4*	...	...	...	...	...	...	...	...	...	...
8	23.0	22.9	22.9	22.3	16.4	*12.6*	*10.1*	*8.0*	...	...	...	...	...	...	...	...	...	...
9	23.0	22.9	22.9	22.3	16.4	*12.6*	*10.1*	*8.0*	...	...	...	...	...	...	...	...	...	...
10	39.1	39.1	39.1	39.1	34.1	26.6	17.3	11.8	...	...	...	...	...	...	...	...	...	...
11	41.4	41.2	41.2	41.2	34.8	26.7	17.3	11.8	...	...	...	...	...	...	...	...	...	...
12	55.2	55.2	55.2	55.2	39.3	26.9	17.7	11.8	...	...	...	...	...	...	...	...	...	...
13	63.0	63.0	63.0	63.0	39.3	26.9	17.7	11.8	...	...	...	...	...	...	...	...	...	...
14	43.7	43.7	43.6	43.5	38.1	28.8	17.4	11.1	...	...	...	...	...	...	...	...	...	...
15	55.2	55.2	55.2	55.2	42.0	29.0	17.7	11.1	...	...	...	...	...	...	...	...	...	...
16	43.7	43.7	43.6	43.5	40.7	28.9	17.6	11.1	...	...	...	...	...	...	...	...	...	...
17	61.1	61.1	61.1	61.1	42.0	29.0	17.7	11.1	...	...	...	...	...	...	...	...	...	...
18	67.0	67.0	67.0	67.0	42.0	29.0	17.7	11.1	...	...	...	...	...	...	...	...	...	...
19	46.0	46.0	45.9	45.8	38.1	28.8	16.7	10.3	...	...	...	...	...	...	...	...	...	...
20	61.1	61.1	61.1	61.1	41.4	29.0	16.9	10.3	...	...	...	...	...	...	...	...	...	...
21	67.0	67.0	67.0	67.0	41.4	29.0	16.9	10.3	...	...	...	...	...	...	...	...	...	...
22	61.1	61.1	61.1	61.1	42.0	29.0	17.7	11.1	...	...	...	...	...	...	...	...	...	...
23	67.0	67.0	67.0	67.0	42.0	29.0	17.7	11.1	...	...	...	...	...	...	...	...	...	...
24	46.0	46.0	45.9	45.8	38.1	28.8	16.7	10.3	...	...	...	...	...	...	...	...	...	...
25	78.8	78.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	76.8	76.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	73.5	73.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	68.9	68.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	64.4	64.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	78.8	78.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	76.8	76.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	86.8	86.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	80.6	80.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	73.5	73.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	78.8	78.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	73.5	73.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	73.5	73.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	78.8	78.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	73.5	73.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	76.8	76.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	73.5	73.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	73.5	73.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	73.5	73.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	86.7	86.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	80.8	80.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
(**23**)	1	...	Plate, sheet	SB–209	...	A95086	O
(**23**)	2	...	Plate, sheet	SB–209	...	A95086	H112
(**23**)	3	...	Plate, sheet	SB–209	...	A95086	H112
(**23**)	4	...	Plate, sheet	SB–209	...	A95086	H112
(**23**)	5	...	Plate, sheet	SB–209	...	A95086	H112
(**23**)	6	...	Plate, sheet	SB–209	...	A95086	H32
(**23**)	7	...	Plate, sheet	SB–209	...	A95086	H34
(**23**)	8	...	Bar, rod, shapes	SB–221	...	A95086	H112
(**23**)	9	...	Smls. extr. tube	SB–241	...	A95086	O
(**23**)	10	...	Smls. extr. tube	SB–241	...	A95086	H111
(**23**)	11	...	Smls. extr. tube	SB–241	...	A95086	H112
(**23**)	12	...	Plate, sheet	SB–928	...	A95086	H116
(**23**)	13	...	Plate, sheet	SB–209	...	A95154	O
(**23**)	14	...	Plate, sheet	SB–209	...	A95154	H112
(**23**)	15	...	Plate, sheet	SB–209	...	A95154	H112
(**23**)	16	...	Plate, sheet	SB–209	...	A95154	H32
(**23**)	17	...	Plate, sheet	SB–209	...	A95154	H34
(**23**)	18	...	Drawn smls. tube	SB–210	...	A95154	O
(**23**)	19	...	Drawn smls. tube	SB–210	...	A95154	H34
(**23**)	20	...	Bar, rod, shapes	SB–221	...	A95154	O
(**23**)	21	...	Bar, rod, shapes	SB–221	...	A95154	H112
(**23**)	22	...	Plate, sheet	SB–209	...	A95254	O
(**23**)	23	...	Plate, sheet	SB–209	...	A95254	H112
(**23**)	24	...	Plate, sheet	SB–209	...	A95254	H112
(**23**)	25	...	Plate, sheet	SB–209	...	A95254	H32
(**23**)	26	...	Plate, sheet	SB–209	...	A95254	H34
	27	...	Plate, sheet	SB–209	...	A95454	O
	28	...	Plate, sheet	SB–209	...	A95454	H112
	29	...	Plate, sheet	SB–209	...	A95454	H112
	30	...	Plate, sheet	SB–209	...	A95454	H32
	31	...	Plate, sheet	SB–209	...	A95454	H34
	32	...	Bar, rod, shapes	SB–221	...	A95454	O
	33	...	Bar, rod, shapes	SB–221	...	A95454	H111
	34	...	Bar, rod, shapes	SB–221	...	A95454	H112
	35	...	Cond. & heat exch. tubes	SB–234	...	A95454	H32
	36	...	Cond. & heat exch. tubes	SB–234	...	A95454	H34
	37	...	Smls. extr. tube	SB–241	...	A95454	O
	38	...	Smls. extr. tube	SB–241	...	A95454	H111
	39	...	Smls. extr. tube	SB–241	...	A95454	H112
	40	...	Plate, sheet	SB–209	...	A95456	O
	41	...	Plate, sheet	SB–209	...	A95456	O
	42	...	Plate, sheet	SB–209	...	A95456	O
	43	...	Plate, sheet	SB–209	...	A95456	O
	44	...	Plate, sheet	SB–209	...	A95456	O
	45	...	Plate, sheet	SB–209	...	A95456	H112

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	0.51–50.80	25	240	95	NP	66 (Cl. 3 only)	66	66	NFA–9	G18, G19, G43
2	4.78–12.69	25	250	125	NP	66 (Cl. 3 only)	66	66	NFA–9	G18, G19, G43, W3
3	12.70–25.40	25	240	110	NP	66 (Cl. 3 only)	66	66	NFA–9	G18, G19, G43, W3
4	25.41–50.80	25	240	95	NP	66 (Cl. 3 only)	66	66	NFA–9	G18, G19, G43, W3
5	50.81–76.20	25	235	95	NP	66 (Cl. 3 only)	66	66	NFA–9	G18, G19, G43
6	0.51–50.80	25	275	195	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W3
7	0.23–25.40	25	305	235	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W3
8	≤127.00	25	240	95	NP	66 (Cl. 3 only)	66	66	NFA–9	G18, G19, G43, W4
9	...	25	240	95	NP	66 (Cl. 3 only)	66	66	NFA–9	G18, G19, G43
10	...	25	250	145	NP	66 (Cl. 3 only)	66	66	NFA–9	G18, G19, G43, W3
11	...	25	240	95	NP	66 (Cl. 3 only)	66	66	NFA–9	G18, G19, G43, W3
12	1.60 < t ≤ 50.00	25	275	195	NP	NP	66	66	NFA–11	G18, G19, G43, W3
13	0.51–76.2	22	205	75	NP	66 (Cl. 3 only)	66	66	NFA–5	G18, G19, G43
14	6.35–12.7	22	220	125	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W3
15	12.7–76.2	22	205	75	NP	66 (Cl. 3 only)	66	66	NFA–5	G18, G19, G43, W3
16	0.51–50.8	22	250	180	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W3
17	0.23–25.4	22	270	200	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W3
18	0.25–11.4	22	205	75	NP	66 (Cl. 3 only)	66	66	NFA–5	G18, G19, G43
19	0.25–11.4	22	270	200	NP	66 (Cl. 3 only)	66	66	NFA–5	G18, G19, G43, W3
20	...	22	205	75	NP	66 (Cl. 3 only)	66	66	NFA–5	G18, G19, G43
21	...	22	205	75	NP	66 (Cl. 3 only)	66	66	NFA–5	G18, G19, G43, W3
22	1.30–76.2	22	205	75	NP	66 (Cl. 3 only)	66	66	NFA–5	G18, G19, G43
23	6.35–12.7	22	220	125	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W3
24	12.7–76.2	22	205	75	NP	66 (Cl. 3 only)	66	66	NFA–5	G18, G19, G43, W3
25	1.30–50.8	22	250	180	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W3
26	1.30–25.4	22	270	200	NP	66 (Cl. 3 only)	66	66	NFA–11	G18, G19, G43, W3
27	0.51–76.2	22	215	85	NP	121 (Cl. 3 only)	204	204	NFA–6	T1
28	6.35–12.7	22	220	125	NP	121 (Cl. 3 only)	204	204	NFA–6	T1, W3
29	12.7–76.2	22	215	85	NP	121 (Cl. 3 only)	204	204	NFA–6	T1, W3
30	0.51–50.8	22	250	180	NP	121 (Cl. 3 only)	204	204	NFA–6	T1, W3
31	0.51–25.4	22	270	200	NP	121 (Cl. 3 only)	204	204	NFA–6	T1, W3
32	≤127	22	215	85	NP	121 (Cl. 3 only)	204	204	NFA–6	T1
33	≤127	22	230	130	NP	121 (Cl. 3 only)	204	204	NFA–6	T1, W3
34	≤127	22	215	85	NP	121 (Cl. 3 only)	204	204	NFA–6	T1, W3
35	0.25–5.08	22	250	180	NP	121 (Cl. 3 only)	204	204	NFA–6	T1, W4
36	0.25–5.08	22	270	200	NP	121 (Cl. 3 only)	204	204	NFA–6	T1, W4
37	...	22	215	85	NP	121 (Cl. 3 only)	204	204	NFA–6	T1
38	...	22	230	130	NP	121 (Cl. 3 only)	204	204	NFA–6	T1, W3
39	...	22	215	85	NP	121 (Cl. 3 only)	204	204	NFA–6	T1, W3
40	1.30–38.10	25	290	130	NP	66 (Cl. 3 only)	66	66	NFA–10	G18, G19
41	38.11–76.20	25	285	125	NP	66 (Cl. 3 only)	66	66	NFA–10	G18, G19
42	76.21–127.00	25	275	115	NP	66 (Cl. 3 only)	66	66	NFA–10	G18, G19
43	127.01–177.80	25	270	110	NP	66 (Cl. 3 only)	66	66	NFA–10	G18, G19
44	177.81–203.2	25	260	105	NP	66 (Cl. 3 only)	66	66	NFA–10	G18, G19
45	6.35–38.10	25	290	130	NP	66 (Cl. 3 only)	66	66	NFA–10	G18, G19, W3

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	64.4	64.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	70.9	70.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	68.9	68.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	64.4	64.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	64.4	64.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	78.8	78.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	86.7	86.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	64.4	64.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	64.4	64.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	70.9	70.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	64.4	64.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	78.8	78.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	50.6	50.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	63.0	63.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	50.6	50.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	70.9	70.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	76.8	76.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	50.6	50.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	76.8	76.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	50.6	50.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	50.6	50.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	50.6	50.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	63.0	63.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	50.6	50.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	70.9	70.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	76.8	76.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	55.2	55.2	55.2	*55.2*	*37.5*	*28.8*	*21.7*	*16.4*	...	...	...	...	...	...	...	...	...	...
28	63.0	63.0	63.0	*63.0*	*37.5*	*28.8*	*21.7*	*16.4*	...	...	...	...	...	...	...	...	...	...
29	55.2	55.2	55.2	*55.2*	*37.5*	*28.8*	*21.7*	*16.4*	...	...	...	...	...	...	...	...	...	...
30	70.9	70.9	70.9	*70.9*	*37.5*	*28.8*	*21.7*	*16.4*	...	...	...	...	...	...	...	...	...	...
31	76.8	76.8	76.8	*75.2*	*37.5*	*28.8*	*21.7*	*16.4*	...	...	...	...	...	...	...	...	...	...
32	55.2	55.2	55.2	*55.2*	*37.5*	*28.8*	*21.7*	*16.4*	...	...	...	...	...	...	...	...	...	...
33	65.0	65.0	65.0	*65.0*	*37.5*	*28.8*	*21.7*	*16.4*	...	...	...	...	...	...	...	...	...	...
34	55.2	55.2	55.2	*55.2*	*37.5*	*28.8*	*21.7*	*16.4*	...	...	...	...	...	...	...	...	...	...
35	70.9	70.9	70.9	*70.9*	*37.5*	*28.8*	*21.7*	*16.4*	...	...	...	...	...	...	...	...	...	...
36	76.8	76.8	76.8	*75.2*	*37.5*	*28.8*	*21.7*	*16.4*	...	...	...	...	...	...	...	...	...	...
37	55.2	55.2	55.2	*55.2*	*37.5*	*28.8*	*21.7*	*16.4*	...	...	...	...	...	...	...	...	...	...
38	65.0	65.0	65.0	*65.0*	*37.5*	*28.8*	*21.7*	*16.4*	...	...	...	...	...	...	...	...	...	...
39	55.2	55.2	55.2	*55.2*	*37.5*	*28.8*	*21.7*	*16.4*	...	...	...	...	...	...	...	...	...	...
40	82.7	82.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	80.8	80.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	78.1	78.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	73.5	73.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	68.9	68.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	82.7	82.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
(**23**)	1	...	Plate, sheet	SB–209	...	A95456	H112
(**23**)	2	...	Plate, sheet	SB–209	...	A95456	H32
(**23**)	3	...	Plate, sheet	SB–209	...	A95456	H32
(**23**)	4	...	Plate, sheet	SB–209	...	A95456	H32
(**23**)	5	...	Bar, rod, shapes	SB–221	...	A95456	O
(**23**)	6	...	Bar, rod, shapes	SB–221	...	A95456	H111
(**23**)	7	...	Bar, rod, shapes	SB–221	...	A95456	H112
(**23**)	8	...	Smls. extr. tube	SB–241	...	A95456	O
(**23**)	9	...	Smls. extr. tube	SB–241	...	A95456	H111
(**23**)	10	...	Smls. extr. tube	SB–241	...	A95456	H112
(**23**)	11	...	Plate, sheet	SB–928	...	A95456	H321
(**23**)	12	...	Plate, sheet	SB–928	...	A95456	H321
(**23**)	13	...	Plate, sheet	SB–928	...	A95456	H321
	14	...	Plate, sheet	SB–209	...	A95652	O
	15	...	Plate, sheet	SB–209	...	A95652	H112
	16	...	Plate, sheet	SB–209	...	A95652	H112
	17	...	Plate, sheet	SB–209	...	A95652	H32
	18	...	Plate, sheet	SB–209	...	A95652	H34
	19	...	Plate, sheet	SB–209	...	A96061	T4
	20	...	Plate, sheet	SB–209	...	A96061	T451
	21	...	Plate, sheet	SB–209	...	A96061	T6
	22	...	Plate, sheet	SB–209	...	A96061	T651
	23	...	Plate, sheet	SB–209	...	A96061	T651
	24	...	Plate, sheet	SB–209	...	A96061	T4 wld.
	25	...	Plate, sheet	SB–209	...	A96061	T451 wld.
	26	...	Plate, sheet	SB–209	...	A96061	T6 wld.
	27	...	Plate, sheet	SB–209	...	A96061	T651 wld.
	28	...	Drawn smls. tube	SB–210	...	A96061	T4
	29	...	Drawn smls. tube	SB–210	...	A96061	T6
	30	...	Drawn smls. tube	SB–210	...	A96061	T4 wld.
	31	...	Drawn smls. tube	SB–210	...	A96061	T6 wld.
	32	...	Bar, rod, wire	SB–211	...	A96061	T6
	33	...	Bar, rod, wire	SB–211	...	A96061	T651
	34	...	Bar, rod, wire	SB–211	...	A96061	T6 wld.
	35	...	Bar, rod, wire	SB–211	...	A96061	T651 wld.
	36	...	Bar, rod, shapes	SB–221	...	A96061	T4
	37	...	Bar, rod, shapes	SB–221	...	A96061	T6
	38	...	Bar, rod, shapes	SB–221	...	A96061	T4 wld.
	39	...	Bar, rod, shapes	SB–221	...	A96061	T6 wld.
	40	...	Cond. & heat exch. tubes	SB–234	...	A96061	T4
	41	...	Cond. & heat exch. tubes	SB–234	...	A96061	T6
	42	...	Cond. & heat exch. tubes	SB–234	...	A96061	T4 wld.
	43	...	Cond. & heat exch. tubes	SB–234	...	A96061	T6 wld.
	44	...	Smls. extr. tube	SB–241	...	A96061	T4
	45	...	Smls. extr. tube	SB–241	...	A96061	T6

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	38.11–76.20	25	285	125	NP	66 (Cl. 3 only)	66	66	NFA–10	G18, G19, G43, W3
2	4.78–12.69	25	315	230	NP	66 (Cl. 3 only)	66	66	NFA–10	G18, G19, G43, W3
3	12.70–38.10	25	305	215	NP	66 (Cl. 3 only)	66	66	NFA–10	G18, G19, G43, W3
4	38.11–76.20	25	285	200	NP	66 (Cl. 3 only)	66	66	NFA–10	G18, G19, G43, W3
5	≤127.0	25	285	130	NP	66 (Cl. 3 only)	66	66	NFA–10	G18, G19, G43
6	≤127.0	25	290	180	NP	66 (Cl. 3 only)	66	66	NFA–10	G18, G19, G43, W3
7	≤127.0	25	285	130	NP	66 (Cl. 3 only)	66	66	NFA–10	G18, G19, G43, W3
8	...	25	285	130	NP	66 (Cl. 3 only)	66	66	NFA–10	G18, G19, G43
9	...	25	290	180	NP	66 (Cl. 3 only)	66	66	NFA–10	G18, G19, G43, W3
10	...	25	285	130	NP	66 (Cl. 3 only)	66	66	NFA–10	G18, G19, G43, W3
11	4.00–12.50	25	315	230	NP	66 (Cl. 3 only)	66	66	NFA–10	G18, G19, G43, W3
12	12.51–40.00	25	305	215	NP	66 (Cl. 3 only)	66	66	NFA–10	G18, G19, G43, W3
13	40.01–80.00	25	285	200	NP	66 (Cl. 3 only)	66	66	NFA–10	G18, G19, G43, W3
14	1.30–76.2	22	170	65	NP	121 (Cl. 3 only)	204	204	NFA–8	T2
15	6.35–12.69	22	195	110	NP	121 (Cl. 3 only)	204	204	NFA–8	T1, W3
16	12.70–76.20	22	170	65	NP	121 (Cl. 3 only)	204	204	NFA–8	T2, W3
17	1.30–50.8	22	210	160	NP	93 (Cl. 3 only)	204	204	NFA–3	T1, W3
18	1.30–25.4	22	235	180	NP	93 (Cl. 3 only)	204	204	NFA–4	T1, W3
19	0.15–6.34	23	205	110	NP	204 (Cl. 3 only)	204	204	NFA–13	G24, T3, W4
20	6.35–76.20	23	205	110	NP	204 (Cl. 3 only)	204	204	NFA–13	G24, T3, W4
21	0.15–6.34	23	290	240	NP	204 (Cl. 3 only)	204	204	NFA–12	G24, T3, W4
22	6.35–101.60	23	290	240	NP	204 (Cl. 3 only)	204	204	NFA–12,13	G24, T3, W4, W9
23	101.61–152.40	23	275	240	NP	204 (Cl. 3 only)	204	204	NFA–12,13	G24, T3, W4, W9
24	0.15–6.34	23	165	...	NP	204 (Cl. 3 only)	204	204	NFA–13	G24, T3, W7
25	6.35–76.20	23	165	...	NP	NP	204	204	NFA–13	G24, T3, W7
26	0.15–6.34	23	165	...	NP	204 (Cl. 3 only)	204	204	NFA–12	G24, T3, W7
27	6.35–152.40	23	165	...	NP	NP	204	204	NFA–12,13	G24, T3, W7, W9
28	0.64–12.70	23	205	110	NP	204 (Cl. 3 only)	204	204	NFA–13	T3, W4
29	0.64–12.70	23	290	240	NP	204 (Cl. 3 only)	204	204	NFA–12,13	T3, W4, W9
30	0.64–12.70	23	165	...	NP	204 (Cl. 3 only)	204	204	NFA–13	T3, W7
31	0.64–12.70	23	165	...	NP	204 (Cl. 3 only)	204	204	NFA–12,13	T3, W7, W9
32	3.18–6.34	23	290	240	NP	204 (Cl. 3 only)	204	204	NFA–12	G24, T3, W4
33	6.35–203.20	23	290	240	NP	204 (Cl. 3 only)	204	204	NFA–12,13	G24, T3, W4, W9
34	3.18–6.34	23	165	...	NP	204 (Cl. 3 only)	204	204	NFA–12	G13, G24, T3, W7
35	6.35–203.20	23	165	...	NP	204 (Cl. 3 only)	204	204	NFA–12,13	G13, G24, T3, W7, W9
36	...	23	180	110	NP	204 (Cl. 3 only)	204	204	NFA–13	G24, T3, W4
37	...	23	260	240	NP	204 (Cl. 3 only)	204	204	NFA–12,13	G24, T3, W4, W9
38	...	23	165	...	NP	204 (Cl. 3 only)	204	204	NFA–13	G24, T3, W7
39	...	23	165	...	NP	204 (Cl. 3 only)	204	204	NFA–12,13	G13, G24, T3, W7, W9
40	0.64–5.08	23	205	110	NP	204 (Cl. 3 only)	204	204	NFA–13	T3, W4
41	0.64–5.08	23	290	240	NP	204 (Cl. 3 only)	204	204	NFA–12	T3, W4
42	0.64–5.08	23	165	...	NP	204 (Cl. 3 only)	204	204	NFA–13	T3, W7
43	0.64–5.08	23	165	...	NP	204 (Cl. 3 only)	204	204	NFA–12	T3, W7
44	...	23	180	110	NP	204 (Cl. 3 only)	204	204	NFA–13	G24, T3, W4
45	...	23	260	240	NP	204 (Cl. 3 only)	204	204	NFA–12,13	G24, T3, W4, W9

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	80.7	80.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	90.3	90.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	86.9	86.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	80.7	80.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	80.7	80.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	82.7	82.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	80.7	80.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	80.7	80.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	82.7	82.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	80.7	80.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	90.6	90.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	86.7	86.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	80.8	80.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	43.4	43.4	43.4	43.3	*41.8*	*29.2*	*18.2*	*8.00*	...	...	...	...	...	...	...	...	...	...
15	55.2	55.2	54.9	*50.7*	*41.5*	*29.1*	*18.3*	*7.92*	...	...	...	...	...	...	...	...	...	...
16	43.4	43.4	43.4	43.3	*41.8*	*29.2*	*18.2*	*8.00*	...	...	...	...	...	...	...	...	...	...
17	61.4	61.4	60.1	*50.3*	*41.6*	*29.1*	*18.3*	*7.93*	...	...	...	...	...	...	...	...	...	...
18	66.9	66.9	64.7	*49.8*	*41.6*	*29.1*	*18.3*	*7.94*	...	...	...	...	...	...	...	...	...	...
19	59.1	59.1	59.1	58.5	47.4	*43.7*	*31.5*	*24.2*	...	...	...	...	...	...	...	...	...	...
20	59.1	59.1	59.1	58.5	47.4	*43.7*	*31.5*	*24.2*	...	...	...	...	...	...	...	...	...	...
21	82.7	82.7	82.7	79.3	57.3	*44.2*	*32.5*	*24.2*	...	...	...	...	...	...	...	...	...	...
22	82.7	82.7	82.7	79.3	57.3	*44.2*	*32.5*	*24.2*	...	...	...	...	...	...	...	...	...	...
23	78.8	78.8	78.8	75.4	55.9	*44.1*	*31.6*	*23.3*	...	...	...	...	...	...	...	...	...	...
24	47.3	47.3	47.3	47.1	37.7	*32.1*	*24.8*	*19.7*	...	...	...	...	...	...	...	...	...	...
25	47.3	47.3	47.3	47.1	37.7	*32.1*	*24.8*	*19.7*	...	...	...	...	...	...	...	...	...	...
26	47.3	47.3	47.3	47.1	37.7	*32.1*	*24.8*	*19.7*	...	...	...	...	...	...	...	...	...	...
27	47.3	47.3	47.3	47.1	37.7	*32.1*	*24.8*	*19.7*	...	...	...	...	...	...	...	...	...	...
28	59.1	59.1	59.1	58.5	47.4	*43.7*	*31.5*	*24.2*	...	...	...	...	...	...	...	...	...	...
29	82.7	82.7	82.7	79.3	57.3	*44.2*	*32.5*	*24.2*	...	...	...	...	...	...	...	...	...	...
30	47.3	47.3	47.3	47.1	37.7	*32.1*	*24.8*	*19.7*	...	...	...	...	...	...	...	...	...	...
31	47.3	47.3	47.3	47.1	37.7	*32.1*	*24.8*	*19.7*	...	...	...	...	...	...	...	...	...	...
32	82.7	82.7	82.7	79.3	57.3	*44.2*	*32.5*	*24.2*	...	...	...	...	...	...	...	...	...	...
33	82.7	82.7	82.7	79.3	57.3	*44.9*	*32.4*	*23.9*	...	...	...	...	...	...	...	...	...	...
34	47.3	47.3	47.3	47.1	37.7	*32.1*	*24.8*	*19.7*	...	...	...	...	...	...	...	...	...	...
35	47.3	47.3	47.3	47.1	37.7	*32.1*	*24.8*	*19.7*	...	...	...	...	...	...	...	...	...	...
36	51.2	51.2	51.2	51.0	41.3	*40.1*	*31.2*	*25.7*	...	...	...	...	...	...	...	...	...	...
37	74.9	74.9	74.9	71.3	54.0	*44.0*	*32.2*	*24.2*	...	...	...	...	...	...	...	...	...	...
38	47.3	47.3	47.3	47.1	37.7	*32.1*	*24.8*	*19.7*	...	...	...	...	...	...	...	...	...	...
39	47.3	47.3	47.3	47.1	37.7	*32.1*	*24.8*	*19.7*	...	...	...	...	...	...	...	...	...	...
40	59.1	59.1	59.1	58.5	47.4	*43.7*	*31.5*	*24.2*	...	...	...	...	...	...	...	...	...	...
41	82.7	82.7	82.7	79.3	57.3	*44.2*	*32.5*	*24.2*	...	...	...	...	...	...	...	...	...	...
42	47.3	47.3	47.3	47.1	37.7	*32.1*	*24.8*	*19.7*	...	...	...	...	...	...	...	...	...	...
43	47.3	47.3	47.3	47.1	37.7	*32.1*	*24.8*	*19.7*	...	...	...	...	...	...	...	...	...	...
44	51.2	51.2	51.2	51.0	41.3	*40.1*	*31.2*	*25.7*	...	...	...	...	...	...	...	...	...	...
45	74.9	74.9	74.9	71.3	54.0	*44.0*	*32.2*	*24.2*	...	...	...	...	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	1	...	Smls. extr. tube	SB–241	...	A96061	T4 wld.
	2	...	Smls. extr. tube	SB–241	...	A96061	T6 wld.
	3	...	Smls. pipe	SB–241	...	A96061	T6 drawn
	4	...	Smls. pipe	SB–241	...	A96061	T6
	5	...	Smls. pipe	SB–241	...	A96061	T6 wld.
	6	...	Die forgings	SB–247	...	A96061	T6
	7	...	Hand forgings	SB–247	...	A96061	T6
	8	...	Hand forgings	SB–247	...	A96061	T6
	9	...	Die & hand forgings	SB–247	...	A96061	T6 wld.
	10	...	Shapes	SB–308	...	A96061	T6
	11	...	Shapes	SB–308	...	A96061	T6 wld.
	12	...	Drawn smls. tube	SB–210	...	A96063	T6
	13	...	Drawn smls. tube	SB–210	...	A96063	T6 wld.
	14	...	Bar, rod, shapes	SB–221	...	A96063	T1
	15	...	Bar, rod, shapes	SB–221	...	A96063	T1
	16	...	Bar, rod, shapes	SB–221	...	A96063	T5
	17	...	Bar, rod, shapes	SB–221	...	A96063	T5
	18	...	Bar, rod, shapes	SB–221	...	A96063	T6
	19	...	Bar, rod, shapes	SB–221	...	A96063	T5 wld.
	20	...	Bar, rod, shapes	SB–221	...	A96063	T6 wld.
	21	...	Smls. extr. tube	SB–241	...	A96063	T1
	22	...	Smls. extr. tube	SB–241	...	A96063	T1
	23	...	Smls. extr. tube	SB–241	...	A96063	T5
	24	...	Smls. extr. tube	SB–241	...	A96063	T5
	25	...	Smls. extr. tube	SB–241	...	A96063	T6
	26	...	Smls. extr. tube	SB–241	...	A96063	T5 wld.
	27	...	Smls. extr. tube	SB–241	...	A96063	T6 wld.
	28	...	Smls. pipe	SB–241	...	A96063	T6
	29	...	Smls. pipe	SB–241	...	A96063	T6 wld.
(**23**)	30	...	Bar, rod	SB–187	...	C10200	O60
(**23**)	31	...	Bar, rod	SB–187	...	C10200	O60
(**23**)	32	...	Smls. tube	SB–75	...	C10200	O50, O60
(**23**)	33	...	Smls. tube	SB–75	...	C10200	O50, O60
	34	...	Smls. pipe	SB–42	...	C10200	O61
	35	...	Smls. pipe	SB–42	...	C10200	O61
	36	...	Plate, sheet, strip	SB–152	...	C10200	H00
	37	...	Plate, sheet, strip	SB–152	...	C10200	H01
	38	...	Plate, sheet, strip	SB–152	...	C10200	H02
	39	...	Plate, sheet, strip	SB–152	...	C10200	H03
	40	...	Plate, sheet, strip	SB–152	...	C10200	H04
	41	...	Plate, sheet, strip	SB–152	...	C10200	M20, O25
	42	...	Plate, sheet, strip	SB–152	...	C10200	M20, O25
	43	...	Smls. pipe	SB–42	...	C10200	H55
	44	...	Smls. tube	SB–75	...	C10200	H55
	45	...	Smls. cond. tube	SB–111	...	C10200	H55

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	...	23	165	...	NP	204 (Cl. 3 only)	204	204	NFA–13	G24, T3, W7
2	...	23	165	...	NP	204 (Cl. 3 only)	204	204	NFA–12,13	G24, T3, W7, W9
3	<25.40	23	290	240	NP	204 (Cl. 3 only)	204	204	NFA–12,13	T3, W4, W9
4	≥25.40	23	260	240	NP	204 (Cl. 3 only)	204	204	NFA–12,13	T3, W4, W9
5	...	23	165	...	NP	204 (Cl. 3 only)	204	204	NFA–12,13	T3, W7, W9
6	≤101.60	23	260	240	NP	204 (Cl. 3 only)	204	204	NFA–12,13	T3, W4, W9
7	≤101.60	23	255	230	NP	204 (Cl. 3 only)	204	204	NFA–12,13	T3, W4, W9
8	101.61–203.20	23	240	220	NP	204 (Cl. 3 only)	204	204	NFA–12,13	T3, W4, W9
9	≤203.20	23	165	...	NP	204 (Cl. 3 only)	204	204	NFA–12,13	T3, W7, W9
10	...	23	260	240	NP	204 (Cl. 3 only)	204	204	NFA–12,13	T3, W4, W9
11	...	23	165	...	NP	204 (Cl. 3 only)	204	204	NFA–12,13	G13, T3, W7, W9
12	0.64–12.70	23	230	190	NP	204 (Cl. 3 only)	204	204	NFA–1	T3, W4
13	0.64–12.70	23	115	55	NP	204 (Cl. 3 only)	204	204	NFA–1	T3, W7
14	≤12.70	23	115	60	NP	176 (Cl. 3 only)	204	204	NFA–1	T3, W4
15	12.71–25.40	23	110	55	NP	176 (Cl. 3 only)	204	204	NFA–1	T3, W4
16	≤12.70	23	150	110	NP	204 (Cl. 3 only)	204	204	NFA–1	T3, W4
17	12.71–25.40	23	145	105	NP	204 (Cl. 3 only)	204	204	NFA–1	T3, W4
18	≤25.40	23	205	170	NP	204 (Cl. 3 only)	204	204	NFA–1	T3, W4
19	≤25.40	23	115	55	NP	204 (Cl. 3 only)	204	204	NFA–1	T3, W7
20	≤25.40	23	115	55	NP	204 (Cl. 3 only)	204	204	NFA–1	T3, W7
21	≤12.70	23	115	60	NP	176 (Cl. 3 only)	NP	NP	NFA–1	T3, W4
22	12.71–25.40	23	110	55	NP	176 (Cl. 3 only)	NP	NP	NFA–1	T3, W4
23	≤12.70	23	150	110	NP	176 (Cl. 3 only)	204	204	NFA–1	T3, W4
24	12.71–25.40	23	145	105	NP	176 (Cl. 3 only)	204	204	NFA–1	T3, W4
25	≤25.40	23	205	170	NP	176 (Cl. 3 only)	204	204	NFA–1	T3, W4
26	≤25.40	23	115	55	NP	176 (Cl. 3 only)	204	204	NFA–1	T3, W7
27	≤25.40	23	115	55	NP	176 (Cl. 3 only)	204	204	NFA–1	T3, W7
28	≤25.40	23	205	170	NP	204 (Cl. 3 only)	204	204	NFA–1	T3, W4
29	≤25.40	23	115	55	NP	204 (Cl. 3 only)	204	204	NFA–1	T3, W7
30	All	31	195	55	NP	149	204	204	NFC–1	G5, T3
31	All	31	195	55	NP	149	204	204	NFC–1	T3
32	All	31	205	62	204	149 (Cl. 3 only)	204	204	NFC–1	G1, G5, T3
33	All	31	205	62	204	149 (Cl. 3 only)	204	204	NFC–1	G1, T3
34	All	31	205	60	204	149	204	204	NFC–1	G1, T3
35	All	31	205	60	204	149	204	204	NFC–1	G1, G5, T3
36	...	31	205	70	NP	149 (Cl. 3 only)	204	204	NFC–1	G41, T3, W3
37	...	31	205	70	NP	149 (Cl. 3 only)	204	204	NFC–1	G41, T3, W3
38	...	31	205	70	NP	149 (Cl. 3 only)	204	204	NFC–1	G41, T3, W3
39	...	31	205	70	NP	149 (Cl. 3 only)	204	204	NFC–1	G41, T3, W3
40	...	31	205	70	NP	149 (Cl. 3 only)	204	204	NFC–1	G41, T3, W3
41	...	31	205	70	NP	149 (Cl. 3 only)	204	204	NFC–1	T3
42	...	31	205	70	NP	121 (Cl. 3 only)	204	204	NFC–1	G5, T2
43	50 < DN ≤ 300	31	250	205	204	204	204	204	NFC–6	G1, G9, W3
44	All	31	250	205	204	204 (Cl. 3 only)	204	204	NFC–6	G1, G9, W3
45	...	31	250	205	NP	204	204	204	NFC–6	G9, W3

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	47.3	47.3	47.3	47.1	37.7	*32.1*	*24.8*	*19.7*	...	...	...	...	...	...	...	...	...	...
2	47.3	47.3	47.3	47.1	37.7	*32.1*	*24.8*	*19.7*	...	...	...	...	...	...	...	...	...	...
3	82.7	82.7	82.7	79.3	57.3	*44.2*	*32.5*	*24.2*	...	...	...	...	...	...	...	...	...	...
4	74.9	74.9	74.9	71.3	54.0	*44.0*	*32.2*	*24.2*	...	...	...	...	...	...	...	...	...	...
5	47.3	47.3	47.3	47.1	37.7	*32.1*	*24.8*	*19.7*	...	...	...	...	...	...	...	...	...	...
6	74.9	74.9	74.9	71.3	54.0	*44.0*	*32.2*	*24.2*	...	...	...	...	...	...	...	...	...	...
7	72.9	72.9	72.9	52.9	52.7	*44.0*	*32.0*	*24.2*	...	...	...	...	...	...	...	...	...	...
8	68.9	68.9	68.9	68.6	50.6	*42.5*	*32.0*	*24.8*	...	...	...	...	...	...	...	...	...	...
9	47.3	47.3	47.3	47.1	37.7	*32.1*	*24.8*	*19.7*	...	...	...	...	...	...	...	...	...	...
10	74.9	74.9	74.9	71.3	49.1	*39.2*	*28.7*	*21.5*	...	...	...	...	...	...	...	...	...	...
11	47.3	47.3	47.3	47.1	34.2	*29.3*	*22.7*	*18.0*	...	...	...	...	...	...	...	...	...	...
12	65.0	65.0	64.9	57.1	37.2	*24.1*	*14.9*	*9.3*	...	...	...	...	...	...	...	...	...	...
13	33.5	33.5	33.5	33.5	26.6	*21.0*	*14.4*	*10.2*	...	...	...	...	...	...	...	...	...	...
14	33.5	33.5	33.5	33.5	28.7	*21.3*	*14.3*	*9.3*	...	...	...	...	...	...	...	...	...	...
15	31.5	31.5	31.5	31.5	27.4	*23.7*	*14.2*	*9.3*	...	...	...	...	...	...	...	...	...	...
16	43.3	43.3	43.3	43.3	31.3	*23.9*	*14.5*	*9.3*	...	...	...	...	...	...	...	...	...	...
17	41.4	41.4	40.3	38.4	29.4	*23.8*	*14.3*	*9.3*	...	...	...	...	...	...	...	...	...	...
18	59.1	59.1	58.0	50.5	33.9	*24.0*	*14.7*	*9.3*	...	...	...	...	...	...	...	...	...	...
19	33.5	33.5	33.5	33.5	26.6	*21.0*	*14.4*	*10.2*	...	...	...	...	...	...	...	...	...	...
20	33.5	33.5	33.5	33.5	26.6	*21.0*	*14.4*	*10.2*	...	...	...	...	...	...	...	...	...	...
21	33.5	33.5	33.5	33.5	28.7	*21.3*	...	...	...	...	...	...	...	...	...	...	...	...
22	31.5	31.5	31.5	31.5	27.4	*23.7*	...	...	...	...	...	...	...	...	...	...	...	...
23	43.3	43.3	43.3	43.3	31.3	*23.9*	*14.5*	*9.3*	...	...	...	...	...	...	...	...	...	...
24	41.4	41.4	40.3	38.4	30.0	*23.8*	*14.4*	*9.3*	...	...	...	...	...	...	...	...	...	...
25	59.1	59.1	58.0	50.5	33.9	*24.0*	*14.7*	*9.3*	...	...	...	...	...	...	...	...	...	...
26	33.5	33.5	33.5	33.5	26.6	*21.0*	*14.4*	*10.2*	...	...	...	...	...	...	...	...	...	...
27	33.5	33.5	33.5	33.5	26.6	*21.0*	*14.4*	*10.2*	...	...	...	...	...	...	...	...	...	...
28	59.1	59.1	58.0	50.5	33.9	*24.0*	*14.7*	*9.3*	...	...	...	...	...	...	...	...	...	...
29	33.5	33.5	33.5	33.5	26.6	*21.0*	*14.4*	*10.2*	...	...	...	...	...	...	...	...	...	...
30	36.8	36.8	36.8	36.8	36.8	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
31	36.8	32.3	32.3	32.3	32.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
32	41.4	41.4	41.4	41.4	41.4	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
33	41.4	36.4	36.4	36.4	36.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
34	41.4	36.4	36.4	36.4	36.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
35	41.4	41.4	41.4	41.4	41.4	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
36	46.0	40.4	40.4	40.4	40.2	*31.3*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
37	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
38	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
39	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
40	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
41	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
42	46.0	46.0	46.0	46.0	*42.8*	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
43	71.0	71.0	71.0	70.9	68.8	67.0	65.1	63.3	...	...	...	...	...	...	...	...	...	...
44	71.0	71.0	71.0	70.9	68.8	67.0	65.1	63.3	...	...	...	...	...	...	...	...	...	...
45	71.0	71.0	71.0	70.9	68.8	67.0	65.1	63.3	...	...	...	...	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	1	...	Smls. U–bend tube	SB–395	...	C10200	H55
	2	...	Smls. pipe	SB–42	...	C10200	H80
	3	...	Smls. tube	SB–75	...	C10200	H80
	4	...	Smls. cond. tube	SB–111	...	C10200	H80
	5	...	Plate, sheet, strip	SB–152	...	C10400	H00
	6	...	Plate, sheet, strip	SB–152	...	C10400	H01
	7	...	Plate, sheet, strip	SB–152	...	C10400	H02
	8	...	Plate, sheet, strip	SB–152	...	C10400	H03
	9	...	Plate, sheet, strip	SB–152	...	C10400	H04
	10	...	Plate, sheet, strip	SB–152	...	C10400	M20, O25
	11	...	Plate, sheet, strip	SB–152	...	C10400	M20, O25
	12	...	Plate, sheet, strip	SB–152	...	C10500	H00
	13	...	Plate, sheet, strip	SB–152	...	C10500	H01
	14	...	Plate, sheet, strip	SB–152	...	C10500	H02
	15	...	Plate, sheet, strip	SB–152	...	C10500	H03
	16	...	Plate, sheet, strip	SB–152	...	C10500	H04
	17	...	Plate, sheet, strip	SB–152	...	C10500	M20, O25
	18	...	Plate, sheet, strip	SB–152	...	C10500	M20, O25
	19	...	Plate, sheet, strip	SB–152	...	C10700	H00
	20	...	Plate, sheet, strip	SB–152	...	C10700	H01
	21	...	Plate, sheet, strip	SB–152	...	C10700	H02
	22	...	Plate, sheet, strip	SB–152	...	C10700	H03
	23	...	Plate, sheet, strip	SB–152	...	C10700	H04
	24	...	Plate, sheet, strip	SB–152	...	C10700	M20, O25
	25	...	Plate, sheet, strip	SB–152	...	C10700	M20, O25
(**23**)	26	...	Bar	SB–187	...	C11000	H04
	27	...	Bar, rod	SB–187	...	C11000	O60
	28	...	Bar, rod	SB–187	...	C11000	O60
	29	...	Plate, sheet, strip, bar	SB–152	...	C11000	H00
	30	...	Plate, sheet, strip, bar	SB–152	...	C11000	H01
	31	...	Plate, sheet, strip, bar	SB–152	...	C11000	H02
	32	...	Plate, sheet, strip, bar	SB–152	...	C11000	H03
	33	...	Plate, sheet, strip, bar	SB–152	...	C11000	H04
	34	...	Plate, sheet, strip, bar	SB–152	...	C11000	M20, O25
	35	...	Plate, sheet, strip, bar	SB–152	...	C11000	M20, O25
(**23**)	36	...	...	...	...	...	...
(**23**)	37	...	...	...	...	...	...
(**23**)	38	...	Smls. tube	SB–75	...	C12000	O50, O60
(**23**)	39	...	Smls. tube	SB–75	...	C12000	O50, O60
	40	...	Smls. pipe	SB–42	...	C12000	O61
	41	...	Smls. pipe	SB–42	...	C12000	O61
	42	...	Smls. pipe	SB–42	...	C12000	H55
	43	...	Smls. tube	SB–75	...	C12000	H55
	44	...	Smls. cond. tube	SB–111	...	C12000	H55
	45	...	Smls. U–bend tube	SB–395	...	C12000	H55

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	...	31	250	205	NP	204 (Cl. 3 only)	204	204	NFC–6	G9, W3
2	6 < DN ≤ 50	31	310	275	204	149	204	204	NFC–6	G1, G6, G9, G39, T20, W3
3	≤102	31	310	275	204	177	204	204	NFC–6	G1, G6, G9, G39, T20, W3
4	...	31	310	275	NP	149	204	204	NFC–6	G6, G9, G39, T20, W3
5	...	31	205	70	NP	149	204	204	NFC–1	G41, T3, W3
6	...	31	205	70	NP	149	204	204	NFC–1	G41, T3, W3
7	...	31	205	70	NP	149	204	204	NFC–1	G41, T3, W3
8	...	31	205	70	NP	149	204	204	NFC–1	G41, T3, W3
9	...	31	205	70	NP	149	204	204	NFC–1	G41, T3, W3
10	...	31	205	70	NP	149	204	204	NFC–1	T3
11	...	31	205	70	NP	121	204	204	NFC–1	G5, T2
12	...	31	205	70	NP	149	204	204	NFC–1	G41, T3, W3
13	...	31	205	70	NP	149	204	204	NFC–1	G41, T3, W3
14	...	31	205	70	NP	149	204	204	NFC–1	G41, T3, W3
15	...	31	205	70	NP	149	204	204	NFC–1	G41, T3, W3
16	...	31	205	70	NP	149	204	204	NFC–1	G41, T3, W3
17	...	31	205	70	NP	149	204	204	NFC–1	T3
18	...	31	205	70	NP	121	204	204	NFC–1	G5, T2
19	...	31	205	70	NP	149	204	204	NFC–1	G41, T3, W3
20	...	31	205	70	NP	149	204	204	NFC–1	G41, T3, W3
21	...	31	205	70	NP	149	204	204	NFC–1	G41, T3, W3
22	...	31	205	70	NP	149	204	204	NFC–1	G41, T3, W3
23	...	31	205	70	NP	149	204	204	NFC–1	G41, T3, W3
24	...	31	205	70	NP	149	204	204	NFC–1	T3
25	...	31	205	70	NP	121	204	204	NFC–1	G5, T2
26	All	31	195	55	NP	149	204	204	NFC–1	G41, T3
27	All	31	195	55	NP	149	204	204	NFC–1	T3
28	All	31	195	55	NP	149	204	204	NFC–1	G5, T3
29	...	31	205	70	NP	NP	204	204	NFC–1	G41, T3, W3
30	...	31	205	70	NP	NP	204	204	NFC–1	G41, T3, W3
31	...	31	205	70	NP	NP	204	204	NFC–1	G41, T3, W3
32	...	31	205	70	NP	NP	204	204	NFC–1	G41, T3, W3
33	...	31	205	70	NP	NP	204	204	NFC–1	G41, T3, W3
34	...	31	205	70	NP	NP	204	204	NFC–1	T3
35	...	31	205	70	NP	NP	204	204	NFC–1	G5, T2
36	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...
38	All	31	205	62	204	149 (Cl. 3 only)	204	204	NFC–1	G1, T3
39	All	31	205	62	204	149 (Cl. 3 only)	204	204	NFC–1	G1, G5, T3
40	All	31	205	60	204	149	204	204	NFC–1	G1, T3
41	All	31	205	60	204	149	204	204	NFC–1	G1, G5, T3
42	50 < DN ≤ 300	31	250	205	204	204	204	204	NFC–6	G1, G9, W3
43	All	31	250	205	204	204 (Cl. 3 only)	204	204	NFC–6	G1, G9, W3
44	...	31	250	205	NP	204	204	204	NFC–6	G9, W3
45	...	31	250	205	NP	204 (Cl. 3 only)	204	204	NFC–6	G9, W3

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	71.0	71.0	71.0	70.9	68.8	67.0	65.1	63.3	...	...	...	...	...	...	...	...	...	...
2	88.9	88.9	88.9	88.8	86.0	82.1	*39.8*	...	...	...	...	...	...	...	...	...	...	...
3	88.9	88.9	88.9	88.8	86.0	82.1	*39.8*	...	...	...	...	...	...	...	...	...	...	...
4	88.9	88.9	88.9	88.8	86.0	82.1	*39.8*	...	...	...	...	...	...	...	...	...	...	...
5	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
6	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
7	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
8	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
9	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
10	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
11	46.0	46.0	46.0	46.0	*42.8*	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
12	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
13	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
14	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
15	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
16	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
17	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
18	46.0	46.0	46.0	46.0	*42.8*	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
19	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
20	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
21	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
22	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
23	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
24	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
25	46.0	46.0	46.0	46.0	*42.8*	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
26	36.8	32.3	32.3	32.3	32.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
27	36.8	32.3	32.3	32.3	32.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
28	36.8	36.8	36.8	36.8	36.8	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
29	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
30	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
31	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
32	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
33	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
34	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
35	46.0	46.0	46.0	46.0	*42.8*	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	41.4	36.4	36.4	36.4	36.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
39	41.4	41.4	41.4	41.4	41.4	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
40	41.4	36.4	36.4	36.4	36.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
41	41.4	41.4	41.4	41.4	41.4	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
42	71.0	71.0	71.0	70.9	68.8	67.0	65.1	63.3	...	...	...	...	...	...	...	...	...	...
43	71.0	71.0	71.0	70.9	68.8	67.0	65.1	63.3	...	...	...	...	...	...	...	...	...	...
44	71.0	71.0	71.0	70.9	68.8	67.0	65.1	63.3	...	...	...	...	...	...	...	...	...	...
45	71.0	71.0	71.0	70.9	68.8	67.0	65.1	63.3	...	...	...	...	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	1	...	Smls. pipe	SB–42	...	C12000	H80
	2	...	Smls. tube	SB–75	...	C12000	H80
	3	...	Smls. cond. tube	SB–111	...	C12000	H80
	4	...	Smls. pipe	SB–42	...	C12200	O61
	5	...	Smls. pipe	SB–42	...	C12200	O61
(**23**)	6	...	Smls. tube	SB–75	...	C12200	O50
(**23**)	7	...	Smls. tube	SB–75	...	C12200	O50
(**23**)	8	...	Smls. tube	SB–75	...	C12200	O60
(**23**)	9	...	Smls. tube	SB–75	...	C12200	O60
	10	...	Finned tube	SB–359	...	C12200	O61
	11	...	Finned tube	SB–359	...	C12200	O61
	12	...	Wld. cond. tube	SB–543	...	C12200	W061
	13	...	Wld. cond. tube	SB–543	...	C12200	W061
	14	...	Plate, sheet, strip	SB–152	...	C12200	H00
	15	...	Plate, sheet, strip	SB–152	...	C12200	H01
	16	...	Plate, sheet, strip	SB–152	...	C12200	H02
	17	...	Plate, sheet, strip	SB–152	...	C12200	H03
	18	...	Plate, sheet, strip	SB–152	...	C12200	H04
	19	...	Plate, sheet, strip	SB–152	...	C12200	M20, O25
	20	...	Plate, sheet, strip	SB–152	...	C12200	M20, O25
	21	...	Wld. cond. tube	SB–543	...	C12200	WC55
	22	...	Smls. pipe	SB–42	...	C12200	H55
	23	...	Smls. tube	SB–75	...	C12200	H55
	24	...	Smls. cond. tube	SB–111	...	C12200	H55
	25	...	Finned tube	SB–359	...	C12200	H55
	26	...	Smls. U–bend tube	SB–395	...	C12200	H55
	27	...	Smls. pipe	SB–42	...	C12200	H80
	28	...	Smls. cond. tube	SB–75	...	C12200	H80
	29	...	Smls. tube	SB–111	...	C12200	H80
	30	...	Plate, sheet, strip, bar	SB–152	...	C12300	H00
	31	...	Plate, sheet, strip, bar	SB–152	...	C12300	H01
	32	...	Plate, sheet, strip, bar	SB–152	...	C12300	H02
	33	...	Plate, sheet, strip, bar	SB–152	...	C12300	H03
	34	...	Plate, sheet, strip, bar	SB–152	...	C12300	H04
	35	...	Plate, sheet, strip, bar	SB–152	...	C12300	M20, O25
	36	...	Plate, sheet, strip, bar	SB–152	...	C12300	M20, O25
	37	...	Plate, sheet, strip	SB–152	...	C14200	M20, O25
	38	...	Plate, sheet, strip	SB–152	...	C14200	M20, O25
	39	...	Smls. cond. tube	SB–111	...	C14200	H55
	40	...	Smls. U–bend tube	SB–395	...	C14200	H55
	41	...	Smls. cond. tube	SB–111	...	C14200	H80
	42	...	Smls. cond. tube	SB–111	...	C19200	O61
(**23**)	43	...	Smls. cond. tube	SB–111	...	C19200	O61
	44	...	Smls. U–bend tube	SB–395	...	C19200	O61
(**23**)	45	...	Smls. U–bend tube	SB–395	...	C19200	O61

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	6 < DN ≤ 50	31	310	275	204	149	204	204	NFC–6	G1, G6, G9, G39, T20, W3
2	≤102	31	310	275	204	177 (Cl. 3 only)	204	204	NFC–6	G1, G6, G9, G39, T20, W3
3	...	31	310	275	NP	149	204	204	NFC–6	G6, G9, G39, T20, W3
4	All	31	205	60	204	149	204	204	NFC–1	G1, T3
5	All	31	205	60	204	149	204	204	NFC–1	G1, G5, T3
6	All	31	205	62	204	149	204	204	NFC–7	G1, T3
7	All	31	205	62	204	149	204	204	NFC–7	G1, G5, T3
8	All	31	205	62	204	149	204	204	NFC–1	G1, T3
9	All	31	205	62	204	149	204	204	NFC–1	G1, G5, T3
10	...	31	205	62	NP	149 (Cl. 3 only)	204	NP	NFC–1	G1, T3
11	...	31	205	62	NP	149 (Cl. 3 only)	204	NP	NFC–1	G1, G5, T3
12	...	31	205	60	NP	149 (Cl. 3 only)	204	204	NFC–1	G14, T3, W11
13	...	31	205	60	NP	149 (Cl. 3 only)	204	204	NFC–1	G5, G14, T3, W11
14	...	31	205	70	NP	149	204	204	NFC–1	G41, T3, W3
15	...	31	205	70	NP	149	204	204	NFC–1	G41, T3, W3
16	...	31	205	70	NP	149	204	204	NFC–1	G41, T3, W3
17	...	31	205	70	NP	149	204	204	NFC–1	G41, T3, W3
18	...	31	205	70	NP	149	204	204	NFC–1	G41, T3, W3
19	...	31	205	70	NP	121	204	204	NFC–1	G5, T2
20	...	31	205	70	NP	149	204	204	NFC–1	T3
21	...	31	220	105	NP	149 (Cl. 3 only)	204	204	NFC–1	G14, G40, T20, W10
22	50 < DN ≤ 300	31	250	205	204	204	204	204	NFC–6	G1, G9, W3
23	All	31	250	205	204	204 (Cl. 3 only)	204	204	NFC–6	G1, G9, W3
24	...	31	250	205	NP	204	204	204	NFC–6	G9, W3
25	...	31	250	205	NP	149 (Cl. 3 only)	204	NP	NFC–6	G1, G9, W3
26	...	31	250	205	NP	204 (Cl. 3 only)	204	204	NFC–6	G9, W3
27	6 < DN ≤ 50	31	310	275	204	149	204	204	NFC–6	G1, G6, G9, G39, T20, W3
28	<102	31	310	275	204	177 (Cl. 3 only)	204	204	NFC–6	G1, G6, G9, G39, T20, W3
29	...	31	310	275	NP	149	204	204	NFC–6	G6, G9, G39, T20, W3
30	...	31	205	70	NP	149	204	204	NFC–1	G41, T2, W3
31	...	31	205	70	NP	149	204	204	NFC–1	G41, T2, W3
32	...	31	205	70	NP	149	204	204	NFC–1	G41, T2, W3
33	...	31	205	70	NP	149	204	204	NFC–1	G41, T2, W3
34	...	31	205	70	NP	149	204	204	NFC–1	G41, T2, W3
35	...	31	205	70	NP	149	204	204	NFC–1	T3
36	...	31	205	70	NP	121	204	204	NFC–1	G5, T2
37	...	31	205	70	NP	149 (Cl. 3 only)	NP	NP	NFC–1	...
38	...	31	205	70	NP	121 (Cl. 3 only)	NP	NP	NFC–1	G5
39	...	31	250	205	NP	204	204	204	NFC–6	G9, W3
40	...	31	250	205	NP	204 (Cl. 3 only)	204	204	NFC–6	G9, W3
41	...	31	310	275	NP	149	204	204	NFC–6	G6, G9, G39, T20, W3
42	...	31	260	85	NP	NP	149	149	NFC–1	...
43	...	31	260	85	NP	NP	149	149	NFC–1	G5, T2
44	...	31	260	85	NP	NP	149	149	NFC–1	...
45	...	31	260	85	NP	NP	149	149	NFC–1	G5, T2

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	88.9	88.9	88.9	88.8	86.0	82.1	*39.8*	...	...	...	...	...	...	...	...	...	...	...
2	88.9	88.9	88.9	88.8	86.0	82.1	*39.8*	...	...	...	...	...	...	...	...	...	...	...
3	88.9	88.9	88.9	88.8	86.0	82.1	*39.8*	...	...	...	...	...	...	...	...	...	...	...
4	41.4	36.4	36.4	36.4	36.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
5	41.4	41.4	41.4	41.4	41.4	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
6	41.4	36.4	36.4	36.4	36.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
7	41.4	41.4	41.4	41.4	41.4	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
8	41.4	36.4	36.4	36.4	36.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
9	41.4	41.4	41.4	41.4	41.4	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
10	41.4	36.4	36.4	36.4	36.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
11	41.4	41.4	41.4	41.4	41.4	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
12	35.2	30.9	30.9	30.9	30.8	*26.5*	*18.6*	*12.6*	...	...	...	...	...	...	...	...	...	...
13	35.2	35.2	35.2	35.2	35.2	*26.5*	*18.6*	*12.6*	...	...	...	...	...	...	...	...	...	...
14	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
15	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
16	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
17	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
18	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
19	46.0	46.0	46.0	46.0	*42.8*	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
20	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
21	53.8	53.8	53.8	53.6	51.7	50.7	*24.4*	...	...	...	...	...	...	...	...	...	...	...
22	71.0	71.0	71.0	70.9	68.8	67.0	65.1	63.3	...	...	...	...	...	...	...	...	...	...
23	71.0	71.0	71.0	70.9	68.8	67.0	65.1	63.3	...	...	...	...	...	...	...	...	...	...
24	71.0	71.0	71.0	70.9	68.8	67.0	65.1	63.3	...	...	...	...	...	...	...	...	...	...
25	71.0	71.0	71.0	70.9	68.8	67.0	65.1	63.3	...	...	...	...	...	...	...	...	...	...
26	71.0	71.0	71.0	70.9	68.8	67.0	65.1	63.3	...	...	...	...	...	...	...	...	...	...
27	88.9	88.9	88.9	88.8	86.0	82.1	*39.8*	...	...	...	...	...	...	...	...	...	...	...
28	88.9	88.9	88.9	88.8	86.0	82.1	*39.8*	...	...	...	...	...	...	...	...	...	...	...
29	88.9	88.9	88.9	88.8	86.0	82.1	*39.8*	...	...	...	...	...	...	...	...	...	...	...
30	46.0	40.4	40.4	40.4	*40.2*	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
31	46.0	40.4	40.4	40.4	*40.2*	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
32	46.0	40.4	40.4	40.4	*40.2*	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
33	46.0	40.4	40.4	40.4	*40.2*	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
34	46.0	40.4	40.4	40.4	*40.2*	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
35	46.0	40.4	40.4	40.4	40.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
36	46.0	46.0	46.0	46.0	*42.8*	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
37	46.0	40.4	40.4	40.4	40.2	...	...	...	...	...	...	...	...	...	...	...	...	...
38	46.0	46.0	46.0	46.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	71.0	71.0	71.0	70.9	68.8	67.0	65.1	63.3	...	...	...	...	...	...	...	...	...	...
40	71.0	71.0	71.0	70.9	68.8	67.0	65.1	63.3	...	...	...	...	...	...	...	...	...	...
41	88.9	88.9	88.9	88.8	86.0	82.1	*39.8*	...	...	...	...	...	...	...	...	...	...	...
42	55.2	49.0	45.7	43.9	42.7	...	...	...	...	...	...	...	...	...	...	...	...	...
43	55.2	55.2	55.2	55.2	*42.8*	...	...	...	...	...	...	...	...	...	...	...	...	...
44	55.2	49.0	45.7	43.9	42.7	...	...	...	...	...	...	...	...	...	...	...	...	...
45	55.2	55.2	55.2	55.2	*42.8*	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
(**23**)	1	...	Wld. cond. tube	SB–543	...	C19400	WO61
(**23**)	2	...	Wld. cond. tube	SB–543	...	C19400	WO61
(**23**)	3	...	Wld. cond. tube	SB–543	...	C19400	WC55
	4	...	Smls. pipe	SB–43	...	C23000	H58
	5	...	Smls. tube	SB–135	...	C23000	O50
	6	...	Smls. red brass tube	SB–135	...	C23000	O60
	7	...	Smls. pipe	SB–43	...	C23000	O61
	8	...	Smls. cond. tube	SB–111	...	C23000	O61
	9	...	Smls. tube	SB–395	...	C23000	O61
	10	...	Wld. cond. tube	SB–543	...	C23000	WO61
	11	...	Wld. cond. tube	SB–543	...	C23000	WC55
	12	...	Smls. tube	SB–111	...	C28000	O61
	13	...	Plate	SB–171	...	C36500	M10, M20
	14	...	Plate	SB–171	...	C36500	O20, O25
	15	...	Plate	SB–171	...	C36500	M10, M20
	16	...	Plate	SB–171	...	C36500	O20, O25
	17	...	Plate	SB–171	...	C36500	M10, M20
	18	...	Plate	SB–171	...	C36500	O20, O25
(**23**)	19	...	Forgings	SB–283	...	C37700	M10, M11, O20
(**23**)	20	...	Forgings	SB–283	...	C37700	M10, M11, O20
(**23**)	21	...	Forgings	SB–283	...	C37700	M10, M11, O20
(**23**)	22	...	Forgings	SB–283	...	C37700	M10, M11, O20
	23	...	Plate	SB–171	...	C44300	M10, M20
	24	...	Plate	SB–171	...	C44300	O20, O25
	25	...	Smls. cond. tube	SB–111	...	C44300	O61
	26	...	Finned tube	SB–359	...	C44300	O61
	27	...	Smls. U–bend tube	SB–395	...	C44300	O61
	28	...	Wld. cond. tube	SB–543	...	C44300	WO61
	29	...	Plate	SB–171	...	C44400	M10, M20
	30	...	Plate	SB–171	...	C44400	O20, O25
	31	...	Smls. cond. tube	SB–111	...	C44400	O61
	32	...	Finned tube	SB–359	...	C44400	O61
	33	...	Smls. U–bend tube	SB–395	...	C44400	O61
	34	...	Wld. cond. tube	SB–543	...	C44400	WO61
	35	...	Plate	SB–171	...	C44500	M10, M20
	36	...	Plate	SB–171	...	C44500	O20, O25
	37	...	Smls. cond. tube	SB–111	...	C44500	O61
	38	...	Finned tube	SB–359	...	C44500	O61
	39	...	Smls. U–bend tube	SB–395	...	C44500	O61
	40	...	Wld. cond. tube	SB–543	...	C44500	WO61
	41	...	Plate	SB–171	...	C46400	M10, M20
	42	...	Plate	SB–171	...	C46400	O20, O25
	43	...	Plate	SB–171	...	C46400	M10, M20
	44	...	Plate	SB–171	...	C46400	O20, O25
	45	...	Plate	SB–171	...	C46500	M10, M20

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	31	310	105	NP	NP	204	204	NFC–5	G14, T20, W11
2	...	31	310	105	NP	NP	204	204	NFC–5	G5, G14, T3, W11
3	...	31	310	150	NP	149 (Cl. 3 only)	204	204	NFC–5	G14, T3, W10
4	...	32	275	85	232	149 (Cl. 3 only)	232	232	NFC–1	G1, G41, T3, W3
5	...	32	275	80	NP	149 (Cl. 3 only)	NP	NP	NFC–1	...
6	...	32	275	80	NP	149 (Cl. 3 only)	232	232	NFC–1	T3
7	...	32	275	85	232	149 (Cl. 3 only)	232	232	NFC–1	G1, T3
8	...	32	275	85	NP	149 (Cl. 3 only)	232	232	NFC–1	T3
9	...	32	275	85	NP	149 (Cl. 3 only)	232	232	NFC–1	T3
10	...	32	275	85	NP	149 (Cl. 3 only)	232	232	NFC–1	G14, T3, W11
11	...	32	290	140	NP	149 (Cl. 3 only)	232	232	NFC–2	G14, G41, T3, W10
12	...	32	345	140	204	177 (Cl. 3 only)	204	204	NFC–3	G1, G6, T3
13	100 < t ≤ 140	32	275	85	NP	177 (Cl. 3 only)	204	204	NFC–2	G7, T4
14	100 < t ≤ 140	32	275	85	NP	177 (Cl. 3 only)	204	204	NFC–2	G7, T4
15	50 < t ≤ 100	32	310	105	NP	177 (Cl. 3 only)	204	204	NFC–2	T4
16	50 < t ≤ 100	32	310	105	NP	177 (Cl. 3 only)	204	204	NFC–2	T4
17	≤50	32	345	140	NP	177 (Cl. 3 only)	204	204	NFC–2	T3
18	≤50	32	345	140	NP	177 (Cl. 3 only)	204	204	NFC–2	T3
19	>38	...	315	100	NP	NP	204	204	NFC–2	G17, T1, W14
20	>38	...	315	100	NP	NP	204	204	NFC–2	G5, G17, T1, W14
21	≥38	...	345	125	NP	NP	204	204	NFC–2	G17, T1, W14
22	≥38	...	345	125	NP	NP	204	204	NFC–2	G5, G17, T1, W14
23	≤100	32	310	105	NP	177 (Cl. 3 only)	232	232	NFC–2	T20
24	≤100	32	310	105	NP	177 (Cl. 3 only)	232	232	NFC–2	T20
25	...	32	310	105	232	177 (Cl. 3 only)	232	232	NFC–2	G1, G6, T20
26	...	32	310	105	NP	177 (Cl. 3 only)	232	NP	NFC–2	G1, G6, T20
27	...	32	310	105	NP	177 (Cl. 3 only)	232	232	NFC–2	T20
28	...	32	310	105	NP	NP	232	232	NFC–2	G7, G14, T20, W11
29	≤100	32	310	105	NP	177 (Cl. 3 only)	232	232	NFC–2	T20
30	≤100	32	310	105	NP	177 (Cl. 3 only)	232	232	NFC–2	T20
31	...	32	310	105	232	177 (Cl. 3 only)	232	232	NFC–2	G1, G6, T20
32	...	32	310	105	NP	177 (Cl. 3 only)	232	NP	NFC–2	G1, G6, T20
33	...	32	310	105	NP	177 (Cl. 3 only)	232	232	NFC–2	T20
34	...	32	310	105	NP	NP	232	232	NFC–2	G7, G14, T20, W11
35	≤100	32	310	105	NP	177 (Cl. 3 only)	232	232	NFC–2	T20
36	≤100	32	310	105	NP	177 (Cl. 3 only)	232	232	NFC–2	T20
37	...	32	310	105	232	177 (Cl. 3 only)	232	232	NFC–2	G1, G6, T20
38	...	32	310	105	NP	177 (Cl. 3 only)	232	NP	NFC–2	G1, G6, T20
39	...	32	310	105	NP	177 (Cl. 3 only)	232	232	NFC–2	T20
40	...	32	310	105	NP	NP	232	232	NFC–2	G7, G14, T20, W11
41	80 < t ≤ 140	32	345	125	NP	149 (Cl. 3 only)	204	204	NFC–2	T3
42	80 < t ≤ 140	32	345	125	NP	149 (Cl. 3 only)	204	204	NFC–2	T3
43	≤80	32	345	140	NP	149 (Cl. 3 only)	204	204	NFC–2	T3
44	≤80	32	345	140	NP	149 (Cl. 3 only)	204	204	NFC–2	T3
45	80 < t ≤ 140	32	345	125	NP	149 (Cl. 3 only)	204	204	NFC–2	T3

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	58.6	57.9	57.0	55.6	53.7	52.6	*37.0*	*29.2*	...	...	...	...	...	...	...	...	...	...
2	58.6	58.6	58.6	58.6	58.6	*53.3*	*37.0*	*29.2*	...	...	...	...	...	...	...	...	...	...
3	75.3	75.3	74.9	72.5	70.0	*53.3*	*37.0*	*29.2*	...	...	...	...	...	...	...	...	...	...
4	55.2	55.2	55.2	55.2	55.1	*48.9*	*37.2*	*19.4*	*0.422*	...	...	...	...	...	...	...	...	...
5	55.2	55.2	55.2	55.2	55.2	...	...	...	...	...	...	...	...	...	...	...	...	...
6	55.2	55.2	55.2	55.2	55.1	*48.9*	*37.2*	*19.4*	*0.422*	...	...	...	...	...	...	...	...	...
7	55.2	55.2	55.2	55.2	55.1	*48.9*	*37.2*	*19.4*	*0.422*	...	...	...	...	...	...	...	...	...
8	55.2	55.2	55.2	55.2	55.1	*48.9*	*37.2*	*19.4*	*0.422*	...	...	...	...	...	...	...	...	...
9	55.2	55.2	55.2	55.2	55.1	*48.9*	*37.2*	*19.4*	*0.422*	...	...	...	...	...	...	...	...	...
10	46.9	46.9	46.9	46.9	46.8	*41.9*	*32.0*	*16.6*	*0.134*	...	...	...	...	...	...	...	...	...
11	46.9	46.9	46.9	46.9	46.8	*41.9*	*32.0*	*16.6*	*0.134*	...	...	...	...	...	...	...	...	...
12	91.7	91.7	91.7	91.7	91.6	*76.3*	*42.3*	*17.6*	...	...	...	...	...	...	...	...	...	...
13	55.2	55.2	55.2	55.2	55.2	55.2	40.3	*22.3*	...	...	...	...	...	...	...	...	...	...
14	55.2	55.2	55.2	55.2	55.2	55.2	40.3	*22.3*	...	...	...	...	...	...	...	...	...	...
15	68.9	68.9	68.9	68.9	68.9	68.9	43.0	*11.7*	...	...	...	...	...	...	...	...	...	...
16	68.9	68.9	68.9	68.9	68.9	68.9	43.0	*11.7*	...	...	...	...	...	...	...	...	...	...
17	91.7	91.7	91.7	91.7	91.6	*76.3*	*42.3*	*17.6*	...	...	...	...	...	...	...	...	...	...
18	91.7	91.7	91.7	91.7	91.6	*76.3*	*42.3*	*17.6*	...	...	...	...	...	...	...	...	...	...
19	68.9	57.4	57.4	*55.6*	*35.7*	*22.4*	*13.7*	*8.0*	...	...	...	...	...	...	...	...	...	...
20	68.9	68.9	68.9	*55.6*	*35.7*	*22.4*	*13.7*	*8.0*	...	...	...	...	...	...	...	...	...	...
21	82.7	68.9	68.9	*55.6*	*35.7*	*22.4*	*13.7*	*8.0*	...	...	...	...	...	...	...	...	...	...
22	82.7	82.7	82.7	*55.6*	*35.7*	*22.4*	*13.7*	*8.0*	...	...	...	...	...	...	...	...	...	...
23	68.9	68.9	68.9	68.9	68.9	68.9	*41.5*	*18.3*	*4.60*	...	...	...	...	...	...	...	...	...
24	68.9	68.9	68.9	68.9	68.9	68.9	*41.5*	*18.3*	*4.60*	...	...	...	...	...	...	...	...	...
25	68.9	68.9	68.9	68.9	68.9	68.9	*41.5*	*18.3*	*4.60*	...	...	...	...	...	...	...	...	...
26	68.9	68.9	68.9	68.9	68.9	68.9	*41.5*	*18.3*	*4.60*	...	...	...	...	...	...	...	...	...
27	68.9	68.9	68.9	68.9	68.9	68.9	*41.5*	*18.3*	*4.60*	...	...	...	...	...	...	...	...	...
28	58.6	58.6	58.6	58.6	58.6	58.6	*35.3*	*15.6*	*3.90*	...	...	...	...	...	...	...	...	...
29	68.9	68.9	68.9	68.9	68.9	68.9	*41.5*	*18.3*	*4.60*	...	...	...	...	...	...	...	...	...
30	68.9	68.9	68.9	68.9	68.9	68.9	*41.5*	*18.3*	*4.60*	...	...	...	...	...	...	...	...	...
31	68.9	68.9	68.9	68.9	68.9	68.9	*41.5*	*18.3*	*4.60*	...	...	...	...	...	...	...	...	...
32	68.9	68.9	68.9	68.9	68.9	68.9	*41.5*	*18.3*	*4.60*	...	...	...	...	...	...	...	...	...
33	68.9	68.9	68.9	68.9	68.9	68.9	*41.5*	*18.3*	*4.60*	...	...	...	...	...	...	...	...	...
34	58.6	58.6	58.6	58.6	58.6	58.6	*35.3*	*15.6*	*3.90*	...	...	...	...	...	...	...	...	...
35	68.9	68.9	68.9	68.9	68.9	68.9	*41.5*	*18.3*	*4.60*	...	...	...	...	...	...	...	...	...
36	68.9	68.9	68.9	68.9	68.9	68.9	*41.5*	*18.3*	*4.60*	...	...	...	...	...	...	...	...	...
37	68.9	68.9	68.9	68.9	68.9	68.9	*41.5*	*18.3*	*4.60*	...	...	...	...	...	...	...	...	...
38	68.9	68.9	68.9	68.9	68.9	68.9	*41.5*	*18.3*	*4.60*	...	...	...	...	...	...	...	...	...
39	68.9	68.9	68.9	68.9	68.9	68.9	*41.5*	*18.3*	*4.60*	...	...	...	...	...	...	...	...	...
40	58.6	58.6	58.6	58.6	58.6	58.6	*35.3*	*15.6*	*3.90*	...	...	...	...	...	...	...	...	...
41	82.7	82.7	82.7	82.7	82.2	*46.1*	*21.6*	*8.70*	...	...	...	...	...	...	...	...	...	...
42	82.7	82.7	82.7	82.7	82.2	*46.1*	*21.6*	*8.70*	...	...	...	...	...	...	...	...	...	...
43	91.7	91.7	91.7	91.7	91.0	*46.1*	*21.6*	*8.70*	...	...	...	...	...	...	...	...	...	...
44	91.7	91.7	91.7	91.7	91.0	*46.1*	*21.6*	*8.70*	...	...	...	...	...	...	...	...	...	...
45	82.7	82.7	82.7	82.7	82.2	*46.1*	*21.6*	*8.70*	...	...	...	...	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	1	...	Plate	SB–171	...	C46500	O20, O25
	2	...	Plate	SB–171	...	C46500	M10, M20
	3	...	Plate	SB–171	...	C46500	O20, O25
	4	...	Smls. cond. tube	SB–111	...	C60800	O61
	5	...	Smls. cond. tube	SB–111	...	C60800	O61
	6	...	Smls. U–bend tube	SB–395	...	C60800	O61
	7	...	Smls. U–bend tube	SB–395	...	C60800	O61
	8	...	Plate	SB–171	...	C61400	M10, M20
	9	...	Plate	SB–171	...	C61400	O20, O25
	10	...	Plate, sheet	SB–169	...	C61400	O25 or O60
	11	...	Plate	SB–171	...	C61400	M10, M20
	12	...	Plate	SB–171	...	C61400	O20, O25
	13	...	Plate, sheet	SB–169	...	C61400	O25 or O60
	14	...	Plate, sheet	SB–169	...	C61400	O25 or O60
	15	...	Plate	SB–171	...	C63000	M10, M20
	16	...	Plate	SB–171	...	C63000	O20, O25
	17	...	Plate	SB–171	...	C63000	M10, M20
	18	...	Plate	SB–171	...	C63000	O20, O25
	19	...	Plate	SB–171	...	C63000	M10, M20
	20	...	Plate	SB–171	...	C63000	O20, O25
(**23**)	21	...	...	...	...	...	...
(**23**)	22	...	...	...	...	...	...
(**23**)	23	...	Forgings	SB–283	...	C64200	M10, M11, O20
(**23**)	24	...	Forgings	SB–283	...	C64200	M10, M11, O20
(**23**)	25	...	...	...	...	...	...
(**23**)	26	...	...	...	...	...	...
(**23**)	27	...	Forgings	SB–283	...	C64200	M10, M11, O20
(**23**)	28	...	Forgings	SB–283	...	C64200	M10, M11, O20
(**23**)	29	...	Bar, rod	SB–98	...	C65100	O60
(**23**)	30	...	Bar, rod	SB–98	...	C65100	O60
	31	...	Bar, rod	SB–98	...	C65100	H02
(**23**)	32	...	Bar, rod	SB–98	...	C65100	H02
(**23**)	33	...	Smls. pipe & tube	SB–315	...	C65500	O61
(**23**)	34	...	Smls. pipe & tube	SB–315	...	C65500	O61
	35	...	Plate, sheet	SB–96	...	C65500	O61
(**23**)	36	...	Plate, sheet	SB–96	...	C65500	O61
	37	...	Bar, rod	SB–98	...	C65500	O60
(**23**)	38	...	Bar, rod	SB–98	...	C65500	O60
	39	...	Bar, rod	SB–98	...	C65500	H02
(**23**)	40	...	Bar, rod	SB–98	...	C66100	O60
	41	...	Bar, rod	SB–98	...	C66100	O60
	42	...	Bar, rod	SB–98	...	C66100	H02
(**23**)	43	...	Smls. cond. tube	SB–111	...	C68700	O61
(**23**)	44	...	Smls. cond. tube	SB–111	...	C68700	O61
(**23**)	45	...	Smls. U–bend tube	SB–395	...	C68700	O61

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	80 < *t* ≤ 140	32	345	125	NP	149 (Cl. 3 only)	204	204	NFC–2	T3
2	≤80	32	345	140	NP	149 (Cl. 3 only)	204	204	NFC–2	T3
3	≤80	32	345	140	NP	149 (Cl. 3 only)	204	204	NFC–2	T3
4	...	35	345	130	NP	149 (Cl. 3 only)	260	260	NFC–2	G6, T3
5	...	35	345	130	NP	149 (Cl. 3 only)	260	260	NFC–2	G5, G6, T3
6	...	35	345	130	NP	149 (Cl. 3 only)	260	260	NFC–2	T3
7	...	35	345	130	NP	149 (Cl. 3 only)	260	260	NFC–2	G5, T3
8	50 < *t* ≤ 140	35	450	195	NP	260 (Cl. 3 only)	260	260	NFC–8	...
9	50 < *t* ≤ 140	35	450	195	NP	260 (Cl. 3 only)	260	260	NFC–8	...
10	50 < *t* ≤ 140	35	450	195	NP	260 (Cl. 3 only)	260	260	NFC–8	...
11	≤50	35	485	205	NP	260 (Cl. 3 only)	260	260	NFC–8	...
12	≤50	35	485	205	NP	260 (Cl. 3 only)	260	260	NFC–8	...
13	12 < *t* ≤ 50	35	485	205	NP	260 (Cl. 3 only)	260	260	NFC–8	...
14	≤12	35	495	220	NP	232 (Cl. 3 only)	260	260	NFC–8	...
15	100 < *t* ≤ 140	35	550	205	NP	260 (Cl. 3 only)	371	343	NFC–8	T6
16	100 < *t* ≤ 140	35	550	205	NP	260 (Cl. 3 only)	371	343	NFC–8	T6
17	50 < *t* ≤ 100	35	585	230	NP	260 (Cl. 3 only)	371	343	NFC–8	T6
18	50 < *t* ≤ 100	35	585	230	NP	260 (Cl. 3 only)	371	343	NFC–8	T6
19	≤50	35	620	250	NP	260 (Cl. 3 only)	371	343	NFC–8	T6
20	≤50	35	620	250	NP	260 (Cl. 3 only)	371	343	NFC–8	T6
21	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...
23	>38	...	469	156	NP	NP	260	260	NFC–3	G10, T20, W14
24	>38	...	469	156	NP	NP	260	260	NFC–3	G5, G10, T20, W14
25	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...
27	≤38	...	483	172	NP	NP	260	260	NFC–3	G10, T20, W14
28	≤38	...	483	172	NP	NP	260	260	NFC–3	G5, G10, T20, W14
29	All	33	275	85	NP	149	177	177	NFC–1	G17, T20
30	All	33	275	83	NP	149	177	177	NFC–1	G5, G17, T20
31	All	33	380	140	NP	149	177	177	NFC–2	G17, T20, W3
32	≤50	33	380	140	NP	149	177	177	NFC–2	G5, G17, T20, W3
33	...	33	345	103	NP	149 (Cl. 3 only)	204	204	NFC–2	G17, T20
34	...	33	345	100	NP	149 (Cl. 3 only)	204	204	NFC–2	G5, G17, T20
35	≤50	33	345	125	NP	149 (Cl. 3 only)	177	177	NFC–2	G17, T3
36	≤50	33	345	125	NP	149 (Cl. 3 only)	177	177	NFC–2	G5, G17, T3
37	All	33	360	105	NP	149	177	177	NFC–2	G17, T20
38	All	33	360	100	NP	149	177	177	NFC–2	G5, G17, T20
39	≤50	33	485	260	NP	149	177	177	NFC–2	G17, W3
40	All	33	360	100	NP	149	177	177	NFC–2	G5, G17, T20
41	All	33	360	105	NP	149	177	177	NFC–2	G17, T20
42	≤50	33	485	260	NP	149	177	177	NFC–2	G17, W3
43	...	32	345	125	NP	149 (Cl. 3 only)	232	232	NFC–2	T3
44	...	32	345	125	NP	149 (Cl. 3 only)	232	232	NFC–2	G5, T3
45	...	32	345	125	NP	149 (Cl. 3 only)	232	232	NFC–2	T3

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	82.7	82.7	82.7	82.7	82.2	*46.1*	*21.6*	*8.70*	...	...	...	...	...	...	...	...	...	...
2	91.7	91.7	91.7	91.7	91.0	*46.1*	*21.6*	*8.70*	...	...	...	...	...	...	...	...	...	...
3	91.7	91.7	91.7	91.7	91.0	*46.1*	*21.6*	*8.70*	...	...	...	...	...	...	...	...	...	...
4	87.3	84.3	84.3	84.0	82.6	*70.4*	*44.9*	*30.6*	*17.7*	*9.48*	...	...	...	...	...	...	...	...
5	87.3	87.3	87.3	87.3	87.3	*70.4*	*44.9*	*30.6*	*17.7*	*9.48*	...	...	...	...	...	...	...	...
6	87.3	84.3	84.3	84.0	82.6	*70.4*	*44.9*	*30.6*	*17.7*	*9.48*	...	...	...	...	...	...	...	...
7	87.3	87.3	87.3	87.3	87.3	*70.4*	*44.9*	*30.6*	*17.7*	*9.48*	...	...	...	...	...	...	...	...
8	128	128	127	126	125	125	124	121	118	115	...	...	...	...	...	...	...	...
9	128	128	127	126	125	125	124	121	118	115	...	...	...	...	...	...	...	...
10	128	128	127	126	125	125	124	121	118	115	...	...	...	...	...	...	...	...
11	138	137	136	136	134	134	133	131	128	124	...	...	...	...	...	...	...	...
12	138	137	136	136	134	134	133	131	128	124	...	...	...	...	...	...	...	...
13	138	137	136	136	134	134	133	131	128	124	...	...	...	...	...	...	...	...
14	142	142	142	142	142	142	140	135	131	127	...	...	...	...	...	...	...	...
15	138	138	138	138	138	138	138	137	136	135	*97.9*	*74.1*	*54.7*	*38.9*	...	...	...	...
16	138	138	138	138	138	138	138	137	136	135	*97.9*	*74.1*	*54.7*	*38.9*	...	...	...	...
17	152	152	152	152	152	152	152	151	150	148	*97.9*	*74.1*	*54.7*	*38.9*	...	...	...	...
18	152	152	152	152	152	152	152	151	150	148	*97.9*	*74.1*	*54.7*	*38.9*	...	...	...	...
19	165	165	165	165	165	165	165	165	164	162	*97.9*	*74.1*	*54.7*	*38.9*	...	...	...	...
20	165	165	165	165	165	165	165	165	164	162	*97.9*	*74.1*	*54.7*	*38.9*	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	106	99.2	97.4	97.3	97.3	97.3	*84.5*	*57.5*	*41.5*	*25.1*	...	...	...	...	...	...	...	...
24	106	106	106	106	106	106	*84.5*	*57.5*	*41.5*	*25.1*	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	115	108	106	106	106	106	*84.5*	*57.5*	*41.5*	*25.1*	...	...	...	...	...	...	...	...
28	115	115	115	115	115	115	*84.5*	*57.5*	*41.5*	*25.1*	...	...	...	...	...	...	...	...
29	55.2	54.8	54.3	54.0	53.6	53.1	*50.8*	...	...	...	...	...	...	...	...	...	...	...
30	55.2	55.2	55.2	55.2	55.2	55.2	*50.8*	...	...	...	...	...	...	...	...	...	...	...
31	91.9	91.9	90.6	88.7	86.2	83.2	*72.3*	...	...	...	...	...	...	...	...	...	...	...
32	91.9	91.9	91.9	91.9	91.9	91.9	*72.3*	...	...	...	...	...	...	...	...	...	...	...
33	68.9	68.8	68.6	68.4	68.1	67.8	*50.8*	*31.9*	...	...	...	...	...	...	...	...	...	...
34	68.9	68.9	68.9	68.9	68.9	68.9	*50.8*	*31.9*	...	...	...	...	...	...	...	...	...	...
35	82.7	82.5	82.3	82.0	81.8	*75.4*	*50.8*	...	...	...	...	...	...	...	...	...	...	...
36	82.7	82.7	82.7	82.7	82.7	*75.4*	*50.8*	...	...	...	...	...	...	...	...	...	...	...
37	68.9	68.8	68.6	68.4	68.1	67.8	*50.8*	...	...	...	...	...	...	...	...	...	...	...
38	68.9	68.9	68.9	68.9	68.9	68.9	*50.8*	...	...	...	...	...	...	...	...	...	...	...
39	138	138	138	138	138	138	138	...	...	...	...	...	...	...	...	...	...	...
40	68.9	68.9	68.9	68.9	68.9	68.9	*50.8*	...	...	...	...	...	...	...	...	...	...	...
41	68.9	68.8	68.6	68.4	68.1	67.8	*50.8*	...	...	...	...	...	...	...	...	...	...	...
42	138	138	138	138	138	138	138	...	...	...	...	...	...	...	...	...	...	...
43	82.4	81.8	81.1	80.6	80.1	*47.2*	*24.8*	*14.9*	*5.88*	...	...	...	...	...	...	...	...	...
44	82.4	82.4	82.4	82.4	82.4	*47.2*	*24.8*	*14.9*	*5.88*	...	...	...	...	...	...	...	...	...
45	82.4	81.8	81.1	80.6	80.1	*47.2*	*24.8*	*14.9*	*5.88*	...	...	...	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
(**23**)	1	...	Smls. U–bend tube	SB–395	...	C68700	O61
(**23**)	2	...	Wld. cond. tube	SB–543	...	C68700	WO61
(**23**)	3	...	Wld. cond. tube	SB–543	...	C68700	WO61
(**23**)	4	...	Smls. cond. tube	SB–111	...	C70400	O61
(**23**)	5	...	Wld. tube	SB–543	...	C70400	WO61
(**23**)	6	...	Smls. cond. tube	SB–111	...	C70400	H55
	7	...	Smls. pipe & tube	SB–466	...	C70600	O60
	8	...	Smls. pipe & tube	SB–466	...	C70600	O60
	9	...	Wld. pipe	SB–467	...	C70600	WO61
	10	...	Wld. pipe	SB–467	...	C70600	WO61
	11	...	Bar, rod	SB–151	...	C70600	O60
	12	...	Bar, rod	SB–151	...	C70600	O60
	13	...	Plate	SB–171	...	C70600	M10, M20
	14	...	Plate	SB–171	...	C70600	M10, M20
	15	...	Plate, sheet	SB–171	...	C70600	M10, M20
	16	...	Plate, sheet	SB–171	...	C70600	M10, M20
	17	...	Plate	SB–171	...	C70600	M10, M20
	18	...	Plate	SB–171	...	C70600	M10, M20
	19	...	Plate	SB–171	...	C70600	O20, O25
	20	...	Plate	SB–171	...	C70600	O20, O25
	21	...	Plate, sheet	SB–171	...	C70600	O20, O25
	22	...	Plate, sheet	SB–171	...	C70600	O20, O25
	23	...	Plate	SB–171	...	C70600	O20, O25
	24	...	Plate	SB–171	...	C70600	O20, O25
	25	...	Smls. cond. tube	SB–111	...	C70600	O61
	26	...	Smls. cond. tube	SB–111	...	C70600	O61
	27	...	Smls. cond. tube	SB–111	...	C70600	O61
	28	...	Smls. cond. tube	SB–111	...	C70600	O61
(**23**)	29	...	Finned tube	SB–359	...	C70600	O61
(**23**)	30	...	Finned tube	SB–359	...	C70600	O61
	31	...	Smls. U–bend tube	SB–395	...	C70600	O61
	32	...	Smls. U–bend tube	SB–395	...	C70600	O61
	33	...	Wld. pipe	SB–467	...	C70600	WO61
	34	...	Wld. pipe	SB–467	...	C70600	WO61
	35	...	Wld. tube	SB–543	...	C70600	WO61
	36	...	Wld. tube	SB–543	...	C70600	WO61
	37	...	Finned wld. tube	SB–956	...	C70600	WO61
	38	...	Finned wld. tube	SB–956	...	C70600	WO61
	39	...	Wld. pipe	SB–467	...	C70600	WM50
	40	...	Smls. tube	SB–111	...	C70600	H55
(**23**)	41	...	Smls. pipe & tube	SB–466	...	C70600	H55
	42	...	Wld. tube	SB–543	...	C70600	WC55
	43	...	Finned wld. tube	SB–956	...	C70600	WC55
	44	...	Wld. pipe	SB–467	...	C70600	Wld. fr. cold rld. strip
	45	...	Smls. pipe & tube	SB–466	...	C70620	O60

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	...	32	345	125	NP	149 (Cl. 3 only)	232	232	NFC–2	G5, T3
2	...	32	345	125	NP	NP	232	232	NFC–2	G14, T3, W11
3	...	32	345	125	NP	NP	232	232	NFC–2	G5, G14, T3, W11
4	...	34	260	85	NP	66 (Cl. 3 only)	66	66	NFC–2	G43
5	...	34	260	85	NP	NP	66	66	NFC–2	G14, G43, W11
6	...	34	275	205	NP	66 (Cl. 3 only)	66	66	NFC–2	G7, G43, W3
7	...	34	260	90	NP	204	316	316	NFC–3	T6
8	...	34	260	90	NP	204	316	316	NFC–3	G5, T5
9	>114	34	260	90	NP	232 (Cl. 3 only)	316	316	NFC–3	G14, G42, T5
10	>114	34	260	90	NP	232 (Cl. 3 only)	316	316	NFC–3	G5, G14, G42, T5
11	All	34	260	105	NP	93	NP	NP	NFC–3	...
12	All	34	260	105	NP	93	NP	NP	NFC–3	G5
13	≤140	34	275	105	NP	204	NP	NP	NFC–3	...
14	≤140	34	275	105	NP	204	NP	NP	NFC–3	G5
15	≤140	34	275	105	NP	232 (Cl. 3 only)	NP	NP	NFC–3	...
16	≤140	34	275	105	NP	232 (Cl. 3 only)	NP	NP	NFC–3	G5, T22
17	≤140	34	275	105	NP	NP	316	316	NFC–3	T5
18	≤140	34	275	105	NP	NP	316	316	NFC–3	G5, T5, T22
19	≤140	34	275	105	NP	204	NP	NP	NFC–3	...
20	≤140	34	275	105	NP	204	NP	NP	NFC–3	G5
21	≤140	34	275	105	NP	232 (Cl. 3 only)	NP	NP	NFC–3	...
22	≤140	34	275	105	NP	232 (Cl. 3 only)	NP	NP	NFC–3	G5, T22
23	≤140	34	275	105	NP	NP	316	316	NFC–3	T5
24	≤140	34	275	105	NP	NP	316	316	NFC–3	G5, T22
25	...	34	275	105	316	204	NP	NP	NFC–3	G1, T5
26	...	34	275	105	316	204	NP	NP	NFC–3	G1, G5, T22
27	...	34	275	105	NP	232 (Cl. 3 only)	316	316	NFC–3	T5
28	...	34	275	105	NP	232 (Cl. 3 only)	316	316	NFC–3	G5, T22
29	...	34	275	105	NP	232 (Cl. 3 only)	316	316	NFC–3	G1, T5
30	...	34	275	105	NP	232 (Cl. 3 only)	316	316	NFC–3	G1, G5, T22
31	...	34	275	105	NP	232 (Cl. 3 only)	316	316	NFC–3	T5
32	...	34	275	105	NP	232 (Cl. 3 only)	316	316	NFC–3	G5, T22
33	≤114	34	275	105	NP	232 (Cl. 3 only)	316	316	NFC–3	G14, G42, T5, T22
34	≤114	34	275	105	NP	232 (Cl. 3 only)	316	316	NFC–3	G5, G14, G42, T5, T22
35	...	34	275	105	NP	232 (Cl. 3 only)	316	316	NFC–3	G14, G42, T22
36	...	34	275	105	NP	232 (Cl. 3 only)	316	316	NFC–3	G5, G14, G42, T5, T22
37	...	34	275	100	NP	NP	316	NP	NFC–3	G14, T5, T22
38	...	34	275	100	NP	NP	316	NP	NFC–3	G5, G14, T5, T22
39	≤114	34	310	205	NP	NP	316	316	NFC–3	G14, G42, T5
40	...	34	310	240	NP	232 (Cl. 3 only)	316	316	NFC–3	G41, T5, W3
41	...	34	310	240	NP	NP	316	316	NFC–3	G41, T5, W3
42	...	34	310	240	NP	232 (Cl. 3 only)	316	316	NFC–3	G14, G41, G42, T5, W10
43	...	34	310	240	NP	NP	316	NP	NFC–3	G14, G41, G42, T5, W10
44	≤114	34	375	310	NP	NP	316	316	NFC–3	G14, G42, T5
45	...	34	260	90	NP	204	316	316	NFC–3	T6

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	82.4	82.4	82.4	82.4	82.4	*47.2*	*24.8*	*14.9*	*5.88*	...	...	...	...	...	...	...	...	...
2	70.1	69.6	69.0	68.5	68.1	*40.1*	*21.1*	*12.7*	*5.00*	...	...	...	...	...	...	...	...	...
3	70.1	70.1	70.1	70.1	70.1	*40.1*	*21.1*	*12.7*	*5.00*	...	...	...	...	...	...	...	...	...
4	55.2	55.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	46.9	46.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	68.9	68.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	59.8	57.9	56.2	54.9	53.7	53.1	51.9	51.1	50.8	49.2	*45.2*	*39.0*	...	...	...	...	...	...
8	59.8	59.8	59.8	59.8	59.8	59.8	59.8	59.8	59.8	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
9	50.8	49.7	47.9	46.8	46.2	44.9	44.2	43.6	43.1	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
10	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
11	68.9	67.2	65.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	68.9	68.9	68.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	68.9	67.3	65.1	63.4	62.0	61.0	60.1	59.2	...	...	...	...	...	...	...	...	...	...
14	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...	...	...	...	...	...
15	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	...	...	...	...	...	...	...	...	...
16	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	*60.4*	...	...	...	...	...	...	...	...	...
17	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
18	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	*60.4*	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
19	68.9	67.3	65.1	63.4	62.0	61.0	60.1	59.2	...	...	...	...	...	...	...	...	...	...
20	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...	...	...	...	...	...
21	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	...	...	...	...	...	...	...	...	...
22	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	*60.4*	...	...	...	...	...	...	...	...	...
23	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
24	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	*60.4*	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
25	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
26	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	*60.4*	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
27	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
28	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	*60.4*	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
29	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
30	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	*60.4*	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
31	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
32	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	*60.4*	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
33	58.6	57.3	55.5	54.3	53.0	51.8	51.2	50.0	*45.8*	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
34	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	*51.3*	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
35	58.6	57.3	55.5	54.3	53.0	51.8	51.2	50.0	*45.8*	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
36	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	*51.3*	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
37	58.6	57.3	55.5	54.3	53.0	51.8	51.2	50.0	*45.8*	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
38	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	*51.3*	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
39	58.6	57.3	55.5	54.3	53.0	51.8	51.2	50.0	45.8	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
40	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
41	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
42	58.6	57.3	55.5	54.3	53.0	51.8	51.2	50.0	45.8	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
43	58.6	57.3	55.5	54.3	53.0	51.8	51.2	50.0	45.8	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
44	58.6	57.3	55.5	54.3	53.0	51.8	51.2	50.0	45.8	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
45	59.8	57.9	56.2	54.9	53.7	53.1	51.9	51.1	50.8	49.2	*45.2*	*39.0*	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	1	...	Smls. pipe & tube	SB–466	...	C70620	O60
	2	...	Wld. pipe	SB–467	...	C70620	WO61
	3	...	Wld. pipe	SB–467	...	C70620	WO61
	4	...	Bar, rod	SB–151	...	C70620	O60
	5	...	Bar, rod	SB–151	...	C70620	O60
	6	...	Forgings	SB–283	...	C70620	M10
	7	...	Forgings	SB–283	...	C70620	M10
	8	...	Plate	SB–171	...	C70620	M10, M20
	9	...	Plate	SB–171	...	C70620	M10, M20
	10	...	Plate, sheet	SB–171	...	C70620	M10, M20
	11	...	Plate, sheet	SB–171	...	C70620	M10, M20
	12	...	Plate	SB–171	...	C70620	M10, M20
	13	...	Plate	SB–171	...	C70620	M10, M20
	14	...	Forgings	SB–283	...	C70620	O20
	15	...	Forgings	SB–283	...	C70620	O20
	16	...	Plate	SB–171	...	C70620	O20, O25
	17	...	Plate	SB–171	...	C70620	O20, O25
	18	...	Plate, sheet	SB–171	...	C70620	O20, O25
	19	...	Plate, sheet	SB–171	...	C70620	O20, O25
	20	...	Plate	SB–171	...	C70620	O20, O25
	21	...	Plate	SB–171	...	C70620	O20, O25
	22	...	Smls. cond. tube	SB–111	...	C70620	O61
	23	...	Smls. cond. tube	SB–111	...	C70620	O61
	24	...	Smls. cond. tube	SB–111	...	C70620	O61
	25	...	Smls. cond. tube	SB–111	...	C70620	O61
(**23**)	26	...	Finned tube	SB–359	...	C70620	O61
(**23**)	27	...	Finned tube	SB–359	...	C70620	O61
	28	...	Smls. U–bend tube	SB–395	...	C70620	O61
	29	...	Smls. U–bend tube	SB–395	...	C70620	O61
	30	...	Wld. pipe	SB–467	...	C70620	WO61
	31	...	Wld. pipe	SB–467	...	C70620	WO61
	32	...	Wld. tube	SB–543	...	C70620	WO61
	33	...	Wld. tube	SB–543	...	C70620	WO61
	34	...	Finned wld. tube	SB–956	...	C70620	WO61
	35	...	Finned wld. tube	SB–956	...	C70620	WO61
	36	...	Forgings	SB–283	...	C70620	M10
	37	...	Forgings	SB–283	...	C70620	M10
	38	...	Wld. pipe	SB–467	...	C70620	WM50
	39	...	Smls. tube	SB–111	...	C70620	H55
(**23**)	40	...	Smls. pipe & tube	SB–466	...	C70620	H55
	41	...	Wld. tube	SB–543	...	C70620	WC55
	42	...	Finned wld. tube	SB–956	...	C70620	WC55
	43	...	Wld. pipe	SB–467	...	C70620	Wld. fr. cold rld. strip
(**23**)	44	...	Smls. tube	SB–466	...	C71000	O60
(**23**)	45	...	Smls. tube	SB–466	...	C71000	O60

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	...	34	260	90	NP	204	316	316	NFC–3	G5, T6
2	>114	34	260	90	NP	232 (Cl. 3 only)	316	316	NFC–3	G14, G42, T5
3	>114	34	260	90	NP	232 (Cl. 3 only)	316	316	NFC–3	G5, G14, G42, T5
4	All	34	260	105	NP	93	NP	NP	NFC–3	...
5	All	34	260	105	NP	93	NP	NP	NFC–3	G5
6	>152	34	276	103	NP	NP	316	316	NFC–3	T5
7	>152	34	276	103	NP	NP	316	316	NFC–3	G5, T5
8	≤140	34	275	105	NP	204	NP	NP	NFC–3	...
9	≤140	34	275	105	NP	204	NP	NP	NFC–3	G5
10	≤125	34	275	105	NP	232 (Cl. 3 only)	NP	NP	NFC–3	...
11	≤125	34	275	105	NP	232 (Cl. 3 only)	NP	NP	NFC–3	G5
12	≤125	34	275	105	NP	NP	316	316	NFC–3	T5
13	≤125	34	275	105	NP	NP	316	316	NFC–3	G5, T5
14	All	34	276	103	NP	NP	316	316	NFC–3	T5
15	All	34	276	103	NP	NP	316	316	NFC–3	G5, T5
16	≤140	34	275	105	NP	204	NP	NP	NFC–3	...
17	≤140	34	275	105	NP	204	NP	NP	NFC–3	G5
18	≤140	34	275	105	NP	232 (Cl. 3 only)	NP	NP	NFC–3	...
19	≤140	34	275	105	NP	232 (Cl. 3 only)	NP	NP	NFC–3	G5
20	≤127	34	275	105	NP	NP	316	316	NFC–3	T5
21	≤127	34	275	105	NP	NP	316	316	NFC–3	G5, T5
22	...	34	275	105	316	204	NP	NP	NFC–3	G1, T5, W10
23	...	34	275	105	316	204	NP	NP	NFC–3	G1, G5, T5, W10
24	...	34	275	105	NP	232 (Cl. 3 only)	316	316	NFC–3	T5
25	...	34	275	105	NP	232 (Cl. 3 only)	316	316	NFC–3	G5, T5
26	...	34	275	105	NP	232 (Cl. 3 only)	316	316	NFC–3	G1, T5, W10
27	...	34	275	105	NP	232 (Cl. 3 only)	316	316	NFC–3	G1, G5, T5, W10
28	...	34	275	105	NP	232 (Cl. 3 only)	316	316	NFC–3	T5
29	...	34	275	105	NP	232 (Cl. 3 only)	316	316	NFC–3	G5, T5
30	≤114	34	275	105	NP	232 (Cl. 3 only)	316	316	NFC–3	G14, G42, T5
31	≤114	34	275	105	NP	232 (Cl. 3 only)	316	316	NFC–3	G5, G14, G42, T22
32	...	34	275	105	NP	232 (Cl. 3 only)	316	316	NFC–3	G14, G42, T5
33	...	34	275	105	NP	232 (Cl. 3 only)	316	316	NFC–3	G5, G14, G42, T22
34	...	34	275	100	NP	NP	316	NP	NFC–3	G14, G42, T5
35	...	34	275	100	NP	NP	316	NP	NFC–3	G5, G14, G42, T22
36	≤152	34	310	124	NP	NP	316	316	NFC–3	T22
37	≤152	34	310	124	NP	NP	316	316	NFC–3	G5, T22
38	≤114	34	310	205	NP	NP	316	316	NFC–3	G14, G42, W11
39	...	34	310	240	NP	232 (Cl. 3 only)	316	316	NFC–3	G41, T5
40	...	34	310	240	NP	NP	316	316	NFC–3	G41, T5
41	...	34	310	240	NP	232 (Cl. 3 only)	316	316	NFC–3	G14, G41, G42, T5
42	...	34	310	240	NP	NP	316	NP	NFC–3	G14, G41, G42, T5
43	≤114	34	370	310	NP	NP	316	316	NFC–3	G14, G42, T5
44	...	34	310	110	NP	371 (Cl. 3 only)	371	343	NFC–3	T7
45	...	34	310	110	NP	371 (Cl. 3 only)	371	343	NFC–3	G5, T7

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	59.8	59.8	59.8	59.8	59.8	59.8	59.8	59.8	59.8	51.7	*45.2*	*39.0*	...	...	...	...	...	...
2	50.8	50.8	47.9	46.8	46.2	44.9	44.2	43.6	43.1	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
3	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
4	68.9	67.2	65.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	68.9	68.9	68.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
7	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	60.4	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
8	68.9	67.3	65.1	63.4	62.0	61.0	60.1	59.2	...	...	...	...	...	...	...	...	...	...
9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	60.4	51.7	45.2	39.0	...	...	...	...	...	...
10	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	...	...	...	...	...	...	...	...	...
11	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	60.4	51.7	45.2	39.0	...	...	...	...	...	...
12	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
13	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	60.4	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
14	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
15	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	60.4	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
16	68.9	67.3	65.1	63.4	62.0	61.0	60.1	59.2	...	...	...	...	...	...	...	...	...	...
17	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	60.4	51.7	45.2	39.0	...	...	...	...	...	...
18	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	...	...	...	...	...	...	...	...	...
19	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	60.4	51.7	45.2	39.0	...	...	...	...	...	...
20	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
21	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	60.4	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
22	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
23	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	60.4	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
24	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
25	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	60.4	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
26	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
27	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	60.4	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
28	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
29	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	60.4	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
30	58.6	57.3	55.5	54.3	53.0	51.8	51.2	50.0	45.8	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
31	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	*51.3*	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
32	58.6	57.3	55.5	54.3	53.0	51.8	51.2	50.0	45.8	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
33	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	*51.3*	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
34	58.6	57.3	55.5	54.3	53.0	51.8	51.2	50.0	45.8	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
35	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	*51.3*	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
36	82.7	80.3	78.3	76.7	74.4	72.9	72.1	70.9	*60.4*	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
37	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	*60.4*	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
38	58.6	57.3	55.5	54.3	53.0	51.8	51.2	50.0	45.8	41.3	35.6	26.2	...	...	...	...	...	...
39	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
40	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
41	58.6	57.3	55.5	54.3	53.0	51.8	51.2	50.0	45.8	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
42	58.6	57.3	55.5	54.3	53.0	51.8	51.2	50.0	45.8	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
43	58.6	57.3	55.5	54.3	53.0	51.8	51.2	50.0	45.8	*41.3*	*35.6*	*26.2*	...	...	...	...	...	...
44	73.8	71.8	69.9	68.4	66.7	65.1	63.5	61.9	60.5	59.2	57.9	*56.4*	*51.9*	*47.6*	...	...	...	...
45	73.8	73.8	73.8	73.8	73.8	73.8	73.8	73.8	73.8	73.8	73.8	*56.4*	*51.9*	*47.6*	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
(**23**)	1	...	Smls. cond. tube	SB–111	...	C71000	O61
(**23**)	2	...	Smls. cond. tube	SB–111	...	C71000	O61
(**23**)	3	...	Finned tube	SB–359	...	C71000	O61
(**23**)	4	...	Finned tube	SB–359	...	C71000	O61
(**23**)	5	...	Smls. tube	SB–395	...	C71000	O61
(**23**)	6	...	Smls. tube	SB–395	...	C71000	O61
	7	...	Wld. pipe	SB–467	...	C71500	WO61
	8	...	Wld. pipe	SB–467	...	C71500	WO61
	9	...	Plate, sheet	SB–171	...	C71500	M10, M20
	10	...	Plate, sheet	SB–171	...	C71500	M10, M20
	11	...	Plate, sheet	SB–171	...	C71500	O20, O25
	12	...	Plate, sheet	SB–171	...	C71500	O20, O25
	13	...	Plate, sheet	SB–171	...	C71500	M10, M20
	14	...	Plate, sheet	SB–171	...	C71500	M10, M20
	15	...	Plate, sheet	SB–171	...	C71500	O20, O25
	16	...	Plate, sheet	SB–171	...	C71500	O20, O25
	17	...	Wld. pipe	SB–467	...	C71500	WO61
	18	...	Wld. pipe	SB–467	...	C71500	WO61
	19	...	Smls. pipe & tube	SB–466	...	C71500	O60
	20	...	Smls. pipe & tube	SB–466	...	C71500	O60
	21	...	Smls. cond. tube	SB–111	...	C71500	O61
	22	...	Smls. cond. tube	SB–111	...	C71500	O61
	23	...	Finned tube	SB–359	...	C71500	O61
	24	...	Finned tube	SB–359	...	C71500	O61
	25	...	Smls. U–bend tube	SB–395	...	C71500	O61
	26	...	Smls. U–bend tube	SB–395	...	C71500	O61
	27	...	Wld. cond. tube	SB–543	...	C71500	WO61
	28	...	Wld. cond. tube	SB–543	...	C71500	WO61
	29	...	Finned wld. cond. tube	SB–956	...	C71500	WO61
	30	...	Finned wld. cond. tube	SB–956	...	C71500	WO61
(**23**)	31	...	Smls. cond. tube	SB–111	...	C71500	HR50
(**23**)	32	...	Smls. U–bend tube	SB–395	...	C71500	HR50
	33	...	Wld. pipe	SB–467	...	C71520	WO61
	34	...	Wld. pipe	SB–467	...	C71520	WO61
	35	...	Forgings	SB–283	...	C71520	M10
	36	...	Forgings	SB–283	...	C71520	M10
	37	...	Plate, sheet	SB–171	...	C71520	M10, M20
	38	...	Plate, sheet	SB–171	...	C71520	M10, M20
	39	...	Forgings	SB–283	...	C71520	O20
	40	...	Forgings	SB–283	...	C71520	O20
	41	...	Plate, sheet	SB–171	...	C71520	O20, O25
	42	...	Plate, sheet	SB–171	...	C71520	O20, O25
	43	...	Forgings	SB–283	...	C71520	M10
	44	...	Forgings	SB–283	...	C71520	M10
	45	...	Plate, sheet	SB–171	...	C71520	M10, M20

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	34	310	110	371	371 (Cl. 3 only)	371	343	NFC–3	G1, T7
2	...	34	310	110	371	371 (Cl. 3 only)	371	343	NFC–3	G5, T7
3	...	34	310	110	NP	371 (Cl. 3 only)	371	NP	NFC–3	G1, T7
4	...	34	310	110	NP	371 (Cl. 3 only)	371	NP	NFC–3	G5, T7
5	...	34	310	110	NP	371 (Cl. 3 only)	371	343	NFC–3	T7
6	...	34	310	110	NP	371 (Cl. 3 only)	371	343	NFC–3	G5, T7
7	>114	34	310	105	NP	316 (Cl. 3 only)	NP	NP	NFC–3	G14, W11
8	>114	34	310	105	NP	316 (Cl. 3 only)	NP	NP	NFC–3	G5, G14, W11
9	60 < *t* ≤ 140	34	310	125	NP	371	371	343	NFC–4	...
10	60 < *t* ≤ 140	34	310	125	NP	371	371	343	NFC–4	G5
11	60 < *t* ≤ 140	34	310	125	NP	371	371	343	NFC–4	...
12	60 < *t* ≤ 140	34	310	125	NP	371	371	343	NFC–4	G5
13	≤60	34	345	140	NP	371	371	343	NFC–4	...
14	≤60	34	345	140	NP	371	371	343	NFC–4	G5
15	≤60	34	345	140	NP	371	371	343	NFC–4	...
16	≤60	34	345	140	NP	371	371	343	NFC–4	G5
17	≤114	34	345	140	NP	316 (Cl. 3 only)	NP	NP	NFC–4	G14
18	≤114	34	345	140	NP	316 (Cl. 3 only)	NP	NP	NFC–4	G5, G14
19	...	34	360	125	NP	371	371	343	NFC–4	...
20	...	34	360	125	NP	371	371	343	NFC–4	G5
21	...	34	360	125	371	371	371	343	NFC–4	G1
22	...	34	360	125	371	371	371	343	NFC–4	G1, G5
23	...	34	360	125	NP	371 (Cl. 3 only)	371	NP	NFC–4	G1
24	...	34	360	125	NP	371 (Cl. 3 only)	371	NP	NFC–4	G1, G5
25	...	34	360	125	NP	371 (Cl. 3 only)	371	343	NFC–4	...
26	...	34	360	125	NP	371 (Cl. 3 only)	371	343	NFC–4	G5
27	...	34	360	125	NP	316 (Cl. 3 only)	316	316	NFC–4	G14, W11
28	...	34	360	125	NP	316 (Cl. 3 only)	316	316	NFC–4	G5, G14, W11
29	...	34	360	125	NP	NP	316	NP	NFC–4	G14, W11
30	...	34	360	125	NP	NP	316	NP	NFC–4	G5, G14, W11
31	...	34	495	345	NP	371	427	343	NFC–4	T9, W3
32	...	34	495	345	NP	371	427	343	NFC–8	T9, W3
33	>114	34	310	100	NP	316 (Cl. 3 only)	NP	NP	NFC–3	G14
34	>114	34	310	100	NP	316 (Cl. 3 only)	NP	NP	NFC–3	G5, G14
35	>152	34	310	124	NP	NP	371	343	NFC–4	...
36	>152	34	310	124	NP	NP	371	343	NFC–4	G5
37	60 < *t* ≤ 140	34	310	125	NP	371	371	343	NFC–4	...
38	60 < *t* ≤ 140	34	310	125	NP	371	371	343	NFC–4	G5
39	...	34	310	124	NP	NP	371	343	NFC–4	...
40	...	34	310	124	NP	NP	371	343	NFC–4	G5
41	60 < *t* ≤ 140	34	310	125	NP	371	371	343	NFC–4	...
42	60 < *t* ≤ 140	34	310	125	NP	371	371	343	NFC–4	G5
43	≤152	34	345	138	NP	NP	371	343	NFC–4	...
44	≤152	34	345	138	NP	NP	371	343	NFC–4	G5
45	≤60	34	345	140	NP	371	371	343	NFC–4	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	73.8	71.8	69.9	68.4	66.7	65.1	63.5	61.9	60.5	59.2	57.9	*56.4*	*51.9*	*47.6*	...	...	...	...
2	73.8	73.8	73.8	73.8	73.8	73.8	73.8	73.8	73.8	73.8	73.8	*56.4*	*51.9*	*47.6*	...	...	...	...
3	73.8	71.8	69.9	68.4	66.7	65.1	63.5	61.9	60.5	59.2	57.9	*56.4*	*51.9*	*47.6*	...	...	...	...
4	73.8	73.8	73.8	73.8	73.8	73.8	73.8	73.8	73.8	73.8	73.8	*56.4*	*51.9*	*47.6*	...	...	...	...
5	73.8	71.8	69.9	68.4	66.7	65.1	63.5	61.9	60.5	59.2	57.9	*56.4*	*51.9*	*47.6*	...	...	...	...
6	73.8	73.8	73.8	73.8	73.8	73.8	73.8	73.8	73.8	73.8	73.8	*56.4*	*51.9*	*47.6*	...	...	...	...
7	58.6	56.6	54.8	53.6	52.4	51.8	50.5	49.8	48.8	47.8	47.3	46.6	...	...	...	...	...	...
8	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	...	...	...	...	...	...
9	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	67.0	65.9	65.4	64.7	...	...	...	...
10	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	...
11	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	67.0	65.9	65.4	64.7	...	...	...	...
12	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	...
13	91.9	89.0	86.4	84.5	82.6	80.8	79.5	77.7	76.3	75.1	74.1	73.6	72.8	71.5	...	...	...	...
14	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	...	...	...	...
15	91.9	89.0	86.4	84.5	82.6	80.8	79.5	77.7	76.3	75.1	74.1	73.6	72.8	71.5	...	...	...	...
16	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	...	...	...	...
17	78.1	75.2	73.3	71.5	70.3	69.1	67.1	66.4	65.4	64.0	63.1	62.5	...	...	...	...	...	...
18	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	...	...	...	...	...	...
19	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	67.0	65.9	65.4	64.7	...	...	...	...
20	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	...
21	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	67.0	65.9	65.4	64.7	...	...	...	...
22	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	...
23	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	67.0	65.9	65.4	64.7	...	...	...	...
24	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	...
25	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	67.0	65.9	65.4	64.7	...	...	...	...
26	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	...
27	70.3	67.6	65.9	64.6	63.4	62.1	60.9	59.7	58.4	57.5	56.9	56.3	...	...	...	...	...	...
28	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	...	...	...	...	...	...
29	70.3	67.6	65.9	64.6	63.4	62.1	60.9	59.7	58.4	57.5	56.9	56.3	...	...	...	...	...	...
30	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	...	...	...	...	...	...
31	142	142	142	142	142	140	138	136	135	133	131	130	128	126	124	*63.0*	*7.30*	...
32	142	142	142	142	142	140	138	136	135	133	131	130	128	126	124	*63.0*	*7.30*	...
33	58.6	56.6	54.8	53.6	52.4	51.8	50.5	49.8	48.8	47.8	47.3	46.6	...	...	...	...	...	...
34	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	58.6	...	...	...	...	...	...
35	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	67.0	65.9	65.4	64.7	...	...	...	...
36	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	...
37	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	67.0	65.9	65.4	64.7	...	...	...	...
38	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	...
39	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	67.0	65.9	65.4	64.7	...	...	...	...
40	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	...
41	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	67.0	65.9	65.4	64.7	...	...	...	...
42	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	...
43	91.9	89.0	86.4	84.5	82.6	80.8	79.5	77.7	76.3	75.1	74.1	73.6	72.8	71.5	...	...	...	...
44	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	...	...	...	...
45	91.9	89.0	86.4	84.5	82.6	80.8	79.5	77.7	76.3	75.1	74.1	73.6	72.8	71.5	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	1	...	Plate, sheet	SB–171	...	C71520	M10, M20
	2	...	Plate, sheet	SB–171	...	C71520	O20, O25
	3	...	Plate, sheet	SB–171	...	C71520	O20, O25
	4	...	Wld. pipe	SB–467	...	C71520	WO61
	5	...	Wld. pipe	SB–467	...	C71520	WO61
	6	...	Smls. pipe & tube	SB–466	...	C71520	O60
	7	...	Smls. pipe & tube	SB–466	...	C71520	O60
	8	...	Smls. cond. tube	SB–111	...	C71520	O61
	9	...	Smls. cond. tube	SB–111	...	C71520	O61
	10	...	Finned tube	SB–359	...	C71520	O61
	11	...	Finned tube	SB–359	...	C71520	O61
	12	...	Smls. U–bend tube	SB–395	...	C71520	O61
	13	...	Smls. U–bend tube	SB–395	...	C71520	O61
	14	...	Wld. cond. tube	SB–543	...	C71520	WO61
	15	...	Wld. cond. tube	SB–543	...	C71520	WO61
	16	...	Finned wld. cond. tube	SB–956	...	C71520	WO61
	17	...	Finned wld. cond. tube	SB–956	...	C71520	WO61
(**23**)	18	...	Smls. cond. tube	SB–111	...	C71520	HR50
(**23**)	19	...	Smls. U–bend tube	SB–395	...	C71520	HR50
(**23**)	20	...	Smls. cond. tube	SB–111	...	C72200	O61
(**23**)	21	...	Castings	SB–62	...	C83600	M01
(**23**)	22	...	Castings	SB–62	...	C83600	M01
	23	...	Castings	SB–61	...	C92200	M01
	24	...	Castings	SB–61	...	C92200	M01
	25	...	Castings	SB–584	...	C92200	M01
(**23**)	26	...	Castings	SB–584	...	C92200	M01
(**23**)	27	...	Castings	SB–584	...	C93700	M01
	28	...	Castings	SB–584	...	C93700	M01
	29	...	Castings	SB–148	...	C95200	M01
	30	...	Castings	SB–271	...	C95200	M02
	31	...	Castings	SB–505	...	C95200	M07
	32	...	Castings	SB–148	...	C95400	M01
	33	...	Castings	SB–271	...	C95400	M02
(**23**)	34	...	Castings	SB–148	...	C95800	M01
(**23**)	35	...	Castings	SB–148	...	C95820	M01
	36	...	Castings	SB–369	...	C96200	M01
	37	...	Castings	SB–584	...	C97600	M01
	38	...	Castings	SB–584	...	C97600	M01
	39	99Ni	Smls. pipe & tube	SB–161	...	N02200	Annealed
	40	99Ni	Smls. & wld. fittings	SB–366	...	N02200	Annealed
	41	99Ni	Bar, rod	SB–160	...	N02200	Annealed
	42	99Ni	Smls. pipe & tube	SB–161	...	N02200	Annealed
	43	99Ni	Plate, sheet, strip	SB–162	...	N02200	Annealed
	44	99Ni	Smls. tube	SB–163	...	N02200	Annealed
	45	99Ni	Plate, sheet, strip	SB–162	...	N02200	As rolled

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	≤60	34	345	140	NP	371	371	343	NFC–4	G5
2	≤60	34	345	140	NP	371	371	343	NFC–4	...
3	≤60	34	345	140	NP	371	371	343	NFC–4	G5
4	≤114	34	345	140	NP	316 (Cl. 3 only)	NP	NP	NFC–4	G14
5	≤114	34	345	140	NP	316 (Cl. 3 only)	NP	NP	NFC–4	G5, G14
6	...	34	360	125	NP	371	371	343	NFC–4	...
7	...	34	360	125	NP	371	371	343	NFC–4	G5
8	...	34	360	125	371	371	371	343	NFC–4	G1, W10
9	...	34	360	125	371	371	371	343	NFC–4	G1, G5, W10
10	...	34	360	125	NP	371 (Cl. 3 only)	371	NP	NFC–4	G1, W10
11	...	34	360	125	NP	371 (Cl. 3 only)	371	NP	NFC–4	G1, G5, W10
12	...	34	360	125	NP	371 (Cl. 3 only)	371	343	NFC–4	...
13	...	34	360	125	NP	371 (Cl. 3 only)	371	343	NFC–4	G5
14	...	34	360	125	NP	316 (Cl. 3 only)	316	316	NFC–4	G14
15	...	34	360	125	NP	316 (Cl. 3 only)	316	316	NFC–4	G5, G14
16	...	34	360	125	NP	NP	316	NP	NFC–4	G14
17	...	34	360	125	NP	NP	316	NP	NFC–4	G5, G14
18	≤79	34	495	345	NP	371	427	343	NFC–4	T9, W9
19	...	34	495	345	NP	371	427	343	NFC–8	T9, W9
20	...	34	310	110	NP	NP	66	66	NFC–3	G43
21	...	...	205	95	232	232 (Cl. 3 only)	232	232	NFC–1	G1, G3, G15, T23, W14
22	...	...	205	95	232	232 (Cl. 3 only)	232	232	NFC–1	G1, G3, G5, G15, T23, W14
23	...	...	235	110	288	260 (Cl. 3 only)	288	288	NFN–1	G1, G3, G15, T5, W14
24	...	...	235	110	288	260 (Cl. 3 only)	288	288	NFN–1	G1, G3, G5, G15, T5, W14
25	...	...	234	110	NP	260 (Cl. 3 only)	288	288	NFN–1	G15, T5
26	...	...	234	110	NP	260 (Cl. 3 only)	288	288	NFN–1	G5, G15, T5
27	...	...	207	83	NP	204 (SPT)	204	204	NFC–1	G15, W8
28	...	...	207	83	NP	204 (SPT)	204	204	NFC–1	G5, G15, W8
29	...	35	450	170	288	260 (Cl. 3 only)	316	316	NFC–4	G15, T6
30	...	35	450	170	NP	260 (Cl. 3 only)	316	316	NFC–4	G15, T6
31	...	35	470	180	NP	260 (Cl. 3 only)	NP	NP	NFC–4	G15
32	...	35	515	205	288	204 (Cl. 3 only)	316	316	NFC–4	G15, T21
33	...	35	515	205	NP	204 (Cl. 3 only)	NP	NP	NFC–4	G15, T21
34	...	35	585	240	NP	204 (Cl. 3 only)	NP	204	NFC–4	G15
35	...	35	650	270	NP	NP	204	204	NFC–4	G15
36	...	34	310	170	NP	93 (Cl. 3 only)	NP	NP	NFC–4	G15
37	...	...	276	117	NP	NP	149	149	NFC–1	G15, W8
38	...	...	276	117	NP	NP	149	149	NFC–1	G5, G15, W8
39	>125 O.D.	41	380	83	NP	316 (Cl. 3 only)	316	316	NFN–2	...
40	...	41	380	83	NP	NP	316	316	NFN–2	W12
41	...	41	380	100	NP	316 (Cl. 3 only)	316	316	NFN–2	...
42	≤125 O.D.	41	380	100	NP	316 (Cl. 3 only)	316	316	NFN–2	...
43	...	41	380	100	NP	316 (Cl. 3 only)	316	316	NFN–2	...
44	...	41	380	100	NP	316 (Cl. 3 only)	316	316	NFN–2	...
45	...	41	380	140	NP	316 (Cl. 3 only)	316	316	NFN–2	G20

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	...	...	...	...
2	91.9	89.0	86.4	84.5	82.6	80.8	79.5	77.7	76.3	75.1	74.1	73.6	72.8	71.5	...	...	...	...
3	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	...	...	...	...
4	77.9	75.2	73.3	71.5	70.3	69.1	67.1	66.4	65.4	64.0	63.1	62.5	...	...	...	...	...	...
5	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	...	...	...	...	...	...
6	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	67.0	65.9	65.4	64.7	...	...	...	...
7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	...
8	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	67.0	65.9	65.4	64.7	...	...	...	...
9	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	...
10	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	67.0	65.9	65.4	64.7	...	...	...	...
11	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	...
12	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	67.0	65.9	65.4	64.7	...	...	...	...
13	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	...
14	70.3	67.6	65.9	64.6	63.4	62.1	60.9	59.7	58.4	57.5	56.9	56.3	...	...	...	...	...	...
15	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	...	...	...	...	...	...
16	70.3	67.6	65.9	64.6	63.4	62.1	60.9	59.7	58.4	57.5	56.9	56.3	...	...	...	...	...	...
17	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	...	...	...	...	...	...
18	142	142	142	142	142	140	138	136	135	133	131	130	128	126	124	*63.0*	*7.30*	...
19	142	142	142	142	142	140	138	136	135	133	131	130	128	126	124	*63.0*	*7.30*	...
20	73.8	71.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	59.1	59.1	57.3	55.5	53.9	52.2	50.6	48.9	*43.4*	...	...	...	...	...	...	...	...	...
22	59.1	59.1	59.1	58.7	57.6	56.7	55.9	55.2	*43.4*	...	...	...	...	...	...	...	...	...
23	67.0	67.0	65.2	63.2	62.0	61.2	60.8	60.4	59.9	*42.2*	*27.1*	...	...	...	...	...	...	...
24	67.0	67.0	67.0	67.0	67.0	67.0	65.6	63.3	59.9	*42.2*	*27.1*	...	...	...	...	...	...	...
25	67.0	67.0	65.2	63.2	62.0	61.2	60.8	60.4	59.9	*42.2*	*27.1*	...	...	...	...	...	...	...
26	67.0	67.0	67.0	67.0	67.0	67.0	65.6	63.3	59.9	*42.2*	*27.1*	...	...	...	...	...	...	...
27	53.1	51.0	48.8	47.8	47.1	46.6	46.1	45.7	...	...	...	...	...	...	...	...	...	...
28	55.2	55.2	55.2	55.2	54.4	52.8	51.4	50.0	...	...	...	...	...	...	...	...	...	...
29	115	108	104	102	99.9	98.7	98.0	97.9	97.9	91.4	*68.1*	*40.8*	...	...	...	...	...	...
30	115	108	104	102	99.9	98.7	98.0	97.9	97.9	91.4	*68.1*	*40.8*	...	...	...	...	...	...
31	119	112	108	106	104	103	102	101	101	101	...	...	...	...	...	...	...	...
32	138	135	134	133	133	133	133	*116*	*101*	*85.4*	*67.8*	*52.9*	...	...	...	...	...	...
33	138	135	134	133	133	133	133	*116*	...	...	...	...	...	...	...	...	...	...
34	161	159	158	157	156	155	152	149	...	...	...	...	...	...	...	...	...	...
35	179	177	176	175	174	171	168	165	...	...	...	...	...	...	...	...	...	...
36	88.6	88.6	87.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	78.1	70.3	65.0	62.2	60.2	...	...	...	...	...	...	...	...	...	...	...	...	...
38	78.1	78.1	77.5	76.5	75.8	...	...	...	...	...	...	...	...	...	...	...	...	...
39	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	...	...	...	...	...	...
40	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	...	...	...	...	...	...
41	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...	...
42	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...	...
43	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...	...
44	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...	...
45	91.7	91.7	91.7	91.7	91.7	91.7	91.7	90.7	88.1	84.9	81.4	78.0	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	1	99Ni	Bar, rod	SB–160	...	N02200	Hot rolled
	2	99Ni	Smls. pipe & tube	SB–161	...	N02200	Stress rel.
	3	99Ni	Smls. tube	SB–163	...	N02200	Stress rel.
	4	99Ni–Low C	Smls. pipe & tube	SB–161	...	N02201	Annealed
(**23**)	5	99Ni–Low C	Smls. & wld. fittings	SB–366	...	N02201	Annealed
	6	99Ni–Low C	Bar, rod	SB–160	...	N02201	Hot rolled/ann.
	7	99Ni–Low C	Smls. pipe & tube	SB–161	...	N02201	Annealed
	8	99Ni–Low C	Smls. tube	SB–163	...	N02201	Annealed
	9	99Ni–Low C	Plate, sheet, strip	SB–162	...	N02201	Hot rolled/ann.
	10	99Ni–Low C	Smls. pipe & tube	SB–161	...	N02201	Stress rel.
	11	99Ni–Low C	Smls. pipe & tube	SB–163	...	N02201	Stress rel.
(**23**)	12	67Ni–30Cu	Bar, rod	SB–164	...	N04400	HW or CW ann.
	13	67Ni–30Cu	Smls. pipe & tube	SB–165	...	N04400	Annealed
	14	67Ni–30Cu	Forgings	SB–564	...	N04400	Annealed
	15	67Ni–30Cu	Plate	SB–127	...	N04400	Annealed
	16	67Ni–30Cu	Smls. tube	SB–163	...	N04400	Annealed
	17	67Ni–30Cu	Smls. pipe & tube	SB–165	...	N04400	Annealed
(**23**)	18	67Ni–30Cu	Smls. & wld. fittings	SB–366	...	N04400	Annealed
(**23**)	19	67Ni–30Cu	Hexagons, rings, discs	SB–164	...	N04400	Hot worked
	20	67Ni–30Cu	Plate	SB–127	...	N04400	As rolled
(**23**)	21	67Ni–30Cu	Rounds, squares, rectangles	SB–164	...	N04400	Hot worked
(**23**)	22	67Ni–30Cu	Rounds, squares, rectangles	SB–164	...	N04400	Hot worked
(**23**)	23	67Ni–30Cu	Hexagons	SB–164	...	N04400	Hot worked
	24	67Ni–30Cu	Smls. tube	SB–163	...	N04400	Stress rel.
	25	67Ni–30Cu	Smls. pipe & tube	SB–165	...	N04400	Stress rel.
	26	67Ni–30Cu–S	Bar	SB–164	...	N04405	Annealed
	27	67Ni–30Cu–S	Bar	SB–164	...	N04405	Hot worked
	28	47Ni–22Cr–9Mo–18Fe	Plate, sheet, strip	SB–435	...	N06002	Annealed
	29	47Ni–22Cr–9Mo–18Fe	Plate, sheet, strip	SB–435	...	N06002	Annealed
	30	47Ni–22Cr–9Mo–18Fe	Rod	SB–572	...	N06002	Annealed
	31	47Ni–22Cr–9Mo–18Fe	Rod	SB–572	...	N06002	Annealed
(**23**)	32	47Ni–22Cr–9Mo–18Fe	Smls. & wld. fittings	SB–366	...	N06002	Annealed
	33	47Ni–22Cr–9Mo–18Fe	Wld. pipe	SB–619	...	N06002	Solution ann.
	34	47Ni–22Cr–9Mo–18Fe	Wld. pipe	SB–619	...	N06002	Solution ann.
	35	47Ni–22Cr–9Mo–18Fe	Smls. pipe & tube	SB–622	...	N06002	Solution ann.
	36	47Ni–22Cr–9Mo–18Fe	Smls. pipe & tube	SB–622	...	N06002	Solution ann.
	37	47Ni–22Cr–9Mo–18Fe	Wld. tube	SB–626	...	N06002	Solution ann.
	38	47Ni–22Cr–9Mo–18Fe	Wld. tube	SB–626	...	N06002	Solution ann.
	39	47Ni–22Cr–19Fe–6Mo	Rod	SB–581	...	N06007	Solution ann.
	40	47Ni–22Cr–19Fe–6Mo	Rod	SB–581	...	N06007	Solution ann.
	41	47Ni–22Cr–19Fe–6Mo	Plate, sheet, strip	SB–582	...	N06007	Solution ann.
	42	47Ni–22Cr–19Fe–6Mo	Plate, sheet, strip	SB–582	...	N06007	Solution ann.
	43	47Ni–22Cr–19Fe–6Mo	Smls. & wld. fittings	SB–366	...	N06007	Annealed
	44	47Ni–22Cr–19Fe–6Mo	Rod	SB–581	...	N06007	Solution ann.
	45	47Ni–22Cr–19Fe–6Mo	Rod	SB–581	...	N06007	Solution ann.

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	41	415	100	NP	316 (Cl. 3 only)	316	316	NFN–2	...
2	...	41	450	275	NP	316 (Cl. 3 only)	316	316	NFN–25	G33
3	...	41	450	275	NP	316 (Cl. 3 only)	316	316	NFN–25	G33
4	>125 O.D.	41	345	69	NP	427 (Cl. 3 only)	649	343	NFN–1	T10
5	...	41	345	69	NP	427 (Cl. 3 only)	621	343	NFN–1	T10, W5, W12
6	...	41	345	69	NP	427 (Cl. 3 only)	649	343	NFN–1	T10
7	≤125 O.D.	41	345	83	NP	427 (Cl. 3 only)	649	343	NFN–1	T9
8	...	41	345	83	NP	427 (Cl. 3 only)	649	343	NFN–1	T9
9	...	41	345	83	NP	427 (Cl. 3 only)	649	343	NFN–1	T9
10	...	41	415	205	NP	316 (Cl. 3 only)	316	316	NFN–1	...
11	...	41	415	205	NP	427 (Cl. 3 only)	482	343	NFN–1	...
12	All	42	480	170	NP	427	482	343	NFN–3	T19
13	>125 O.D.	42	485	170	NP	427	482	343	NFN–3	T19
14	...	42	485	170	NP	427	482	343	NFN–3	T19
15	...	42	485	195	NP	427	482	343	NFN–3	T19
16	≤75	42	485	195	NP	427	482	343	NFN–3	T19
17	≤125 O.D.	42	485	195	NP	427	482	343	NFN–3	T19
18	...	42	485	195	NP	427	482	343	NFN–3	T19, W5, W12
19	54 < t ≤ 102	42	517	207	NP	427	482	343	NFN–3	T9
20	...	42	515	275	NP	427	482	343	NFN–3	G12, G20, T9
21	305 < t ≤ 356	42	517	276	NP	NP	482	343	NFN–3	T9
22	≤305	42	552	276	NP	427 (Cl. 3 only)	482	343	NFN–3	T9
23	≤54	42	552	276	NP	427 (Cl. 3 only)	482	343	NFN–3	T9
24	...	42	585	380	NP	427	427	343	NFN–3	G11, T8
25	...	42	585	380	NP	427	260	260	NFN–3	G5, G21, T8
26	...	42	485	170	NP	427	482	343	NFN–3	T10
27	...	42	515	240	NP	427	482	343	NFN–3	T10
28	...	43	655	240	NP	427	899	343	NFN–15	G4, G5, T15
29	...	43	655	240	NP	NP	899	343	NFN–15	G4, T16
30	...	43	655	240	NP	427	899	343	NFN–15	G4, G5, G13, T15
31	...	43	655	240	NP	NP	899	343	NFN–15	G4, G13, T16
32	...	43	690	275	NP	427	899	343	NFN–15	G4, G5, T15, W5, W12
33	...	43	690	275	NP	427	899	343	NFN–15	G4, G5, G14, T14, W5
34	...	43	690	275	NP	NP	899	343	NFN–15	G4, G14, T16
35	...	43	690	275	NP	427	899	343	NFN–15	G4, G5, T14
36	...	43	690	275	NP	NP	899	343	NFN–15	G4, T16
37	...	43	690	275	NP	427	899	343	NFN–15	G4, G5, G14, T14, W5
38	...	43	690	275	NP	NP	899	343	NFN–15	G4, G14, T16
39	>19	45	585	205	NP	NP	538	343	NFN–11	...
40	>19	45	585	205	NP	NP	538	343	NFN–11	G5
41	>19	45	585	205	NP	NP	538	343	NFN–11	...
42	>19	45	585	205	NP	NP	538	343	NFN–11	G5
43	...	45	620	240	NP	NP	538	343	NFN–11	G5, W12
44	≤19	45	620	240	NP	NP	538	343	NFN–11	...
45	≤19	45	620	240	NP	NP	538	343	NFN–11	G5

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...	...
2	128	128	128	128	128	128	128	128	127	125	123	121	...	...	...	...	...	...
3	128	128	128	128	128	128	128	128	127	125	123	121	...	...	...	...	...	...
4	46.2	45.0	44.0	43.7	43.4	43.0	42.8	42.7	42.7	42.7	42.7	42.7	42.7	42.7	42.0	41.4	40.3	*33.6*
5	46.2	45.0	44.0	43.7	43.4	43.0	42.8	42.7	42.7	42.7	42.7	42.7	42.7	42.7	42.0	41.4	40.3	*33.6*
6	46.2	45.0	44.0	43.7	43.4	43.0	42.8	42.7	42.7	42.7	42.7	42.7	42.7	42.7	42.0	41.4	40.3	*33.6*
7	55.2	54.1	52.8	52.1	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.6	51.0	51.0	*50.0*	*41.8*	*33.0*
8	55.2	54.1	52.8	52.1	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.6	51.0	51.0	*50.0*	*41.8*	*33.0*
9	55.2	54.1	52.8	52.1	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.6	51.0	51.0	*50.0*	*41.8*	*33.0*
10	118	118	118	118	117	117	117	117	116	115	114	107	...	...	...	...	...	...
11	118	118	118	118	117	117	117	117	116	115	114	107	95.4	91.8	88.1	83.7	81.1	77.7
12	115	107	99.4	95.9	93.7	92.1	91.1	90.6	90.4	90.3	90.3	90.3	90.2	89.5	88.9	87.9	*78.5*	*60.8*
13	115	107	99.4	95.9	93.7	92.1	91.1	90.6	90.4	90.3	90.3	90.3	90.2	89.5	88.9	87.9	*78.5*	*60.8*
14	115	107	99.4	95.9	93.7	92.1	91.1	90.6	90.4	90.3	90.3	90.3	90.2	89.5	88.9	87.9	*78.5*	*60.8*
15	129	121	112	108	105	103	101	101	101	101	101	101	101	101	100	99.3	*79.9*	*60.2*
16	129	121	112	108	105	103	101	101	101	101	101	101	101	101	100	99.3	*79.9*	*60.2*
17	129	121	112	108	105	103	101	101	101	101	101	101	101	101	100	99.3	*79.9*	*60.2*
18	129	121	112	108	105	103	101	101	101	101	101	101	101	101	100	99.3	*79.9*	*60.2*
19	138	136	133	131	128	126	124	122	122	121	120	119	118	117	116	*102*	*65.2*	*34.9*
20	148	148	148	148	148	148	148	148	148	148	148	148	147	141	127	*102*	*64.9*	*35.0*
21	148	148	148	148	148	148	148	148	148	148	148	148	147	141	127	*102*	*64.9*	*35.0*
22	158	158	158	158	158	158	158	158	158	158	158	158	157	149	127	*102*	*65.0*	*35.0*
23	158	158	158	158	158	158	158	158	158	158	158	158	157	149	127	*102*	*65.0*	*35.0*
24	168	168	168	168	168	168	168	168	168	167	166	164	162	154	*123*	*89.7*	*56.9*	...
25	168	168	168	168	168	168	168	168	168	167	166	164	162	154	*123*	*89.7*	*56.9*	...
26	115	107	99.4	95.9	93.7	92.1	91.1	90.6	90.4	90.3	90.3	90.3	90.2	89.5	88.9	87.9	78.5	*60.8*
27	148	148	148	148	148	146	144	143	142	141	140	139	138	136	127	102	64.9	*35.1*
28	161	161	161	161	161	161	161	159	155	152	148	145	142	140	139	137	136	135
29	161	153	143	137	132	127	123	119	115	112	110	107	105	104	103	101	101	100
30	161	161	161	161	161	161	161	159	155	152	148	145	142	140	139	137	136	135
31	161	153	143	137	132	127	123	119	115	112	110	107	105	104	103	101	101	100
32	184	184	184	184	184	184	184	182	178	173	169	166	163	160	158	157	155	155
33	157	157	157	157	157	157	157	155	151	147	143	140	138	136	134	133	132	131
34	157	148	139	134	129	124	119	116	112	109	106	104	102	100	99.2	98.6	98.0	97.4
35	184	184	184	184	184	184	184	182	178	173	169	166	163	160	158	157	155	155
36	184	175	164	157	151	146	141	136	132	128	125	122	120	118	117	116	115	115
37	157	157	157	157	157	157	157	155	151	147	143	140	138	136	134	133	132	131
38	157	148	139	134	129	124	119	116	112	109	106	104	102	100	99.2	98.6	98.0	97.4
39	138	131	123	119	115	112	109	106	104	102	100	98.8	97.7	97.1	96.5	95.9	95.3	94.7
40	138	138	138	138	138	138	138	138	138	137	136	134	132	131	130	129	128	128
41	138	131	123	119	115	112	109	106	104	102	100	98.8	97.7	97.1	96.5	95.9	95.3	94.7
42	138	138	138	138	138	138	138	138	138	137	136	134	132	131	130	129	128	128
43	161	161	161	161	161	161	161	161	161	160	158	156	154	153	152	150	150	149
44	161	152	143	138	134	130	127	124	121	119	117	115	114	113	112	112	111	110
45	161	161	161	161	161	161	161	161	161	160	158	156	154	153	152	150	150	149

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	*27.0*	*23.0*	*18.7*	*15.6*	*13.0*	*9.96*	*8.20*	...	...	...	...	...	...	...	...	...	...	
5	*27.0*	*23.0*	*18.7*	*15.6*	*13.0*	*9.96*	...	...	...	...	...	...	...	...	...	...	...	(**23**)
6	*27.0*	*23.0*	*18.7*	*15.6*	*13.0*	*9.96*	*8.20*	...	...	...	...	...	...	...	...	...	...	
7	*27.3*	*22.9*	*18.7*	*15.6*	*13.0*	*9.96*	*8.20*	...	...	...	...	...	...	...	...	...	...	
8	*27.3*	*22.9*	*18.7*	*15.6*	*13.0*	*9.96*	*8.20*	...	...	...	...	...	...	...	...	...	...	
9	*27.3*	*22.9*	*18.7*	*15.6*	*13.0*	*9.96*	*8.20*	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	73.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	*41.8*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
13	*41.8*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	*41.8*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	*42.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	*42.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	*42.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	*42.1*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
19	*8.09*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
20	*8.02*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	*8.02*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
22	*8.04*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
23	*8.04*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	*41.8*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	*8.01*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	135	134	133	131	*115*	*95.9*	*77.3*	*64.8*	*54.9*	*44.8*	*36.1*	*29.2*	*23.7*	*19.0*	*14.8*	*11.2*	*8.14*	
29	99.5	98.8	98.6	98.4	97.8	*95.9*	*77.3*	*64.8*	*54.9*	*44.8*	*36.1*	*29.2*	*23.7*	*19.0*	*14.8*	*11.2*	*8.14*	
30	135	134	133	131	*115*	*95.9*	*77.3*	*64.8*	*54.9*	*44.8*	*36.1*	*29.2*	*23.7*	*19.0*	*14.8*	*11.2*	*8.14*	
31	99.5	98.8	98.6	98.4	97.8	*95.9*	*77.3*	*64.8*	*54.9*	*44.8*	*36.1*	*29.2*	*23.7*	*19.0*	*14.8*	*11.2*	*8.14*	
32	153	153	151	143	*114*	*94.8*	*77.2*	*64.8*	*54.8*	*45.3*	*36.3*	*29.2*	*23.7*	*19.0*	*14.8*	*11.2*	*8.14*	(**23**)
33	131	130	129	*122*	*96.8*	*80.3*	*65.6*	*55.1*	*46.3*	*38.1*	*30.9*	*24.7*	*20.1*	*16.6*	*12.7*	*9.19*	*6.79*	
34	96.8	96.1	95.8	95.6	93.6	*80.3*	*65.6*	*55.1*	*46.3*	*38.1*	*30.9*	*24.7*	*20.1*	*16.6*	*12.7*	*9.19*	*6.79*	
35	153	153	151	*143*	*114*	*94.8*	*77.2*	*64.8*	*54.8*	*45.3*	*36.3*	*29.2*	*23.7*	*19.0*	*14.8*	*11.2*	*8.14*	
36	114	113	113	112	110	*94.8*	*77.2*	*64.8*	*54.8*	*45.3*	*36.3*	*29.2*	*23.7*	*19.0*	*14.8*	*11.2*	*8.14*	
37	131	130	129	*122*	*96.8*	*80.3*	*65.6*	*55.1*	*46.3*	*38.1*	*30.9*	*24.7*	*20.1*	*16.6*	*12.7*	*9.19*	*6.79*	
38	96.8	96.1	95.8	95.6	93.6	*80.3*	*65.6*	*55.1*	*46.3*	*38.1*	*30.9*	*24.7*	*20.1*	*16.6*	*12.7*	*9.19*	*6.79*	
39	94.0	93.8	93.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	127	126	126	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	94.0	93.8	93.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	127	126	126	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	149	148	147	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	110	109	109	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	148	148	147	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	1	47Ni–22Cr–19Fe–6Mo	Plate, sheet, strip	SB–582	...	N06007	Solution ann.
	2	47Ni–22Cr–19Fe–6Mo	Plate, sheet, strip	SB–582	...	N06007	Solution ann.
	3	47Ni–22Cr–19Fe–6Mo	Wld. pipe	SB–619	...	N06007	Solution ann.
	4	47Ni–22Cr–19Fe–6Mo	Wld. pipe	SB–619	...	N06007	Solution ann.
	5	47Ni–22Cr–19Fe–6Mo	Smls. pipe & tube	SB–622	...	N06007	Solution ann.
	6	47Ni–22Cr–19Fe–6Mo	Smls. pipe & tube	SB–622	...	N06007	Solution ann.
	7	47Ni–22Cr–19Fe–6Mo	Wld. tube	SB–626	...	N06007	Solution ann.
	8	47Ni–22Cr–19Fe–6Mo	Wld. tube	SB–626	...	N06007	Solution ann.
(**23**)	9	55Ni–21Cr–13.5Mo	Smls. & wld. fittings	SB–366	...	N06022	Solution ann.
	10	55Ni–21Cr–13.5Mo	Forgings	SB–462	...	N06022	Solution ann.
	11	55Ni–21Cr–13.5Mo	Forgings	SB–462	...	N06022	Solution ann.
	12	55Ni–21Cr–13.5Mo	Forgings	SB–564	...	N06022	Solution ann.
	13	55Ni–21Cr–13.5Mo	Forgings	SB–564	...	N06022	Solution ann.
	14	55Ni–21Cr–13.5Mo	Rod	SB–574	...	N06022	Solution ann.
	15	55Ni–21Cr–13.5Mo	Rod	SB–574	...	N06022	Solution ann.
	16	55Ni–21Cr–13.5Mo	Plate, sheet, strip	SB–575	...	N06022	Solution ann.
	17	55Ni–21Cr–13.5Mo	Plate, sheet, strip	SB–575	...	N06022	Solution ann.
	18	55Ni–21Cr–13.5Mo	Wld. pipe	SB–619	...	N06022	Solution ann.
	19	55Ni–21Cr–13.5Mo	Wld. pipe	SB–619	...	N06022	Solution ann.
	20	55Ni–21Cr–13.5Mo	Smls. pipe & tube	SB–622	...	N06022	Solution ann.
	21	55Ni–21Cr–13.5Mo	Smls. pipe & tube	SB–622	...	N06022	Solution ann.
	22	55Ni–21Cr–13.5Mo	Wld. tube	SB–626	...	N06022	Solution ann.
	23	55Ni–21Cr–13.5Mo	Wld. tube	SB–626	...	N06022	Solution ann.
(**23**)	24	60Ni–25Cr–9.5Fe–2.1Al	Smls. tube	SB–163	...	N06025	Annealed
(**23**)	25	60Ni–25Cr–9.5Fe–2.1Al	Smls. tube	SB–163	...	N06025	Annealed
(**23**)	26	60Ni–25Cr–9.5Fe–2.1Al	Plate, sheet, strip	SB–168	...	N06025	Annealed
(**23**)	27	60Ni–25Cr–9.5Fe–2.1Al	Plate, sheet, strip	SB–168	...	N06025	Annealed
(**23**)	28	60Ni–25Cr–9.5Fe–2.1Al	Wrought fittings	SB–366	...	N06025	Annealed
(**23**)	29	60Ni–25Cr–9.5Fe–2.1Al	Wrought fittings	SB–366	...	N06025	Annealed
(**23**)	30	60Ni–25Cr–9.5Fe–2.1Al	Forgings	SB–462	...	N06025	Annealed
(**23**)	31	60Ni–25Cr–9.5Fe–2.1Al	Forgings	SB–462	...	N06025	Annealed
(**23**)	32	60Ni–25Cr–9.5Fe–2.1Al	Wld. tube	SB–516	...	N06025	Annealed
(**23**)	33	60Ni–25Cr–9.5Fe–2.1Al	Wld. tube	SB–516	...	N06025	Annealed
(**23**)	34	60Ni–25Cr–9.5Fe–2.1Al	Wld. pipe	SB–517	...	N06025	Annealed
(**23**)	35	60Ni–25Cr–9.5Fe–2.1Al	Wld. pipe	SB–517	...	N06025	Annealed
(**23**)	36	60Ni–25Cr–9.5Fe–2.1Al	Forgings	SB–564	...	N06025	Annealed
(**23**)	37	60Ni–25Cr–9.5Fe–2.1Al	Forgings	SB–564	...	N06025	Annealed
(**23**)	38	60Ni–25Cr–9.5Fe–2.1Al	Bar	SB–166	...	N06025	HW or CW ann.
(**23**)	39	60Ni–25Cr–9.5Fe–2.1Al	Bar	SB–166	...	N06025	HW or CW ann.
(**23**)	40	60Ni–25Cr–9.5Fe–2.1Al	Smls. pipe & tube	SB–167	...	N06025	HW or CW ann.
(**23**)	41	60Ni–25Cr–9.5Fe–2.1Al	Smls. pipe & tube	SB–167	...	N06025	HW or CW ann.
(**23**)	42	40Ni–29Cr–15Fe–5Mo	Smls. & wld. fittings	SB–366	...	N06030	Solution ann.
	43	40Ni–29Cr–15Fe–5Mo	Forgings	SB–462	...	N06030	Solution ann.
	44	40Ni–29Cr–15Fe–5Mo	Forgings	SB–462	...	N06030	Solution ann.
	45	40Ni–29Cr–15Fe–5Mo	Rod	SB–581	...	N06030	Solution ann.

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	≤19	45	620	240	NP	NP	538	343	NFN–11	...
2	≤19	45	620	240	NP	NP	538	343	NFN–11	G5
3	...	45	620	240	NP	NP	538	343	NFN–11	G14
4	...	45	620	240	NP	NP	538	343	NFN–11	G5, G14
5	...	45	620	240	NP	NP	538	343	NFN–11	...
6	...	45	620	240	NP	NP	538	343	NFN–11	G5
7	...	45	620	240	NP	NP	538	343	NFN–11	G14
8	...	45	620	240	NP	NP	538	343	NFN–11	G5, G14
9	...	43	690	310	677	427	677	343	NFN–10	G5, G27, G28, T15, W5, W12
10	...	43	690	310	677	NP	677	NP	NFN–10	G5, G27, G28, T15
11	...	43	690	310	677	NP	677	NP	NFN–10	G27, G28, T15
12	...	43	690	310	677	427	677	343	NFN–10	G5, G27, G28, T15
13	...	43	690	310	677	NP	677	343	NFN–10	G27, G28, T15
14	...	43	690	310	677	427	677	343	NFN–10	G5, G27, G28, T15
15	...	43	690	310	677	NP	677	343	NFN–10	G27, G28, T15
16	...	43	690	310	677	427	677	343	NFN–10	G5, G27, G28, T15
17	...	43	690	310	677	NP	677	343	NFN–10	G27, G28, T15
18	...	43	690	310	677	427	677	343	NFN–10	G5, G14, G27, G28, T15, W6
19	...	43	690	310	677	NP	677	343	NFN–10	G14, G27, G28, T15
20	...	43	690	310	677	427	677	343	NFN–10	G5, G27, G28, T15
21	...	43	690	310	677	NP	677	343	NFN–10	G27, G28, T15
22	...	43	690	310	677	427	677	343	NFN–10	G5, G14, G27, G28, T15, W6
23	...	43	690	310	677	NP	677	343	NFN–10	G14, G27, G28, T15
24	...	43	676	269	899	NP	982	NP	NFN–13	G4, G5, G34, G35, G36, G37, T12
25	...	43	676	269	899	NP	982	NP	NFN–13	G4, G34, G35, G36, G37, T13
26	...	43	676	269	899	NP	982	NP	NFN–13	G4, G5, G34, G35, G36, G37, T12
27	...	43	676	269	899	NP	982	NP	NFN–13	G4, G34, G35, G36, G37, T13
28	...	43	676	269	899	NP	982	NP	NFN–13	G4, G5, G34, G35, G36, G37, T12
29	...	43	676	269	899	NP	982	NP	NFN–13	G4, G34, G35, G36, G37, T13
30	$t \le 102$	43	676	269	899	NP	982	NP	NFN–13	G4, G5, G34, G35, G36, G37, T12
31	$t \le 102$	43	676	269	899	NP	982	NP	NFN–13	G4, G34, G35, G36, G37, T13
32	...	43	676	269	899	NP	982	NP	NFN–13	G4, G5, G14, G34, G35, G36, G38, T12
33	...	43	676	269	899	NP	982	NP	NFN–13	G4, G14, G34, G35, G36, G38, T13
34	...	43	676	269	899	NP	982	NP	NFN–13	G4, G5, G14, G34, G35, G36, G38, T12
35	...	43	676	269	899	NP	982	NP	NFN–13	G4, G14, G34, G35, G36, G38, T13
36	$t \le 102$	43	676	269	899	NP	982	NP	NFN–13	G4, G5, G34, G35, G36, G37, T12
37	$t \le 102$	43	676	269	899	NP	982	NP	NFN–13	G4, G34, G35, G36, G37, T13
38	$t \le 102$	43	676	269	899	NP	982	NP	NFN–13	G4, G5, G34, G35, G36, G37, T12
39	$t \le 102$	43	676	269	899	NP	982	NP	NFN–13	G4, G34, G35, G36, G37, T13
40	...	43	676	269	899	NP	982	NP	NFN–13	G4, G5, G34, G35, G36, G37, T12
41	...	43	676	269	899	NP	982	NP	NFN–13	G4, G34, G35, G36, G37, T13
42	...	45	585	240	NP	427	427	343	NFN–19	G5, W5, W12
43	...	45	585	240	NP	NP	427	NP	NFN–19	G5
44	...	45	585	240	NP	NP	427	NP	NFN–19	...
45	...	45	585	240	NP	427	427	343	NFN–19	G5

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	161	152	143	138	134	130	127	124	121	119	117	115	114	113	112	112	111	110
2	161	161	161	161	161	161	161	161	161	160	158	156	154	153	152	150	150	149
3	137	129	121	117	114	110	107	105	103	101	99.5	98.1	97.0	96.4	95.1	94.5	94.5	94.0
4	137	137	137	137	137	137	137	137	137	136	134	133	131	129	129	128	127	126
5	161	152	143	138	134	130	127	124	121	119	117	115	114	113	112	112	111	110
6	161	161	161	161	161	161	161	161	161	160	158	156	154	153	152	150	150	149
7	137	129	121	117	114	110	107	105	103	101	99.5	98.1	97.0	96.4	95.1	94.5	94.5	94.0
8	137	137	137	137	137	137	137	137	137	136	134	133	131	129	129	128	127	126
9	197	197	197	196	194	191	188	185	183	182	180	179	178	176	175	174	173	172
10	197	197	197	196	194	191	188	185	183	182	180	179	178	176	175	174	173	172
11	197	191	182	176	169	164	159	154	150	146	142	140	137	135	133	131	130	129
12	197	197	197	196	194	191	188	185	183	182	180	179	178	176	175	174	173	172
13	197	191	182	176	169	164	159	154	150	146	142	140	137	135	133	131	130	129
14	197	197	197	196	194	191	188	185	183	182	180	179	178	176	175	174	173	172
15	197	191	182	176	169	164	159	154	150	146	142	140	137	135	133	131	130	129
16	197	197	197	196	194	191	188	185	183	182	180	179	178	176	175	174	173	172
17	197	191	182	176	169	164	159	154	150	146	142	140	137	135	133	131	130	129
18	168	168	167	166	165	162	160	158	156	155	153	152	151	150	149	148	147	146
19	168	162	155	149	144	139	134	131	127	124	122	119	117	115	113	112	111	109
20	197	197	197	196	194	191	188	185	183	182	180	179	178	176	175	174	173	172
21	197	191	182	176	169	164	159	154	150	146	142	140	137	135	133	131	130	129
22	168	168	167	166	165	162	160	158	156	155	153	152	151	150	149	148	147	146
23	168	162	155	149	144	139	134	131	127	124	122	119	117	115	113	112	111	109
24	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179
25	179	179	177	175	171	168	164	160	156	153	150	147	145	143	141	139	138	137
26	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179
27	179	179	177	175	171	168	164	160	156	153	150	147	145	143	141	139	138	137
28	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179
29	179	179	177	175	171	168	164	160	156	153	150	147	145	143	141	139	138	137
30	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179
31	179	179	177	175	171	168	164	160	156	153	150	147	145	143	141	139	138	137
32	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152
33	152	152	151	148	146	142	139	136	133	130	127	125	123	121	120	119	118	117
34	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152
35	152	152	151	148	146	142	139	136	133	130	127	125	123	121	120	119	118	117
36	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179
37	179	179	177	175	171	168	164	160	156	153	150	147	145	143	141	139	138	137
38	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179
39	179	179	177	175	171	168	164	160	156	153	150	147	145	143	141	139	138	137
40	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179	179
41	179	179	177	175	171	168	164	160	156	153	150	147	145	143	141	139	138	137
42	161	161	161	161	161	159	156	153	152	150	148	146	143	141	138	136	134	...
43	161	161	161	161	161	159	156	153	152	150	148	146	143	141	138	136	134	...
44	161	148	136	130	126	122	119	116	114	112	110	108	106	105	103	101	98.9	...
45	161	161	161	161	161	159	156	153	152	150	148	146	143	141	138	136	134	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	110	109	109	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	148	148	147	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	93.3	93.1	93.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	126	126	125	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	110	109	109	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	148	148	147	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	93.3	93.1	93.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	126	126	125	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	171	169	167	148	*116*	*83.9*	*65.6*	*53.2*	*40.9*	...	...	...	...	...	...	...	...	(**23**)
10	171	169	167	148	*116*	*83.9*	*65.6*	*53.2*	*40.9*	...	...	...	...	...	...	...	...	
11	128	127	126	124	*116*	*83.9*	*65.6*	*53.2*	*40.9*	...	...	...	...	...	...	...	...	
12	171	169	167	148	*116*	*83.9*	*65.6*	*53.2*	*40.9*	...	...	...	...	...	...	...	...	
13	128	127	126	124	*116*	*83.9*	*65.6*	*53.2*	*40.9*	...	...	...	...	...	...	...	...	
14	171	169	167	148	*116*	*83.9*	*65.6*	*53.2*	*40.9*	...	...	...	...	...	...	...	...	
15	128	127	126	124	*116*	*83.9*	*65.6*	*53.2*	*40.9*	...	...	...	...	...	...	...	...	
16	171	169	167	148	*116*	*83.9*	*65.6*	*53.2*	*40.9*	...	...	...	...	...	...	...	...	
17	128	127	126	124	*116*	*83.9*	*65.6*	*53.2*	*40.9*	...	...	...	...	...	...	...	...	
18	145	144	142	126	*98.4*	*71.4*	*56.1*	*45.5*	*35.0*	...	...	...	...	...	...	...	...	
19	108	108	108	105	*98.4*	*71.4*	*56.1*	*45.5*	*35.0*	...	...	...	...	...	...	...	...	
20	171	169	167	148	*116*	*83.9*	*65.6*	*53.2*	*40.9*	...	...	...	...	...	...	...	...	
21	128	127	126	124	*116*	*83.9*	*65.6*	*53.2*	*40.9*	...	...	...	...	...	...	...	...	
22	145	144	142	126	*98.4*	*71.4*	*56.1*	*45.5*	*35.0*	...	...	...	...	...	...	...	...	
23	108	108	108	105	*98.4*	*71.4*	*56.1*	*45.5*	*35.0*	...	...	...	...	...	...	...	...	
24	179	*179*	*149*	*123*	*102*	*84.3*	*69.7*	*57.7*	*47.7*	*39.5*	*32.7*	*19.8*	*10.4*	*8.5*	*7.1*	*5.8*	*4.8*	(**23**)
25	137	136	*135*	*123*	*102*	*84.3*	*69.7*	*57.7*	*47.7*	*39.5*	*32.7*	*19.8*	*10.4*	*8.5*	*7.1*	*5.8*	*4.8*	(**23**)
26	179	*179*	*149*	*123*	*102*	*84.3*	*69.7*	*57.7*	*47.7*	*39.5*	*32.7*	*19.8*	*10.4*	*8.5*	*7.1*	*5.8*	*4.8*	(**23**)
27	137	136	*135*	*123*	*102*	*84.3*	*69.7*	*57.7*	*47.7*	*39.5*	*32.7*	*19.8*	*10.4*	*8.5*	*7.1*	*5.8*	*4.8*	(**23**)
28	179	*179*	*149*	*123*	*102*	*84.3*	*69.7*	*57.7*	*47.7*	*39.5*	*32.7*	*19.8*	*10.4*	*8.5*	*7.1*	*5.8*	*4.8*	(**23**)
29	137	136	*135*	*123*	*102*	*84.3*	*69.7*	*57.7*	*47.7*	*39.5*	*32.7*	*19.8*	*10.4*	*8.5*	*7.1*	*5.8*	*4.8*	(**23**)
30	179	*179*	*149*	*123*	*102*	*84.3*	*69.7*	*57.7*	*47.7*	*39.5*	*32.7*	*19.8*	*10.4*	*8.5*	*7.1*	*5.8*	*4.8*	(**23**)
31	137	136	*135*	*123*	*102*	*84.3*	*69.7*	*57.7*	*47.7*	*39.5*	*32.7*	*19.8*	*10.4*	*8.5*	*7.1*	*5.8*	*4.8*	(**23**)
32	152	*152*	*127*	*105*	*86.6*	*71.7*	*59.3*	*49.1*	*40.6*	*33.6*	*27.8*	*16.8*	*8.8*	*7.3*	*6.0*	*5.0*	*4.1*	(**23**)
33	116	116	*115*	*105*	*86.6*	*71.7*	*59.3*	*49.1*	*40.6*	*33.6*	*27.8*	*16.8*	*8.8*	*7.3*	*6.0*	*5.0*	*4.1*	(**23**)
34	152	*152*	*127*	*105*	*86.6*	*71.7*	*59.3*	*49.1*	*40.6*	*33.6*	*27.8*	*16.8*	*8.8*	*7.3*	*6.0*	*5.0*	*4.1*	(**23**)
35	116	116	*115*	*105*	*86.6*	*71.7*	*59.3*	*49.1*	*40.6*	*33.6*	*27.8*	*16.8*	*8.8*	*7.3*	*6.0*	*5.0*	*4.1*	(**23**)
36	179	*179*	*149*	*123*	*102*	*84.3*	*69.7*	*57.7*	*47.7*	*39.5*	*32.7*	*19.8*	*10.4*	*8.5*	*7.1*	*5.8*	*4.8*	(**23**)
37	137	136	*135*	*123*	*102*	*84.3*	*69.7*	*57.7*	*47.7*	*39.5*	*32.7*	*19.8*	*10.4*	*8.5*	*7.1*	*5.8*	*4.8*	(**23**)
38	179	*179*	*149*	*123*	*102*	*84.3*	*69.7*	*57.7*	*47.7*	*39.5*	*32.7*	*19.8*	*10.4*	*8.5*	*7.1*	*5.8*	*4.8*	(**23**)
39	137	136	*135*	*123*	*102*	*84.3*	*69.7*	*57.7*	*47.7*	*39.5*	*32.7*	*19.8*	*10.4*	*8.5*	*7.1*	*5.8*	*4.8*	(**23**)
40	179	*179*	*149*	*123*	*102*	*84.3*	*69.7*	*57.7*	*47.7*	*39.5*	*32.7*	*19.8*	*10.4*	*8.5*	*7.1*	*5.8*	*4.8*	(**23**)
41	137	136	*135*	*123*	*102*	*84.3*	*69.7*	*57.7*	*47.7*	*39.5*	*32.7*	*19.8*	*10.4*	*8.5*	*7.1*	*5.8*	*4.8*	(**23**)
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
1	40Ni–29Cr–15Fe–5Mo	Rod	SB–581	...	N06030	Solution ann.
2	40Ni–29Cr–15Fe–5Mo	Plate, sheet, strip	SB–582	...	N06030	Solution ann.
3	40Ni–29Cr–15Fe–5Mo	Plate, sheet, strip	SB–582	...	N06030	Solution ann.
4	40Ni–29Cr–15Fe–5Mo	Wld. pipe	SB–619	...	N06030	Solution ann.
5	40Ni–29Cr–15Fe–5Mo	Wld. pipe	SB–619	...	N06030	Solution ann.
6	40Ni–29Cr–15Fe–5Mo	Smls. pipe & tube	SB–622	...	N06030	Solution ann.
7	40Ni–29Cr–15Fe–5Mo	Smls. pipe & tube	SB–622	...	N06030	Solution ann.
8	40Ni–29Cr–15Fe–5Mo	Wld. tube	SB–626	...	N06030	Solution ann.
9	40Ni–29Cr–15Fe–5Mo	Wld. tube	SB–626	...	N06030	Solution ann.
10	58Ni–33Cr–8Mo	Smls. & wld. fittings	SB–366	...	N06035	Solution ann.
11	58Ni–33Cr–8Mo	Forgings	SB–462	...	N06035	Solution ann.
12	58Ni–33Cr–8Mo	Forgings	SB–462	...	N06035	Solution ann.
13	58Ni–33Cr–8Mo	Forgings	SB–564	...	N06035	Solution ann.
14	58Ni–33Cr–8Mo	Forgings	SB–564	...	N06035	Solution ann.
15	58Ni–33Cr–8Mo	Rod	SB–574	...	N06035	Solution ann.
16	58Ni–33Cr–8Mo	Rod	SB–574	...	N06035	Solution ann.
17	58Ni–33Cr–8Mo	Plate, sheet, strip	SB–575	...	N06035	Solution ann.
18	58Ni–33Cr–8Mo	Plate, sheet, strip	SB–575	...	N06035	Solution ann.
19	58Ni–33Cr–8Mo	Wld. pipe	SB–619	...	N06035	Solution ann.
20	58Ni–33Cr–8Mo	Wld. pipe	SB–619	...	N06035	Solution ann.
21	58Ni–33Cr–8Mo	Smls. pipe & tube	SB–622	...	N06035	Solution ann.
22	58Ni–33Cr–8Mo	Smls. pipe & tube	SB–622	...	N06035	Solution ann.
23	58Ni–33Cr–8Mo	Wld. tube	SB–626	...	N06035	Solution ann.
24	58Ni–33Cr–8Mo	Wld. tube	SB–626	...	N06035	Solution ann.
25	46Ni–27Cr–23Fe–2.75Si	Rod	SB–166	...	N06045	Solution ann.
26	46Ni–27Cr–23Fe–2.75Si	Rod	SB–166	...	N06045	Solution ann.
27	46Ni–27Cr–23Fe–2.75Si	Smls. pipe & tube	SB–167	...	N06045	Solution ann.
28	46Ni–27Cr–23Fe–2.75Si	Smls. pipe & tube	SB–167	...	N06045	Solution ann.
29	46Ni–27Cr–23Fe–2.75Si	Plate, sheet, strip	SB–168	...	N06045	Solution ann.
30	46Ni–27Cr–23Fe–2.75Si	Plate, sheet, strip	SB–168	...	N06045	Solution ann.
31	46Ni–27Cr–23Fe–2.75Si	Smls. & wld. fittings	SB–366	...	N06045	Solution ann.
32	46Ni–27Cr–23Fe–2.75Si	Forged fittings	SB–462	...	N06045	Solution ann.
33	46Ni–27Cr–23Fe–2.75Si	Forged fittings	SB–462	...	N06045	Solution ann.
34	46Ni–27Cr–23Fe–2.75Si	Wld. tube	SB–516	...	N06045	Solution ann.
35	46Ni–27Cr–23Fe–2.75Si	Wld. tube	SB–516	...	N06045	Solution ann.
36	46Ni–27Cr–23Fe–2.75Si	Wld. pipe	SB–517	...	N06045	Solution ann.
37	46Ni–27Cr–23Fe–2.75Si	Wld. pipe	SB–517	...	N06045	Solution ann.
38	46Ni–27Cr–23Fe–2.75Si	Forgings	SB–564	...	N06045	Solution ann.
39	46Ni–27Cr–23Fe–2.75Si	Forgings	SB–564	...	N06045	Solution ann.
40	59Ni–23Cr–16Mo	Fittings	SB–366	CR5923	N06059	Annealed
41	59Ni–23Cr–16Mo	Fittings	SB–366	WP5923	N06059	Annealed
42	59Ni–23Cr–16Mo	Wld. fittings	SB–366	WP5923W	N06059	Annealed
43	59Ni–23Cr–16Mo	Fittings	SB–366	WP5923WX	N06059	Annealed
44	59Ni–23Cr–16Mo	Forged fittings	SB–462	...	N06059	Solution ann.
45	59Ni–23Cr–16Mo	Forged fittings	SB–462	...	N06059	Solution ann.

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	...	45	585	240	NP	NP	427	343	NFN–19	...
2	...	45	585	240	NP	427	427	343	NFN–19	G5
3	...	45	585	240	NP	NP	427	343	NFN–19	...
4	...	45	585	240	NP	427	427	343	NFN–19	G5, G14, W6
5	...	45	585	240	NP	NP	427	343	NFN–19	G14
6	...	45	585	240	NP	427	427	343	NFN–19	G5
7	...	45	585	240	NP	NP	427	343	NFN–19	...
8	...	45	585	240	NP	427	427	343	NFN–19	G5, G14, W6
9	...	45	585	240	NP	NP	427	343	NFN–19	G14
10	...	43	586	241	NP	NP	427	NP	NFN–27	G5, W12
11	...	43	586	241	NP	NP	427	NP	NFN–27	G5
12	...	43	586	241	NP	NP	427	NP	NFN–27	...
13	...	43	586	241	NP	NP	427	NP	NFN–27	G5
14	...	43	586	241	NP	NP	427	NP	NFN–27	...
15	...	43	586	241	NP	NP	427	NP	NFN–27	G5
16	...	43	586	241	NP	NP	427	NP	NFN–27	...
17	...	43	586	241	NP	NP	427	NP	NFN–27	G5
18	...	43	586	241	NP	NP	427	NP	NFN–27	...
19	...	43	586	241	NP	NP	427	NP	NFN–27	G5, G14
20	...	43	586	241	NP	NP	427	NP	NFN–27	G14
21	...	43	586	241	NP	NP	427	NP	NFN–27	G5
22	...	43	586	241	NP	NP	427	NP	NFN–27	...
23	...	43	586	241	NP	NP	427	NP	NFN–27	G5, G14
24	...	43	586	241	NP	NP	427	NP	NFN–27	G14
25	...	46	620	240	816	NP	816	NP	NFN–8	G5, T11
26	...	46	620	240	816	NP	816	NP	NFN–8	T11
27	...	46	620	240	816	NP	816	NP	NFN–8	G5, T11
28	...	46	620	240	816	NP	816	NP	NFN–8	T11
29	...	46	620	240	816	NP	816	NP	NFN–8	G5, T11
30	...	46	620	240	816	NP	816	NP	NFN–8	T11
31	...	46	620	240	816	NP	816	NP	NFN–8	G5, T11, W12
32	...	46	620	240	816	NP	816	NP	NFN–8	G5, T11
33	...	46	620	240	816	NP	816	NP	NFN–8	T11
34	...	46	620	240	816	NP	816	NP	NFN–8	G5, G14, T11
35	...	46	620	240	816	NP	816	NP	NFN–8	G14, T11
36	...	46	620	240	816	NP	816	NP	NFN–8	G5, G14, T11
37	...	46	620	240	816	NP	816	NP	NFN–8	G14, T11
38	...	46	620	240	816	NP	816	NP	NFN–8	G5, T11
39	...	46	620	240	816	NP	816	NP	NFN–8	T11
40	...	43	690	310	NP	427	760	343	NFN–14	G5, G14, G23, T16
41	...	43	690	310	NP	427	760	343	NFN–14	G5, G23, T16
42	...	43	690	310	NP	427	760	343	NFN–14	G5, G14, G23, T16
43	...	43	690	310	NP	427	760	343	NFN–14	G5, G23, T16
44	...	43	690	310	NP	NP	760	343	NFN–14	G23, T16
45	...	43	690	310	NP	NP	760	343	NFN–14	G5, G23, T16

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	161	148	136	130	126	122	119	116	114	112	110	108	106	105	103	101	98.9	...
2	161	161	161	161	161	159	156	153	152	150	148	146	143	141	138	136	134	...
3	161	148	136	130	126	122	119	116	114	112	110	108	106	105	103	101	98.9	...
4	137	137	137	137	136	135	132	130	129	128	126	124	121	120	118	116	114	...
5	137	126	116	111	107	104	101	98.6	96.5	94.9	93.4	91.7	89.9	88.8	87.5	85.6	83.7	...
6	161	161	161	161	161	159	156	153	152	150	148	146	143	141	138	136	134	...
7	161	148	136	130	126	122	119	116	114	112	110	108	106	105	103	101	98.9	...
8	137	137	137	137	136	135	132	130	129	128	126	124	121	120	118	116	114	...
9	137	126	116	111	107	104	101	98.6	96.5	94.9	93.4	91.7	89.9	88.8	87.5	85.6	83.7	...
10	161	161	161	161	161	161	154	149	144	140	137	135	133	132	131	129	128	...
11	161	161	161	161	161	161	154	149	144	140	137	135	133	132	131	129	128	...
12	161	149	139	132	125	119	114	110	107	104	102	100	98.8	97.8	96.9	95.8	94.7	...
13	161	161	161	161	161	161	154	149	144	140	137	135	133	132	131	129	128	...
14	161	149	139	132	125	119	114	110	107	104	102	100	98.8	97.8	96.9	95.8	94.7	...
15	161	161	161	161	161	161	154	149	144	140	137	135	133	132	131	129	128	...
16	161	149	139	132	125	119	114	110	107	104	102	100	98.8	97.8	96.9	95.8	94.7	...
17	161	161	161	161	161	161	154	149	144	140	137	135	133	132	131	129	128	...
18	161	149	139	132	125	119	114	110	107	104	102	100	98.8	97.8	96.9	95.8	94.7	...
19	137	137	137	137	137	137	131	127	122	119	116	115	113	112	111	110	109	...
20	137	127	118	112	106	101	96.9	93.5	91.0	88.4	86.7	85.0	84.0	83.1	82.4	81.4	80.5	...
21	161	161	161	161	161	161	154	149	144	140	137	135	133	132	131	129	128	...
22	161	149	139	132	125	119	114	110	107	104	102	100	98.8	97.8	96.9	95.8	94.7	...
23	137	137	137	137	137	137	131	127	122	119	116	115	113	112	111	110	109	...
24	137	127	118	112	106	101	96.9	93.5	91.0	88.4	86.7	85.0	84.0	83.1	82.4	81.4	80.5	...
25	161	161	161	161	161	161	161	160	157	155	153	152	151	149	149	148	146	121
26	161	152	142	137	133	129	125	123	121	119	118	117	116	116	115	115	114	113
27	161	161	161	161	161	161	161	160	157	155	153	152	151	149	149	148	146	121
28	161	152	142	137	133	129	125	123	121	119	118	117	116	116	115	115	114	113
29	161	161	161	161	161	161	161	160	157	155	153	152	151	149	149	148	146	121
30	161	152	142	137	133	129	125	123	121	119	118	117	116	116	115	115	114	113
31	161	161	161	161	161	161	161	160	157	155	153	152	151	149	149	148	146	121
32	161	161	161	161	161	161	161	160	157	155	153	152	151	149	149	148	146	121
33	161	152	142	137	133	129	125	123	121	119	118	117	116	116	115	115	114	113
34	137	137	137	137	137	137	137	135	133	131	130	129	128	127	127	126	124	102
35	137	129	121	117	113	110	107	104	103	101	101	99.4	98.6	98.6	97.9	97.3	96.5	95.7
36	137	137	137	137	137	137	137	135	133	131	130	129	128	127	127	126	124	102
37	137	129	121	117	113	110	107	104	103	101	101	99.4	98.6	98.6	97.9	97.3	96.5	95.7
38	161	161	161	161	161	161	161	160	157	155	153	152	151	149	149	148	146	121
39	161	152	142	137	133	129	125	123	121	119	118	117	116	116	115	115	114	113
40	168	168	168	168	168	166	164	162	160	157	154	152	150	147	146	144	143	142
41	197	197	197	197	197	196	194	191	187	184	181	178	176	173	172	170	168	167
42	168	168	168	168	168	166	164	162	160	157	154	152	150	147	146	144	143	142
43	197	197	197	197	197	196	194	191	187	184	181	178	176	173	172	170	168	167
44	197	191	184	179	174	169	165	161	157	154	150	146	142	139	135	132	128	125
45	197	197	197	197	197	196	194	191	187	184	181	178	176	173	172	170	168	167

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	*98.1*	*76.1*	*56.8*	*45.1*	*36.5*	*29.3*	*23.9*	*19.6*	*15.7*	*13.1*	*10.6*	*8.45*	*6.81*	*5.28*	...	...	...
26	*98.1*	*76.1*	*56.8*	*45.1*	*36.5*	*29.3*	*23.9*	*19.6*	*15.7*	*13.1*	*10.6*	*8.45*	*6.81*	*5.28*	...	...	...
27	*98.1*	*76.1*	*56.8*	*45.1*	*36.5*	*29.3*	*23.9*	*19.6*	*15.7*	*13.1*	*10.6*	*8.45*	*6.81*	*5.28*	...	...	...
28	*98.1*	*76.1*	*56.8*	*45.1*	*36.5*	*29.3*	*23.9*	*19.6*	*15.7*	*13.1*	*10.6*	*8.45*	*6.81*	*5.28*	...	...	...
29	*98.1*	*76.1*	*56.8*	*45.1*	*36.5*	*29.3*	*23.9*	*19.6*	*15.7*	*13.1*	*10.6*	*8.45*	*6.81*	*5.28*	...	...	...
30	*98.1*	*76.1*	*56.8*	*45.1*	*36.5*	*29.3*	*23.9*	*19.6*	*15.7*	*13.1*	*10.6*	*8.45*	*6.81*	*5.28*	...	...	...
31	*98.1*	*76.1*	*56.8*	*45.1*	*36.5*	*29.3*	*23.9*	*19.6*	*15.7*	*13.1*	*10.6*	*8.45*	*6.81*	*5.28*	...	...	...
32	*98.1*	*76.1*	*56.8*	*45.1*	*36.5*	*29.3*	*23.9*	*19.6*	*15.7*	*13.1*	*10.6*	*8.45*	*6.81*	*5.28*	...	...	...
33	*98.1*	*76.1*	*56.8*	*45.1*	*36.5*	*29.3*	*23.9*	*19.6*	*15.7*	*13.1*	*10.6*	*8.45*	*6.81*	*5.28*	...	...	...
34	*83.5*	*64.6*	*48.1*	*38.3*	*31.2*	*24.7*	*20.5*	*16.8*	*13.6*	*11.0*	*9.00*	*7.11*	*5.54*	*4.38*	...	...	...
35	*83.5*	*64.6*	*48.1*	*38.3*	*31.2*	*24.7*	*20.5*	*16.8*	*13.6*	*11.0*	*9.00*	*7.11*	*5.54*	*4.38*	...	...	...
36	*83.5*	*64.6*	*48.1*	*38.3*	*31.2*	*24.7*	*20.5*	*16.8*	*13.6*	*11.0*	*9.00*	*7.11*	*5.54*	*4.38*	...	...	...
37	*83.5*	*64.6*	*48.1*	*38.3*	*31.2*	*24.7*	*20.5*	*16.8*	*13.6*	*11.0*	*9.00*	*7.11*	*5.54*	*4.38*	...	...	...
38	*98.1*	*76.1*	*56.8*	*45.1*	*36.5*	*29.3*	*23.9*	*19.6*	*15.7*	*13.1*	*10.6*	*8.45*	*6.81*	*5.28*	...	...	...
39	*98.1*	*76.1*	*56.8*	*45.1*	*36.5*	*29.3*	*23.9*	*19.6*	*15.7*	*13.1*	*10.6*	*8.45*	*6.81*	*5.28*	...	...	...
40	140	137	134	128	104	*83.1*	*67.7*	*55.9*	*45.2*	*36.5*	*30.4*	*25.0*	...	...	...	...	...
41	165	161	158	150	122	*97.8*	*79.3*	*65.7*	*53.1*	*43.0*	*35.7*	*29.0*	...	...	...	...	...
42	140	137	134	128	104	*83.1*	*67.7*	*55.9*	*45.2*	*36.5*	*30.4*	*25.0*	...	...	...	...	...
43	165	161	158	150	122	*97.8*	*79.3*	*65.7*	*53.1*	*43.0*	*35.7*	*29.0*	...	...	...	...	...
44	122	119	117	115	112	*97.8*	*79.3*	*65.7*	*53.1*	*43.0*	*35.7*	*29.0*	...	...	...	...	...
45	165	161	158	150	122	*97.8*	*79.3*	*65.7*	*53.1*	*43.0*	*35.7*	*29.0*	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
1	59Ni–23Cr–16Mo	Forgings	SB–564	...	N06059	Solution ann.
2	59Ni–23Cr–16Mo	Forgings	SB–564	...	N06059	Solution ann.
3	59Ni–23Cr–16Mo	Rod	SB–574	...	N06059	Solution ann.
4	59Ni–23Cr–16Mo	Rod	SB–574	...	N06059	Solution ann.
5	59Ni–23Cr–16Mo	Plate, sheet, strip	SB–575	...	N06059	Solution ann.
6	59Ni–23Cr–16Mo	Plate, sheet, strip	SB–575	...	N06059	Solution ann.
7	59Ni–23Cr–16Mo	Wld. pipe	SB–619	...	N06059	Solution ann.
8	59Ni–23Cr–16Mo	Wld. pipe	SB–619	...	N06059	Solution ann.
9	59Ni–23Cr–16Mo	Smls. pipe & tube	SB–622	...	N06059	Solution ann.
10	59Ni–23Cr–16Mo	Smls. pipe & tube	SB–622	...	N06059	Solution ann.
11	59Ni–23Cr–16Mo	Wld. tube	SB–626	...	N06059	Solution ann.
12	59Ni–23Cr–16Mo	Wld. tube	SB–626	...	N06059	Solution ann.
13	59Ni–23Cr–16Mo–1.6Cu	Smls. & wld. fittings	SB–366	...	N06200	Solution ann.
14	59Ni–23Cr–16Mo–1.6Cu	Forgings	SB–462	...	N06200	Solution ann.
15	59Ni–23Cr–16Mo–1.6Cu	Forgings	SB–462	...	N06200	Solution ann.
16	59Ni–23Cr–16Mo–1.6Cu	Forgings	SB–564	...	N06200	Solution ann.
17	59Ni–23Cr–16Mo–1.6Cu	Forgings	SB–564	...	N06200	Solution ann.
18	59Ni–23Cr–16Mo–1.6Cu	Rod	SB–574	...	N06200	Solution ann.
19	59Ni–23Cr–16Mo–1.6Cu	Rod	SB–574	...	N06200	Solution ann.
20	59Ni–23Cr–16Mo–1.6Cu	Plate, sheet, strip	SB–575	...	N06200	Solution ann.
21	59Ni–23Cr–16Mo–1.6Cu	Plate, sheet, strip	SB–575	...	N06200	Solution ann.
22	59Ni–23Cr–16Mo–1.6Cu	Wld. pipe	SB–619	...	N06200	Solution ann.
23	59Ni–23Cr–16Mo–1.6Cu	Wld. pipe	SB–619	...	N06200	Solution ann.
24	59Ni–23Cr–16Mo–1.6Cu	Smls. pipe & tube	SB–622	...	N06200	Solution ann.
25	59Ni–23Cr–16Mo–1.6Cu	Smls. pipe & tube	SB–622	...	N06200	Solution ann.
26	59Ni–23Cr–16Mo–1.6Cu	Wld. tube	SB–626	...	N06200	Solution ann.
27	59Ni–23Cr–16Mo–1.6Cu	Wld. tube	SB–626	...	N06200	Solution ann.
28	60Ni–19Cr–19Mo–1.8Ta	Smls. & wld. fittings	SB–366	...	N06210	Solution ann.
29	60Ni–19Cr–19Mo–1.8Ta	Forgings	SB–564	...	N06210	Solution ann.
30	60Ni–19Cr–19Mo–1.8Ta	Forgings	SB–564	...	N06210	Solution ann.
31	60Ni–19Cr–19Mo–1.8Ta	Rod	SB–574	...	N06210	Solution ann.
32	60Ni–19Cr–19Mo–1.8Ta	Rod	SB–574	...	N06210	Solution ann.
33	60Ni–19Cr–19Mo–1.8Ta	Plate, sheet, strip	SB–575	...	N06210	Solution ann.
34	60Ni–19Cr–19Mo–1.8Ta	Plate, sheet, strip	SB–575	...	N06210	Solution ann.
35	60Ni–19Cr–19Mo–1.8Ta	Wld. pipe	SB–619	...	N06210	Solution ann.
36	60Ni–19Cr–19Mo–1.8Ta	Wld. pipe	SB–619	...	N06210	Solution ann.
37	60Ni–19Cr–19Mo–1.8Ta	Smls. pipe & tube	SB–622	...	N06210	Solution ann.
38	60Ni–19Cr–19Mo–1.8Ta	Smls. pipe & tube	SB–622	...	N06210	Solution ann.
39	60Ni–19Cr–19Mo–1.8Ta	Wld. tube	SB–626	...	N06210	Solution ann.
40	60Ni–19Cr–19Mo–1.8Ta	Wld. tube	SB–626	...	N06210	Solution ann.
41	57Ni–22Cr–14W–2Mo–La	Smls. & wld. fittings	SB–366	...	N06230	Solution ann.
42	57Ni–22Cr–14W–2Mo–La	Plate, sheet, strip	SB–435	...	N06230	Solution ann.
43	57Ni–22Cr–14W–2Mo–La	Plate, sheet, strip	SB–435	...	N06230	Solution ann.
44	57Ni–22Cr–14W–2Mo–La	Forgings	SB–564	...	N06230	Solution ann.
45	57Ni–22Cr–14W–2Mo–La	Forgings	SB–564	...	N06230	Solution ann.

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	...	43	690	310	NP	427	760	343	NFN–14	G23, T16
2	...	43	690	310	NP	427	760	343	NFN–14	G5, G23, T16
3	...	43	690	310	NP	427	760	343	NFN–14	G23, T16
4	...	43	690	310	NP	427	760	343	NFN–14	G5, G23, T16
5	...	43	690	310	NP	427	760	343	NFN–14	G23, T16
6	...	43	690	310	NP	427	760	343	NFN–14	G5, G23, T16
7	...	43	690	310	NP	427	760	343	NFN–14	G14, G23, T16
8	...	43	690	310	NP	427	760	343	NFN–14	G5, G14, G23, T16
9	...	43	690	310	NP	427	760	343	NFN–14	G23, T16
10	...	43	690	310	NP	427	760	343	NFN–14	G5, G23, T16
11	...	43	690	310	NP	427	760	343	NFN–14	G14, G23, T16
12	...	43	690	310	NP	427	760	343	NFN–14	G5, G14, G23, T16
13	...	43	690	310	NP	NP	427	NP	NFN–10	G5, W12
14	...	43	690	310	NP	NP	427	NP	NFN–10	...
15	...	43	690	310	NP	NP	427	NP	NFN–10	G5
16	...	43	690	310	NP	NP	427	NP	NFN–10	...
17	...	43	690	310	NP	NP	427	NP	NFN–10	G5
18	...	43	690	310	NP	NP	427	NP	NFN–10	...
19	...	43	690	310	NP	NP	427	NP	NFN–10	G5
20	...	43	690	310	NP	NP	427	NP	NFN–10	...
21	...	43	690	310	NP	NP	427	NP	NFN–10	G5
22	...	43	690	310	NP	NP	427	NP	NFN–10	G14
23	...	43	690	310	NP	NP	427	NP	NFN–10	G5, G14
24	...	43	690	310	NP	NP	427	NP	NFN–10	...
25	...	43	690	310	NP	NP	427	NP	NFN–10	G5
26	...	43	690	310	NP	NP	427	NP	NFN–10	G14
27	...	43	690	310	NP	NP	427	NP	NFN–10	G5, G14
28	...	43	690	310	NP	NP	427	NP	NFN–14	G5, W12
29	...	43	690	310	NP	NP	427	NP	NFN–14	...
30	...	43	690	310	NP	NP	427	NP	NFN–14	G5
31	...	43	690	310	NP	NP	427	NP	NFN–14	...
32	...	43	690	310	NP	NP	427	NP	NFN–14	G5
33	...	43	690	310	NP	NP	427	NP	NFN–14	...
34	...	43	690	310	NP	NP	427	NP	NFN–14	G5
35	...	43	690	310	NP	NP	427	NP	NFN–14	G14
36	...	43	690	310	NP	NP	427	NP	NFN–14	G5, G14
37	...	43	690	310	NP	NP	427	NP	NFN–14	...
38	...	43	690	310	NP	NP	427	NP	NFN–14	G5
39	...	43	690	310	NP	NP	427	NP	NFN–14	G14
40	...	43	690	310	NP	NP	427	NP	NFN–14	G5, G14
41	...	43	760	310	899	NP	982	343	NFN–24	G4, G5, G31, T15, W12
42	...	43	760	310	899	NP	982	343	NFN–24	G4, G31, T16
43	...	43	760	310	899	NP	982	343	NFN–24	G4, G5, G31, T15
44	...	43	760	310	899	NP	982	343	NFN–24	G4, G31, T16
45	...	43	760	310	899	NP	982	343	NFN–24	G4, G5, G31, T15

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	197	191	184	179	174	169	165	161	157	154	150	146	142	139	135	132	128	125
2	197	197	197	197	197	196	194	191	187	184	181	178	176	173	172	170	168	167
3	197	191	184	179	174	169	165	161	157	154	150	146	142	139	135	132	128	125
4	197	197	197	197	197	196	194	191	187	184	181	178	176	173	172	170	168	167
5	197	191	184	179	174	169	165	161	157	154	150	146	142	139	135	132	128	125
6	197	197	197	197	197	196	194	191	187	184	181	178	176	173	172	170	168	167
7	168	163	157	152	147	143	140	137	134	131	127	124	121	118	115	112	109	106
8	168	168	168	168	168	166	164	162	160	157	154	152	150	147	146	144	143	142
9	197	191	184	179	174	169	165	161	157	154	150	146	142	139	135	132	128	125
10	197	197	197	197	197	196	194	191	187	184	181	178	176	173	172	170	168	167
11	168	163	157	152	147	143	140	137	134	131	127	124	121	118	115	112	109	106
12	168	168	168	168	168	166	164	162	160	157	154	152	150	147	146	144	143	142
13	197	...	197	...	197	...	191	...	185	...	182	180	179	177	175	174	172	...
14	197	...	184	...	171	...	159	...	148	...	139	136	133	131	130	129	128	...
15	197	...	197	...	197	...	191	...	185	...	182	180	179	177	175	174	172	...
16	197	...	184	...	171	...	159	...	148	...	139	136	133	131	130	129	128	...
17	197	...	197	...	197	...	191	...	185	...	182	180	179	177	175	174	172	...
18	197	...	184	...	171	...	159	...	148	...	139	136	133	131	130	129	128	...
19	197	...	197	...	197	...	191	...	185	...	182	180	179	177	175	174	172	...
20	197	...	184	...	171	...	159	...	148	...	139	136	133	131	130	129	128	...
21	197	...	197	...	197	...	191	...	185	...	182	180	179	177	175	174	172	...
22	167	...	156	...	145	...	135	...	126	...	118	116	113	112	110	109	109	...
23	167	...	167	...	167	...	162	...	158	...	154	153	152	151	149	148	146	...
24	197	...	184	...	171	...	159	...	148	...	139	136	133	131	130	129	128	...
25	197	...	197	...	197	...	191	...	185	...	182	180	179	177	175	174	172	...
26	167	...	156	...	145	...	135	...	126	...	118	116	113	112	110	109	109	...
27	167	...	167	...	167	...	162	...	158	...	154	153	152	151	149	148	146	...
28	197	197	197	197	196	...	191	...	186	...	183	180	175	170	166	163	160	...
29	197	192	182	175	169	...	157	...	146	...	137	133	129	126	123	121	118	...
30	197	197	197	197	196	...	191	...	186	...	183	180	175	170	166	163	160	...
31	197	192	182	175	169	...	157	...	146	...	137	133	129	126	123	121	118	...
32	197	197	197	197	196	...	191	...	186	...	183	180	175	170	166	163	160	...
33	197	192	182	175	169	...	157	...	146	...	137	133	129	126	123	121	118	...
34	197	197	197	197	196	...	191	...	186	...	183	180	175	170	166	163	160	...
35	167	163	155	149	143	...	133	...	124	...	117	113	110	107	105	102	101	...
36	167	167	167	167	167	...	162	...	158	...	155	153	149	145	141	138	136	...
37	197	192	182	175	169	...	157	...	146	...	137	133	129	126	123	121	118	...
38	197	197	197	197	196	...	191	...	186	...	183	180	175	170	166	163	160	...
39	167	163	155	149	143	...	133	...	124	...	117	113	110	107	105	102	101	...
40	167	167	167	167	167	...	162	...	158	...	155	153	149	145	141	138	136	...
41	207	207	207	207	207	207	207	207	207	206	206	203	200	197	196	195	195	195
42	207	200	193	188	182	176	171	166	161	157	153	150	148	146	145	144	144	144
43	207	207	207	207	207	207	207	207	207	206	206	203	200	197	196	195	195	195
44	207	200	193	188	182	176	171	166	161	157	153	150	148	146	145	144	144	144
45	207	207	207	207	207	207	207	207	207	206	206	203	200	197	196	195	195	195

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	122	119	117	115	112	*97.8*	*79.3*	*65.7*	*53.1*	*43.0*	*35.7*	*29.0*	...	...	...	...	...
2	165	161	158	150	122	*97.8*	*79.3*	*65.7*	*53.1*	*43.0*	*35.7*	*29.0*	...	...	...	...	...
3	122	119	117	115	112	*97.8*	*79.3*	*65.7*	*53.1*	*43.0*	*35.7*	*29.0*	...	...	...	...	...
4	165	161	158	150	122	*97.8*	*79.3*	*65.7*	*53.1*	*43.0*	*35.7*	*29.0*	...	...	...	...	...
5	122	119	117	115	112	*97.8*	*79.3*	*65.7*	*53.1*	*43.0*	*35.7*	*29.0*	...	...	...	...	...
6	165	161	158	150	122	*97.8*	*79.3*	*65.7*	*53.1*	*43.0*	*35.7*	*29.0*	...	...	...	...	...
7	104	101	99.3	97.9	95.1	*83.1*	*67.7*	*55.9*	*45.2*	*36.5*	*30.4*	*25.0*	...	...	...	...	...
8	140	137	134	128	104	*83.1*	*67.7*	*55.9*	*45.2*	*36.5*	*30.4*	*25.0*	...	...	...	...	...
9	122	119	117	115	112	*97.8*	*79.3*	*65.7*	*53.1*	*43.0*	*35.7*	*29.0*	...	...	...	...	...
10	165	161	158	150	122	*97.8*	*79.3*	*65.7*	*53.1*	*43.0*	*35.7*	*29.0*	...	...	...	...	...
11	104	101	99.3	97.9	95.1	*83.1*	*67.7*	*55.9*	*45.2*	*36.5*	*30.4*	*25.0*	...	...	...	...	...
12	140	137	134	128	104	*83.1*	*67.7*	*55.9*	*45.2*	*36.5*	*30.4*	*25.0*	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	195	195	195	183	*153*	*128*	*107*	*89.7*	*74.7*	*61.9*	*50.8*	*41.1*	*32.6*	*25.2*	*18.9*	*13.8*	*10.2*
42	144	144	144	144	144	*128*	*107*	*89.7*	*74.7*	*61.9*	*50.8*	*41.1*	*32.8*	*25.2*	*18.9*	*13.8*	*10.2*
43	195	195	195	183	*153*	*128*	*107*	*89.7*	*74.7*	*61.9*	*50.8*	*41.1*	*32.6*	*25.2*	*18.9*	*13.8*	*10.2*
44	144	144	144	144	144	*128*	*107*	*89.7*	*74.7*	*61.9*	*50.8*	*41.1*	*32.8*	*25.2*	*18.9*	*13.8*	*10.2*
45	195	195	195	183	*153*	*128*	*107*	*89.7*	*74.7*	*61.9*	*50.8*	*41.1*	*32.6*	*25.2*	*18.9*	*13.8*	*10.2*

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
1	57Ni–22Cr–14W–2Mo–La	Bar	SB–572	...	N06230	Solution ann.
2	57Ni–22Cr–14W–2Mo–La	Bar	SB–572	...	N06230	Solution ann.
3	57Ni–22Cr–14W–2Mo–La	Wld. pipe	SB–619	...	N06230	Solution ann.
4	57Ni–22Cr–14W–2Mo–La	Wld. pipe	SB–619	...	N06230	Solution ann.
5	57Ni–22Cr–14W–2Mo–La	Smls. pipe & tube	SB–622	...	N06230	Solution ann.
6	57Ni–22Cr–14W–2Mo–La	Smls. pipe & tube	SB–622	...	N06230	Solution ann.
7	57Ni–22Cr–14W–2Mo–La	Wld. tube	SB–626	...	N06230	Solution ann.
8	57Ni–22Cr–14W–2Mo–La	Wld. tube	SB–626	...	N06230	Solution ann.
9	61Ni–16Mo–16Cr	Smls. & wld. fittings	SB–366	...	N06455	Annealed
10	61Ni–16Mo–16Cr	Rod	SB–574	...	N06455	Solution ann.
11	61Ni–16Mo–16Cr	Rod	SB–574	...	N06455	Solution ann.
12	61Ni–16Mo–16Cr	Plate, sheet, strip	SB–575	...	N06455	Solution ann.
13	61Ni–16Mo–16Cr	Plate, sheet, strip	SB–575	...	N06455	Solution ann.
14	61Ni–16Mo–16Cr	Wld. pipe	SB–619	...	N06455	Solution ann.
15	61Ni–16Mo–16Cr	Wld. pipe	SB–619	...	N06455	Solution ann.
16	61Ni–16Mo–16Cr	Smls. pipe & tube	SB–622	...	N06455	Solution ann.
17	61Ni–16Mo–16Cr	Smls. pipe & tube	SB–622	...	N06455	Solution ann.
18	61Ni–16Mo–16Cr	Wld. tube	SB–626	...	N06455	Solution ann.
19	61Ni–16Mo–16Cr	Wld. tube	SB–626	...	N06455	Solution ann.
20	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Hot fin./ann.
21	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Hot fin./ann.
(**23**) 22	72Ni–15Cr–8Fe	Smls. & wld. fittings	SB–366	...	N06600	Annealed
23	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Cold drawn/ann.
24	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Cold drawn/ann.
25	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Hot fin./ann.
26	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Hot fin./ann.
27	72Ni–15Cr–8Fe	Smls. tube	SB–163	...	N06600	Annealed
28	72Ni–15Cr–8Fe	Smls. tube	SB–163	...	N06600	Annealed
29	72Ni–15Cr–8Fe	Bar	SB–166	...	N06600	Annealed
30	72Ni–15Cr–8Fe	Bar	SB–166	...	N06600	Annealed
31	72Ni–15Cr–8Fe	Plate	SB–168	...	N06600	Annealed
32	72Ni–15Cr–8Fe	Plate, sheet, strip	SB–168	...	N06600	Annealed
33	72Ni–15Cr–8Fe	Wld. tube	SB–516	...	N06600	Annealed
34	72Ni–15Cr–8Fe	Wld. tube	SB–516	...	N06600	Annealed
35	72Ni–15Cr–8Fe	Forgings	SB–564	...	N06600	...
36	72Ni–15Cr–8Fe	Forgings	SB–564	...	N06600	Annealed
37	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Cold drawn/ann.
38	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Cold drawn/ann.
39	72Ni–15Cr–8Fe	Wld. pipe	SB–517	...	N06600	Cold drawn/ann.
40	72Ni–15Cr–8Fe	Wld. pipe	SB–517	...	N06600	Cold drawn/ann.
41	72Ni–15Cr–8Fe	Bar, rod	SB–166	...	N06600	Hot fin.
42	72Ni–15Cr–8Fe	Bar, rod	SB–166	...	N06600	Hot fin.
43	72Ni–15Cr–8Fe	Plate, sheet, strip	SB–168	...	N06600	Hot rolled
44	72Ni–15Cr–8Fe	Plate, sheet, strip	SB–168	...	N06600	Hot rolled
45	60Ni–23Cr–Fe	Smls. tube	SB–163	...	N06601	Annealed

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	...	43	760	310	899	NP	982	343	NFN–24	G4, G31, T16
2	...	43	760	310	899	NP	982	343	NFN–24	G4, G5, G31, T15
3	...	43	760	310	899	NP	982	343	NFN–24	G4, G14, G32, T16
4	...	43	760	310	899	NP	982	343	NFN–24	G4, G5, G14, G32, T15
5	...	43	760	310	899	NP	982	343	NFN–24	G4, G31, T16
6	...	43	760	310	899	NP	982	343	NFN–24	G4, G5, G31, T15
7	...	43	760	310	899	NP	982	343	NFN–24	G4, G14, G32, T16
8	...	43	760	310	899	NP	982	343	NFN–24	G4, G5, G14, G32, T15
9	...	43	690	275	NP	NP	427	343	NFN–14	G5, W12
10	...	43	690	275	NP	NP	427	343	NFN–14	...
11	...	43	690	275	NP	NP	427	343	NFN–14	G5
12	...	43	690	275	NP	NP	427	343	NFN–14	...
13	...	43	690	275	NP	NP	427	343	NFN–14	G5
14	...	43	690	275	NP	NP	427	343	NFN–14	G14
15	...	43	690	275	NP	NP	427	343	NFN–14	G5, G14
16	...	43	690	275	NP	NP	427	343	NFN–14	...
17	...	43	690	275	NP	NP	427	343	NFN–14	G5
18	...	43	690	275	NP	NP	427	343	NFN–14	G14
19	...	43	690	275	NP	NP	427	343	NFN–14	G5, G14
20	>125	43	515	170	NP	427	649	343	NFN–4	T12
21	>125	43	515	170	NP	427	649	343	NFN–4	G5, T11
22	...	43	550	205	NP	427	649	343	NFN–4	G5, T11, W5, W12
23	>125	43	550	205	NP	427 (Cl. 3 only)	649	343	NFN–4	T12
24	>125	43	550	205	NP	427 (Cl. 3 only)	649	343	NFN–4	G5, T11
25	≤125	43	550	205	NP	427	649	343	NFN–4	G5, T11
26	≤125	43	550	205	NP	NP	649	343	NFN–4	T12
27	≤75	43	550	240	649	427	649	343	NFN–4	G5, T11
28	≤75	43	550	240	649	NP	649	343	NFN–4	T11
29	...	43	550	240	649	427	649	343	NFN–4	G5, T11
30	...	43	550	240	649	NP	649	343	NFN–4	T11
31	...	43	550	240	649	427	649	343	NFN–4	G5, T11
32	...	43	550	240	649	NP	649	343	NFN–4	T11
33	...	43	550	240	NP	NP	649	343	NFN–4	G14, T11
34	...	43	550	240	NP	NP	649	343	NFN–4	G5, G14, T11
35	...	43	550	240	NP	427	NP	NP	NFN–4	G5
36	...	43	550	240	NP	NP	649	343	NFN–4	T11
37	≤125	43	550	240	649	427 (Cl. 3 only)	649	343	NFN–4	T11
38	≤125	43	550	240	649	427	649	343	NFN–4	G5, T11
39	...	43	550	240	NP	NP	649	343	NFN–4	G14, T11
40	...	43	550	240	NP	NP	649	343	NFN–4	G5, G14, T11
41	...	43	585	240	649	427 (Cl. 3 only)	649	343	NFN–4	T13
42	...	43	585	240	649	427 (Cl. 3 only)	649	343	NFN–4	G5, T12
43	...	43	585	240	649	427 (Cl. 3 only)	649	343	NFN–4	G20, T13
44	...	43	585	240	649	427 (Cl. 3 only)	649	343	NFN–4	G5, G20, T12
45	≤75 O.D.	43	552	207	899	NP	899	NP	NFN–4	G4, T14

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	207	200	193	188	182	176	171	166	161	157	153	150	148	146	145	144	144	144
2	207	207	207	207	207	207	207	207	207	206	206	203	200	197	196	195	195	195
3	176	170	164	159	155	150	145	141	137	133	130	128	126	124	123	123	122	122
4	176	176	176	176	176	176	176	176	176	176	176	173	170	167	167	166	166	166
5	207	200	193	188	182	176	171	166	161	157	153	150	148	146	145	144	144	144
6	207	207	207	207	207	207	207	207	207	206	206	203	200	197	196	195	195	195
7	176	170	164	159	155	150	145	141	137	133	130	128	126	124	123	123	122	122
8	176	176	176	176	176	176	176	176	176	176	176	173	170	167	167	166	166	166
9	184	184	184	184	184	184	184	184	184	184	184	184	184	182	180	178	176	...
10	184	177	168	163	158	154	150	147	144	142	140	138	137	135	134	132	130	...
11	184	184	184	184	184	184	184	184	184	184	184	184	184	182	180	178	176	...
12	184	177	168	163	158	154	150	147	144	142	140	138	137	135	134	132	130	...
13	184	184	184	184	184	184	184	184	184	184	184	184	184	182	180	178	176	...
14	157	150	143	138	134	131	128	125	123	121	119	117	116	115	114	112	110	...
15	157	157	157	157	157	157	157	157	157	157	157	157	156	155	153	151	149	...
16	184	177	168	163	158	154	150	147	144	142	140	138	137	135	134	132	130	...
17	184	184	184	184	184	184	184	184	184	184	184	184	184	182	180	178	176	...
18	157	150	143	138	134	131	128	125	123	121	119	117	116	115	114	112	110	...
19	157	157	157	157	157	157	157	157	157	157	157	157	156	155	153	151	149	...
20	115	112	109	107	105	103	101	99.1	97.2	95.5	93.9	92.6	91.4	90.1	88.9	87.7	86.3	85.7
21	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115
22	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	120
23	138	135	131	129	126	124	121	119	117	115	113	111	109	108	107	105	104	103
24	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	120
25	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	120
26	138	135	131	129	126	124	121	119	117	115	113	111	109	108	107	105	104	103
27	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	156	124
28	158	152	146	144	143	142	142	141	140	139	138	137	136	135	134	132	130	118
29	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	156	124
30	158	152	146	144	143	142	142	141	140	139	138	137	136	135	134	132	130	118
31	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	156	124
32	158	152	146	144	143	142	142	141	140	139	138	137	136	135	134	132	130	118
33	134	129	124	123	122	121	120	119	119	118	117	116	116	115	114	112	110	99.9
34	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134	132	106
35	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	...
36	158	152	146	144	143	142	142	141	140	139	138	137	136	135	134	132	130	118
37	158	152	146	144	143	142	142	141	140	139	138	137	136	135	134	132	130	118
38	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	156	124
39	134	129	124	123	122	121	120	119	119	118	117	116	116	115	114	112	110	99.9
40	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134	132	106
41	161	156	152	150	148	147	147	147	147	147	146	146	145	145	143	141	139	137
42	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
43	161	156	152	150	148	147	147	147	147	147	146	146	145	145	143	141	139	137
44	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
45	138	128	122	118	114	111	108	105	102	100	98.9	97.6	96.6	95.9	95.4	95.1	94.9	94.8

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	144	144	144	144	144	*128*	*107*	*89.7*	*74.7*	*61.9*	*50.8*	*41.1*	*32.8*	*25.2*	*18.9*	*13.8*	*10.2*
2	195	195	195	183	*153*	*128*	*107*	*89.7*	*74.7*	*61.9*	*50.8*	*41.1*	*32.6*	*25.2*	*18.9*	*13.8*	*10.2*
3	122	122	122	122	122	*109*	*91.0*	*76.2*	*63.5*	*52.6*	*43.2*	*34.9*	*27.7*	*21.4*	*16.1*	*11.7*	*8.67*
4	166	166	166	156	*130*	*109*	*91.0*	*76.2*	*63.5*	*52.6*	*43.2*	*34.9*	*27.7*	*21.4*	*16.1*	*11.7*	*8.67*
5	144	144	144	144	144	*128*	*107*	*89.7*	*74.7*	*61.9*	*50.8*	*41.1*	*32.8*	*25.2*	*18.9*	*13.8*	*10.2*
6	195	195	195	183	*153*	*128*	*107*	*89.7*	*74.7*	*61.9*	*50.8*	*41.1*	*32.6*	*25.2*	*18.9*	*13.8*	*10.2*
7	122	122	122	122	122	*109*	*91.0*	*76.2*	*63.5*	*52.6*	*43.2*	*34.9*	*27.7*	*21.4*	*16.1*	*11.7*	*8.67*
8	166	166	166	156	*130*	*109*	*91.0*	*76.2*	*63.5*	*52.6*	*43.2*	*34.9*	*27.7*	*21.4*	*16.1*	*11.7*	*8.67*
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	79.7	*59.8*	*40.1*	*26.9*	*19.0*	*14.8*	*13.8*	...	...	...	...	...	...	...	...	...	...
21	*87.5*	*59.8*	*40.1*	*26.9*	*19.0*	*14.8*	*13.8*	...	...	...	...	...	...	...	...	...	...
22	*86.1*	*58.3*	*40.0*	*26.8*	*19.0*	*14.8*	*13.8*	...	...	...	...	...	...	...	...	...	... (**23**)
23	86.1	*58.3*	*40.0*	*26.8*	*19.0*	*14.8*	*13.8*	...	...	...	...	...	...	...	...	...	...
24	*86.1*	*58.3*	*40.0*	*26.8*	*19.0*	*14.8*	*13.8*	...	...	...	...	...	...	...	...	...	...
25	*86.1*	*58.3*	*40.0*	*26.8*	*19.0*	*14.8*	*13.8*	...	...	...	...	...	...	...	...	...	...
26	86.1	*58.3*	*40.0*	*26.8*	*19.0*	*14.8*	*13.8*	...	...	...	...	...	...	...	...	...	...
27	*86.5*	*58.7*	*40.0*	*26.8*	*19.0*	*14.8*	*13.8*	...	...	...	...	...	...	...	...	...	...
28	*86.5*	*58.7*	*40.0*	*26.8*	*19.0*	*14.8*	*13.8*	...	...	...	...	...	...	...	...	...	...
29	*86.5*	*58.7*	*40.0*	*26.8*	*19.0*	*14.8*	*13.8*	...	...	...	...	...	...	...	...	...	...
30	*86.5*	*58.7*	*40.0*	*26.8*	*19.0*	*14.8*	*13.8*	...	...	...	...	...	...	...	...	...	...
31	*86.5*	*58.7*	*40.0*	*26.8*	*19.0*	*14.8*	*13.8*	...	...	...	...	...	...	...	...	...	...
32	*86.5*	*58.7*	*40.0*	*26.8*	*19.0*	*14.8*	*13.8*	...	...	...	...	...	...	...	...	...	...
33	*73.4*	*50.1*	*34.1*	*22.7*	*16.5*	*12.7*	*11.7*	...	...	...	...	...	...	...	...	...	...
34	*73.4*	*50.1*	*34.1*	*22.7*	*16.5*	*12.7*	*11.7*	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	*86.5*	*58.7*	*40.0*	*26.8*	*19.0*	*14.8*	*13.8*	...	...	...	...	...	...	...	...	...	...
37	*86.5*	*58.7*	*40.0*	*26.8*	*19.0*	*14.8*	*13.8*	...	...	...	...	...	...	...	...	...	...
38	*86.5*	*58.7*	*40.0*	*26.8*	*19.0*	*14.8*	*13.8*	...	...	...	...	...	...	...	...	...	...
39	*73.4*	*50.1*	*34.1*	*22.7*	*16.5*	*12.7*	*11.7*	...	...	...	...	...	...	...	...	...	...
40	*73.4*	*50.1*	*34.1*	*22.7*	*16.5*	*12.7*	*11.7*	...	...	...	...	...	...	...	...	...	...
41	134	118	*85.6*	*62.9*	*46.2*	*39.4*	*37.9*	...	...	...	...	...	...	...	...	...	...
42	151	*119*	*85.6*	*62.9*	*46.2*	*39.4*	*37.9*	...	...	...	...	...	...	...	...	...	...
43	134	118	*85.6*	*62.9*	*46.2*	*39.4*	*37.9*	...	...	...	...	...	...	...	...	...	...
44	151	*119*	*85.6*	*62.9*	*46.2*	*39.4*	*37.9*	...	...	...	...	...	...	...	...	...	...
45	94.8	94.7	94.5	*85.7*	*67.5*	*52.9*	*41.5*	*32.5*	*25.6*	*20.3*	*16.2*	*13.0*	*10.5*	*8.6*	*7.0*	*5.8*	*5.0*

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	1	60Ni–23Cr–Fe	Smls. tube	SB–163	...	N06601	Annealed
	2	60Ni–23Cr–Fe	Bar	SB–166	...	N06601	Annealed
	3	60Ni–23Cr–Fe	Bar	SB–166	...	N06601	Annealed
	4	60Ni–23Cr–Fe	Smls. pipe & tube	SB–167	...	N06601	Annealed
	5	60Ni–23Cr–Fe	Smls. pipe & tube	SB–167	...	N06601	Annealed
	6	60Ni–23Cr–Fe	Plate, sheet, strip	SB–168	...	N06601	Annealed
	7	60Ni–23Cr–Fe	Plate, sheet, strip	SB–168	...	N06601	Annealed
	8	52Ni–22Cr–13Co–9Mo	Bar, rod	SB–166	...	N06617	Annealed
	9	52Ni–22Cr–13Co–9Mo	Bar, rod	SB–166	...	N06617	Annealed
	10	52Ni–22Cr–13Co–9Mo	Smls. pipe & tube	SB–167	...	N06617	Annealed
	11	52Ni–22Cr–13Co–9Mo	Smls. pipe & tube	SB–167	...	N06617	Annealed
(**23**)	12	52Ni–22Cr–13Co–9Mo	Wld. tube	SB–626	...	N06617	Solution ann.
(**23**)	13	52Ni–22Cr–13Co–9Mo	Wld. tube	SB–626	...	N06617	Solution ann.
	14	52Ni–22Cr–13Co–9Mo	Plate, sheet, strip	SB–168	...	N06617	Annealed
	15	52Ni–22Cr–13Co–9Mo	Plate, sheet, strip	SB–168	...	N06617	Annealed
	16	52Ni–22Cr–13Co–9Mo	Forgings	SB–564	...	N06617	Annealed
	17	52Ni–22Cr–13Co–9Mo	Forgings	SB–564	...	N06617	Annealed
	18	60Ni–22Cr–9Mo–3.5Cb	Plate, sheet, strip	SB–443	2	N06625	Cold rolled/solution ann.
	19	60Ni–22Cr–9Mo–3.5Cb	Plate, sheet	SB–443	2	N06625	Hot rolled/solution ann.
	20	60Ni–22Cr–9Mo–3.5Cb	Smls. pipe & tube	SB–444	2	N06625	Solution ann.
	21	60Ni–22Cr–9Mo–3.5Cb	Smls. pipe & tube	SB–444	2	N06625	Solution ann.
	22	60Ni–22Cr–9Mo–3.5Cb	Bar	SB–446	2	N06625	Solution ann.
	23	60Ni–22Cr–9Mo–3.5Cb	Bar	SB–446	2	N06625	Solution ann.
(**23**)	24	60Ni–22Cr–9Mo–3.5Cb	Smls. & wld. fittings	SB–366	...	N06625	Annealed
	25	60Ni–22Cr–9Mo–3.5Cb	Bar	SB–446	1	N06625	Annealed
	26	60Ni–22Cr–9Mo–3.5Cb	Forgings	SB–564	...	N06625	Annealed
	27	60Ni–22Cr–9Mo–3.5Cb	Plate	SB–443	1	N06625	Cold rolled/ann.
	28	60Ni–22Cr–9Mo–3.5Cb	Plate, sheet	SB–443	1	N06625	Hot rolled/ann.
	29	60Ni–22Cr–9Mo–3.5Cb	Sheet, strip	SB–443	1	N06625	Cold rolled/ann.
	30	60Ni–22Cr–9Mo–3.5Cb	Smls. pipe	SB–444	1	N06625	Annealed
	31	60Ni–22Cr–9Mo–3.5Cb	Bar	SB–446	1	N06625	Annealed
	32	60Ni–22Cr–9Mo–3.5Cb	Forgings	SB–564	...	N06625	Annealed
	33	60Ni–22Cr–9Mo–3.5Cb	Wld. tube	SB–704	...	N06625	Annealed
	34	60Ni–22Cr–9Mo–3.5Cb	Wld. pipe	SB–705	1	N06625	Annealed
	35	Ni–Cr–Mo–W	Forged fittings	SB–462	...	N06686	Solution ann.
	36	Ni–Cr–Mo–W	Forged fittings	SB–462	...	N06686	Solution ann.
	37	Ni–Cr–Mo–W	Forgings	SB–564	...	N06686	Solution ann.
	38	Ni–Cr–Mo–W	Forgings	SB–564	...	N06686	Solution ann.
	39	Ni–Cr–Mo–W	Rod	SB–574	...	N06686	Solution ann.
	40	Ni–Cr–Mo–W	Rod	SB–574	...	N06686	Solution ann.
	41	Ni–Cr–Mo–W	Plate, sheet, strip	SB–575	...	N06686	Solution ann.
	42	Ni–Cr–Mo–W	Plate, sheet, strip	SB–575	...	N06686	Solution ann.
	43	Ni–Cr–Mo–W	Wld. pipe	SB–619	...	N06686	Solution ann.
	44	Ni–Cr–Mo–W	Wld. pipe	SB–619	...	N06686	Solution ann.
	45	Ni–Cr–Mo–W	Smls. pipe & tube	SB–622	...	N06686	Solution ann.

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	≤75 O.D.	43	552	207	899	NP	899	NP	NFN–4	G4, G5, T13
2	...	43	552	207	899	NP	899	NP	NFN–4	G4, T14
3	...	43	552	207	899	NP	899	NP	NFN–4	G4, G5, T13
4	...	43	552	207	899	NP	899	NP	NFN–4	G4, T14
5	...	43	552	207	899	NP	899	NP	NFN–4	G4, G5, T13
6	...	43	552	207	899	NP	899	NP	NFN–4	G4, T14
7	...	43	552	207	899	NP	899	NP	NFN–4	G4, G5, T13
8	...	43	655	240	899	NP	982	NP	NFN–4	G4, G29, T18
9	...	43	655	240	899	NP	982	NP	NFN–4	G4, G5, G29, T17
10	...	43	655	240	899	NP	982	NP	NFN–4	G4, G29, T18
11	...	43	655	240	899	NP	982	NP	NFN–4	G4, G5, G29, T17
12	...	43	655	240	899	NP	982	NP	NFN–4	G4, G14, G44, T18
13	...	43	655	240	899	NP	982	NP	NFN–4	G4, G5, G14, G44, T17
14	...	43	655	240	899	NP	982	NP	NFN–4	G4, G29, T18
15	...	43	655	240	899	NP	982	NP	NFN–4	G4, G5, G29, T17
16	...	43	655	240	899	NP	982	NP	NFN–4	G4, G29, T18
17	...	43	655	240	899	NP	982	NP	NFN–4	G4, G5, G29, T17
18	...	43	690	276	593	NP	871	343	NFN–22	G4, G5, G23, T17, W13
19	...	43	690	276	593	NP	871	343	NFN–22	G4, G23, T18, W13
20	...	43	690	275	593	NP	871	343	NFN–22	G4, G5, G23, T17, W13
21	...	43	690	275	593	NP	871	343	NFN–22	G4, G23, T18, W13
22	...	43	690	275	593	NP	871	343	NFN–22	G4, G5, G23, T17, W13
23	...	43	690	275	593	NP	871	343	NFN–22	G4, G23, T18, W13
24	...	43	760	345	593	427	649	343	NFN–17	G23, T16, W5, W12
25	100 < *t* ≤ 250	43	760	345	593	427	649	343	NFN–17	G23, T16
26	100 < *t* ≤ 250	43	760	345	593	427	649	343	NFN–17	G23, T16
27	≤9.5	43	758	379	593	427	649	343	NFN–17	G23, T16
28	≤70	43	758	379	593	427	649	343	NFN–17	G23, T16
29	...	43	827	414	593	NP	649	343	NFN–17	G22, G23, T16
30	...	43	825	415	593	427	649	343	NFN–17	G22, G23, T16
31	≤100	43	825	415	593	427	649	343	NFN–17	G22, G23, T16
32	≤100	43	825	415	593	427	649	343	NFN–17	G22, G23, T16
33	...	43	825	415	593	427	649	343	NFN–17	G14, G22, G23, T16
34	...	43	825	415	593	NP	649	343	NFN–17	G14, G22, G23, T16
35	≤88.9	43	689	310	NP	NP	427	NP	NFN–10	G5
36	≤88.9	43	689	310	NP	NP	427	NP	NFN–10	...
37	...	43	689	310	NP	NP	427	NP	NFN–10	G5
38	...	43	689	310	NP	NP	427	NP	NFN–10	...
39	≤88.9	43	689	310	NP	NP	427	NP	NFN–10	G5
40	≤88.9	43	689	310	NP	NP	427	NP	NFN–10	...
41	...	43	689	310	NP	NP	427	NP	NFN–10	G5
42	...	43	689	310	NP	NP	427	NP	NFN–10	...
43	≤203.2	43	689	310	NP	NP	427	NP	NFN–10	G5, G14
44	≤203.2	43	689	310	NP	NP	427	NP	NFN–10	G14
45	...	43	689	310	NP	NP	427	NP	NFN–10	G5

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	138	138	138	138	138	138	138	138	138	136	133	132	130	129	129	128	128	128
2	138	128	122	118	114	111	108	105	102	100	98.9	97.6	96.6	95.9	95.4	95.1	94.9	94.8
3	138	138	138	138	138	138	138	138	138	136	133	132	130	129	129	128	128	128
4	138	128	122	118	114	111	108	105	102	100	98.9	97.6	96.6	95.9	95.4	95.1	94.9	94.8
5	138	138	138	138	138	138	138	138	138	136	133	132	130	129	129	128	128	128
6	138	128	122	118	114	111	108	105	102	100	98.9	97.6	96.6	95.9	95.4	95.1	94.9	94.8
7	138	138	138	138	138	138	138	138	138	136	133	132	130	129	129	128	128	128
8	161	152	142	136	132	129	125	122	120	117	115	114	113	111	110	110	109	108
9	161	161	161	161	161	161	161	161	161	160	157	154	152	151	150	148	147	146
10	161	152	142	136	132	129	125	122	120	117	115	114	113	111	110	110	109	108
11	161	161	161	161	161	161	161	161	161	160	157	154	152	151	150	148	147	146
12	137	129	121	116	112	110	106	104	102	99.5	97.8	96.9	96.1	94.4	93.5	93.5	92.7	91.8
13	137	137	137	137	137	137	137	137	137	136	133	131	129	128	128	126	125	124
14	161	152	142	136	132	129	125	122	120	117	115	114	113	111	110	110	109	108
15	161	161	161	161	161	161	161	161	161	160	157	154	152	151	150	148	147	146
16	161	152	142	136	132	129	125	122	120	117	115	114	113	111	110	110	109	108
17	161	161	161	161	161	161	161	161	161	160	157	154	152	151	150	148	147	146
18	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184
19	184	175	169	165	161	158	155	153	150	148	146	144	143	141	140	139	138	137
20	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184
21	184	175	169	165	161	158	155	153	150	148	146	144	143	141	140	139	138	137
22	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184
23	184	175	169	165	161	158	155	153	150	148	146	144	143	141	140	139	138	137
24	217	217	217	217	215	212	209	206	204	201	199	197	194	192	191	189	187	186
25	217	217	217	217	215	212	209	206	204	201	199	197	194	192	191	189	187	186
26	217	217	217	217	215	212	209	206	204	201	199	197	194	192	191	189	187	186
27	217	217	217	217	217	217	217	217	217	207	205	204	202	201	199	197	196	194
28	217	217	217	217	217	217	217	217	217	207	205	204	202	201	199	197	196	194
29	236	236	236	236	236	234	232	230	228	226	224	222	221	219	217	215	213	212
30	236	236	236	236	236	234	232	230	228	226	224	222	221	219	217	215	213	212
31	236	236	236	236	236	234	232	230	228	226	224	222	221	219	217	215	213	212
32	236	236	236	236	236	234	232	230	228	226	224	222	221	219	217	215	213	212
33	201	201	201	201	201	199	197	195	194	192	190	189	188	186	185	183	182	180
34	201	201	201	201	201	199	197	195	194	192	191	189	188	186	185	183	181	180
35	197	197	197	...	194	...	188	...	183	...	180	178	177	175	174	172	170	...
36	197	182	170	...	161	...	155	...	150	...	145	142	140	139	137	137	137	...
37	197	197	197	...	194	...	188	...	183	...	180	178	177	175	174	172	170	...
38	197	182	170	...	161	...	155	...	150	...	145	142	140	139	137	137	137	...
39	197	197	197	...	194	...	188	...	183	...	180	178	177	175	174	172	170	...
40	197	182	170	...	161	...	155	...	150	...	145	142	140	139	137	137	137	...
41	197	197	197	...	194	...	188	...	183	...	180	178	177	175	174	172	170	...
42	197	182	170	...	161	...	155	...	150	...	145	142	140	139	137	137	137	...
43	167	167	167	...	165	...	160	...	156	...	153	151	150	149	148	146	144	...
44	167	154	144	...	137	...	132	...	128	...	123	121	119	118	117	116	116	...
45	197	197	197	...	194	...	188	...	183	...	180	178	177	175	174	172	170	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	128	128	*108*	*85.7*	*67.5*	*52.9*	*41.5*	*32.5*	*25.6*	*20.3*	*16.2*	*13.0*	*10.5*	*8.6*	*7.0*	*5.8*	*5.0*	
2	94.8	94.7	94.5	*85.7*	*67.5*	*52.9*	*41.5*	*32.5*	*25.6*	*20.3*	*16.2*	*13.0*	*10.5*	*8.6*	*7.0*	*5.8*	*5.0*	
3	128	128	*108*	*85.7*	*67.5*	*52.9*	*41.5*	*32.5*	*25.6*	*20.3*	*16.2*	*13.0*	*10.5*	*8.6*	*7.0*	*5.8*	*5.0*	
4	94.8	94.7	94.5	*85.7*	*67.5*	*52.9*	*41.5*	*32.5*	*25.6*	*20.3*	*16.2*	*13.0*	*10.5*	*8.6*	*7.0*	*5.8*	*5.0*	
5	128	128	*108*	*85.7*	*67.5*	*52.9*	*41.5*	*32.5*	*25.6*	*20.3*	*16.2*	*13.0*	*10.5*	*8.6*	*7.0*	*5.8*	*5.0*	
6	94.8	94.7	94.5	*85.7*	*67.5*	*52.9*	*41.5*	*32.5*	*25.6*	*20.3*	*16.2*	*13.0*	*10.5*	*8.6*	*7.0*	*5.8*	*5.0*	
7	128	128	*108*	*85.7*	*67.5*	*52.9*	*41.5*	*32.5*	*25.6*	*20.3*	*16.2*	*13.0*	*10.5*	*8.6*	*7.0*	*5.8*	*5.0*	
8	108	107	106	106	106	105	105	*101*	*81.0*	*64.1*	*50.4*	*39.5*	*31.3*	*24.6*	*19.4*	*15.3*	*12.3*	
9	145	144	144	144	143	142	*124*	*101*	*81.0*	*64.1*	*50.4*	*39.5*	*31.3*	*24.6*	*19.4*	*15.3*	*12.3*	
10	108	107	106	106	106	105	105	*101*	*81.0*	*64.1*	*50.4*	*39.5*	*31.3*	*24.6*	*19.4*	*15.3*	*12.3*	
11	145	144	144	144	143	142	*124*	*101*	*81.0*	*64.1*	*50.4*	*39.5*	*31.3*	*24.6*	*19.4*	*15.3*	*12.3*	
12	91.8	91.0	90.1	90.1	90.1	89.3	89.3	*85.9*	*68.9*	*54.5*	*42.8*	*33.6*	*26.6*	*20.9*	*16.5*	*13.0*	*10.5*	(**23**)
13	123	122	122	122	122	121	*105*	*85.9*	*68.9*	*54.5*	*42.8*	*33.6*	*26.6*	*20.9*	*16.5*	*13.0*	*10.5*	(**23**)
14	108	107	106	106	106	105	105	*101*	*81.0*	*64.1*	*50.4*	*39.5*	*31.3*	*24.6*	*19.4*	*15.3*	*12.3*	
15	145	144	144	144	143	142	*124*	*101*	*81.0*	*64.1*	*50.4*	*39.5*	*31.3*	*24.6*	*19.4*	*15.3*	*12.3*	
16	108	107	106	106	106	105	105	*101*	*81.0*	*64.1*	*50.4*	*39.5*	*31.3*	*24.6*	*19.4*	*15.3*	*12.3*	
17	145	144	144	144	143	142	*124*	*101*	*81.0*	*64.1*	*50.4*	*39.5*	*31.3*	*24.6*	*19.4*	*15.3*	*12.3*	
18	184	183	182	181	178	173	*136*	*105*	*84.3*	*63.6*	*50.2*	*39.3*	*30.3*	*23.4*	*16.5*	*12.5*	...	
19	136	135	135	134	134	133	133	*105*	*84.3*	*63.6*	*50.2*	*39.3*	*30.3*	*23.4*	*16.5*	*12.5*	...	
20	184	183	182	181	178	173	*136*	*105*	*84.3*	*63.6*	*50.2*	*39.3*	*30.3*	*23.4*	*16.5*	*12.5*	...	
21	136	135	135	134	134	133	133	*105*	*84.3*	*63.6*	*50.2*	*39.3*	*30.3*	*23.4*	*16.5*	*12.5*	...	
22	184	183	182	181	178	173	*136*	*105*	*84.3*	*63.6*	*50.2*	*39.3*	*30.3*	*23.4*	*16.5*	*12.5*	...	
23	136	135	135	134	134	133	133	*105*	*84.3*	*63.6*	*50.2*	*39.3*	*30.3*	*23.4*	*16.5*	*12.5*	...	
24	185	184	183	182	178	*137*	*88.8*	...	...	...	...	...	...	...	...	...	...	(**23**)
25	185	184	183	182	178	*137*	*88.9*	...	...	...	...	...	...	...	...	...	...	
26	185	184	183	182	178	*137*	*88.9*	...	...	...	...	...	...	...	...	...	...	
27	192	190	188	185	179	*137*	*88.9*	...	...	...	...	...	...	...	...	...	...	
28	192	190	188	185	179	*137*	*88.9*	...	...	...	...	...	...	...	...	...	...	
29	210	207	205	202	192	*136*	*89.0*	...	...	...	...	...	...	...	...	...	...	
30	210	207	205	202	192	*136*	*89.0*	...	...	...	...	...	...	...	...	...	...	
31	210	207	205	202	192	*136*	*89.0*	...	...	...	...	...	...	...	...	...	...	
32	210	207	205	202	192	*136*	*89.0*	...	...	...	...	...	...	...	...	...	...	
33	178	176	174	172	164	*116*	*75.5*	...	...	...	...	...	...	...	...	...	...	
34	178	176	174	172	164	*116*	*75.5*	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
1	Ni–Cr–Mo–W	Smls. pipe & tube	SB–622	...	N06686	Solution ann.
2	Ni–Cr–Mo–W	Wld. tube	SB–626	...	N06686	Solution ann.
3	Ni–Cr–Mo–W	Wld. tube	SB–626	...	N06686	Solution ann.
4	58Ni–29Cr–9Fe	Bar, rod	SB–166	...	N06690	Annealed
5	58Ni–29Cr–9Fe	Bar, rod	SB–166	...	N06690	Annealed
6	58Ni–29Cr–9Fe	Plate, sheet, strip	SB–168	...	N06690	Annealed
7	58Ni–29Cr–9Fe	Plate, sheet, strip	SB–168	...	N06690	Annealed
8	58Ni–29Cr–9Fe	Smls. pipe & tube	SB–167	...	N06690	Cold drawn/ann.
9	58Ni–29Cr–9Fe	Smls. pipe & tube	SB–167	...	N06690	Cold drawn/ann.
10	49Ni–25Cr–18Fe–6Mo	Plate, sheet, strip	SB–582	...	N06975	Solution ann.
11	49Ni–25Cr–18Fe–6Mo	Plate, sheet, strip	SB–582	...	N06975	Solution ann.
12	49Ni–25Cr–18Fe–6Mo	Wld. pipe	SB–619	...	N06975	Solution ann.
13	49Ni–25Cr–18Fe–6Mo	Wld. pipe	SB–619	...	N06975	Solution ann.
14	49Ni–25Cr–18Fe–6Mo	Smls. pipe & tube	SB–622	...	N06975	Solution ann.
15	49Ni–25Cr–18Fe–6Mo	Smls. pipe & tube	SB–622	...	N06975	Solution ann.
16	49Ni–25Cr–18Fe–6Mo	Wld. tube	SB–626	...	N06975	Solution ann.
17	49Ni–25Cr–18Fe–6Mo	Wld. tube	SB–626	...	N06975	Solution ann.
18	47Ni–22Cr–20Fe–7Mo	Rod	SB–581	...	N06985	Annealed
19	47Ni–22Cr–20Fe–7Mo	Rod	SB–581	...	N06985	Annealed
20	47Ni–22Cr–20Fe–7Mo	Plate, sheet, strip	SB–582	...	N06985	Annealed
21	47Ni–22Cr–20Fe–7Mo	Plate, sheet, strip	SB–582	...	N06985	Annealed
22	47Ni–22Cr–20Fe–7Mo	Smls. & wld. fittings	SB–366	...	N06985	Annealed
23	47Ni–22Cr–20Fe–7Mo	Rod	SB–581	...	N06985	Annealed
24	47Ni–22Cr–20Fe–7Mo	Rod	SB–581	...	N06985	Annealed
25	47Ni–22Cr–20Fe–7Mo	Plate, sheet, strip	SB–582	...	N06985	Annealed
26	47Ni–22Cr–20Fe–7Mo	Plate, sheet, strip	SB–582	...	N06985	Annealed
27	47Ni–22Cr–20Fe–7Mo	Wld. pipe	SB–619	...	N06985	Annealed
28	47Ni–22Cr–20Fe–7Mo	Wld. pipe	SB–619	...	N06985	Annealed
29	47Ni–22Cr–20Fe–7Mo	Smls. pipe & tube	SB–622	...	N06985	Annealed
30	47Ni–22Cr–20Fe–7Mo	Smls. pipe & tube	SB–622	...	N06985	Annealed
31	47Ni–22Cr–20Fe–7Mo	Wld. tube	SB–626	...	N06985	Annealed
32	47Ni–22Cr–20Fe–7Mo	Wld. tube	SB–626	...	N06985	Annealed
33	35Ni–35Fe–20Cr–Cb	Forgings	SB–462	...	N08020	Annealed
34	35Ni–35Fe–20Cr–Cb	Forgings	SB–462	...	N08020	Annealed
35	35Ni–35Fe–20Cr–Cb	Plate	SB–463	...	N08020	Annealed
36	35Ni–35Fe–20Cr–Cb	Plate	SB–463	...	N08020	Annealed
37	35Ni–35Fe–20Cr–Cb	Bar	SB–473	...	N08020	Annealed
38	35Ni–35Fe–20Cr–Cb	Bar	SB–473	...	N08020	Annealed
39	35Ni–35Fe–20Cr–Cb	Smls. pipe & tube	SB–729	...	N08020	Annealed
40	35Ni–35Fe–20Cr–Cb	Smls. pipe & tube	SB–729	...	N08020	Annealed
41	35Ni–35Fe–20Cr–Cb	Wld. pipe	SB–464	...	N08020	Wld. ann.
42	35Ni–35Fe–20Cr–Cb	Wld. pipe	SB–464	...	N08020	Wld. ann.
43	35Ni–35Fe–20Cr–Cb	Wld. pipe	SB–464	...	N08020	Wld. ann.
44	35Ni–35Fe–20Cr–Cb	Wld. tube	SB–468	...	N08020	Wld. ann.
45	35Ni–35Fe–20Cr–Cb	Wld. tube	SB–468	...	N08020	Wld. ann.

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	43	689	310	NP	NP	427	NP	NFN–10	...
2	≤88.9	43	689	310	NP	NP	427	NP	NFN–10	G5, G14
3	≤88.9	43	689	310	NP	NP	427	NP	NFN–10	G14
4	...	43	585	240	NP	NP	454	343	NFN–4	...
5	...	43	585	240	NP	NP	454	343	NFN–4	G5
6	...	43	585	240	NP	NP	454	343	NFN–4	...
7	...	43	585	240	NP	NP	454	343	NFN–4	G5
8	...	43	585	240	649	NP	454	343	NFN–4	H3, T12
9	...	43	585	240	649	NP	454	343	NFN–4	G5, H3, T11
10	...	45	585	220	NP	NP	427	343	NFN–11	...
11	...	45	585	220	NP	NP	427	343	NFN–11	G5
12	...	45	585	220	NP	NP	427	343	NFN–11	G14
13	...	45	585	220	NP	NP	427	343	NFN–11	G5, G14
14	...	45	585	220	NP	NP	427	343	NFN–11	...
15	...	45	585	220	NP	NP	427	343	NFN–11	G5
16	...	45	585	220	NP	NP	427	343	NFN–11	G14
17	...	45	585	220	NP	NP	427	343	NFN–11	G5, G14
18	>19	45	585	205	NP	NP	427	343	NFN–19	...
19	>19	45	585	205	NP	NP	427	343	NFN–19	G5
20	>19	45	585	205	NP	NP	427	343	NFN–19	...
21	>19	45	585	205	NP	NP	427	343	NFN–19	G5
22	...	45	620	240	NP	NP	427	343	NFN–18	G5, W12
23	≤19	45	620	240	NP	NP	427	343	NFN–18	...
24	≤19	45	620	240	NP	NP	427	343	NFN–18	G5
25	≤19	45	620	240	NP	NP	427	343	NFN–18	...
26	≤19	45	620	240	NP	NP	427	343	NFN–18	G5
27	...	45	620	240	NP	NP	427	343	NFN–18	G14
28	...	45	620	240	NP	NP	427	343	NFN–18	G5, G14
29	...	45	620	240	NP	NP	427	343	NFN–18	...
30	...	45	620	240	NP	NP	427	343	NFN–18	G5
31	...	45	620	240	NP	NP	427	343	NFN–18	G14
32	...	45	620	240	NP	NP	427	343	NFN–18	G5, G14
33	...	45	550	240	NP	427	427	343	NFN–12	G5
34	...	45	550	240	NP	NP	427	343	NFN–12	...
35	...	45	550	240	NP	NP	427	343	NFN–12	...
36	...	45	550	240	NP	427	427	343	NFN–12	G5
37	...	45	550	240	NP	427	427	343	NFN–12	G5
38	...	45	550	240	NP	NP	427	343	NFN–12	...
39	...	45	550	240	NP	NP	427	343	NFN–12	...
40	...	45	550	240	NP	NP	427	343	NFN–12	G5
41	...	45	550	240	NP	427	NP	NP	NFN–12	G5, W5
42	...	45	550	240	NP	NP	427	343	NFN–12	G14
43	...	45	550	240	NP	NP	427	343	NFN–12	G5, G14
44	...	45	550	240	NP	427	NP	NP	NFN–12	G5, W5
45	...	45	550	240	NP	NP	427	343	NFN–12	G14

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	197	182	170	...	161	...	155	...	150	...	145	142	140	139	137	137	137	...
2	167	167	167	...	165	...	160	...	156	...	153	151	150	149	148	146	144	...
3	167	154	144	...	137	...	132	...	128	...	123	121	119	118	117	116	116	...
4	161	153	144	140	137	134	132	130	129	128	127	127	127	127	127	127	127	127
5	161	161	161	161	161	161	161	160	160	159	158	158	158	157	156	156	155	155
6	161	153	144	140	137	134	132	130	129	128	127	127	127	127	127	127	127	127
7	161	161	161	161	161	161	161	160	160	159	158	158	158	157	156	156	155	155
8	161	151	144	140	137	134	132	130	129	128	127	127	127	127	127	127	127	127
9	161	161	161	161	161	161	161	160	159	159	158	158	158	157	157	156	155	154
10	147	140	133	130	127	124	121	118	115	112	109	107	105	103	102	101	101	...
11	147	147	147	147	147	147	147	147	147	147	146	145	141	139	138	137	135	...
12	125	119	114	111	108	106	103	100	97.6	95.1	92.9	91.0	89.1	87.4	86.9	86.2	85.6	...
13	125	125	125	125	125	125	125	125	125	125	124	123	120	118	117	116	115	...
14	147	140	133	130	127	124	121	118	115	112	109	107	105	103	102	101	101	...
15	147	147	147	147	147	147	147	147	147	147	146	145	141	139	138	137	135	...
16	125	119	114	111	108	106	103	100	97.6	95.1	92.9	91.0	89.1	87.4	86.9	86.2	85.6	...
17	125	125	125	125	125	125	125	125	125	125	124	123	120	118	117	116	115	...
18	138	130	121	116	111	107	103	100	97.0	94.2	91.7	89.6	87.7	86.0	84.7	82.9	81.0	...
19	138	138	138	138	138	138	138	136	132	127	124	121	119	116	114	112	110	...
20	138	130	121	116	111	107	103	100	97.0	94.2	91.7	89.6	87.7	86.0	84.7	82.9	81.0	...
21	138	138	138	138	138	138	138	136	132	127	124	121	119	116	114	112	110	...
22	161	161	161	161	161	161	161	158	153	148	145	142	138	135	133	130	128	...
23	161	152	142	135	130	125	121	117	113	110	107	104	102	100	98.5	96.6	94.8	...
24	161	161	161	161	161	161	161	158	153	148	145	142	138	135	133	130	128	...
25	161	152	142	135	130	125	121	117	113	110	107	104	102	100	98.5	96.6	94.8	...
26	161	161	161	161	161	161	161	158	153	148	145	142	138	135	133	130	128	...
27	137	129	121	115	111	107	103	99.3	96.3	93.5	91.0	88.9	87.1	85.2	83.4	82.1	80.9	...
28	137	137	137	137	137	137	137	135	130	126	123	120	117	115	113	111	109	...
29	161	152	142	135	130	125	121	117	113	110	107	104	102	100	98.5	96.6	94.8	...
30	161	161	161	161	161	161	161	158	153	148	145	142	138	135	133	130	128	...
31	137	129	121	115	111	107	103	99.3	96.3	93.5	91.0	88.9	87.1	85.2	83.4	82.1	80.9	...
32	137	137	137	137	137	137	137	135	130	126	123	120	117	115	113	111	109	...
33	158	158	158	157	156	154	153	153	152	152	152	152	152	151	150	150	150	...
34	158	149	141	138	136	133	131	128	126	124	123	122	120	120	119	116	114	...
35	158	149	141	138	136	133	131	128	126	124	123	122	120	120	119	116	114	...
36	158	158	158	157	156	154	153	153	152	152	152	152	152	151	150	150	150	...
37	158	158	158	157	156	154	153	153	152	152	152	152	152	151	150	150	150	...
38	158	149	141	138	136	133	131	128	126	124	123	122	120	120	119	116	114	...
39	158	149	141	138	136	133	131	128	126	124	123	122	120	120	119	116	114	...
40	158	158	158	157	156	154	153	153	152	152	152	152	152	151	150	150	150	...
41	158	158	158	157	156	154	153	153	152	152	152	152	152	151	150	150	150	...
42	134	127	120	117	115	113	111	109	108	106	104	103	103	102	101	98.7	96.9	...
43	134	134	134	133	132	131	130	130	130	130	130	129	129	128	128	128	128	...
44	158	158	158	157	156	154	153	153	152	152	152	152	152	151	150	150	150	...
45	134	127	120	117	115	113	111	109	108	106	104	103	103	102	101	98.7	96.9	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	126	*95.0*	*71.4*	*54.3*	*41.4*	*30.6*	*19.7*	...	...	...	...	...	...	...	...	...	...
9	*127*	*95.0*	*71.4*	*54.3*	*41.4*	*30.6*	*19.7*	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	1	35Ni–35Fe–20Cr–Cb	Wld. tube	SB–468	...	N08020	Wld. ann.
(**23**)	2	35Ni–35Fe–20Cr–Cb	Smls. & wld. fittings	SB–366	...	N08020	Annealed
	3	37Ni–33Fe–23Cr–4Mo–Cu	Wld. pipe	SB–464	...	N08024	Wld. ann.
	4	37Ni–33Fe–23Cr–4Mo–Cu	Wld. pipe	SB–464	...	N08024	Wld. ann.
	5	37Ni–33Fe–23Cr–4Mo–Cu	Wld. tube	SB–468	...	N08024	Wld. ann.
	6	37Ni–33Fe–23Cr–4Mo–Cu	Wld. tube	SB–468	...	N08024	Wld. ann.
	7	35Ni–30Fe–24Cr–6Mo–Cu	Wld. pipe	SB–464	...	N08026	Wld. ann.
	8	35Ni–30Fe–24Cr–6Mo–Cu	Wld. pipe	SB–464	...	N08026	Wld. ann.
	9	35Ni–30Fe–24Cr–6Mo–Cu	Wld. tube	SB–468	...	N08026	Wld. ann.
	10	35Ni–30Fe–24Cr–6Mo–Cu	Wld. tube	SB–468	...	N08026	Wld. ann.
	11	31Ni–31Fe–29Cr–Mo	Smls. tube	SB–668	...	N08028	Annealed
	12	31Ni–31Fe–29Cr–Mo	Smls. tube	SB–668	...	N08028	Annealed
	13	31Ni–31Fe–29Cr–Mo	Plate, sheet, strip	SB–709	...	N08028	Annealed
	14	31Ni–31Fe–29Cr–Mo	Plate, sheet, strip	SB–709	...	N08028	Annealed
	15	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Smls. & wld. fittings	SB–366	...	N08031	Solution ann.
	16	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Forged fittings	SB–462	...	N08031	Solution ann.
	17	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Forged fittings	SB–462	...	N08031	Solution ann.
	18	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Forgings	SB–564	...	N08031	Solution ann.
	19	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Forgings	SB–564	...	N08031	Solution ann.
	20	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Rod	SB–581	...	N08031	Solution ann.
	21	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Rod	SB–581	...	N08031	Solution ann.
	22	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Wld. pipe	SB–619	...	N08031	Solution ann.
	23	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Wld. pipe	SB–619	...	N08031	Solution ann.
	24	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Smls. pipe & tube	SB–622	...	N08031	Solution ann.
	25	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Smls. pipe & tube	SB–622	...	N08031	Solution ann.
	26	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Plate, sheet, strip	SB–625	...	N08031	Solution ann.
	27	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Plate, sheet, strip	SB–625	...	N08031	Solution ann.
	28	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Wld. tube	SB–626	...	N08031	Solution ann.
	29	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Wld. tube	SB–626	...	N08031	Solution ann.
	30	37Ni–33Fe–25Cr	Condenser tubes	SB–163	...	N08120	Solution ann.
	31	37Ni–33Fe–25Cr	Condenser tubes	SB–163	...	N08120	Solution ann.
	32	37Ni–33Fe–25Cr	Smls. & wld. fittings	SB–366	...	N08120	Solution ann.
	33	37Ni–33Fe–25Cr	Smls. pipe & tube	SB–407	...	N08120	Solution ann.
	34	37Ni–33Fe–25Cr	Smls. pipe & tube	SB–407	...	N08120	Solution ann.
	35	37Ni–33Fe–25Cr	Bar, rod	SB–408	...	N08120	Solution ann.
	36	37Ni–33Fe–25Cr	Bar, rod	SB–408	...	N08120	Solution ann.
	37	37Ni–33Fe–25Cr	Plate, sheet, strip	SB–409	...	N08120	Solution ann.
	38	37Ni–33Fe–25Cr	Plate, sheet, strip	SB–409	...	N08120	Solution ann.
	39	37Ni–33Fe–25Cr	Wld. pipe	SB–514	...	N08120	Solution ann.
	40	37Ni–33Fe–25Cr	Wld. pipe	SB–514	...	N08120	Solution ann.
	41	37Ni–33Fe–25Cr	Wld. tube	SB–515	...	N08120	Solution ann.
	42	37Ni–33Fe–25Cr	Wld. tube	SB–515	...	N08120	Solution ann.
	43	37Ni–33Fe–25Cr	Forgings	SB–564	...	N08120	Solution ann.
	44	37Ni–33Fe–25Cr	Forgings	SB–564	...	N08120	Solution ann.
	45	26Ni–43Fe–22Cr–5Mo	Wld. pipe	SB–619	...	N08320	Solution ann.

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	...	45	550	240	NP	NP	427	343	NFN–12	G5, G14
2	...	45	585	275	NP	427	427	343	NFN–12	G5, W5, W12
3	...	45	550	240	NP	NP	NP	343	NFN–13	G14
4	...	45	550	240	NP	NP	NP	343	NFN–13	G5, G14
5	...	45	550	240	NP	NP	NP	343	NFN–13	G14
6	...	45	550	240	NP	NP	NP	343	NFN–13	G5, G14
7	...	45	550	240	NP	NP	NP	343	NFN–13	G14
8	...	45	550	240	NP	NP	NP	343	NFN–13	G5, G14
9	...	45	550	240	NP	NP	NP	343	NFN–13	G14
10	...	45	550	240	NP	NP	NP	343	NFN–13	G5, G14
11	...	45	505	215	NP	316	454	343	NFN–13	...
12	...	45	505	215	NP	316	454	343	NFN–13	G5
13	...	45	505	215	NP	NP	454	343	NFN–13	...
14	...	45	505	215	NP	NP	454	343	NFN–13	G5
15	...	45	650	275	NP	NP	427	NP	NFN–11	G5, W12
16	...	45	650	275	NP	NP	427	NP	NFN–11	...
17	...	45	650	275	NP	NP	427	NP	NFN–11	G5
18	...	45	650	275	NP	NP	427	NP	NFN–11	...
19	...	45	650	275	NP	NP	427	NP	NFN–11	G5
20	...	45	650	275	NP	NP	427	NP	NFN–11	...
21	...	45	650	275	NP	NP	427	NP	NFN–11	G5
22	...	45	650	275	NP	NP	427	NP	NFN–11	G14
23	...	45	650	275	NP	NP	427	NP	NFN–11	G5, G14
24	...	45	650	275	NP	NP	427	NP	NFN–11	...
25	...	45	650	275	NP	NP	427	NP	NFN–11	G5
26	...	45	650	275	NP	NP	427	NP	NFN–11	...
27	...	45	650	275	NP	NP	427	NP	NFN–11	G5
28	...	45	650	275	NP	NP	427	NP	NFN–11	G14
29	...	45	650	275	NP	NP	427	NP	NFN–11	G5, G14
30	...	45	621	276	NP	NP	899	NP	NFN–9	G4, G14, T16
31	...	45	621	276	NP	NP	899	NP	NFN–9	G4, G5, G14, T15
32	...	45	621	276	NP	NP	899	NP	NFN–9	G4, G5, T15, W12
33	...	45	621	276	NP	NP	899	NP	NFN–9	G4, T16
34	...	45	621	276	NP	NP	899	NP	NFN–9	G4, G5, T15
35	...	45	621	276	NP	NP	899	NP	NFN–9	G4, T16
36	...	45	621	276	NP	NP	899	NP	NFN–9	G4, G5, T15
37	...	45	621	276	NP	NP	899	NP	NFN–9	G4, T16
38	...	45	621	276	NP	NP	899	NP	NFN–9	G4, G5, T15
39	...	45	621	276	NP	NP	899	NP	NFN–9	G4, G14, T16
40	...	45	621	276	NP	NP	899	NP	NFN–9	G4, G5, G14, T15
41	...	45	621	276	NP	NP	899	NP	NFN–9	G4, G14, T16
42	...	45	621	276	NP	NP	899	NP	NFN–9	G4, G5, G14, T15
43	...	45	621	276	NP	NP	899	NP	NFN–9	G4, T16
44	...	45	621	276	NP	NP	899	NP	NFN–9	G4, G5, T15
45	...	45	515	195	NP	NP	427	343	NFN–13	G14

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	134	134	134	133	132	131	130	130	130	130	130	129	129	128	128	128	128	...
2	158	158	158	157	156	154	153	153	152	152	152	152	152	151	150	150	150	...
3	134	127	119	115	112	109	107	104	101	98.3	95.5	92.8	90.5	88.6	86.8	85.6	84.3	...
4	134	134	134	133	132	131	129	127	126	125	123	122	120	119	117	115	113	...
5	134	127	119	115	112	109	107	104	101	98.3	95.5	92.8	90.5	88.6	86.8	85.6	84.3	...
6	134	134	134	133	132	131	129	127	126	125	123	122	120	119	117	115	113	...
7	134	128	120	115	111	107	103	99.8	96.4	93.4	91.0	88.9	87.1	85.2	83.4	82.1	80.9	...
8	134	134	134	133	132	130	128	126	125	123	122	120	117	115	112	110	109	...
9	134	128	120	115	111	107	103	99.8	96.4	93.4	91.0	88.9	87.1	85.2	83.4	82.1	80.9	...
10	134	134	134	133	132	130	128	126	125	123	122	120	117	115	112	110	109	...
11	143	136	129	125	122	118	114	111	107	104	101	98.3	95.9	93.3	90.2	88.4	86.0	83.4
12	143	143	143	141	138	136	133	131	130	128	126	125	124	122	121	119	116	113
13	143	136	129	125	122	118	114	111	107	104	101	98.3	95.9	93.3	90.2	88.4	86.0	83.4
14	143	143	143	141	138	136	133	131	130	128	126	125	124	122	121	119	116	113
15	184	184	184	181	178	174	170	166	162	159	155	152	149	146	144	142	139	...
16	184	167	149	142	136	131	127	123	120	117	115	112	111	109	107	105	103	...
17	184	184	184	181	178	174	170	166	162	159	155	152	149	146	144	142	139	...
18	184	167	149	142	136	131	127	123	120	117	115	112	111	109	107	105	103	...
19	184	184	184	181	178	174	170	166	162	159	155	152	149	146	144	142	139	...
20	184	167	149	142	136	131	127	123	120	117	115	112	111	109	107	105	103	...
21	184	184	184	181	178	174	170	166	162	159	155	152	149	146	144	142	139	...
22	157	142	127	121	115	112	108	105	102	99.7	97.0	95.4	94.0	92.2	90.9	89.1	87.2	...
23	157	157	156	154	151	147	144	141	138	135	132	129	126	125	123	120	118	...
24	184	167	149	142	136	131	127	123	120	117	115	112	111	109	107	105	103	...
25	184	184	184	181	178	174	170	166	162	159	155	152	149	146	144	142	139	...
26	184	167	149	142	136	131	127	123	120	117	115	112	111	109	107	105	103	...
27	184	184	184	181	178	174	170	166	162	159	155	152	149	146	144	142	139	...
28	157	142	127	121	115	112	108	105	102	99.7	97.0	95.4	94.0	92.2	90.9	89.1	87.2	...
29	157	157	156	154	151	147	144	141	138	135	132	129	126	125	123	120	118	...
30	177	172	162	155	149	143	138	134	130	126	123	121	119	117	116	115	114	113
31	177	177	177	176	173	170	167	166	164	163	162	162	161	158	157	155	154	153
32	177	177	177	176	173	170	167	166	164	163	162	162	161	158	157	155	154	153
33	177	172	162	155	149	143	138	134	130	126	123	121	119	117	116	115	114	113
34	177	177	177	176	173	170	167	166	164	163	162	162	161	158	157	155	154	153
35	177	172	162	155	149	143	138	134	130	126	123	121	119	117	116	115	114	113
36	177	177	177	176	173	170	167	166	164	163	162	162	161	158	157	155	154	153
37	177	172	162	155	149	143	138	134	130	126	123	121	119	117	116	115	114	113
38	177	177	177	176	173	170	167	166	164	163	162	162	161	158	157	155	154	153
39	150	146	138	132	127	122	117	114	111	107	105	103	101	99.5	98.6	97.8	96.9	96.1
40	150	150	150	150	147	145	142	141	139	139	138	138	137	134	133	132	131	130
41	150	146	138	132	127	122	117	114	111	107	105	103	101	99.5	98.6	97.8	96.9	96.1
42	150	150	150	150	147	145	142	141	139	139	138	138	137	134	133	132	131	130
43	177	172	162	155	149	143	138	134	130	126	123	121	119	117	116	115	114	113
44	177	177	177	176	173	170	167	166	164	163	162	162	161	158	157	155	154	153
45	110	105	101	98.0	95.7	93.3	90.8	88.2	85.7	83.6	81.8	79.9	78.2	77.0	75.8	74.5	73.3	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	113	113	112	112	112	*96.2*	*79.3*	*65.6*	*54.4*	*45.0*	*37.2*	*30.6*	*25.1*	*20.5*	*16.5*	*13.0*	*9.8*
31	153	152	152	143	*117*	*96.2*	*79.3*	*65.6*	*54.4*	*45.0*	*37.2*	*30.6*	*25.1*	*20.5*	*16.5*	*13.0*	*9.8*
32	153	152	152	143	*117*	*96.2*	*79.3*	*65.6*	*54.4*	*45.0*	*37.2*	*30.6*	*25.1*	*20.5*	*16.5*	*13.0*	*9.8*
33	113	113	112	112	112	*96.2*	*79.3*	*65.6*	*54.4*	*45.0*	*37.2*	*30.6*	*25.1*	*20.5*	*16.5*	*13.0*	*9.8*
34	153	152	152	143	*117*	*96.2*	*79.3*	*65.6*	*54.4*	*45.0*	*37.2*	*30.6*	*25.1*	*20.5*	*16.5*	*13.0*	*9.8*
35	113	113	112	112	112	*96.2*	*79.3*	*65.6*	*54.4*	*45.0*	*37.2*	*30.6*	*25.1*	*20.5*	*16.5*	*13.0*	*9.8*
36	153	152	152	143	*117*	*96.2*	*79.3*	*65.6*	*54.4*	*45.0*	*37.2*	*30.6*	*25.1*	*20.5*	*16.5*	*13.0*	*9.8*
37	113	113	112	112	112	*96.2*	*79.3*	*65.6*	*54.4*	*45.0*	*37.2*	*30.6*	*25.1*	*20.5*	*16.5*	*13.0*	*9.8*
38	153	152	152	143	*117*	*96.2*	*79.3*	*65.6*	*54.4*	*45.0*	*37.2*	*30.6*	*25.1*	*20.5*	*16.5*	*13.0*	*9.8*
39	96.1	96.1	95.2	95.2	95.2	*81.8*	*67.4*	*55.8*	*46.2*	*38.3*	*31.6*	*26.0*	*21.3*	*17.4*	*14.0*	*11.1*	*8.33*
40	130	129	129	122	*99.5*	*81.8*	*67.4*	*55.8*	*46.2*	*38.3*	*31.6*	*26.0*	*21.3*	*17.4*	*14.0*	*11.1*	*8.33*
41	96.1	96.1	95.2	95.2	95.2	*81.8*	*67.4*	*55.8*	*46.2*	*38.3*	*31.6*	*26.0*	*21.3*	*17.4*	*14.0*	*11.1*	*8.33*
42	130	129	129	122	*99.5*	*81.8*	*67.4*	*55.8*	*46.2*	*38.3*	*31.6*	*26.0*	*21.3*	*17.4*	*14.0*	*11.1*	*8.33*
43	113	113	112	112	112	*96.2*	*79.3*	*65.6*	*54.4*	*45.0*	*37.2*	*30.6*	*25.1*	*20.5*	*16.5*	*13.0*	*9.8*
44	153	152	152	143	*117*	*96.2*	*79.3*	*65.6*	*54.4*	*45.0*	*37.2*	*30.6*	*25.1*	*20.5*	*16.5*	*13.0*	*9.8*
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
1	26Ni–43Fe–22Cr–5Mo	Wld. pipe	SB–619	...	N08320	Solution ann.
2	26Ni–43Fe–22Cr–5Mo	Plate, sheet, strip	SB–620	...	N08320	Solution ann.
3	26Ni–43Fe–22Cr–5Mo	Plate, sheet, strip	SB–620	...	N08320	Solution ann.
4	26Ni–43Fe–22Cr–5Mo	Rod	SB–621	...	N08320	Solution ann.
5	26Ni–43Fe–22Cr–5Mo	Rod	SB–621	...	N08320	Solution ann.
6	26Ni–43Fe–22Cr–5Mo	Smls. pipe & tube	SB–622	...	N08320	Solution ann.
7	26Ni–43Fe–22Cr–5Mo	Smls. pipe & tube	SB–622	...	N08320	Solution ann.
8	26Ni–43Fe–22Cr–5Mo	Wld. tube	SB–626	...	N08320	Solution ann.
9	26Ni–43Fe–22Cr–5Mo	Wld. tube	SB–626	...	N08320	Solution ann.
10	35Ni–19Cr–1 1/4Si	Bar	SB–511	...	N08330	...
11	35Ni–19Cr–1 1/4Si	Bar	SB–511	...	N08330	...
12	35Ni–19Cr–1 1/4Si	Bar	SB–511	...	N08330	...
13	35Ni–19Cr–1 1/4Si	Bar	SB–511	...	N08330	...
14	35Ni–19Cr–1 1/4Si	Pipe	SB–535	...	N08330	...
15	35Ni–19Cr–1 1/4Si	Pipe	SB–535	...	N08330	...
16	35Ni–19Cr–1 1/4Si	Plate	SB–536	...	N08330	...
17	35Ni–19Cr–1 1/4Si	Plate	SB–536	...	N08330	...
18	35Ni–19Cr–1 1/4Si	Smls. & wld. fittings	SB–366	...	N08330	Annealed
19	35Ni–19Cr–1 1/4Si	Smls. & wld. pipe	SB–535	...	N08330	Annealed
20	35Ni–19Cr–1 1/4Si	Smls. & wld. pipe	SB–535	...	N08330	Annealed
21	35Ni–19Cr–1 1/4Si	Plate, sheet, strip	SB–536	...	N08330	Annealed
22	35Ni–19Cr–1 1/4Si	Plate, sheet, strip	SB–536	...	N08330	Annealed
23	35Ni–19Cr–1 1/4Si	Wld. pipe	SB–710	...	N08330	Annealed
24	35Ni–19Cr–1 1/4Si	Wld. pipe	SB–710	...	N08330	Annealed
25	35Ni–23Cr–7.5Mo–N	Plate, sheet, strip	SB–625	...	N08354	Solution ann.
26	35Ni–23Cr–7.5Mo–N	Plate, sheet, strip	SB–625	...	N08354	Solution ann.
(**23**) 27	35Ni–23Cr–7.5Mo–N	Bar, wire	SB–649	...	N08354	Solution ann.
28	35Ni–23Cr–7.5Mo–N	Bar, wire	SB–649	...	N08354	Solution ann.
29	35Ni–23Cr–7.5Mo–N	Wld. pipe	SB–673	...	N08354	Solution ann.
30	35Ni–23Cr–7.5Mo–N	Wld. pipe	SB–673	...	N08354	Solution ann.
31	35Ni–23Cr–7.5Mo–N	Wld. tube	SB–674	...	N08354	Solution ann.
32	35Ni–23Cr–7.5Mo–N	Wld. tube	SB–674	...	N08354	Solution ann.
33	35Ni–23Cr–7.5Mo–N	Smls. pipe & tube	SB–677	...	N08354	Solution ann.
34	35Ni–23Cr–7.5Mo–N	Smls. pipe & tube	SB–677	...	N08354	Solution ann.
35	46Fe–24Ni–21Cr–6Mo–N	Smls. & wld. fittings	SB–366	...	N08367	Solution ann.
36	46Fe–24Ni–21Cr–6Mo–N	Forgings	SB–462	...	N08367	Solution ann.
37	46Fe–24Ni–21Cr–6Mo–N	Forgings	SB–462	...	N08367	Solution ann.
38	46Fe–24Ni–21Cr–6Mo–N	Forgings	SB–564	...	N08367	Solution ann.
39	46Fe–24Ni–21Cr–6Mo–N	Forgings	SB–564	...	N08367	Solution ann.
40	46Fe–24Ni–21Cr–6Mo–N	Wld. pipe	SB–675	...	N08367	Solution ann.
41	46Fe–24Ni–21Cr–6Mo–N	Wld. pipe	SB–675	...	N08367	Solution ann.
42	46Fe–24Ni–21Cr–6Mo–N	Wld. tube	SB–676	...	N08367	Solution ann.
43	46Fe–24Ni–21Cr–6Mo–N	Wld. tube	SB–676	...	N08367	Solution ann.
44	46Fe–24Ni–21Cr–6Mo–N	Plate, sheet, strip	SB–688	...	N08367	Solution ann.
45	46Fe–24Ni–21Cr–6Mo–N	Plate, sheet, strip	SB–688	...	N08367	Solution ann.

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	...	45	515	195	NP	NP	427	343	NFN–13	G5, G14
2	...	45	515	195	NP	NP	427	343	NFN–13	...
3	...	45	515	195	NP	NP	427	343	NFN–13	G5
4	...	45	515	195	NP	NP	427	343	NFN–13	...
5	...	45	515	195	NP	NP	427	343	NFN–13	G5
6	...	45	515	195	NP	NP	427	343	NFN–13	...
7	...	45	515	195	NP	NP	427	343	NFN–13	G5
8	...	45	515	195	NP	NP	427	343	NFN–13	G14
9	...	45	515	195	NP	NP	427	343	NFN–13	G5, G14
10	...	46	690	205	816	NP	NP	NP	NFN–13	G2, H2, T14
11	...	46	485	205	816	NP	NP	NP	NFN–13	G2, G5, H2, T12
12	...	46	485	205	NP	NP	899	343	NFN–13	G4, H1, T14
13	...	46	485	205	NP	NP	899	343	NFN–13	G4, G5, H1, T12
14	...	46	485	205	816	NP	NP	NP	NFN–13	G2, H2, T14
15	...	46	485	205	816	NP	NP	NP	NFN–13	G2, G5, H2, T12
16	...	46	485	205	816	NP	NP	NP	NFN–13	G2, H2, T14
17	...	46	485	205	816	NP	NP	NP	NFN–13	G2, G5, H2, T12
18	...	46	485	205	NP	NP	899	343	NFN–13	G4, G5, T12, W12
19	...	46	485	205	NP	NP	816	343	NFN–13	H1, T14, W12
20	...	46	485	205	NP	NP	816	343	NFN–13	G5, H1, T12, W12
21	...	46	485	205	NP	NP	899	343	NFN–13	G4, H1, T14
22	...	46	485	205	NP	NP	899	343	NFN–13	G4, G5, H1, T12
23	...	46	485	205	NP	NP	899	343	NFN–13	G4, G14, H1, T14
24	...	46	485	205	NP	NP	899	343	NFN–13	G4, G5, G14, H1, T12
25	...	45	640	295	NP	NP	427	NP	HA–6	...
26	...	45	640	295	NP	NP	427	NP	HA–6	G5
27	...	45	640	295	NP	NP	427	NP	HA–6	...
28	...	45	640	295	NP	NP	427	NP	HA–6	G5
29	...	45	640	295	NP	NP	427	NP	HA–6	G14
30	...	45	640	295	NP	NP	427	NP	HA–6	G5, G14
31	...	45	640	295	NP	NP	427	NP	HA–6	G14
32	...	45	640	295	NP	NP	427	NP	HA–6	G5, G14
33	...	45	640	295	NP	NP	427	NP	HA–6	...
34	...	45	640	295	NP	NP	427	NP	HA–6	G5
35	>5	45	655	310	NP	427	427	NP	NFN–12	G5, W5, W12
36	...	45	655	310	NP	427	427	343	NFN–12	...
37	...	45	655	310	NP	427	427	343	NFN–12	G5
38	...	45	655	310	NP	427	427	343	NFN–12	...
39	...	45	655	310	NP	427	427	343	NFN–12	G5
40	>5	45	655	310	NP	427	427	343	NFN–12	G14
41	>5	45	655	310	NP	427	427	343	NFN–12	G5, G14
42	>5	45	655	310	NP	427	427	343	NFN–12	G14
43	>5	45	655	310	NP	427	427	343	NFN–12	G5, G14
44	>5	45	655	310	NP	427	427	343	NFN–12	...
45	>5	45	655	310	NP	427	427	343	NFN–12	G5

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	110	110	110	110	110	110	110	110	110	109	109	108	106	104	103	101	98.9	...
2	129	124	118	115	112	109	107	104	101	98.5	96.4	94.4	92.5	90.8	89.6	87.7	85.8	...
3	129	129	129	129	129	129	129	129	129	129	128	127	125	122	121	119	117	...
4	129	124	118	115	112	109	107	104	101	98.5	96.4	94.4	92.5	90.8	89.6	87.7	85.8	...
5	129	129	129	129	129	129	129	129	129	129	128	127	125	122	121	119	117	...
6	129	124	118	115	112	109	107	104	101	98.5	96.4	94.4	92.5	90.8	89.6	87.7	85.8	...
7	129	129	129	129	129	129	129	129	129	129	128	127	125	122	121	119	117	...
8	110	105	101	98.0	95.7	93.3	90.8	88.2	85.7	83.6	81.8	79.9	78.2	77.0	75.8	74.5	73.3	...
9	110	110	110	110	110	110	110	110	110	109	109	108	106	104	103	101	98.9	...
10	138	130	121	116	113	110	107	105	102	100	97.8	95.8	94.0	92.1	90.3	89.0	87.2	85.9
11	138	138	138	138	138	137	135	134	134	133	132	129	127	124	122	120	118	116
12	138	130	121	116	113	110	107	105	102	100	97.8	95.8	94.0	92.1	90.3	89.0	87.2	85.9
13	138	138	138	138	138	137	135	134	134	133	132	129	127	124	122	120	118	116
14	138	130	121	116	113	110	107	105	102	100	97.8	95.8	94.0	92.1	90.3	89.0	87.2	85.9
15	138	138	138	138	138	137	135	134	134	133	132	129	127	124	122	120	118	116
16	138	130	121	116	113	110	107	105	102	100	97.8	95.8	94.0	92.1	90.3	89.0	87.2	85.9
17	138	138	138	138	138	137	135	134	134	133	132	129	127	124	122	120	118	116
18	138	138	138	138	138	137	135	134	134	133	132	129	127	124	122	120	118	116
19	138	130	121	116	113	110	107	105	102	100	97.8	95.8	94.0	92.1	90.3	89.0	87.2	85.9
20	138	138	138	138	138	137	135	134	134	133	132	129	127	124	122	120	118	116
21	138	130	121	116	113	110	107	105	102	100	97.8	95.8	94.0	92.1	90.3	89.0	87.2	85.9
22	138	138	138	138	138	137	135	134	134	133	132	129	127	124	122	120	118	116
23	117	110	102	98.9	96.4	93.9	91.4	89.2	87.0	84.9	83.0	81.6	80.2	78.4	77.2	75.3	74.0	72.8
24	117	117	117	117	117	116	115	115	114	113	112	110	108	106	104	102	100	98.6
25	183	178	166	158	152	...	142	...	136	...	132	130	128	126	124	122	121	...
26	183	183	182	177	172	...	165	...	160	...	156	155	154	152	151	150	148	...
27	183	178	166	158	152	...	142	...	136	...	132	130	128	126	124	122	121	...
28	183	183	182	177	172	...	165	...	160	...	156	155	154	152	151	150	148	...
29	156	151	141	134	129	...	121	...	116	...	112	111	109	107	105	104	103	...
30	156	156	155	150	146	...	140	...	136	...	133	132	131	129	128	128	126	...
31	156	151	141	134	129	...	121	...	116	...	112	111	109	107	105	104	103	...
32	156	156	155	150	146	...	140	...	136	...	133	132	131	129	128	128	126	...
33	183	178	166	158	152	...	142	...	136	...	132	130	128	126	124	122	121	...
34	183	183	182	177	172	...	165	...	160	...	156	155	154	152	151	150	148	...
35	187	185	179	172	164	157	152	147	143	139	136	133	130	128	126	124	122	...
36	187	185	179	172	164	157	152	147	143	139	136	133	130	128	126	124	122	...
37	187	187	186	182	177	173	170	167	165	163	161	160	159	158	157	156	155	...
38	187	185	179	172	164	157	152	147	143	139	136	133	130	128	126	124	122	...
39	187	187	186	182	177	173	170	167	165	163	161	160	159	158	157	156	155	...
40	159	157	152	145	139	134	130	125	121	118	115	113	110	109	107	106	104	...
41	159	159	159	155	150	147	144	142	140	138	137	136	135	134	134	132	131	...
42	159	157	152	145	139	134	130	125	121	118	115	113	110	109	107	106	104	...
43	159	159	159	155	150	147	144	142	140	138	137	136	135	134	134	132	131	...
44	187	185	179	172	164	157	152	147	143	139	136	133	130	128	126	124	122	...
45	187	187	186	182	177	173	170	167	165	163	161	160	159	158	157	156	155	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	84.2	82.6	77.9	*63.7*	*50.5*	*39.9*	*32.1*	*26.5*	*22.1*	*17.8*	*13.7*	*11.3*	*9.12*	*7.12*	...	...	...
11	112	*100*	*78.1*	*63.7*	*50.5*	*39.9*	*32.1*	*26.5*	*22.1*	*17.8*	*13.7*	*11.3*	*9.12*	*7.12*	...	...	...
12	84.2	82.6	77.9	*63.7*	*50.5*	*39.9*	*32.1*	*26.5*	*22.1*	*17.8*	*13.7*	*11.3*	*9.12*	*7.12*	*5.88*	*4.48*	*3.26*
13	112	*100*	*78.1*	*63.7*	*50.5*	*39.9*	*32.1*	*26.5*	*22.1*	*17.8*	*13.7*	*11.3*	*9.12*	*7.12*	*5.88*	*4.48*	*3.26*
14	84.2	82.6	77.9	*63.7*	*50.5*	*39.9*	*32.1*	*26.5*	*22.1*	*17.8*	*13.7*	*11.3*	*9.12*	*7.12*	...	...	...
15	112	*100*	*78.1*	*63.7*	*50.5*	*39.9*	*32.1*	*26.5*	*22.1*	*17.8*	*13.7*	*11.3*	*9.12*	*7.12*	...	...	...
16	84.2	82.6	77.9	*63.7*	*50.5*	*39.9*	*32.1*	*26.5*	*22.1*	*17.8*	*13.7*	*11.3*	*9.12*	*7.12*	...	...	...
17	112	*100*	*78.1*	*63.7*	*50.5*	*39.9*	*32.1*	*26.5*	*22.1*	*17.8*	*13.7*	*11.3*	*9.12*	*7.12*	...	...	...
18	112	*100*	*78.1*	*63.7*	*50.5*	*39.9*	*32.1*	*26.5*	*22.1*	*17.8*	*13.7*	*11.3*	*9.12*	*7.12*	*5.88*	*4.48*	*3.26*
19	84.2	82.6	77.9	*63.7*	*50.5*	*39.9*	*32.1*	*26.5*	*22.1*	*17.8*	*13.7*	*11.3*	*9.12*	*7.12*	...	...	...
20	112	*100*	*78.1*	*63.7*	*50.5*	*39.9*	*32.1*	*26.5*	*22.1*	*17.8*	*13.7*	*11.3*	*9.12*	*7.12*	...	...	...
21	84.2	82.6	77.9	*63.7*	*50.5*	*39.9*	*32.1*	*26.5*	*22.1*	*17.8*	*13.7*	*11.3*	*9.12*	*7.12*	*5.88*	*4.48*	*3.26*
22	112	*100*	*78.1*	*63.7*	*50.5*	*39.9*	*32.1*	*26.5*	*22.1*	*17.8*	*13.7*	*11.3*	*9.12*	*7.12*	*5.88*	*4.48*	*3.26*
23	71.5	70.2	64.9	*54.4*	*42.7*	*34.0*	*27.3*	*22.3*	*18.6*	*14.9*	*11.3*	*9.58*	*7.91*	*5.95*	*5.03*	*3.82*	*2.78*
24	95.7	*85.3*	*66.4*	*54.4*	*42.7*	*34.0*	*27.3*	*22.3*	*18.6*	*14.9*	*11.3*	*9.58*	*7.91*	*5.95*	*5.03*	*3.82*	*2.78*
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	1	46Fe–24Ni–21Cr–6Mo–N	Smls. pipe & tube	SB–690	...	N08367	Solution ann.
	2	46Fe–24Ni–21Cr–6Mo–N	Smls. pipe & tube	SB–690	...	N08367	Solution ann.
	3	46Fe–24Ni–21Cr–6Mo–N	Bar, rod, wire	SB–691	...	N08367	Solution ann.
	4	46Fe–24Ni–21Cr–6Mo–N	Bar, rod, wire	SB–691	...	N08367	Solution ann.
	5	46Fe–24Ni–21Cr–6Mo–N	Wld. pipe	SB–804	...	N08367	Solution ann.
	6	46Fe–24Ni–21Cr–6Mo–N	Wld. pipe	SB–804	...	N08367	Solution ann.
(**23**)	7	46Fe–24Ni–21Cr–6Mo–N	Smls. & wld. fittings	SB–366	...	N08367	Solution ann.
	8	46Fe–24Ni–21Cr–6Mo–N	Wld. pipe	SB–675	...	N08367	Solution ann.
	9	46Fe–24Ni–21Cr–6Mo–N	Wld. pipe	SB–675	...	N08367	Solution ann.
	10	46Fe–24Ni–21Cr–6Mo–N	Wld. tube	SB–676	...	N08367	Solution ann.
	11	46Fe–24Ni–21Cr–6Mo–N	Wld. tube	SB–676	...	N08367	Solution ann.
	12	46Fe–24Ni–21Cr–6Mo–N	Plate, sheet, strip	SB–688	...	N08367	Solution ann.
	13	46Fe–24Ni–21Cr–6Mo–N	Plate, sheet, strip	SB–688	...	N08367	Solution ann.
	14	46Fe–24Ni–21Cr–6Mo–N	Smls. pipe & tube	SB–690	...	N08367	Solution ann.
	15	46Fe–24Ni–21Cr–6Mo–N	Smls. pipe & tube	SB–690	...	N08367	Solution ann.
	16	46Fe–24Ni–21Cr–6Mo–N	Wld. pipe	SB–804	...	N08367	Solution ann.
	17	46Fe–24Ni–21Cr–6Mo–N	Wld. pipe	SB–804	...	N08367	Solution ann.
	18	46Fe–24Ni–21Cr–6Mo–N	Castings	SA–351	CN3MN	J94651	Solution ann.
	19	25Ni–47Fe–21Cr–5Mo	Plate, sheet, strip	SB–599	...	N08700	Solution ann.
	20	25Ni–47Fe–21Cr–5Mo	Plate, sheet, strip	SB–599	...	N08700	Solution ann.
	21	25Ni–47Fe–21Cr–5Mo	Bar, wire	SB–672	...	N08700	Solution ann.
	22	32Ni–45Fe–20Cr–Cb	Castings	SA–351	CT15C	...	As cast
	23	33Ni–42Fe–21Cr	Smls. tube	SB–163	...	N08800	Annealed
	24	33Ni–42Fe–21Cr	Smls. tube	SB–163	...	N08800	Annealed
(**23**)	25	33Ni–42Fe–21Cr	Smls. & wld. fittings	SB–366	...	N08800	Annealed
	26	33Ni–42Fe–21Cr	Smls. pipe & tube	SB–407	...	N08800	Annealed
	27	33Ni–42Fe–21Cr	Smls. pipe & tube	SB–407	...	N08800	Annealed
	28	33Ni–42Fe–21Cr	Bar	SB–408	...	N08800	Annealed
	29	33Ni–42Fe–21Cr	Bar	SB–408	...	N08800	Annealed
	30	33Ni–42Fe–21Cr	Plate	SB–409	...	N08800	Annealed
	31	33Ni–42Fe–21Cr	Plate	SB–409	...	N08800	Annealed
	32	33Ni–42Fe–21Cr	Wld. pipe	SB–514	...	N08800	Annealed
	33	33Ni–42Fe–21Cr	Wld. pipe	SB–514	...	N08800	Annealed
	34	33Ni–42Fe–21Cr	Wld. tube	SB–515	...	N08800	Annealed
	35	33Ni–42Fe–21Cr	Wld. tube	SB–515	...	N08800	Annealed
	36	33Ni–42Fe–21Cr	Forgings	SB–564	...	N08800	Annealed
	37	33Ni–42Fe–21Cr	Forgings	SB–564	...	N08800	Annealed
	38	32Ni–44Fe–21Cr	Smls. tube	SB–163	...	N08801	Ann./stabilized
	39	32Ni–44Fe–21Cr	Smls. tube	SB–163	...	N08801	Ann./stabilized
	40	32Ni–44Fe–21Cr	Smls. pipe & tube	SB–407	...	N08801	Ann./stabilized
	41	32Ni–44Fe–21Cr	Smls. pipe & tube	SB–407	...	N08801	Ann./stabilized
	42	33Ni–42Fe–21Cr	Smls. tube	SB–163	...	N08810	Annealed
	43	33Ni–42Fe–21Cr	Smls. tube	SB–163	...	N08810	Annealed
	44	33Ni–42Fe–21Cr	Smls. pipe & tube	SB–407	...	N08810	Annealed
	45	33Ni–42Fe–21Cr	Smls. pipe & tube	SB–407	...	N08810	Hot fin./ann.

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	>5	45	655	310	NP	427	427	343	NFN–12	...
2	>5	45	655	310	NP	427	427	343	NFN–12	G5
3	...	45	655	310	NP	427	427	343	NFN–12	...
4	...	45	655	310	NP	427	427	343	NFN–12	G5
5	>5	45	655	310	NP	427	427	343	NFN–12	G14
6	>5	45	655	310	NP	427	427	343	NFN–12	G5, G14
7	≤5	45	690	310	NP	427	427	NP	NFN–12	G5, W5, W12
8	≤5	45	690	310	NP	427	427	343	NFN–12	G14
9	≤5	45	690	310	NP	427	427	343	NFN–12	G5, G14
10	≤5	45	690	310	NP	427	427	343	NFN–12	G14
11	≤5	45	690	310	NP	427	427	343	NFN–12	G5, G14
12	≤5	45	690	310	NP	427	427	343	NFN–12	...
13	≤5	45	690	310	NP	427	427	343	NFN–12	G5
14	≤5	45	690	310	NP	427	427	343	NFN–12	...
15	≤5	45	690	310	NP	427	427	343	NFN–12	G5
16	≤5	45	690	310	NP	427	427	343	NFN–12	G14
17	≤5	45	690	310	NP	427	427	343	NFN–12	G5, G14
18	...	45	550	260	NP	427	427	343	NFN–12	G15
19	...	45	550	240	NP	NP	343	343	NFN–8	...
20	...	45	550	240	NP	NP	343	343	NFN–8	G5
21	...	45	550	240	NP	NP	343	343	NFN–8	...
22	...	45	435	170	NP	NP	871	343	NFN–9	G4, G15
23	...	45	515	205	NP	427	816	NP	NFN–8	G5, T14
24	...	45	515	205	NP	NP	816	NP	NFN–8	T15
25	...	45	515	205	NP	427	816	NP	NFN–8	G5, T14, W5, W12
26	...	45	515	205	816	427	816	NP	NFN–8	G5, T14
27	...	45	515	205	816	NP	816	NP	NFN–8	T15
28	...	45	515	205	816	427	816	NP	NFN–8	G5, T14
29	...	45	515	205	816	NP	816	NP	NFN–8	T15
30	...	45	515	205	816	427	816	NP	NFN–8	G5, T14
31	...	45	515	205	816	NP	816	NP	NFN–8	T15
32	...	45	515	205	NP	NP	816	NP	NFN–8	G14, T15
33	...	45	515	205	NP	NP	816	NP	NFN–8	G5, G14, T14
34	...	45	515	205	816	NP	816	NP	NFN–8	G5, G14, T14
35	...	45	515	205	816	NP	816	NP	NFN–8	G14, T15
36	...	45	515	205	816	427	816	NP	NFN–8	G5, T14
37	...	45	515	205	816	NP	816	NP	NFN–8	T15
38	...	45	450	170	566	NP	482	NP	NFN–9	H4
39	...	45	450	170	566	NP	482	NP	NFN–9	G5, H4
40	...	45	450	170	566	NP	482	NP	NFN–9	H4
41	...	45	450	170	566	NP	482	NP	NFN–9	G5, H4
42	...	45	450	170	NP	NP	899	NP	NFN–9	G4, T16
43	...	45	450	170	NP	427	899	NP	NFN–9	G4, G5, T15
44	...	45	450	170	816	NP	982	NP	NFN–9	G4, G30, T16
45	...	45	450	170	816	427	982	NP	NFN–9	G4, G5, G30, T15

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	187	185	179	172	164	157	152	147	143	139	136	133	130	128	126	124	122	...
2	187	187	186	182	177	173	170	167	165	163	161	160	159	158	157	156	155	...
3	187	185	179	172	164	157	152	147	143	139	136	133	130	128	126	124	122	...
4	187	187	186	182	177	173	170	167	165	163	161	160	159	158	157	156	155	...
5	159	157	152	145	139	134	130	125	121	118	115	113	110	109	107	106	104	...
6	159	159	159	155	150	147	144	142	140	138	137	136	135	134	134	132	131	...
7	197	189	179	171	164	157	152	147	143	139	136	133	130	128	126	124	122	...
8	168	160	151	145	139	134	130	125	121	118	115	113	110	109	107	106	104	...
9	168	168	167	163	158	155	152	150	148	146	144	143	142	141	141	139	138	...
10	168	160	151	145	139	134	130	125	121	118	115	113	110	109	107	106	104	...
11	168	168	167	163	158	155	152	150	148	146	144	143	142	141	141	139	138	...
12	197	189	179	171	164	157	152	147	143	139	136	133	130	128	126	124	122	...
13	197	197	197	192	186	181	178	176	173	171	170	168	167	166	165	164	163	...
14	197	189	179	171	164	157	152	147	143	139	136	133	130	128	126	124	122	...
15	197	197	197	192	186	181	178	176	173	171	170	168	167	166	165	164	163	...
16	168	160	151	145	139	134	130	125	121	118	115	113	110	109	107	106	104	...
17	168	168	167	163	158	155	152	150	148	146	144	143	142	141	141	139	138	...
18	158	154	146	138	129	123	117	113	110	106	104	102	101	99.9	99.2	98.0	96.7	...
19	158	152	143	137	131	126	123	120	118	117	116	112	108	...	...	...	...	...
20	158	158	158	157	156	154	152	150	149	148	148	148	148	...	...	...	...	...
21	158	152	143	137	131	126	123	120	118	117	116	112	108	...	...	...	...	...
22	115	111	108	106	105	104	103	102	101	100	98.9	97.2	95.4	94.3	93.0	91.8	90.5	89.3
23	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
24	138	132	127	124	123	121	119	117	116	115	113	112	111	109	108	107	106	104
25	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
26	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
27	138	132	127	124	123	121	119	117	116	115	113	112	111	109	108	107	106	104
28	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
29	138	132	127	124	123	121	119	117	116	115	113	112	111	109	108	107	106	104
30	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
31	138	132	127	124	123	121	119	117	116	115	113	112	111	109	108	107	106	104
32	117	112	108	106	104	102	101	99.5	98.3	97.4	96.5	95.4	94.1	92.9	91.7	91.1	89.9	88.5
33	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
34	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
35	117	112	108	106	104	102	101	99.5	98.3	97.4	96.5	95.4	94.1	92.9	91.7	91.1	89.9	88.5
36	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
37	138	132	127	124	123	121	119	117	116	115	113	112	111	109	108	107	106	104
38	115	111	105	102	99.2	96.6	94.2	92.0	89.8	87.6	85.4	83.4	81.5	79.8	78.5	76.6	75.3	74.2
39	115	115	115	115	115	115	115	115	115	115	115	113	110	108	105	104	102	100
40	115	111	105	102	99.2	96.6	94.2	92.0	89.8	87.6	85.4	83.4	81.5	79.8	78.5	76.6	75.3	74.2
41	115	115	115	115	115	115	115	115	115	115	115	113	110	108	105	104	102	100
42	115	111	105	102	99.2	96.6	94.2	92.0	89.8	87.6	85.4	83.4	81.5	79.8	78.5	76.6	75.3	74.2
43	115	115	115	115	115	115	115	115	115	115	115	113	110	108	105	104	102	100
44	115	111	105	102	99.2	96.6	94.2	92.0	89.8	87.6	85.4	83.4	81.5	79.8	78.5	76.6	75.3	74.2
45	115	115	115	115	115	115	115	115	115	115	115	113	110	108	105	104	102	100

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	88.0	84.0	74.8	66.7	59.5	52.7	45.9	39.7	34.0	28.9	24.4	20.4	17.0	14.2	11.8	9.26	...	
23	138	137	131	*108*	*85.0*	*64.4*	*44.8*	*30.0*	*15.5*	*11.3*	*8.82*	*6.98*	*6.43*	*5.00*	...	...	...	
24	103	102	101	98.1	*85.0*	*64.4*	*44.8*	*30.0*	*15.5*	*11.3*	*8.82*	*6.98*	*6.43*	*5.00*	...	...	...	
25	138	137	131	*108*	*85.0*	*64.4*	*44.8*	*30.0*	*15.5*	*11.3*	*8.82*	*6.98*	*6.43*	*5.00*	...	...	...	(**23**)
26	138	137	131	*108*	*85.0*	*64.4*	*44.8*	*30.0*	*15.5*	*11.3*	*8.82*	*6.98*	*6.43*	*5.00*	...	...	...	
27	103	102	101	98.1	*85.0*	*64.4*	*44.8*	*30.0*	*15.5*	*11.3*	*8.82*	*6.98*	*6.43*	*5.00*	...	...	...	
28	138	137	131	*108*	*85.0*	*64.4*	*44.8*	*30.0*	*15.5*	*11.3*	*8.82*	*6.98*	*6.43*	*5.00*	...	...	...	
29	103	102	101	98.1	*85.0*	*64.4*	*44.8*	*30.0*	*15.5*	*11.3*	*8.82*	*6.98*	*6.43*	*5.00*	...	...	...	
30	138	137	131	*108*	*85.0*	*64.4*	*44.8*	*30.0*	*15.5*	*11.3*	*8.82*	*6.98*	*6.43*	*5.00*	...	...	...	
31	103	102	101	98.1	*85.0*	*64.4*	*44.8*	*30.0*	*15.5*	*11.3*	*8.82*	*6.98*	*6.43*	*5.00*	...	...	...	
32	87.9	86.8	85.8	83.2	*72.6*	*54.5*	*38.0*	*25.7*	*12.8*	*10.2*	*7.63*	*6.16*	*5.46*	*4.27*	...	...	...	
33	117	117	112	*91.8*	*72.6*	*54.5*	*38.0*	*25.7*	*12.8*	*10.2*	*7.63*	*6.16*	*5.46*	*4.27*	...	...	...	
34	117	117	112	*91.8*	*72.6*	*54.5*	*38.0*	*25.7*	*12.8*	*10.2*	*7.63*	*6.16*	*5.46*	*4.27*	...	...	...	
35	87.9	86.8	85.8	83.2	*72.6*	*54.5*	*38.0*	*25.7*	*12.8*	*10.2*	*7.63*	*6.16*	*5.46*	*4.27*	...	...	...	
36	138	137	131	*108*	*85.0*	*64.4*	*44.8*	*30.0*	*15.5*	*11.3*	*8.82*	*6.98*	*6.43*	*5.00*	...	...	...	
37	103	102	101	98.1	*85.0*	*64.4*	*44.8*	*30.0*	*15.5*	*11.3*	*8.82*	*6.98*	*6.43*	*5.00*	...	...	...	
38	72.8	72.0	71.2	69.9	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	98.6	97.1	95.9	91.8	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	72.8	72.0	71.2	69.9	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	98.6	97.1	95.9	91.8	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	72.8	72.0	71.2	69.9	68.4	*62.6*	*50.6*	*41.2*	*33.6*	*27.7*	*22.6*	*18.3*	*15.0*	*11.9*	*9.03*	*7.35*	*5.86*	
43	98.6	97.1	95.9	91.8	*75.7*	*62.6*	*50.6*	*41.2*	*33.6*	*27.7*	*22.6*	*18.3*	*15.0*	*11.9*	*9.03*	*7.35*	*5.86*	
44	72.8	72.0	71.2	69.9	68.4	*62.6*	*50.6*	*41.2*	*33.6*	*27.7*	*22.6*	*18.3*	*15.0*	*11.9*	*9.03*	*7.35*	*5.86*	
45	98.6	97.1	95.9	91.8	*75.7*	*62.6*	*50.6*	*41.2*	*33.6*	*27.7*	*22.6*	*18.3*	*15.0*	*11.9*	*9.03*	*7.35*	*5.86*	

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	1	33Ni–42Fe–21Cr	Bar	SB–408	...	N08810	Annealed
	2	33Ni–42Fe–21Cr	Bar	SB–408	...	N08810	Annealed
	3	33Ni–42Fe–21Cr	Plate	SB–409	...	N08810	Annealed
	4	33Ni–42Fe–21Cr	Plate	SB–409	...	N08810	Annealed
	5	33Ni–42Fe–21Cr	Wld. pipe	SB–514	...	N08810	Annealed
	6	33Ni–42Fe–21Cr	Wld. pipe	SB–514	...	N08810	Annealed
	7	33Ni–42Fe–21Cr	Wld. tube	SB–515	...	N08810	Annealed
	8	33Ni–42Fe–21Cr	Wld. tube	SB–515	...	N08810	Annealed
	9	33Ni–42Fe–21Cr	Forgings	SB–564	...	N08810	Annealed
	10	33Ni–42Fe–21Cr	Forgings	SB–564	...	N08810	Annealed
	11	33Ni–42Fe–21Cr	Smls. tube	SB–163	...	N08811	Annealed
	12	33Ni–42Fe–21Cr	Smls. tube	SB–163	...	N08811	Annealed
	13	33Ni–42Fe–21Cr	Smls. pipe & tube	SB–407	...	N08811	Annealed
	14	33Ni–42Fe–21Cr	Smls. pipe & tube	SB–407	...	N08811	Annealed
	15	33Ni–42Fe–21Cr	Bar	SB–408	...	N08811	Annealed
	16	33Ni–42Fe–21Cr	Bar	SB–408	...	N08811	Annealed
	17	33Ni–42Fe–21Cr	Plate	SB–409	...	N08811	Annealed
	18	33Ni–42Fe–21Cr	Plate	SB–409	...	N08811	Annealed
	19	33Ni–42Fe–21Cr	Wld. tube	SB–515	...	N08811	Annealed
	20	33Ni–42Fe–21Cr	Wld. tube	SB–515	...	N08811	Annealed
	21	33Ni–42Fe–21Cr	Forgings	SB–564	...	N08811	Annealed
	22	33Ni–42Fe–21Cr	Forgings	SB–564	...	N08811	Annealed
	23	42Ni–21.5Cr–3Mo–2.3Cu	Smls. tube	SB–163	...	N08825	Annealed
	24	42Ni–21.5Cr–3Mo–2.3Cu	Smls. tube	SB–163	...	N08825	Annealed
(**23**)	25	42Ni–21.5Cr–3Mo–2.3Cu	Smls. & wld. fittings	SB–366	...	N08825	Annealed
	26	42Ni–21.5Cr–3Mo–2.3Cu	Smls. pipe & tube	SB–423	...	N08825	Cold worked/ann.
	27	42Ni–21.5Cr–3Mo–2.3Cu	Smls. pipe & tube	SB–423	...	N08825	Cold worked/ann.
	28	42Ni–21.5Cr–3Mo–2.3Cu	Plate	SB–424	...	N08825	Annealed
	29	42Ni–21.5Cr–3Mo–2.3Cu	Plate	SB–424	...	N08825	Annealed
	30	42Ni–21.5Cr–3Mo–2.3Cu	Bar, rod	SB–425	...	N08825	Annealed
	31	42Ni–21.5Cr–3Mo–2.3Cu	Bar, rod	SB–425	...	N08825	Annealed
	32	42Ni–21.5Cr–3Mo–2.3Cu	Forgings	SB–564	...	N08825	Annealed
	33	42Ni–21.5Cr–3Mo–2.3Cu	Forgings	SB–564	...	N08825	Annealed
	34	42Ni–21.5Cr–3Mo–2.3Cu	Wld. tube	SB–704	...	N08825	Annealed
	35	42Ni–21.5Cr–3Mo–2.3Cu	Wld. tube	SB–704	...	N08825	Annealed
	36	42Ni–21.5Cr–3Mo–2.3Cu	Wld. pipe	SB–705	...	N08825	Annealed
	37	42Ni–21.5Cr–3Mo–2.3Cu	Wld. pipe	SB–705	...	N08825	Annealed
	38	44Fe–25Ni–21Cr–Mo	Forgings	SA–182	...	N08904	Annealed
(**23**)	39	44Fe–25Ni–21Cr–Mo	Smls. tube	SA–213	...	N08904	Annealed
	40	44Fe–25Ni–21Cr–Mo	Plate, sheet, strip	SA–240	...	N08904	Annealed
	41	44Fe–25Ni–21Cr–Mo	Wld. tube	SA–249	...	N08904	Annealed
	42	44Fe–25Ni–21Cr–Mo	Smls. pipe	SA–312	...	N08904	Annealed
	43	44Fe–25Ni–21Cr–Mo	Wld. pipe	SA–312	...	N08904	Annealed
	44	44Fe–25Ni–21Cr–Mo	Fittings	SA–403	...	N08904	Annealed
(**23**)	45	44Fe–25Ni–21Cr–Mo	Bar	SA–479	...	N08904	Annealed

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	...	45	450	170	816	NP	899	NP	NFN–9	G4, T16
2	...	45	450	170	816	427	899	NP	NFN–9	G4, G5, T15
3	...	45	450	170	816	NP	899	NP	NFN–9	G4, T16
4	...	45	450	170	816	427	899	NP	NFN–9	G4, G5, T15
5	...	45	450	170	NP	NP	899	NP	NFN–9	G4, G14, T16
6	...	45	450	170	NP	NP	899	NP	NFN–9	G4, G5, G14, T15
7	...	45	450	170	816	NP	899	NP	NFN–9	G4, G14, T16
8	...	45	450	170	816	NP	899	NP	NFN–9	G4, G5, G14, T15
9	...	45	450	170	816	NP	899	NP	NFN–9	G4, T16
10	...	45	450	170	816	427	899	NP	NFN–9	G4, G5, T15
11	...	45	450	170	816	NP	899	NP	NFN–9	G4, T17
12	...	45	450	170	816	NP	899	NP	NFN–9	G4, G5, T15
13	...	45	450	170	816	NP	899	NP	NFN–9	G4, T17
14	...	45	450	170	816	NP	899	NP	NFN–9	G4, G5, T15
15	...	45	450	170	816	NP	899	NP	NFN–9	G4, T17
16	...	45	450	170	816	NP	899	NP	NFN–9	G4, G5, T15
17	...	45	450	170	816	NP	899	NP	NFN–9	G4, T17
18	...	45	450	170	816	NP	899	NP	NFN–9	G4, G5, T15
19	...	45	450	170	816	NP	899	NP	NFN–9	G4, G14, T17
20	...	45	450	170	816	NP	899	NP	NFN–9	G4, G5, G14, T16
21	...	45	450	170	816	NP	899	NP	NFN–9	G4, T17
22	...	45	450	170	816	NP	899	NP	NFN–9	G4, G5, T15
23	...	45	585	240	NP	427 (Cl. 3 only)	538	343	NFN–7	...
24	...	45	585	240	NP	427 (Cl. 3 only)	538	343	NFN–7	G5
25	...	45	585	240	NP	427 (Cl. 3 only)	538	343	NFN–7	G5, W5, W12
26	...	45	585	240	538	427 (Cl. 3 only)	538	343	NFN–7	...
27	...	45	585	240	538	427 (Cl. 3 only)	538	343	NFN–7	G5
28	...	45	585	240	538	427 (Cl. 3 only)	538	343	NFN–7	...
29	...	45	585	240	538	427 (Cl. 3 only)	538	343	NFN–7	G5
30	...	45	585	240	538	427 (Cl. 3 only)	538	343	NFN–7	...
31	...	45	585	240	538	427 (Cl. 3 only)	538	343	NFN–7	G5
32	...	45	585	240	NP	NP	538	NP	NFN–7	...
33	...	45	585	240	NP	NP	538	NP	NFN–7	G5
34	...	45	585	240	NP	427	538	343	NFN–7	G14
35	...	45	585	240	NP	NP	538	343	NFN–7	G5, G14
36	...	45	585	240	NP	NP	538	343	NFN–7	G14
37	...	45	585	240	NP	NP	538	343	NFN–7	G5, G14
38	...	45	490	215	NP	371	371	343	NFN–9	W12
39	...	45	490	215	NP	371	371	343	NFN–9	...
40	...	45	490	215	NP	371	371	343	NFN–9	...
41	...	45	490	215	NP	371	371	343	NFN–9	G14
42	...	45	490	215	NP	371	371	343	NFN–9	...
43	...	45	490	215	NP	371	371	343	NFN–9	G14
44	...	45	490	215	NP	371	371	343	NFN–9	W12
45	...	45	490	215	NP	371	371	343	NFN–9	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	115	111	105	102	99.2	96.6	94.2	92.0	89.8	87.6	85.4	83.4	81.5	79.8	78.5	76.6	75.3	74.2
2	115	115	115	115	115	115	115	115	115	115	115	113	110	108	105	104	102	100
3	115	111	105	102	99.2	96.6	94.2	92.0	89.8	87.6	85.4	83.4	81.5	79.8	78.5	76.6	75.3	74.2
4	115	115	115	115	115	115	115	115	115	115	115	113	110	108	105	104	102	100
5	97.9	94.0	89.6	87.0	84.7	82.6	80.4	78.1	75.9	74.2	72.7	71.0	69.2	68.1	66.8	65.6	64.4	63.0
6	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.8	97.2	95.9	93.8	91.3	89.6	88.4	86.5	85.1
7	97.9	94.0	89.6	87.0	84.7	82.6	80.4	78.1	75.9	74.2	72.7	71.0	69.2	68.1	66.8	65.6	64.4	63.0
8	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.8	97.2	95.9	93.8	91.3	89.6	88.4	86.5	85.1
9	115	111	105	102	99.2	96.6	94.2	92.0	89.8	87.6	85.4	83.4	81.5	79.8	78.5	76.6	75.3	74.2
10	115	115	115	115	115	115	115	115	115	115	115	113	110	108	105	104	102	100
11	115	111	105	102	99.2	96.6	94.2	92.0	89.8	87.6	85.4	83.4	81.5	79.8	78.5	76.6	75.3	74.2
12	115	115	115	115	115	115	115	115	115	115	115	113	110	108	105	104	102	100
13	115	111	105	102	99.2	96.6	94.2	92.0	89.8	87.6	85.4	83.4	81.5	79.8	78.5	76.6	75.3	74.2
14	115	115	115	115	115	115	115	115	115	115	115	113	110	108	105	104	102	100
15	115	111	105	102	99.2	96.6	94.2	92.0	89.8	87.6	85.4	83.4	81.5	79.8	78.5	76.6	75.3	74.2
16	115	115	115	115	115	115	115	115	115	115	115	113	110	108	105	104	102	100
17	115	111	105	102	99.2	96.6	94.2	92.0	89.8	87.6	85.4	83.4	81.5	79.8	78.5	76.6	75.3	74.2
18	115	115	115	115	115	115	115	115	115	115	115	113	110	108	105	104	102	100
19	97.9	94.0	89.6	87.0	84.7	82.6	80.4	78.1	75.9	74.2	72.7	71.0	69.2	68.1	66.8	65.6	64.4	63.0
20	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.8	97.2	95.9	93.8	91.3	89.6	88.4	86.5	85.1
21	115	111	105	102	99.2	96.6	94.2	92.0	89.8	87.6	85.4	83.4	81.5	79.8	78.5	76.6	75.3	74.2
22	115	115	115	115	115	115	115	115	115	115	115	113	110	108	105	104	102	100
23	161	154	146	143	140	137	134	131	129	126	124	122	120	119	119	117	117	117
24	161	161	161	161	161	161	161	161	161	161	161	161	161	161	160	159	158	157
25	161	161	161	161	161	161	161	161	161	161	161	161	161	161	160	159	158	157
26	161	154	146	143	140	137	134	131	129	126	124	122	120	119	119	117	117	117
27	161	161	161	161	161	161	161	161	161	161	161	161	161	161	160	159	158	157
28	161	154	146	143	140	137	134	131	129	126	124	122	120	119	119	117	117	117
29	161	161	161	161	161	161	161	161	161	161	161	161	161	161	160	159	158	157
30	161	154	146	143	140	137	134	131	129	126	124	122	120	119	119	117	117	117
31	161	161	161	161	161	161	161	161	161	161	161	161	161	161	160	159	158	157
32	160	151	146	...	139	...	133	...	128	...	123	...	120	119	118	117	116	116
33	160	160	160	...	160	...	160	...	160	...	160	...	160	160	159	158	157	156
34	137	131	125	122	119	117	114	112	110	108	106	104	102	101	101	100	99.4	98.8
35	137	137	137	137	137	137	137	137	137	137	137	137	137	136	136	135	135	134
36	137	131	125	122	119	117	114	112	110	108	106	104	102	101	101	100	99.4	98.8
37	137	137	137	137	137	137	137	137	137	137	137	137	137	136	136	135	135	134
38	140	126	113	108	104	99.9	95.8	92.1	88.8	85.9	83.4	81.3	79.6	78.4	...	...	...	...
39	140	126	113	108	104	99.9	95.8	92.1	88.8	85.9	83.4	81.3	79.6	78.4	...	...	...	...
40	140	126	113	108	104	99.9	95.8	92.1	88.8	85.9	83.4	81.3	79.6	78.4	...	...	...	...
41	119	107	96.3	91.9	88.8	85.5	82.0	78.6	75.6	72.9	70.7	69.1	67.9	66.7	...	...	...	...
42	140	126	113	108	104	99.9	95.8	92.1	88.8	85.9	83.4	81.3	79.6	78.4	...	...	...	...
43	119	107	96.3	91.9	88.8	85.5	82.0	78.6	75.6	72.9	70.7	69.1	67.9	66.7	...	...	...	...
44	140	126	113	108	104	99.9	95.8	92.1	88.8	85.9	83.4	81.3	79.6	78.4	...	...	...	...
45	140	126	113	108	104	99.9	95.8	92.1	88.8	85.9	83.4	81.3	79.6	78.4	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	72.8	72.0	71.2	69.9	68.4	*62.6*	*50.6*	*41.2*	*33.6*	*27.7*	*22.6*	*18.3*	*15.0*	*11.9*	*9.03*	*7.35*	*5.86*	
2	98.6	97.1	95.9	91.8	*75.7*	*62.6*	*50.6*	*41.2*	*33.6*	*27.7*	*22.6*	*18.3*	*15.0*	*11.9*	*9.03*	*7.35*	*5.86*	
3	72.8	72.0	71.2	69.9	68.4	*62.6*	*50.6*	*41.2*	*33.6*	*27.7*	*22.6*	*18.3*	*15.0*	*11.9*	*9.03*	*7.35*	*5.86*	
4	98.6	97.1	95.9	91.8	*75.7*	*62.6*	*50.6*	*41.2*	*33.6*	*27.7*	*22.6*	*18.3*	*15.0*	*11.9*	*9.03*	*7.35*	*5.86*	
5	62.3	61.3	60.3	59.6	58.1	*53.2*	*43.0*	*34.9*	*28.6*	*23.3*	*19.4*	*15.6*	*12.5*	*10.1*	*7.75*	*6.28*	*4.98*	
6	83.9	82.7	81.4	77.9	*64.6*	*53.2*	*43.0*	*34.9*	*28.6*	*23.3*	*19.4*	*15.6*	*12.5*	*10.1*	*7.75*	*6.28*	*4.98*	
7	62.3	61.3	60.3	59.6	58.1	*53.2*	*43.0*	*34.9*	*28.6*	*23.3*	*19.4*	*15.6*	*12.5*	*10.1*	*7.75*	*6.28*	*4.98*	
8	83.9	82.7	81.4	77.9	*64.6*	*53.2*	*43.0*	*34.9*	*28.6*	*23.3*	*19.4*	*15.6*	*12.5*	*10.1*	*7.75*	*6.28*	*4.98*	
9	72.8	72.0	71.2	69.9	68.4	*62.6*	*50.6*	*41.2*	*33.6*	*27.7*	*22.6*	*18.3*	*15.0*	*11.9*	*9.03*	*7.35*	*5.86*	
10	98.6	97.1	95.9	91.8	*75.7*	*62.6*	*50.6*	*41.2*	*33.6*	*27.7*	*22.6*	*18.3*	*15.0*	*11.9*	*9.03*	*7.35*	*5.86*	
11	72.8	72.0	71.2	69.8	68.6	66.4	*56.8*	*46.8*	*38.6*	*31.5*	*25.5*	*20.6*	*17.1*	*13.8*	*10.2*	*7.98*	*6.20*	
12	98.7	97.1	96.1	94.1	*85.5*	*69.3*	*56.8*	*46.8*	*38.6*	*31.5*	*25.5*	*20.6*	*17.1*	*13.8*	*10.2*	*7.98*	*6.20*	
13	72.8	72.0	71.2	69.8	68.6	66.4	*56.8*	*46.8*	*38.6*	*31.5*	*25.5*	*20.6*	*17.1*	*13.8*	*10.2*	*7.98*	*6.20*	
14	98.7	97.1	96.1	94.1	*85.5*	*69.3*	*56.8*	*46.8*	*38.6*	*31.5*	*25.5*	*20.6*	*17.1*	*13.8*	*10.2*	*7.98*	*6.20*	
15	72.8	72.0	71.2	69.8	68.6	66.4	*56.8*	*46.8*	*38.6*	*31.5*	*25.5*	*20.6*	*17.1*	*13.8*	*10.2*	*7.98*	*6.20*	
16	98.7	97.1	96.1	94.1	*85.5*	*69.3*	*56.8*	*46.8*	*38.6*	*31.5*	*25.5*	*20.6*	*17.1*	*13.8*	*10.2*	*7.98*	*6.20*	
17	72.8	72.0	71.2	69.8	68.6	66.4	*56.8*	*46.8*	*38.6*	*31.5*	*25.5*	*20.6*	*17.1*	*13.8*	*10.2*	*7.98*	*6.20*	
18	98.7	97.1	96.1	94.1	*85.5*	*69.3*	*56.8*	*46.8*	*38.6*	*31.5*	*25.5*	*20.6*	*17.1*	*13.8*	*10.2*	*7.98*	*6.20*	
19	62.3	61.3	60.3	59.6	58.3	56.7	*48.6*	*39.8*	*32.8*	*27.1*	*21.9*	*17.5*	*14.7*	*11.7*	*8.26*	*6.68*	*5.24*	
20	83.9	82.7	81.4	80.2	76.6	*58.2*	*48.6*	*39.8*	*32.8*	*27.1*	*21.9*	*17.5*	*14.7*	*11.7*	*8.26*	*6.68*	*5.24*	
21	72.8	72.0	71.2	69.8	68.6	66.4	*56.8*	*46.8*	*38.6*	*31.5*	*25.5*	*20.6*	*17.1*	*13.8*	*10.2*	*7.98*	*6.20*	
22	98.7	97.1	96.1	94.1	*85.5*	*69.3*	*56.8*	*46.8*	*38.6*	*31.5*	*25.5*	*20.6*	*17.1*	*13.8*	*10.2*	*7.98*	*6.20*	
23	116	115	113	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	156	155	153	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	156	155	153	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
26	116	115	113	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	156	155	153	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	116	115	113	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	156	155	153	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	116	115	113	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	156	155	153	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	115	114	112	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	156	154	151	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	98.2	97.2	95.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	133	131	129	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	98.2	97.2	95.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	133	131	129	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
1	25Ni–20Cr–6Mo–Cu–N	Plate, sheet, strip	SB–625	...	N08925	Annealed
2	25Ni–20Cr–6Mo–Cu–N	Plate, sheet, strip	SB–625	...	N08925	Annealed
3	25Ni–20Cr–6Mo–Cu–N	Bar, wire	SB–649	...	N08925	Annealed
4	25Ni–20Cr–6Mo–Cu–N	Bar, wire	SB–649	...	N08925	Annealed
5	25Ni–20Cr–6Mo–Cu–N	Wld. pipe	SB–673	...	N08925	Annealed
6	25Ni–20Cr–6Mo–Cu–N	Wld. pipe	SB–673	...	N08925	Annealed
7	25Ni–20Cr–6Mo–Cu–N	Wld. tube	SB–674	...	N08925	Annealed
8	25Ni–20Cr–6Mo–Cu–N	Wld. tube	SB–674	...	N08925	Annealed
9	25Ni–20Cr–6Mo–Cu–N	Smls. pipe & tube	SB–677	...	N08925	Annealed
10	25Ni–20Cr–6Mo–Cu–N	Smls. pipe & tube	SB–677	...	N08925	Annealed
11	62Ni–28Mo–5Fe	Plate	SB–333	...	N10001	Annealed
12	62Ni–28Mo–5Fe	Plate	SB–333	...	N10001	Annealed
13	62Ni–28Mo–5Fe	Smls. & wld. fittings	SB–366	...	N10001	Annealed
14	62Ni–28Mo–5Fe	Wld. pipe	SB–619	...	N10001	Solution ann.
15	62Ni–28Mo–5Fe	Wld. pipe	SB–619	...	N10001	Solution ann.
16	62Ni–28Mo–5Fe	Smls. pipe & tube	SB–622	...	N10001	Solution ann.
17	62Ni–28Mo–5Fe	Smls. pipe & tube	SB–622	...	N10001	Solution ann.
18	62Ni–28Mo–5Fe	Wld. tube	SB–626	...	N10001	Solution ann.
19	62Ni–28Mo–5Fe	Wld. tube	SB–626	...	N10001	Solution ann.
20	62Ni–28Mo–5Fe	Rod	SB–335	...	N10001	Annealed
21	62Ni–28Mo–5Fe	Rod	SB–335	...	N10001	Annealed
22	62Ni–28Mo–5Fe	Rod	SB–335	...	N10001	Annealed
23	62Ni–28Mo–5Fe	Rod	SB–335	...	N10001	Annealed
24	62Ni–28Mo–5Fe	Sheet, strip	SB–333	...	N10001	Annealed
25	62Ni–28Mo–5Fe	Sheet, strip	SB–333	...	N10001	Annealed
26	70Ni–16Mo–7Cr–5Fe	Smls. & wld. fittings	SB–366	...	N10003	Annealed
27	70Ni–16Mo–7Cr–5Fe	Plate, sheet, strip	SB–434	...	N10003	Annealed
28	70Ni–16Mo–7Cr–5Fe	Rod	SB–573	...	N10003	Annealed
29	62Ni–25Mo–8Cr–2Fe	Smls. & wld. fittings	SB–366	...	N10242	Annealed
30	62Ni–25Mo–8Cr–2Fe	Plate, sheet, strip	SB–434	...	N10242	Annealed
31	62Ni–25Mo–8Cr–2Fe	Plate, sheet, strip	SB–434	...	N10242	Annealed
32	62Ni–25Mo–8Cr–2Fe	Forgings	SB–564	...	N10242	Annealed
33	62Ni–25Mo–8Cr–2Fe	Forgings	SB–564	...	N10242	Annealed
34	62Ni–25Mo–8Cr–2Fe	Rod	SB–573	...	N10242	Annealed
35	62Ni–25Mo–8Cr–2Fe	Rod	SB–573	...	N10242	Annealed
36	62Ni–25Mo–8Cr–2Fe	Wld. pipe	SB–619	...	N10242	Solution ann.
37	62Ni–25Mo–8Cr–2Fe	Wld. pipe	SB–619	...	N10242	Solution ann.
38	62Ni–25Mo–8Cr–2Fe	Smls. pipe & tube	SB–622	...	N10242	Solution ann.
39	62Ni–25Mo–8Cr–2Fe	Smls. pipe & tube	SB–622	...	N10242	Solution ann.
40	62Ni–25Mo–8Cr–2Fe	Wld. tube	SB–626	...	N10242	Solution ann.
41	62Ni–25Mo–8Cr–2Fe	Wld. tube	SB–626	...	N10242	Solution ann.
(**23**) 42	54Ni–16Mo–15Cr	Smls. & wld. fittings	SB–366	...	N10276	Solution ann.
43	54Ni–16Mo–15Cr	Forgings	SB–462	...	N10276	Solution ann.
44	54Ni–16Mo–15Cr	Forgings	SB–462	...	N10276	Solution ann.
45	54Ni–16Mo–15Cr	Forgings	SB–564	...	N10276	Solution ann.

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	...	45	600	295	NP	NP	427	343	NFN–12	...
2	...	45	600	295	NP	NP	427	343	NFN–12	G5
3	...	45	600	295	NP	NP	427	343	NFN–12	...
4	...	45	600	295	NP	NP	427	343	NFN–12	G5
5	...	45	600	295	NP	NP	427	343	NFN–12	G14
6	...	45	600	295	NP	NP	427	343	NFN–12	G5, G14
7	...	45	600	295	NP	NP	427	343	NFN–12	G14
8	...	45	600	295	NP	NP	427	343	NFN–12	G5, G14
9	...	45	600	295	NP	NP	427	343	NFN–12	...
10	...	45	600	295	NP	NP	427	343	NFN–12	G5
11	...	44	690	310	NP	427 (Cl. 3 only)	427	343	NFN–5	...
12	...	44	690	310	NP	427 (Cl. 3 only)	427	343	NFN–5	G5
13	...	44	690	310	NP	NP	427	343	NFN–5	G5, W12
14	...	44	690	310	NP	NP	427	343	NFN–5	G14
15	...	44	690	310	NP	NP	427	343	NFN–5	G5, G14
16	...	44	690	310	NP	NP	427	343	NFN–5	...
17	...	44	690	310	NP	NP	427	343	NFN–5	G5
18	...	44	690	310	NP	NP	427	343	NFN–5	G14
19	...	44	690	310	NP	NP	427	343	NFN–5	G5, G14
20	...	44	690	315	NP	427 (Cl. 3 only)	427	343	NFN–5	G13
21	...	44	690	315	NP	427 (Cl. 3 only)	427	343	NFN–5	G5, G13
22	...	44	795	315	NP	427 (Cl. 3 only)	427	343	NFN–5	G13
23	...	44	795	315	NP	427 (Cl. 3 only)	427	343	NFN–5	G5, G13
24	...	44	795	345	NP	427 (Cl. 3 only)	427	343	NFN–5	...
25	...	44	795	345	NP	427 (Cl. 3 only)	427	NP	NFN–5	G5
26	...	44	690	275	NP	NP	704	343	NFN–6	T15, W12
27	...	44	690	275	NP	NP	704	343	NFN–6	T15
28	...	44	690	275	NP	NP	704	343	NFN–6	T15
29	...	44	725	310	NP	NP	538	NP	NFN–6	G5, W12
30	...	44	725	310	NP	NP	538	NP	NFN–6	G5
31	...	44	725	310	NP	NP	538	NP	NFN–6	...
32	...	44	725	310	NP	NP	538	NP	NFN–6	G5
33	...	44	725	310	NP	NP	538	NP	NFN–6	...
34	...	44	725	310	NP	NP	538	NP	NFN–6	G5
35	...	44	725	310	NP	NP	538	NP	NFN–6	...
36	...	44	725	310	NP	NP	538	NP	NFN–6	G5, G14
37	...	44	725	310	NP	NP	538	NP	NFN–6	G14
38	...	44	725	310	NP	NP	538	NP	NFN–6	G5
39	...	44	725	310	NP	NP	538	NP	NFN–6	...
40	...	44	725	310	NP	NP	538	NP	NFN–6	G5, G14
41	...	44	725	310	NP	NP	538	NP	NFN–6	G14
42	...	43	690	285	538	427	677	343	NFN–10	G5, T14, W5, W12
43	...	43	690	285	NP	NP	677	NP	NFN–10	T15
44	...	43	690	285	NP	NP	677	NP	NFN–10	G5, T14
45	...	43	690	285	NP	NP	677	343	NFN–10	T15

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	172	166	158	152	147	142	137	133	128	124	121	118	117	117	117	117	117	...
2	172	172	171	168	165	162	159	156	153	151	149	147	145	143	141	139	137	...
3	172	166	158	152	147	142	137	133	128	124	121	118	117	117	117	117	117	...
4	172	172	171	168	165	162	159	156	153	151	149	147	145	143	141	139	137	...
5	145	141	135	129	125	120	117	113	109	106	103	101	99.3	99.3	99.3	99.3	99.3	...
6	145	145	145	143	141	138	135	132	130	129	127	125	123	122	120	117	115	...
7	145	141	135	129	125	120	117	113	109	106	103	101	99.3	99.3	99.3	99.3	99.3	...
8	145	145	145	143	141	138	135	132	130	129	127	125	123	122	120	117	115	...
9	172	166	158	152	147	142	137	133	128	124	121	118	117	117	117	117	117	...
10	172	172	171	168	165	162	159	156	153	151	149	147	145	143	141	139	137	...
11	197	193	186	181	177	173	170	167	164	162	160	158	157	155	154	152	151	...
12	197	197	197	197	197	196	194	193	192	192	191	191	189	189	188	188	187	...
13	197	197	197	197	197	196	194	193	192	192	191	191	190	189	188	188	187	...
14	168	164	158	154	150	147	145	142	140	138	136	134	133	131	130	130	129	...
15	168	168	168	168	168	166	165	164	164	163	162	162	161	161	160	159	159	...
16	197	193	186	181	177	173	170	167	164	162	160	158	157	155	154	152	151	...
17	197	197	197	197	197	196	194	193	192	192	191	191	189	189	188	188	187	...
18	168	164	158	154	150	147	145	142	140	138	136	134	133	131	130	130	129	...
19	168	168	168	168	168	166	165	164	164	163	162	162	161	161	160	159	159	...
20	197	195	191	186	181	177	174	171	168	166	164	162	160	158	157	156	155	...
21	197	197	197	197	197	196	194	193	192	192	191	191	189	189	188	188	187	...
22	212	201	190	185	181	177	174	171	168	166	164	162	160	158	157	156	155	...
23	212	212	212	212	212	212	212	212	212	212	212	212	212	212	212	210	209	...
24	227	217	207	201	197	193	189	186	183	180	178	176	174	172	171	170	168	...
25	227	227	227	227	227	225	223	222	221	220	220	219	218	217	216	216	215	...
26	184	177	168	162	156	151	146	142	139	136	134	133	131	130	129	127	125	122
27	184	177	168	162	156	151	146	142	139	136	134	133	131	130	129	127	125	122
28	184	177	168	162	156	151	146	142	139	136	134	133	131	130	129	127	125	122
29	207	207	207	207	207	207	207	207	207	207	206	206	205	205	204	204	203	203
30	207	207	207	207	207	207	207	207	207	207	206	206	205	205	204	204	203	203
31	207	201	193	186	180	175	171	168	166	164	164	163	162	161	160	158	155	152
32	207	207	207	207	207	207	207	207	207	207	206	206	205	205	204	204	203	203
33	207	201	193	186	180	175	171	168	166	164	164	163	162	161	160	158	155	152
34	207	207	207	207	207	207	207	207	207	207	206	206	205	205	204	204	203	203
35	207	201	193	186	180	175	171	168	166	164	164	163	162	161	160	158	155	152
36	176	176	176	176	176	176	176	176	176	176	175	175	174	174	173	173	173	173
37	176	171	164	158	153	149	145	143	141	139	139	139	138	137	136	134	132	129
38	207	207	207	207	207	207	207	207	207	207	206	206	205	205	204	204	203	203
39	207	201	193	186	180	175	171	168	166	164	164	163	162	161	160	158	155	152
40	176	176	176	176	176	176	176	176	176	176	175	175	174	174	173	173	173	173
41	176	171	164	158	153	149	145	143	141	139	139	139	138	137	136	134	132	129
42	188	188	188	188	188	188	188	188	187	183	177	172	169	165	162	159	157	156
43	188	180	170	164	158	153	148	143	139	135	131	128	125	122	120	118	117	115
44	188	188	188	188	188	188	188	188	187	183	177	172	169	165	162	159	157	156
45	188	180	170	164	158	153	148	143	139	135	131	128	125	122	120	118	117	115

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	118	113	107	96.7	*80.4*	*59.2*	*40.7*	*30.9*	*25.2*	*17.9*	...	...	...	...	...	...	...
27	118	113	108	97.8	*80.7*	*60.7*	*40.8*	*33.5*	*25.7*	*17.4*	...	...	...	...	...	...	...
28	118	113	108	97.8	*80.7*	*60.7*	*40.8*	*33.5*	*25.7*	*17.4*	...	...	...	...	...	...	...
29	202	201	201	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	202	201	201	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	150	149	149	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	202	201	201	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	150	149	149	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	202	201	201	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	150	149	149	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	172	171	171	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	128	127	127	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	202	201	201	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	150	149	149	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	172	171	171	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	128	127	127	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	155	154	145	*118*	*99.1*	*81.6*	*67.0*	*54.6*	*42.2*	...	...	...	...	...	...	...	... (**23**)
43	115	114	114	112	*99.1*	*81.6*	*67.0*	*54.6*	*42.2*	...	...	...	...	...	...	...	...
44	155	154	145	*118*	*99.1*	*81.6*	*67.0*	*54.6*	*42.2*	...	...	...	...	...	...	...	...
45	115	114	114	112	*99.1*	*81.6*	*67.0*	*54.6*	*42.2*	...	...	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
1	54Ni–16Mo–15Cr	Forgings	SB–564	...	N10276	Solution ann.
2	54Ni–16Mo–15Cr	Rod	SB–574	...	N10276	Solution ann.
3	54Ni–16Mo–15Cr	Rod	SB–574	...	N10276	Solution ann.
4	54Ni–16Mo–15Cr	Plate, sheet, strip	SB–575	...	N10276	Solution ann.
5	54Ni–16Mo–15Cr	Plate, sheet, strip	SB–575	...	N10276	Solution ann.
6	54Ni–16Mo–15Cr	Wld. pipe	SB–619	...	N10276	Solution ann.
7	54Ni–16Mo–15Cr	Wld. pipe	SB–619	...	N10276	Solution ann.
8	54Ni–16Mo–15Cr	Wld. pipe	SB–619	...	N10276	Solution ann.
9	54Ni–16Mo–15Cr	Wld. pipe	SB–619	...	N10276	Solution ann.
10	54Ni–16Mo–15Cr	Smls. pipe & tube	SB–622	...	N10276	Solution ann.
11	54Ni–16Mo–15Cr	Smls. pipe & tube	SB–622	...	N10276	Solution ann.
12	54Ni–16Mo–15Cr	Wld. tube	SB–626	...	N10276	Solution ann.
13	54Ni–16Mo–15Cr	Wld. tube	SB–626	...	N10276	Solution ann.
14	54Ni–16Mo–15Cr	Wld. tube	SB–626	...	N10276	Solution ann.
15	54Ni–16Mo–15Cr	Wld. tube	SB–626	...	N10276	Solution ann.
16	62Ni–22Mo–15Cr	Smls. & wld. fittings	SB–366	...	N10362	Solution ann.
17	62Ni–22Mo–15Cr	Forgings	SB–462	...	N10362	Solution ann.
18	62Ni–22Mo–15Cr	Forgings	SB–462	...	N10362	Solution ann.
19	62Ni–22Mo–15Cr	Forgings	SB–564	...	N10362	Solution ann.
20	62Ni–22Mo–15Cr	Forgings	SB–564	...	N10362	Solution ann.
21	62Ni–22Mo–15Cr	Rod	SB–574	...	N10362	Solution ann.
22	62Ni–22Mo–15Cr	Rod	SB–574	...	N10362	Solution ann.
23	62Ni–22Mo–15Cr	Plate, sheet, strip	SB–575	...	N10362	Solution ann.
24	62Ni–22Mo–15Cr	Plate, sheet, strip	SB–575	...	N10362	Solution ann.
25	62Ni–22Mo–15Cr	Wld. pipe	SB–619	...	N10362	Solution ann.
26	62Ni–22Mo–15Cr	Wld. pipe	SB–619	...	N10362	Solution ann.
27	62Ni–22Mo–15Cr	Smls. pipe & tube	SB–622	...	N10362	Solution ann.
28	62Ni–22Mo–15Cr	Smls. pipe & tube	SB–622	...	N10362	Solution ann.
29	62Ni–22Mo–15Cr	Wld. tube	SB–626	...	N10362	Solution ann.
30	62Ni–22Mo–15Cr	Wld. tube	SB–626	...	N10362	Solution ann.
31	Ni–28Mo–3Fe–1.3Cr–0.25Al	Plate, sheet, strip	SB–333	...	N10629	Solution ann.
32	Ni–28Mo–3Fe–1.3Cr–0.25Al	Plate, sheet, strip	SB–333	...	N10629	Solution ann.
33	Ni–28Mo–3Fe–1.3Cr–0.25Al	Rod	SB–335	...	N10629	Solution ann.
34	Ni–28Mo–3Fe–1.3Cr–0.25Al	Rod	SB–335	...	N10629	Solution ann.
35	Ni–28Mo–3Fe–1.3Cr–0.25Al	Smls. & wld. fittings	SB–366	...	N10629	Solution ann.
36	Ni–28Mo–3Fe–1.3Cr–0.25Al	Forged fittings	SB–462	...	N10629	Solution ann.
37	Ni–28Mo–3Fe–1.3Cr–0.25Al	Forged fittings	SB–462	...	N10629	Solution ann.
38	Ni–28Mo–3Fe–1.3Cr–0.25Al	Forgings	SB–564	...	N10629	Solution ann.
39	Ni–28Mo–3Fe–1.3Cr–0.25Al	Forgings	SB–564	...	N10629	Solution ann.
40	Ni–28Mo–3Fe–1.3Cr–0.25Al	Wld. pipe	SB–619	...	N10629	Solution ann.
41	Ni–28Mo–3Fe–1.3Cr–0.25Al	Wld. pipe	SB–619	...	N10629	Solution ann.
42	Ni–28Mo–3Fe–1.3Cr–0.25Al	Smls. pipe & tube	SB–622	...	N10629	Solution ann.
43	Ni–28Mo–3Fe–1.3Cr–0.25Al	Smls. pipe & tube	SB–622	...	N10629	Solution ann.
(**23**) 44	Ni–28Mo–3Fe–1.3Cr–0.25Al	Wld. tube	SB–626	...	N10629	Solution ann.
45	Ni–28Mo–3Fe–1.3Cr–0.25Al	Wld. tube	SB–626	...	N10629	Solution ann.

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	...	43	690	285	NP	NP	677	343	NFN–10	G5, T14
2	...	43	690	285	538	427 (Cl. 3 only)	677	343	NFN–10	T15
3	...	43	690	285	538	427	677	343	NFN–10	G5, T14
4	...	43	690	285	538	427	677	343	NFN–10	G5, T14
5	...	43	690	285	538	427 (Cl. 3 only)	677	343	NFN–10	T15
6	...	43	690	285	NP	427 (Cl. 3 only)	NP	NP	NFN–10	W5
7	...	43	690	285	NP	427 (Cl. 3 only)	NP	NP	NFN–10	G5, W5
8	...	43	690	285	538	427	677	343	NFN–10	G5, G14, T14, W6
9	...	43	690	285	538	NP	677	343	NFN–10	G14, T15
10	...	43	690	285	538	427	677	343	NFN–10	G5, T14
11	...	43	690	285	538	427 (Cl. 3 only)	677	343	NFN–10	T15
12	...	43	690	285	NP	427 (Cl. 3 only)	NP	NP	NFN–10	W5
13	...	43	690	285	NP	427 (Cl. 3 only)	NP	NP	NFN–10	G5, W5
14	...	43	690	285	538	427	677	343	NFN–10	G5, G14, T14, W6
15	...	43	690	285	538	NP	677	343	NFN–10	G14, T15
16	...	43	725	310	NP	NP	427	NP	NFN–10	G5, W12
17	...	43	725	310	NP	NP	427	NP	NFN–10	...
18	...	43	725	310	NP	NP	427	NP	NFN–10	G5
19	...	43	725	310	NP	NP	427	NP	NFN–10	...
20	...	43	725	310	NP	NP	427	NP	NFN–10	G5
21	...	43	725	310	NP	NP	427	NP	NFN–10	...
22	...	43	725	310	NP	NP	427	NP	NFN–10	G5
23	...	43	725	310	NP	NP	427	NP	NFN–10	...
24	...	43	725	310	NP	NP	427	NP	NFN–10	G5
25	...	43	725	310	NP	NP	427	NP	NFN–10	G14
26	...	43	725	310	NP	NP	427	NP	NFN–10	G5, G14
27	...	43	725	310	NP	NP	427	NP	NFN–10	...
28	...	43	725	310	NP	NP	427	NP	NFN–10	G5
29	...	43	725	310	NP	NP	427	NP	NFN–10	G14
30	...	43	725	310	NP	NP	427	NP	NFN–10	G5, G14
31	...	44	760	350	NP	NP	427	NP	NFN–16	G5
32	...	44	760	350	NP	NP	427	NP	NFN–16	...
33	...	44	760	350	NP	NP	427	NP	NFN–16	G5
34	...	44	760	350	NP	NP	427	NP	NFN–16	...
35	...	44	760	350	NP	NP	427	NP	NFN–16	G5, W12
36	...	44	760	350	NP	NP	427	NP	NFN–16	G5
37	...	44	760	350	NP	NP	427	NP	NFN–16	...
38	...	44	760	350	NP	NP	427	NP	NFN–16	G5
39	...	44	760	350	NP	NP	427	NP	NFN–16	...
40	...	44	760	350	NP	NP	427	NP	NFN–16	G5, G14
41	...	44	760	350	NP	NP	427	NP	NFN–16	G14
42	...	44	760	350	NP	NP	427	NP	NFN–16	G5
43	...	44	760	350	NP	NP	427	NP	NFN–16	...
44	...	44	760	350	NP	427 (Cl. 3 only)	427	NP	NFN–16	G5, G14, W5
45	...	44	760	350	NP	NP	427	NP	NFN–16	G14

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	188	188	188	188	188	188	188	188	187	183	177	172	169	165	162	159	157	156
2	188	180	170	164	158	153	148	143	139	135	131	128	125	122	120	118	117	115
3	188	188	188	188	188	188	188	188	187	183	177	172	169	165	162	159	157	156
4	188	188	188	188	188	188	188	188	187	183	177	172	169	165	162	159	157	156
5	188	180	170	164	158	153	148	143	139	135	131	128	125	122	120	118	117	115
6	188	180	170	164	158	153	148	143	139	135	131	128	125	122	120	118	117	...
7	188	188	188	188	188	188	188	188	187	183	177	172	169	165	162	159	157	...
8	160	160	160	160	160	160	160	160	158	155	151	147	143	140	138	135	134	133
9	160	152	144	139	135	130	126	121	118	115	111	109	106	104	102	100	98.8	98.1
10	188	188	188	188	188	188	188	188	187	183	177	172	169	165	162	159	157	156
11	188	180	170	164	158	153	148	143	139	135	131	128	125	122	120	118	117	115
12	188	180	170	164	158	153	148	143	139	135	131	128	125	122	120	118	117	...
13	188	188	188	188	188	188	188	188	187	183	177	172	169	165	162	159	157	...
14	160	160	160	160	160	160	160	160	158	155	151	147	143	140	138	135	134	133
15	160	152	144	139	135	130	126	121	118	115	111	109	106	104	102	100	98.8	98.1
16	207	207	207	207	207	207	204	202	199	197	193	190	188	186	184	182	180	...
17	207	193	182	175	169	163	157	153	149	146	143	141	139	138	136	135	134	...
18	207	207	207	207	207	207	204	202	199	197	193	190	188	186	184	182	180	...
19	207	193	182	175	169	163	157	153	149	146	143	141	139	138	136	135	134	...
20	207	207	207	207	207	207	204	202	199	197	193	190	188	186	184	182	180	...
21	207	193	182	175	169	163	157	153	149	146	143	141	139	138	136	135	134	...
22	207	207	207	207	207	207	204	202	199	197	193	190	188	186	184	182	180	...
23	207	193	182	175	169	163	157	153	149	146	143	141	139	138	136	135	134	...
24	207	207	207	207	207	207	204	202	199	197	193	190	188	186	184	182	180	...
25	176	164	155	149	144	139	133	130	127	124	122	120	118	117	116	115	114	...
26	176	176	176	176	176	176	173	172	169	167	164	162	160	158	156	155	153	...
27	207	193	182	175	169	163	157	153	149	146	143	141	139	138	136	135	134	...
28	207	207	207	207	207	207	204	202	199	197	193	190	188	186	184	182	180	...
29	176	164	155	149	144	139	133	130	127	124	122	120	118	117	116	115	114	...
30	176	176	176	176	176	176	173	172	169	167	164	162	160	158	156	155	153	...
31	216	216	216	216	216	216	216	216	215	213	212	210	209	208	207	206	205	...
32	216	216	216	211	204	198	194	191	187	184	181	179	177	176	174	173	172	...
33	216	216	216	216	216	216	216	216	215	213	212	210	209	208	207	206	205	...
34	216	216	216	211	204	198	194	191	187	184	181	179	177	176	174	173	172	...
35	216	216	216	216	216	216	216	216	215	213	212	210	209	208	207	206	205	...
36	216	216	216	216	216	216	216	216	215	213	212	210	209	208	207	206	205	...
37	216	216	216	211	204	198	194	191	187	184	181	179	177	176	174	173	172	...
38	216	216	216	216	216	216	216	216	215	213	212	210	209	208	207	206	205	...
39	216	216	216	211	204	198	194	191	187	184	181	179	177	176	174	173	172	...
40	184	184	184	184	184	184	184	184	183	181	180	179	178	177	176	175	174	...
41	184	184	184	179	174	169	165	162	160	157	154	152	151	149	148	147	146	...
42	216	216	216	216	216	216	216	216	215	213	212	210	209	208	207	206	205	...
43	216	216	216	211	204	198	194	191	187	184	181	179	177	176	174	173	172	...
44	184	184	184	184	184	184	184	184	183	181	180	179	178	177	176	175	174	...
45	184	184	184	179	174	169	165	162	160	157	154	152	151	149	148	147	146	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	155	154	145	*118*	*99.1*	*81.6*	*67.0*	*54.6*	*42.2*	...	...	...	...	...	...	...	...
2	115	114	114	112	*99.1*	*81.6*	*67.0*	*54.6*	*42.2*	...	...	...	...	...	...	...	...
3	155	154	145	*118*	*99.1*	*81.6*	*67.0*	*54.6*	*42.2*	...	...	...	...	...	...	...	...
4	155	154	145	*118*	*99.1*	*81.6*	*67.0*	*54.6*	*42.2*	...	...	...	...	...	...	...	...
5	115	114	114	112	*99.1*	*81.6*	*67.0*	*54.6*	*42.2*	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	131	131	124	*100*	*84.6*	*69.5*	*56.7*	*46.2*	*35.7*	...	...	...	...	...	...	...	...
9	97.5	96.7	96.5	95.2	*84.6*	*69.5*	*56.7*	*46.2*	*35.7*	...	...	...	...	...	...	...	...
10	155	154	145	*118*	*99.1*	*81.6*	*67.0*	*54.6*	*42.2*	...	...	...	...	...	...	...	...
11	115	114	114	112	*99.1*	*81.6*	*67.0*	*54.6*	*42.2*	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	131	131	124	*100*	*84.6*	*69.5*	*56.7*	*46.2*	*35.7*	...	...	...	...	...	...	...	...
15	97.5	96.7	96.5	95.2	*84.6*	*69.5*	*56.7*	*46.2*	*35.7*	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
1	65Ni–28Mo–2Fe	Smls. & wld. fittings	SB–366	...	N10665	Annealed
2	65Ni–28Mo–2Fe	Wld. pipe	SB–619	...	N10665	Annealed
3	65Ni–28Mo–2Fe	Wld. pipe	SB–619	...	N10665	Annealed
4	65Ni–28Mo–2Fe	Wld. tube	SB–626	...	N10665	Annealed
5	65Ni–28Mo–2Fe	Wld. tube	SB–626	...	N10665	Annealed
6	65Ni–28Mo–2Fe	Plate, sheet, strip	SB–333	...	N10665	Solution ann.
7	65Ni–28Mo–2Fe	Plate, sheet, strip	SB–333	...	N10665	Solution ann.
8	65Ni–28Mo–2Fe	Rod	SB–335	...	N10665	Solution ann.
9	65Ni–28Mo–2Fe	Rod	SB–335	...	N10665	Solution ann.
10	65Ni–28Mo–2Fe	Forgings	SB–462	...	N10665	Solution ann.
11	65Ni–28Mo–2Fe	Forgings	SB–462	...	N10665	Solution ann.
12	65Ni–28Mo–2Fe	Forgings	SB–564	...	N10665	Solution ann.
13	65Ni–28Mo–2Fe	Forgings	SB–564	...	N10665	Solution ann.
14	65Ni–28Mo–2Fe	Wld. pipe	SB–619	...	N10665	Solution ann.
15	65Ni–28Mo–2Fe	Wld. pipe	SB–619	...	N10665	Solution ann.
16	65Ni–28Mo–2Fe	Smls. pipe & tube	SB–622	...	N10665	Solution ann.
17	65Ni–28Mo–2Fe	Smls. pipe & tube	SB–622	...	N10665	Solution ann.
18	65Ni–28Mo–2Fe	Wld. tube	SB–626	...	N10665	Solution ann.
19	65Ni–28Mo–2Fe	Wld. tube	SB–626	...	N10665	Solution ann.
20	65Ni–29.5Mo–2Fe–2Cr	Plate, sheet, strip	SB–333	...	N10675	Solution ann.
21	65Ni–29.5Mo–2Fe–2Cr	Plate, sheet, strip	SB–333	...	N10675	Solution ann.
22	65Ni–29.5Mo–2Fe–2Cr	Rod	SB–335	...	N10675	Solution ann.
23	65Ni–29.5Mo–2Fe–2Cr	Rod	SB–335	...	N10675	Solution ann.
24	65Ni–29.5Mo–2Fe–2Cr	Smls. & wld. fittings	SB–366	...	N10675	Solution ann.
25	65Ni–29.5Mo–2Fe–2Cr	Forgings	SB–462	...	N10675	Solution ann.
26	65Ni–29.5Mo–2Fe–2Cr	Forgings	SB–462	...	N10675	Solution ann.
27	65Ni–29.5Mo–2Fe–2Cr	Forgings	SB–564	...	N10675	Solution ann.
28	65Ni–29.5Mo–2Fe–2Cr	Forgings	SB–564	...	N10675	Solution ann.
29	65Ni–29.5Mo–2Fe–2Cr	Wld. pipe	SB–619	...	N10675	Solution ann.
30	65Ni–29.5Mo–2Fe–2Cr	Wld. pipe	SB–619	...	N10675	Solution ann.
31	65Ni–29.5Mo–2Fe–2Cr	Smls. pipe & tube	SB–622	...	N10675	Solution ann.
32	65Ni–29.5Mo–2Fe–2Cr	Smls. pipe & tube	SB–622	...	N10675	Solution ann.
33	65Ni–29.5Mo–2Fe–2Cr	Wld. tube	SB–626	...	N10675	Solution ann.
34	65Ni–29.5Mo–2Fe–2Cr	Wld. tube	SB–626	...	N10675	Solution ann.
35	37Ni–30Co–28Cr–2.7Si	Smls. & wld. fittings	SB–366	...	N12160	Solution ann.
36	37Ni–30Co–28Cr–2.7Si	Plate, sheet, strip	SB–435	...	N12160	Solution ann.
37	37Ni–30Co–28Cr–2.7Si	Plate, sheet, strip	SB–435	...	N12160	Solution ann.
38	37Ni–30Co–28Cr–2.7Si	Forgings	SB–564	...	N12160	Solution ann.
39	37Ni–30Co–28Cr–2.7Si	Forgings	SB–564	...	N12160	Solution ann.
40	37Ni–30Co–28Cr–2.7Si	Rod	SB–572	...	N12160	Solution ann.
41	37Ni–30Co–28Cr–2.7Si	Rod	SB–572	...	N12160	Solution ann.
42	37Ni–30Co–28Cr–2.7Si	Wld. pipe	SB–619	...	N12160	Solution ann.
43	37Ni–30Co–28Cr–2.7Si	Wld. pipe	SB–619	...	N12160	Solution ann.
44	37Ni–30Co–28Cr–2.7Si	Smls. pipe & tube	SB–622	...	N12160	Solution ann.
45	37Ni–30Co–28Cr–2.7Si	Smls. pipe & tube	SB–622	...	N12160	Solution ann.

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	...	44	760	350	NP	NP	427	343	NFN–16	G5, W12
2	...	44	760	350	NP	427 (Cl. 3 only)	NP	NP	NFN–16	G5, W5
3	...	44	760	350	NP	427 (Cl. 3 only)	NP	NP	NFN–16	W5
4	...	44	760	350	NP	427 (Cl. 3 only)	NP	NP	NFN–16	G5, W5
5	...	44	760	350	NP	427 (Cl. 3 only)	NP	NP	NFN–16	W5
6	...	44	760	350	NP	427 (Cl. 3 only)	427	343	NFN–16	...
7	...	44	760	350	NP	427 (Cl. 3 only)	427	NP	NFN–16	G5
8	...	44	760	350	NP	427 (Cl. 3 only)	427	343	NFN–16	G13
9	...	44	760	350	NP	427 (Cl. 3 only)	427	343	NFN–16	G5, G13
10	...	44	760	350	NP	NP	427	NP	NFN–16	...
11	...	44	760	350	NP	NP	427	NP	NFN–16	G5
12	...	44	760	350	NP	NP	427	NP	NFN–16	...
13	...	44	760	350	NP	NP	427	NP	NFN–16	G5
14	...	44	760	350	NP	NP	427	343	NFN–16	G14
15	...	44	760	350	NP	NP	427	343	NFN–16	G5, G14
16	...	44	760	350	NP	427 (Cl. 3 only)	427	343	NFN–16	...
17	...	44	760	350	NP	427 (Cl. 3 only)	427	343	NFN–16	G5
18	...	44	760	350	NP	NP	427	343	NFN–16	G5, G14
19	...	44	760	350	NP	NP	427	343	NFN–16	G14
20	...	44	760	350	NP	NP	427	343	NFN–16	G5
21	...	44	760	350	NP	NP	427	343	NFN–16	...
22	...	44	760	350	NP	NP	427	343	NFN–16	G5
23	...	44	760	350	NP	NP	427	343	NFN–16	...
24	...	44	760	350	NP	NP	427	343	NFN–16	G5, W12
25	...	44	760	350	NP	NP	427	NP	NFN–16	G5
26	...	44	760	350	NP	NP	427	NP	NFN–16	...
27	...	44	760	350	NP	NP	427	343	NFN–16	G5
28	...	44	760	350	NP	NP	427	343	NFN–16	...
29	...	44	760	350	NP	NP	427	343	NFN–16	G5, G14
30	...	44	760	350	NP	NP	427	343	NFN–16	G14
31	...	44	760	350	NP	NP	427	343	NFN–16	G5
32	...	44	760	350	NP	NP	427	343	NFN–16	...
33	...	44	760	350	NP	NP	427	343	NFN–16	G5, G14
34	...	44	760	350	NP	NP	427	343	NFN–16	G14
35	...	46	620	240	NP	NP	816	NP	NFN–13	G5, T14, W12
36	...	46	620	240	NP	NP	816	NP	NFN–13	T14
37	...	46	620	240	NP	NP	816	NP	NFN–13	G5, T14
38	...	46	620	240	NP	NP	816	NP	NFN–13	T14
39	...	46	620	240	NP	NP	816	NP	NFN–13	G5, T14
40	...	46	620	240	NP	NP	816	NP	NFN–13	T14
41	...	46	620	240	NP	NP	816	NP	NFN–13	G5, T14
42	...	46	620	240	NP	NP	816	NP	NFN–13	G14, T14
43	...	46	620	240	NP	NP	816	NP	NFN–13	G5, G14, T14
44	...	46	620	240	NP	NP	816	NP	NFN–13	T14
45	...	46	620	240	NP	NP	816	NP	NFN–13	G5, T14

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	216	216	216	216	216	216	216	216	216	216	216	215	214	213	212	211	210	...
2	216	216	216	216	216	216	216	216	216	216	216	215	214	213	212	211	210	...
3	216	216	216	213	208	204	200	196	193	191	189	187	185	183	181	178	176	...
4	216	216	216	216	216	216	216	216	216	216	216	215	214	213	212	211	210	...
5	216	216	216	213	208	204	200	196	193	191	189	187	185	183	181	178	176	...
6	216	216	216	213	208	204	200	196	193	191	189	187	185	183	181	178	176	...
7	216	216	216	216	216	216	216	216	216	216	216	215	214	213	212	211	210	...
8	216	216	216	213	208	204	200	196	193	191	189	187	185	183	181	178	176	...
9	216	216	216	216	216	216	216	216	216	216	216	215	214	213	212	211	210	...
10	216	216	216	213	208	204	200	196	193	191	189	187	185	183	181	178	176	...
11	216	216	216	216	216	216	216	216	216	216	216	215	214	213	212	211	210	...
12	216	216	216	213	208	204	200	196	193	191	189	187	185	183	181	178	176	...
13	216	216	216	216	216	216	216	216	216	216	216	215	214	213	212	211	210	...
14	184	184	184	181	177	173	170	167	164	162	160	159	157	156	154	151	149	...
15	184	184	184	184	184	184	184	184	184	184	183	182	182	181	180	179	179	...
16	216	216	216	213	208	204	200	196	193	191	189	187	185	183	181	178	176	...
17	216	216	216	216	216	216	216	216	216	216	216	215	214	213	212	211	210	...
18	184	184	184	184	184	184	184	184	184	184	183	182	182	181	180	179	179	...
19	184	184	184	181	177	173	170	167	164	162	160	159	157	156	154	151	149	...
20	216	216	216	216	216	216	216	216	215	213	212	210	209	208	207	206	205	...
21	216	216	216	213	209	204	199	195	191	187	183	180	177	175	173	171	169	...
22	216	216	216	216	216	216	216	216	215	213	212	210	209	208	207	206	205	...
23	216	216	216	213	209	204	199	195	191	187	183	180	177	175	173	171	169	...
24	216	216	216	216	216	216	216	216	215	213	212	210	209	208	207	206	205	...
25	216	216	216	216	216	216	216	216	215	213	212	210	209	208	207	206	205	...
26	216	216	216	213	209	204	199	195	191	187	183	180	177	175	173	171	169	...
27	216	216	216	216	216	216	216	216	215	213	212	210	209	208	207	206	205	...
28	216	216	216	213	209	204	199	195	191	187	183	180	177	175	173	171	169	...
29	184	184	184	184	184	184	184	184	183	181	180	179	178	177	176	175	174	...
30	184	184	184	181	178	174	170	166	163	160	156	153	150	149	147	146	144	...
31	216	216	216	216	216	216	216	216	215	213	212	210	209	208	207	206	205	...
32	216	216	216	213	209	204	199	195	191	187	183	180	177	175	173	171	169	...
33	184	184	184	184	184	184	184	184	183	181	180	179	178	177	176	175	174	...
34	184	184	184	181	178	174	170	166	163	160	156	153	150	149	147	146	144	...
35	161	161	161	161	161	159	154	148	142	137	133	130	128	127	126	126	126	126
36	161	151	139	132	126	120	115	110	105	101	98.6	96.5	94.7	93.8	93.8	93.1	93.1	93.1
37	161	161	161	161	161	159	154	148	142	137	133	130	128	127	126	126	126	126
38	161	151	139	132	126	120	115	110	105	101	98.6	96.5	94.7	93.8	93.8	93.1	93.1	93.1
39	161	161	161	161	161	159	154	148	142	137	133	130	128	127	126	126	126	126
40	161	151	139	132	126	120	115	110	105	101	98.6	96.5	94.7	93.8	93.8	93.1	93.1	93.1
41	161	161	161	161	161	159	154	148	142	137	133	130	128	127	126	126	126	126
42	137	128	118	113	107	102	97.3	93.1	89.5	86.6	84.1	81.9	80.4	80.0	80.0	79.3	79.3	79.3
43	137	137	137	137	136	135	131	126	121	117	113	111	108	108	108	108	108	108
44	161	151	139	132	126	120	115	110	105	101	98.6	96.5	94.7	93.8	93.8	93.1	93.1	93.1
45	161	161	161	161	161	159	154	148	142	137	133	130	128	127	126	126	126	126

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	126	122	105	*89.2*	*72.4*	*61.2*	*51.3*	*43.2*	*36.2*	*31.0*	*26.5*	*22.5*	*19.1*	*16.1*	...	...	...
36	93.1	93.1	93.0	*89.2*	*72.4*	*61.2*	*51.3*	*43.2*	*36.2*	*31.0*	*26.5*	*22.5*	*19.1*	*16.1*	...	...	...
37	126	122	105	*89.2*	*72.4*	*61.2*	*51.3*	*43.2*	*36.2*	*31.0*	*26.5*	*22.5*	*19.1*	*16.1*	...	...	...
38	93.1	93.1	93.0	*89.2*	*72.4*	*61.2*	*51.3*	*43.2*	*36.2*	*31.0*	*26.5*	*22.5*	*19.1*	*16.1*	...	...	...
39	126	122	105	*89.2*	*72.4*	*61.2*	*51.3*	*43.2*	*36.2*	*31.0*	*26.5*	*22.5*	*19.1*	*16.1*	...	...	...
40	93.1	93.1	93.0	*89.2*	*72.4*	*61.2*	*51.3*	*43.2*	*36.2*	*31.0*	*26.5*	*22.5*	*19.1*	*16.1*	...	...	...
41	126	122	105	*89.2*	*72.4*	*61.2*	*51.3*	*43.2*	*36.2*	*31.0*	*26.5*	*22.5*	*19.1*	*16.1*	...	...	...
42	79.3	79.3	79.3	*76.1*	*61.8*	*51.8*	*43.8*	*37.0*	*30.6*	*26.5*	*22.8*	*19.4*	*16.4*	*13.3*	...	...	...
43	108	104	89.4	*76.1*	*61.8*	*51.8*	*43.8*	*37.0*	*30.6*	*26.5*	*22.8*	*19.4*	*16.4*	*13.3*	...	...	...
44	93.1	93.1	93.0	*89.2*	*72.4*	*61.2*	*51.3*	*43.2*	*36.2*	*31.0*	*26.5*	*22.5*	*19.1*	*16.1*	...	...	...
45	126	122	105	*89.2*	*72.4*	*61.2*	*51.3*	*43.2*	*36.2*	*31.0*	*26.5*	*22.5*	*19.1*	*16.1*	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
1	37Ni–30Co–28Cr–2.7Si	Wld. tube	SB–626	...	N12160	Solution ann.
2	37Ni–30Co–28Cr–2.7Si	Wld. tube	SB–626	...	N12160	Solution ann.
3	59Ni–22Cr–14Mo–4Fe–3W	Castings	SA–494	CX2MW	N26022	Solution ann.
4	53Ni–17Mo–16Cr–6Fe–5W	Castings	SA–494	CW–12MW/C	N30002	Annealed
5	62Ni–28Mo–5Fe	Castings	SA–494	N–12MV/B	N30012	Annealed
6	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Smls. & wld. fittings	SB–366	...	R20033	Solution ann.
7	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Forged fittings	SB–462	...	R20033	Solution ann.
8	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Forgings	SB–564	...	R20033	Solution ann.
9	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Wld. pipe	SB–619	...	R20033	Solution ann.
10	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Smls. pipe & tube	SB–622	...	R20033	Solution ann.
11	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Plate, sheet, strip	SB–625	...	R20033	Solution ann.
12	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Wld. tube	SB–626	...	R20033	Solution ann.
13	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Rod	SB–649	...	R20033	Solution ann.
14	21Ni–30Fe–22Cr–18Co–3Mo–3W	Plate, sheet, strip	SB–435	...	R30556	Annealed
15	21Ni–30Fe–22Cr–18Co–3Mo–3W	Plate, sheet, strip	SB–435	...	R30556	Annealed
16	21Ni–30Fe–22Cr–18Co–3Mo–3W	Rod	SB–572	...	R30556	Annealed
17	21Ni–30Fe–22Cr–18Co–3Mo–3W	Rod	SB–572	...	R30556	Annealed
18	21Ni–30Fe–22Cr–18Co–3Mo–3W	Wld. pipe	SB–619	...	R30556	Annealed
19	21Ni–30Fe–22Cr–18Co–3Mo–3W	Wld. pipe	SB–619	...	R30556	Annealed
20	21Ni–30Fe–22Cr–18Co–3Mo–3W	Smls. pipe & tube	SB–622	...	R30556	Annealed
21	21Ni–30Fe–22Cr–18Co–3Mo–3W	Smls. pipe & tube	SB–622	...	R30556	Annealed
22	21Ni–30Fe–22Cr–18Co–3Mo–3W	Wld. tube	SB–626	...	R30556	Annealed
23	21Ni–30Fe–22Cr–18Co–3Mo–3W	Wld. tube	SB–626	...	R30556	Annealed
24	Co–26Cr–9Ni–5Mo–3Fe–2W	Rod	SB–815	...	R31233	Solution ann.
25	Co–26Cr–9Ni–5Mo–3Fe–2W	Plate, sheet, strip	SB–818	...	R31233	Solution ann.
26	Ti	Plate, sheet, strip	SB–265	1	R50250	Annealed
27	Ti	Smls. tube	SB–338	1	R50250	Annealed
28	Ti	Wld. tube	SB–338	1	R50250	Annealed
29	Ti	Bar, billet	SB–348	1	R50250	Annealed
30	Ti	Smls. & wld. fittings	SB–363	WPT1	R50250	Annealed
31	Ti	Forgings	SB–381	F–1	R50250	Annealed
32	Ti	Smls. pipe	SB–861	1	R50250	Annealed
33	Ti	Wld. pipe	SB–862	1	R50250	Annealed
34	Ti	Castings	SB–367	C–2	R50400	...
35	Ti	Plate, sheet, strip	SB–265	2	R50400	Annealed
36	Ti	Smls. tube	SB–338	2	R50400	Annealed
37	Ti	Wld. tube	SB–338	2	R50400	Annealed
38	Ti	Bar, billet	SB–348	2	R50400	Annealed
39	Ti	Smls. & wld. fittings	SB–363	WPT2	R50400	Annealed
40	Ti	Forgings	SB–381	F–2	R50400	Annealed
41	Ti	Smls. pipe	SB–861	2	R50400	Annealed
42	Ti	Wld. pipe	SB–862	2	R50400	Annealed
43	Ti	Plate, sheet, strip	SB–265	2H	R50400	Annealed
44	Ti	Smls. tube	SB–338	2H	R50400	Annealed
45	Ti	Wld. tube	SB–338	2H	R50400	Annealed

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	46	620	240	NP	NP	816	NP	NFN–13	G14, T14
2	...	46	620	240	NP	NP	816	NP	NFN–13	G5, G14, T14
3	...	43	550	310	NP	NP	260	260	NFN–10	G15
4	...	...	495	275	NP	NP	538	343	NFN–10	G15, W1
5	...	...	525	275	NP	NP	538	343	NFN–10	G15, W1
6	...	45	750	380	NP	NP	427	NP	NFN–10	W12
7	...	45	750	380	NP	NP	427	NP	NFN–10	...
8	...	45	750	380	NP	NP	427	NP	NFN–10	...
9	...	45	750	380	NP	NP	427	NP	NFN–10	G14
10	...	45	750	380	NP	NP	427	NP	NFN–10	...
11	...	45	750	380	NP	NP	427	NP	NFN–10	...
12	...	45	750	380	NP	NP	427	NP	NFN–10	G14
13	...	45	750	380	NP	NP	427	NP	NFN–10	...
14	...	45	690	310	NP	NP	899	343	NFN–15	G4, T17
15	...	45	690	310	NP	NP	899	343	NFN–15	G4, G5, T16
16	...	45	690	310	NP	NP	899	343	NFN–15	G4, T17
17	...	45	690	310	NP	NP	899	343	NFN–15	G4, G5, T16
18	...	45	690	310	NP	NP	899	343	NFN–15	G4, G14, T16
19	...	45	690	310	NP	NP	899	343	NFN–15	G4, G5, G14, T15
20	...	45	690	310	NP	NP	899	343	NFN–15	G4, T17
21	...	45	690	310	NP	NP	899	343	NFN–15	G4, G5, T16
22	...	45	690	310	NP	NP	899	343	NFN–15	G4, G14, T16
23	...	45	690	310	NP	NP	899	343	NFN–15	G4, G5, G14, T15
24	...	49	896	379	NP	NP	427	NP	NFN–15	G8
25	...	49	896	379	NP	NP	427	NP	NFN–15	G8
26	...	51	240	138	316	316	316	NP	NFT–3	...
27	...	51	240	138	316	316	316	NP	NFT–3	...
28	...	51	240	138	316	316	316	NP	NFT–3	G14, W6
29	...	51	240	138	316	316	316	NP	NFT–3	...
30	...	51	240	138	NP	316	316	NP	NFT–3	W5, W12
31	...	51	240	138	NP	316	316	NP	NFT–3	...
32	...	51	240	138	316	316	316	NP	NFT–3	...
33	...	51	240	138	316	316	316	NP	NFT–3	G14, W6
34	...	51	345	275	NP	NP	260	260	NFT–2	G15
35	...	51	345	275	316	316	316	316	NFT–2	...
36	...	51	345	275	316	316	316	316	NFT–2	...
37	...	51	345	275	316	316	316	316	NFT–2	G14, W6
38	...	51	345	275	316	316	316	316	NFT–2	...
39	...	51	345	275	NP	316	316	316	NFT–2	W5, W12
40	...	51	345	275	NP	316	316	316	NFT–2	...
41	...	51	345	275	316	316	316	316	NFT–2	...
42	...	51	345	275	316	316	316	316	NFT–2	G14, W6
43	...	51	400	275	NP	NP	316	NP	NFT–2	...
44	...	51	400	275	NP	NP	316	NP	NFT–2	...
45	...	51	400	275	NP	NP	316	NP	NFT–2	G14, W6

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	137	128	118	113	107	102	97.3	93.1	89.5	86.6	84.1	81.9	80.4	80.0	80.0	79.3	79.3	79.3
2	137	137	137	137	136	135	131	126	121	117	113	111	108	108	108	108	108	108
3	158	156	152	150	149	148	148	148	148	148	...	...	...	...	...	...	...	...
4	142	138	133	130	128	128	128	127	126	122	118	117	117	117	117	117	117	115
5	150	143	140	140	140	140	140	140	140	138	132	127	126	124	122	119	118	115
6	214	214	212	204	193	186	181	177	173	168	164	162	161	159	158	156	154	...
7	214	214	212	204	193	186	181	177	173	168	164	162	161	159	158	156	154	...
8	214	214	212	204	193	186	181	177	173	168	164	162	161	159	158	156	154	...
9	182	182	180	173	164	158	154	150	147	143	140	138	137	135	134	133	131	...
10	214	214	212	204	193	186	181	177	173	168	164	162	161	159	158	156	154	...
11	214	214	212	204	193	186	181	177	173	168	164	162	161	159	158	156	154	...
12	182	182	180	173	164	158	154	150	147	143	140	138	137	135	134	133	131	...
13	214	214	212	204	193	186	181	177	173	168	164	162	161	159	158	156	154	...
14	197	187	174	166	159	153	148	143	140	137	135	132	130	129	127	126	124	123
15	197	197	197	195	193	190	187	185	183	181	180	178	176	173	172	170	168	167
16	197	187	174	166	159	153	148	143	140	137	135	132	130	129	127	126	124	123
17	197	197	197	195	193	190	187	185	183	181	180	178	176	173	172	170	168	167
18	168	159	148	141	135	130	125	122	119	116	114	112	111	109	108	107	106	105
19	168	168	167	166	164	161	159	157	156	155	153	151	149	147	145	144	143	142
20	197	187	174	166	159	153	148	143	140	137	135	132	130	129	127	126	124	123
21	197	197	197	195	193	190	187	185	183	181	180	178	176	173	172	170	168	167
22	168	159	148	141	135	130	125	122	119	116	114	112	111	109	108	107	106	105
23	168	168	167	166	164	161	159	157	156	155	153	151	149	147	145	144	143	142
24	236	235	218	...	196	...	177	...	163	...	154	151	148	146	144	142	139	...
25	236	235	218	...	196	...	177	...	163	...	154	151	148	146	144	142	139	...
26	68.9	64.2	55.6	50.2	45.3	41.6	38.4	33.9	30.3	27.4	25.2	23.4	...	...	...	...	...	...
27	68.9	64.2	55.6	50.2	45.3	41.6	38.4	33.9	30.3	27.4	25.2	23.4	...	...	...	...	...	...
28	58.6	54.6	47.0	42.8	38.4	35.3	32.9	28.6	25.8	23.3	21.4	19.2	...	...	...	...	...	...
29	68.9	64.2	55.6	50.2	45.3	41.6	38.4	33.9	30.3	27.4	25.2	23.4	...	...	...	...	...	...
30	68.9	64.2	55.6	50.2	45.3	41.6	38.4	33.9	30.3	27.4	25.2	23.4	...	...	...	...	...	...
31	68.9	64.2	55.6	50.2	45.3	41.6	38.4	33.9	30.3	27.4	25.2	23.4	...	...	...	...	...	...
32	68.9	64.2	55.6	50.2	45.3	41.6	38.4	33.9	30.3	27.4	25.2	23.4	...	...	...	...	...	...
33	58.6	54.6	47.0	42.8	38.4	35.3	32.9	28.6	25.8	23.3	21.4	19.2	...	...	...	...	...	...
34	98.6	90.5	79.4	72.8	66.6	61.7	56.7	52.2	48.3	44.7	...	...	...	...	...	...	...	...
35	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
36	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
37	83.4	80.8	71.2	65.4	60.5	56.1	52.3	49.1	46.1	43.0	39.9	36.7	...	...	...	...	...	...
38	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
39	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
40	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
41	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
42	83.4	80.8	71.2	65.4	60.5	56.1	52.3	49.1	46.1	43.0	39.9	36.7	...	...	...	...	...	...
43	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
44	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
45	96.9	93.5	82.6	75.9	70.1	65.1	60.7	56.8	53.1	49.6	46.3	43.3	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	79.3	79.3	79.3	*76.1*	*61.8*	*51.8*	*43.8*	*37.0*	*30.6*	*26.5*	*22.8*	*19.4*	*16.4*	*13.3*	...	...	...
2	108	104	89.4	*76.1*	*61.8*	*51.8*	*43.8*	*37.0*	*30.6*	*26.5*	*22.8*	*19.4*	*16.4*	*13.3*	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	112	110	108	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	113	110	107	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	122	121	120	119	118	115	*93.0*	*76.1*	*62.9*	*51.3*	*41.8*	*34.3*	*28.3*	*22.6*	*17.4*	*14.0*	*10.9*
15	165	163	162	158	140	*115*	*93.0*	*76.1*	*62.9*	*51.3*	*41.8*	*34.3*	*28.3*	*22.6*	*17.4*	*14.0*	*10.9*
16	122	121	120	119	118	115	*93.0*	*76.1*	*62.9*	*51.3*	*41.8*	*34.3*	*28.3*	*22.6*	*17.4*	*14.0*	*10.9*
17	165	163	162	158	140	*115*	*93.0*	*76.1*	*62.9*	*51.3*	*41.8*	*34.3*	*28.3*	*22.6*	*17.4*	*14.0*	*10.9*
18	104	103	102	101	99.8	*98.1*	*79.3*	*65.0*	*53.6*	*43.9*	*35.9*	*29.1*	*24.0*	*19.5*	*14.8*	*12.0*	*9.54*
19	140	138	138	134	*119*	*98.1*	*79.3*	*65.0*	*53.6*	*43.9*	*35.9*	*29.1*	*24.0*	*19.5*	*14.8*	*12.0*	*9.54*
20	122	121	120	119	118	115	*93.0*	*76.1*	*62.9*	*51.3*	*41.8*	*34.3*	*28.3*	*22.6*	*17.4*	*14.0*	*10.9*
21	165	163	162	158	140	*115*	*93.0*	*76.1*	*62.9*	*51.3*	*41.8*	*34.3*	*28.3*	*22.6*	*17.4*	*14.0*	*10.9*
22	104	103	102	101	99.8	*98.1*	*79.3*	*65.0*	*53.6*	*43.9*	*35.9*	*29.1*	*24.0*	*19.5*	*14.8*	*12.0*	*9.54*
23	140	138	138	134	*119*	*98.1*	*79.3*	*65.0*	*53.6*	*43.9*	*35.9*	*29.1*	*24.0*	*19.5*	*14.8*	*12.0*	*9.54*
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
1	Ti	Bar, billet	SB–348	2H	R50400	Annealed
2	Ti	Smls. fittings	SB–363	WPT2H	R50400	Annealed
3	Ti	Wld. fittings	SB–363	WPT2HW	R50400	Annealed
4	Ti	Forgings	SB–381	F–2H	R50400	Annealed
5	Ti	Smls. pipe	SB–861	2H	R50400	Annealed
6	Ti	Wld. pipe	SB–862	2H	R50400	Annealed
7	Ti	Castings	SB–367	C–3	R50550	...
8	Ti	Plate, sheet, strip	SB–265	3	R50550	Annealed
9	Ti	Smls. tube	SB–338	3	R50550	Annealed
10	Ti	Wld. tube	SB–338	3	R50550	Annealed
11	Ti	Bar, billet	SB–348	3	R50550	Annealed
12	Ti	Smls. & wld. fittings	SB–363	WPT3	R50550	Annealed
13	Ti	Forgings	SB–381	F–3	R50550	Annealed
14	Ti	Smls. pipe	SB–861	3	R50550	Annealed
15	Ti	Wld. pipe	SB–862	3	R50550	Annealed
16	Ti–Pd	Plate, sheet, strip	SB–265	11	R52250	Annealed
17	Ti–Pd	Plate, sheet, strip	SB–265	17	R52252	Annealed
18	Ti–Ru	Plate, sheet, strip	SB–265	27	R52254	Annealed
19	Ti–Pd	Plate, sheet, strip	SB–265	7	R52400	Annealed
20	Ti–Pd	Smls. tube	SB–338	7	R52400	Annealed
21	Ti–Pd	Wld. tube	SB–338	7	R52400	Annealed
22	Ti–Pd	Bar, billet	SB–348	7	R52400	Annealed
23	Ti–Pd	Smls. fittings	SB–363	WPT7	R52400	Annealed
24	Ti–Pd	Wld. fittings	SB–363	WPT7W	R52400	Annealed
25	Ti–Pd	Castings	SB–367	C–7	R52400	Annealed
26	Ti–Pd	Forgings	SB–381	F–7	R52400	Annealed
27	Ti–Pd	Smls. pipe	SB–861	7	R52400	Annealed
28	Ti–Pd	Wld. pipe	SB–862	7	R52400	Annealed
29	Ti–0.15Pd	Plate, sheet, strip	SB–265	7H	R52400	Annealed
30	Ti–0.15Pd	Smls. tube	SB–338	7H	R52400	Annealed
31	Ti–0.15Pd	Wld. tube	SB–338	7H	R52400	Annealed
32	Ti–0.15Pd	Bar, billet	SB–348	7H	R52400	Annealed
33	Ti–0.15Pd	Smls. fittings	SB–363	WPT7H	R52400	Annealed
34	Ti–0.15Pd	Wld. fittings	SB–363	WPT7HW	R52400	Annealed
35	Ti–0.15Pd	Forgings	SB–381	F–7H	R52400	Annealed
36	Ti–0.15Pd	Smls. pipe	SB–861	7H	R52400	Annealed
37	Ti–0.15Pd	Wld. pipe	SB–862	7H	R52400	Annealed
38	Ti–Pd	Plate, sheet, strip	SB–265	16	R52402	Annealed
39	Ti–Pd	Smls. tube	SB–338	16	R52402	Annealed
40	Ti–Pd	Wld. tube	SB–338	16	R52402	Annealed
41	Ti–Pd	Bar, billet	SB–348	16	R52402	Annealed
42	Ti–Pd	Forgings	SB–381	F–16	R52402	Annealed
43	Ti–0.05Pd	Plate, sheet, strip	SB–265	16H	R52402	Annealed
44	Ti–0.05Pd	Smls. tube	SB–338	16H	R52402	Annealed
45	Ti–0.05Pd	Wld. tube	SB–338	16H	R52402	Annealed

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	...	51	400	275	NP	NP	316	NP	NFT–2	...
2	...	51	400	275	NP	NP	316	NP	NFT–2	...
3	...	51	400	275	NP	NP	316	NP	NFT–2	W12
4	...	51	400	275	NP	NP	316	NP	NFT–2	...
5	...	51	400	275	NP	NP	316	NP	NFT–2	...
6	...	51	400	275	NP	NP	316	NP	NFT–2	W12
7	...	52	450	380	NP	NP	260	NP	NFT–1	G15
8	...	52	450	380	316	316	316	316	NFT–1	...
9	...	52	450	380	316	316	316	316	NFT–1	...
10	...	52	450	380	316	316	316	316	NFT–1	G14, W6
11	...	52	450	380	316	316	316	316	NFT–1	...
12	...	52	450	380	NP	316	316	316	NFT–1	W5, W12
13	...	52	450	380	NP	316	316	316	NFT–1	...
14	...	52	450	380	316	316	316	316	NFT–1	...
15	...	52	450	380	316	316	316	316	NFT–1	G14, W6
16	...	51	240	138	NP	NP	316	NP	NFT–3	...
17	...	51	240	138	NP	NP	316	NP	NFT–3	...
18	...	51	240	138	NP	NP	316	NP	NFT–3	...
19	...	51	345	275	NP	316	316	316	NFT–2	...
20	...	51	345	275	NP	316	316	316	NFT–2	...
21	...	51	345	275	NP	316	316	316	NFT–2	G14, W6
22	...	51	345	275	NP	316	316	316	NFT–2	...
23	...	51	345	275	NP	NP	316	316	NFT–2	...
24	...	51	345	275	NP	NP	316	316	NFT–2	G14
25	...	51	345	275	NP	NP	260	260	NFT–2	G15
26	...	51	345	275	NP	NP	316	316	NFT–2	...
27	...	51	345	275	NP	316	316	316	NFT–2	...
28	...	51	345	275	NP	316	316	316	NFT–2	G14, W6
29	...	51	400	275	NP	NP	316	NP	NFT–2	...
30	...	51	400	275	NP	NP	316	NP	NFT–2	...
31	...	51	400	275	NP	NP	316	NP	NFT–2	G14, W6
32	...	51	400	275	NP	NP	316	NP	NFT–2	...
33	...	51	400	275	NP	NP	316	NP	NFT–2	...
34	...	51	400	275	NP	NP	316	NP	NFT–2	W12
35	...	51	400	275	NP	NP	316	NP	NFT–2	...
36	...	51	400	275	NP	NP	316	NP	NFT–2	...
37	...	51	400	275	NP	NP	316	NP	NFT–2	W12
38	...	51	345	275	NP	NP	316	316	NFT–2	...
39	...	51	345	275	NP	NP	316	316	NFT–2	...
40	...	51	345	275	NP	NP	316	316	NFT–2	G14, W6
41	...	51	345	275	NP	NP	316	316	NFT–2	...
42	...	51	345	275	NP	NP	316	316	NFT–2	...
43	...	51	400	275	NP	NP	316	NP	NFT–2	...
44	...	51	400	275	NP	NP	316	NP	NFT–2	...
45	...	51	400	275	NP	NP	316	NP	NFT–2	G14, W6

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
2	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
3	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
4	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
5	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
6	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
7	128	121	106	96.5	87.9	79.8	72.3	65.8	60.4	56.2	...	...	...	...	...	...	...	...
8	128	121	106	96.5	87.9	79.8	72.3	65.8	60.4	56.2	52.9	49.9	...	...	...	...	...	...
9	128	121	106	96.5	87.9	79.8	72.3	65.8	60.4	56.2	52.9	49.9	...	...	...	...	...	...
10	109	103	90.1	82.2	74.1	67.3	61.7	56.0	51.2	47.6	44.9	42.5	...	...	...	...	...	...
11	128	121	106	96.5	87.9	79.8	72.3	65.8	60.4	56.2	52.9	49.9	...	...	...	...	...	...
12	128	121	106	96.5	87.9	79.8	72.3	65.8	60.4	56.2	52.9	49.9	...	...	...	...	...	...
13	128	121	106	96.5	87.9	79.8	72.3	65.8	60.4	56.2	52.9	49.9	...	...	...	...	...	...
14	128	121	106	96.5	87.9	79.8	72.3	65.8	60.4	56.2	52.9	49.9	...	...	...	...	...	...
15	109	103	90.1	82.2	74.1	67.3	61.7	56.0	51.2	47.6	44.9	42.5	...	...	...	...	...	...
16	68.9	64.2	55.6	50.2	45.3	41.6	38.4	33.9	30.3	27.4	25.2	23.4	...	...	...	...	...	...
17	68.9	64.2	55.6	50.2	45.3	41.6	38.4	33.9	30.3	27.4	25.2	23.4	...	...	...	...	...	...
18	68.9	64.2	55.6	50.2	45.3	41.6	38.4	33.9	30.3	27.4	25.2	23.4	...	...	...	...	...	...
19	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
20	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
21	83.4	80.8	71.2	65.4	60.5	56.1	52.3	49.1	46.1	43.0	39.9	36.7	...	...	...	...	...	...
22	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
23	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
24	83.4	80.8	71.2	65.4	60.5	56.1	52.3	49.1	46.1	43.0	39.9	36.7	...	...	...	...	...	...
25	98.6	90.5	79.4	72.8	66.6	61.7	56.7	52.2	48.3	44.7	...	...	...	...	...	...	...	...
26	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
27	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
28	83.4	80.8	71.2	65.4	60.5	56.1	52.3	49.1	46.1	43.0	39.9	36.7	...	...	...	...	...	...
29	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
30	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
31	96.9	93.5	82.6	75.9	70.1	65.1	60.7	56.8	53.1	49.6	46.3	43.3	...	...	...	...	...	...
32	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
33	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
34	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
35	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
36	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
37	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
38	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
39	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
40	83.4	80.8	71.2	65.4	60.5	56.1	52.3	49.1	46.1	43.0	39.9	36.7	...	...	...	...	...	...
41	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
42	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
43	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
44	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
45	97.1	93.4	82.6	75.9	70.1	65.1	60.8	56.8	53.1	49.6	46.3	43.3	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	1	Ti–0.05Pd	Bar, billet	SB–348	16H	R52402	Annealed
	2	Ti–0.05Pd	Smls. fittings	SB–363	WPT16H	R52402	Annealed
	3	Ti–0.05Pd	Wld. fittings	SB–363	WPT16HW	R52402	Annealed
	4	Ti–0.05Pd	Forgings	SB–381	F–16H	R52402	Annealed
	5	Ti–0.05Pd	Smls. pipe	SB–861	16H	R52402	Annealed
	6	Ti–0.05Pd	Wld. pipe	SB–862	16H	R52402	Annealed
	7	Ti–Ru	Plate, sheet, strip	SB–265	26	R52404	Annealed
	8	Ti–Ru	Smls. tube	SB–338	26	R52404	Annealed
	9	Ti–Ru	Wld. tube	SB–338	26	R52404	Annealed
	10	Ti–Ru	Bar, billet	SB–348	26	R52404	Annealed
	11	Ti–Ru	Smls. fittings	SB–363	WPT26	R52404	Annealed
	12	Ti–Ru	Wld. fittings	SB–363	WPT26W	R52404	Annealed
	13	Ti–Ru	Forgings	SB–381	F–26	R52404	Annealed
	14	Ti–Ru	Smls. pipe	SB–861	26	R52404	Annealed
	15	Ti–Ru	Wld. pipe	SB–862	26	R52404	Annealed
	16	Ti–0.10Ru	Plate, sheet, strip	SB–265	26H	R52404	Annealed
	17	Ti–0.10Ru	Smls. tube	SB–338	26H	R52404	Annealed
	18	Ti–0.10Ru	Wld. tube	SB–338	26H	R52404	Annealed
	19	Ti–0.10Ru	Bar, billet	SB–348	26H	R52404	Annealed
	20	Ti–0.10Ru	Smls. fittings	SB–363	WPT26H	R52404	Annealed
	21	Ti–0.10Ru	Wld. fittings	SB–363	WPT26HW	R52404	Annealed
	22	Ti–0.10Ru	Forgings	SB–381	F–26H	R52404	Annealed
	23	Ti–0.10Ru	Smls. pipe	SB–861	26H	R52404	Annealed
	24	Ti–0.10Ru	Wld. pipe	SB–862	26H	R52404	Annealed
(**23**)	25	Ti–0.3Mo–0.8Ni	Plate, sheet, strip	SB–265	12	R53400	Annealed
(**23**)	26	Ti–0.3Mo–0.8Ni	Smls. tube	SB–338	12	R53400	Annealed
(**23**)	27	Ti–0.3Mo–0.8Ni	Wld. tube	SB–338	12	R53400	Annealed
(**23**)	28	Ti–0.3Mo–0.8Ni	Bar, billet	SB–348	12	R53400	Annealed
(**23**)	29	Ti–0.3Mo–0.8Ni	Smls. fittings	SB–363	WPT12	R53400	Annealed
(**23**)	30	Ti–0.3Mo–0.8Ni	Wld. fittings	SB–363	WPT12W	R53400	Annealed
(**23**)	31	Ti–0.3Mo–0.8Ni	Forgings	SB–381	F–12	R53400	Annealed
(**23**)	32	Ti–0.3Mo–0.8Ni	Smls. pipe	SB–861	12	R53400	Annealed
(**23**)	33	Ti–0.3Mo–0.8Ni	Wld. pipe	SB–862	12	R53400	Annealed
	34	Ti–4Al–2.5V–1.5Fe	Plate, sheet, strip	SB–265	38	R54250	Annealed
	35	Ti–4Al–2.5V–1.5Fe	Smls. tube	SB–338	38	R54250	Annealed
	36	Ti–4Al–2.5V–1.5Fe	Wld. tube	SB–338	38	R54250	Annealed
	37	Ti–4Al–2.5V–1.5Fe	Bar, billet	SB–348	38	R54250	Annealed
	38	Ti–4Al–2.5V–1.5Fe	Smls. fittings	SB–363	WPT38	R54250	Annealed
	39	Ti–4Al–2.5V–1.5Fe	Wld. fittings	SB–363	WPT38W	R54250	Annealed
	40	Ti–4Al–2.5V–1.5Fe	Forgings	SB–381	F–38	R54250	Annealed
	41	Ti–4Al–2.5V–1.5Fe	Smls. pipe	SB–861	38	R54250	Annealed
	42	Ti–4Al–2.5V–1.5Fe	Wld. pipe	SB–862	38	R54250	Annealed
	43	Ti–3Al–2.5V	Plate, sheet, strip	SB–265	9	R56320	Annealed
	44	Ti–3Al–2.5V	Smls. tube	SB–338	9	R56320	Annealed
	45	Ti–3Al–2.5V	Wld. tube	SB–338	9	R56320	Annealed

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only) I	III	VIII-1	XII	External Pressure Chart No.	Notes
1	...	51	400	275	NP	NP	316	NP	NFT–2	...
2	...	51	400	275	NP	NP	316	NP	NFT–2	...
3	...	51	400	275	NP	NP	316	NP	NFT–2	W12
4	...	51	400	275	NP	NP	316	NP	NFT–2	...
5	...	51	400	275	NP	NP	316	NP	NFT–2	...
6	...	51	400	275	NP	NP	316	NP	NFT–2	W12
7	...	51	345	275	NP	NP	316	316	NFT–2	...
8	...	51	345	275	NP	NP	316	316	NFT–2	...
9	...	51	345	275	NP	NP	316	316	NFT–2	G14, W6
10	...	51	345	275	NP	NP	316	316	NFT–2	...
11	...	51	345	275	NP	NP	316	316	NFT–2	...
12	...	51	345	275	NP	NP	316	316	NFT–2	G14
13	...	51	345	275	NP	NP	316	316	NFT–2	...
14	...	51	345	275	NP	NP	316	316	NFT–2	...
15	...	51	345	275	NP	NP	316	316	NFT–2	G14, W6
16	...	51	400	275	NP	NP	316	NP	NFT–2	...
17	...	51	400	275	NP	NP	316	NP	NFT–2	...
18	...	51	400	275	NP	NP	316	NP	NFT–2	G14, W6
19	...	51	400	275	NP	NP	316	NP	NFT–2	...
20	...	51	400	275	NP	NP	316	NP	NFT–2	...
21	...	51	400	275	NP	NP	316	NP	NFT–2	W12
22	...	51	400	275	NP	NP	316	NP	NFT–2	...
23	...	51	400	275	NP	NP	316	NP	NFT–2	...
24	...	51	400	275	NP	NP	316	NP	NFT–2	W12
25	...	52	485	345	NP	NP	316	316	NFT–5	...
26	...	52	485	345	NP	NP	316	316	NFT–5	...
27	...	52	485	345	NP	NP	316	316	NFT–5	G14, W6
28	...	52	485	345	NP	NP	316	316	NFT–5	...
29	...	52	485	345	NP	NP	316	316	NFT–5	...
30	...	52	485	345	NP	NP	316	316	NFT–5	G14
31	...	52	485	345	NP	NP	316	316	NFT–5	...
32	...	52	485	345	NP	NP	316	316	NFT–5	...
33	...	52	485	345	NP	NP	316	316	NFT–5	G14, W6
34	...	54	895	794	NP	NP	349	NP	NFT–6	...
35	...	54	895	794	NP	NP	349	NP	NFT–6	...
36	...	54	895	794	NP	NP	349	NP	NFT–6	G14, W6
37	...	54	895	794	NP	NP	349	NP	NFT–6	...
38	...	54	895	794	NP	NP	349	NP	NFT–6	...
39	...	54	895	794	NP	NP	349	NP	NFT–6	G14, W6
40	...	54	895	794	NP	NP	349	NP	NFT–6	...
41	...	54	895	794	NP	NP	349	NP	NFT–6	...
42	...	54	895	794	NP	NP	349	NP	NFT–6	G14, W6
43	...	53	620	485	NP	316	316	316	NFT–4	...
44	...	53	620	485	NP	316	316	316	NFT–4	...
45	...	53	620	485	NP	316	316	316	NFT–4	G14, W6

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
2	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
3	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
4	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
5	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
6	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
7	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
8	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
9	83.4	80.8	71.2	65.4	60.5	56.1	52.3	49.1	46.1	43.0	39.9	36.7	...	...	...	...	...	...
10	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
11	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
12	83.4	80.8	71.2	65.4	60.5	56.1	52.3	49.1	46.1	43.0	39.9	36.7	...	...	...	...	...	...
13	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
14	98.6	94.6	83.5	76.9	70.8	65.8	61.4	57.6	53.9	50.1	46.7	43.7	...	...	...	...	...	...
15	83.4	80.8	71.2	65.4	60.5	56.1	52.3	49.1	46.1	43.0	39.9	36.7	...	...	...	...	...	...
16	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
17	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
18	97.1	93.4	82.6	75.9	70.1	65.1	60.8	56.8	53.1	49.6	46.3	43.3	...	...	...	...	...	...
19	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
20	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
21	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
22	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
23	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
24	114	110	97.2	89.3	82.5	76.6	71.5	66.8	62.5	58.4	54.4	51.0	...	...	...	...	...	...
25	138	138	126	119	111	105	99.5	94.9	91.4	88.8	86.4	83.9	...	...	...	...	...	...
26	138	138	126	119	111	105	99.5	94.9	91.4	88.8	86.4	83.9	...	...	...	...	...	...
27	117	117	108	101	94.9	89.3	84.2	80.2	77.4	75.4	73.6	71.7	...	...	...	...	...	...
28	138	138	126	119	111	105	99.5	94.9	91.4	88.8	86.4	83.9	...	...	...	...	...	...
29	138	138	126	119	111	105	99.5	94.9	91.4	88.8	86.4	83.9	...	...	...	...	...	...
30	117	117	108	101	94.9	89.3	84.2	80.2	77.4	75.4	73.6	71.7	...	...	...	...	...	...
31	138	138	126	119	111	105	99.5	94.9	91.4	88.8	86.4	83.9	...	...	...	...	...	...
32	138	138	126	119	111	105	99.5	94.9	91.4	88.8	86.4	83.9	...	...	...	...	...	...
33	117	117	108	101	94.9	89.3	84.2	80.2	77.4	75.4	73.6	71.7	...	...	...	...	...	...
34	256	256	252	242	232	223	215	208	202	197	193	190	187	...	...	...	...	...
35	256	256	252	242	232	223	215	208	202	197	193	190	187	...	...	...	...	...
36	218	218	214	206	197	190	183	177	172	167	164	162	159	...	...	...	...	...
37	256	256	252	242	232	223	215	208	202	197	193	190	187	...	...	...	...	...
38	256	256	252	242	232	223	215	208	202	197	193	190	187	...	...	...	...	...
39	218	218	214	206	197	190	183	177	172	167	164	162	159	...	...	...	...	...
40	256	256	252	242	232	223	215	208	202	197	193	190	187	...	...	...	...	...
41	256	256	252	242	232	223	215	208	202	197	193	190	187	...	...	...	...	...
42	218	218	214	206	197	190	183	177	172	167	164	162	159	...	...	...	...	...
43	177	177	168	162	155	148	141	133	127	122	120	118	...	...	...	...	...	...
44	177	177	168	162	155	148	141	133	127	122	120	118	...	...	...	...	...	...
45	151	151	143	138	132	126	119	113	108	104	102	101	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	1	Ti–3Al–2.5V	Bar, billet	SB–348	9	R56320	Annealed
	2	Ti–3Al–2.5V	Smls. fittings	SB–363	WPT9	R56320	Annealed
	3	Ti–3Al–2.5V	Wld. fittings	SB–363	WPT9W	R56320	Annealed
	4	Ti–3Al–2.5V	Forgings	SB–381	F–9	R56320	Annealed
	5	Ti–3Al–2.5V	Smls. pipe	SB–861	9	R56320	Annealed
	6	Ti–3Al–2.5V	Wld. pipe	SB–862	9	R56320	Annealed
	7	Ti–3Al–2.5V–0.1Ru	Plate, sheet, strip	SB–265	28	R56323	Annealed
	8	Ti–3Al–2.5V–0.1Ru	Smls. tube	SB–338	28	R56323	Annealed
	9	Ti–3Al–2.5V–0.1Ru	Wld. tube	SB–338	28	R56323	Annealed
	10	Ti–3Al–2.5V–0.1Ru	Bar, billet	SB–348	28	R56323	Annealed
	11	Ti–3Al–2.5V–0.1Ru	Smls. fittings	SB–363	WPT28	R56323	Annealed
	12	Ti–3Al–2.5V–0.1Ru	Wld. fittings	SB–363	WPT28W	R56323	Annealed
	13	Ti–3Al–2.5V–0.1Ru	Forgings	SB–381	F–28	R56323	Annealed
	14	Ti–3Al–2.5V–0.1Ru	Smls. pipe	SB–861	28	R56323	Annealed
	15	Ti–3Al–2.5V–0.1Ru	Wld. pipe	SB–862	28	R56323	Annealed
	16	99.2Zr	Forgings	SB–493	...	R60702	Annealed
	17	99.2Zr	Smls. tube	SB–523	...	R60702	Annealed
	18	99.2Zr	Wld. tube	SB–523	...	R60702	Annealed
	19	99.2Zr	Bar, wire	SB–550	...	R60702	Annealed
(**23**)	20	99.2Zr	Plate, sheet, strip	SB–551	...	R60702	Annealed
(**23**)	21	99.2Zr	Smls. fittings	SB–653	PZ–2	R60702	Annealed
(**23**)	22	99.2Zr	Wld. fittings	SB–653	PZ–2W	R60702	Annealed
(**23**)	23	99.2Zr	Smls. & wld. pipe	SB–658	...	R60702	Annealed
(**23**)	24	99.2Zr	Castings	SB–752	702C	R61702	...
(**23**)	25	95.5Zr + 2.5Nb	Forgings	SB–493	...	R60705	Annealed
(**23**)	26	...	...	...	...	...	...
(**23**)	27	...	...	...	...	...	...
(**23**)	28	95.5Zr + 2.5Nb	Bar, wire	SB–550	...	R60705	Annealed
(**23**)	29	95.5Zr + 2.5Nb	Plate, sheet, strip	SB–551	...	R60705	Annealed
(**23**)	30	95.5Zr + 2.5Nb	Smls. & wld. pipe	SB–658	...	R60705	Annealed
(**23**)	31	95.5Zr + 2.5Nb	Castings	SB–752	705C	R61705	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	53	620	485	NP	316	NP	NP	NFT–4	...
2	...	53	620	485	NP	316	NP	NP	NFT–4	...
3	...	53	620	485	NP	316	NP	NP	NFT–4	G14, W6
4	...	53	620	485	NP	316	NP	NP	NFT–4	...
5	...	53	620	485	NP	316	316	316	NFT–4	...
6	...	53	620	485	NP	316	316	316	NFT–4	G14, W6
7	...	53	620	485	NP	NP	316	NP	NFT–4	...
8	...	53	620	485	NP	NP	316	NP	NFT–4	...
9	...	53	620	485	NP	NP	316	NP	NFT–4	G14, W6
10	...	53	620	485	NP	NP	316	NP	NFT–4	...
11	...	53	620	485	NP	NP	316	NP	NFT–4	...
12	...	53	620	485	NP	NP	316	NP	NFT–4	G14, W6
13	...	53	620	485	NP	NP	316	NP	NFT–4	...
14	...	53	620	485	NP	NP	316	NP	NFT–4	...
15	...	53	620	485	NP	NP	316	NP	NFT–4	G14, W6
16	...	61	380	205	NP	204	371	NP	NFZ–1	...
17	...	61	380	205	NP	204	371	NP	NFZ–1	...
18	...	61	380	205	NP	204	371	NP	NFZ–1	G14, W6
19	...	61	380	205	NP	204	371	NP	NFZ–1	...
20	...	61	380	205	NP	NP	371	NP	NFZ–1	...
21	...	61	380	205	NP	NP	371	NP	NFZ–1	...
22	...	61	380	205	NP	NP	371	NP	NFZ–1	G14, W6
23	...	61	380	205	NP	NP	371	NP	NFZ–1	W12
24	...	61	380	276	NP	NP	316	NP	NFZ–1	G15
25	...	62	485	380	NP	NP	371	NP	NFZ–2	...
26	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...
28	...	62	550	380	NP	NP	371	NP	NFZ–2	...
29	...	62	550	380	NP	NP	371	NP	NFZ–2	...
30	...	62	550	380	NP	NP	371	NP	NFZ–2	W12
31	...	62	483	345	NP	NP	316	NP	NFZ–1	G15

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	177	177	168	162	155	148	141	133	127	122	120	118	...	...	...	...	...	...
2	177	177	168	162	155	148	141	133	127	122	120	118	...	...	...	...	...	...
3	151	151	143	138	132	126	119	113	108	104	102	101	...	...	...	...	...	...
4	177	177	168	162	155	148	141	133	127	122	120	118	...	...	...	...	...	...
5	177	177	168	162	155	148	141	133	127	122	120	118	...	...	...	...	...	...
6	151	151	143	138	132	126	119	113	108	104	102	101	...	...	...	...	...	...
7	177	177	168	162	155	148	141	133	127	122	120	118	...	...	...	...	...	...
8	177	177	168	162	155	148	141	133	127	122	120	118	...	...	...	...	...	...
9	151	151	143	138	132	126	119	113	108	104	102	101	...	...	...	...	...	...
10	177	177	168	162	155	148	141	133	127	122	120	118	...	...	...	...	...	...
11	177	177	168	162	155	148	141	133	127	122	120	118	...	...	...	...	...	...
12	151	151	143	138	132	126	119	113	108	104	102	101	...	...	...	...	...	...
13	177	177	168	162	155	148	141	133	127	122	120	118	...	...	...	...	...	...
14	177	177	168	162	155	148	141	133	127	122	120	118	...	...	...	...	...	...
15	151	151	143	138	132	126	119	113	108	104	102	101	...	...	...	...	...	...
16	108	104	92.1	84.3	76.9	70.1	63.7	58.7	53.3	47.9	43.5	40.3	38.0	35.5	...	...	...	...
17	108	104	92.1	84.3	76.9	70.1	63.7	58.7	53.3	47.9	43.5	40.3	38.0	35.5	...	...	...	...
18	92.4	88.4	78.0	71.4	65.2	59.7	54.0	49.4	45.2	40.7	37.0	34.1	32.0	30.9	...	...	...	...
19	108	104	92.1	84.3	76.9	70.1	63.7	58.7	53.3	47.9	43.5	40.3	38.0	35.5	...	...	...	...
20	108	104	92.1	84.3	76.9	70.1	63.7	58.7	53.3	47.9	43.5	40.3	38.0	35.5	...	...	...	...
21	108	104	92.1	84.3	76.9	70.1	63.7	58.7	53.3	47.9	43.5	40.3	38.0	35.5	...	...	...	...
22	92.4	88.4	78.0	71.4	65.2	59.7	54.0	49.4	45.2	40.7	37.0	34.1	32.0	30.9	...	...	...	...
23	108	104	92.1	84.3	76.9	70.1	63.7	58.7	53.3	47.9	43.5	40.3	38.0	35.5	...	...	...	...
24	108	107	97.0	89.5	82.0	74.7	67.6	61.1	55.1	49.9	45.7	42.4	...	...	...	...	...	...
25	138	127	112	103	96.0	90.0	86.0	83.0	81.0	80.0	79.0	78.0	76.0	74.0	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	158	145	128	118	110	103	99.0	95.0	93.0	91.0	89.0	84.0	81.0	78.0	...	...	...	...
29	158	145	128	118	110	103	99.0	95.0	93.0	91.0	89.0	84.0	81.0	78.0	...	...	...	...
30	158	145	128	118	110	103	99.0	95.0	93.0	91.0	89.0	84.0	81.0	78.0	...	...	...	...
31	138	137	126	118	110	102	95.1	88.6	82.6	77.3	72.8	69.2	...	...	...	...	...	...

Table 1B (Cont'd)
Section I; Section III, Division 1, Classes 2 and 3;* Section VIII, Division 1; and Section XII
Maximum Allowable Stress Values, *S*, for Nonferrous Materials
(*See Maximum Temperature Limits for Restrictions on Class)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)

NOTES TO TABLE 1B

GENERAL NOTES

(a) The following abbreviations are used: ann., annealed; cond., condenser; CW, cold worked; exch., exchanger; extr., extruded; fin., finished; fr., from; HW, Hot worked; rel., relieved; rld., rolled; Smls., Seamless; Sol., Solution; treat., treated; and Wld., Welded.

(b) The stress values in this Table may be interpolated to determine values for intermediate temperatures. The values at intermediate temperatures shall be rounded to the same number of decimal places as the value at the higher temperature between which values are being interpolated. The rounding rule is: when the next digit beyond the last place to be retained is less than 5, retain unchanged the digit in the last place retained; when the digit next beyond the last place to be retained is 5 or greater, increase by 1 the digit in the last place retained.

(c) The properties of steels are influenced by the processing history, heat treatment, melting practice, and level of residual elements. See Nonmandatory Appendix A for more information.

(d) Where a size limit appears in the Size/Thickness column, the limit applies to the dimension appropriate to the product form: wall thickness of tubing, pipe, pipe fittings, and hollow forgings; thickness of plate, flat bar and forgings, and polygonal bar; diameter of solid bar and bolting; and thickest cross–section of other pressure parts, e.g., castings and forgings.

(e) An alternative typeface is used for stress values obtained from time–dependent properties (see Notes T1 through T20).

(f) Where specifications, grades, classes, and types are listed in this Table, and where the material specification in Section II, Part A or Part B is a dual–unit specification (e.g., SB–407/SB–407M), the values listed in this Table shall be applicable to either the customary U.S. version of the material specification or the SI units version of the material specification. For example, the values listed for SB–407 Grade N08800 shall be used when SB–407M Grade N08800 is used in construction.

NOTES – GENERAL REQUIREMENTS

G1 For steam at 1700 kPa (208°C), the values given for 200°C may be used.

G2 At temperatures over 550°C, these stress values apply only when the carbon is 0.04% or higher.

G3 In the absence of evidence that the casting is of high quality throughout, values not in excess of 80% of those given in the Table shall be used. This is not intended to apply to valves and fittings made to recognized standards.

G4 Creep–fatigue, thermal ratcheting, and environmental effects are increasingly significant failure modes at temperatures in excess of 825°C and shall be considered in the design.

G5 Due to the relatively low yield strength of these materials, these higher stress values were established at temperatures where the short–time tensile properties govern to permit the use of these alloys where slightly greater deformation is acceptable. The stress values in this range exceed $66\frac{2}{3}$% but do not exceed 90% of the yield strength at temperature. Use of these stresses may result in dimensional changes due to permanent strain. These stress values are not recommended for the flanges of gasketed joints or other applications where slight amounts of distortion can cause leakage or malfunction. For Section III applications, Table Y–2 lists multiplying factors that, when applied to the yield strength values shown in Table Y–1, will give allowable stress values that will result in lower levels of permanent strain.

G6 Maximum temperature for external pressure not to exceed 175°C.

G7 Use 175°C curve for all temperature values below 175°C.

G8 The stresses for this material are based on 828 MPa minimum tensile strength because of weld metal strength limitations.

G9 Use Figure NFC–6 up to and including 150°C. Use the 315°C curve of Figure NFC–3 above 150°C up to and including 200°C. Maximum temperature for external pressure not to exceed 200°C.

G10 Maximum temperature for external pressure not to exceed 225°C.

G11 Referenced external pressure chart is applicable up to 375°C.

G12 Referenced external pressure chart is applicable up to 425°C.

G13 For Section VIII and XII applications, use of external pressure charts for material in the form of bar stock is permitted for stiffener rings only.

G14 For Section VIII applications, a factor of 0.85 has been applied in arriving at the maximum allowable stress values in tension for this material. Divide tabulated values by 0.85 for maximum allowable longitudinal tensile stress.

G15 To these stress values a quality factor as specified in ND–3115 of Section III; UG–24 of Section VIII, Division 1; or TM–190 of Section XII shall be applied for castings. This is not intended to apply to valves and fittings made to recognized standards.

G16 Allowable stress values shown are 90% of those for the corresponding core material.

(**23**) G17 C37700 and copper–silicon alloys are not always suitable when exposed to certain media and high temperatures, particularly steam above 100°C. The user should ensure that the alloy selected is satisfactory for the service for which it is to be used.

G18 Because of the occasionally contingent danger from the failure of pressure vessels by stress corrosion cracking, the following is pertinent. These materials are suitable for engineering use under a wide variety of ordinary corrosive conditions with no particular hazard in respect to stress corrosion.

G19 Few alloys are completely immune to stress corrosion cracking in all combinations of stress and corrosive environments, and the supplier of the material should be consulted. Reference may also be made to the following sources: (1) Stress Corrosion Cracking Control Measures, B. F. Brown, U.S. National Bureau of Standards (1977), available from NACE, Texas; (2) The Stress Corrosion of Metals, H. L. Logan, John Wiley & Sons, New York, 1966.

G20 For plate only.

G21 The maximum operating temperature is arbitrarily set at 250°C because harder temper adversely affects design stress in the creep rupture temperature range.

G22 The minimum tensile strength of reduced section tension specimens in accordance with QW–462.1 of Section IX shall not be less than 760 MPa.

G23 This alloy is subject to severe loss of impact strength at room temperatures after exposure in the range of 550°C to 750°C.

NOTES TO TABLE 1B (CONT'D)

NOTES – GENERAL REQUIREMENTS (CONT'D)

G24 For stress relieved tempers (T351, T3510, T3511, T451, T4510, T4511, T651, T6510, T6511), stress values for materials in the basic temper shall be used.

G25 The tension test specimen from plate 13 mm and thicker is machined from the core and does not include the cladding alloy; therefore, the allowable stress values for thickness less than 13 mm shall be used.

G26 The tension test specimen from plate 13 mm and thicker is machined from the core and does not include the cladding alloy; therefore, the allowable stress values shown are 90% of those for the core material of the same thickness.

G27 Alloy N06022 in the solution annealed condition is subject to severe loss of impact strength at room temperatures after exposure in the range of 550°C to 675°C.

G28 For external pressure design, the maximum design temperature is limited to 550°C.

G29 The maximum allowable stress values for greater than 900°C are 9.7 MPa (927°C), 7.6 MPa (954°C), and 5.0 MPa (982°C).

G30 The maximum allowable stress values for greater than 900°C are 5.0 MPa (925°C), 4.0 MPa (950°C), 3.2 MPa (975°C), and 2.6 MPa (1000°C). The maximum use temperature is 982°C; the value listed at 1000°C is provided for interpolation purposes only.

G31 The maximum allowable stress values for greater than 900°C are 7.8 MPa (925°C), 5.2 MPa (950°C), 3.5 MPa (975°C), and 2.4 MPa (1000°C). The maximum use temperature is 982°C; the value listed at 1000°C is provided for interpolation purposes only.

G32 The maximum allowable stress values for greater than 900°C are 6.6 MPa (925°C), 4.4 MPa (950°C), 2.9 MPa (975°C), and 2.0 MPa (1000°C). The maximum use temperature is 982°C; the value listed at 1000°C is provided for interpolation purposes only.

G33 External pressure chart NFN–2 may be used for temperatures between 205°C and 315°C.

G34 Alloy N06025 in the solution annealed condition is subject to severe loss of rupture ductility in the approximate temperature range of 650°C to 760°C.

G35 For external pressure design, the maximum design temperature is limited to 650°C.

G36 For Section I use, the *y* values (see Section I, PG–27.4.6) shall be as follows: for 566°C and below, 0.4; for 593°C, 0.5; and for 621°C and above, 0.7.

G37 The maximum allowable stress values for greater than 900°C are 3.4 MPa (925°C), 3.0 MPa (950°C), 2.6 MPa (975°C), and 2.3 MPa (1000°C). The maximum use temperature is 982°C; the value listed at 1000°C is provided for interpolation purposes only.

G38 The maximum allowable stress values for greater than 900°C are 2.9 MPa (925°C), 2.5 MPa (950°C), 2.2 MPa (975°C), and 2.0 MPa (1000°C). The maximum use temperature is 982°C; the value listed at 1000°C is provided for interpolation purposes only.

G39 The maximum allowable stress value at 204°C is 29.6 MPa.

G40 The maximum allowable stress value at 204°C is 17.9 MPa.

G41 Allowable stress values listed are set equal to those of an annealed temper, as data were not provided to justify higher values.

G42 Time–dependent values are based on creep testing of as–welded product.

(**23**) G43 The allowable stress value at 65°C shall be used at 66°C.

(**23**) G44 The maximum allowable stress values for greater than 900°C are 8.2 MPa (927°C), 6.5 MPa (954°C), and 4.3 MPa (982°C).

NOTES – HEAT TREATMENT REQUIREMENTS

H1 For temperatures above 550°C, these stress values may be used only if the material is annealed at a minimum temperature of 1040°C and has a carbon content of 0.04% or higher.

H2 For temperatures above 550°C, these stress values may be used only if the material is heat treated by heating it to a minimum temperature of 1040°C and quenching in water or rapidly cooling by other means.

H3 For Section I applications, cold drawn pipe and tube shall be annealed at 1038°C minimum.

H4 The material shall be given a 940°C to 995°C stabilizing heat treatment.

NOTES – TIME–DEPENDENT PROPERTIES [See General Note (e)]

T1 Allowable stresses for temperatures of 125°C and above are values obtained from time–dependent properties.

T2 Allowable stresses for temperatures of 150°C and above are values obtained from time–dependent properties.

T3 Allowable stresses for temperatures of 175°C and above are values obtained from time–dependent properties.

T4 Allowable stresses for temperatures of 205°C and above are values obtained from time–dependent properties.

T5 Allowable stresses for temperatures of 260°C and above are values obtained from time–dependent properties.

T6 Allowable stresses for temperatures of 290°C and above are values obtained from time–dependent properties.

T7 Allowable stresses for temperatures of 315°C and above are values obtained from time–dependent properties.

T8 Allowable stresses for temperatures of 400°C and above are values obtained from time–dependent properties.

T9 Allowable stresses for temperatures of 425°C and above are values obtained from time–dependent properties.

T10 Allowable stresses for temperatures of 455°C and above are values obtained from time–dependent properties.

T11 Allowable stresses for temperatures of 480°C and above are values obtained from time–dependent properties.

T12 Allowable stresses for temperatures of 510°C and above are values obtained from time–dependent properties.

T13 Allowable stresses for temperatures of 540°C and above are values obtained from time–dependent properties.

T14 Allowable stresses for temperatures of 565°C and above are values obtained from time–dependent properties.

T15 Allowable stresses for temperatures of 595°C and above are values obtained from time–dependent properties.

T16 Allowable stresses for temperatures of 620°C and above are values obtained from time–dependent properties.

T17 Allowable stresses for temperatures of 650°C and above are values obtained from time–dependent properties.

T18 Allowable stresses for temperatures of 675°C and above are values obtained from time–dependent properties.

T19 Allowable stresses for temperatures of 450°C and above are values obtained from time–dependent properties.

T20 Allowable stresses for temperatures of 200°C and above are values obtained from time–dependent properties.

T21 Allowable stresses for temperatures of 225°C and above are values obtained from time–dependent properties.

T22 Allowable stresses for temperatures of 250°C and above are values obtained from time–dependent properties.

NOTES TO TABLE 1B (CONT'D)

NOTES – TIME–DEPENDENT PROPERTIES [See General Note (e)] (CONT'D)

(**23**) T23 Allowable stresses for temperatures of 230°C and above are values obtained from time–dependent properties.

NOTES – WELDING REQUIREMENTS

W1 No welding or brazing permitted.

W2 For Section VIII applications, UNF–56(d) shall apply for welded constructions.

W3 For welded and brazed constructions, stress values for O (annealed) temper material shall be used.

W4 The stress values given for this material are not applicable when either welding or thermal cutting is employed.

W5 These *S* values do not include a longitudinal weld efficiency factor. For Section III applications, for materials welded without filler metal, ultrasonic examination, radiographic examination, or eddy current examination, in accordance with NC–2550, shall provide a longitudinal weld efficiency factor of 1.00. Materials welded with filler metal meeting the requirements of NC–2560 shall receive a longitudinal weld efficiency factor of 1.00. Other longitudinal weld efficiency factors shall be in accordance with the following:

(a) for single butt weld, with filler metal, 0.80

(b) for single or double butt weld, without filler metal, 0.85

(c) for double butt weld, with filler metal, 0.90

(d) for single or double butt weld, with radiography or ultrasonic, 1.00

W6 Filler metal shall not be used in the manufacture of welded pipe or tubing.

W7 Strength of reduced–section tensile specimen required to qualify welding procedures. See QW–150, Section IX.

W8 For Section VIII and XII applications, no welding is permitted.

W9 Use NFA–12 when welded with 5356 or 5556 filler metal, all thicknesses, or 4043 or 5554 filler metal, thickness ≤ 10 mm. Use NFA–13 when welded with 4043 or 5554 filler metal, thickness > 10 mm.

W10 For welded and brazed constructions, stress values for the welded and annealed (WO61) temper material shall be used.

W11 These maximum allowable stress values are to be used in welded or brazed constructions.

W12 These *S* values do not include a weld factor. For Section VIII, Division 1 and Section XII applications using welds made without filler metal, the tabulated tensile stress values shall be multiplied by 0.85. For welds made with filler metal, consult UW–12 of Section VIII, Division 1, or TW–130.4 of Section XII, as applicable.

W13 For service at 650°C or higher, the deposited weld metal shall be of the same nominal chemistry as the base metal.

W14 No welding permitted.

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Table 2A
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	Carbon steel	Bar, shapes	SA–675	45	...	...	...	1	1
2	Carbon steel	Plate	SA–285	A	K01700	...	...	1	1
3	Carbon steel	Wld. pipe	SA–672	A45	K01700	...	...	1	1
4	Carbon steel	Wld. pipe	SA–53	E/A	K02504	...	...	1	1
5	Carbon steel	Smls. pipe	SA–53	S/A	K02504	...	...	1	1
6	Carbon steel	Smls. pipe	SA–106	A	K02501	...	...	1	1
7	Carbon steel	Bar, shapes	SA–675	50	...	...	...	1	1
(**23**) 8	...	...	...	...	...	...	...	...	...
9	Carbon steel	Plate	SA–285	B	K02200	...	≤50	1	1
10	Carbon steel	Wld. pipe	SA–672	A50	K02200	...	...	1	1
11	Carbon steel	Bar, shapes	SA–675	55	...	...	...	1	1
12	Carbon steel	Plate	SA–285	C	K02801	...	≤50	1	1
13	Carbon steel	Wld. pipe	SA–333	1	K03008	...	...	1	1
14	Carbon steel	Smls. pipe	SA–333	1	K03008	...	...	1	1
15	Carbon steel	Wld. tube	SA–334	1	K03008	...	...	1	1
16	Carbon steel	Smls. tube	SA–334	1	K03008	...	...	1	1
17	Carbon steel	Plate	SA–516	55	K01800	...	...	1	1
18	Carbon steel	Smls. pipe	SA–524	II	K02104	...	...	1	1
19	Carbon steel	Wld. pipe	SA–671	CA55	K02801	...	...	1	1
20	Carbon steel	Wld. pipe	SA–671	CE55	K02202	...	...	1	1
21	Carbon steel	Wld. pipe	SA–672	A55	K02801	...	...	1	1
22	Carbon steel	Wld. pipe	SA–672	B55	K02001	...	...	1	1
23	Carbon steel	Wld. pipe	SA–672	C55	K01800	...	...	1	1
24	Carbon steel	Wld. pipe	SA–672	E55	K02202	...	...	1	1
25	Carbon steel	Plate, bar, shapes	SA–36	...	K02600	...	...	1	1
26	Carbon steel	Plate	SA–662	A	K01701	...	...	1	1
27	Carbon steel	Forgings	SA–181	...	K03502	60	...	1	1
28	Carbon steel	Castings	SA–216	WCA	J02502	...	...	1	1
29	Carbon steel	Forgings	SA–266	1	K03506	...	...	1	1
30	Carbon steel	Forgings	SA–350	LF1	K03009	1	...	1	1
31	Carbon steel	Castings	SA–352	LCA	J02504	...	...	1	1
32	Carbon steel	Cast pipe	SA–660	WCA	J02504	...	...	1	1
33	Carbon steel	Bar, shapes	SA–675	60	...	...	...	1	1
34	Carbon steel	Forgings	SA–765	I	K03046	...	...	1	1
35	Carbon steel	Plate	SA–515	60	K02401	...	...	1	1
36	Carbon steel	Plate	SA–516	60	K02100	...	...	1	1
37	Carbon steel	Wld. pipe	SA–671	CB60	K02401	...	...	1	1
38	Carbon steel	Wld. pipe	SA–671	CC60	K02100	...	...	1	1
39	Carbon steel	Wld. pipe	SA–671	CE60	K02402	...	...	1	1
40	Carbon steel	Wld. pipe	SA–672	B60	K02401	...	...	1	1
41	Carbon steel	Wld. pipe	SA–672	C60	K02100	...	...	1	1
42	Carbon steel	Wld. pipe	SA–672	E60	K02402	...	...	1	1
43	Carbon steel	Plate	SA–283	D	K02702	...	...	1	1
44	Carbon steel	Wld. pipe	SA–53	E/B	K03005	...	...	1	1
45	Carbon steel	Smls. pipe	SA–53	S/B	K03005	...	...	1	1

Table 2A
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	310	155	NP	371	CS-6	...
2	310	165	371	371	CS-1	...
3	310	165	371	NP	CS-1	G1, G4
4	330	205	371 (SPT)	NP	CS-2	E2
5	330	205	371 (SPT)	NP	CS-2	E2
6	330	205	371	371	CS-2	E2
7	345	170	371 (SPT)	371	CS-1	...
8	...	...	...	...	...	...
9	345	185	371	371	CS-1	E2
10	345	185	371	NP	CS-1	E2, G1, G4
11	380	190	371 (SPT)	371	CS-1	...
12	380	205	371	371	CS-2	...
13	380	205	371	NP	CS-2	...
14	380	205	371	371	CS-2	...
15	380	205	371	NP	CS-2	...
16	380	205	371	371	CS-2	...
17	380	205	371	371	CS-2	...
18	380	205	NP	371	CS-2	...
19	380	205	371	NP	CS-2	G1, G4
20	380	205	371	NP	CS-2	G1, G4
21	380	205	371	NP	CS-2	G1, G4
22	380	205	371	NP	CS-2	G1, G4
23	380	205	371	NP	CS-2	G1, G4
24	380	205	371	NP	CS-2	G1, G4
25	400	250	371 (SPT)	371	CS-2	E2
26	400	275	NP	371	CS-2	E1
27	415	205	371	371	CS-2	...
28	415	205	371	371	CS-2	...
29	415	205	371	371	CS-2	...
30	415	205	371	371	CS-2	...
31	415	205	371	NP	CS-2	...
32	415	205	371	NP	CS-2	...
33	415	205	371 (SPT)	371	CS-2	...
34	415	205	NP	371	CS-2	...
35	415	220	371	371	CS-2	...
36	415	220	371	371	CS-2	...
37	415	220	371	NP	CS-2	G1, G4
38	415	220	371	NP	CS-2	G1, G4
39	415	220	371	NP	CS-2	G1, G4
40	415	220	371	NP	CS-2	G1, G4
41	415	220	371	NP	CS-2	G1, G4
42	415	220	371	NP	CS-2	G1, G4
43	415	230	NP	371	CS-2	E2
44	415	240	371 (SPT)	NP	CS-2	E2
45	415	240	371 (SPT)	NP	CS-2	E2

Table 2A
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500
1	103	97.3	94.1	92.8	91.6	88.6	84.9	80.7	78.4	75.9	73.4	...	...	...	...	...
2	103	103	101	99.4	97.8	94.8	90.5	86.2	83.9	81.4	78.9	...	...	...	...	...
3	103	103	101	99.4	97.8	94.8	90.5	86.2	83.9	81.4	78.9	...	...	...	...	...
4	110	110	110	110	110	110	110	108	104	100	**99.1**	...	...	...	...	...
5	110	110	110	110	110	110	110	108	104	100	**99.1**	...	...	...	...	...
6	110	110	110	110	110	110	110	108	104	100	**99.1**	...	...	...	...	...
7	115	110	105	103	101	98.2	94.6	89.8	87.4	84.7	81.6	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
9	115	115	113	112	110	106	102	97.1	93.9	91.1	**89.4**	...	...	...	...	...
10	115	115	113	112	110	106	102	97.1	93.9	91.1	**89.4**	...	...	...	...	...
11	126	121	115	113	112	109	104	98.9	96.1	92.9	89.8	...	...	...	...	...
12	126	126	126	124	122	118	114	107	104	101	98.1	...	...	...	...	...
13	126	126	126	124	122	118	114	107	104	101	98.1	...	...	...	...	...
14	126	126	126	124	122	118	114	107	104	101	98.1	...	...	...	...	...
15	126	126	126	124	122	118	114	107	104	101	98.1	...	...	...	...	...
16	126	126	126	124	122	118	114	107	104	101	98.1	...	...	...	...	...
17	126	126	126	124	122	118	114	107	104	101	98.1	...	...	...	...	...
18	126	126	126	124	122	118	114	107	104	101	98.1	...	...	...	...	...
19	126	126	126	124	122	118	114	107	104	101	98.1	...	...	...	...	...
20	126	126	126	124	122	118	114	107	104	101	98.1	...	...	...	...	...
21	126	126	126	124	122	118	114	107	104	101	98.1	...	...	...	...	...
22	126	126	126	124	122	118	114	107	104	101	98.1	...	...	...	...	...
23	126	126	126	124	122	118	114	107	104	101	98.1	...	...	...	...	...
24	126	126	126	124	122	118	114	107	104	101	98.1	...	...	...	...	...
25	133	133	133	133	133	133	133	129	125	122	**119**	...	...	...	...	...
26	133	133	133	133	133	133	133	133	133	**133**	**132**	...	...	...	...	...
27	138	130	126	124	122	118	114	107	104	101	98.1	...	...	...	...	...
28	138	131	125	123	122	118	113	107	104	101	98.1	...	...	...	...	...
29	138	130	126	124	122	118	114	107	104	101	98.1	...	...	...	...	...
30	138	130	126	124	122	118	114	107	104	101	98.1	...	...	...	...	...
31	138	131	125	123	122	118	113	107	104	101	98.1	...	...	...	...	...
32	138	131	125	123	122	118	113	107	104	101	98.1	...	...	...	...	...
33	138	131	125	123	122	118	113	107	104	101	98.1	...	...	...	...	...
34	138	130	126	124	122	118	114	107	104	101	98.1	...	...	...	...	...
35	138	138	134	132	130	126	121	115	112	108	105	...	...	...	...	...
36	138	138	134	132	130	126	121	115	112	108	105	...	...	...	...	...
37	138	136	134	132	130	126	121	115	112	108	105	...	...	...	...	...
38	138	136	134	132	130	126	121	115	112	108	105	...	...	...	...	...
39	138	136	134	132	130	126	121	115	112	108	105	...	...	...	...	...
40	138	136	134	132	130	126	121	115	112	108	105	...	...	...	...	...
41	138	136	134	132	130	126	121	115	112	108	105	...	...	...	...	...
42	138	136	134	132	130	126	121	115	112	108	105	...	...	...	...	...
43	138	138	138	136	134	130	125	118	115	111	**105**	...	...	...	...	...
44	138	138	138	138	138	137	132	126	122	118	**115**	...	...	...	...	...
45	138	138	138	138	138	137	132	126	122	118	**115**	...	...	...	...	...

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	Carbon steel	Smls. pipe	SA–106	B	K03006	...	...	1	1
2	Carbon steel	Fittings	SA–234	WPB	K03006	...	...	1	1
3	Carbon steel	Wld. fittings	SA–234	WPB	K03006	W	...	1	1
4	Carbon steel	Wld. tube	SA–333	6	K03006	...	...	1	1
5	Carbon steel	Smls. pipe	SA–333	6	K03006	...	...	1	1
6	Carbon steel	Smls. & wld. tube	SA–334	6	K03006	...	...	1	1
7	Carbon steel	Forgings	SA–372	A	K03002	...	...	1	1
8	Carbon steel	Fittings	SA–420	WPL6	...	...	...	1	1
9	Carbon steel	Wld. fittings	SA–420	WPL6	...	WP–W	...	1	1
10	Carbon steel	Smls. pipe	SA–524	I	K02104	...	...	1	1
11	Carbon steel	Bar	SA–696	B	K03200	...	...	1	1
12	Carbon steel	Forgings	SA–727	...	K02506	...	...	1	1
13	Carbon steel	Wld. tube	SA–178	C	K03503	...	...	1	1
14	Carbon steel	Wld. tube	SA–178	C	K03503	...	...	1	1
15	Carbon steel	Smls. tube	SA–210	A–1	K02707	...	...	1	1
16	Carbon steel	Bar, shapes	SA–675	65	...	...	...	1	1
17	Carbon steel	Castings	SA–352	LCB	J03003	...	...	1	1
18	Carbon steel	Plate	SA–515	65	K02800	...	...	1	1
19	Carbon steel	Plate	SA–516	65	K02403	...	...	1	1
20	Carbon steel	Wld. pipe	SA–671	CB65	K02800	...	...	1	1
21	Carbon steel	Wld. pipe	SA–671	CC65	K02403	...	...	1	1
22	Carbon steel	Wld. pipe	SA–672	B65	K02800	...	...	1	1
23	Carbon steel	Wld. pipe	SA–672	C65	K02403	...	...	1	1
24	Carbon steel	Plate	SA–662	B	K02203	...	...	1	1
25	Carbon steel	Plate	SA–537	...	K12437	1	65 < t ≤ 100	1	2
(**23**) 26	Carbon steel	Forgings	SA/EN 10222–2	P280GH	...	NT or QT	35 < t ≤ 160	1	1
(**23**) 27	Carbon steel	Forgings	SA/EN 10222–2	P280GH	...	Normalized	t ≤ 35	1	1
(**23**) 28	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	150 < t ≤ 250	1	2
(**23**) 29	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	100 < t ≤ 150	1	2
30	Carbon steel	Wld. pipe	SA–691	CMSH–70	K12437	...	65 < t ≤ 100	1	2
31	Carbon steel	Bar, shapes	SA–675	70	...	...	...	1	1
32	Carbon steel	Forgings	SA–105	...	K03504	...	...	1	2
33	Carbon steel	Forgings	SA–181	...	K03502	70	...	1	2
34	Carbon steel	Castings	SA–216	WCB	J03002	...	...	1	2
35	Carbon steel	Forgings	SA–266	2	K03506	...	...	1	2
36	Carbon steel	Forgings	SA–266	4	K03017	...	...	1	2
37	Carbon steel	Forgings	SA–350	LF2	K03011	...	...	1	2
38	Carbon steel	Forgings	SA–508	1	K13502	...	...	1	2
39	Carbon steel	Forgings	SA–508	1A	K13502	...	...	1	2
40	Carbon steel	Forgings	SA–541	1	K03506	...	...	1	2
41	Carbon steel	Forgings	SA–541	1A	K03020	...	...	1	2
42	Carbon steel	Cast pipe	SA–660	WCB	J03003	...	...	1	2
43	Carbon steel	Forgings	SA–765	II	K03047	...	...	1	2
44	Carbon steel	Plate	SA–515	70	K03101	...	...	1	2
45	Carbon steel	Plate	SA–516	70	K02700	...	...	1	2

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	415	240	371	371	CS-2	E2
2	415	240	371	371	CS-2	E2
3	415	240	371	NP	CS-2	E2
4	415	240	371	NP	CS-2	E2
5	415	240	371	371	CS-2	E2
6	415	240	371	NP	CS-2	E2
7	415	240	NP	343	CS-2	G19, H5
8	415	240	371	371	CS-2	E2
9	415	240	371	NP	CS-2	E2
10	415	240	NP	371	CS-2	E2
11	415	240	371	NP	CS-2	E2
12	415	250	371 (SPT)	371	CS-2	E2
13	415	255	371	NP	CS-2	E2
14	415	255	NP	371	CS-2	E2, G18
15	415	255	371	371	CS-2	E2
16	450	225	NP	371	CS-2	...
17	450	240	371	371	CS-2	...
18	450	240	371	371	CS-2	...
19	450	240	371	371	CS-2	...
20	450	240	371	NP	CS-2	G1, G4
21	450	240	371	NP	CS-2	G1, G4
22	450	240	371	NP	CS-2	G1, G4
23	450	240	371	NP	CS-2	G1, G4
24	450	275	NP	371	CS-2	E2
25	450	310	371	371	CS-2	E2
26	460	255	NP	371	CS-2	E2
27	460	280	NP	371	CS-2	E2
28	470	280	NP	371	CS-2	E2
29	480	295	NP	371	CS-2	E2
30	450	310	371	NP	CS-2	E2, G1, G2
31	485	240	NP	371	CS-2	...
32	485	250	371	371	CS-2	...
33	485	250	371	371	CS-2	...
34	485	250	371	371	CS-2	...
35	485	250	371	371	CS-2	...
36	485	250	NP	371	CS-2	...
37	485	250	371	371	CS-2	...
38	485	250	371	371	CS-2	...
39	485	250	371	371	CS-2	...
40	485	250	371	371	CS-2	...
41	485	250	371	371	CS-2	...
42	485	250	371	NP	CS-2	...
43	485	250	NP	371	CS-2	...
44	485	260	371	371	CS-2	...
45	485	260	371	371	CS-2	...

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500	
1	138	138	138	138	138	137	132	126	122	118	**115**	...	...	...	...	...	
2	138	138	138	138	138	137	132	126	122	118	**115**	...	...	...	...	...	
3	138	138	138	138	138	137	132	126	122	118	**115**	...	...	...	...	...	
4	138	138	138	138	138	137	132	126	122	118	**115**	...	...	...	...	...	
5	138	138	138	138	138	137	132	126	122	118	**115**	...	...	...	...	...	
6	138	138	138	138	138	137	132	126	122	118	**115**	...	...	...	...	...	
7	138	138	138	138	138	137	132	126	122	119	...	...	...	...	...	...	
8	138	138	138	138	138	137	132	126	122	118	**115**	...	...	...	...	...	
9	138	138	138	138	138	137	132	126	122	118	**115**	...	...	...	...	...	
10	138	138	138	138	138	137	132	126	122	118	**115**	...	...	...	...	...	
11	138	138	138	138	138	137	132	126	122	118	**115**	...	...	...	...	...	
12	138	138	138	138	138	138	136	129	125	122	**119**	...	...	...	...	...	
13	138	138	138	138	138	138	138	133	129	125	**122**	...	...	...	...	...	
14	117	117	117	117	117	117	117	113	109	106	**104**	...	...	...	...	...	
15	138	138	138	138	138	138	138	133	129	125	**122**	...	...	...	...	...	
16	150	141	136	134	132	128	123	117	113	110	106	...	...	...	...	...	
17	150	150	147	144	142	138	132	126	122	118	115	...	...	...	...	...	
18	150	150	147	144	142	138	132	126	122	118	115	...	...	...	...	...	
19	150	150	147	144	142	138	132	126	122	118	115	...	...	...	...	...	
20	150	149	147	145	142	138	132	126	122	118	115	...	...	...	...	...	
21	150	149	147	145	142	138	132	126	122	118	115	...	...	...	...	...	
22	150	149	147	145	142	138	132	126	122	118	115	...	...	...	...	...	
23	150	149	147	145	142	138	132	126	122	118	115	...	...	...	...	...	
24	150	150	150	150	150	150	150	144	139	136	**132**	...	...	...	...	...	
25	150	150	150	150	150	150	150	150	148	140	**134**	...	...	...	...	...	
26	153	153	153	151	149	145	139	132	128	124	**120**	**101**	**83.8**	**66.8**	**50.3**	**33.2**	(**23**)
27	153	153	153	153	153	153	153	145	141	136	**132**	**101**	**83.8**	**66.8**	**50.3**	**33.2**	(**23**)
28	157	157	157	157	157	157	154	146	141	137	**123**	**101**	**83.8**	**66.8**	**50.3**	**33.2**	(**23**)
29	160	160	160	160	160	160	160	153	149	144	**123**	**101**	**83.8**	**66.8**	**50.3**	**33.2**	(**23**)
30	150	150	150	150	150	150	150	150	148	140	**134**	...	...	...	...	...	
31	161	151	147	144	142	138	132	126	122	118	115	...	...	...	...	...	
32	161	156	151	148	146	142	136	129	125	122	118	...	...	...	...	...	
33	161	156	151	148	146	142	136	129	125	122	118	...	...	...	...	...	
34	161	156	151	148	146	142	136	129	125	122	118	...	...	...	...	...	
35	161	156	151	148	146	142	136	129	125	122	118	...	...	...	...	...	
36	161	156	151	148	146	142	136	129	125	122	118	...	...	...	...	...	
37	161	156	151	148	146	142	136	129	125	122	118	...	...	...	...	...	
38	161	156	151	148	146	142	136	129	125	122	118	...	...	...	...	...	
39	161	156	151	148	146	142	136	129	125	122	118	...	...	...	...	...	
40	161	156	151	148	146	142	136	129	125	122	118	...	...	...	...	...	
41	161	156	151	148	146	142	136	129	125	122	118	...	...	...	...	...	
42	161	156	151	148	146	142	136	129	125	122	118	...	...	...	...	...	
43	161	156	151	148	146	142	136	129	125	122	118	...	...	...	...	...	
44	161	161	160	157	154	149	143	136	132	129	124	...	...	...	...	...	
45	161	161	160	157	154	149	143	136	132	129	124	...	...	...	...	...	

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
	1	Carbon steel	Wld. pipe	SA–671	CB70	K03101	...	...	1	2
	2	Carbon steel	Wld. pipe	SA–671	CC70	K02700	...	...	1	2
	3	Carbon steel	Wld. pipe	SA–672	B70	K03101	...	...	1	2
	4	Carbon steel	Wld. pipe	SA–672	C70	K02700	...	...	1	2
	5	Carbon steel	Smls. pipe	SA–106	C	K03501	...	...	1	2
	6	Carbon steel	Smls. tube	SA–210	C	K03501	...	...	1	2
	7	Carbon steel	Castings	SA–216	WCC	K02503	...	...	1	2
	8	Carbon steel	Fittings	SA–234	WPC	K03501	...	...	1	2
	9	Carbon steel	Wld. fittings	SA–234	WPC	K03501	W	...	1	2
	10	Carbon steel	Castings	SA–352	LCC	J02505	...	...	1	2
	11	Carbon steel	Castings	SA–487	16	...	A	...	1	2
	12	Carbon steel	Plate	SA–537	...	K12437	3	$100 < t \le 150$	1	3
	13	Carbon steel	Cast pipe	SA–660	WCC	J02505	...	...	1	2
	14	Carbon steel	Bar	SA–696	C	K03200	...	...	1	2
	15	Carbon steel	Plate	SA–662	C	K02007	...	...	1	2
	16	Carbon steel	Plate	SA–537	...	K12437	2	$100 < t \le 150$	1	3
	17	Carbon steel	Plate	SA–738	C	...	...	$100 < t \le 150$	1	3
	18	Carbon steel	Plate	SA–537	...	K12437	1	≤65	1	2
	19	Carbon steel	Wld. pipe	SA–671	CD70	K12437	...	≤65	1	2
	20	Carbon steel	Wld. pipe	SA–672	D70	K12437	...	≤65	1	2
	21	Carbon steel	Wld. pipe	SA–691	CMSH–70	K12437	...	≤65	1	2
(**23**)	22	Carbon steel	Plate	SA–841	A	...	1	$t \le 100$	1	2
(**23**)	23	Carbon steel	Forgings	SA/EN 10222–2	P305GH	...	NT	$35 < t \le 160$	1	2
(**23**)	24	Carbon steel	Forgings	SA/EN 10222–2	P305GH	...	Normalized	$t \le 35$	1	2
(**23**)	25	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	$60 < t \le 100$	1	2
(**23**)	26	Carbon steel	Forgings	SA/EN 10222–2	P305GH	...	QT	$t \le 70$	1	2
(**23**)	27	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	$40 < t \le 60$	1	2
(**23**)	28	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	$16 < t \le 40$	1	2
(**23**)	29	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	≤16	1	2
(**23**)	30	Carbon steel	Forgings	SA–266	3	K05001	...	...	1	2
	31	Carbon steel	Plate	SA–299	A	K02803	...	>25	1	2
	32	Carbon steel	Wld. pipe	SA–691	CMS–75	K02803	...	>25	1	2
	33	Carbon steel	Plate	SA–299	A	K02803	...	≤25	1	2
	34	Carbon steel	Wld. pipe	SA–671	CK75	K02803	...	≤25	1	2
	35	Carbon steel	Wld. pipe	SA–672	N75	K02803	...	≤25	1	2
	36	Carbon steel	Wld. pipe	SA–691	CMS–75	K02803	...	≤25	1	2
	37	Carbon steel	Forgings	SA–372	B	K04001	...	...	1	2
	38	Carbon steel	Plate	SA–738	A	K12447	N	≤65	1	2
	39	Carbon steel	Plate	SA–738	A	K12447	QT	...	1	2
	40	Carbon steel	Plate	SA–537	...	K12437	3	$65 < t \le 100$	1	3
	41	Carbon steel	Plate	SA–537	...	K12437	2	$65 < t \le 100$	1	3
	42	Carbon steel	Wld. pipe	SA–691	CMSH–80	K12437	...	$65 < t \le 100$	1	3
	43	Carbon steel	Plate	SA–738	C	...	...	$65 < t \le 100$	1	3
(**23**)	44	Carbon steel	Plate	SA–299	B	K02803	...	$t > 25$	1	3
(**23**)	45	Carbon steel	Plate	SA–299	B	K02803	...	$t \le 25$	1	3

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	485	260	371	NP	CS-2	G1, G3
2	485	260	371	NP	CS-2	G1, G4
3	485	260	371	NP	CS-2	G1, G3
4	485	260	371	NP	CS-2	G1, G4
5	485	275	371	371	CS-2	E2
6	485	275	NP	371	CS-2	E2
7	485	275	371	371	CS-2	E2
8	485	275	371	371	CS-2	E2
9	485	275	371	NP	CS-2	E2
10	485	275	371	NP	CS-2	E2
11	485	275	371	NP	CS-2	E2
12	485	275	NP	371	CS-2	E2
13	485	275	371	NP	CS-2	E2
14	485	275	371	NP	CS-2	E2
15	485	295	NP	371	CS-3	E2
16	485	315	371	371	CS-3	E2
17	485	315	NP	343	CS-3	...
18	485	345	371	371	CS-3	E2
19	485	345	371	NP	CS-3	E2, G1, G4
20	485	345	371	NP	CS-3	E2, G1, G4
21	485	345	371	NP	CS-3	E2, G1, G4
22	485	345	NP	371	CS-3	E2
23	490	280	NP	371	CS-2	E2
24	490	305	NP	371	CS-2	E2
25	490	315	NP	371	CS-2	E2
26	510	285	NP	371	CS-2	E2
27	510	335	NP	371	CS-2	E2
28	510	345	NP	371	CS-2	E2
29	510	355	NP	371	CS-2	E2
30	515	260	371	371	CS-2	W6
31	515	275	371	371	CS-2	...
32	515	275	371	NP	CS-2	G1, G4
33	515	290	371	371	CS-2	E2
34	515	290	371	NP	CS-2	E2, G1
35	515	290	371	NP	CS-2	E2, G1
36	515	290	371	NP	CS-2	E2, G1
37	515	310	NP	38	CS-3	G19, H5, W5, W6
38	515	310	NP	371	CS-2	...
39	515	310	NP	371	CS-2	...
40	515	345	NP	371	CS-5	E2
41	515	380	371	371	CS-5	E2
42	515	380	371	NP	CS-5	E2
43	515	380	NP	343	CS-5	...
44	550	310	NP	371	CS-3	E2
45	550	325	NP	371	CS-3	E2

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500	
1	161	160	160	157	154	149	143	136	132	129	124	...	...	...	...	...	
2	161	160	160	157	154	149	143	136	132	129	124	...	...	...	...	...	
3	161	160	160	157	154	149	143	136	132	129	124	...	...	...	...	...	
4	161	160	160	157	154	149	143	136	132	129	124	...	...	...	...	...	
5	161	161	161	161	161	158	151	143	139	136	**132**	...	...	...	...	...	
6	161	161	161	161	161	158	151	143	139	136	**132**	...	...	...	...	...	
7	161	161	161	161	161	158	151	143	139	136	**132**	...	...	...	...	...	
8	161	161	161	161	161	158	151	143	139	136	**132**	...	...	...	...	...	
9	161	161	161	161	161	158	151	143	139	136	**132**	...	...	...	...	...	
10	161	161	161	161	161	158	151	143	139	136	**132**	...	...	...	...	...	
11	161	160	159	155	151	146	142	137	134	131	**128**	...	...	...	...	...	
12	161	161	161	160	160	154	148	143	141	139	**136**	...	...	...	...	...	
13	161	161	161	161	161	158	151	143	139	136	**132**	...	...	...	...	...	
14	161	161	161	161	161	158	151	143	139	136	**132**	...	...	...	...	...	
15	161	161	161	161	161	161	161	155	150	145	**142**	...	...	...	...	...	
16	161	161	161	161	161	161	161	160	159	153	**141**	...	...	...	...	...	
17	161	161	161	161	161	161	161	160	159	153	...	...	...	...	...	...	
18	161	161	160	159	157	156	157	156	153	150	**147**	...	...	...	...	...	
19	161	161	160	159	157	156	157	156	153	150	**147**	...	...	...	...	...	
20	161	161	160	159	157	156	157	156	153	150	**147**	...	...	...	...	...	
21	161	161	160	159	157	156	157	156	153	150	**147**	...	...	...	...	...	
22	161	161	161	161	161	161	161	161	161	156	**149**	...	...	...	...	...	(**23**)
23	163	163	163	163	163	159	153	145	141	136	**132**	**101.0**	**83.8**	**66.8**	**50.3**	**33.2**	(**23**)
24	163	163	163	163	163	163	163	157	153	149	**136**	**101.0**	**83.3**	**66.8**	**50.3**	**33.2**	(**23**)
25	163	163	163	163	163	163	163	163	159	154	**123**	**101.0**	**83.8**	**66.8**	**50.3**	**33.2**	(**23**)
26	170	170	170	169	167	161	155	147	143	139	**135**	**101.0**	**83.8**	**66.8**	**50.3**	**33.2**	(**23**)
27	170	170	170	170	170	170	170	170	169	164	**123**	**101.0**	**83.8**	**66.8**	**50.3**	**33.2**	(**23**)
28	170	170	170	170	170	170	170	170	170	169	**123**	**101.0**	**83.8**	**66.8**	**50.3**	**33.2**	(**23**)
29	170	170	170	170	170	170	170	170	170	170	**123**	**101.0**	**83.8**	**66.8**	**50.3**	**33.2**	(**23**)
30	172	162	157	155	152	148	142	135	131	127	123	...	...	...	...	...	(**23**)
31	172	172	167	164	163	158	151	143	139	135	131	...	...	...	...	...	
32	172	170	168	165	163	158	151	143	139	135	131	...	...	...	...	...	
33	172	172	172	172	171	165	159	151	147	142	**139**	...	...	...	...	...	
34	172	172	172	172	171	165	159	151	147	142	**139**	...	...	...	...	...	
35	172	172	172	172	171	165	159	151	147	142	**139**	...	...	...	...	...	
36	172	172	172	172	171	165	159	151	147	142	**139**	...	...	...	...	...	
37	172	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	172	172	172	171	167	157	148	141	138	135	133	...	...	...	...	...	
39	172	172	172	172	172	172	167	161	158	156	153	...	...	...	...	...	
40	172	172	172	172	172	172	172	172	167	152	**147**	...	...	...	...	...	
41	172	172	172	172	172	172	172	172	170	168	**167**	...	...	...	...	...	
42	172	172	172	172	172	172	172	172	170	168	**167**	...	...	...	...	...	
43	172	172	172	172	172	172	172	172	170	168	...	...	...	...	...	...	
44	183	183	183	183	183	177	170	161	157	152	**133**	...	...	...	...	...	(**23**)
45	183	183	183	183	183	177	170	161	157	152	**133**	...	...	...	...	...	(**23**)

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
	1	Carbon steel	Forgings	SA–765	IV	K02009	...	...	1	3
	2	Carbon steel	Plate	SA–537	...	K12437	3	≤65	1	3
	3	Carbon steel	Plate	SA–537	...	K12437	2	≤65	1	3
	4	Carbon steel	Wld. pipe	SA–671	CD80	K12437	...	≤65	1	3
	5	Carbon steel	Wld. pipe	SA–672	D80	K12437	...	≤65	1	3
	6	Carbon steel	Wld. pipe	SA–691	CMSH–80	K12437	...	≤65	1	3
	7	Carbon steel	Plate	SA–738	C	...	...	≤65	1	3
(**23**)	8	Carbon steel	Plate	SA–841	B	...	2	$t \le 100$	1	3
	9	Carbon steel	Plate	SA–612	...	K02900	N	$12.5 < t \le 25$	10C	1
	10	Carbon steel	Plate	SA–612	...	K02900	N	≤12.5	10C	1
(**23**)	11	Carbon steel	Plate	SA–738	B	K12007	...	...	1	3
(**23**)	12	...	...	...	...	...	...	...	...	...
	13	Carbon steel	Forgings	SA–372	C	K04801	...	...	...	...
	14	Carbon steel	Plate	SA–724	A	K11831	...	...	1	4
	15	Carbon steel	Plate	SA–724	C	K12037	...	...	1	4
	16	Carbon steel	Plate	SA–724	B	K12031	...	...	1	4
	17	Ductile cast iron	Castings	SA–874	...	...	...	$300 < t < 530$	...	...
	18	Ductile cast iron	Castings	SA/JIS G5504	FCD 300 LT	...	...	$300 < t < 530$	...	...
	19	C–Mn–Si–Cb	Plate	SA–737	B	K12001	...	...	1	2
	20	C–Mn–Si–V	Plate	SA–737	C	K12202	...	...	1	3
	21	C–½Mo	Smls. tube	SA–209	T1b	K11422	...	...	3	1
	22	C–½Mo	Smls. tube	SA–209	T1	K11522	...	...	3	1
	23	C–½Mo	Fittings	SA–234	WP1	K12821	...	...	3	1
	24	C–½Mo	Wld. fittings	SA–234	WP1	K12821	W	...	3	1
	25	C–½Mo	Smls. pipe	SA–335	P1	K11522	...	...	3	1
	26	C–½Mo	Forged pipe	SA–369	FP1	K11522	...	...	3	1
	27	C–½Mo	Smls. tube	SA–209	T1a	K12023	...	...	3	1
	28	C–½Mo	Castings	SA–217	WC1	J12524	...	...	3	1
	29	C–½Mo	Castings	SA–352	LC1	J12522	...	...	3	1
	30	C–½Mo	Cast pipe	SA–426	CP1	J12521	...	...	3	1
	31	C–½Mo	Plate	SA–204	A	K11820	...	...	3	1
	32	C–½Mo	Wld. pipe	SA–672	L65	K11820	...	...	3	1
	33	C–½Mo	Wld. pipe	SA–691	CM–65	K11820	...	...	3	1
	34	C–½Mo	Forgings	SA–182	F1	K12822	...	...	3	2
	35	C–½Mo	Plate	SA–204	B	K12020	...	...	3	2
	36	C–½Mo	Forgings	SA–336	F1	K12520	...	...	3	2
	37	C–½Mo	Wld. pipe	SA–672	L70	K12020	...	...	3	2
	38	C–½Mo	Wld. pipe	SA–691	CM–70	K12020	...	...	3	2
	39	C–½Mo	Plate	SA–204	C	K12320	...	...	3	2
	40	C–½Mo	Wld. pipe	SA–672	L75	K12320	...	...	3	2
	41	C–½Mo	Wld. pipe	SA–691	CM–75	K12320	...	...	3	2
	42	½Cr–⅕Mo	Forgings	SA–372	G	K13049	70	...	...	...
	43	½Cr–⅕Mo	Forgings	SA–372	H	K13547	70	...	...	...
	44	½Cr–⅕Mo–V	Plate	SA–517	B	K11630	...	≤32	11B	4
	45	½Cr–¼Mo–Si	Forgings	SA–592	A	K11856	...	$65 < t \le 100$	11B	1

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	550	345	NP	371	CS–3	...
2	550	380	NP	371	CS–5	E1
3	550	415	371	371	CS–5	E1
4	550	415	371	NP	CS–5	E1, G1, G4
5	550	415	371	NP	CS–5	E1, G1, G4
6	550	415	371	NP	CS–5	E1, G1, G4
7	550	415	NP	343	CS–5	E1
8	550	415	NP	343	CS–3	...
9	560	345	NP	343	CS–3	...
10	570	345	NP	343	CS–3	...
11	585	415	343	316	CS–5	...
12	...	...	...	...	...	...
13	620	380	NP	38	CS–3	G19, H5, W5, W6
14	620	485	NP	371	CS–5	E1
15	620	485	NP	371	CS–5	E1
16	655	515	NP	371	CS–5	E1
17	300	200	343	NP	CD–2	G17, W1
18	300	200	343	NP	CD–2	G17, W1
19	485	345	371	371	CS–3	E2
20	550	415	371	371	CS–3	E1
21	365	195	NP	371	CS–1	...
22	380	205	NP	371	CS–2	...
23	380	205	371	371	CS–2	...
24	380	205	371	NP	CS–2	...
25	380	205	371	371	CS–2	...
26	380	205	371	371	CS–2	...
27	415	220	NP	371	CS–2	...
28	450	240	371	371	CS–2	...
29	450	240	371	371	CS–2	...
30	450	240	371	NP	CS–2	...
31	450	255	371	371	CS–2	...
32	450	255	371	NP	CS–2	G1, G2
33	450	255	371	NP	CS–2	G1, G2
34	485	275	371	371	CS–2	...
35	485	275	371	371	CS–2	...
36	485	275	371	371	CS–2	...
37	485	275	371	NP	CS–2	G1, G2
38	485	275	371	NP	CS–2	G1, G2
39	515	295	371	371	CS–2	...
40	515	295	371	NP	CS–2	G1, G2
41	515	295	371	NP	CS–2	G1, G2
42	825	485	NP	38	CS–3	G19, H4, W5, W6
43	825	485	NP	38	CS–3	G19, H4, W5, W6
44	795	690	371 (SPT)	371	HT–1	...
45	725	620	371 (SPT)	NP	CS–5	...

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500	
1	184	184	184	184	184	182	182	178	175	172	170	...	...	...	...	...	
2	184	184	184	184	184	184	184	183	182	**177**	**166**	...	...	...	...	...	
3	184	184	184	184	184	184	184	183	182	**177**	**166**	...	...	...	...	...	
4	184	184	184	184	184	184	184	183	182	**177**	**166**	...	...	...	...	...	
5	184	184	184	184	184	184	184	183	182	**177**	**166**	...	...	...	...	...	
6	184	184	184	184	184	184	184	183	182	**177**	**166**	...	...	...	...	...	
7	184	184	184	184	184	184	184	183	182	**177**	...	...	...	...	...	...	
8	183	183	183	183	183	183	183	183	183	178	166	161	215	...	...	...	(**23**)
9	186	186	186	185	183	173	164	158	155	151	...	...	...	...	...	...	
10	191	191	191	190	187	174	163	158	154	151	...	...	...	...	...	...	
11	195	195	195	195	195	195	195	195	193	190	...	...	...	...	...	...	(**23**)
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
13	207	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	207	207	207	207	207	207	207	206	197	**180**	**178**	...	...	...	...	...	
15	207	207	207	207	207	207	207	206	197	**180**	**178**	...	...	...	...	...	
16	219	219	219	219	219	219	219	218	204	**180**	**178**	...	...	...	...	...	
17	75.0	75.0	74.3	...	71.2	68.9	67.6	66.7	65.8	64.2	...	...	...	...	...	...	
18	75.0	75.0	74.3	...	71.2	68.9	67.6	66.7	65.8	64.2	...	...	...	...	...	...	
19	161	161	161	161	161	161	161	157	155	153	**152**	...	...	...	...	...	
20	184	184	184	184	184	184	184	184	183	**180**	**178**	...	...	...	...	...	
21	122	122	120	118	116	113	110	107	105	103	101	...	...	...	...	...	
22	126	126	126	125	124	120	117	114	112	110	108	...	...	...	...	...	
23	126	126	126	125	124	120	117	114	112	110	108	...	...	...	...	...	
24	126	126	126	125	124	120	117	114	112	110	108	...	...	...	...	...	
25	126	126	126	125	124	120	117	114	112	110	108	...	...	...	...	...	
26	126	126	126	125	124	120	117	114	112	110	108	...	...	...	...	...	
27	138	138	138	135	132	129	125	121	119	117	116	...	...	...	...	...	
28	150	150	149	147	145	140	137	133	131	128	127	...	...	...	...	...	
29	150	150	149	147	145	140	137	133	131	128	127	...	...	...	...	...	
30	150	150	149	147	145	140	137	133	131	128	127	...	...	...	...	...	
31	150	150	150	150	150	148	144	141	138	136	133	...	...	...	...	...	
32	150	150	150	150	150	148	144	141	138	136	133	...	...	...	...	...	
33	150	150	150	150	150	148	144	141	138	136	133	...	...	...	...	...	
34	161	161	161	161	161	160	156	152	149	147	144	...	...	...	...	...	
35	161	161	161	161	161	160	156	152	149	147	144	...	...	...	...	...	
36	161	161	161	161	161	160	156	152	149	147	144	...	...	...	...	...	
37	161	161	161	161	161	160	156	152	149	147	144	...	...	...	...	...	
38	161	161	161	161	161	160	156	152	149	147	144	...	...	...	...	...	
39	172	172	172	172	172	172	168	163	160	158	155	...	...	...	...	...	
40	172	172	172	172	172	172	168	163	160	158	155	...	...	...	...	...	
41	172	172	172	172	172	172	168	163	160	158	155	...	...	...	...	...	
42	276	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	276	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	264	264	264	264	264	264	264	264	264	263	258	...	...	...	...	...	
45	241	241	241	241	241	241	241	240	239	233	228	...	...	...	...	...	

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
	1	½Cr–¼Mo–Si	Plate	SA–517	A	K11856	...	≤32	11B	1
	2	½Cr–¼Mo–Si	Forgings	SA–592	A	K11856	...	≤65	11B	1
	3	½Cr–½Mo	Smls. pipe	SA–335	P2	K11547	...	...	3	1
	4	½Cr–½Mo	Forged pipe	SA–369	FP2	K11547	...	...	3	1
	5	½Cr–½Mo	Plate	SA–387	2	K12143	1	...	3	1
	6	½Cr–½Mo	Wld. pipe	SA–691	½CR	K12143	...	...	3	1
	7	½Cr–½Mo	Smls. tube	SA–213	T2	K11547	...	...	3	1
	8	½Cr–½Mo	Cast pipe	SA–426	CP2	J11547	...	...	3	1
	9	½Cr–½Mo	Forgings	SA–182	F2	K12122	...	...	3	2
	10	½Cr–½Mo	Plate	SA–387	2	K12143	2/NT	...	3	2
	11	¾Cr–½Ni–Cu	Smls. tube	SA–423	1	K11535	...	...	4	2
	12	¾Cr–¾Ni–Cu–Al	Smls. pipe	SA–333	4	K11267	...	...	4	2
	13	1Cr–⅕Mo	Forgings	SA–372	E	K13047	70	...	...	...
(**23**)	14	1Cr–⅕Mo	Forgings	SA–372	F	G41350	70	...	...	...
	15	1Cr–⅕Mo	Forgings	SA–372	J	K13548	70	...	...	...
	16	1Cr–⅕Mo	Forgings	SA–372	J	G41370	110	...	...	...
	17	1Cr–½Mo	Plate	SA–387	12	K11757	1	...	4	1
	18	1Cr–½Mo	Wld. pipe	SA–691	1CR	K11757	22	...	4	1
	19	1Cr–½Mo	Cast pipe	SA–426	CP12	J11562	...	...	4	1
	20	1Cr–½Mo	Forgings	SA–182	F12	K11562	1	...	4	1
	21	1Cr–½Mo	Smls. tube	SA–213	T12	K11562	...	...	4	1
	22	1Cr–½Mo	Fittings	SA–234	WP12	K12062	1	...	4	1
	23	1Cr–½Mo	Smls. pipe	SA–335	P12	K11562	...	...	4	1
	24	1Cr–½Mo	Forged pipe	SA–369	FP12	K11562	...	...	4	1
(**23**)	25	1Cr–½Mo	Forgings	SA/EN 10222–2	13CrMo4–5	...	NT or QT	250 < t ≤ 500	4	1
(**23**)	26	1Cr–½Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...	150 < t ≤ 250	4	1
(**23**)	27	1Cr–½Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...	100 < t ≤ 150	4	1
(**23**)	28	1Cr–½Mo	Forgings	SA/EN 10222–2	13CrMo4–5	...	NT or QT	100 < t ≤ 250	4	1
(**23**)	29	1Cr–½Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...	60 < t ≤ 100	4	1
(**23**)	30	1Cr–½Mo	Forgings	SA/EN 10222–2	13CrMo4–5	...	NT or QT	70 < t ≤ 100	4	1
(**23**)	31	1Cr–½Mo	Forgings	SA/EN 10222–2	13CrMo4–5	...	NT	35 < t ≤ 70	4	1
(**23**)	32	1Cr–½Mo	Forgings	SA/EN 10222–2	13CrMo4–5	...	NT	t ≤ 35	4	1
	33	1Cr–½Mo	Plate	SA–387	12	K11757	2	...	4	1
(**23**)	34	1Cr–½Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...	16 < t ≤ 60	4	1
(**23**)	35	1Cr–½Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...	t ≤ 16	4	1
	36	1Cr–½Mo	Wld. pipe	SA–691	1CR	K11757	42/NT	...	4	1
	37	1Cr–½Mo	Forgings	SA–182	F12	K11564	2	...	4	1
	38	1Cr–½Mo	Forgings	SA–336	F12	K11564	...	...	4	1
	39	1¼Cr–½Mo	Castings	SA–217	WC6	J12072	...	...	4	1
	40	1¼Cr–½Mo	Cast pipe	SA–426	CP11	J12072	...	...	4	1
	41	1¼Cr–½Mo	Bar	SA–739	B11	K11797	...	...	4	1
	42	1¼Cr–½Mo–Si	Forgings	SA–182	F11	K11597	1	...	4	1
	43	1¼Cr–½Mo–Si	Smls. tube	SA–213	T11	K11597	...	...	4	1
	44	1¼Cr–½Mo–Si	Fittings	SA–234	WP11	...	1	...	4	1
	45	1¼Cr–½Mo–Si	Wld. fittings	SA–234	WP11	...	1/W	...	4	1

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	795	690	371 (SPT)	371	HT–1	...
2	795	690	NP	371	HT–1	...
3	380	205	371	371	CS–2	...
4	380	205	371	371	CS–2	...
5	380	230	371	371	CS–2	...
6	380	230	371	NP	CS–2	G1, G2
7	415	205	371	371	CS–2	...
8	415	205	371	NP	CS–2	...
9	485	275	NP	371	CS–2	...
10	485	310	NP	38	CS–3	...
11	415	255	NP	371	CS–2	...
12	415	240	NP	38	CS–2	...
13	825	485	NP	343	CS–5	G19, H4, W5, W6
14	825	485	NP	343	CS–5	G19, H4, W5, W6
15	825	485	NP	343	CS–5	G19, H4, W5, W6
16	930	760	NP	343	HT–1	H4, W5, W6
17	380	230	371	482	CS–2	...
18	380	230	371	NP	CS–2	G15
19	415	205	371	NP	CS–2	...
20	415	220	NP	482	CS–2	...
21	415	220	371	482	CS–2	...
22	415	220	371	482	CS–2	...
23	415	220	371	482	CS–2	...
24	415	220	371	482	CS–2	...
25	420	240	NP	482	CS–2	E4
26	420	245	NP	482	CS–2	E4
27	430	255	NP	482	CS–2	E4
28	440	265	NP	482	CS–2	E4
29	440	270	NP	482	CS–2	E4
30	440	275	NP	482	CS–2	E4
31	440	285	NP	482	CS–2	E4
32	440	295	NP	482	CS–2	E4
33	450	275	371	482	CS–2	E4
34	450	290	NP	482	CS–2	E4
35	450	300	NP	482	CS–2	E4
36	450	275	371	NP	CS–2	G16
37	485	275	371	482	CS–2	E4
38	485	275	371	482	CS–2	E4
39	485	275	371	482	CS–2	E4
40	485	275	371	NP	CS–2	...
41	485	310	371	482	CS–3	E4
42	415	205	NP	482	CS–2	...
43	415	205	371	482	CS–2	...
44	415	205	371	482	CS–2	...
45	415	205	371	NP	CS–2	...

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500	
1	264	264	264	264	264	264	264	264	264	263	258	...	...	...	...	...	
2	264	264	264	264	264	264	264	264	264	263	258	...	...	...	...	...	
3	126	126	126	125	124	120	117	114	112	110	108	...	...	...	...	...	
4	126	126	126	125	124	120	117	114	112	110	108	...	...	...	...	...	
5	126	126	126	126	126	126	126	125	123	121	119	...	...	...	...	...	
6	126	126	126	126	126	126	126	125	123	121	119	...	...	...	...	...	
7	138	134	129	126	124	120	117	114	112	110	108	...	...	...	...	...	
8	138	134	129	126	124	120	117	114	112	110	108	...	...	...	...	...	
9	161	161	161	161	161	160	156	152	149	147	144	...	...	...	...	...	
10	161	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	138	138	138	138	138	138	138	138	138	138	138	...	...	...	...	...	
12	138	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	276	276	276	276	276	276	273	265	259	253	...	...	...	...	...	...	
14	276	276	276	276	276	276	273	265	259	253	...	...	...	...	...	...	(**23**)
15	276	276	276	276	276	276	273	265	259	253	...	...	...	...	...	...	
16	310	304	297	296	295	293	291	289	286	272	...	...	...	...	...	...	
17	126	125	124	122	121	121	119	117	115	113	112	110	108	107	104	102	
18	126	125	124	122	121	121	119	117	115	113	112	...	...	...	...	...	
19	138	131	124	120	117	112	109	106	104	103	102	...	...	...	...	...	
20	138	136	132	128	125	120	116	113	112	110	109	107	106	103	101	98.2	
21	138	136	132	128	125	120	116	113	112	110	109	107	106	103	101	98.2	
22	138	136	132	128	125	120	116	113	112	110	109	107	106	103	101	98.2	
23	138	136	132	128	125	120	116	113	112	110	109	107	106	103	101	98.2	
24	138	136	132	128	125	120	116	113	112	110	109	107	106	103	101	98.2	
25	140	139	138	136	134	131	127	123	122	121	119	117	115	113	**110**	**97.2**	(**23**)
26	140	139	137	136	136	133	129	125	124	123	121	119	117	115	**112**	**94.4**	(**23**)
27	143	142	140	139	139	138	134	131	129	127	125	124	121	119	**117**	**94.4**	(**23**)
28	147	145	143	143	142	141	140	136	135	133	131	129	127	124	**121**	**97.2**	(**23**)
29	147	147	147	147	147	147	142	138	137	135	133	131	129	126	**123**	**94.4**	(**23**)
30	147	145	144	143	141	140	140	140	140	138	136	134	132	129	**126**	**97.2**	(**23**)
31	147	145	144	143	141	140	140	140	140	140	140	139	137	133	**131**	**97.2**	(**23**)
32	147	145	144	143	141	140	140	140	140	140	140	140	140	138	**135**	**97.2**	(**23**)
33	150	150	146	144	143	143	143	141	139	137	136	134	132	129	**125**	**121**	
34	150	148	147	146	145	144	144	144	144	144	143	141	139	135	**133**	**94.4**	(**23**)
35	150	148	147	146	145	144	144	144	144	144	144	144	143	140	**137**	**94.4**	(**23**)
36	150	148	146	144	143	143	143	141	139	137	136	...	...	...	...	...	
37	161	159	158	156	154	150	145	141	139	137	136	134	132	129	**125**	**121**	
38	161	161	157	156	154	150	145	141	139	137	136	134	132	129	**125**	**121**	
39	161	161	161	161	161	156	151	146	143	141	138	136	133	130	**106**	**71.4**	
40	161	161	161	161	161	156	151	146	143	141	138	...	...	...	...	...	
41	161	161	161	161	161	161	161	161	160	159	155	153	149	143	**108**	**65.0**	
42	138	132	127	124	121	116	112	109	108	106	104	102	99.5	97.0	94.5	92.0	
43	138	132	127	124	121	116	112	109	108	106	104	102	99.5	97.0	94.5	92.0	
44	138	132	127	124	121	116	112	109	108	106	104	102	99.5	97.0	94.5	92.0	
45	138	132	127	124	121	116	112	109	108	106	104	...	...	...	...	...	

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
	1	1¼Cr–½Mo–Si	Smls. pipe	SA–335	P11	K11597	...	...	4	1
	2	1¼Cr–½Mo–Si	Forged pipe	SA–369	FP11	K11597	...	...	4	1
	3	1¼Cr–½Mo–Si	Plate	SA–387	11	K11789	1	...	4	1
	4	1¼Cr–½Mo–Si	Wld. pipe	SA–691	1¼CR	K11789	...	...	4	1
	5	1¼Cr–½Mo–Si	Forgings	SA–182	F11	K11572	2	...	4	1
	6	1¼Cr–½Mo–Si	Forgings	SA–336	F11	K11572	2	...	4	1
(**23**)	7	1¼Cr–½Mo–Si	Plate	SA/EN 10028–2	13CrMoSi5–5	...	QT	100 < t ≤ 250	4	1
(**23**)	8	1¼Cr–½Mo–Si	Plate	SA/EN 10028–2	13CrMoSi5–5	...	QT	60 < t ≤ 100	4	1
(**23**)	9	1¼Cr–½Mo–Si	Plate	SA/EN 10028–2	13CrMoSi5–5	...	QT	≤60	4	1
	10	1¼Cr–½Mo–Si	Forgings	SA–336	F11	K11572	3	...	4	1
	11	1¼Cr–½Mo–Si	Plate	SA–387	11	K11789	2	...	4	1
	12	1¼Cr–½Mo–Si	Wld. pipe	SA–691	1¼CR	K11789	NT	...	4	1
	13	1¾Cr–½Mo–Cu	Forgings	SA–592	E	K11695	...	65 < t ≤ 100	11B	2
	14	1¾Cr–½Mo–Cu	Forgings	SA–592	E	K11695	...	≤65	11B	2
	15	1¾Cr–½Mo–Ti	Plate	SA–517	E	K21604	...	65 < t ≤ 150	11B	2
	16	1¾Cr–½Mo–Ti	Plate	SA–517	E	K21604	...	≤65	11B	2
(**23**)	17	2¼Cr–1Mo	Forgings	SA–182	F22	K21590	1	...	5A	1
	18	2¼Cr–1Mo	Forgings	SA–182	F22	K21590	1	...	5A	1
	19	2¼Cr–1Mo	Smls. tube	SA–213	T22	K21590	...	...	5A	1
	20	2¼Cr–1Mo	Fittings	SA–234	WP22	K21590	1	...	5A	1
	21	2¼Cr–1Mo	Wld. fittings	SA–234	WP22	K21590	1/W	...	5A	1
	22	2¼Cr–1Mo	Smls. pipe	SA–335	P22	K21590	...	...	5A	1
	23	2¼Cr–1Mo	Forgings	SA–336	F22	K21590	1	...	5A	1
	24	2¼Cr–1Mo	Forged pipe	SA–369	FP22	K21590	...	...	5A	1
	25	2¼Cr–1Mo	Plate	SA–387	22	K21590	1	...	5A	1
(**23**)	26	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...	150 < t ≤ 250	5A	1
(**23**)	27	2¼Cr–1Mo	Forgings	SA/EN 10222–2	11CrMo9–10	...	NT or QT	200 < t ≤ 500	5A	1
(**23**)	28	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...	100 < t ≤ 150	5A	1
(**23**)	29	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...	60 < t ≤ 100	5A	1
(**23**)	30	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...	40 < t ≤ 60	5A	1
(**23**)	31	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...	16 < t ≤ 40	5A	1
(**23**)	32	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...	t ≤ 16	5A	1
	33	2¼Cr–1Mo	Wld. pipe	SA–691	2¼CR	K21590	...	...	5A	1
	34	2¼Cr–1Mo	Castings	SA–217	WC9	J21890	...	...	5A	1
	35	2¼Cr–1Mo	Castings	SA–217	WC9	J21890	...	...	5A	1
	36	2¼Cr–1Mo	Cast pipe	SA–426	CP22	J21890	...	...	5A	1
	37	2¼Cr–1Mo	Forgings	SA–182	F22	K21590	3	...	5A	1
	38	2¼Cr–1Mo	Forgings	SA–336	F22	K21590	3	...	5A	1
	39	2¼Cr–1Mo	Plate	SA–387	22	K21590	2	...	5A	1
	40	2¼Cr–1Mo	Wld. pipe	SA–691	2¼CR	K21590	NT	...	5A	1
	41	2¼Cr–1Mo	Bar	SA–739	B22	K21390	...	...	5A	1
(**23**)	42	2¼Cr–1Mo	Forgings	SA/EN 10222–2	11CrMo9–10	...	NT	t ≤ 200	5A	1
	43	2¼Cr–1Mo	Castings	SA–487	8	J22091	A	...	5C	1
	44	2¼Cr–1Mo	Forgings	SA–508	22	K21590	3	...	5C	1
	45	2¼Cr–1Mo	Forgings	SA–541	22	K21390	3	...	5C	1

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	415	205	371	482	CS-2	...
2	415	205	371	482	CS-2	...
3	415	240	371	482	CS-2	E4
4	415	240	371	NP	CS-2	G1, G2
5	485	275	371	482	CS-2	E4
6	485	275	NP	482	CS-2	E4
7	490	380	...	482	CS-3	E4
8	500	390	...	482	CS-3	E4
9	510	400	...	482	CS-3	E4
10	515	310	NP	371	CS-3	...
11	515	310	371	482	CS-3	E3
12	515	310	371	NP	CS-3	G1, G2
13	725	620	371 (SPT)	371	CS-5	S1
14	795	690	NP	371	HT-1	...
15	725	620	371 (Cl. MC & SPT)	371	CS-5	...
16	795	690	371 (Cl. MC & SPT)	371	HT-1	...
17	415	205	NP	482	CS-2	E3, W2
18	415	205	371	NP	CS-2	...
19	415	205	371	482	CS-2	E3, W2
20	415	205	371	482	CS-2	E3, W2
21	415	205	371	NP	CS-2	...
22	415	205	371	482	CS-2	E3, W2
23	415	205	371	482	CS-2	E3, W2
24	415	205	371	482	CS-2	E3, W2
25	415	205	371	482	CS-2	E3, H1, W2
26	450	250	NP	482	CS-3	E3, W2
27	450	265	NP	482	CS-3	E3, W2
28	460	260	NP	482	CS-3	E3, W2
29	470	280	NP	482	CS-3	E3, W2
30	480	290	NP	482	CS-3	E3, W2
31	480	300	NP	482	CS-3	E3, W2
32	480	310	NP	482	CS-3	E3, W2
33	415	205	371	NP	CS-2	G1, G2
34	485	275	371	482	CS-2	E4, W2
35	485	275	371 (SPT)	NP	CS-2	...
36	485	275	371	NP	CS-2	...
37	515	310	371	482	CS-3	E3, W2
38	515	310	371	482	CS-3	E3, W2
39	515	310	371	482	CS-3	E3, W2
40	515	310	371	NP	CS-3	G1, G2
41	515	310	371	482	CS-3	E3, W2
42	520	310	NP	482	CS-3	E3, W5
43	585	380	371	371	CS-3	...
44	585	380	371	454	CS-2	...
45	585	380	NP	454	CS-2	G21

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500	
1	138	132	127	124	121	116	112	109	108	106	104	102	99.5	97.0	94.5	92.0	
2	138	132	127	124	121	116	112	109	108	106	104	102	99.5	97.0	94.5	92.0	
3	138	138	138	138	138	135	131	127	126	123	121	118	116	114	**106**	**97.1**	
4	138	138	138	138	138	135	131	127	126	123	121	...	...	...	...	...	
5	161	161	161	161	161	156	151	146	143	141	138	136	133	130	**109**	**80.6**	
6	161	161	161	161	161	156	151	146	143	141	138	136	133	130	**109**	**80.6**	
7	163	163	163	163	162	162	162	162	162	162	162	162	160	155	**104**	**73.7**	(**23**)
8	167	167	167	166	165	165	165	165	165	165	165	165	163	158	**104**	**73.7**	(**23**)
9	170	170	170	169	168	168	168	168	168	168	168	168	166	161	**104**	**73.7**	(**23**)
10	172	172	172	172	172	172	169	164	161	158	155	...	...	...	...	...	
11	172	172	172	172	172	172	169	164	161	158	155	153	149	**142**	**119**	**91.4**	
12	172	172	172	172	172	172	169	164	161	158	155	...	...	...	...	...	
13	241	241	241	241	241	241	241	241	241	241	241	...	...	...	...	...	
14	264	264	264	264	264	264	264	264	264	264	263	...	...	...	...	...	
15	241	241	241	241	241	241	241	241	241	241	241	...	...	...	...	...	
16	264	264	264	264	264	264	264	264	264	264	263	...	...	...	...	...	
17	138	133	128	126	125	124	123	123	123	123	123	123	122	**119**	**99.6**	**80.9**	(**23**)
18	138	133	128	126	125	124	123	123	123	123	123	...	...	...	...	...	
19	138	133	128	126	125	124	123	123	123	123	123	123	122	**119**	**101**	**77.7**	
20	138	132	128	127	125	124	123	123	123	123	123	123	122	**119**	**101**	**77.7**	
21	138	132	128	127	125	124	123	123	123	123	123	...	...	...	...	...	
22	138	132	128	127	125	124	123	123	123	123	123	123	122	**119**	**101**	**77.7**	
23	138	132	128	127	125	124	123	123	123	123	123	123	122	**119**	**101**	**77.7**	
24	138	132	128	127	125	124	123	123	123	123	123	123	122	**119**	**101**	**77.7**	
25	138	133	128	126	125	124	123	123	123	123	123	123	122	**119**	**101**	**77.7**	
26	150	150	150	149	145	141	139	136	135	133	132	130	127	**125**	**123**	**88.4**	(**23**)
27	150	150	150	149	147	145	144	144	143	142	141	139	136	**132**	**128**	**88.4**	(**23**)
28	153	153	153	152	151	147	144	141	140	139	137	135	133	**129**	**126**	**122.0**	(**23**)
29	157	157	156	155	154	151	150	149	149	148	146	144	141	**138**	**128**	**88.4**	(**23**)
30	160	160	160	159	157	154	154	153	152	151	149	147	144	**141**	**128**	**88.4**	(**23**)
31	160	160	160	159	158	155	155	154	153	152	150	148	144	**139**	**128**	**88.4**	(**23**)
32	160	160	160	159	158	155	155	154	153	152	150	148	144	**139**	**128**	**88.4**	(**23**)
33	138	133	128	126	125	124	123	123	123	123	123	...	...	...	...	...	
34	161	161	161	160	159	156	155	155	154	153	151	148	145	139	**118**	**93.2**	
35	161	161	161	160	159	156	155	155	154	153	151	...	...	...	...	...	
36	161	161	161	160	159	156	155	155	154	153	151	...	...	...	...	...	
37	172	172	172	170	167	166	166	165	164	162	161	158	155	**152**	**128**	**94.6**	
38	172	172	172	170	167	166	166	165	164	162	161	158	155	**152**	**128**	**94.6**	
39	172	172	172	170	167	166	166	165	164	162	161	158	155	**152**	**128**	**94.6**	
40	172	172	172	170	167	166	166	165	164	162	161	...	...	...	...	...	
41	172	172	172	170	167	166	166	165	164	162	161	158	155	**152**	**128**	**94.6**	
42	173	173	173	172	170	167	167	166	165	164	163	160	157	**153**	**116**	**89.4**	(**23**)
43	195	195	195	193	191	189	189	188	187	186	184	...	...	...	...	...	
44	195	195	195	193	191	189	189	188	187	186	184	180	176	156	133	...	
45	195	195	195	193	191	189	189	188	187	186	184	180	176	156	133	...	

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	2¼Cr–1Mo	Plate	SA–542	B	K21590	4	...	5C	1
2	2¼Cr–1Mo	Forgings	SA–541	22	K21390	4	≥6	5C	4
3	2¼Cr–1Mo–V	Forgings	SA–182	F22V	K31835	...	...	5C	1
4	2¼Cr–1Mo–V	Forgings	SA–336	F22V	K31835	...	...	5C	1
5	2¼Cr–1Mo–V	Forgings	SA–541	22V	K31835	...	...	5C	1
6	2¼Cr–1Mo–V	Plate	SA–542	D	K31835	4a	...	5C	1
7	2¼Cr–1Mo–V	Plate	SA–832	22V	K31835	...	...	5C	1
8	3Cr–1Mo	Smls. tube	SA–213	T21	K31545	...	...	5A	1
9	3Cr–1Mo	Smls. pipe	SA–335	P21	K31545	...	...	5A	1
10	3Cr–1Mo	Forgings	SA–336	F21	K31545	1	...	5A	1
11	3Cr–1Mo	Forged pipe	SA–369	FP21	K31545	...	...	5A	1
12	3Cr–1Mo	Plate	SA–387	21	K31545	1	...	5A	1
13	3Cr–1Mo	Cast pipe	SA–426	CP21	J31545	...	...	5A	1
14	3Cr–1Mo	Forgings	SA–182	F21	K31545	...	...	5A	1
15	3Cr–1Mo	Forgings	SA–336	F21	K31545	3	...	5A	1
16	3Cr–1Mo	Plate	SA–387	21	K31545	2	...	5A	1
17	3Cr–1Mo–¼V–Ti–B	Forgings	SA–182	F3V	K31830	...	...	5C	1
18	3Cr–1Mo–¼V–Ti–B	Forgings	SA–336	F3V	K31830	...	...	5C	1
19	3Cr–1Mo–¼V–Ti–B	Forgings	SA–508	3V	K31830	...	...	5C	1
20	3Cr–1Mo–¼V–Ti–B	Forgings	SA–541	3V	K31830	...	...	5C	1
21	3Cr–1Mo–¼V–Ti–B	Plate	SA–542	C	K31830	4a	...	5C	1
22	3Cr–1Mo–¼V–Ti–B	Plate	SA–832	21V	K31830	...	...	5C	1
23	5Cr–½Mo	Smls. tube	SA–213	T5	K41545	...	...	5B	1
24	5Cr–½Mo	Fittings	SA–234	WP5	K41545	...	...	5B	1
25	5Cr–½Mo	Wld. fittings	SA–234	WP5	K41545	W	...	5B	1
26	5Cr–½Mo	Smls. pipe	SA–335	P5	K41545	...	...	5B	1
27	5Cr–½Mo	Forged pipe	SA–369	FP5	K41545	...	...	5B	1
28	5Cr–½Mo	Plate	SA–387	5	K41545	1	...	5B	1
29	5Cr–½Mo	Wld. pipe	SA–691	5CR	K41545	...	...	5B	1
30	5Cr–½Mo	Forgings	SA–336	F5	K41545	...	...	5B	1
31	5Cr–½Mo	Forgings	SA–182	F5	K41545	...	...	5B	1
32	5Cr–½Mo	Plate	SA–387	5	K41545	2	...	5B	1
33	5Cr–½Mo	Forgings	SA–336	F5A	K42544	...	...	5B	1
34	5Cr–½Mo	Castings	SA–217	C5	J42045	NT	...	5B	1
35	5Cr–½Mo	Cast pipe	SA–426	CP5	J42045	...	...	5B	1
36	5Cr–½Mo	Forgings	SA–182	F5a	K42544	...	...	5B	1
37	5Cr–½Mo–Si	Smls. tube	SA–213	T5b	K51545	...	...	5B	1
38	5Cr–½Mo–Si	Smls. pipe	SA–335	P5b	K51545	...	...	5B	1
39	5Cr–½Mo–Ti	Smls. tube	SA–213	T5c	K41245	...	...	5B	1
40	5Cr–½Mo–Ti	Smls. pipe	SA–335	P5c	K41245	...	...	5B	1
41	9Cr–1Mo	Smls. tube	SA–213	T9	K90941	...	...	5B	1
42	9Cr–1Mo	Fittings	SA–234	WP9	K90941	...	...	5B	1
43	9Cr–1Mo	Smls. pipe	SA–335	P9	K90941	...	...	5B	1
44	9Cr–1Mo	Forged pipe	SA–369	FP9	K90941	...	...	5B	1
45	9Cr–1Mo	Forgings	SA–182	F9	K90941	...	...	5B	1

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	585	380	NP	454	CS-2	G21
2	725	585	371	NP	CS-3	S3, W1
3	585	415	NP	482	CS-2	G21
4	585	415	NP	482	CS-2	G21
5	585	415	NP	482	CS-2	G21
6	585	415	NP	482	CS-2	G21
7	585	415	NP	482	CS-2	G21
8	415	205	371	454	CS-2	E3
9	415	205	371	454	CS-2	E3
10	415	205	371	454	CS-2	E3
11	415	205	371	454	CS-2	E3
12	415	205	371	454	CS-2	E3
13	415	205	371	NP	CS-2	...
14	515	310	371	454	CS-3	E3
15	515	310	371	454	CS-3	E3
16	515	310	371	454	CS-3	E3
17	585	415	NP	454	CS-3	G21
18	585	415	NP	454	CS-3	G21
19	585	415	NP	454	CS-3	G21
20	585	415	NP	454	CS-3	G21
21	585	415	NP	454	CS-3	G21
22	585	415	NP	454	CS-3	G21
23	415	205	371	371	CS-2	...
24	415	205	371	371	CS-2	...
25	415	205	371	NP	CS-2	...
26	415	205	371	371	CS-2	...
27	415	205	371	371	CS-2	...
28	415	205	371	371	CS-2	...
29	415	205	371	NP	CS-2	G1, G2
30	415	250	NP	371	CS-2	...
31	485	275	371	371	CS-2	...
32	515	310	371	371	CS-3	...
33	550	345	NP	371	CS-3	...
34	620	415	371	371	CS-3	...
35	620	415	371	NP	CS-3	...
36	620	450	NP	371	CS-5	...
37	415	205	NP	371	CS-2	...
38	415	205	NP	371	CS-2	...
39	415	205	NP	371	CS-2	...
40	415	205	NP	371	CS-2	...
41	415	205	371	371	CS-2	...
42	415	205	NP	371	CS-2	...
43	415	205	371	371	CS-2	...
44	415	205	371	371	CS-2	...
45	585	380	NP	371	CS-3	...

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500
1	195	195	195	193	191	189	189	188	187	186	184	180	176	156	133	...
2	241	241	241	241	241	241	240	238	236	234	231	...	...	...	...	...
3	195	195	195	195	195	195	195	192	189	186	182	178	174	170	164	159
4	195	195	195	195	195	195	195	192	189	186	182	178	174	170	164	159
5	195	195	195	195	195	195	195	192	189	186	182	178	174	170	164	159
6	195	195	195	195	195	195	195	192	189	186	182	178	174	170	164	159
7	195	195	195	195	195	195	195	192	189	186	182	178	174	170	164	159
8	138	133	128	126	125	124	123	123	123	123	123	123	122	**112**	**101**	...
9	138	133	128	126	125	124	123	123	123	123	123	123	122	**112**	**101**	...
10	138	132	128	127	125	124	123	123	123	123	123	123	122	**112**	**101**	...
11	138	133	128	126	125	124	123	123	123	123	123	123	122	**112**	**101**	...
12	138	133	128	126	125	124	123	123	123	123	123	123	122	**112**	**101**	...
13	138	133	128	126	125	124	123	123	123	123	123	...	...	...	...	...
14	172	172	172	170	167	166	166	165	164	162	161	158	156	**136**	**113**	...
15	172	172	172	170	167	166	166	165	164	162	161	158	156	**136**	**113**	...
16	172	172	172	170	167	166	166	165	164	162	161	158	156	**136**	**113**	...
17	195	195	195	192	187	182	179	176	175	173	172	170	168	165	162	...
18	195	195	195	192	187	182	179	176	175	173	172	170	168	165	162	...
19	195	195	195	192	187	182	179	176	175	173	172	170	168	165	162	...
20	195	195	195	192	187	182	179	176	175	173	172	170	168	165	162	...
21	195	195	195	192	187	182	179	176	175	173	172	170	168	165	162	...
22	195	195	195	192	187	182	179	176	175	173	172	170	168	165	162	...
23	138	131	124	121	120	119	118	117	115	114	112	...	...	...	...	...
24	138	131	124	121	120	119	118	117	115	114	112	...	...	...	...	...
25	138	131	124	121	120	119	118	117	115	114	112	...	...	...	...	...
26	138	131	124	121	120	119	118	117	115	114	112	...	...	...	...	...
27	138	131	124	121	120	119	118	117	115	114	112	...	...	...	...	...
28	138	131	124	121	120	119	118	117	115	114	112	...	...	...	...	...
29	138	131	124	121	120	119	118	117	115	114	112	...	...	...	...	...
30	138	138	138	136	134	132	132	131	130	128	125	...	...	...	...	...
31	161	161	160	158	156	154	154	153	151	149	146	...	...	...	...	...
32	172	172	171	169	167	165	165	164	162	159	156	...	...	...	...	...
33	184	184	183	180	178	177	177	175	173	170	167	...	...	...	...	...
34	207	206	206	203	201	199	198	196	194	191	188	...	...	...	...	...
35	207	206	206	203	201	199	198	196	194	191	188	...	...	...	...	...
36	207	206	206	203	201	199	198	196	194	191	188	...	...	...	...	...
37	138	131	124	121	120	119	118	117	115	114	112	...	...	...	...	...
38	138	131	124	121	120	119	118	117	115	114	112	...	...	...	...	...
39	138	131	124	121	120	119	118	117	115	114	112	...	...	...	...	...
40	138	131	124	121	120	119	118	117	115	114	112	...	...	...	...	...
41	138	131	124	121	120	119	118	117	115	114	112	...	...	...	...	...
42	138	131	124	121	120	119	118	117	115	114	112	...	...	...	...	...
43	138	131	124	121	120	119	118	117	115	114	112	...	...	...	...	...
44	138	131	124	121	120	119	118	117	115	114	112	...	...	...	...	...
45	195	195	195	192	189	188	187	186	184	180	177	...	...	...	...	...

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
	1	9Cr–1Mo	Forgings	SA–336	F9	K90941	...	...	5B	1
	2	9Cr–1Mo	Castings	SA–217	C12	J82090	NT	...	5B	1
	3	9Cr–1Mo	Cast pipe	SA–426	CP9	J82090	...	...	5B	1
	4	9Cr–1Mo–V	Smls. tube	SA–213	T91 Type 1	K90901	...	...	15E	1
	5	9Cr–1Mo–V	Smls. pipe	SA–335	P91 Type 1	K90901	...	...	15E	1
	6	9Cr–1Mo–V	Plate	SA–387	91 Type 1	K90901	2	...	15E	1
	7	9Cr–1Mo–V	Forgings	SA–182	F91 Type 1	K90901	...	...	15E	1
(**23**)	8	9Cr–1Mo–V	Forgings	SA–336	F91	K90901	...	...	15E	1
	9	12Cr	Bar	SA–479	403	S40300	A	...	6	1
	10	12Cr	Bar	SA–479	403	S40300	1	...	6	1
	11	12Cr–Al	Bar	SA/JIS G4303	SUS405	...	...	...	7	1
	12	12Cr–Al	Plate	SA–240	405	S40500	...	...	7	1
	13	12Cr–Al	Bar	SA–479	405	S40500	...	...	7	1
	14	12Cr–Al	Smls. tube	SA–268	TP405	S40500	...	...	7	1
	15	12½Cr–2Ni	Bar	SA–479	414	S41400	...	...	6	4
	16	13Cr	Plate	SA–240	410S	S41008	...	...	7	1
	17	13Cr	Smls. tube	SA–268	TP410	S41000	...	...	6	1
	18	13Cr	Plate	SA–240	410	S41000	...	...	6	1
	19	13Cr	Forgings	SA–182	F6a	S41000	1	...	6	1
(**23**)	20	13Cr	Forgings	SA–182	F6a	S41000	1	...	6	3
	21	13Cr	Bar	SA–479	410	S41000	A	...	6	1
	22	13Cr	Bar	SA–479	410	S41000	1	...	6	1
	23	13Cr	Forgings	SA–182	F6a	S41000	2	...	6	3
	24	13Cr	Forgings	SA–336	F6	S41000	...	...	6	3
	25	13Cr	Castings	SA–217	CA15	J91150	...	...	6	3
	26	13Cr	Cast pipe	SA–426	CPCA15	J91150	...	...	6	3
	27	13Cr	Bar	SA/EN 10088–3	X12Cr13	...	QT650	$t \le 160$	...	...
	28	13Cr–4Ni	Castings	SA–487	CA6NM	J91540	A	...	6	4
	29	13Cr–4Ni	Forgings	SA–182	F6NM	S41500	...	...	6	4
	30	13Cr–4Ni	Bar	SA–479	...	S41500	...	...	6	4
	31	13Cr–8Ni–2Mo	Forgings	SA–705	XM–13	S13800	...	...	...	...
	32	15Cr	Smls. tube	SA–268	TP429	S42900	...	...	6	2
	33	15Cr	Plate	SA–240	429	S42900	...	...	6	2
	34	17Cr	Smls. tube	SA–268	TP430	S43000	...	...	7	2
	35	17Cr	Plate	SA–240	430	S43000	...	...	7	2
	36	17Cr–4Ni–4Cu	Forgings, bar	SA–564	630	S17400	H1150	...	...	...
	37	17Cr–4Ni–4Cu	Plate	SA–693	630	S17400	H1150	...	...	...
	38	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H1150	...	...	...
(**23**)	39	17Cr–4Ni–4Cu	Bar	SA–564	630	S17400	H1100	...	...	...
(**23**)	40	17Cr–4Ni–4Cu	Plate	SA–693	630	S17400	H1100	...	...	...
(**23**)	41	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H1100	...	...	...
	42	17Cr–4Ni–4Cu	Bar	SA–564	630	S17400	H1075	...	...	...
	43	17Cr–4Ni–4Cu	Plate	SA–693	630	S17400	H1075	...	...	...
	44	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H1075	...	...	...
	45	26Cr–3Ni–3Mo	Plate	SA–240	26–3–3	S44660	...	≤5	10K	1

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	585	380	NP	371	CS–3	...
2	620	415	371 (SPT)	371	CS–3	...
3	620	415	371	NP	CS–3	...
4	585	415	371	NP	CS–3	...
5	585	415	371	NP	CS–3	...
6	585	415	371	NP	CS–3	...
7	620	415	371	NP	CS–3	...
8	585	415	NP	482	CS–3	...
9	485	275	371	NP	...	...
10	485	275	371	NP	...	...
11	410	174	371	NP	CS–1	G13
12	415	170	371	427	CS–1	G13
13	415	170	371	NP	CS–1	G13
14	415	205	NP	427	CS–2	G13
15	795	620	371	NP	CS–3	...
16	415	205	371	427	CS–2	...
17	415	205	NP	427	CS–2	...
18	450	205	NP	427	CS–2	...
19	485	275	371	NP	CS–2	...
20	485	275	NP	427	CS–3	E3
21	485	275	371	NP	CS–2	...
22	485	275	371	NP	CS–2	...
23	585	380	371	427	CS–3	...
24	585	380	NP	427	CS–3	...
25	620	450	371	38	CS–5	...
26	620	450	371	NP	CS–5	...
27	650	450	371 (SPT)	NP	...	H2, W1
28	760	550	371	NP	CS–5	...
29	795	620	371	NP	CS–3	...
30	795	620	371	NP	CS–3	...
31	1035	930	316	NP	HA–7	W1
32	415	240	NP	427	CS–2	G13
33	450	205	NP	427	CS–2	G13
34	415	240	NP	427	CS–2	G13
35	450	205	NP	427	CS–2	G13
36	930	725	343	NP	HT–1	G8, W1
37	930	725	343	NP	HT–1	G8, W1
38	930	725	343	NP	HT–1	G8, W1
39	965	795	343	316	HT–1	G8, W1
40	965	795	343	316	HT–1	G8, W1
41	965	795	343	316	HT–1	G8, W1
42	1000	860	343	NP	HT–1	G8, W1
43	1000	860	343	NP	HT–1	G8, W1
44	1000	860	343	NP	HT–1	G8, W1
45	585	450	NP	371	HA–5	G13, H6

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500	
1	195	195	195	192	189	188	187	186	184	180	177	...	...	...	...	...	
2	207	206	206	203	201	199	198	196	194	191	188	...	...	...	...	...	
3	207	206	206	203	201	199	198	196	194	191	188	...	...	...	...	...	
4	195	195	195	195	195	194	194	192	190	187	183	...	...	...	...	...	
5	195	195	195	195	195	194	194	192	190	187	183	...	...	...	...	...	
6	195	195	195	195	195	194	194	192	190	187	183	...	...	...	...	...	
7	207	207	207	207	207	206	205	204	201	198	194	...	...	...	...	...	
8	195	195	195	195	195	194	194	192	190	187	183	178	172	165	156	147	(**23**)
9	161	161	160	159	158	155	153	150	148	145	141	...	...	...	...	...	
10	161	161	160	159	158	155	153	150	148	145	141	...	...	...	...	...	
11	115	110	105	103	102	100	98.9	97.2	96.1	94.7	92.7	...	...	...	...	...	
12	115	110	105	103	102	100	98.9	97.2	96.1	94.7	92.7	90.2	87.1	83.5	...	...	
13	115	110	105	103	102	100	98.9	97.2	96.1	94.7	92.7	...	...	...	...	...	
14	138	132	126	124	123	120	119	117	115	114	111	108	104	101	...	...	
15	264	264	264	262	260	254	249	244	241	237	232	...	...	...	...	...	
16	138	132	126	124	123	120	119	117	115	114	111	108	104	101	...	...	
17	138	132	126	124	123	120	119	117	115	114	111	108	104	101	...	...	
18	138	132	126	124	123	120	119	117	115	114	111	108	104	101	...	...	
19	161	161	160	159	158	155	153	150	148	145	141	...	...	...	...	...	
20	161	161	161	159	158	155	153	150	148	145	142	137	133	**125**	**92.5**	**68.4**	(**23**)
21	161	161	160	159	158	155	153	150	148	145	141	...	...	...	...	...	
22	161	161	160	159	158	155	153	150	148	145	141	...	...	...	...	...	
23	195	195	195	194	192	188	186	182	180	176	172	167	161	155	...	...	
24	195	195	195	194	192	188	186	182	180	176	172	167	161	155	...	...	
25	207	207	207	205	203	199	197	193	190	186	182	...	...	...	...	...	
26	207	207	207	205	203	199	197	193	190	186	182	...	...	...	...	...	
27	217	217	217	215	212	209	206	202	199	196	191	...	...	...	...	...	
28	253	253	253	250	248	242	238	233	231	227	224	...	...	...	...	...	
29	264	264	264	264	264	262	254	244	240	235	229	...	...	...	...	...	
30	264	264	264	264	264	262	254	244	240	235	229	...	...	...	...	...	
31	345	345	345	345	345	341	331	319	313	...	...	...	...	...	...	...	
32	138	138	138	137	135	133	131	129	127	124	122	118	113	109	...	...	
33	138	132	126	124	123	120	119	117	115	114	111	108	104	101	...	...	
34	138	138	138	137	135	133	131	129	127	124	122	118	113	109	...	...	
35	138	132	126	124	123	120	119	117	115	114	111	108	104	101	...	...	
36	310	310	310	310	310	302	296	292	290	288	...	...	...	...	...	...	
37	310	310	310	310	310	302	296	292	290	288	...	...	...	...	...	...	
38	310	310	310	310	310	302	296	292	290	288	...	...	...	...	...	...	
39	322	322	322	322	322	314	308	303	301	299	...	...	...	...	...	...	(**23**)
40	322	322	322	322	322	314	308	303	301	299	...	...	...	...	...	...	(**23**)
41	322	322	322	322	322	314	308	303	301	299	...	...	...	...	...	...	(**23**)
42	333	333	333	333	333	325	319	314	312	309	...	...	...	...	...	...	
43	333	333	333	333	333	325	319	314	312	309	...	...	...	...	...	...	
44	333	333	333	333	333	325	319	314	312	309	...	...	...	...	...	...	
45	195	195	195	195	195	193	191	191	190	189	188	...	...	...	...	...	

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	26Cr–3Ni–3Mo	Smls. tube	SA–268	26–3–3	S44660	...	≤5	10K	1
2	26Cr–3Ni–3Mo	Wld. tube	SA–268	26–3–3	S44660	...	≤5	10K	1
3	26Cr–3Ni–3Mo	Wld. tube	SA–803	26–3–3	S44660	...	≤5	10K	1
4	27Cr–1Mo	Plate	SA–240	XM–27	S44627	...	...	10I	1
5	27Cr–1Mo	Smls. & wld. tube	SA–268	TPXM–27	S44627	...	...	10I	1
6	27Cr–1Mo	Bar	SA–479	XM–27	S44627	...	...	10I	1
7	29Cr–4Mo–Ti	Smls. tube	SA–268	...	S44735	...	...	10J	1
8	Mn–¼Mo	Forgings	SA–372	D	K14508	NT	...	...	...
9	Mn–¼Mo	Forgings	SA–372	D	K14508	QT	...	...	...
10	Mn–¼Mo–V	Castings	SA–487	2	J13005	A	...	3	3
11	Mn–½Mo	Plate	SA–302	A	K12021	...	...	3	2
12	Mn–½Mo	Wld. pipe	SA–672	H75	K12021	...	...	3	2
13	Mn–½Mo	Plate	SA–302	B	K12022	...	...	3	3
14	Mn–½Mo	Plate	SA–533	A	K12521	1	...	3	3
15	Mn–½Mo	Wld. pipe	SA–672	H80	K12022	...	...	3	3
16	Mn–½Mo	Plate	SA–533	A	K12521	2	...	3	3
17	Mn–½Mo	Plate	SA–533	A	K12521	3	...	11A	4
18	Mn–½Mo–¼Ni	Plate	SA–533	D	K12529	1	...	3	3
19	Mn–½Mo–¼Ni	Plate	SA–533	D	K12529	2	...	3	3
20	Mn–½Mo–¼Ni	Plate	SA–533	D	K12529	3	...	11A	4
21	Mn–½Mo–½Ni	Plate	SA–302	C	K12039	...	...	3	3
22	Mn–½Mo–½Ni	Plate	SA–533	B	K12539	1	...	3	3
23	Mn–½Mo–½Ni	Wld. pipe	SA–672	J80	K12539	...	...	3	3
24	Mn–½Mo–½Ni	Plate	SA–533	B	K12539	2	...	3	3
25	Mn–½Mo–½Ni	Wld. pipe	SA–672	J90	K12539	...	...	3	3
26	Mn–½Mo–½Ni	Plate	SA–533	B	K12539	3	...	11A	4
27	Mn–½Mo–½Ni	Wld. pipe	SA–672	J100	K12539	...	...	11A	4
28	Mn–½Mo–¾Ni	Plate	SA–302	D	K12054	...	...	3	3
29	Mn–½Mo–¾Ni	Plate	SA–533	C	K12554	1	...	3	3
(**23**) 30	Mn–½Mo–¾Ni	Plate	SA–533	E	K12554	1	...	3	3
31	Mn–½Mo–¾Ni	Plate	SA–533	C	K12554	2	...	3	3
(**23**) 32	Mn–½Mo–¾Ni	Plate	SA–533	E	K12554	2	...	3	3
(**23**) 33	Mn–½Mo–¾Ni	Plate	SA–533	B	K12554	3	...	3	3
34	Mn–½Mo–¾Ni	Plate	SA–533	C	K12554	3	...	11A	4
(**23**) 35	Mn–½Ni–V	Plate	SA/NF A 36–215	P440NJ4	...	...	$8 \le t \le 20$	10A	1
36	Mn–½Ni–V	Plate	SA–225	C	K12524	...	...	10A	1
37	Mn–V	Castings	SA–487	1	J13002	A/NT	...	10A	1
38	½Ni–½Cr–¼Mo–V	Castings	SA–487	4	J13047	A/NT	...	3	3
39	½Ni–½Mo–V	Forgings	SA–541	3	K12045	1	...	3	3
40	½Ni–½Mo–V	Forgings	SA–541	3	K12045	2	...	3	3
41	¾Ni–½Cr–½Mo–V	Forgings	SA–592	F	K11576	...	$65 < t \le 100$	11B	3
42	¾Ni–½Cr–½Mo–V	Plate	SA–517	F	K11576	...	≤65	11B	3
43	¾Ni–½Cr–½Mo–V	Forgings	SA–592	F	K11576	...	≤65	11B	3
44	¾Ni–½Cu–Mo	Smls. tube	SA–423	2	K11540	...	...	4	2
45	¾Ni–½Mo–⅓Cr–V	Forgings	SA–508	2	K12766	1	...	3	3

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	585	450	NP	371	HA–5	G13, H6
2	585	450	NP	371	HA–5	G13, G18, H6
3	585	450	NP	316	HA–5	G13, G18, H6
4	450	275	343	NP	HA–2	G13
5	450	275	343	NP	HA–2	G13
6	450	275	343	NP	HA–2	G13
7	515	415	NP	316	HA–6	G13
8	725	450	NP	343	CS–5	G19, W5, W6
9	725	450	NP	343	CS–5	G19, W5, W6
10	585	365	371 (SPT)	NP	CS–3	...
11	515	310	371	371	CS–3	...
12	515	310	371	NP	CS–3	G1, G2
13	550	345	371	371	CS–3	...
14	550	345	371	371	CS–5	...
15	550	345	371	NP	CS–3	G1, G2
16	620	485	371	371	CS–5	...
17	690	570	371	NP	CS–5	...
18	550	345	371	NP	CS–5	...
19	620	485	371	371	CS–5	...
20	690	570	371	371	CS–5	...
21	550	345	371	371	CS–3	...
22	550	345	371	371	CS–5	...
23	550	345	371	NP	CS–5	G1, G2
24	620	485	371	371	CS–5	...
25	620	485	371	NP	CS–5	G1, G2
26	690	570	371	371	CS–5	...
27	690	570	371	NP	CS–5	G1, G2
28	550	345	371	371	CS–3	...
29	550	345	371	371	CS–5	...
30	550	345	NP	371	CS–5	...
31	620	485	371	371	CS–5	...
32	620	485	NP	371	CS–5	...
33	690	570	NP	371	CS–5	...
34	690	570	371	NP	CS–5	...
35	630	440	NP	65	CS–5	...
36	725	485	NP	371	CS–5	...
37	585	380	371 (SPT)	371	CS–3	...
38	620	415	371	371	CS–3	...
39	550	345	371	371	CS–5	...
40	620	450	371	371	CS–5	...
41	725	620	371 (SPT)	371	CS–5	S1
42	795	690	371 (SPT)	371	HT–1	...
43	795	690	NP	371	HT–1	...
44	415	255	NP	371	CS–2	...
45	550	345	371	371	CS–5	...

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500	
1	195	195	195	195	195	193	191	191	190	189	188	...	...	...	...	...	
2	166	166	166	166	165	164	163	162	161	160	160	...	...	...	...	...	
3	166	166	166	166	165	164	163	162	161	...	...	...	...	...	...	...	
4	150	150	149	147	144	135	131	129	129	128	...	...	...	...	...	...	
5	150	150	149	147	144	135	131	129	129	128	...	...	...	...	...	...	
6	150	150	149	147	144	135	131	129	129	128	...	...	...	...	...	...	
7	172	171	169	168	167	166	163	161	160	...	...	...	...	...	...	...	
8	241	236	229	228	226	226	226	226	226	226	...	...	...	...	...	...	
9	241	236	229	228	226	226	226	226	226	226	...	...	...	...	...	...	
10	195	195	195	195	195	194	194	190	187	185	182	...	...	...	...	...	
11	172	172	172	172	172	172	172	172	172	171	168	...	...	...	...	...	
12	172	172	172	172	172	172	172	172	172	171	168	...	...	...	...	...	
13	184	184	184	184	184	184	184	184	184	184	184	...	...	...	...	...	
14	184	184	184	184	184	184	184	184	184	184	184	...	...	...	...	...	
15	184	184	184	184	184	184	184	184	184	184	184	...	...	...	...	...	
16	207	207	207	207	207	207	207	207	207	207	207	...	...	...	...	...	
17	230	230	230	230	230	230	230	230	230	230	230	...	...	...	...	...	
18	184	184	184	184	184	184	184	184	184	184	184	...	...	...	...	...	
19	207	207	207	207	207	207	207	207	207	207	207	...	...	...	...	...	
20	230	230	230	230	230	230	230	230	230	230	230	...	...	...	...	...	
21	184	184	184	184	184	184	184	184	184	184	184	...	...	...	...	...	
22	184	184	184	184	184	184	184	184	184	184	184	...	...	...	...	...	
23	184	184	184	184	184	184	184	184	184	184	184	...	...	...	...	...	
24	207	207	207	207	207	207	207	207	207	207	207	...	...	...	...	...	
25	207	207	207	207	207	207	207	207	207	207	207	...	...	...	...	...	
26	230	230	230	230	230	230	230	230	230	230	230	...	...	...	...	...	
27	230	230	230	230	230	230	230	230	230	230	230	...	...	...	...	...	
28	184	184	184	184	184	184	184	184	184	184	184	...	...	...	...	...	
29	184	184	184	184	184	184	184	184	184	184	184	...	...	...	...	...	
30	183	183	183	183	183	183	183	183	183	183	183	...	...	...	...	...	(**23**)
31	207	207	207	207	207	207	207	207	207	207	207	...	...	...	...	...	
32	207	207	207	207	207	207	207	207	207	207	207	...	...	...	...	...	(**23**)
33	230	230	230	230	230	230	230	230	230	230	230	...	...	...	...	...	(**23**)
34	230	230	230	230	230	230	230	230	230	230	230	...	...	...	...	...	
35	210	210	210	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
36	241	241	241	241	241	241	241	241	239	233	229	...	...	...	...	...	
37	196	190	184	181	180	180	180	178	175	172	168	...	...	...	...	...	
38	207	207	207	207	207	207	207	207	207	207	207	...	...	...	...	...	
39	184	184	184	184	184	184	184	184	184	184	184	...	...	...	...	...	
40	207	207	207	207	207	207	207	207	207	207	207	...	...	...	...	...	
41	241	241	241	241	241	241	241	241	241	240	236	...	...	...	...	...	
42	264	264	264	264	264	264	264	264	264	263	258	...	...	...	...	...	
43	264	264	264	264	264	264	264	264	264	263	258	...	...	...	...	...	
44	138	138	138	138	138	138	138	138	138	138	138	...	...	...	...	...	
45	184	184	184	184	184	184	184	184	184	184	184	...	...	...	...	...	

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	¾Ni–½Mo–⅓Cr–V	Forgings	SA–541	2	K12765	1	...	3	3
2	¾Ni–½Mo–⅓Cr–V	Forgings	SA–508	2	K12766	2	...	3	3
3	¾Ni–½Mo–⅓Cr–V	Forgings	SA–541	2	K12765	2	...	3	3
4	¾Ni–½Mo–Cr–V	Forgings	SA–508	3	K12042	1	...	3	3
5	¾Ni–½Mo–Cr–V	Forgings	SA–508	3	K12042	2	...	3	3
6	¾Ni–1Mo–¾Cr	Castings	SA–217	WC5	J22000	...	...	4	1
7	1Ni–½Cr–½Mo	Castings	SA–217	WC4	J12082	...	...	4	1
8	1¼Ni–1Cr–½Mo	Plate	SA–517	P	K21650	...	$65 < t \le 100$	11B	8
9	1¼Ni–1Cr–½Mo	Plate	SA–517	P	K21650	...	≤65	11B	8
10	2Ni–1Cu	Forgings	SA–182	FR	K22035	...	...	9A	1
11	2Ni–1Cu	Smls. pipe	SA–333	9	K22035	...	...	9A	1
12	2Ni–1Cu	Smls. pipe	SA–334	9	K22035	...	...	9A	1
13	2Ni–1Cu	Forgings	SA–350	LF9	K22036	...	...	9A	1
14	2Ni–1Cu	Fittings	SA–420	WPL9	K22035	...	...	9A	1
15	2Ni–1½Cr–¼Mo–V	Forgings	SA–723	1	K23550	1	...	...	...
16	2Ni–1½Cr–¼Mo–V	Forgings	SA–723	1	K23550	2	...	...	...
17	2Ni–1½Cr–¼Mo–V	Forgings	SA–723	1	K23550	3	...	...	...
18	2Ni–1½Cr–¼Mo–V	Forgings	SA–723	1	K23550	4	...	...	...
19	2Ni–1½Cr–¼Mo–V	Forgings	SA–723	1	K23550	5	...	...	...
20	2½Ni	Plate	SA–203	A	K21703	...	...	9A	1
21	2½Ni	Plate	SA–203	B	K22103	...	...	9A	1
22	2½Ni	Castings	SA–352	LC2	J22500	...	...	9A	1
23	2¾Ni–1½Cr–½Mo	Plate	SA–543	C	...	3	...	3	3
24	2¾Ni–1½Cr–½Mo	Plate	SA–543	C	...	1	...	11A	5
25	2¾Ni–1½Cr–½Mo	Plate	SA–543	C	...	2	...	11B	10
26	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	1	...	...	...
27	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	2	...	...	...
28	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	3	...	...	...
29	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	4	...	...	...
30	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	5	...	...	...
31	3Ni–1¾Cr–½Mo	Plate	SA–543	B	K42339	3	...	3	3
32	3Ni–1¾Cr–½Mo	Plate	SA–543	B	K42339	1	...	11A	5
33	3Ni–1¾Cr–½Mo	Plate	SA–543	B	K42339	2	...	11B	10
34	3½Ni	Smls. pipe	SA–333	3	K31918	...	...	9B	1
35	3½Ni	Smls. tube	SA–334	3	K31918	...	...	9B	1
36	3½Ni	Fittings	SA–420	WPL3	...	...	...	9B	1
37	3½Ni	Plate	SA–203	D	K31718	...	...	9B	1
38	3½Ni	Forgings	SA–350	LF3	K32025	...	...	9B	1
39	3½Ni	Forgings	SA–765	III	K32026	...	...	9B	1
40	3½Ni	Plate	SA–203	E	K32018	...	...	9B	1
41	3½Ni	Plate	SA–203	E	K32018	...	...	9B	1
42	3½Ni	Castings	SA–352	LC3	J31550	...	...	9B	1
43	3½Ni	Plate	SA–203	F	...	...	>50	9B	1
44	3½Ni	Plate	SA–203	F	...	...	≤50	9B	1
45	3½Ni–1¾Cr–½Mo–V	Forgings	SA–508	4N	K22375	3	...	3	3

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	550	345	371	371	CS–5	...
2	620	450	371	371	CS–5	...
3	620	450	371	371	CS–5	...
4	550	345	371	371	CS–5	...
5	620	450	371	371	CS–5	...
6	485	275	371	371	CS–2	...
7	485	275	371 (SPT)	371	CS–2	...
8	725	620	371 (SPT)	371	CS–5	...
9	795	690	371 (SPT)	371	HT–1	...
10	435	315	NP	38	CS–3	...
11	435	315	NP	38	CS–3	...
12	435	315	NP	38	CS–3	...
13	435	315	NP	38	CS–3	...
14	435	315	NP	38	CS–3	...
15	795	690	371 (SPT)	371	HT–1	G14, G20, W1
16	930	825	371 (SPT)	371	HT–1	G6, G20, W1
17	1070	965	371 (SPT)	NP	HT–1	W1
18	1205	1105	371 (SPT)	NP	HT–1	W1
19	1310	1240	371 (SPT)	NP	HT–1	W1
20	450	255	NP	149	CS–2	...
21	485	275	NP	149	CS–2	...
22	485	275	38	38	CS–2	...
23	620	485	NP	343	CS–5	...
24	725	585	NP	343	CS–5	...
25	795	690	NP	343	HT–1	...
26	795	690	371 (SPT)	371	HT–1	G14, G20, W1
27	930	825	371 (SPT)	371	HT–1	G6, G20, W1
28	1070	965	371 (SPT)	NP	HT–1	W1
29	1205	1105	371 (SPT)	NP	HT–1	W1
30	1310	1240	371 (SPT)	NP	HT–1	W1
31	620	485	NP	343	CS–5	...
32	725	585	343	343	CS–5	G5, H3, S4, W3
33	795	690	NP	343	HT–1	...
34	450	240	NP	38	CS–2	...
35	450	240	NP	38	CS–2	...
36	450	240	NP	149	CS–2	...
37	450	255	NP	149	CS–2	...
38	485	260	371	149	CS–2	...
39	485	260	NP	38	CS–2	...
40	485	275	149 (SPT)	149	CS–2	...
41	485	275	260	NP	CS–2	...
42	485	275	38	38	CS–2	...
43	515	345	NP	38	CS–3	...
44	550	380	NP	38	CS–3	...
45	620	485	343	371	CS–5	...

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500
1	184	184	184	184	184	184	184	184	184	184	184	...	...	...	...	...
2	207	207	207	207	207	207	207	207	207	207	207	...	...	...	...	...
3	207	207	207	207	207	207	207	207	207	207	207	...	...	...	...	...
4	184	184	184	184	184	184	184	184	184	184	184	...	...	...	...	...
5	207	207	207	207	207	207	207	207	207	207	207	...	...	...	...	...
6	161	161	161	161	161	161	159	156	154	152	149	...	...	...	...	...
7	161	161	161	161	161	161	159	156	154	152	149	...	...	...	...	...
8	241	241	241	241	241	241	241	241	241	240	236	...	...	...	...	...
9	264	264	264	264	264	264	264	264	264	263	258	...	...	...	...	...
10	145	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	145	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	145	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	145	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	145	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	264	264	264	264	264	264	264	264	263	259	253	...	...	...	...	...
16	310	310	310	310	310	310	310	310	309	304	297	...	...	...	...	...
17	356	356	356	356	356	356	356	356	355	349	341	...	...	...	...	...
18	402	402	402	402	402	402	402	402	401	394	386	...	...	...	...	...
19	436	436	436	436	436	436	436	436	435	428	418	...	...	...	...	...
20	150	150	150	150	150	...	...	...	...	...	...	...	...	...	...	...
21	161	161	161	161	161	...	...	...	...	...	...	...	...	...	...	...
22	161	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	207	207	207	207	207	205	204	202	200	197	...	...	...	...	...	...
24	241	241	241	241	241	239	237	236	233	230	...	...	...	...	...	...
25	264	264	264	264	264	262	260	257	255	252	...	...	...	...	...	...
26	264	264	264	264	264	264	264	264	263	259	253	...	...	...	...	...
27	310	310	310	310	310	310	310	310	309	304	297	...	...	...	...	...
28	356	356	356	356	356	356	356	356	355	349	341	...	...	...	...	...
29	402	402	402	402	402	402	402	402	401	394	386	...	...	...	...	...
30	436	436	436	436	436	436	436	436	435	428	418	...	...	...	...	...
31	207	207	207	207	207	205	204	202	200	197	...	...	...	...	...	...
32	241	241	241	241	241	239	237	236	233	230	...	...	...	...	...	...
33	264	264	264	264	264	262	260	257	255	252	...	...	...	...	...	...
34	150	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	150	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	150	149	147	145	142	...	...	...	...	...	...	...	...	...	...	...
37	150	150	150	150	150	...	...	...	...	...	...	...	...	...	...	...
38	161	160	157	155	152	148	142	133	128	122	116	...	...	...	...	...
39	161	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	161	161	161	161	161	...	...	...	...	...	...	...	...	...	...	...
41	161	161	161	161	161	158	151	...	...	...	...	...	...	...	...	...
42	161	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	172	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	184	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	207	207	207	207	207	205	204	202	200	197	194	...	...	...	...	...

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
	1	3½Ni–1¾Cr–½Mo–V	Forgings	SA–508	4N	K22375	1	...	11A	5
	2	3½Ni–1¾Cr–½Mo–V	Forgings	SA–508	4N	K22375	2	...	11B	10
	3	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	1	...	...	...
	4	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	2	...	...	...
	5	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	3	...	...	...
	6	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	4	...	...	...
	7	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	5	...	...	...
	8	5Ni–¼Mo	Plate	SA–645	...	K41583	...	...	11A	2
(**23**)	9	7Ni	Plate	SA–553	III	K61365	...	≤50	11A	1
(**23**)	10	7Ni	Plate	SA–553	III	K61365	...	≤50	11A	1
	11	8Ni	Plate	SA–553	II	K71340	...	...	11A	1
	12	8Ni	Plate	SA–553	II	K71340	...	...	11A	1
	13	9Ni	Smls. pipe	SA–333	8	K81340	...	...	11A	1
	14	9Ni	Smls. pipe	SA–333	8	K81340	...	...	11A	1
	15	9Ni	Smls. tube	SA–334	8	K81340	...	...	11A	1
	16	9Ni	Smls. tube	SA–334	8	K81340	...	...	11A	1
	17	9Ni	Plate	SA–353	...	K81340	...	...	11A	1
	18	9Ni	Plate	SA–353	...	K81340	...	...	11A	1
	19	9Ni	Fittings	SA–420	WPL8	K81340	...	...	11A	1
	20	9Ni	Fittings	SA–420	WPL8	K81340	...	...	11A	1
	21	9Ni	Forgings	SA–522	I	K81340	...	...	11A	1
	22	9Ni	Forgings	SA–522	I	K81340	...	...	11A	1
	23	9Ni	Plate	SA–553	I	K81340	...	...	11A	1
	24	9Ni	Plate	SA–553	I	K81340	...	...	11A	1
	25	25Ni–15Cr–2Ti	Forgings, bar	SA–638	660	S66286	...	...	...	...
(**23**)	26	16Cr–4Ni–6Mn	Plate	SA–240	201LN	S20153	...	...	8	3
(**23**)	27	16Cr–4Ni–6Mn	Plate	SA–240	201LN	S20153	...	...	8	3
	28	16Cr–12Ni–2Mo	Forgings	SA–182	F316L	S31603	...	>130	8	1
	29	16Cr–12Ni–2Mo	Forgings	SA–965	F316L	S31603	...	...	8	1
	30	16Cr–12Ni–2Mo	Bar	SA/JIS G4303	SUS316L	...	...	...	8	1
	31	16Cr–12Ni–2Mo	Forgings	SA–182	F316L	S31603	...	≤130	8	1
	32	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316L	S31603	...	...	8	1
	33	16Cr–12Ni–2Mo	Plate	SA–240	316L	S31603	...	...	8	1
	34	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316L	S31603	...	...	8	1
	35	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316L	S31603	...	...	8	1
	36	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316L	S31603	...	...	8	1
	37	16Cr–12Ni–2Mo	Smls. pipe	SA–312	TP316L	S31603	...	...	8	1
	38	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316L	S31603	...	...	8	1
	39	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316L	S31603	1	...	8	1
	40	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316L	S31603	3	...	8	1
	41	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316L	S31603	4	...	8	1
	42	16Cr–12Ni–2Mo	Fittings	SA–403	316L	S31603	...	...	8	1
	43	16Cr–12Ni–2Mo	Fittings	SA–403	316L	S31603	CR	...	8	1
	44	16Cr–12Ni–2Mo	Wld. fittings	SA–403	316L	S31603	WP–W	...	8	1
	45	16Cr–12Ni–2Mo	Wld. fittings	SA–403	316L	S31603	WP–W	...	8	1

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	725	585	343	371	CS–5	H3, S4, W3
2	795	690	NP	343	HT–1	...
3	795	690	371 (SPT)	371	HT–1	G14, G20, W1
4	930	825	371 (SPT)	371	HT–1	G6, G20, W1
5	1070	965	371 (SPT)	NP	HT–1	W1
6	1205	1105	371 (SPT)	NP	HT–1	W1
7	1310	1240	371 (SPT)	NP	HT–1	W1
8	655	450	NP	121	CS–3	W4
9	690	515	NP	66	CS–3	G22, W7
10	690	515	NP	66	CS–3	G22, W4
11	690	585	NP	121	CS–3	W7
12	690	585	NP	121	CS–3	W4
13	690	515	NP	121	CS–3	W7
14	690	515	NP	121	CS–3	W4
15	690	515	NP	121	CS–3	W7
16	690	515	NP	121	CS–3	W4
17	690	515	NP	121	CS–3	W7
18	690	515	NP	121	CS–3	W4
19	690	515	NP	121	CS–3	W7
20	690	515	NP	121	CS–3	W4
21	690	515	NP	121	CS–3	G19, S6, W7
22	690	515	NP	121	CS–3	G19, S6, W4
23	690	585	NP	121	CS–3	W7
24	690	585	NP	121	CS–3	W4
25	895	585	371	NP	HA–5	W1
26	655	310	NP	38	HA–6	...
27	655	310	NP	427	HA–6	G7
28	450	170	427	427	HA–4	G7
29	450	170	427	427	HA–4	G7
30	480	175	427	NP	HA–4	G7
31	485	170	427	427	HA–4	G7
32	485	170	427	427	HA–4	G7
33	485	170	427	427	HA–4	G7
34	485	170	427	NP	HA–4	G7
35	485	170	NP	427	HA–4	G7, G18
36	485	170	427	NP	HA–4	G7
37	485	170	427	427	HA–4	G7
38	485	170	NP	427	HA–4	G7, G18
39	485	170	427	NP	HA–4	G7
40	485	170	427	NP	HA–4	G7
41	485	170	427	NP	HA–4	G7
42	485	170	427	NP	HA–4	G7
43	485	170	NP	427	HA–4	G7, G18
44	485	170	427	NP	HA–4	G7
45	485	170	NP	427	HA–4	G7, G18

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500	
1	241	241	241	241	241	239	237	236	233	230	226	...	...	...	...	...	
2	264	264	264	264	264	262	260	257	255	252	...	...	...	...	...	...	
3	264	264	264	264	264	264	264	264	263	259	253	...	...	...	...	...	
4	310	310	310	310	310	310	310	310	309	304	297	...	...	...	...	...	
5	356	356	356	356	356	356	356	356	355	349	341	...	...	...	...	...	
6	402	402	402	402	402	402	402	402	401	394	386	...	...	...	...	...	
7	436	436	436	436	436	436	436	436	435	428	418	...	...	...	...	...	
8	208	208	193	191	...	...	...	...	...	...	...	...	...	...	...	...	
9	230	230	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
10	219	219	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
11	230	230	213	207	...	...	...	...	...	...	...	...	...	...	...	...	
12	219	219	202	197	...	...	...	...	...	...	...	...	...	...	...	...	
13	230	230	213	207	...	...	...	...	...	...	...	...	...	...	...	...	
14	219	219	202	197	...	...	...	...	...	...	...	...	...	...	...	...	
15	230	230	213	207	...	...	...	...	...	...	...	...	...	...	...	...	
16	219	219	202	197	...	...	...	...	...	...	...	...	...	...	...	...	
17	230	230	213	207	...	...	...	...	...	...	...	...	...	...	...	...	
18	219	219	202	197	...	...	...	...	...	...	...	...	...	...	...	...	
19	230	230	213	207	...	...	...	...	...	...	...	...	...	...	...	...	
20	219	219	202	197	...	...	...	...	...	...	...	...	...	...	...	...	
21	230	230	213	207	...	...	...	...	...	...	...	...	...	...	...	...	
22	219	219	202	197	...	...	...	...	...	...	...	...	...	...	...	...	
23	230	230	213	207	...	...	...	...	...	...	...	...	...	...	...	...	
24	219	219	202	197	...	...	...	...	...	...	...	...	...	...	...	...	
25	299	299	299	299	299	299	294	289	287	284	282	...	...	...	...	...	
26	207	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
27	207	203	187	179	170	162	159	158	158	157	156	154	152	149	146	143	(**23**)
28	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...	...	
29	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...	...	
30	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...	...	
31	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...	...	
32	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...	...	
33	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...	...	
34	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...	...	
35	97.9	97.9	97.9	97.9	97.9	93.0	87.2	82.9	81.6	80.2	78.4	77.2	75.9	74.7	...	...	
36	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...	...	
37	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...	...	
38	97.9	97.9	97.9	97.9	97.9	93.0	87.2	82.9	81.6	80.2	78.4	77.2	75.9	74.7	...	...	
39	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...	...	
40	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...	...	
41	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...	...	
42	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...	...	
43	97.9	97.9	97.9	97.9	97.9	93.0	87.2	82.9	81.6	80.2	78.4	77.2	75.9	74.7	...	...	
44	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...	...	
45	97.9	97.9	97.9	97.9	97.9	93.0	87.2	82.9	81.6	80.2	78.4	77.2	75.9	74.7	...	...	

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	16Cr–12Ni–2Mo	Wld. fittings	SA–403	316L	S31603	WP–WX	...	8	1
2	16Cr–12Ni–2Mo	Bar	SA–479	316L	S31603	...	...	8	1
3	16Cr–12Ni–2Mo	Wld. tube	SA–688	TP316L	S31603	...	...	8	1
4	16Cr–12Ni–2Mo	Wld. pipe	SA–688	TP316L	S31603	...	...	8	1
5	16Cr–12Ni–2Mo	Wld. pipe	SA–813	TP316L	S31603	...	...	8	1
6	16Cr–12Ni–2Mo	Wld. pipe	SA–814	TP316L	S31603	...	...	8	1
7	16Cr–12Ni–2Mo	Forgings	SA–182	F316	S31600	...	>130	8	1
8	16Cr–12Ni–2Mo	Forgings	SA–965	F316	S31600	...	...	8	1
9	16Cr–12Ni–2Mo	Forgings	SA–182	F316H	S31609	...	>130	8	1
10	16Cr–12Ni–2Mo	Forgings	SA–965	F316H	S31609	...	...	8	1
11	16Cr–12Ni–2Mo	Forgings	SA–182	F316	S31600	...	≤130	8	1
12	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316	S31600	...	...	8	1
13	16Cr–12Ni–2Mo	Plate	SA–240	316	S31600	...	...	8	1
14	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316	S31600	...	...	8	1
15	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316	S31600	...	...	8	1
16	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316	S31600	...	...	8	1
17	16Cr–12Ni–2Mo	Smls. pipe	SA–312	TP316	S31600	...	...	8	1
18	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316	S31600	...	...	8	1
19	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316	S31600	1	...	8	1
20	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316	S31600	3	...	8	1
21	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316	S31600	4	...	8	1
22	16Cr–12Ni–2Mo	Smls. pipe	SA–376	TP316	S31600	...	...	8	1
23	16Cr–12Ni–2Mo	Fittings	SA–403	316	S31600	...	...	8	1
24	16Cr–12Ni–2Mo	Fittings	SA–403	316	S31600	WP–S	...	8	1
25	16Cr–12Ni–2Mo	Wld. fittings	SA–403	316	S31600	WP–W	...	8	1
26	16Cr–12Ni–2Mo	Bar	SA–479	316	S31600	...	...	8	1
27	16Cr–12Ni–2Mo	Wld. tube	SA–688	TP316	S31600	...	...	8	1
28	16Cr–12Ni–2Mo	Wld. tube	SA–688	TP316	S31600	...	...	8	1
29	16Cr–12Ni–2Mo	Wld. pipe	SA–813	TP316	S31600	...	...	8	1
30	16Cr–12Ni–2Mo	Wld. pipe	SA–814	TP316	S31600	...	...	8	1
31	16Cr–12Ni–2Mo	Forgings	SA–182	F316H	S31609	...	≤130	8	1
32	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316H	S31609	...	...	8	1
33	16Cr–12Ni–2Mo	Plate	SA–240	316H	S31609	...	...	8	1
34	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316H	S31609	...	...	8	1
35	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316H	S31609	...	...	8	1
36	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316H	S31609	...	...	8	1
37	16Cr–12Ni–2Mo	Smls. pipe	SA–312	TP316H	S31609	...	...	8	1
38	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316H	S31609	...	...	8	1
39	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316H	S31609	1	...	8	1
40	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316H	S31609	3	...	8	1
41	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316H	S31609	4	...	8	1
42	16Cr–12Ni–2Mo	Smls. pipe	SA–376	TP316H	S31609	...	...	8	1
43	16Cr–12Ni–2Mo	Fittings	SA–403	316H	S31609	...	...	8	1
44	16Cr–12Ni–2Mo	Wld. fittings	SA–403	316H	S31609	WP–W	...	8	1
45	16Cr–12Ni–2Mo	Bar	SA–479	316H	S31609	...	...	8	1

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	485	170	NP	427	HA–4	G7, G18
2	485	170	427	NP	HA–4	G7
3	485	170	427	NP	HA–4	G7
4	485	170	NP	427	HA–4	G7, G18
5	485	170	427	NP	HA–4	G7
6	485	170	427	NP	HA–4	G7
7	485	205	427	427	HA–2	G7
8	485	205	427	427	HA–2	G7, G9, G10
9	485	205	427	427	HA–2	G7
10	485	205	427	427	HA–2	G7
11	515	205	427	427	HA–2	G7, G9
12	515	205	427	427	HA–2	G7, G9
13	515	205	427	427	HA–2	G7, G9, G10
14	515	205	427	NP	HA–2	G7
15	515	205	NP	427	HA–2	G7, G9, G18
16	515	205	427	NP	HA–2	G7
17	515	205	427	427	HA–2	G7, G9, G10
18	515	205	NP	427	HA–2	G7, G9, G18
19	515	205	427	NP	HA–2	G7
20	515	205	427	NP	HA–2	G7
21	515	205	427	NP	HA–2	G7
22	515	205	427	427	HA–2	G7, G9, G10
23	515	205	427	NP	HA–2	G7
24	515	205	NP	427	HA–2	G7
25	515	205	427	NP	HA–2	G7
26	515	205	427	NP	HA–2	G7
27	515	205	427	NP	HA–2	G7
28	515	205	NP	427	HA–2	G7, G9, G18
29	515	205	427	NP	HA–2	G7
30	515	205	427	NP	HA–2	G7
31	515	205	427	NP	HA–2	G7
32	515	205	427	427	HA–2	G7
33	515	205	427	NP	HA–2	G7
34	515	205	427	NP	HA–2	G7
35	515	205	NP	427	HA–2	G7, G18
36	515	205	427	NP	HA–2	G7
37	515	205	427	427	HA–2	G7
38	515	205	NP	427	HA–2	G7, G18
39	515	205	427	NP	HA–2	G7
40	515	205	427	NP	HA–2	G7
41	515	205	427	NP	HA–2	G7
42	515	205	427	427	HA–2	G7
43	515	205	427	NP	HA–2	G7
44	515	205	427	NP	HA–2	G7
45	515	205	427	NP	HA–2	G7

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500
1	97.9	97.9	97.9	97.9	97.9	93.0	87.2	82.9	81.6	80.2	78.4	77.2	75.9	74.7	...	...
2	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...	...
3	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...	...
4	97.9	97.9	97.9	97.9	97.9	93.0	87.2	82.9	81.6	80.2	78.4	77.2	75.9	74.7	...	...
5	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...	...
6	115	115	115	115	115	109	103	98.0	95.7	94.1	92.8	90.9	89.0	87.8	...	...
7	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
8	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
9	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
10	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
11	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
12	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
13	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
14	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
15	117	117	117	117	117	114	107	101	99.0	96.8	95.7	94.4	93.1	92.5	...	...
16	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
17	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
18	117	117	117	117	117	114	107	101	99.0	96.8	95.7	94.4	93.1	92.5	...	...
19	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
20	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
21	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
22	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
23	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
24	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
25	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
26	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
27	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
28	117	117	117	117	117	114	107	101	99.0	96.8	95.7	94.4	93.1	92.5	...	...
29	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
30	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
31	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
32	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
33	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
34	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
35	117	117	117	117	117	114	107	101	99.0	96.8	95.7	94.4	93.1	92.5	...	...
36	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
37	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
38	117	117	117	117	117	114	107	101	99.0	96.8	95.7	94.4	93.1	92.5	...	...
39	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
40	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
41	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
42	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
43	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
44	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...
45	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	16Cr–12Ni–2Mo	Wld. pipe	SA–813	TP316H	S31609	...	...	8	1
2	16Cr–12Ni–2Mo	Wld. pipe	SA–814	TP316H	S31609	...	...	8	1
3	16Cr–12Ni–2Mo	Bar	SA/JIS G4303	SUS316	...	...	...	8	1
(**23**) 4	16Cr–12Ni–2Mo	Plate	SA/EN 10028–7	X2CrNiMo17–12–2	...	...	≤75	8	1
(**23**) 5	16Cr–12Ni–2Mo	Plate	SA/EN 10028–7	X5CrNiMo17–12–2	...	...	≤75	8	1
6	16Cr–12Ni–2Mo–N	Forgings	SA–182	F316LN	S31653	...	>130	8	1
7	16Cr–12Ni–2Mo–N	Forgings	SA–965	F316LN	S31653	...	...	8	1
8	16Cr–12Ni–2Mo–N	Forgings	SA–182	F316LN	S31653	...	≤130	8	1
9	16Cr–12Ni–2Mo–N	Smls. tube	SA–213	TP316LN	S31653	...	...	8	1
10	16Cr–12Ni–2Mo–N	Plate	SA–240	316LN	S31653	...	...	8	1
11	16Cr–12Ni–2Mo–N	Wld. tube	SA–249	TP316LN	S31653	...	...	8	1
12	16Cr–12Ni–2Mo–N	Smls. & wld. pipe	SA–312	TP316LN	S31653	...	...	8	1
13	16Cr–12Ni–2Mo–N	Wld. pipe	SA–358	316LN	S31653	1	...	8	1
14	16Cr–12Ni–2Mo–N	Wld. pipe	SA–358	316LN	S31653	3	...	8	1
15	16Cr–12Ni–2Mo–N	Wld. pipe	SA–358	316LN	S31653	4	...	8	1
16	16Cr–12Ni–2Mo–N	Smls. pipe	SA–376	TP316LN	S31653	...	...	8	1
17	16Cr–12Ni–2Mo–N	Fittings	SA–403	316LN	S31653	...	...	8	1
18	16Cr–12Ni–2Mo–N	Wld. fittings	SA–403	316LN	S31653	WP–W	...	8	1
19	16Cr–12Ni–2Mo–N	Bar	SA–479	316LN	S31653	...	...	8	1
20	16Cr–12Ni–2Mo–N	Wld. tube	SA–688	TP316LN	S31653	...	...	8	1
21	16Cr–12Ni–2Mo–N	Wld. pipe	SA–813	TP316LN	S31653	...	...	8	1
22	16Cr–12Ni–2Mo–N	Wld. pipe	SA–814	TP316LN	S31653	...	...	8	1
23	16Cr–12Ni–2Mo–N	Forgings	SA–182	F316N	S31651	...	≤130	8	1
24	16Cr–12Ni–2Mo–N	Smls. tube	SA–213	TP316N	S31651	...	≤125	8	1
25	16Cr–12Ni–2Mo–N	Plate	SA–240	316N	S31651	...	≤125	8	1
26	16Cr–12Ni–2Mo–N	Wld. tube	SA–249	TP316N	S31651	...	...	8	1
27	16Cr–12Ni–2Mo–N	Wld. pipe	SA–312	TP316N	S31651	...	≤125	8	1
28	16Cr–12Ni–2Mo–N	Smls. pipe	SA–312	TP316N	S31651	...	≤125	8	1
29	16Cr–12Ni–2Mo–N	Wld. pipe	SA–312	TP316N	S31651	...	...	8	1
30	16Cr–12Ni–2Mo–N	Wld. pipe	SA–358	316N	S31651	1	≤125	8	1
31	16Cr–12Ni–2Mo–N	Wld. pipe	SA–358	316N	S31651	3	≤125	8	1
32	16Cr–12Ni–2Mo–N	Wld. pipe	SA–358	316N	S31651	4	≤125	8	1
33	16Cr–12Ni–2Mo–N	Smls. pipe	SA–376	TP316N	S31651	...	...	8	1
34	16Cr–12Ni–2Mo–N	Fittings	SA–403	316N	S31651	...	...	8	1
35	16Cr–12Ni–2Mo–N	Fittings	SA–403	316N	S31651	CR	...	8	1
36	16Cr–12Ni–2Mo–N	Wld. fittings	SA–403	316N	S31651	WP–W	...	8	1
37	16Cr–12Ni–2Mo–N	Wld. fittings	SA–403	316N	S31651	WP–W	...	8	1
38	16Cr–12Ni–2Mo–N	Wld. fittings	SA–403	316N	S31651	WP–WX	...	8	1
39	16Cr–12Ni–2Mo–N	Bar	SA–479	316N	S31651	...	...	8	1
40	16Cr–12Ni–2Mo–N	Wld. tube	SA–688	TP316N	S31651	...	...	8	1
41	16Cr–12Ni–2Mo–N	Wld. pipe	SA–813	TP316N	S31651	...	...	8	1
42	16Cr–12Ni–2Mo–N	Wld. pipe	SA–814	TP316N	S31651	...	...	8	1
43	16Cr–12Ni–2Mo–N	Forgings	SA–965	F316N	S31651	...	≤125	8	1
(**23**) 44	16Cr–12Ni–2Mo–N	Plate	SA/EN 10028–7	X2CrNiMoN17–11–2	...	...	≤75	8	1
(**23**) 45	16Cr–12Ni–2Mo–N	Plate	SA/EN 10028–7	X2CrNiMoN17–13–3	...	...	≤75	8	1

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	515	205	427	NP	HA–2	G7
2	515	205	427	NP	HA–2	G7
3	520	205	427	NP	HA–2	G7
4	520	220	NP	427	HA–4	G7
5	520	220	NP	427	HA–2	G7
6	485	205	427	NP	HA–2	G7
7	485	205	427	NP	HA–2	G7
8	515	205	427	NP	HA–2	G7
9	515	205	427	NP	HA–2	G7
10	515	205	427	NP	HA–2	G7
11	515	205	427	NP	HA–2	G7
12	515	205	427	NP	HA–2	G7
13	515	205	427	NP	HA–2	G7
14	515	205	427	NP	HA–2	G7
15	515	205	427	NP	HA–2	G7
16	515	205	427	NP	HA–2	G7
17	515	205	427	NP	HA–2	G7
18	515	205	427	NP	HA–2	G7
19	515	205	427	NP	HA–2	G7
20	515	205	427	NP	HA–2	G7
21	515	205	427	NP	HA–2	G7
22	515	205	427	NP	HA–2	G7
23	550	240	427	NP	HA–2	G7
24	550	240	427	427	HA–2	G7
25	550	240	427	427	HA–2	G7
26	550	240	NP	427	HA–2	G7, G18
27	550	240	427	NP	HA–2	G7
28	550	240	427	427	HA–2	G7
29	550	240	NP	427	HA–2	G7, G18
30	550	240	427	NP	HA–2	G7
31	550	240	427	NP	HA–2	G7
32	550	240	427	NP	HA–2	G7
33	550	240	427	427	HA–2	G7
34	550	240	427	NP	HA–2	G7
35	550	240	NP	427	HA–2	G7, G18
36	550	240	427	NP	HA–2	G7
37	550	240	NP	427	HA–2	G7, G18
38	550	240	NP	427	HA–2	G7, G18
39	550	240	427	NP	HA–2	G7
40	550	240	427	NP	HA–2	G7
41	550	240	427	NP	HA–2	G7
42	550	240	427	NP	HA–2	G7
43	550	240	427	427	HA–2	G7
44	580	280	...	427	HA–2	G7
45	580	280	...	427	HA–2	G7

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500	
1	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...	
2	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...	
3	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...	
4	147	147	147	147	147	140	131	125	122	121	119	116	114	113	110	108	(**23**)
5	147	147	147	147	147	142	133	127	124	122	120	118	117	115	114	113	(**23**)
6	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...	...	
7	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...	...	
8	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...	...	
9	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...	...	
10	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...	...	
11	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...	...	
12	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...	...	
13	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...	...	
14	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...	...	
15	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...	...	
16	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...	...	
17	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...	...	
18	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...	...	
19	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...	...	
20	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...	...	
21	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...	...	
22	138	138	138	138	138	131	122	116	113	110	107	105	102	99.7	...	...	
23	161	161	161	161	161	161	155	147	144	140	137	135	133	130	...	...	
24	161	161	161	161	161	161	155	147	144	140	137	135	133	130	...	...	
25	161	161	161	161	161	161	155	147	144	140	137	135	133	130	...	...	
26	137	137	137	137	137	137	132	125	122	119	117	115	113	110	...	...	
27	161	161	161	161	161	161	155	147	144	140	137	135	133	130	...	...	
28	161	161	161	161	161	161	155	147	144	140	137	135	133	130	...	...	
29	137	137	137	137	137	137	132	125	122	119	117	115	113	110	...	...	
30	161	161	161	161	161	161	155	147	144	140	137	135	133	130	...	...	
31	161	161	161	161	161	161	155	147	144	140	137	135	133	130	...	...	
32	161	161	161	161	161	161	155	147	144	140	137	135	133	130	...	...	
33	161	161	161	161	161	161	155	147	144	140	137	135	133	130	...	...	
34	161	161	161	161	161	161	155	147	144	140	137	135	133	130	...	...	
35	137	137	137	137	137	137	132	125	122	119	117	115	113	110	...	...	
36	161	161	161	161	161	161	155	147	144	140	137	135	133	130	...	...	
37	137	137	137	137	137	137	132	125	122	119	117	115	113	110	...	...	
38	137	137	137	137	137	137	132	125	122	119	117	115	113	110	...	...	
39	161	161	161	161	161	161	155	147	144	140	137	135	133	130	...	...	
40	161	161	161	161	161	161	155	147	144	140	137	135	133	130	...	...	
41	161	161	161	161	161	161	155	147	144	140	137	135	133	130	...	...	
42	161	161	161	161	161	161	155	147	144	140	137	135	133	130	...	...	
43	161	161	161	161	161	161	155	147	144	140	137	135	133	130	...	...	
44	187	187	187	187	182	174	166	157	152	149	145	142	139	136	...	...	(**23**)
45	187	187	187	187	182	174	166	157	152	149	145	142	139	136	...	...	(**23**)

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	18Cr–3Ni–12Mn	Plate	SA–240	XM–29	S24000	...	...	8	3
2	18Cr–3Ni–12Mn	Plate	SA–240	XM–29	S24000	...	...	8	3
3	18Cr–5Ni–3Mo	Smls. tube	SA–789	...	S31500	...	...	10H	1
4	18Cr–5Ni–3Mo	Wld. tube	SA–789	...	S31500	...	...	10H	1
5	18Cr–5Ni–3Mo	Smls. pipe	SA–790	...	S31500	...	...	10H	1
6	18Cr–5Ni–3Mo	Wld. pipe	SA–790	...	S31500	...	...	10H	1
7	18Cr–8Ni	Forgings	SA–182	F304L	S30403	...	>130	8	1
8	18Cr–8Ni	Forgings	SA–965	F304L	S30403	...	...	8	1
9	18Cr–8Ni	Bar	SA/JIS G4303	SUS304L	...	...	...	8	1
10	18Cr–8Ni	Forgings	SA–182	F304L	S30403	...	≤130	8	1
11	18Cr–8Ni	Smls. tube	SA–213	TP304L	S30403	...	...	8	1
12	18Cr–8Ni	Plate	SA–240	304L	S30403	...	...	8	1
13	18Cr–8Ni	Wld. tube	SA–249	TP304L	S30403	...	...	8	1
14	18Cr–8Ni	Wld. tube	SA–249	TP304L	S30403	...	...	8	1
15	18Cr–8Ni	Wld. pipe	SA–312	TP304L	S30403	...	...	8	1
16	18Cr–8Ni	Smls. pipe	SA–312	TP304L	S30403	...	...	8	1
17	18Cr–8Ni	Wld. pipe	SA–312	TP304L	S30403	...	...	8	1
18	18Cr–8Ni	Wld. pipe	SA–358	304L	S30403	1	...	8	1
19	18Cr–8Ni	Wld. pipe	SA–358	304L	S30403	3	...	8	1
20	18Cr–8Ni	Wld. pipe	SA–358	304L	S30403	4	...	8	1
21	18Cr–8Ni	Fittings	SA–403	304L	S30403	...	...	8	1
22	18Cr–8Ni	Fittings	SA–403	304L	S30403	WP–S	...	8	1
23	18Cr–8Ni	Wld. fittings	SA–403	304L	S30403	WP–W	...	8	1
24	18Cr–8Ni	Bar	SA–479	304L	S30403	...	...	8	1
25	18Cr–8Ni	Wld. tube	SA–688	TP304L	S30403	...	...	8	1
26	18Cr–8Ni	Wld. tube	SA–688	TP304L	S30403	...	...	8	1
27	18Cr–8Ni	Wld. pipe	SA–813	TP304L	S30403	...	...	8	1
28	18Cr–8Ni	Wld. pipe	SA–814	TP304L	S30403	...	...	8	1
29	18Cr–8Ni	Castings	SA–351	CF3	J92500	...	...	8	1
30	18Cr–8Ni	Cast pipe	SA–451	CPF3	J92500	...	...	8	1
31	18Cr–8Ni	Castings	SA–351	CF10	J92590	...	...	8	1
32	18Cr–8Ni	Castings	SA–351	CF8	J92600	...	...	8	1
33	18Cr–8Ni	Cast pipe	SA–451	CPF8	J92600	...	...	8	1
34	18Cr–8Ni	Forgings	SA–182	F304	S30400	...	>130	8	1
(**23**) 35	18Cr–8Ni	Smls. pipe	SA–376	TP304	S30400	...	≥200	8	1
36	18Cr–8Ni	Forgings	SA–965	F304	S30400	...	...	8	1
37	18Cr–8Ni	Forgings	SA–182	F304H	S30409	...	>130	8	1
38	18Cr–8Ni	Forgings	SA–965	F304H	S30409	...	...	8	1
(**23**) 39	18Cr–8Ni	Plate	SA/EN 10028–7	X2CrNi18–9	...	...	≤75	8	1
40	18Cr–8Ni	Plate	SA–240	302	S30200	...	...	8	1
(**23**) 41	18Cr–8Ni	Plate	SA–240	304H	S30409	...	...	8	1
42	18Cr–8Ni	Bar	SA–479	302	S30200	...	...	8	1
43	18Cr–8Ni	Forgings	SA–182	F304	S30400	...	≤130	8	1
44	18Cr–8Ni	Smls. tube	SA–213	TP304	S30400	...	...	8	1
45	18Cr–8Ni	Plate	SA–240	304	S30400	...	...	8	1

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	690	380	NP	427	HA–6	G7
2	690	415	NP	427	HA–6	G7
3	635	440	NP	316	HA–5	G13
4	635	440	NP	316	HA–5	G13, G18
5	635	440	NP	316	HA–5	G13
6	635	440	NP	316	HA–5	G13, G18
7	450	170	427	427	HA–3	G7
8	450	170	NP	427	HA–3	G7
9	480	175	427	NP	HA–3	G7
10	485	170	427	427	HA–3	G7
11	485	170	427	427	HA–3	G7
12	485	170	427	427	HA–3	G7
13	485	170	427	NP	HA–3	G7
14	485	170	NP	427	HA–3	G7, G18
15	485	170	427	NP	HA–3	G7
16	485	170	427	427	HA–3	G7
17	485	170	NP	427	HA–3	G7, G18
18	485	170	427	NP	HA–3	G7
19	485	170	427	NP	HA–3	G7
20	485	170	427	NP	HA–3	G7
21	485	170	427	NP	HA–3	G7
22	485	170	NP	427	HA–3	G7
23	485	170	427	NP	HA–3	G7
24	485	170	427	NP	HA–3	G7
25	485	170	427	NP	HA–3	G7
26	485	170	NP	427	HA–3	G7, G18
27	485	170	427	NP	HA–3	G7
28	485	170	427	NP	HA–3	G7
29	485	205	427	427	HA–3	G7, G13
30	485	205	427	NP	HA–3	G7, G13
31	485	205	NP	427	HA–3	G7, G10, G13
32	485	205	427	427	HA–1	G7, G9, G10, G13
33	485	205	427	NP	HA–1	G7, G13
34	485	205	427	427	HA–1	G7, G9, G10
35	485	205	427	427	HA–1	G7, G9, G10, S2
36	485	205	427	427	HA–1	G7, G9, G10
37	485	205	427	427	HA–1	G7
38	485	205	427	427	HA–1	G7
39	500	200	NP	427	HA–3	G7
40	515	205	NP	427	HA–1	G7, G9
41	515	205	NP	427	HA–1	G7
42	515	205	427	NP	HA–1	G7
43	515	205	427	427	HA–1	G7, G9, G10
44	515	205	427	427	HA–1	G7, G9
45	515	205	427	427	HA–1	G7, G9, G10

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500	
1	230	228	223	216	209	201	190	181	177	174	172	169	166	163	...	...	
2	230	228	223	216	209	201	197	193	191	187	184	180	175	170	...	...	
3	212	208	203	199	196	195	195	195	195	...	...	...	...	...	...	...	
4	180	177	173	169	167	165	165	165	165	...	...	...	...	...	...	...	
5	212	208	203	199	196	195	195	195	195	...	...	...	...	...	...	...	
6	180	177	173	169	167	165	165	165	165	...	...	...	...	...	...	...	
7	115	115	115	115	115	110	103	97.7	95.8	94.1	92.9	91.6	89.7	88.4	...	...	
8	115	115	115	115	115	110	103	97.7	95.8	94.1	92.9	91.6	89.7	88.4	...	...	
9	115	115	115	115	115	110	103	97.7	95.8	94.1	92.9	91.6	89.7	88.4	...	...	
10	115	115	115	115	115	110	103	97.7	95.8	94.1	92.9	91.6	89.7	88.4	...	...	
11	115	115	115	115	115	110	103	97.7	95.8	94.1	92.9	91.6	89.7	88.4	...	...	
12	115	115	115	115	115	110	103	97.7	95.8	94.1	92.9	91.6	89.7	88.4	...	...	
13	115	115	115	115	115	110	103	97.7	95.8	94.1	92.9	91.6	89.7	88.4	...	...	
14	97.9	97.9	97.9	97.9	97.9	93.0	87.2	82.9	81.6	80.2	78.4	77.9	76.6	75.4	...	...	
15	115	115	115	115	115	110	103	97.7	95.8	94.1	92.9	91.6	89.7	88.4	...	...	
16	115	115	115	115	115	110	103	97.7	95.8	94.1	92.9	91.6	89.7	88.4	...	...	
17	97.9	97.9	97.9	97.9	97.9	93.0	87.2	82.9	81.6	80.2	78.4	77.9	76.6	75.4	...	...	
18	115	115	115	115	115	110	103	97.7	95.8	94.1	92.9	91.6	89.7	88.4	...	...	
19	115	115	115	115	115	110	103	97.7	95.8	94.1	92.9	91.6	89.7	88.4	...	...	
20	115	115	115	115	115	110	103	97.7	95.8	94.1	92.9	91.6	89.7	88.4	...	...	
21	115	115	115	115	115	110	103	97.7	95.8	94.1	92.9	91.6	89.7	88.4	...	...	
22	115	115	115	115	115	110	103	97.7	95.8	94.1	92.9	91.6	89.7	88.4	...	...	
23	115	115	115	115	115	110	103	97.7	95.8	94.1	92.9	91.6	89.7	88.4	...	...	
24	115	115	115	115	115	110	103	97.7	95.8	94.1	92.9	91.6	89.7	88.4	...	...	
25	115	115	115	115	115	110	103	97.7	95.8	94.1	92.9	91.6	89.7	88.4	...	...	
26	97.9	97.9	97.9	97.9	97.9	93.0	87.2	82.9	81.6	80.2	78.4	77.9	76.6	75.4	...	...	
27	115	115	115	115	115	110	103	97.7	95.8	94.1	92.9	91.6	89.7	88.4	...	...	
28	115	115	115	115	115	110	103	97.7	95.8	94.1	92.9	91.6	89.7	88.4	...	...	
29	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
30	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
31	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
32	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
33	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
34	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
35	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	(**23**)
36	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
37	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
38	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
39	133	133	133	133	133	127	119	113	111	109	107	106	104	104	102	99.9	(**23**)
40	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
41	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	(**23**)
42	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
43	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
44	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
45	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
	1	18Cr–8Ni	Wld. tube	SA–249	TP304	S30400	...	...	8	1
	2	18Cr–8Ni	Wld. tube	SA–249	TP304	S30400	...	...	8	1
	3	18Cr–8Ni	Wld. pipe	SA–312	TP304	S30400	...	...	8	1
	4	18Cr–8Ni	Smls. pipe	SA–312	TP304	S30400	...	...	8	1
	5	18Cr–8Ni	Wld. pipe	SA–312	TP304	S30400	...	...	8	1
	6	18Cr–8Ni	Wld. pipe	SA–358	304	S30400	1	...	8	1
	7	18Cr–8Ni	Wld. pipe	SA–358	304	S30400	3	...	8	1
	8	18Cr–8Ni	Wld. pipe	SA–358	304	S30400	4	...	8	1
(**23**)	9	18Cr–8Ni	Smls. pipe	SA–376	TP304	S30400	...	<200	8	1
	10	18Cr–8Ni	Fittings	SA–403	304	S30400	...	...	8	1
	11	18Cr–8Ni	Fittings	SA–403	304	S30400	CR	...	8	1
	12	18Cr–8Ni	Fittings	SA–403	304	S30400	WP–S	...	8	1
	13	18Cr–8Ni	Wld. fittings	SA–403	304	S30400	WP–W	...	8	1
	14	18Cr–8Ni	Wld. fittings	SA–403	304	S30400	WP–W	...	8	1
	15	18Cr–8Ni	Wld. fittings	SA–403	304	S30400	WP–WX	...	8	1
	16	18Cr–8Ni	Bar	SA–479	304	S30400	...	...	8	1
	17	18Cr–8Ni	Wld. tube	SA–688	TP304	S30400	...	...	8	1
	18	18Cr–8Ni	Wld. tube	SA–688	TP304	S30400	...	...	8	1
	19	18Cr–8Ni	Wld. tube	SA–813	TP304	S30400	...	...	8	1
	20	18Cr–8Ni	Wld. tube	SA–814	TP304	S30400	...	...	8	1
	21	18Cr–8Ni	Forgings	SA–182	F304H	S30409	...	≤130	8	1
	22	18Cr–8Ni	Smls. tube	SA–213	TP304H	S30409	...	...	8	1
	23	18Cr–8Ni	Plate	SA–240	304H	S30409	...	...	8	1
	24	18Cr–8Ni	Wld. tube	SA–249	TP304H	S30409	...	...	8	1
	25	18Cr–8Ni	Wld. tube	SA–249	TP304H	S30409	...	...	8	1
	26	18Cr–8Ni	Wld. pipe	SA–312	TP304H	S30409	...	...	8	1
	27	18Cr–8Ni	Smls. pipe	SA–312	TP304H	S30409	...	...	8	1
	28	18Cr–8Ni	Wld. pipe	SA–312	TP304H	S30409	...	...	8	1
	29	18Cr–8Ni	Wld. pipe	SA–358	304H	S30409	1	...	8	1
	30	18Cr–8Ni	Wld. pipe	SA–358	304H	S30409	3	...	8	1
	31	18Cr–8Ni	Wld. pipe	SA–358	304H	S30409	4	...	8	1
	32	18Cr–8Ni	Smls. pipe	SA–376	TP304H	S30409	...	...	8	1
	33	18Cr–8Ni	Fittings	SA–403	304H	S30409	...	...	8	1
	34	18Cr–8Ni	Fittings	SA–403	304H	S30409	CR	...	8	1
	35	18Cr–8Ni	Fittings	SA–403	304H	S30409	WP–S	...	8	1
	36	18Cr–8Ni	Wld. fittings	SA–403	304H	S30409	WP–W	...	8	1
	37	18Cr–8Ni	Wld. fittings	SA–403	304H	S30409	WP–W	...	8	1
	38	18Cr–8Ni	Wld. fittings	SA–403	304H	S30409	WP–WX	...	8	1
	39	18Cr–8Ni	Bar	SA–479	304H	S30409	...	...	8	1
	40	18Cr–8Ni	Wld. tube	SA–813	TP304H	S30409	...	...	8	1
	41	18Cr–8Ni	Wld. tube	SA–814	TP304H	S30409	...	...	8	1
(**23**)	42	18Cr–8Ni	Plate	SA/EN 10028–7	X5CrNi18–10	...	...	≤75	8	1
	43	18Cr–8Ni	Bar	SA/JIS G4303	SUS302	...	...	...	8	1
	44	18Cr–8Ni	Bar	SA/JIS G4303	SUS304	...	...	...	8	1
	45	18Cr–8Ni	Castings	SA–351	CF3A	J92500	...	...	8	1

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	515	205	427	NP	HA–1	G7
2	515	205	NP	427	HA–1	G7, G9, G18
3	515	205	427	NP	HA–1	G7
4	515	205	427	427	HA–1	G7, G9, G10
5	515	205	NP	427	HA–1	G7, G9, G18
6	515	205	427	NP	HA–1	G7
7	515	205	427	NP	HA–1	G7
8	515	205	427	NP	HA–1	G7
9	515	205	427	427	HA–1	G7, G9, G10, S5
10	515	205	427	NP	HA–1	G7
11	515	205	NP	427	HA–1	G7, G18
12	515	205	NP	427	HA–1	G7
13	515	205	427	NP	HA–1	G7
14	515	205	NP	427	HA–1	G7, G18
15	515	205	NP	427	HA–1	G7, G18
16	515	205	427	NP	HA–1	G7
17	515	205	427	NP	HA–1	G7
18	515	205	NP	427	HA–1	G7, G9, G18
19	515	205	427	NP	HA–1	G7
20	515	205	427	NP	HA–1	G7
21	515	205	427	427	HA–1	G7
22	515	205	427	427	HA–1	G7
23	515	205	427	NP	HA–1	G7
24	515	205	427	NP	HA–1	G7
25	515	205	NP	427	HA–1	G7, G18
26	515	205	427	NP	HA–1	G7
27	515	205	427	427	HA–1	G7
28	515	205	NP	427	HA–1	G7, G18
29	515	205	427	NP	HA–1	G7
30	515	205	427	NP	HA–1	G7
31	515	205	427	NP	HA–1	G7
32	515	205	427	427	HA–1	G7
33	515	205	427	NP	HA–1	G7
34	515	205	NP	427	HA–1	G7, G18
35	515	205	NP	427	HA–1	G7
36	515	205	427	NP	HA–1	G7
37	515	205	NP	427	HA–1	G7, G18
38	515	205	NP	427	HA–1	G7, G18
39	515	205	427	NP	HA–1	G7
40	515	205	427	NP	HA–1	G7
41	515	205	427	NP	HA–1	G7
42	520	210	NP	427	HA–1	G7, G18
43	520	205	427	NP	HA–1	G7
44	520	205	427	NP	HA–1	G7
45	530	240	371	NP	HA–3	G7, G13

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500	
1	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
2	117	117	117	117	117	110	103	98.5	96.5	94.7	92.8	90.9	89.1	87.2	...	...	
3	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
4	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
5	117	117	117	117	117	110	103	98.5	96.5	94.7	92.8	90.9	89.1	87.2	...	...	
6	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
7	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
8	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
9	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	(**23**)
10	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
11	117	117	117	117	117	110	103	98.5	96.5	94.7	92.8	90.9	89.1	87.2	...	...	
12	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
13	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
14	117	117	117	117	117	110	103	98.5	96.5	94.7	92.8	90.9	89.1	87.2	...	...	
15	117	117	117	117	117	110	103	98.5	96.5	94.7	92.8	90.9	89.1	87.2	...	...	
16	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
17	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
18	117	117	117	117	117	110	103	98.5	96.5	94.7	92.8	90.9	89.1	87.2	...	...	
19	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
20	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
21	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
22	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
23	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
24	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
25	117	117	117	117	117	110	103	98.5	96.5	94.7	92.8	90.9	89.1	87.2	...	...	
26	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
27	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
28	117	117	117	117	117	110	103	98.5	96.5	94.7	92.8	90.9	89.1	87.2	...	...	
29	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
30	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
31	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
32	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
33	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
34	117	117	117	117	117	110	103	98.5	96.5	94.7	92.8	90.9	89.1	87.2	...	...	
35	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
36	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
37	117	117	117	117	117	110	103	98.5	96.5	94.7	92.8	90.9	89.1	87.2	...	...	
38	117	117	117	117	117	110	103	98.5	96.5	94.7	92.8	90.9	89.1	87.2	...	...	
39	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
40	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
41	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
42	140	140	140	140	140	131.4	123.3	117.9	115.2	112.5	110.7	108.9	106.2	104.4	...	...	(**23**)
43	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
44	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
45	161	161	161	159	156	150	142	135	132	130	127	...	...	...	...	...	

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	18Cr–8Ni	Cast pipe	SA–451	CPF3A	J92500	...	...	8	1
2	18Cr–8Ni	Castings	SA–351	CF8A	J92600	...	...	8	1
3	18Cr–8Ni	Cast pipe	SA–451	CPF8A	J92600	...	...	8	1
4	18Cr–8Ni–N	Forgings	SA–182	F304LN	S30453	...	>130	8	1
5	18Cr–8Ni–N	Forgings	SA–965	F304LN	S30453	...	...	8	1
6	18Cr–8Ni–N	Forgings	SA–182	F304LN	S30453	...	≤130	8	1
7	18Cr–8Ni–N	Smls. tube	SA–213	TP304LN	S30453	...	...	8	1
8	18Cr–8Ni–N	Plate	SA–240	304LN	S30453	...	...	8	1
9	18Cr–8Ni–N	Wld. tube	SA–249	TP304LN	S30453	...	...	8	1
10	18Cr–8Ni–N	Smls. & wld. pipe	SA–312	TP304LN	S30453	...	...	8	1
11	18Cr–8Ni–N	Wld. pipe	SA–358	304LN	S30453	1	...	8	1
12	18Cr–8Ni–N	Wld. pipe	SA–358	304LN	S30453	3	...	8	1
13	18Cr–8Ni–N	Wld. pipe	SA–358	304LN	S30453	4	...	8	1
14	18Cr–8Ni–N	Smls. pipe	SA–376	TP304LN	S30453	...	...	8	1
15	18Cr–8Ni–N	Fittings	SA–403	304LN	S30453	...	...	8	1
16	18Cr–8Ni–N	Wld. fittings	SA–403	304LN	S30453	WP–W	...	8	1
17	18Cr–8Ni–N	Bar	SA–479	304LN	S30453	...	...	8	1
18	18Cr–8Ni–N	Wld. tube	SA–688	TP304LN	S30453	...	...	8	1
19	18Cr–8Ni–N	Wld. tube	SA–813	TP304LN	S30453	...	...	8	1
20	18Cr–8Ni–N	Wld. tube	SA–814	TP304LN	S30453	...	...	8	1
21	18Cr–8Ni–N	Forgings	SA–182	F304N	S30451	...	...	8	1
22	18Cr–8Ni–N	Smls. tube	SA–213	TP304N	S30451	...	...	8	1
23	18Cr–8Ni–N	Plate	SA–240	304N	S30451	...	...	8	1
24	18Cr–8Ni–N	Wld. tube	SA–249	TP304N	S30451	...	...	8	1
25	18Cr–8Ni–N	Wld. pipe	SA–312	TP304N	S30451	...	...	8	1
26	18Cr–8Ni–N	Smls. pipe	SA–312	TP304N	S30451	...	...	8	1
27	18Cr–8Ni–N	Wld. pipe	SA–312	TP304N	S30451	...	...	8	1
28	18Cr–8Ni–N	Wld. pipe	SA–358	304N	S30451	1	...	8	1
29	18Cr–8Ni–N	Wld. pipe	SA–358	304N	S30451	3	...	8	1
30	18Cr–8Ni–N	Wld. pipe	SA–358	304N	S30451	4	...	8	1
31	18Cr–8Ni–N	Smls. pipe	SA–376	TP304N	S30451	...	...	8	1
32	18Cr–8Ni–N	Fittings	SA–403	304N	S30451	...	...	8	1
33	18Cr–8Ni–N	Fittings	SA–403	304N	S30451	CR	...	8	1
34	18Cr–8Ni–N	Wld. fittings	SA–403	304N	S30451	WP–W	...	8	1
35	18Cr–8Ni–N	Wld. fittings	SA–403	304N	S30451	WP–W	...	8	1
36	18Cr–8Ni–N	Wld. fittings	SA–403	304N	S30451	WP–WX	...	8	1
37	18Cr–8Ni–N	Bar	SA–479	304N	S30451	...	...	8	1
38	18Cr–8Ni–N	Wld. tube	SA–688	TP304N	S30451	...	...	8	1
39	18Cr–8Ni–N	Wld. pipe	SA–813	TP304N	S30451	...	...	8	1
40	18Cr–8Ni–N	Wld. pipe	SA–814	TP304N	S30451	...	...	8	1
41	18Cr–8Ni–N	Forgings	SA–965	F304N	S30451	...	...	8	1
(**23**) 42	18Cr–8Ni–N	Plate	SA/EN 10028–7	X2CrNiN18–10	...	...	≤75	8	1
(**23**) 43	18Cr–8Ni–N	Plate	SA/EN 10028–7	X5CrNiN19–9	...	...	≤75	8	1
44	18Cr–8Ni–4Si–N	Bar	SA–479	...	S21800	...	...	8	3
45	18Cr–10Ni–Cb	Castings	SA–351	CF8C	J92710	...	...	8	1

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	530	240	371	NP	HA–3	G7, G13
2	530	240	371	NP	HA–1	G7, G13
3	530	240	371	NP	HA–1	G7, G13
4	485	205	427	NP	HA–1	G7
5	485	205	427	NP	HA–1	G7
6	515	205	427	NP	HA–1	G7
7	515	205	427	NP	HA–1	G7
8	515	205	427	NP	HA–1	G7
9	515	205	427	NP	HA–1	G7
10	515	205	427	NP	HA–1	G7
11	515	205	427	NP	HA–1	G7
12	515	205	427	NP	HA–1	G7
13	515	205	427	NP	HA–1	G7
14	515	205	427	NP	HA–1	G7
15	515	205	427	NP	HA–1	G7
16	515	205	427	NP	HA–1	G7
17	515	205	427	NP	HA–1	G7
18	515	205	427	NP	HA–1	G7
19	515	205	427	NP	HA–1	G7
20	515	205	427	NP	HA–1	G7
21	550	240	427	NP	HA–1	G7
22	550	240	427	427	HA–1	G7
23	550	240	427	427	HA–1	G7
24	550	240	NP	427	HA–1	G7, G18
25	550	240	427	NP	HA–1	G7
26	550	240	427	427	HA–1	G7
27	550	240	NP	427	HA–1	G7, G18
28	550	240	427	NP	HA–1	G7
29	550	240	427	NP	HA–1	G7
30	550	240	427	NP	HA–1	G7
31	550	240	427	427	HA–1	G7
32	550	240	427	NP	HA–1	G7
33	550	240	NP	427	HA–1	G7, G18
34	550	240	427	NP	HA–1	G7
35	550	240	NP	427	HA–1	G7, G18
36	550	240	NP	427	HA–1	G7, G18
37	550	240	427	NP	HA–1	G7
38	550	240	427	NP	HA–1	G7
39	550	240	427	NP	HA–1	G7
40	550	240	427	NP	HA–1	G7
41	550	240	427	427	HA–1	G7
42	550	270	NP	427	HA–1	G7
43	550	270	NP	427	HA–1	G7
44	655	345	427	NP	HA–6	...
45	485	205	427	427	HA–2	G7, G9, G13

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500	
1	161	161	161	159	156	150	142	135	132	130	127	...	...	...	...	...	
2	161	161	161	159	156	150	142	135	132	130	127	...	...	...	...	...	
3	161	161	161	159	156	150	142	135	132	130	127	...	...	...	...	...	
4	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
5	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
6	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
7	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
8	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
9	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
10	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
11	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
12	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
13	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
14	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
15	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
16	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
17	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
18	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
19	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
20	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
21	161	161	160	159	155	141	132	125	122	120	118	116	115	113	...	...	
22	161	161	160	159	155	141	132	125	122	120	118	116	115	113	...	...	
23	161	161	160	159	155	141	132	125	122	120	118	116	115	113	...	...	
24	137	137	136	135	132	120	112	106	104	102	100	99.2	97.3	95.5	...	...	
25	161	161	160	159	155	141	132	125	122	120	118	116	115	113	...	...	
26	161	161	160	159	155	141	132	125	122	120	118	116	115	113	...	...	
27	137	137	136	135	132	120	112	106	104	102	100	99.2	97.3	95.5	...	...	
28	161	161	160	159	155	141	132	125	122	120	118	116	115	113	...	...	
29	161	161	160	159	155	141	132	125	122	120	118	116	115	113	...	...	
30	161	161	160	159	155	141	132	125	122	120	118	116	115	113	...	...	
31	161	161	160	159	155	141	132	125	122	120	118	116	115	113	...	...	
32	161	161	160	159	155	141	132	125	122	120	118	116	115	113	...	...	
33	137	137	136	135	132	120	112	106	104	102	100	99.2	97.3	95.5	...	...	
34	161	161	160	159	155	141	132	125	122	120	118	116	115	113	...	...	
35	137	137	136	135	132	120	112	106	104	102	100	99.2	97.3	95.5	...	...	
36	137	137	136	135	132	120	112	106	104	102	100	99.2	97.3	95.5	...	...	
37	161	161	160	159	155	141	132	125	122	120	118	116	115	113	...	...	
38	161	161	160	159	155	141	132	125	122	120	118	116	115	113	...	...	
39	161	161	160	159	155	141	132	125	122	120	118	116	115	113	...	...	
40	161	161	160	159	155	141	132	125	122	120	118	116	115	113	...	...	
41	161	161	160	159	155	141	132	125	122	120	118	116	115	113	...	...	
42	180	178	172	167	163	157	154	151	148	145	142	140	137	134	...	...	(**23**)
43	180	180	180	178	174	158	148	140	137	135	132	131	129	126	...	...	(**23**)
44	219	198	175	162	152	138	128	123	121	119	118	116	116	115	...	...	
45	138	138	138	138	138	134	129	127	127	126	126	126	126	126	...	...	

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	18Cr–10Ni–Cb	Cast pipe	SA–451	CPF8C	J92710	...	...	8	1
2	18Cr–10Ni–Cb	Forgings	SA–182	F347	S34700	...	>130	8	1
3	18Cr–10Ni–Cb	Forgings	SA–965	F347	S34700	...	...	8	1
4	18Cr–10Ni–Cb	Forgings	SA–182	F347H	S34709	...	>130	8	1
5	18Cr–10Ni–Cb	Forgings	SA–965	F347H	S34709	...	...	8	1
6	18Cr–10Ni–Cb	Forgings	SA–182	F348	S34800	...	>130	8	1
7	18Cr–10Ni–Cb	Forgings	SA–182	F348H	S34809	...	>130	8	1
8	18Cr–10Ni–Cb	Forgings	SA–182	F347	S34700	...	≤130	8	1
9	18Cr–10Ni–Cb	Smls. tube	SA–213	TP347	S34700	...	...	8	1
10	18Cr–10Ni–Cb	Plate	SA–240	347	S34700	...	...	8	1
11	18Cr–10Ni–Cb	Wld. tube	SA–249	TP347	S34700	...	...	8	1
12	18Cr–10Ni–Cb	Wld. tube	SA–249	TP347	S34700	...	...	8	1
13	18Cr–10Ni–Cb	Wld. pipe	SA–312	TP347	S34700	...	...	8	1
14	18Cr–10Ni–Cb	Smls. pipe	SA–312	TP347	S34700	...	...	8	1
15	18Cr–10Ni–Cb	Wld. pipe	SA–312	TP347	S34700	...	...	8	1
16	18Cr–10Ni–Cb	Wld. pipe	SA–358	347	S34700	1	...	8	1
17	18Cr–10Ni–Cb	Wld. pipe	SA–358	347	S34700	3	...	8	1
18	18Cr–10Ni–Cb	Wld. pipe	SA–358	347	S34700	4	...	8	1
19	18Cr–10Ni–Cb	Smls. pipe	SA–376	TP347	S34700	...	...	8	1
20	18Cr–10Ni–Cb	Fittings	SA–403	347	S34700	...	...	8	1
21	18Cr–10Ni–Cb	Fittings	SA–403	347	S34700	CR	...	8	1
22	18Cr–10Ni–Cb	Fittings	SA–403	347	S34700	WP–S	...	8	1
23	18Cr–10Ni–Cb	Wld. fittings	SA–403	347	S34700	WP–W	...	8	1
24	18Cr–10Ni–Cb	Wld. fittings	SA–403	347	S34700	WP–W	...	8	1
25	18Cr–10Ni–Cb	Wld. fittings	SA–403	347	S34700	WP–WX	...	8	1
26	18Cr–10Ni–Cb	Bar	SA–479	347	S34700	...	...	8	1
27	18Cr–10Ni–Cb	Wld. pipe	SA–813	TP347	S34700	...	...	8	1
28	18Cr–10Ni–Cb	Wld. pipe	SA–814	TP347	S34700	...	...	8	1
29	18Cr–10Ni–Cb	Forgings	SA–182	F347H	S34709	...	≤130	8	1
30	18Cr–10Ni–Cb	Smls. tube	SA–213	TP347H	S34709	...	...	8	1
31	18Cr–10Ni–Cb	Plate	SA–240	347H	S34709	...	...	8	1
32	18Cr–10Ni–Cb	Wld. tube	SA–249	TP347H	S34709	...	...	8	1
33	18Cr–10Ni–Cb	Wld. tube	SA–249	TP347H	S34709	...	...	8	1
34	18Cr–10Ni–Cb	Wld. pipe	SA–312	TP347H	S34709	...	...	8	1
35	18Cr–10Ni–Cb	Smls. pipe	SA–312	TP347H	S34709	...	...	8	1
36	18Cr–10Ni–Cb	Wld. pipe	SA–312	TP347H	S34709	...	...	8	1
37	18Cr–10Ni–Cb	Smls. pipe	SA–376	TP347H	S34709	...	...	8	1
38	18Cr–10Ni–Cb	Fittings	SA–403	347H	S34709	...	...	8	1
39	18Cr–10Ni–Cb	Fittings	SA–403	347H	S34709	CR	...	8	1
40	18Cr–10Ni–Cb	Fittings	SA–403	347H	S34709	WP–S	...	8	1
41	18Cr–10Ni–Cb	Wld. fittings	SA–403	347H	S34709	WP–W	...	8	1
42	18Cr–10Ni–Cb	Wld. fittings	SA–403	347H	S34709	WP–W	...	8	1
43	18Cr–10Ni–Cb	Wld. fittings	SA–403	347H	S34709	WP–WX	...	8	1
44	18Cr–10Ni–Cb	Bar	SA–479	347H	S34709	...	...	8	1
45	18Cr–10Ni–Cb	Wld. pipe	SA–813	TP347H	S34709	...	...	8	1

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	485	205	427	NP	HA–2	G7, G13
2	485	205	427	427	HA–2	G7, G9
3	485	205	427	427	HA–2	G7, G9
4	485	205	427	427	HA–2	G7
5	485	205	427	427	HA–2	G7, G9
6	485	205	NP	427	HA–2	G7, G9
7	485	205	NP	427	HA–2	G7
8	515	205	427	427	HA–2	G7, G9
9	515	205	427	427	HA–2	G7, G9
10	515	205	427	427	HA–2	G7, G9
11	515	205	427	NP	HA–2	G7
12	515	205	NP	427	HA–2	G7, G9, G18
13	515	205	427	NP	HA–2	G7
14	515	205	427	427	HA–2	G7, G9
15	515	205	NP	427	HA–2	G7, G9, G18
16	515	205	427	NP	HA–2	G7
17	515	205	427	NP	HA–2	G7
18	515	205	427	NP	HA–2	G7
19	515	205	427	427	HA–2	G7, G9
20	515	205	427	NP	HA–2	G7
21	515	205	NP	427	HA–2	G7, G18
22	515	205	NP	427	HA–2	G7
23	515	205	427	NP	HA–2	G7
24	515	205	NP	427	HA–2	G7, G18
25	515	205	NP	427	HA–2	G7, G18
26	515	205	427	NP	HA–2	G7
27	515	205	427	NP	HA–2	G7
28	515	205	427	NP	HA–2	G7
29	515	205	427	427	HA–2	G7
30	515	205	427	427	HA–2	G7
31	515	205	427	427	HA–2	G7
32	515	205	427	NP	HA–2	G7
33	515	205	NP	427	HA–2	G7, G18
34	515	205	427	NP	HA–2	G7
35	515	205	427	427	HA–2	G7
36	515	205	NP	427	HA–2	G7, G18
37	515	205	427	427	HA–2	G7
38	515	205	427	NP	HA–2	G7
39	515	205	NP	427	HA–2	G7, G14
40	515	205	NP	427	HA–2	G7
41	515	205	427	NP	HA–2	G7
42	515	205	NP	427	HA–2	G7, G18
43	515	205	NP	427	HA–2	G7, G18
44	515	205	427	NP	HA–2	G7
45	515	205	427	NP	HA–2	G7

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
No.	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500
1	138	138	138	138	138	134	129	127	127	126	126	126	126	126	...	...
2	138	138	138	138	138	134	129	127	127	126	126	126	126	126	...	...
3	138	138	138	138	138	134	129	127	127	126	126	126	126	126	...	...
4	138	138	138	138	138	134	129	127	127	126	126	126	126	126	...	...
5	138	138	138	138	138	134	129	127	127	126	126	126	126	126	...	...
6	138	138	138	138	138	134	129	127	127	126	126	126	126	126	...	...
7	138	138	138	138	138	134	129	127	127	126	126	126	126	126	...	...
8	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
9	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
10	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
11	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
12	117	117	117	117	117	117	117	115	112	111	109	108	108	107	...	...
13	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
14	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
15	117	117	117	117	117	117	117	115	112	111	109	108	108	107	...	...
16	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
17	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
18	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
19	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
20	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
21	117	117	117	117	117	117	117	115	112	111	109	108	108	107	...	...
22	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
23	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
24	117	117	117	117	117	117	117	115	112	111	109	108	108	107	...	...
25	117	117	117	117	117	117	117	115	112	111	109	108	108	107	...	...
26	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
27	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
28	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
29	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
30	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
31	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
32	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
33	117	117	117	117	117	117	117	115	112	111	109	108	108	107	...	...
34	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
35	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
36	117	117	117	117	117	117	117	115	112	111	109	108	108	107	...	...
37	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
38	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
39	117	117	117	117	117	117	117	115	112	111	109	108	108	107	...	...
40	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
41	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
42	117	117	117	117	117	117	117	115	112	111	109	108	108	107	...	...
43	117	117	117	117	117	117	117	115	112	111	109	108	108	107	...	...
44	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
45	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	18Cr–10Ni–Cb	Wld. pipe	SA–814	TP347H	S34709	...	...	8	1
2	18Cr–10Ni–Cb	Forgings	SA–182	F348	S34800	...	≤130	8	1
3	18Cr–10Ni–Cb	Smls. tube	SA–213	TP348	S34800	...	...	8	1
4	18Cr–10Ni–Cb	Plate	SA–240	348	S34800	...	...	8	1
5	18Cr–10Ni–Cb	Wld. tube	SA–249	TP348	S34800	...	...	8	1
6	18Cr–10Ni–Cb	Wld. tube	SA–249	TP348	S34800	...	...	8	1
7	18Cr–10Ni–Cb	Wld. pipe	SA–312	TP348	S34800	...	...	8	1
8	18Cr–10Ni–Cb	Smls. pipe	SA–312	TP348	S34800	...	...	8	1
9	18Cr–10Ni–Cb	Wld. pipe	SA–312	TP348	S34800	...	...	8	1
10	18Cr–10Ni–Cb	Wld. pipe	SA–358	348	S34800	1	...	8	1
11	18Cr–10Ni–Cb	Wld. pipe	SA–358	348	S34800	3	...	8	1
12	18Cr–10Ni–Cb	Wld. pipe	SA–358	348	S34800	4	...	8	1
13	18Cr–10Ni–Cb	Smls. pipe	SA–376	TP348	S34800	...	...	8	1
14	18Cr–10Ni–Cb	Fittings	SA–403	348	S34800	...	...	8	1
15	18Cr–10Ni–Cb	Fittings	SA–403	348	S34800	CR	...	8	1
16	18Cr–10Ni–Cb	Fittings	SA–403	348	S34800	WP–S	...	8	1
17	18Cr–10Ni–Cb	Wld. fittings	SA–403	348	S34800	WP–W	...	8	1
18	18Cr–10Ni–Cb	Wld. fittings	SA–403	348	S34800	WP–W	...	8	1
19	18Cr–10Ni–Cb	Wld. fittings	SA–403	348	S34800	WP–WX	...	8	1
20	18Cr–10Ni–Cb	Bar	SA–479	348	S34800	...	...	8	1
21	18Cr–10Ni–Cb	Wld. pipe	SA–813	TP348	S34800	...	...	8	1
22	18Cr–10Ni–Cb	Wld. pipe	SA–814	TP348	S34800	...	...	8	1
23	18Cr–10Ni–Cb	Forgings	SA–182	F348H	S34809	...	≤130	8	1
24	18Cr–10Ni–Cb	Smls. tube	SA–213	TP348H	S34809	...	...	8	1
25	18Cr–10Ni–Cb	Plate	SA–240	348H	S34809	...	...	8	1
26	18Cr–10Ni–Cb	Wld. tube	SA–249	TP348H	S34809	...	...	8	1
27	18Cr–10Ni–Cb	Wld. tube	SA–249	TP348H	S34809	...	...	8	1
28	18Cr–10Ni–Cb	Wld. pipe	SA–312	TP348H	S34809	...	...	8	1
29	18Cr–10Ni–Cb	Smls. pipe	SA–312	TP348H	S34809	...	...	8	1
30	18Cr–10Ni–Cb	Wld. pipe	SA–312	TP348H	S34809	...	...	8	1
31	18Cr–10Ni–Cb	Fittings	SA–403	348H	S34809	...	...	8	1
32	18Cr–10Ni–Cb	Fittings	SA–403	348H	S34809	CR	...	8	1
33	18Cr–10Ni–Cb	Fittings	SA–403	348H	S34809	WP–S	...	8	1
34	18Cr–10Ni–Cb	Wld. fittings	SA–403	348H	S34809	WP–W	...	8	1
35	18Cr–10Ni–Cb	Wld. fittings	SA–403	348H	S34809	WP–W	...	8	1
36	18Cr–10Ni–Cb	Wld. fittings	SA–403	348H	S34809	WP–WX	...	8	1
37	18Cr–10Ni–Cb	Bar	SA–479	348H	S34809	...	...	8	1
38	18Cr–10Ni–Cb	Wld. pipe	SA–813	TP348H	S34809	...	...	8	1
39	18Cr–10Ni–Cb	Wld. pipe	SA–814	TP348H	S34809	...	...	8	1
40	18Cr–10Ni–Cb	Bar	SA/JIS G4303	SUS347	...	...	...	8	1
41	18Cr–10Ni–Ti	Smls. pipe	SA–312	TP321	S32100	...	>9.5	8	1
42	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321	S32100	...	>9.5	8	1
43	18Cr–10Ni–Ti	Smls. pipe	SA–312	TP321H	S32109	...	>9.5	8	1
44	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321H	S32109	...	>9.5	8	1
45	18Cr–10Ni–Ti	Forgings	SA–182	F321	S32100	...	>130	8	1

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	515	205	427	NP	HA–2	G7
2	515	205	427	427	HA–2	G7, G9
3	515	205	427	427	HA–2	G7, G9
4	515	205	427	427	HA–2	G7, G9
5	515	205	427	NP	HA–2	G7
6	515	205	NP	427	HA–2	G7, G9, G18
7	515	205	427	NP	HA–2	G7
8	515	205	427	427	HA–2	G7, G9
9	515	205	NP	427	HA–2	G7, G9, G18
10	515	205	427	NP	HA–2	G7
11	515	205	427	NP	HA–2	G7
12	515	205	427	NP	HA–2	G7
13	515	205	427	427	HA–2	G7, G9
14	515	205	427	NP	HA–2	G7
15	515	205	NP	427	HA–2	G7, G18
16	515	205	NP	427	HA–2	G7
17	515	205	427	NP	HA–2	G7
18	515	205	NP	427	HA–2	G7, G18
19	515	205	NP	427	HA–2	G7, G18
20	515	205	427	NP	HA–2	G7
21	515	205	427	NP	HA–2	G7
22	515	205	427	NP	HA–2	G7
23	515	205	427	427	HA–2	G7
24	515	205	427	427	HA–2	G7
25	515	205	427	NP	HA–2	G7
26	515	205	427	NP	HA–2	G7
27	515	205	NP	427	HA–2	G7, G18
28	515	205	427	NP	HA–2	G7
29	515	205	427	427	HA–2	G7
30	515	205	NP	427	HA–2	G7, G18
31	515	205	427	NP	HA–2	G7
32	515	205	NP	427	HA–2	G7, G18
33	515	205	NP	427	HA–2	G7
34	515	205	427	NP	HA–2	G7
35	515	205	NP	427	HA–2	G7, G18
36	515	205	NP	427	HA–2	G7, G18
37	515	205	427	NP	HA–2	G7
38	515	205	427	NP	HA–2	G7
39	515	205	427	NP	HA–2	G7
40	520	205	427	NP	HA–2	G7
41	485	170	NP	427	HA–2	G7, G9
42	485	170	427	427	HA–2	G7, G9
43	485	170	NP	427	HA–2	G7
44	485	170	427	427	HA–2	G7
45	485	205	427	427	HA–2	G7, G9

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
No.	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500
1	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
2	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
3	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
4	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
5	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
6	117	117	117	117	117	117	117	115	112	111	109	108	108	107	...	...
7	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
8	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
9	117	117	117	117	117	117	117	115	112	111	109	108	108	107	...	...
10	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
11	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
12	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
13	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
14	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
15	117	117	117	117	117	117	117	115	112	111	109	108	108	107	...	...
16	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
17	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
18	117	117	117	117	117	117	117	115	112	111	109	108	108	107	...	...
19	117	117	117	117	117	117	117	115	112	111	109	108	108	107	...	...
20	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
21	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
22	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
23	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
24	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
25	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
26	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
27	117	117	117	117	117	117	117	115	112	111	109	108	108	107	...	...
28	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
29	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
30	117	117	117	117	117	117	117	115	112	111	109	108	108	107	...	...
31	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
32	117	117	117	117	117	117	117	115	112	111	109	108	108	107	...	...
33	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
34	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
35	117	117	117	117	117	117	117	115	112	111	109	108	108	107	...	...
36	117	117	117	117	117	117	117	115	112	111	109	108	108	107	...	...
37	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
38	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
39	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
40	138	138	138	138	138	138	138	135	132	130	129	128	126	125	...	...
41	115	115	115	115	115	115	112	106	104	102	100	98.5	97.3	96.0	...	...
42	115	115	115	115	115	115	112	106	104	102	100	98.5	97.3	96.0	...	...
43	115	115	115	115	115	115	112	106	104	102	100	98.5	97.3	96.0	...	...
44	115	115	115	115	115	115	112	106	104	102	100	98.5	97.3	96.0	...	...
45	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	18Cr–10Ni–Ti	Forgings	SA–965	F321	S32100	...	...	8	1
2	18Cr–10Ni–Ti	Forgings	SA–182	F321H	S32109	...	>130	8	1
3	18Cr–10Ni–Ti	Forgings	SA–965	F321H	S32109	...	...	8	1
(**23**) 4	18Cr–10Ni–Ti	Plate	SA/EN 10028–7	X6CrNiTi18–10	...	...	≤75	8	1
5	18Cr–10Ni–Ti	Forgings	SA–182	F321	S32100	...	≤130	8	1
6	18Cr–10Ni–Ti	Smls. tube	SA–213	TP321	S32100	...	...	8	1
7	18Cr–10Ni–Ti	Plate	SA–240	321	S32100	...	...	8	1
8	18Cr–10Ni–Ti	Wld. tube	SA–249	TP321	S32100	...	...	8	1
9	18Cr–10Ni–Ti	Wld. tube	SA–249	TP321	S32100	...	...	8	1
10	18Cr–10Ni–Ti	Wld. pipe	SA–312	TP321	S32100	...	≤9.5	8	1
11	18Cr–10Ni–Ti	Smls. pipe	SA–312	TP321	S32100	...	≤9.5	8	1
12	18Cr–10Ni–Ti	Wld. pipe	SA–312	TP321	S32100	...	≤9.5	8	1
13	18Cr–10Ni–Ti	Wld. pipe	SA–358	321	S32100	1	...	8	1
14	18Cr–10Ni–Ti	Wld. pipe	SA–358	321	S32100	3	...	8	1
15	18Cr–10Ni–Ti	Wld. pipe	SA–358	321	S32100	4	...	8	1
16	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321	S32100	...	≤9.5	8	1
17	18Cr–10Ni–Ti	Fittings	SA–403	321	S32100	...	...	8	1
18	18Cr–10Ni–Ti	Fittings	SA–403	321	S32100	CR	...	8	1
19	18Cr–10Ni–Ti	Fittings	SA–403	321	S32100	WP–S	...	8	1
20	18Cr–10Ni–Ti	Wld. fittings	SA–403	321	S32100	WP–W	...	8	1
21	18Cr–10Ni–Ti	Wld. fittings	SA–403	321	S32100	WP–W	...	8	1
22	18Cr–10Ni–Ti	Wld. fittings	SA–403	321	S32100	WP–WX	...	8	1
23	18Cr–10Ni–Ti	Bar	SA–479	321	S32100	...	...	8	1
24	18Cr–10Ni–Ti	Wld. pipe	SA–813	TP321	S32100	...	...	8	1
25	18Cr–10Ni–Ti	Wld. pipe	SA–814	TP321	S32100	...	...	8	1
26	18Cr–10Ni–Ti	Forgings	SA–182	F321H	S32109	...	≤130	8	1
27	18Cr–10Ni–Ti	Smls. tube	SA–213	TP321H	S32109	...	...	8	1
28	18Cr–10Ni–Ti	Plate	SA–240	321H	S32109	...	...	8	1
29	18Cr–10Ni–Ti	Wld. tube	SA–249	TP321H	S32109	...	...	8	1
30	18Cr–10Ni–Ti	Wld. tube	SA–249	TP321H	S32109	...	...	8	1
31	18Cr–10Ni–Ti	Wld. pipe	SA–312	TP321H	S32109	...	≤9.5	8	1
32	18Cr–10Ni–Ti	Smls. pipe	SA–312	TP321H	S32109	...	≤9.5	8	1
33	18Cr–10Ni–Ti	Wld. pipe	SA–312	TP321H	S32109	...	≤9.5	8	1
34	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321H	S32109	...	≤9.5	8	1
35	18Cr–10Ni–Ti	Fittings	SA–403	321H	S32109	...	...	8	1
36	18Cr–10Ni–Ti	Fittings	SA–403	321H	S32109	CR	...	8	1
37	18Cr–10Ni–Ti	Fittings	SA–403	321H	S32109	WP–S	...	8	1
38	18Cr–10Ni–Ti	Wld. fittings	SA–403	321H	S32109	WP–W	...	8	1
39	18Cr–10Ni–Ti	Wld. fittings	SA–403	321H	S32109	WP–W	...	8	1
40	18Cr–10Ni–Ti	Wld. fittings	SA–403	321H	S32109	WP–WX	...	8	1
41	18Cr–10Ni–Ti	Bar	SA–479	321H	S32109	...	...	8	1
42	18Cr–10Ni–Ti	Wld. pipe	SA–813	TP321H	S32109	...	...	8	1
43	18Cr–10Ni–Ti	Wld. pipe	SA–814	TP321H	S32109	...	...	8	1
44	18Cr–10Ni–Ti	Bar	SA/JIS G4303	SUS321	...	...	...	8	1
45	18Cr–11Ni	Plate	SA–240	305	S30500	...	...	8	1

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	485	205	427	427	HA–2	G7, G9
2	485	205	427	427	HA–2	G7
3	485	205	427	427	HA–2	G7, G9
4	500	200	NP	427	HA–2	G7
5	515	205	427	427	HA–2	G7, G9
6	515	205	427	427	HA–2	G7, G9
7	515	205	427	427	HA–2	G7, G9
8	515	205	427	NP	HA–2	G7
9	515	205	NP	427	HA–2	G7, G9, G18
10	515	205	427	NP	HA–2	G7
11	515	205	427	427	HA–2	G7, G9
12	515	205	NP	427	HA–2	G7, G9, G18
13	515	205	427	NP	HA–2	G7
14	515	205	427	NP	HA–2	G7
15	515	205	427	NP	HA–2	G7
16	515	205	427	427	HA–2	G7, G9
17	515	205	427	NP	HA–2	G7
18	515	205	NP	427	HA–2	G7, G18
19	515	205	NP	427	HA–2	G7
20	515	205	427	NP	HA–2	G7
21	515	205	NP	427	HA–2	G7, G18
22	515	205	NP	427	HA–2	G7, G18
23	515	205	427	NP	HA–2	G7
24	515	205	427	NP	HA–2	G7
25	515	205	427	NP	HA–2	G7
26	515	205	427	427	HA–2	G7
27	515	205	427	427	HA–2	G7
28	515	205	427	427	HA–2	G7
29	515	205	427	NP	HA–2	G7
30	515	205	NP	427	HA–2	G7, G18
31	515	205	427	NP	HA–2	G7
32	515	205	427	427	HA–2	G7
33	515	205	NP	427	HA–2	G7, G18
34	515	205	427	427	HA–2	G7
35	515	205	427	NP	HA–2	G7
36	515	205	NP	427	HA–2	G7, G18
37	515	205	NP	427	HA–2	G7
38	515	205	427	NP	HA–2	G7
39	515	205	NP	427	HA–2	G7, G18
40	515	205	NP	427	HA–2	G7, G18
41	515	205	427	NP	HA–2	G7
42	515	205	427	NP	HA–2	G7
43	515	205	427	NP	HA–2	G7
44	520	205	427	NP	HA–2	G7
45	515	205	427	NP	HA–1	G7

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500
1	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
2	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
3	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
4	133	133	133	133	133	133	131	123	121	118	116	114	113	112	...	...
5	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
6	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
7	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
8	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
9	117	117	117	117	117	117	114	109	106	104	102	101	99.4	98.1	...	...
10	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
11	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
12	117	117	117	117	117	117	114	109	106	104	102	101	99.4	98.1	...	...
13	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
14	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
15	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
16	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
17	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
18	117	117	117	117	117	117	114	109	106	104	102	101	99.4	98.1	...	...
19	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
20	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
21	117	117	117	117	117	117	114	109	106	104	102	101	99.4	98.1	...	...
22	117	117	117	117	117	117	114	109	106	104	102	101	99.4	98.1	...	...
23	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
24	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
25	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
26	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
27	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
28	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
29	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
30	117	117	117	117	117	117	114	109	106	104	102	101	99.4	98.1	...	...
31	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
32	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
33	117	117	117	117	117	117	114	109	106	104	102	101	99.4	98.1	...	...
34	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
35	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
36	117	117	117	117	117	117	114	109	106	104	102	101	99.4	98.1	...	...
37	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
38	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
39	117	117	117	117	117	117	114	109	106	104	102	101	99.4	98.1	...	...
40	117	117	117	117	117	117	114	109	106	104	102	101	99.4	98.1	...	...
41	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
42	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
43	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
44	138	138	138	138	138	138	134	128	125	123	120	119	117	115	...	...
45	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
(**23**)	1	18Cr–12Ni–2Mo	Castings	SA–351	CF3M	J92800	...	...	8	1
(**23**)	2	18Cr–12Ni–2Mo	Cast pipe	SA–451	CPF3M	J92800	...	...	8	1
(**23**)	3	18Cr–12Ni–2Mo	Castings	SA–351	CF8M	J92900	...	...	8	1
(**23**)	4	18Cr–12Ni–2Mo	Cast pipe	SA–451	CPF8M	J92900	...	...	8	1
	5	18Cr–13Ni–3Mo	Plate	SA–240	317	S31700	...	≤125	8	1
	6	18Cr–13Ni–3Mo	Wld. tube	SA–249	TP317	S31700	...	...	8	1
	7	18Cr–13Ni–3Mo	Wld. tube	SA–249	TP317	S31700	...	...	8	1
	8	18Cr–13Ni–3Mo	Smls. & wld. pipe	SA–312	TP317	S31700	...	...	8	1
	9	18Cr–13Ni–3Mo	Smls. pipe	SA–312	TP317	S31700	...	≤125	8	1
	10	18Cr–13Ni–3Mo	Wld. pipe	SA–312	TP317	S31700	...	≤125	8	1
	11	18Cr–13Ni–3Mo	Fittings	SA–403	317	S31700	WP–S	...	8	1
	12	18Cr–13Ni–3Mo	Plate	SA–240	317L	S31703	...	...	8	1
	13	18Cr–13Ni–3Mo	Fittings	SA–403	317L	S31703	WP–S	...	8	1
	14	18Cr–18Ni–2Si	Smls. tube	SA–213	XM–15	S38100	...	≤125	8	1
	15	18Cr–18Ni–2Si	Plate	SA–240	XM–15	S38100	...	≤125	8	1
	16	18Cr–18Ni–2Si	Wld. tube	SA–249	TPXM–15	S38100	...	≤125	8	1
	17	18Cr–18Ni–2Si	Smls. pipe	SA–312	TPXM–15	S38100	...	≤125	8	1
	18	18Cr–18Ni–2Si	Wld. pipe	SA–312	TPXM–15	S38100	...	≤125	8	1
	19	20Cr–10Ni	Bar	SA–479	ER308	S30880	...	...	8	1
	20	21Cr–6Ni–9Mn	Forgings	SA–182	FXM–11	S21904	...	...	8	3
	21	21Cr–6Ni–9Mn	Wld. pipe	SA–312	TPXM–11	S21904	...	...	8	3
	22	21Cr–6Ni–9Mn	Smls. pipe	SA–312	TPXM–11	S21904	...	...	8	3
	23	21Cr–6Ni–9Mn	Wld. pipe	SA–312	TPXM–11	S21904	...	...	8	3
	24	21Cr–6Ni–9Mn	Plate	SA–666	XM–11	S21904	...	...	8	3
	25	21Cr–6Ni–9Mn	Forgings	SA–965	FXM–11	S21904	...	...	8	3
	26	22Cr–5Ni–3Mo–N	Forgings	SA–182	F51	S31803	...	...	10H	1
	27	22Cr–5Ni–3Mo–N	Plate	SA–240	...	S31803	...	...	10H	1
	28	22Cr–5Ni–3Mo–N	Smls. tube	SA–789	...	S31803	...	...	10H	1
	29	22Cr–5Ni–3Mo–N	Wld. tube	SA–789	...	S31803	...	...	10H	1
	30	22Cr–5Ni–3Mo–N	Smls. pipe	SA–790	...	S31803	...	...	10H	1
	31	22Cr–5Ni–3Mo–N	Wld. pipe	SA–790	...	S31803	...	...	10H	1
(**23**)	32	22Cr–5Ni–3Mo–N	Plate	SA–240	...	S32205	...	...	10H	1
(**23**)	33	22Cr–5Ni–3Mo–N	Smls. pipe	SA–790	...	S32205	...	...	10H	1
(**23**)	34	22Cr–5Ni–3Mo–N	Wld. pipe	SA–790	...	S32205	...	...	10H	1
(**23**)	35	22Cr–5Ni–3Mo–N	Forgings	SA–182	F60	S32205	...	...	10H	1
(**23**)	36	22Cr–5Ni–3Mo–N	Smls. tube	SA–789	...	S32205	...	O.D. ≤ 200	10H	1
(**23**)	37	22Cr–5Ni–3Mo–N	Wld. tube	SA–789	...	S32205	...	O.D. ≤ 200	10H	1
	38	22Cr–13Ni–5Mn	Forgings	SA–182	FXM–19	S20910	...	...	8	3
	39	22Cr–13Ni–5Mn	Plate	SA–240	XM–19	S20910	...	...	8	3
	40	22Cr–13Ni–5Mn	Wld. tube	SA–249	TPXM–19	S20910	...	...	8	3
	41	22Cr–13Ni–5Mn	Wld. tube	SA–249	TPXM–19	S20910	...	...	8	3
	42	22Cr–13Ni–5Mn	Wld. pipe	SA–312	TPXM–19	S20910	...	...	8	3
	43	22Cr–13Ni–5Mn	Smls. pipe	SA–312	TPXM–19	S20910	...	...	8	3
	44	22Cr–13Ni–5Mn	Wld. pipe	SA–312	TPXM–19	S20910	...	...	8	3
	45	22Cr–13Ni–5Mn	Wld. pipe	SA–358	XM–19	S20910	1	...	8	3

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	485	205	427	NP	HA–4	G7, G13
2	485	205	427	NP	HA–4	G7, G13
3	485	205	427	427	HA–2	G7, G9, G10, G13
4	485	205	427	NP	HA–2	G7, G13
5	515	205	NP	427	HA–2	G7, G9
6	515	205	427	NP	HA–2	G7
7	515	205	NP	427	HA–2	G7, G9, G18
8	515	205	427	NP	HA–2	G7
9	515	205	NP	427	HA–2	G7, G9
10	515	205	NP	427	HA–2	G7, G9, G18
11	515	205	NP	427	HA–2	G7
12	515	205	NP	427	HA–4	G7
13	515	205	NP	427	HA–4	G7
14	515	205	NP	427	HA–2	G7, G9
15	515	205	NP	427	HA–2	G7, G9
16	515	205	NP	427	HA–2	G7, G9, G18
17	515	205	NP	427	HA–2	G7, G9
18	515	205	NP	427	HA–2	G7, G9, G18
19	515	205	427	NP	HA–2	G7
20	620	345	316	316	HA–6	G7
21	620	345	316	NP	HA–6	G7
22	620	345	316	316	HA–6	G7
23	620	345	NP	316	HA–6	G7, G18
24	620	345	316	316	HA–6	G7
25	620	345	316	316	HA–6	G7
26	620	450	NP	316	HA–5	G13
27	620	450	NP	316	HA–5	G13
28	620	450	NP	316	HA–5	G13
29	620	450	NP	316	HA–5	G13, G18
30	620	450	NP	316	HA–5	G13
31	620	450	NP	316	HA–5	G13, G18
32	655	450	NP	316	HA–5	G7
33	655	450	NP	316	HA–5	G7
34	655	450	NP	316	HA–5	G7
35	655	480	NP	316	HA–5	G7
36	655	480	NP	316	HA–5	G7
37	655	480	NP	316	HA–5	G7
38	690	380	427	427	HA–6	G7
39	690	380	427	427	HA–6	G7
40	690	380	427	NP	HA–6	G7
41	690	380	NP	427	HA–6	G7, G18
42	690	380	427	NP	HA–6	G7
43	690	380	427	427	HA–6	G7
44	690	380	NP	427	HA–6	G7, G18
45	690	380	427	NP	HA–6	G7

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500	
1	138	138	138	138	138	133	125	119	116	114	112	110	109	108	...	...	(**23**)
2	138	138	138	138	138	133	125	119	116	114	112	110	109	108	...	...	(**23**)
3	138	138	138	138	138	133	125	119	116	114	112	110	109	108	...	...	(**23**)
4	138	138	138	138	138	133	125	119	116	114	112	110	109	108	...	...	(**23**)
5	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...	
6	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...	
7	117	117	117	117	117	114	107	101	99.0	96.8	95.7	94.4	93.1	92.5	...	...	
8	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...	
9	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...	
10	117	117	117	117	117	114	107	101	99.0	96.8	95.7	94.4	93.1	92.5	...	...	
11	138	138	138	138	138	134	126	119	116	114	112	111	110	108	...	...	
12	138	138	138	138	138	131	123	118	116	113	111	109	107	105	...	...	
13	138	138	138	138	138	131	123	118	116	113	111	109	107	105	...	...	
14	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
15	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
16	117	117	117	117	117	110	103	98.5	96.5	94.7	92.8	90.9	89.1	87.2	...	...	
17	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
18	117	117	117	117	117	110	103	98.5	96.5	94.7	92.8	90.9	89.1	87.2	...	...	
19	138	138	138	138	138	129	122	116	114	111	109	107	105	103	...	...	
20	207	207	206	200	193	183	171	162	158	...	...	...	...	...	...	...	
21	207	207	206	200	193	183	171	162	158	...	...	...	...	...	...	...	
22	207	207	206	200	193	183	171	162	158	...	...	...	...	...	...	...	
23	176	176	175	170	164	156	145	137	135	...	...	...	...	...	...	...	
24	207	207	206	200	193	183	171	162	158	...	...	...	...	...	...	...	
25	207	207	206	200	193	183	171	162	158	...	...	...	...	...	...	...	
26	207	207	207	204	199	193	188	186	185	...	...	...	...	...	...	...	
27	207	207	207	204	199	193	188	186	185	...	...	...	...	...	...	...	
28	207	207	207	204	199	193	188	186	185	...	...	...	...	...	...	...	
29	176	176	176	173	169	164	160	158	157	...	...	...	...	...	...	...	
30	207	207	207	204	199	193	188	186	185	...	...	...	...	...	...	...	
31	176	176	176	173	169	164	160	158	157	...	...	...	...	...	...	...	
32	218	218	218	214	210	203	199	196	196	...	...	...	...	...	...	...	(**23**)
33	218	218	218	214	210	203	199	196	196	...	...	...	...	...	...	...	(**23**)
34	186	186	186	182	179	173	169	167	166	...	...	...	...	...	...	...	(**23**)
35	218	218	218	214	210	203	199	196	196	...	...	...	...	...	...	...	(**23**)
36	218	218	218	214	210	203	199	196	196	...	...	...	...	...	...	...	(**23**)
37	186	186	186	182	179	173	169	167	166	...	...	...	...	...	...	...	(**23**)
38	230	229	228	222	216	210	206	202	201	200	198	196	195	194	...	...	
39	230	229	228	222	216	210	206	202	201	200	198	196	195	194	...	...	
40	230	229	228	222	216	210	206	202	201	200	198	196	195	194	...	...	
41	195	190	182	175	169	160	153	147	145	144	142	140	138	136	...	...	
42	230	229	228	222	216	210	206	202	201	200	198	196	195	194	...	...	
43	230	229	228	222	216	210	206	202	201	200	198	196	195	194	...	...	
44	195	195	194	189	184	178	174	172	171	170	169	167	166	164	...	...	
45	230	229	228	222	216	210	206	202	201	200	198	196	195	194	...	...	

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	22Cr–13Ni–5Mn	Wld. pipe	SA–358	XM–19	S20910	3	...	8	3
2	22Cr–13Ni–5Mn	Wld. pipe	SA–358	XM–19	S20910	4	...	8	3
3	22Cr–13Ni–5Mn	Fittings	SA–403	XM–19	S20910	...	...	8	3
4	22Cr–13Ni–5Mn	Fittings	SA–403	XM–19	S20910	CR	...	8	3
5	22Cr–13Ni–5Mn	Wld. fittings	SA–403	XM–19	S20910	WP–W	...	8	3
6	22Cr–13Ni–5Mn	Wld. fittings	SA–403	XM–19	S20910	WP–W	...	8	3
7	22Cr–13Ni–5Mn	Wld. fittings	SA–403	XM–19	S20910	WP–WX	...	8	3
8	22Cr–13Ni–5Mn	Bar	SA–479	XM–19	S20910	...	...	8	3
9	22Cr–13Ni–5Mn	Wld. pipe	SA–813	TPXM–19	S20910	...	...	8	3
10	22Cr–13Ni–5Mn	Wld. pipe	SA–814	TPXM–19	S20910	...	...	8	3
11	22Cr–13Ni–5Mn	Forgings	SA–965	FXM–19	S20910	...	...	8	3
12	23Cr–4Ni–Mo–Cu	Plate	SA–240	...	S32304	...	...	10H	1
13	23Cr–12Ni	Fittings	SA–403	309	S30900	...	...	8	2
14	23Cr–12Ni	Fittings	SA–403	309	S30900	...	...	8	2
15	23Cr–12Ni	Fittings	SA–403	309	S30900	WP–S	...	8	2
16	23Cr–12Ni	Wld. fittings	SA–403	309	S30900	WP–W	...	8	2
17	23Cr–12Ni	Wld. fittings	SA–403	309	S30900	WP–W	...	8	2
18	23Cr–12Ni	Wld. fittings	SA–403	309	S30900	WP–WX	...	8	2
19	23Cr–12Ni	Smls. tube	SA–213	TP309S	S30908	...	...	8	2
20	23Cr–12Ni	Plate	SA–240	309S	S30908	...	...	8	2
21	23Cr–12Ni	Wld. tube	SA–249	TP309S	S30908	...	...	8	2
22	23Cr–12Ni	Smls. pipe	SA–312	TP309S	S30908	...	...	8	2
23	23Cr–12Ni	Wld. pipe	SA–312	TP309S	S30908	...	...	8	2
24	23Cr–12Ni	Wld. pipe	SA–358	309S	S30908	1	...	8	2
25	23Cr–12Ni	Wld. pipe	SA–358	309S	S30908	3	...	8	2
26	23Cr–12Ni	Wld. pipe	SA–358	309S	S30908	4	...	8	2
27	23Cr–12Ni	Bar	SA–479	309S	S30908	...	...	8	2
28	23Cr–12Ni	Wld. pipe	SA–813	TP309S	S30908	...	...	8	2
29	23Cr–12Ni	Wld. pipe	SA–814	TP309S	S30908	...	...	8	2
30	23Cr–12Ni	Smls. tube	SA–213	TP309H	S30909	...	...	8	2
31	23Cr–12Ni	Plate	SA–240	309H	S30909	...	...	8	2
32	23Cr–12Ni	Wld. tube	SA–249	TP309H	S30909	...	...	8	2
33	23Cr–12Ni	Smls. pipe	SA–312	TP309H	S30909	...	...	8	2
34	23Cr–12Ni	Wld. pipe	SA–312	TP309H	S30909	...	...	8	2
35	23Cr–12Ni	Bar	SA–479	309H	S30909	...	...	8	2
36	23Cr–12Ni	Bar	SA/JIS G4303	SUS309S	...	...	...	8	2
37	23Cr–12Ni–Cb	Smls. tube	SA–213	TP309Cb	S30940	...	...	8	2
38	23Cr–12Ni–Cb	Plate	SA–240	309Cb	S30940	...	...	8	2
39	23Cr–12Ni–Cb	Wld. tube	SA–249	TP309Cb	S30940	...	...	8	2
40	23Cr–12Ni–Cb	Smls. pipe	SA–312	TP309Cb	S30940	...	...	8	2
41	23Cr–12Ni–Cb	Wld. pipe	SA–312	TP309Cb	S30940	...	...	8	2
42	23Cr–12Ni–Cb	Wld. pipe	SA–813	TP309Cb	S30940	...	...	8	2
43	23Cr–12Ni–Cb	Wld. pipe	SA–814	TP309Cb	S30940	...	...	8	2
(**23**) 44	24Cr–22Ni–6Mo–2W–Cu–N	Forgings	SA–182	F58	S31266	...	...	45	...
(**23**) 45	24Cr–22Ni–6Mo–2W–Cu–N	Forgings	SA–240	...	S31266	...	...	45	...

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	690	380	427	NP	HA–6	G7
2	690	380	427	NP	HA–6	G7
3	690	380	427	NP	HA–6	G7
4	690	380	NP	427	HA–6	G7, G18
5	690	380	427	NP	HA–6	G7
6	690	380	NP	427	HA–6	G7, G18
7	690	380	NP	427	HA–6	G7, G18
8	690	380	427	427	HA–6	G7
9	690	380	427	NP	HA–6	G7
10	690	380	427	NP	HA–6	G7
11	690	380	427	427	HA–6	G7
12	600	400	NP	316	HA–6	G7, G13
13	515	205	427	NP	HA–2	G7
14	515	205	NP	427	HA–2	G7, G18
15	515	205	NP	427	HA–2	G7
16	515	205	427	NP	HA–2	G7
17	515	205	NP	427	HA–2	G7, G18
18	515	205	NP	427	HA–2	G7, G18
19	515	205	NP	427	HA–2	G7, G9
20	515	205	NP	427	HA–2	G7, G9
21	515	205	NP	427	HA–2	G7, G18
22	515	205	NP	427	HA–2	G7, G9
23	515	205	NP	427	HA–2	G7, G9, G18
24	515	205	427	NP	HA–2	G7
25	515	205	427	NP	HA–2	G7
26	515	205	427	NP	HA–2	G7
27	515	205	427	NP	HA–2	G7
28	515	205	NP	427	HA–2	G7, G9, G18
29	515	205	NP	427	HA–2	G7, G9, G18
30	515	205	NP	427	HA–2	G7
31	515	205	NP	427	HA–2	G7
32	515	205	NP	427	HA–2	G7, G18
33	515	205	NP	427	HA–2	G7
34	515	205	NP	427	HA–2	G7, G18
35	515	205	NP	427	HA–2	G7
36	520	205	427	NP	HA–2	G7
37	515	205	NP	427	HA–2	G7, G9
38	515	205	NP	427	HA–2	G7, G9
39	515	205	NP	427	HA–2	G7, G9, G18
40	515	205	NP	427	HA–2	G7, G9
41	515	205	NP	427	HA–2	G7, G9, G18
42	515	205	NP	427	HA–2	G7, G9, G18
43	515	205	NP	427	HA–2	G7, G9, G18
44	750	420	NP	427	HA–10	G7
45	750	420	NP	427	HA–10	G7

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500	
1	230	229	228	222	216	210	206	202	201	200	198	196	195	194	...	...	
2	230	229	228	222	216	210	206	202	201	200	198	196	195	194	...	...	
3	230	229	228	222	216	210	206	202	201	200	198	196	195	194	...	...	
4	195	195	194	189	184	178	174	172	171	170	169	167	166	164	...	...	
5	230	229	228	222	216	210	206	202	201	200	198	196	195	194	...	...	
6	195	195	194	189	184	178	174	172	171	170	169	167	166	164	...	...	
7	195	195	194	189	184	178	174	172	171	170	169	167	166	164	...	...	
8	230	229	228	222	216	210	206	202	201	200	198	196	195	194	...	...	
9	230	229	228	222	216	210	206	202	201	200	198	196	195	194	...	...	
10	230	229	228	222	216	210	206	202	201	200	198	196	195	194	...	...	
11	230	229	228	222	216	210	206	202	201	200	198	196	195	194	...	...	
12	200	197	192	186	180	175	172	170	168	...	...	...	...	...	...	...	
13	138	138	138	138	138	138	135	131	129	127	125	124	122	121	...	...	
14	117	117	117	117	117	117	115	111	109	108	107	105	104	102	...	...	
15	138	138	138	138	138	138	135	131	129	127	125	124	122	121	...	...	
16	138	138	138	138	138	138	135	131	129	127	125	124	122	121	...	...	
17	117	117	117	117	117	117	115	111	109	108	107	105	104	102	...	...	
18	117	117	117	117	117	117	115	111	109	108	107	105	104	102	...	...	
19	138	138	138	138	138	138	135	131	129	127	125	124	122	121	...	...	
20	138	138	138	138	138	138	135	131	129	127	125	124	122	121	...	...	
21	117	117	117	117	117	117	115	111	109	108	107	105	104	102	...	...	
22	138	138	138	138	138	138	135	131	129	127	125	124	122	121	...	...	
23	117	117	117	117	117	117	115	111	109	108	107	105	104	102	...	...	
24	138	138	138	138	138	138	135	131	129	127	125	124	122	121	...	...	
25	138	138	138	138	138	138	135	131	129	127	125	124	122	121	...	...	
26	138	138	138	138	138	138	135	131	129	127	125	124	122	121	...	...	
27	138	138	138	138	138	138	135	131	129	127	125	124	122	121	...	...	
28	117	117	117	117	117	117	115	111	109	108	107	105	104	102	...	...	
29	117	117	117	117	117	117	115	111	109	108	107	105	104	102	...	...	
30	138	138	138	138	138	138	135	131	129	127	125	124	122	121	...	...	
31	138	138	138	138	138	138	135	131	129	127	125	124	122	121	...	...	
32	117	117	117	117	117	117	115	111	109	108	107	105	104	102	...	...	
33	138	138	138	138	138	138	135	131	129	127	125	124	122	121	...	...	
34	117	117	117	117	117	117	115	111	109	108	107	105	104	102	...	...	
35	138	138	138	138	138	138	135	131	129	127	125	124	122	121	...	...	
36	138	138	138	138	138	138	135	131	129	127	125	124	122	121	...	...	
37	138	138	138	138	138	138	135	131	129	127	125	124	122	121	...	...	
38	138	138	138	138	138	138	135	131	129	127	125	124	122	121	...	...	
39	117	117	117	117	117	117	115	111	109	108	107	105	104	102	...	...	
40	138	138	138	138	138	138	135	131	129	127	125	124	122	121	...	...	
41	117	117	117	117	117	117	115	111	109	108	107	105	104	102	...	...	
42	117	117	117	117	117	117	115	111	109	108	107	105	104	102	...	...	
43	117	117	117	117	117	117	115	111	109	108	107	105	104	102	...	...	
44	250	248	245	239	232	223	217	213	211	209	208	206	205	202	...	...	(**23**)
45	250	248	245	239	232	223	217	213	211	209	208	206	205	202	...	...	(**23**)

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
(**23**)	1	24Cr–22Ni–6Mo–2W–Cu–N	Wld. pipe	SA–358	...	S31266	...	...	45	...
(**23**)	2	25Cr–5Ni–3Mo–2Cu	Plate	SA–240	255	S32550	...	...	10H	1
	3	25Cr–6Ni–Mo–N	Plate	SA–240	...	S31200	...	...	10H	1
	4	25Cr–12Ni	Castings	SA–351	CH8	J93400	...	...	8	2
	5	25Cr–12Ni	Cast pipe	SA–451	CPH8	J93400	...	...	8	2
	6	25Cr–12Ni	Castings	SA–351	CH20	J93402	...	...	8	2
	7	25Cr–12Ni	Cast pipe	SA–451	CPH20	J93402	...	...	8	2
	8	25Cr–20Ni	Castings	SA–351	CK20	J94202	...	...	8	2
	9	25Cr–20Ni	Cast pipe	SA–451	CPK20	J94202	...	...	8	2
	10	25Cr–20Ni	Forgings	SA–182	F310	S31000	...	≤130	8	2
	11	25Cr–20Ni	Forgings	SA–965	F310	S31000	...	...	8	2
	12	25Cr–20Ni	Smls. tube	SA–213	TP310S	S31008	...	...	8	2
	13	25Cr–20Ni	Plate	SA–240	310S	S31008	...	...	8	2
	14	25Cr–20Ni	Wld. tube	SA–249	TP310S	S31008	...	...	8	2
	15	25Cr–20Ni	Smls. pipe	SA–312	TP310S	S31008	...	...	8	2
	16	25Cr–20Ni	Wld. pipe	SA–312	TP310S	S31008	...	...	8	2
	17	25Cr–20Ni	Wld. pipe	SA–358	310S	S31008	1	...	8	2
	18	25Cr–20Ni	Wld. pipe	SA–358	310S	S31008	3	...	8	2
	19	25Cr–20Ni	Wld. pipe	SA–358	310S	S31008	4	...	8	2
	20	25Cr–20Ni	Fittings	SA–403	310S	S31008	...	...	8	2
	21	25Cr–20Ni	Fittings	SA–403	310S	S31008	CR	...	8	2
	22	25Cr–20Ni	Fittings	SA–403	310S	S31008	WP–S	...	8	2
	23	25Cr–20Ni	Wld. fittings	SA–403	310S	S31008	WP–W	...	8	2
	24	25Cr–20Ni	Wld. fittings	SA–403	310S	S31008	WP–W	...	8	2
	25	25Cr–20Ni	Wld. fittings	SA–403	310S	S31008	WP–WX	...	8	2
	26	25Cr–20Ni	Wld. pipe	SA–813	TP310S	S31008	...	...	8	2
	27	25Cr–20Ni	Wld. pipe	SA–814	TP310S	S31008	...	...	8	2
	28	25Cr–20Ni	Smls. tube	SA–213	TP310H	S31009	...	...	8	2
	29	25Cr–20Ni	Plate	SA–240	310H	S31009	...	...	8	2
	30	25Cr–20Ni	Wld. tube	SA–249	TP310H	S31009	...	...	8	2
	31	25Cr–20Ni	Smls. pipe	SA–312	TP310H	S31009	...	...	8	2
	32	25Cr–20Ni	Wld. pipe	SA–312	TP310H	S31009	...	...	8	2
	33	25Cr–20Ni–Cb	Wld. tube	SA–249	TP310Cb	S31040	...	...	8	2
	34	25Cr–20Ni–Cb	Wld. pipe	SA–312	TP310Cb	S31040	...	...	8	2
	35	25Cr–20Ni–Cb	Wld. pipe	SA–813	TP310Cb	S31040	...	...	8	2
	36	25Cr–20Ni–Cb	Wld. pipe	SA–814	TP310Cb	S31040	...	...	8	2
(**23**)	37	25Cr–22Ni–2Mo–N	Forgings	SA–182	F310MoLn	S31050	...	...	8	2
	38	25Cr–22Ni–2Mo–N	Smls. tube	SA–213	TP310MoLN	S31050	...	$6 < t \le 32$	8	2
	39	25Cr–22Ni–2Mo–N	Wld. tube	SA–249	TP310MoLN	S31050	...	$6 < t \le 32$	8	2
	40	25Cr–22Ni–2Mo–N	Wld. pipe	SA–312	TP310MoLN	S31050	...	$6 < t \le 32$	8	2
	41	25Cr–22Ni–2Mo–N	Plate	SA–240	310MoLN	S31050	...	...	8	2
	42	25Cr–22Ni–2Mo–N	Smls. tube	SA–213	TP310MoLN	S31050	...	≤6	8	2
	43	25Cr–22Ni–2Mo–N	Wld. tube	SA–249	TP310MoLN	S31050	...	≤6	8	2
	44	25Cr–22Ni–2Mo–N	Wld. pipe	SA–312	TP310MoLN	S31050	...	≤6	8	2
(**23**)	45	29Cr–6.5Ni–2Mo–N	Plate, sheet, strip	SA–240	...	S32906	...	$t \ge 10$	10H	1

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	750	420	NP	427	HA–10	G7
2	760	550	NP	260	HA–5	G7
3	690	450	NP	316	HA–5	G7, G13
4	450	195	427	427	HA–3	G7, G9, G10, G13
5	450	195	427	NP	HA–3	G7, G13
6	485	205	427	427	HA–2	G7
7	485	205	427	NP	HA–2	G7
8	450	195	427	427	HA–3	G7
9	450	195	427	NP	HA–3	G7
10	515	205	NP	427	HA–2	G7, G9, G11, G12
11	515	205	427	427	HA–2	G7, G9, G11, G12
12	515	205	NP	427	HA–2	G7, G9, G11, G12
13	515	205	NP	427	HA–2	G7, G9, G11, G12
14	515	205	NP	427	HA–2	G7, G9, G11, G12, G18
15	515	205	NP	427	HA–2	G7, G9, G11, G12
16	515	205	NP	427	HA–2	G7, G9, G11, G12, G18
17	515	205	427	NP	HA–2	G7
18	515	205	427	NP	HA–2	G7
19	515	205	427	NP	HA–2	G7
20	515	205	427	NP	HA–2	G7
21	515	205	NP	427	HA–2	G7, G18
22	515	205	NP	427	HA–2	G7
23	515	205	427	NP	HA–2	G7
24	515	205	NP	427	HA–2	G7, G18
25	515	205	NP	427	HA–2	G7, G18
26	515	205	NP	427	HA–2	G7, G9, G11, G12, G18
27	515	205	NP	427	HA–2	G7, G9, G11, G12, G18
28	515	205	NP	427	HA–2	G7
29	515	205	NP	427	HA–2	G7
30	515	205	NP	427	HA–2	G7, G18
31	515	205	NP	427	HA–2	G7
32	515	205	NP	427	HA–2	G7, G18
33	515	205	NP	427	HA–2	G7, G9, G11, G12, G18
34	515	205	NP	427	HA–2	G7, G9, G11, G12, G18
35	515	205	NP	427	HA–2	G7, G9, G11, G12, G18
36	515	205	NP	427	HA–2	G7, G9, G11, G12, G18
37	540	255	NP	427	HA–2	G7
38	540	255	NP	427	HA–2	...
39	540	255	NP	427	HA–2	G18
40	540	255	NP	427	HA–2	G18
41	550	240	NP	316	HA–2	...
42	580	270	NP	427	HA–2	...
43	580	270	NP	427	HA–2	G18
44	580	270	NP	427	HA–2	G18
45	750	550	NP	316	HA–5	G8

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500	
1	213	211	209	203	197	190	184	181	179	178	177	175	174	172	...	...	(**23**)
2	253	252	251	244	237	230	227	226	...	...	...	...	...	...	...	...	(**23**)
3	230	230	229	224	218	212	210	210	210	...	...	...	...	...	...	...	
4	129	129	129	128	127	124	122	119	117	114	112	110	106	103	...	...	
5	129	129	129	128	127	124	122	119	117	114	112	110	106	103	...	...	
6	138	138	138	138	137	134	131	128	125	123	120	117	114	111	...	...	
7	138	138	138	138	137	134	131	128	125	123	120	117	114	111	...	...	
8	129	129	129	128	127	124	122	119	117	114	112	110	106	103	...	...	
9	129	129	129	128	127	124	122	119	117	114	112	110	106	103	...	...	
10	138	138	138	138	138	138	134	129	127	125	123	122	120	118	...	...	
11	138	138	138	138	138	138	134	129	127	125	123	122	120	118	...	...	
12	138	138	138	138	138	138	134	129	127	125	123	122	120	118	...	...	
13	138	138	138	138	138	138	134	129	127	125	123	122	120	118	...	...	
14	117	117	117	117	117	117	114	109	108	106	105	103	102	101	...	...	
15	138	138	138	138	138	138	134	129	127	125	123	122	120	118	...	...	
16	117	117	117	117	117	117	114	109	108	106	105	103	102	101	...	...	
17	138	138	138	138	138	138	134	129	127	125	123	122	120	118	...	...	
18	138	138	138	138	138	138	134	129	127	125	123	122	120	118	...	...	
19	138	138	138	138	138	138	134	129	127	125	123	122	120	118	...	...	
20	138	138	138	138	138	138	134	129	127	125	123	122	120	118	...	...	
21	117	117	117	117	117	117	114	109	108	106	105	103	102	101	...	...	
22	138	138	138	138	138	138	134	129	127	125	123	122	120	118	...	...	
23	138	138	138	138	138	138	134	129	127	125	123	122	120	118	...	...	
24	117	117	117	117	117	117	114	109	108	106	105	103	102	101	...	...	
25	117	117	117	117	117	117	114	109	108	106	105	103	102	101	...	...	
26	117	117	117	117	117	117	114	109	108	106	105	103	102	101	...	...	
27	117	117	117	117	117	117	114	109	108	106	105	103	102	101	...	...	
28	138	138	138	138	138	138	134	129	127	125	123	122	120	118	...	...	
29	138	138	138	138	138	138	134	129	127	125	123	122	120	118	...	...	
30	117	117	117	117	117	117	114	109	108	106	105	103	102	101	...	...	
31	138	138	138	138	138	138	134	129	127	125	123	122	120	118	...	...	
32	117	117	117	117	117	117	114	109	108	106	105	103	102	101	...	...	
33	117	117	117	117	117	117	114	109	108	106	105	103	102	101	...	...	
34	117	117	117	117	117	117	114	109	108	106	105	103	102	101	...	...	
35	117	117	117	117	117	117	114	109	108	106	105	103	102	101	...	...	
36	117	117	117	117	117	117	114	109	108	106	105	103	102	101	...	...	
37	170	170	170	170	167	162	157	150	147	144	140	137	134	131	...	...	(**23**)
38	170	170	170	169	167	162	158	151	147	144	140	137	134	131	...	...	
39	145	145	145	144	143	138	134	128	125	122	120	116	114	111	...	...	
40	145	145	145	144	143	138	134	128	125	122	120	116	114	111	...	...	
41	161	161	161	161	161	157	149	142	139	...	...	...	...	...	...	...	
42	179	179	179	179	179	174	166	159	155	151	148	145	142	138	...	...	
43	152	152	152	152	152	148	141	135	132	129	126	123	120	118	...	...	
44	152	152	152	152	152	148	141	135	132	129	126	123	120	118	...	...	
45	250	250	249	243	238	231	228	228	228	...	...	...	...	...	...	...	(**23**)

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Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
(**23**)	1	29Cr–6.5Ni–2Mo–N	Bar	SA–479	...	S32906	...	...	10H	1
(**23**)	2	29Cr–6.5Ni–2Mo–N	Smls. tube	SA–789	...	S32906	...	$t \geq 10$	10H	1
(**23**)	3	29Cr–6.5Ni–2Mo–N	Smls. pipe	SA–790	...	S32906	...	$t \geq 10$	10H	1
(**23**)	4	29Cr–6.5Ni–2Mo–N	Plate, sheet, strip	SA–240	...	S32906	...	$t < 10$	10H	1
(**23**)	5	29Cr–6.5Ni–2Mo–N	Smls. tube	SA–789	...	S32906	...	$t < 10$	10H	1
(**23**)	6	29Cr–6.5Ni–2Mo–N	Smls. pipe	SA–790	...	S32906	...	$t < 10$	10H	1

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	750	550	NP	316	HA–5	G8
2	750	550	NP	316	HA–5	G8
3	750	550	NP	316	HA–5	G8
4	800	650	NP	316	HA–5	G8
5	800	650	NP	316	HA–5	G8
6	800	650	NP	316	HA–5	G8

Table 2A (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	200	250	300	325	350	375	400	425	450	475	500	
1	250	250	249	243	238	231	228	228	228	...	...	...	...	...	...	...	(**23**)
2	250	250	249	243	238	231	228	228	228	...	...	...	...	...	...	...	(**23**)
3	250	250	249	243	238	231	228	228	228	...	...	...	...	...	...	...	(**23**)
4	267	266	265	259	253	246	243	242	242	...	...	...	...	...	...	...	(**23**)
5	267	266	265	259	253	246	243	242	242	...	...	...	...	...	...	...	(**23**)
6	267	266	265	259	253	246	243	242	242	...	...	...	...	...	...	...	(**23**)

NOTES TO TABLE 2A

GENERAL NOTES

(a) The following abbreviations are used: Smls., Seamless; Temp., Temperature; and Wld., Welded.

(b) An alternative typeface is used for stress values based on successful experience in service (see Notes E1 through E4).

(c) Where specifications, grades, classes, and types are listed in this Table, and where the material specification in Section II, Part A or Part B is a dual–unit specification (e.g., SA–516/SA–516M), the values listed in this Table shall be applicable to either the customary U.S. version of the material specification or the SI units version of the material specification. For example, the values listed for SA–516 Grade 70 shall be used when SA–516M Grade 485 is used in construction.

(d) The values in this Table may be interpolated to determine values for intermediate temperatures. The values at intermediate temperatures shall be rounded to the same number of decimal places as the value at the higher temperature between which values are being interpolated. The rounding rule is: when the next digit beyond the last place to be retained is less than 5, retain unchanged the digit in the last place retained; when the digit next beyond the last place to be retained is 5 or greater, increase by 1 the digit in the last place retained.

(e) The properties of steels are influenced by the processing history, heat treatment, melting practice, and level of residual elements. See Nonmandatory Appendix A for more information.

(f) Where a size limit appears in the Size/Thickness column, the limit applies to the dimension appropriate to the product form: wall thickness of tubing, pipe, pipe fittings, and hollow forgings; thickness of plate, flat bar and forgings, and polygonal bar; diameter of solid bar and bolting; and thickest cross–section of other pressure parts, e.g., castings and forgings.

NOTES – EXPERIENCE CRITERION

E1 For values at 350°C and above, the design stress intensity values or maximum allowable stress values are based on successful experience in service.

E2 For values at 375°C and above, the design stress intensity values or maximum allowable stress values are based on successful experience in service.

E3 For values at 450°C and above, the design stress intensity values or maximum allowable stress values are based on successful experience in service.

E4 For values at 475°C, the design stress intensity values or maximum allowable stress values are based on successful experience in service.

NOTES – GENERAL REQUIREMENTS

G1 Material that conforms to Class 10, 13, 20, 23, 30, 33, 40, 43, 50, or 53 is not permitted.

G2 Material that conforms to Class 11 or 12 is not permitted.

G3 Material that conforms to Class 11 or 12 is not permitted when the nominal thickness of the material exceeds 19 mm.

G4 Material that conforms to Class 11 or 12 is not permitted when the nominal thickness of the material exceeds 32 mm.

G5 For Section III applications, a product analysis is required on this material.

G6 SA–723 shall not be used for minimum permissible temperature below +5°C.

G7 Due to the relatively low yield strength of these materials, these higher stress values were established at temperatures where the short–time tensile properties govern to permit the use of these alloys where slightly greater deformation is acceptable. The stress values in this range exceed 66⅔% but do not exceed 90% of the yield strength at temperature. Use of these stresses may result in dimensional changes due to permanent strain. These stress values are not recommended for the flanges of gasketed joints or other applications where slight amounts of distortion can cause leakage or malfunction. Table Y–2 lists multiplying factors that, when applied to the yield strength values shown in Table Y–1, will give allowable stress values that will result in lower levels of permanent strain.

G8 This material has reduced toughness at room temperature after exposure at high temperature. The degree of embrittlement depends on composition, heat treatment, time, and temperature. The lowest temperature of concern is about 250°C. See Nonmandatory Appendix A, A–207.

G9 At temperatures over 550°C, these stress values apply only when the carbon is 0.04% or higher. This note is applicable only when stresses above 550°C are published.

G10 For temperatures above 550°C, these stress values may be used only if the material has been heat treated by heating to a minimum temperature of 1040°C and quenching in water or rapidly cooling by other means. This note is applicable only when stresses above 550° C are published.

G11 These stress values at temperatures of 575°C and above should be used only when assurance is provided that the steel has a predominant grain size not finer than ASTM No. 6. This note is applicable only when stresses above 550°C are published.

G12 These stress values shall be considered basic values to be used when no effort is made to control or check the grain size of the steel.

G13 This steel may be expected to develop embrittlement after service at moderately elevated temperature; see Nonmandatory Appendix A, A–207 and A–208.

G14 All forgings shall have a maximum tensile strength not in excess of 175 MPa above the specified minimum.

G15 Fabricated from SA–387 Grade 12 Class 1 plate.

G16 Fabricated from SA–387 Grade 12 Class 2 plate.

G17 A factor of 4 was used for tensile strength to obtain the stress value.

G18 A quality factor of 0.85 has been applied in arriving at the stress values for this material.

G19 The tensile strength shall not be in excess of 140 MPa above the specified minimum.

G20 For Section VIII applications, SA–723 is exempt from the requirement in Section VIII, Division 2, 6.7.6.3(b) that the average of the individual Brinell hardness numbers shall not be more than 10% below or 25% above the number corresponding to the tensile strength.

G21 See Section VIII, Division 2, 3.4.

(**23**) G22 The allowable stress value at 65°C shall be used at 66°C.

NOTES TO TABLE 2A (CONT'D)

NOTES – HEAT TREATMENT REQUIREMENTS

H1 Annealed.

H2 Quenched and tempered at 650°C.

H3 For Section III applications, pieces that are formed (after quenching and tempering) at a temperature lower than 15°C below the final tempering temperature shall be heat treated after forming when the extreme fiber strain from forming exceeds 3%. Heat treatment shall be 580°C minimum, but not higher than 15°C below the final tempering temperature for a minimum time of 1 h per 25 mm of thickness. Pieces formed at temperatures within 15°C higher than the original tempering temperature shall be requenched and tempered, either before or after welding into the vessel.

H4 Liquid quenched and tempered.

H5 Normalized, normalized and tempered, or quenched and tempered.

H6 For Section VIII applications involving consideration of heat treatment after forming or welding, see Section VIII, Division 2, Table 6.15 for P–No. 10K, Group No. 1 materials.

NOTES – SIZE REQUIREMENTS

S1 The maximum thickness of forgings shall not exceed 95 mm (100 mm as heat treated).

S2 Both DN 200 and larger, and schedule 140 and heavier.

S3 The minimum thickness of pressure–retaining parts shall be 6 mm.

S4 For Section III applications, the minimum thickness of shells, heads, and other pressure–retaining parts shall be 6 mm. The maximum thickness shall be limited only by the ability to develop the specified mechanical properties.

S5 Either DN 200 and larger and less than schedule 140 wall, or less than DN 200 and all wall thicknesses.

S6 The maximum section thickness shall not exceed 75 mm for double–normalized–and–tempered forgings, or 125 mm for quenched–and–tempered forgings.

NOTES – WELDING REQUIREMENTS

W1 Not for welded construction.

W2 In welded construction, for temperatures above 450°C, the weld metal shall have a carbon content of greater than 0.05%.

W3 The following, in addition to the variables in Section IX, QW–250, shall be considered as essential variables requiring requalification of the welding procedure:

(a) An increase in the maximum or a decrease in the minimum specified preheat or interpass temperatures. The specified range of preheat temperatures shall not exceed 85°C.

(b) A change in the thickness *T* of the welding procedure qualification test plate as follows:

(1) For welded joints that are quenched and tempered after welding, any increase in thickness (the minimum thickness qualified in all cases is 6 mm).

(2) For welded joints that are not quenched and tempered after welding, any change as follows:

(–a) for *T* less than 16 mm, any decrease in thickness (the maximum thickness qualified is 2*T*)

(–b) for *T* equal to 16 mm and over, any departure from the range of 16 mm to 2*T*

W4 Welded, with the tensile strength of the Section IX reduced section tension test less than 690 MPa but not less than 655 MPa.

W5 For Section VIII applications, welding not permitted when carbon content exceeds 0.35% by ladle analysis except for limited types of welding, as allowed in Section VIII, Division 2, Part 6.

W6 For Section VIII applications, Section IX, QW–250 Variables QW–404.12, QW–406.3, QW–407.2, and QW–409.1 shall also apply to this material. These variables shall be applied in accordance with the rules for welding of Section VIII, Division 2, Part 6.

W7 Nonwelded, or welded if the tensile strength of the Section IX reduced section tension test is not less than 690 MPa.

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Table 2B
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	P-No.
1	...	Drawn smls. tube	SB–210	...	Alclad 3003	O	0.25–12.7	21
2	...	Drawn smls. tube	SB–210	...	Alclad 3003	H113	1.27–12.7	21
3	...	Smls. extr. tube	SB–241	...	Alclad 3003	O	...	21
4	...	Smls. extr. tube	SB–241	...	Alclad 3003	H112	...	21
5	...	Plate, sheet	SB–209	...	A93003	O	0.15–76.2	21
6	...	Plate, sheet	SB–209	...	A93003	H112	6.35–12.69	21
7	...	Plate, sheet	SB–209	...	A93003	H112	12.70–50.80	21
8	...	Plate, sheet	SB–209	...	A93003	H112	50.81–76.2	21
9	...	Drawn smls. tube	SB–210	...	A93003	O	0.25–12.7	21
10	...	Drawn smls. tube	SB–210	...	A93003	H113	0.25–12.7	21
11	...	Bar, rod, shapes	SB–221	...	A93003	O	...	21
12	...	Bar, rod, shapes	SB–221	...	A93003	H112	...	21
13	...	Smls. extr. tube	SB–241	...	A93003	O	...	21
14	...	Smls. pipe	SB–241	...	A93003	H112	≥25.4	21
15	...	Smls. extr. tube	SB–241	...	A93003	H112	...	21
16	...	Plate, sheet	SB–209	...	A93004	O	0.15–76.2	22
17	...	Plate, sheet	SB–209	...	A93004	H112	6.35–76.2	22
18	...	Plate, sheet	SB–209	...	A95052	O	1.30–76.2	22
19	...	Plate, sheet	SB–209	...	A95052	H112	6.35–12.69	22
20	...	Plate, sheet	SB–209	...	A95052	H112	12.70–76.20	22
(23) 21	...	Plate, sheet	SB–209	...	A95083	O	1.30–38.10	25
(23) 22	...	Plate, sheet	SB–209	...	A95083	O	38.11–76.20	25
(23) 23	...	Plate, sheet	SB–209	...	A95083	O	76.21–127.00	25
(23) 24	...	Plate, sheet	SB–209	...	A95083	O	127.01–177.80	25
(23) 25	...	Plate, sheet	SB–209	...	A95083	O	177.81–203.2	25
(23) 26	...	Plate, sheet	SB–209	...	A95083	H112	6.35–38.10	25
(23) 27	...	Plate, sheet	SB–209	...	A95083	H112	38.11–76.20	25
(23) 28	...	Bar, rod, shapes	SB–221	...	A95083	H111	≤127.0	25
(23) 29	...	Smls. extr. tube	SB–241	...	A95083	H111	...	25
(23) 30	...	Plate, sheet	SB–209	...	A95086	O	1.30–50.8	25
(23) 31	...	Plate, sheet	SB–209	...	A95086	H112	1.60–12.69	25
(23) 32	...	Plate, sheet	SB–209	...	A95086	H112	12.70–25.40	25
(23) 33	...	Plate, sheet	SB–209	...	A95086	H112	25.41–50.80	25
(23) 34	...	Plate, sheet	SB–209	...	A95086	H112	50.81–76.2	25
35	...	Plate, sheet	SB–209	...	A95454	O	1.30–76.2	22
36	...	Plate, sheet	SB–209	...	A95454	H112	6.35–12.69	22
37	...	Plate, sheet	SB–209	...	A95454	H112	12.70–76.20	22
38	...	Bar, rod, shapes	SB–221	...	A95454	O	≤127.0	22
39	...	Bar, rod, shapes	SB–221	...	A95454	H112	≤127.0	22
40	...	Smls. extr. tube	SB–241	...	A95454	O	≤127.0	22
41	...	Smls. extr. tube	SB–241	...	A95454	H112	≤127.0	22
42	...	Plate, sheet	SB–209	...	A96061	T4	1.30–6.34	23
43	...	Plate, sheet	SB–209	...	A96061	T451	6.35–76.2	23
44	...	Plate, sheet	SB–209	...	A96061	T6	1.30–6.34	23
45	...	Plate, sheet	SB–209	...	A96061	T651	6.35–101.60	23

Table 2B
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	90	31	NP	121	NFA–7	G8
2	90	31	NP	121	NFA–7	G8, W2
3	90	31	NP	121	NFA–7	G8
4	90	31	NP	121	NFA–7	G8, W2
5	97	34	NP	121	NFA–1	G8
6	120	69	NP	121	NFA–1	G8, W2
7	100	41	NP	93	NFA–1	G8, W2
8	100	41	NP	93	NFA–1	G8, W2
9	97	34	NP	121	NFA–1	G8
10	97	34	NP	121	NFA–1	G8, W2
11	97	34	NP	121	NFA–1	G2, G8
12	97	34	NP	121	NFA–1	G2, G8, W2
13	97	34	NP	121	NFA–1	G8
14	97	34	NP	121	NFA–1	G8
15	97	34	NP	121	NFA–1	G8, W2
16	150	59	NP	121	NFA–3	G8
17	160	62	NP	121	NFA–3	G8, W2
18	170	65	NP	93	NFA–8	G8
19	195	110	NP	93	NFA–8	G8, W2
20	170	65	NP	93	NFA–8	G8, W2
21	275	125	NP	66	NFA–11	G7, G8, G11
22	270	120	NP	66	NFA–11	G7, G8, G11
23	260	110	NP	66	NFA–11	G7, G8, G11
24	255	100	NP	66	NFA–11	G7, G8, G11
25	250	97	NP	66	NFA–11	G7, G8, G11
26	275	125	NP	66	NFA–11	G7, G8, G11, W2
27	270	120	NP	66	NFA–11	G7, G8, G11, W2
28	275	165	NP	66	NFA–11	G2, G7, G8, G11, W2
29	275	165	NP	66	NFA–11	G7, G8, G11, W2
30	240	97	NP	66	NFA–9	G7, G8, G11
31	250	125	NP	66	NFA–9	G7, G8, G11, W2
32	240	110	NP	66	NFA–9	G7, G8, G11, W2
33	240	97	NP	66	NFA–9	G7, G8, G11, W2
34	235	97	NP	66	NFA–9	G7, G8, G11, W2
35	210	83	NP	121	NFA–6	E2, G8
36	220	125	NP	121	NFA–6	E2, G8, W2
37	210	83	NP	121	NFA–6	E2, G8, W2
38	210	83	NP	121	NFA–6	E2, G2, G8
39	210	83	NP	121	NFA–6	E2, G2, G8, W2
40	210	83	NP	121	NFA–6	E2, G8
41	210	83	NP	121	NFA–6	E2, G8, W2
42	205	110	NP	149	NFA–13	G8, G9, W3
43	205	110	NP	149	NFA–13	G8, G9, W3
44	290	240	NP	149	NFA–12	G8, G9, W3
45	290	240	NP	149	NFA–12,13	G8, G9, W3

Table 2B
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	
1	20.7	20.7	20.2	18.3	...	...	...	...	...	...	...	...	...	...	...	...	
2	20.7	20.7	20.2	18.3	...	...	...	...	...	...	...	...	...	...	...	...	
3	20.7	20.7	20.2	18.3	...	...	...	...	...	...	...	...	...	...	...	...	
4	20.7	20.7	20.2	18.3	...	...	...	...	...	...	...	...	...	...	...	...	
5	22.8	22.8	22.4	20.4	...	...	...	...	...	...	...	...	...	...	...	...	
6	39.3	39.3	39.0	36.1	...	...	...	...	...	...	...	...	...	...	...	...	
7	27.6	27.6	27.6	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	27.6	27.6	27.6	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	22.8	22.8	22.4	20.4	...	...	...	...	...	...	...	...	...	...	...	...	
10	22.8	22.8	22.4	20.4	...	...	...	...	...	...	...	...	...	...	...	...	
11	22.8	22.8	22.4	20.4	...	...	...	...	...	...	...	...	...	...	...	...	
12	22.8	22.8	22.4	20.4	...	...	...	...	...	...	...	...	...	...	...	...	
13	22.8	22.8	22.4	20.4	...	...	...	...	...	...	...	...	...	...	...	...	
14	22.8	22.8	22.4	20.4	...	...	...	...	...	...	...	...	...	...	...	...	
15	22.8	22.8	22.4	20.4	...	...	...	...	...	...	...	...	...	...	...	...	
16	39.3	39.3	39.1	37.6	...	...	...	...	...	...	...	...	...	...	...	...	
17	41.4	41.4	41.2	39.6	...	...	...	...	...	...	...	...	...	...	...	...	
18	43.4	43.4	43.4	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	64.1	64.1	64.1	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	43.4	43.4	43.4	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	82.7	82.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
22	78.6	77.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
23	73.8	73.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
24	68.9	68.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
25	64.1	64.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
26	82.7	82.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
27	77.9	77.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
28	91.7	91.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
29	91.7	91.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
30	64.1	62.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
31	82.7	81.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
32	73.8	72.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
33	64.1	62.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
34	64.1	62.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
35	55.2	55.2	54.9	**50.7**	...	...	...	...	...	...	...	...	...	...	...	...	
36	73.8	73.8	71.0	**48.1**	...	...	...	...	...	...	...	...	...	...	...	...	
37	55.2	55.2	54.9	**50.7**	...	...	...	...	...	...	...	...	...	...	...	...	
38	55.2	55.2	54.9	**50.7**	...	...	...	...	...	...	...	...	...	...	...	...	
39	55.2	55.2	54.9	**50.7**	...	...	...	...	...	...	...	...	...	...	...	...	
40	55.2	55.2	54.9	**50.7**	...	...	...	...	...	...	...	...	...	...	...	...	
41	55.2	55.2	54.9	**50.7**	...	...	...	...	...	...	...	...	...	...	...	...	
42	68.9	68.9	67.5	58.3	55.8	...	...	...	...	...	...	...	...	...	...	...	
43	68.9	68.9	67.5	58.3	55.8	...	...	...	...	...	...	...	...	...	...	...	
44	96.5	96.5	96.3	90.9	77.3	...	...	...	...	...	...	...	...	...	...	...	
45	96.5	96.5	96.3	90.9	77.3	...	...	...	...	...	...	...	...	...	...	...	

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Table 2B (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	P-No.
	1	...	Plate, sheet	SB–209	...	A96061	T651	101.61–152.4	23
	2	...	Drawn smls. tube	SB–210	...	A96061	T4	0.64–12.7	23
	3	...	Drawn smls. tube	SB–210	...	A96061	T6	0.64–12.7	23
	4	...	Bar, rod, shapes	SB–221	...	A96061	T4	...	23
	5	...	Bar, rod, shapes	SB–221	...	A96061	T6	...	23
	6	...	Smls. extr. tube/pipe	SB–241	...	A96061	T4	...	23
	7	...	Smls. extr. tube/pipe	SB–241	...	A96061	T6	...	23
	8	...	Smls. drawn pipe	SB–241	...	A96061	T6	DN < 25	23
	9	...	Smls. drawn pipe	SB–241	...	A96061	T6	DN ≥ 25	23
	10	...	Shapes	SB–308	...	A96061	T6	...	23
	11	...	Drawn smls. tube	SB–210	...	A96063	T6	0.64–12.7	23
	12	...	Bar, rod, shapes	SB–221	...	A96063	T5	≤12.70	23
	13	...	Bar, rod, shapes	SB–221	...	A96063	T5	12.71–25.4	23
	14	...	Bar, rod, shapes	SB–221	...	A96063	T6	≤25.4	23
	15	...	Smls. extr. tube	SB–241	...	A96063	T5	≤12.70	23
	16	...	Smls. extr. tube	SB–241	...	A96063	T5	12.71–25.4	23
	17	...	Smls. extr. tube	SB–241	...	A96063	T6	≤25.4	23
(**23**)	18	...	Bar, rod	SB–187	...	C10200	O60	All	31
(**23**)	19	...	Bar, rod	SB–187	...	C10200	O60	All	31
(**23**)	20	...	Bar, rod	SB–187	...	C11000	O60	All	31
(**23**)	21	...	Bar, rod	SB–187	...	C11000	O60	All	31
	22	...	Smls. tube	SB–111	...	C28000	O61	...	32
	23	...	Smls. tube	SB–111	...	C44300	O61	...	32
	24	...	Smls. tube	SB–111	...	C44400	O61	...	32
	25	...	Smls. tube	SB–111	...	C44500	O61	...	32
	26	...	Plate	SB–171	...	C46400	M10, M20, O20, O25	75 < t ≤ 125	32
	27	...	Plate	SB–171	...	C46400	M10, M20, O20, O25	≤75	32
	28	...	Smls. tube	SB–111	...	C60800	O61	...	35
(**23**)	29	...	Plate, sheet	SB–169	...	C61400	O25 or O60 or M20	50 < t ≤ 140	35
(**23**)	30	...	Plate, sheet	SB–169	...	C61400	O25 or O60 or M20	50 < t ≤ 140	35
(**23**)	31	...	Plate, sheet	SB–169	...	C61400	O25 or O60 or M20	12 < t ≤ 50	35
(**23**)	32	...	Plate, sheet	SB–169	...	C61400	O25 or O60 or M20	12 < t ≤ 50	35
(**23**)	33	...	Plate, sheet	SB–169	...	C61400	O25 or O60 or M20	t ≤ 12	35
(**23**)	34	...	Plate, sheet	SB–169	...	C61400	O25 or O60 or M20	t ≤ 12	35
(**23**)	35	...	Bar, rod	SB–98	...	C65100	O60	All	33
(**23**)	36	...	Bar, rod	SB–98	...	C65100	O60	All	33
(**23**)	37	...	Bar, rod	SB–98	...	C65100	H02	≤50	33
(**23**)	38	...	Bar, rod	SB–98	...	C65100	H02	≤50	33
(**23**)	39	...	Plate, sheet	SB–96	...	C65500	O61	≤50	33
(**23**)	40	...	Plate, sheet	SB–96	...	C65500	O61	≤50	33
(**23**)	41	...	Bar, rod	SB–98	...	C65500	O60	All	33
(**23**)	42	...	Bar, rod	SB–98	...	C65500	O60	All	33
(**23**)	43	...	Bar, rod	SB–98	...	C65500	H02	≤50	33
(**23**)	44	...	Bar, rod	SB–98	...	C66100	O60	All	33
(**23**)	45	...	Bar, rod	SB–98	...	C66100	O60	All	33

Table 2B (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	275	240	NP	149	NFA–12,13	G8, G9, W3
2	205	110	NP	149	NFA–13	G8, W3
3	290	240	NP	149	NFA–12,13	G8, W3
4	180	110	NP	149	NFA–13	G2, G8, G9, W3
5	260	240	NP	149	NFA–12,13	G2, G8, G9, W3
6	180	110	NP	149	NFA–13	G8, G9, W3
7	260	240	NP	149	NFA–12,13	G8, G9, W3
8	290	240	NP	149	NFA–12,13	G8, W3
9	260	240	NP	149	NFA–12,13	G8, W3
10	260	240	NP	149	NFA–12,13	G2, G8, W3
11	230	195	NP	149	NFA–1	G8, W3
12	150	110	NP	149	NFA–1	E2, G2, G8, W3
13	145	100	NP	149	NFA–1	E2, G2, G8, W3
14	205	170	NP	149	NFA–1	G2, G8, W3
15	150	110	NP	149	NFA–1	E2, G8, W3
16	145	100	NP	149	NFA–1	E2, G8, W3
17	205	170	NP	149	NFA–1	G8, W3
18	195	55	NP	149	NFC–1	E5, G4
19	195	55	NP	149	NFC–1	E5, G1, G4
20	195	55	NP	149	NFC–1	E5, G4
21	195	55	NP	149	NFC–1	E5, G1, G4
22	345	140	NP	260	NFC–3	E3, G4, G6
23	310	105	NP	260	NFC–2	E3, G4, G6
24	310	105	NP	260	NFC–2	E3, G4, G6
25	310	105	NP	260	NFC–2	E3, G4, G6
26	345	125	NP	38	NFC–2	G4
27	345	140	NP	38	NFC–2	G4
28	345	130	NP	38	NFC–3	G4, G6
29	450	195	NP	260	NFC–8	G4
30	450	195	NP	260	NFC–8	G1, G4
31	485	205	NP	260	NFC–8	G4
32	485	205	NP	260	NFC–8	G1, G4
33	495	220	NP	260	NFC–8	G4
34	495	220	NP	260	NFC–8	G1, G4
35	275	83	NP	177	NFC–1	G4, G10
36	275	83	NP	177	NFC–1	G1, G4, G10
37	380	140	NP	177	NFC–2	G4, G10, W2
38	380	140	NP	177	NFC–2	G1, G4, G10, W2
39	345	125	NP	149	NFC–2	G4, G10
40	345	125	NP	149	NFC–2	G1, G4, G10
41	360	100	NP	177	NFC–2	G4, G10
42	360	100	NP	177	NFC–2	G1, G4, G10
43	485	260	NP	177	NFC–2	G4, G10, W2
44	360	100	NP	177	NFC–2	G4, G10
45	360	100	NP	177	NFC–2	G1, G4, G10

Table 2B (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	
1	91.7	91.7	91.5	86.8	73.9	...	...	...	...	...	...	...	...	...	...	...	
2	68.9	68.9	67.5	58.3	55.8	...	...	...	...	...	...	...	...	...	...	...	
3	96.5	96.5	96.3	90.9	77.3	...	...	...	...	...	...	...	...	...	...	...	
4	60.0	60.0	59.8	58.2	55.0	...	...	...	...	...	...	...	...	...	...	...	
5	87.6	87.6	87.2	82.0	69.8	...	...	...	...	...	...	...	...	...	...	...	
6	60.0	60.0	59.8	58.2	55.0	...	...	...	...	...	...	...	...	...	...	...	
7	87.6	87.6	87.2	82.0	69.8	...	...	...	...	...	...	...	...	...	...	...	
8	96.5	96.5	96.3	90.9	77.3	...	...	...	...	...	...	...	...	...	...	...	
9	87.6	87.6	87.2	82.0	69.8	...	...	...	...	...	...	...	...	...	...	...	
10	87.6	87.6	87.2	82.0	69.8	...	...	...	...	...	...	...	...	...	...	...	
11	75.8	75.8	73.8	57.4	43.5	...	...	...	...	...	...	...	...	...	...	...	
12	50.3	50.3	47.1	**34.5**	**31.6**	...	...	...	...	...	...	...	...	...	...	...	
13	48.3	48.3	46.1	**32.4**	**30.3**	...	...	...	...	...	...	...	...	...	...	...	
14	68.9	68.9	67.1	52.1	39.4	...	...	...	...	...	...	...	...	...	...	...	
15	50.3	50.3	47.1	**34.5**	**31.6**	...	...	...	...	...	...	...	...	...	...	...	
16	48.3	48.3	46.1	**32.4**	**30.3**	...	...	...	...	...	...	...	...	...	...	...	
17	68.9	68.9	67.1	52.1	39.4	...	...	...	...	...	...	...	...	...	...	...	
18	36.7	36.7	32.3	32.3	**32.2**	**31.1**	**21.9**	**14.8**	...	...	...	...	...	...	...	...	(**23**)
19	36.7	36.7	36.7	36.7	**36.7**	**31.1**	**21.9**	**14.8**	...	...	...	...	...	...	...	...	(**23**)
20	36.7	36.7	32.3	32.3	**32.2**	**31.1**	**21.9**	**14.8**	...	...	...	...	...	...	...	...	(**23**)
21	36.7	36.7	36.7	36.7	**36.7**	**31.1**	**21.9**	**14.8**	...	...	...	...	...	...	...	...	(**23**)
22	91.7	91.7	91.7	91.7	91.6	76.3	**42.3**	**17.6**	**8.70**	**3.45**	...	...	...	...	...	...	
23	68.9	68.9	68.9	68.9	68.9	68.3	**29.4**	**16.4**	**9.10**	**3.29**	...	...	...	...	...	...	
24	68.9	68.9	68.9	68.9	68.9	68.3	**29.4**	**16.4**	**9.10**	**3.29**	...	...	...	...	...	...	
25	68.9	68.9	68.9	68.9	68.9	68.3	**29.4**	**16.4**	**9.10**	**3.29**	...	...	...	...	...	...	
26	82.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	91.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	87.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	129	128	127	126	126	125	124	123	121	120	...	...	...	...	...	...	(**23**)
30	129	129	129	129	129	129	129	129	129	129	...	...	...	...	...	...	(**23**)
31	137	137	136	135	135	134	133	131	130	130	...	...	...	...	...	...	(**23**)
32	137	137	137	137	137	137	137	137	137	137	...	...	...	...	...	...	(**23**)
33	147	147	145	144	144	143	142	140	139	139	...	...	...	...	...	...	(**23**)
34	147	147	147	147	147	147	147	147	147	147	...	...	...	...	...	...	(**23**)
35	55.2	54.8	54.3	54.0	53.6	53.1	50.8	...	...	...	...	...	...	...	...	...	(**23**)
36	55.2	55.2	55.2	55.2	55.2	55.2	50.8	...	...	...	...	...	...	...	...	...	(**23**)
37	91.9	91.9	90.6	88.7	86.2	83.2	72.3	...	...	...	...	...	...	...	...	...	(**23**)
38	91.9	91.9	91.9	91.9	91.9	91.9	72.3	...	...	...	...	...	...	...	...	...	(**23**)
39	82.7	82.5	82.3	82.0	81.8	75.4	50.8	...	...	...	...	...	...	...	...	...	(**23**)
40	82.7	82.7	82.7	82.7	82.7	...	...	...	...	...	...	...	...	...	...	...	(**23**)
41	68.9	68.8	68.6	68.4	68.1	67.8	50.8	...	...	...	...	...	...	...	...	...	(**23**)
42	68.9	68.9	68.9	68.9	68.9	68.9	50.8	...	...	...	...	...	...	...	...	...	(**23**)
43	161	161	161	161	161	161	160	...	...	...	...	...	...	...	...	...	(**23**)
44	68.9	68.8	68.6	68.4	68.1	67.8	50.8	...	...	...	...	...	...	...	...	...	(**23**)
45	68.9	68.9	68.9	68.9	68.9	68.9	50.8	...	...	...	...	...	...	...	...	...	(**23**)

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Table 2B (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	P-No.
(**23**)	1	...	Bar, rod	SB–98	...	C66100	H02	≤50	33
	2	...	Plate	SB–171	...	C70600	M10, M20, O20, O25	≤140	34
	3	...	Plate	SB–171	...	C70600	M10, M20, O20, O25	≤140	34
	4	...	Cond. tube	SB–111	...	C70600	O61	...	34
	5	...	Cond. tube	SB–111	...	C70600	O61	...	34
	6	...	Smls. U–bend tube	SB–395	...	C70600	O61	...	34
	7	...	Smls. U–bend tube	SB–395	...	C70600	O61	...	34
(**23**)	8	...	Plate	SB–171	...	C70620	M10, M20, O20, O25	≤140	34
(**23**)	9	...	Plate	SB–171	...	C70620	M10, M20, O20, O25	≤140	34
(**23**)	10	...	Cond. tube	SB–111	...	C70620	O61	...	34
(**23**)	11	...	Cond. tube	SB–111	...	C70620	O61	...	34
(**23**)	12	...	Smls. U–bend tube	SB–395	...	C70620	O61	...	34
(**23**)	13	...	Smls. U–bend tube	SB–395	...	C70620	O61	...	34
	14	...	Plate	SB–171	...	C71500	M10, M20, O20, O25	60 < t ≤ 140	34
	15	...	Plate	SB–171	...	C71500	M10, M20, O20, O25	60 < t ≤ 140	34
	16	...	Plate	SB–171	...	C71500	M10, M20, O20, O25	≤60	34
	17	...	Plate	SB–171	...	C71500	M10, M20, O20, O25	≤60	34
	18	...	Cond. tube	SB–111	...	C71500	O61	...	34
	19	...	Cond. tube	SB–111	...	C71500	O61	...	34
	20	...	Smls. U–bend tube	SB–395	...	C71500	O61	...	34
	21	...	Smls. U–bend tube	SB–395	...	C71500	O61	...	34
(**23**)	22	...	Smls. tube	SB–111	...	C71500	HR50	...	34
	23	...	Plate	SB–171	...	C71520	M10, M20, O20, O25	60 < t ≤ 140	34
	24	...	Plate	SB–171	...	C71520	M10, M20, O20, O25	60 < t ≤ 140	34
	25	...	Plate	SB–171	...	C71520	M10, M20, O20, O25	≤60	34
	26	...	Plate	SB–171	...	C71520	M10, M20, O20, O25	≤60	34
	27	...	Smls. tube	SB–111	...	C71520	O61	...	34
	28	...	Smls. tube	SB–111	...	C71520	O61	...	34
	29	...	Smls. U–bend tube	SB–395	...	C71520	O61	...	34
	30	...	Smls. U–bend tube	SB–395	...	C71520	O61	...	34
(**23**)	31	...	Smls. tube	SB–111	...	C71520	HR50	...	34
	32	...	Castings	SB–584	...	C93700	M01 or M07	...	...
	33	...	Castings	SB–584	...	C93700	M01 or M07	...	...
	34	99Ni	Smls. pipe & tube	SB–161	...	N02200	Annealed	>125 O.D.	41
	35	99Ni	Bar, rod	SB–160	...	N02200	Annealed	...	41
	36	99Ni	Smls. pipe & tube	SB–161	...	N02200	Annealed	≤125 O.D.	41
	37	99Ni	Plate, sheet, strip	SB–162	...	N02200	Annealed	...	41
	38	99Ni	Smls. tube	SB–163	...	N02200	Annealed	...	41
	39	99Ni	Plate, sheet, strip	SB–162	...	N02200	As rolled	...	41
	40	99Ni–Low C	Bar, rod	SB–160	...	N02201	Annealed	...	41
	41	99Ni–Low C	Smls. pipe & tube	SB–161	...	N02201	Annealed	>125 O.D.	41
	42	99Ni–Low C	Bar, rod	SB–160	...	N02201	Hot fin.	...	41
	43	99Ni–Low C	Smls. pipe & tube	SB–161	...	N02201	Annealed	≤125 O.D.	41
	44	99Ni–Low C	Plate, sheet, strip	SB–162	...	N02201	Annealed	...	41
	45	99Ni–Low C	Smls. tube	SB–163	...	N02201	Annealed	...	41

Table 2B (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	485	260	NP	177	NFC–2	G4, G10, W2
2	275	105	NP	232	NFC–3	G4
3	275	105	NP	232	NFC–3	G1, G4
4	275	105	NP	232	NFC–3	G4
5	275	105	NP	232	NFC–3	G1, G4
6	275	105	NP	232	NFC–3	G4
7	275	105	NP	232	NFC–3	G1, G4
8	275	105	NP	232	NFC–3	G4
9	275	105	NP	232	NFC–3	G1, G4
10	275	105	NP	232	NFC–3	G4
11	275	105	NP	232	NFC–3	G1, G4
12	275	105	NP	232	NFC–3	G4
13	275	105	NP	232	NFC–3	G1, G4
14	310	125	260	343	NFC–4	G4
15	310	125	260	343	NFC–4	G1, G4
16	345	140	260	343	NFC–4	G4
17	345	140	260	343	NFC–4	G1, G4
18	360	125	260	343	NFC–4	G4
19	360	125	260	343	NFC–4	G1, G4
20	360	125	NP	343	NFC–4	G4
21	360	125	NP	343	NFC–4	G1, G4
22	495	345	260	NP	NFC–4	...
23	310	125	260	343	NFC–4	G4
24	310	125	260	343	NFC–4	G1, G4
25	345	140	260	343	NFC–4	G4
26	345	140	260	343	NFC–4	G1, G4
27	360	125	260	343	NFC–4	G4
28	360	125	260	343	NFC–4	G1, G4
29	360	125	NP	343	NFC–4	G4
30	360	125	NP	343	NFC–4	G1, G4
31	495	345	260	260	NFC–4	...
32	207	83	204 (SPT)	NP	NFC–1	...
33	207	83	204 (SPT)	NP	NFC–1	G1
34	380	83	NP	316	NFN–2	G4
35	380	100	NP	316	NFN–2	G2, G4
36	380	100	NP	316	NFN–2	G4
37	380	100	NP	316	NFN–2	G4
38	380	100	NP	316	NFN–2	G4
39	380	140	NP	316	NFN–2	G4
40	345	69	NP	427	NFN–1	G2, G4
41	345	69	NP	427	NFN–1	G4
42	345	69	NP	427	NFN–1	G2, G4
43	345	83	NP	427	NFN–1	E1, G4
44	345	83	NP	427	NFN–1	E1, G4
45	345	83	NP	427	NFN–1	E1, G4

Table 2B (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	
1	161	161	161	161	161	161	160	...	...	...	...	...	...	...	...	...	(**23**)
2	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	...	...	...	...	...	...	...	
3	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...	...	...	
4	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	...	...	...	...	...	...	...	
5	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...	...	...	
6	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	...	...	...	...	...	...	...	
7	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...	...	...	
8	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	...	...	...	...	...	...	...	(**23**)
9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...	...	...	(**23**)
10	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	...	...	...	...	...	...	...	(**23**)
11	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...	...	...	(**23**)
12	68.9	66.9	65.2	63.9	62.0	60.7	60.1	59.1	56.8	...	...	...	...	...	...	...	(**23**)
13	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...	...	...	(**23**)
14	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	67.0	65.9	65.4	...	...	...	
15	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	
16	91.9	89.0	86.4	84.5	82.6	80.8	79.5	77.7	76.3	75.1	74.1	73.6	72.8	...	...	...	
17	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	...	...	...	
18	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	67.0	65.9	65.4	...	...	...	
19	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	
20	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	67.0	65.9	65.4	...	...	...	
21	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	
22	165	165	165	165	165	164	161	159	157	155	...	...	...	...	...	...	(**23**)
23	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	67.0	65.9	65.4	...	...	...	
24	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	
25	91.9	89.0	86.4	84.5	82.6	80.8	79.5	77.7	76.3	75.1	74.1	73.6	72.8	...	...	...	
26	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	...	...	...	...	...	...	
27	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	67.0	65.9	65.4	...	...	...	
28	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	
29	82.7	80.0	77.4	75.6	74.4	72.5	71.2	70.0	68.7	67.9	67.0	65.9	65.4	...	...	...	
30	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	
31	165	165	165	165	165	164	161	159	157	155	...	...	...	...	...	...	(**23**)
32	55.2	51.0	48.8	47.8	47.1	46.6	46.1	45.7	...	...	...	...	...	...	...	...	
33	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	...	...	...	...	...	...	...	...	
34	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	...	...	...	...	
35	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	
36	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	
37	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	
38	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	
39	91.7	91.7	91.7	91.7	91.7	91.7	91.7	90.9	88.3	84.6	81.2	78.1	...	...	...	...	
40	46.2	44.8	43.9	43.4	43.4	42.8	42.7	42.7	42.7	42.7	42.7	42.7	42.7	42.7	42.0	41.4	
41	46.2	44.8	43.9	43.4	43.4	42.8	42.7	42.7	42.7	42.7	42.7	42.7	42.7	42.7	42.0	41.4	
42	46.2	44.8	43.9	43.4	43.4	42.8	42.7	42.7	42.7	42.7	42.7	42.7	42.7	42.7	42.0	41.4	
43	55.2	53.8	52.9	52.3	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.6	51.0	51.0	**49.7**	
44	55.2	53.8	52.9	52.3	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.6	51.0	51.0	**49.7**	
45	55.2	53.8	52.9	52.3	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.6	51.0	51.0	**49.7**	

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Table 2B (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	P-No.
(**23**)	1	67Ni–30Cu	Bar, rod	SB–164	...	N04400	HW or CW ann.	All	42
	2	67Ni–30Cu	Smls. pipe & tube	SB–165	...	N04400	Annealed	>125 O.D.	42
	3	67Ni–30Cu	Forgings	SB–564	...	N04400	Annealed	...	42
	4	67Ni–30Cu	Plate	SB–127	...	N04400	Annealed	...	42
	5	67Ni–30Cu	Smls. tube	SB–163	...	N04400	Annealed	...	42
	6	67Ni–30Cu	Smls. pipe & tube	SB–165	...	N04400	Annealed	≤125 O.D.	42
(**23**)	7	67Ni–30Cu	Hexagons, rings, discs	SB–164	...	N04400	Hot worked	54 < t ≤ 102	42
	8	67Ni–30Cu	Plate	SB–127	...	N04400	As rolled	...	42
(**23**)	9	67Ni–30Cu	Rounds, squares, rectangles	SB–164	...	N04400	Hot worked	305 < t ≤ 356	42
	10	67Ni–30Cu	Smls. tube	SB–163	...	N04400	Stress rel.	...	42
	11	67Ni–30Cu	Smls. pipe & tube	SB–165	...	N04400	Stress rel.	...	42
	12	67Ni–30Cu–S	Bar, rod	SB–164	...	N04405	Annealed	...	42
	13	67Ni–30Cu–S	Bar, rod	SB–164	...	N04405	Hot worked	...	42
	14	47Ni–22Cr–9Mo–18Fe	Plate	SB–435	...	N06002	Annealed	5 < t ≤ 64	43
	15	47Ni–22Cr–9Mo–18Fe	Sheet	SB–435	...	N06002	Annealed	1.5 < t ≤ 5	43
	16	47Ni–22Cr–9Mo–18Fe	Rod	SB–572	...	N06002	Solution ann.	≥5	43
	17	47Ni–22Cr–9Mo–18Fe	Wld. pipe	SB–619	...	N06002	Solution ann.	...	43
	18	47Ni–22Cr–9Mo–18Fe	Wld. pipe	SB–619	...	N06002	Solution ann.	...	43
	19	47Ni–22Cr–9Mo–18Fe	Smls. pipe & tube	SB–622	...	N06002	Solution ann.	...	43
	20	47Ni–22Cr–9Mo–18Fe	Wld. tube	SB–626	...	N06002	Solution ann.	...	43
	21	47Ni–22Cr–9Mo–18Fe	Wld. tube	SB–626	...	N06002	Solution ann.	...	43
	22	47Ni–22Cr–19Fe–6Mo	Rod	SB–581	...	N06007	Solution ann.	>19	45
	23	47Ni–22Cr–19Fe–6Mo	Plate, sheet, strip	SB–582	...	N06007	Solution ann.	>19	45
	24	47Ni–22Cr–19Fe–6Mo	Rod	SB–581	...	N06007	Solution ann.	8 < t ≤ 19	45
	25	47Ni–22Cr–19Fe–6Mo	Plate, sheet, strip	SB–582	...	N06007	Solution ann.	5 < t ≤ 19	45
	26	47Ni–22Cr–19Fe–6Mo	Wld. pipe	SB–619	...	N06007	Solution ann.	...	45
	27	47Ni–22Cr–19Fe–6Mo	Smls. pipe & tube	SB–622	...	N06007	Solution ann.	...	45
	28	47Ni–22Cr–19Fe–6Mo	Wld. tube	SB–626	...	N06007	Solution ann.	...	45
	29	55Ni–21Cr–13.5Mo	Smls. & wld. fittings	SB–366	...	N06022	Solution ann.	...	43
	30	55Ni–21Cr–13.5Mo	Forgings	SB–462	...	N06022	Solution ann.	...	43
	31	55Ni–21Cr–13.5Mo	Forgings	SB–564	...	N06022	Solution ann.	...	43
	32	55Ni–21Cr–13.5Mo	Rod	SB–574	...	N06022	Solution ann.	...	43
	33	55Ni–21Cr–13.5Mo	Plate, sheet, strip	SB–575	...	N06022	Solution ann.	...	43
	34	55Ni–21Cr–13.5Mo	Wld. pipe	SB–619	...	N06022	Solution ann.	...	43
	35	55Ni–21Cr–13.5Mo	Smls. pipe & tube	SB–622	...	N06022	Solution ann.	...	43
	36	55Ni–21Cr–13.5Mo	Wld. tube	SB–626	...	N06022	Solution ann.	...	43
	37	59Ni–23Cr–16Mo	Wld. fittings	SB–366	...	N06059	Solution ann.	...	43
	38	59Ni–23Cr–16Mo	Wld. fittings	SB–366	...	N06059	Solution ann.	...	43
	39	59Ni–23Cr–16Mo	Smls. fittings	SB–366	...	N06059	Solution ann.	...	43
	40	59Ni–23Cr–16Mo	Forged fittings	SB–462	...	N06059	Solution ann.	...	43
	41	59Ni–23Cr–16Mo	Forgings	SB–564	...	N06059	Solution ann.	...	43
	42	59Ni–23Cr–16Mo	Rod	SB–574	...	N06059	Solution ann.	...	43
	43	59Ni–23Cr–16Mo	Plate, sheet, strip	SB–575	...	N06059	Solution ann.	...	43
	44	59Ni–23Cr–16Mo	Wld. pipe	SB–619	...	N06059	Solution ann.	...	43
	45	59Ni–23Cr–16Mo	Wld. pipe	SB–619	...	N06059	Solution ann.	...	43

Table 2B (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	480	170	427	427	NFN–3	G1, G2, G4
2	485	170	427	427	NFN–3	G1, G4
3	485	170	427	427	NFN–3	G1, G2, G4
4	485	195	427	427	NFN–3	G1, G4
5	485	195	427	427	NFN–3	G1, G4
6	485	195	427	427	NFN–3	G1, G4
7	517	207	427	NP	NFN–3	E1, G1
8	515	275	427	427	NFN–3	E1, G1, G4
9	517	276	427	NP	NFN–3	E1, G1
10	585	380	260	427	NFN–3	E4, G1, G4, W1
11	585	380	260	NP	NFN–3	G1
12	485	170	427	427	NFN–3	G1, G2, G4
13	515	240	427	NP	NFN–3	G1
14	655	240	427	427	NFN–15	G1, G4
15	655	240	427	427	NFN–15	G1, G4
16	655	240	427	427	NFN–15	G1, G2, G4
17	690	275	427	NP	NFN–15	G1
18	690	275	NP	427	NFN–15	G1, G4, G5
19	690	275	427	427	NFN–15	G1, G4
20	690	275	427	NP	NFN–15	G1
21	690	275	NP	427	NFN–15	G1, G4, G5
22	585	205	NP	427	NFN–11	G1, G2, G4
23	585	205	NP	427	NFN–11	G1, G4
24	620	240	NP	427	NFN–11	G1, G2, G4
25	620	240	NP	427	NFN–11	G1, G4
26	620	240	NP	427	NFN–11	G1, G4, G5
27	620	240	NP	427	NFN–11	G1, G4
28	620	240	NP	427	NFN–11	G1, G4, G5
29	690	310	427	427	NFN–10	G1
30	690	310	427	427	NFN–10	G1
31	690	310	427	427	NFN–10	G1
32	690	310	427	427	NFN–10	G1
33	690	310	427	427	NFN–10	G1
34	690	310	427	427	NFN–10	G1
35	690	310	427	427	NFN–10	G1
36	690	310	427	427	NFN–10	G1
37	690	310	427	NP	NFN–14	G1, G4
38	690	310	NP	427	NFN–14	G1, G4, G5
39	690	310	427	427	NFN–14	G1, G4
40	690	310	427	427	NFN–14	G1, G4
41	690	310	427	427	NFN–14	G1, G4
42	690	310	427	427	NFN–14	G1, G4
43	690	310	427	427	NFN–14	G1, G4
44	690	310	427	NP	NFN–14	G1, G4
45	690	310	NP	427	NFN–14	G1, G4, G5

Table 2B (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	
1	115	106	99.7	96.1	93.7	91.8	91.1	90.4	90.3	90.3	90.3	90.3	90.2	89.5	88.9	87.7	(**23**)
2	115	106	99.7	96.1	93.7	91.8	91.1	90.4	90.3	90.3	90.3	90.3	90.2	89.5	88.9	87.7	
3	115	106	99.7	96.1	93.7	91.8	91.1	90.4	90.3	90.3	90.3	90.3	90.2	89.5	88.9	87.7	
4	129	119	112	108	105	103	101	101	101	101	101	101	101	101	99.9	98.7	
5	129	119	112	108	105	103	101	101	101	101	101	101	101	101	99.9	98.7	
6	129	119	112	108	105	103	101	101	101	101	101	101	101	101	99.9	98.7	
7	138	136	133	131	128	126	124	122	122	121	120	119	118	117	116	**106**	(**23**)
8	172	172	172	172	171	168	165	164	162	161	160	159	158	156	144	**140**	
9	172	172	172	172	171	168	165	164	162	161	160	159	158	156	144	**140**	(**23**)
10	195	195	195	195	195	195	195	195	195	195	194	191	188	179	**122**	**89.3**	
11	195	195	195	195	195	195	195	195	195	195	...	...	...	...	...	...	
12	115	106	99.7	96.1	93.7	91.8	91.1	90.4	90.3	90.3	90.3	90.3	90.2	89.5	88.9	87.7	
13	161	151	140	136	132	129	128	128	128	128	128	128	128	127	125	122	
14	161	151	143	138	132	127	123	119	115	112	110	107	105	104	103	101	
15	161	151	143	138	132	127	123	119	115	112	110	107	105	104	103	101	
16	161	151	143	138	132	127	123	119	115	112	110	107	105	104	103	101	
17	184	173	164	157	151	146	141	136	132	128	125	122	120	118	117	116	
18	157	147	139	134	129	124	119	115	112	109	106	104	102	100	99.2	98.6	
19	184	173	164	157	151	146	141	136	132	128	125	122	120	118	117	116	
20	184	173	164	157	151	146	141	136	132	128	125	122	120	118	117	116	
21	157	147	139	134	129	124	119	115	112	109	106	104	102	100	99.2	98.6	
22	138	138	138	138	138	138	138	138	138	137	136	134	132	131	130	129	
23	138	138	138	138	138	138	138	138	138	137	136	134	132	131	130	129	
24	161	161	161	161	161	161	161	161	161	160	158	156	154	153	152	150	
25	161	161	161	161	161	161	161	161	161	160	158	156	154	153	152	150	
26	137	137	137	137	137	137	137	137	137	136	134	133	131	129	129	128	
27	161	161	161	161	161	161	161	161	161	160	158	156	154	153	152	150	
28	137	137	137	137	137	137	137	137	137	136	134	133	131	129	129	128	
29	207	207	207	...	207	...	207	...	202	...	193	189	185	182	180	177	
30	207	207	207	...	207	...	207	...	202	...	193	189	185	182	180	177	
31	207	207	207	...	207	...	207	...	202	...	193	189	185	182	180	177	
32	207	207	207	...	207	...	207	...	202	...	193	189	185	182	180	177	
33	207	207	207	...	207	...	207	...	202	...	193	189	185	182	180	177	
34	176	176	176	...	176	...	176	...	172	...	164	160	157	155	153	151	
35	207	207	207	...	207	...	207	...	202	...	193	189	185	182	180	177	
36	176	176	176	...	176	...	176	...	172	...	164	160	157	155	153	151	
37	207	207	207	207	207	207	207	207	207	207	202	197	192	187	183	178	
38	176	176	176	176	176	176	176	176	176	176	172	168	164	159	155	151	
39	207	207	207	207	207	207	207	207	207	207	202	197	192	187	183	178	
40	207	207	207	207	207	207	207	207	207	207	202	197	192	187	183	178	
41	207	207	207	207	207	207	207	207	207	207	202	197	192	187	183	178	
42	207	207	207	207	207	207	207	207	207	207	202	197	192	187	183	178	
43	207	207	207	207	207	207	207	207	207	207	202	197	192	187	183	178	
44	207	207	207	207	207	207	207	207	207	207	202	197	192	187	183	178	
45	176	176	176	176	176	176	176	176	176	176	172	168	164	159	155	151	

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Table 2B (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	P-No.
1	59Ni–23Cr–16Mo	Smls. pipe & tube	SB–622	...	N06059	Solution ann.	...	43
2	59Ni–23Cr–16Mo	Wld. tube	SB–626	...	N06059	Solution ann.	...	43
3	59Ni–23Cr–16Mo	Wld. tube	SB–626	...	N06059	Solution ann.	...	43
4	61Ni–16Mo–16Cr	Rod	SB–574	...	N06455	Solution ann.	...	43
5	61Ni–16Mo–16Cr	Plate, sheet, strip	SB–575	...	N06455	Solution ann.	...	43
6	61Ni–16Mo–16Cr	Wld. pipe	SB–619	...	N06455	Solution ann.	...	43
7	61Ni–16Mo–16Cr	Wld. pipe & tube	SB–622	...	N06455	Solution ann.	...	43
8	61Ni–16Mo–16Cr	Wld. tube	SB–626	...	N06455	Solution ann.	...	43
9	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Hot fin.	>125 O.D.	43
10	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Cold worked/ann.	>125 O.D.	43
11	72Ni–15Cr–8Fe	Smls. tube	SB–163	...	N06600	Annealed	...	43
12	72Ni–15Cr–8Fe	Bar, rod	SB–166	...	N06600	Annealed	...	43
13	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Cold worked/ann.	≤125 O.D.	43
14	72Ni–15Cr–8Fe	Plate	SB–168	...	N06600	Annealed	...	43
15	72Ni–15Cr–8Fe	Forgings	SB–564	...	N06600	Annealed	...	43
16	72Ni–15Cr–8Fe	Wld. tube	SB–516	...	N06600	Cold drawn/ann.	≤114	43
17	72Ni–15Cr–8Fe	Wld. pipe	SB–517	...	N06600	Cold drawn/ann.	≤114	43
18	72Ni–15Cr–8Fe	Smls. tube	SB–163	...	N06600	Annealed	$6 < t \le 22$	43
19	60Ni–22Cr–9Mo–3.5Cb	Bar, rod	SB–446	...	N06625	Annealed	$100 < t \le 250$	43
20	60Ni–22Cr–9Mo–3.5Cb	Plate, sheet	SB–443	...	N06625	Hot rolled/ann.	≤70	43
21	60Ni–22Cr–9Mo–3.5Cb	Plate	SB–443	...	N06625	Cold rolled/ann.	≤9.5	43
22	60Ni–22Cr–9Mo–3.5Cb	Smls. pipe & tube	SB–444	...	N06625	Annealed	...	43
23	60Ni–22Cr–9Mo–3.5Cb	Bar, rod	SB–446	...	N06625	Annealed	≤100	43
24	58Ni–29Cr–9Fe	Smls. pipe & tube	SB–167	...	N06690	Hot worked/ann.	>127 O.D.	43
25	58Ni–29Cr–9Fe	Smls. tube	SB–163	...	N06690	Annealed	...	43
26	58Ni–29Cr–9Fe	Plate	SB–168	...	N06690	Annealed	...	43
27	58Ni–29Cr–9Fe	Forgings	SB–564	...	N06690	Annealed	...	43
28	58Ni–29Cr–9Fe	Bar, rod	SB–166	...	N06690	Cold worked/ann.	...	43
29	58Ni–29Cr–9Fe	Bar, rod	SB–166	...	N06690	Hot worked	...	43
30	58Ni–29Cr–9Fe	Bar, rod	SB–166	...	N06690	Hot worked/ann.	...	43
31	58Ni–29Cr–9Fe	Smls. tube	SB–163	...	N06690	Annealed	$6 < t \le 22$	43
32	58Ni–29Cr–9Fe	Smls. pipe & tube	SB–167	...	N06690	Cold worked/ann.	>127 O.D.	43
33	58Ni–29Cr–9Fe	Smls. pipe & tube	SB–167	...	N06690	Hot worked/ann.	≤127 O.D.	43
34	58Ni–29Cr–9Fe	Smls. pipe & tube	SB–167	...	N06690	Cold worked/ann.	≤127 O.D.	43
35	35Ni–19Cr–1¼Si	Bar	SB–511	...	N08330	Annealed	...	46
36	35Ni–19Cr–1¼Si	Smls. & wld. pipe	SB–535	...	N08330	Annealed	...	46
37	35Ni–19Cr–1¼Si	Plate, sheet, strip	SB–536	...	N08330	Annealed	...	46
38	42Fe–33Ni–21Cr	Smls. tube	SB–163	...	N08800	Annealed	...	45
39	42Fe–33Ni–21Cr	Smls. pipe & tube	SB–407	...	N08800	Annealed	...	45
40	42Fe–33Ni–21Cr	Plate	SB–409	...	N08800	Annealed	...	45
41	42Fe–33Ni–21Cr	Wld. pipe	SB–514	...	N08800	Annealed	...	45
42	42Fe–33Ni–21Cr	Wld. tube	SB–515	...	N08800	Annealed	...	45
43	42Fe–33Ni–21Cr	Forgings	SB–564	...	N08800	Annealed	...	45
44	42Fe–33Ni–21Cr	Bar, rod	SB–408	...	N08800	Hot fin.	...	45
45	42Fe–33Ni–21Cr	Smls. tube	SB–163	...	N08800	Annealed	$6 < t \le 22$	45

Table 2B (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	690	310	427	427	NFN–14	G1, G4
2	690	310	427	NP	NFN–14	G1, G4
3	690	310	NP	427	NFN–14	G1, G4, G5
4	690	275	NP	427	NFN–14	G1, G2, G4
5	690	275	NP	427	NFN–14	G1, G4
6	690	275	NP	427	NFN–14	G1, G4, G5
7	690	275	NP	427	NFN–14	G1, G4
8	690	275	NP	427	NFN–14	G1, G4, G5
9	515	170	427	NP	NFN–4	G1
10	550	205	427	427	NFN–4	G1, G4
11	550	240	427	427	NFN–4	G1, G4
12	550	240	427	427	NFN–4	G1, G2, G4
13	550	240	427	427	NFN–4	G1, G4
14	550	240	427	427	NFN–4	G1, G4
15	550	240	427	427	NFN–4	G1, G2, G4
16	550	240	NP	427	NFN–4	G1, G4
17	550	240	NP	427	NFN–4	G1, G4
18	550	275	427	NP	NFN–21	G1, G3, S1
19	760	345	427	NP	NFN–17	...
20	758	379	427	NP	NFN–17	...
21	758	379	427	NP	NFN–17	...
22	825	415	427	NP	NFN–17	...
23	825	415	427	NP	NFN–17	...
24	515	170	427	NP	NFN–4	G1
25	585	240	427	NP	NFN–4	G1
26	585	240	427	NP	NFN–4	G1
27	585	240	427	NP	NFN–4	G1
28	585	240	427	NP	NFN–4	G1
29	585	240	427	NP	NFN–4	G1
30	585	240	427	NP	NFN–4	G1
31	585	275	427	NP	NFN–21	G1, G3, S1
32	586	205	427	NP	NFN–4	G1
33	586	205	427	NP	NFN–4	G1
34	586	240	427	NP	NFN–4	G1
35	485	205	NP	427	NFN–13	G1, G2, G4
36	485	205	NP	427	NFN–13	G1, G4, G5
37	485	205	NP	427	NFN–13	G1, G4
38	515	205	427	427	NFN–8	G1, G4
39	515	205	427	427	NFN–8	G1, G4
40	515	205	427	427	NFN–8	G1, G4
41	515	205	NP	427	NFN–8	G1, G4
42	515	205	NP	427	NFN–8	G1, G4
43	515	205	427	427	NFN–8	G1, G2, G4
44	515	205	427	427	NFN–8	G1, G2, G4
45	515	275	427	NP	NFN–8	G1, G3, S1

Table 2B (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425
1	207	207	207	207	207	207	207	207	207	207	202	197	192	187	183	178
2	207	207	207	207	207	207	207	207	207	207	202	197	192	187	183	178
3	176	176	176	176	176	176	176	176	176	176	172	168	164	159	155	151
4	184	184	184	184	184	184	184	184	184	184	184	184	184	182	180	178
5	184	184	184	184	184	184	184	184	184	184	184	184	184	182	180	178
6	157	157	157	157	157	157	157	157	157	157	157	157	156	155	153	151
7	184	184	184	184	184	184	184	184	184	184	184	184	184	182	180	178
8	157	157	157	157	157	157	157	157	157	157	157	157	156	155	153	151
9	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115
10	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
11	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
12	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
13	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
14	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
15	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
16	137	137	137	137	137	137	137	137	137	137	137	137	137	137	137	137
17	137	137	137	137	137	137	137	137	137	137	137	137	137	137	137	137
18	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184
19	230	225	221	218	215	212	209	206	204	201	199	197	194	192	191	189
20	253	247	243	239	236	233	230	227	224	221	219	216	214	212	210	208
21	253	247	243	239	236	233	230	227	224	221	219	216	214	212	210	208
22	276	270	265	261	258	254	251	248	245	242	239	236	233	231	229	227
23	276	270	265	261	258	254	251	248	245	242	239	236	233	231	229	227
24	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115
25	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
26	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
27	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
28	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
29	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
30	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
31	184	184	184	184	184	184	184	184	184	184	184	184	184	183	183	182
32	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
33	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
34	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
35	138	138	138	138	138	138	138	138	137	135	132	129	127	124	122	120
36	117	117	117	117	117	117	117	117	117	115	113	110	108	106	104	102
37	138	138	138	138	138	138	138	138	137	135	132	129	127	124	122	120
38	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
39	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
40	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
41	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
42	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
43	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
44	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
45	172	172	172	172	172	172	172	172	172	172	172	171	171	171	170	170

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Table 2B (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	P-No.
1	42Fe–33Ni–21Cr	Smls. tube	SB–163	...	N08800	Cold worked	...	45
2	42Fe–33Ni–21Cr	Smls. tube	SB–163	...	N08810	Annealed	...	45
3	42Fe–33Ni–21Cr	Smls. pipe & tube	SB–407	...	N08810	Annealed	...	45
4	42Fe–33Ni–21Cr	Bar, rod	SB–408	...	N08810	Annealed	...	45
5	42Fe–33Ni–21Cr	Plate	SB–409	...	N08810	Annealed	...	45
6	42Fe–33Ni–21Cr	Wld. pipe	SB–514	...	N08810	Annealed	...	45
7	42Fe–33Ni–21Cr	Wld. tube	SB–515	...	N08810	Annealed	...	45
8	42Fe–33Ni–21Cr	Forgings	SB–564	...	N08810	Annealed	...	45
9	42Ni–21.5Cr–3Mo–2.3Cu	Smls. tube	SB–163	...	N08825	Annealed	...	45
10	42Ni–21.5Cr–3Mo–2.3Cu	Smls. pipe & tube	SB–423	...	N08825	Annealed	...	45
11	42Ni–21.5Cr–3Mo–2.3Cu	Plate, sheet, strip	SB–424	...	N08825	Annealed	...	45
12	42Ni–21.5Cr–3Mo–2.3Cu	Bar, rod	SB–425	...	N08825	Annealed	...	45
13	62Ni–28Mo–5Fe	Plate, strip	SB–333	...	N10001	Solution ann.	$5 < t \le 64$	44
14	62Ni–28Mo–5Fe	Wld. pipe	SB–619	...	N10001	Solution ann.	...	44
15	62Ni–28Mo–5Fe	Smls. pipe & tube	SB–622	...	N10001	Solution ann.	...	44
16	62Ni–28Mo–5Fe	Wld. tube	SB–626	...	N10001	Solution ann.	...	44
17	62Ni–28Mo–5Fe	Rod	SB–335	...	N10001	Solution ann.	$38 < t \le 89$	44
18	62Ni–28Mo–5Fe	Rod	SB–335	...	N10001	Solution ann.	$8 < t \le 38$	44
19	62Ni–28Mo–5Fe	Plate, strip	SB–333	...	N10001	Solution ann.	<5	44
20	70Ni–16Mo–7Cr–5Fe	Plate, sheet, strip	SB–434	...	N10003	Annealed	<64	44
21	70Ni–16Mo–7Cr–5Fe	Rod	SB–573	...	N10003	Solution ann.	...	44
22	54Ni–16Mo–15Cr	Smls. fittings	SB–366	...	N10276	Solution ann.	...	43
23	54Ni–16Mo–15Cr	Wld. fittings	SB–366	...	N10276	Solution ann.	...	43
24	54Ni–16Mo–15Cr	Forgings	SB–462	...	N10276	Solution ann.	...	43
25	54Ni–16Mo–15Cr	Rod	SB–574	...	N10276	Solution ann.	...	43
26	54Ni–16Mo–15Cr	Plate, sheet, strip	SB–575	...	N10276	Solution ann.	...	43
27	54Ni–16Mo–15Cr	Wld. pipe	SB–619	...	N10276	Solution ann.	...	43
28	54Ni–16Mo–15Cr	Smls. pipe & tube	SB–622	...	N10276	Solution ann.	...	43
29	54Ni–16Mo–15Cr	Wld. tube	SB–626	...	N10276	Solution ann.	...	43
30	65Ni–28Mo–2Fe	Plate, strip	SB–333	...	N10665	Solution ann.	...	44
31	65Ni–28Mo–2Fe	Rod	SB–335	...	N10665	Solution ann.	...	44
32	65Ni–28Mo–2Fe	Smls. fittings	SB–366	...	N10665	Solution ann.	...	44
33	65Ni–28Mo–2Fe	Wld. fittings	SB–366	...	N10665	Solution ann.	...	44
34	65Ni–28Mo–2Fe	Forgings	SB–462	...	N10665	Solution ann.	...	44
35	65Ni–28Mo–2Fe	Wld. pipe	SB–619	...	N10665	Solution ann.	...	44
36	65Ni–28Mo–2Fe	Smls. pipe & tube	SB–622	...	N10665	Solution ann.	...	44
37	65Ni–28Mo–2Fe	Wld. tube	SB–626	...	N10665	Solution ann.	...	44
(**23**) 38	Ti	Plate, sheet, strip	SB–265	1	R50250	Annealed	...	51
(**23**) 39	Ti	Bar, billet	SB–348	1	R50250	Annealed	...	51
(**23**) 40	Ti	Forgings	SB–381	1	R50250	Annealed	...	51
(**23**) 41	Ti	Smls. tube	SB–338	1	R50250	Smls. ann.	...	51
(**23**) 42	Ti	Smls. pipe	SB–861	1	R50250	Smls. ann.	...	51
(**23**) 43	Ti	Wld. tube	SB–338	1	R50250	Wld. ann.	...	51
(**23**) 44	Ti	Wld. pipe	SB–862	1	R50250	Wld. ann.	...	51
(**23**) 45	Ti	Plate, sheet, strip	SB–265	2	R50400	Annealed	...	51

Table 2B (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	570	325	343	NP	NFN–23	G1
2	450	170	427	427	NFN–9	G1, G4
3	450	170	427	427	NFN–9	G1, G4
4	450	170	427	427	NFN–9	G1, G2, G4
5	450	170	427	427	NFN–9	G1, G4
6	450	170	NP	427	NFN–9	G1, G4, G5
7	450	170	NP	427	NFN–9	G1, G4, G5
8	450	170	427	427	NFN–9	G1, G2, G4
9	585	240	427	427	NFN–7	G1, G4
10	585	240	NP	427	NFN–7	G1, G4
11	585	240	NP	427	NFN–7	G4
12	585	240	427	427	NFN–7	G2, G4
13	690	310	NP	427	NFN–5	G1, G4
14	690	310	NP	427	NFN–5	G1, G4, G5
15	690	310	NP	427	NFN–5	G1, G4
16	690	310	NP	427	NFN–5	G1, G4, G5
17	690	315	NP	427	NFN–5	G1, G2, G4
18	795	315	NP	427	NFN–5	G1, G2, G4
19	795	345	NP	427	NFN–5	G1, G4
20	690	275	NP	427	NFN–6	G4
21	690	275	NP	427	NFN–6	G1, G2, G4
22	690	285	NP	427	NFN–10	G1, G4
23	690	285	NP	427	NFN–10	G1, G4, G5
24	690	285	NP	427	NFN–10	G1, G4
25	690	285	NP	427	NFN–10	G1, G2, G4
26	690	285	NP	427	NFN–10	G1, G4
27	690	285	NP	427	NFN–10	G1, G4, G5
28	690	285	NP	427	NFN–10	G1, G4
29	690	285	NP	427	NFN–10	G1, G4, G5
30	760	350	NP	427	NFN–16	G1, G4
31	760	350	NP	427	NFN–16	G1, G2, G4
32	760	350	NP	427	NFN–16	G1, G4
33	760	350	NP	427	NFN–16	G1, G4, G5
34	760	350	NP	427	NFN–16	G1, G4
35	760	350	NP	427	NFN–16	G1, G4, G5
36	760	350	NP	427	NFN–16	G1, G4
37	760	350	NP	427	NFN–16	G1, G4, G5
38	240	170	NP	316	NFT–3	...
39	240	170	NP	316	NFT–3	...
40	240	170	NP	316	NFT–3	...
41	240	170	NP	316	NFT–3	...
42	240	170	NP	316	NFT–3	...
43	240	170	NP	316	NFT–3	G5
44	240	170	NP	316	NFT–3	G5
45	345	275	NP	316	NFT–2	...

Table 2B (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	
1	191	191	191	191	191	191	190	188	186	185	184	183	183	...	...	...	
2	115	115	115	115	115	115	115	115	115	115	115	113	110	108	105	104	
3	115	115	115	115	115	115	115	115	115	115	115	113	110	108	105	104	
4	115	115	115	115	115	115	115	115	115	115	115	113	110	108	105	104	
5	115	115	115	115	115	115	115	115	115	115	115	113	110	108	105	104	
6	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.5	95.9	93.8	91.3	89.6	88.3	
7	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.9	97.5	95.9	93.8	91.3	89.6	88.3	
8	115	115	115	115	115	115	115	115	115	115	115	113	110	108	105	104	
9	161	161	161	161	161	161	161	161	161	161	161	161	161	161	160	159	
10	161	161	161	161	161	161	161	161	161	161	161	161	161	161	160	159	
11	161	161	161	161	161	161	161	161	161	161	161	161	161	161	160	159	
12	161	161	161	161	161	161	161	161	161	161	161	161	161	161	160	159	
13	207	207	207	207	207	207	207	207	207	207	207	207	207	207	207	206	
14	176	176	176	176	176	176	176	176	176	176	176	176	176	176	176	175	
15	207	207	207	207	207	207	207	207	207	207	207	207	207	207	207	206	
16	176	176	176	176	176	176	176	176	176	176	176	176	176	176	176	175	
17	212	212	212	212	212	212	212	212	212	212	212	212	212	212	212	210	
18	212	212	212	212	212	212	212	212	212	212	212	212	212	212	212	210	
19	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	229	
20	184	176	168	162	156	151	146	142	139	136	134	133	131	130	129	127	
21	184	176	168	162	156	151	146	142	139	136	134	133	131	130	129	127	
22	188	188	188	188	188	188	188	188	187	182	177	172	169	165	162	159	
23	160	160	160	160	160	160	160	160	159	155	150	147	143	140	138	135	
24	188	188	188	188	188	188	188	188	187	182	177	172	169	165	162	159	
25	188	188	188	188	188	188	188	188	187	182	177	172	169	165	162	159	
26	188	188	188	188	188	188	188	188	187	182	177	172	169	165	162	159	
27	160	160	160	160	160	160	160	160	159	155	150	147	143	140	138	135	
28	188	188	188	188	188	188	188	188	187	182	177	172	169	165	162	159	
29	160	160	160	160	160	160	160	160	159	155	150	147	143	140	138	135	
30	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	
31	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	
32	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	
33	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	
34	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	
35	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	
36	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	
37	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	
38	80.7	75.3	64.3	58.4	52.9	48.5	44.7	41.7	37.6	33.9	30.9	27.8	...	...	...	...	(**23**)
39	80.7	75.3	64.3	58.4	52.9	48.5	44.7	41.7	37.6	33.9	30.9	27.8	...	...	...	...	(**23**)
40	80.7	75.3	64.3	58.4	52.9	48.5	44.7	41.7	37.6	33.9	30.9	27.8	...	...	...	...	(**23**)
41	80.7	75.3	64.3	58.4	52.9	48.5	44.7	41.7	37.6	33.9	30.9	27.8	...	...	...	...	(**23**)
42	80.7	75.3	64.3	58.4	52.9	48.5	44.7	41.7	37.6	33.9	30.9	27.8	...	...	...	...	(**23**)
43	68.3	63.6	54.9	49.5	44.6	40.9	38.4	35.4	32.3	29.2	26.1	23.0	...	...	...	...	(**23**)
44	68.3	63.6	54.9	49.5	44.6	40.9	38.4	35.4	32.3	29.2	26.1	23.0	...	...	...	...	(**23**)
45	115	110	97.6	89.9	83.1	76.9	71.8	67.4	63.1	58.7	54.7	51.0	...	...	...	...	(**23**)

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Table 2B (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	P-No.
(**23**)	1	Ti	Bar, billet	SB–348	2	R50400	Annealed	...	51
(**23**)	2	Ti	Forgings	SB–381	2	R50400	Annealed	...	51
(**23**)	3	Ti	Smls. tube	SB–338	2	R50400	Smls. ann.	...	51
(**23**)	4	Ti	Smls. pipe	SB–861	2	R50400	Smls. ann.	...	51
(**23**)	5	Ti	Wld. tube	SB–338	2	R50400	Wld. ann.	...	51
(**23**)	6	Ti	Wld. pipe	SB–862	2	R50400	Wld. ann.	...	51
(**23**)	7	Ti	Plate, sheet, strip	SB–265	3	R50550	Annealed	...	52
(**23**)	8	Ti	Bar, billet	SB–348	3	R50550	Annealed	...	52
(**23**)	9	Ti	Forgings	SB–381	3	R50550	Annealed	...	52
(**23**)	10	Ti	Smls. tube	SB–338	3	R50550	Smls. ann.	...	52
(**23**)	11	Ti	Smls. pipe	SB–861	3	R50550	Smls. ann.	...	52
(**23**)	12	Ti	Wld. tube	SB–338	3	R50550	Wld. ann.	...	52
(**23**)	13	Ti	Wld. pipe	SB–862	3	R50550	Wld. ann.	...	52
(**23**)	14	Ti–Pd	Plate, sheet, strip	SB–265	7	R52400	Annealed	...	51
(**23**)	15	Ti–Pd	Bar, billet	SB–348	7	R52400	Annealed	...	51
(**23**)	16	Ti–Pd	Forgings	SB–381	7	R52400	Annealed	...	51
(**23**)	17	Ti–Pd	Smls. tube	SB–338	7	R52400	Smls. ann.	...	51
(**23**)	18	Ti–Pd	Smls. pipe	SB–861	7	R52400	Smls. ann.	...	51
(**23**)	19	Ti–Pd	Wld. tube	SB–338	7	R52400	Wld. ann.	...	51
(**23**)	20	Ti–Pd	Wld. pipe	SB–862	7	R52400	Wld. ann.	...	51
(**23**)	21	Ti–Pd	Plate, sheet, strip	SB–265	16	R52402	Annealed	...	51
(**23**)	22	Ti–0.3Mo–0.8Ni	Plate, sheet, strip	SB–265	12	R53400	Annealed	...	52
(**23**)	23	Ti–0.3Mo–0.8Ni	Bar, billet	SB–348	12	R53400	Annealed	...	52
(**23**)	24	Ti–0.3Mo–0.8Ni	Forgings	SB–381	F–12	R53400	Annealed	...	52
(**23**)	25	Ti–0.3Mo–0.8Ni	Smls. tube	SB–338	12	R53400	Smls. ann.	...	52
(**23**)	26	Ti–0.3Mo–0.8Ni	Smls. pipe	SB–861	12	R53400	Smls. ann.	...	52
(**23**)	27	Ti–0.3Mo–0.8Ni	Wld. tube	SB–338	12	R53400	Wld. ann.	...	52
(**23**)	28	Ti–0.3Mo–0.8Ni	Wld. pipe	SB–862	12	R53400	Wld. ann.	...	52
(**23**)	29	Ti–3Al–2.5V	Plate, sheet, strip	SB–265	9	R56320	Annealed	...	53
(**23**)	30	Ti–3Al–2.5V	Bar, billet	SB–348	9	R56320	Annealed	...	53
(**23**)	31	Ti–3Al–2.5V	Forgings	SB–381	F–9	R56320	Annealed	...	53
(**23**)	32	Ti–3Al–2.5V	Smls. & wld. tube	SB–338	9	R56320	Smls. ann.	...	53
(**23**)	33	Ti–3Al–2.5V	Wld. fittings	SB–363	9	R56320	Smls. ann.	...	53
(**23**)	34	Ti–3Al–2.5V	Smls. pipe	SB–861	9	R56320	Smls. ann.	...	53
(**23**)	35	Ti–3Al–2.5V	Smls. & wld. tube	SB–338	9	R56320	Wld. ann.	...	53
(**23**)	36	Ti–3Al–2.5V	Wld. fittings	SB–363	9	R56320	Wld. ann.	...	53
(**23**)	37	Ti–3Al–2.5V	Wld. pipe	SB–862	9	R56320	Wld. ann.	...	53

Table 2B (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)		External Pressure Chart No.	Notes
			III	VIII-2		
1	345	275	NP	316	NFT–2	...
2	345	275	NP	316	NFT–2	...
3	345	275	NP	316	NFT–2	...
4	345	275	NP	316	NFT–2	...
5	345	275	NP	316	NFT–2	G5
6	345	275	NP	316	NFT–2	G5
7	450	380	NP	316	NFT–1	...
8	450	380	NP	316	NFT–1	...
9	450	380	NP	316	NFT–1	...
10	450	380	NP	316	NFT–1	...
11	450	380	NP	316	NFT–1	...
12	450	380	NP	316	NFT–1	G5
13	450	380	NP	316	NFT–1	G5
14	345	275	NP	316	NFT–2	...
15	345	275	NP	316	NFT–2	...
16	345	275	NP	316	NFT–2	...
17	345	275	NP	316	NFT–2	...
18	345	275	NP	316	NFT–2	...
19	345	275	NP	316	NFT–2	G5
20	345	275	NP	316	NFT–2	G5
21	345	275	NP	316	NFT–2	...
22	485	345	NP	316	NFT–5	...
23	485	345	NP	316	NFT–5	...
24	485	345	NP	316	NFT–5	...
25	485	345	NP	316	NFT–5	...
26	485	345	NP	316	NFT–5	...
27	485	345	NP	316	NFT–5	G5
28	485	345	NP	316	NFT–5	G5
29	620	485	316	NP	NFT–4	...
30	620	485	316	NP	NFT–4	...
31	620	485	316	NP	NFT–4	...
32	620	485	316	NP	NFT–4	...
33	620	485	316	NP	NFT–4	...
34	620	485	316	NP	NFT–4	...
35	620	485	316	NP	NFT–4	G5
36	620	485	316	NP	NFT–4	G5
37	620	485	316	NP	NFT–4	G5

Table 2B (Cont'd)
Section III, Division 1, Classes 1, MC, and CS; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2, Class 1 Maximum Allowable Stress Values, S, for Nonferrous Materials

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	
1	115	110	97.6	89.9	83.1	76.9	71.8	67.4	63.1	58.7	54.7	51.0	...	...	...	...	(**23**)
2	115	110	97.6	89.9	83.1	76.9	71.8	67.4	63.1	58.7	54.7	51.0	...	...	...	...	(**23**)
3	115	110	97.6	89.9	83.1	76.9	71.8	67.4	63.1	58.7	54.7	51.0	...	...	...	...	(**23**)
4	115	110	97.6	89.9	83.1	76.9	71.8	67.4	63.1	58.7	54.7	51.0	...	...	...	...	(**23**)
5	97.9	93.9	82.7	76.3	70.8	65.1	61.3	57.1	53.1	49.8	46.8	43.6	...	...	...	...	(**23**)
6	97.9	93.9	82.7	76.3	70.8	65.1	61.3	57.1	53.1	49.8	46.8	43.6	...	...	...	...	(**23**)
7	150	141	124	113	102	93.0	84.8	77.2	70.5	65.5	61.6	57.9	...	...	...	...	(**23**)
8	150	141	124	113	102	93.0	84.8	77.2	70.5	65.5	61.6	57.9	...	...	...	...	(**23**)
9	150	141	124	113	102	93.0	84.8	77.2	70.5	65.5	61.6	57.9	...	...	...	...	(**23**)
10	150	141	124	113	102	93.0	84.8	77.2	70.5	65.5	61.6	57.9	...	...	...	...	(**23**)
11	150	141	124	113	102	93.0	84.8	77.2	70.5	65.5	61.6	57.9	...	...	...	...	(**23**)
12	127	120	105	95.9	87.2	79.1	71.5	65.7	60.0	55.5	52.3	49.2	...	...	...	...	(**23**)
13	127	120	105	95.9	87.2	79.1	71.5	65.7	60.0	55.5	52.3	49.2	...	...	...	...	(**23**)
14	115	110	97.6	89.9	83.1	76.9	71.8	67.4	63.1	58.7	54.7	51.0	...	...	...	...	(**23**)
15	115	110	97.6	89.9	83.1	76.9	71.8	67.4	63.1	58.7	54.7	51.0	...	...	...	...	(**23**)
16	115	110	97.6	89.9	83.1	76.9	71.8	67.4	63.1	58.7	54.7	51.0	...	...	...	...	(**23**)
17	115	110	97.6	89.9	83.1	76.9	71.8	67.4	63.1	58.7	54.7	51.0	...	...	...	...	(**23**)
18	115	110	97.6	89.9	83.1	76.9	71.8	67.4	63.1	58.7	54.7	51.0	...	...	...	...	(**23**)
19	97.9	93.9	82.7	76.3	70.8	65.1	61.3	57.1	53.1	49.8	46.8	43.6	...	...	...	...	(**23**)
20	97.9	93.9	82.7	76.3	70.8	65.1	61.3	57.1	53.1	49.8	46.8	43.6	...	...	...	...	(**23**)
21	115	110	97.6	89.9	83.1	76.9	71.8	67.4	63.1	58.7	54.7	51.0	...	...	...	...	(**23**)
22	161	161	147	139	130	122	116	111	106	103	101	98.3	...	...	...	...	(**23**)
23	161	161	147	139	130	122	116	111	106	103	101	98.3	...	...	...	...	(**23**)
24	161	161	147	139	130	122	116	111	106	103	101	98.3	...	...	...	...	(**23**)
25	161	161	147	139	130	122	116	111	106	103	101	98.3	...	...	...	...	(**23**)
26	161	161	147	139	130	122	116	111	106	103	101	98.3	...	...	...	...	(**23**)
27	137	137	125	118	111	105	98.8	94.3	90.2	87.7	85.8	83.1	...	...	...	...	(**23**)
28	137	137	125	118	111	105	98.8	94.3	90.2	87.7	85.8	83.1	...	...	...	...	(**23**)
29	207	207	197	190	182	173	164	155	148	143	140	138	...	...	...	...	(**23**)
30	207	207	197	190	182	173	164	155	148	143	140	138	...	...	...	...	(**23**)
31	207	207	197	190	182	173	164	155	148	143	140	138	...	...	...	...	(**23**)
32	207	207	197	190	182	173	164	155	148	143	140	138	...	...	...	...	(**23**)
33	207	207	197	190	182	173	164	155	148	143	140	138	...	...	...	...	(**23**)
34	207	207	197	190	182	173	164	155	148	143	140	138	...	...	...	...	(**23**)
35	176	176	167	161	154	147	139	132	126	122	119	117	...	...	...	...	(**23**)
36	176	176	167	161	154	147	139	132	126	122	119	117	...	...	...	...	(**23**)
37	176	176	167	161	154	147	139	132	126	122	119	117	...	...	...	...	(**23**)

NOTES TO TABLE 2B

GENERAL NOTES

(a) The following abbreviations are used: ann., annealed; fin., finished; rel., relieved; Smls., Seamless; and Wld., Welded.

(b) An alternative typeface is used for stress values based on successful experience in service (see Notes E1 through E5).

(c) Where specifications, grades, classes, and types are listed in this Table, and where the material specification in Section II, Part A or Part B is a dual–unit specification (e.g., SB–407/SB–407M), the values listed in this Table shall be applicable to either the customary U.S. version of the material specification or the SI units version of the material specification. For example, the values listed for SB–407 Grade N08800 shall be used when SB–407M Grade N08800 is used in construction.

(d) The values in this Table may be interpolated to determine values for intermediate temperatures. The values at intermediate temperatures shall be rounded to the same number of decimal places as the value at the higher temperature between which values are being interpolated. The rounding rule is: when the next digit beyond the last place to be retained is less than 5, retain unchanged the digit in the last place retained; when the digit next beyond the last place to be retained is 5 or greater, increase by 1 the digit in the last place retained.

(e) The properties of steels are influenced by the processing history, heat treatment, melting practice, and level of residual elements. See Nonmandatory Appendix A for more information.

(f) Where a size limit appears in the Size/Thickness column, the limit applies to the dimension appropriate to the product form: wall thickness of tubing, pipe, pipe fittings, and hollow forgings; thickness of plate, flat bar and forgings, and polygonal bar; diameter of solid bar and bolting; and thickest cross–section of other pressure parts, e.g., castings and forgings.

NOTES – EXPERIENCE CRITERION

E1 For values at 425°C, the design stress intensity values or maximum allowable stress values are based on successful experience in service.

E2 For values at 125°C and above, the design stress intensity values or maximum allowable stress values are based on successful experience in service.

E3 For values at 200°C and above, the design stress intensity values or maximum allowable stress values are based on successful experience in service.

E4 For values at 400°C and above, the design stress intensity values or maximum allowable stress values are based on successful experience in service.

E5 For values at 150°C and above, the design stress intensity values or maximum allowable stress values are based on successful experience in service.

(**23**) E6 For values at 175°C and above, the design stress intensity values are based on successful experience in service.

NOTES – GENERAL REQUIREMENTS

G1 Due to the relatively low yield strength of these materials, these higher stress values were established at temperatures where the short–time tensile properties govern to permit the use of these alloys where slightly greater deformation is acceptable. The stress values in this range exceed 66⅔% but do not exceed 90% of the yield strength at temperature. Use of these stresses may result in dimensional changes due to permanent strain. These stress values are not recommended for the flanges of gasketed joints or other applications where slight amounts of distortion can cause leakage or malfunction. Table Y–2 lists multiplying factors that, when applied to the yield strength values shown in Table Y–1, will give allowable stress values that will result in lower levels of permanent strain.

G2 Use of external pressure charts for material in the form of bar stock is permitted for stiffening rings only.

G3 SB–163 Supplementary Requirement S2 shall be met.

G4 Stress values for 40°C may be used at temperatures down to –200°C without additional specification requirements.

G5 A joint efficiency factor of 0.85 has been applied in arriving at the stress values for this material.

G6 Maximum temperature for external pressure design not to exceed 175°C.

G7 These alloys are occasionally subject to the hazard of stress corrosion cracking. Even though they are suitable for engineering use under a wide variety of corrosive conditions, with no particular hazard with respect to stress corrosion, the supplier of the material should be consulted before applying them.

G8 Stress values for 40°C may be used at temperatures down to –270°C without additional specification requirements.

G9 For stress relieved tempers (T451, T4510, T4511, T651, T6510, and T6511), stress values for materials in the basic temper shall be used.

G10 Copper–silicon alloys are not always suitable when exposed to certain media and high temperature, particularly steam above 100°C. The user should satisfy him/herself that the alloy selected is satisfactory for the service for which it is to be used.

(**23**) G11 The allowable stress value at 65°C shall be used at 66°C.

NOTES – SIZE REQUIREMENTS

S1 Thickness ≤ 2.5 mm.

NOTES – WELDING REQUIREMENTS

W1 Welding except for seal welds is not permitted.

W2 For welded construction, stress values for material of O temper shall be used.

W3 The stress values given for this material are not applicable when either welding or thermal cutting is employed.

Table 3
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm
	Ferrous Materials						
1	Carbon steel	Bolting	SA–307	A	...	...	$6 \le t \le 100$
2	Carbon steel	Bolting	SA–307	B	...	...	...
3	Carbon steel	Bolting	SA–449	1	K04200	...	$38 < t \le 75$
4	Carbon steel	Bolting	SA–325	...	...	...	...
5	Carbon steel	Bolting	SA–325	1	K02706	...	$29 \le t \le 38$
6	Carbon steel	Bolting	SA–449	1	K04200	...	$25 < t \le 38$
7	Carbon steel	Bolting	SA–354	BC	K04100	...	$64 < t \le 100$
8	Carbon steel	Bolting	SA–325	1	K02706	...	$13 \le t \le 25$
9	Carbon steel	Bolting	SA–449	1	K04200	...	≤25
10	Carbon steel	Bolting	SA–354	BC	K04100	...	$6 < t \le 64$
11	Carbon steel	Bolting	SA–354	BD	K04100	...	$64 < t \le 100$
12	Carbon steel	Bolting	SA–354	BD	K04100	...	$6 < t \le 64$
13	C–¼Mo	Bolting	SA–320	L7A	G40370	...	≤65
14	C–¼Mo	Bolting	SA–574	4037	G40370	...	≥16
15	C–¼Mo	Bolting	SA–574	4042	G40420	...	≥16
16	C–¼Mo	Bolting	SA–574	4037	G40370	...	≤13
17	C–¼Mo	Bolting	SA–574	4042	G40420	...	≤13
18	¾Cr	Bolting	SA–574	5137M	...	...	≥16
19	¾Cr	Bolting	SA–574	51B37M	...	...	≥16
20	¾Cr	Bolting	SA–574	5137M	...	...	≤13
21	¾Cr	Bolting	SA–574	51B37M	...	...	≤13
22	1Cr–1Mn–¼Mo	Bolting	SA–540	B22	H41420	5	$50 < t \le 100$
23	1Cr–1Mn–¼Mo	Bolting	SA–540	B22	H41420	5	≤50
24	1Cr–1Mn–¼Mo	Bolting	SA–540	B22	H41420	4	≤100
25	1Cr–1Mn–¼Mo	Bolting	SA–540	B22	H41420	3	≤100
26	1Cr–1Mn–¼Mo	Bolting	SA–540	B22	H41420	2	≤75
27	1Cr–1Mn–¼Mo	Bolting	SA–540	B22	H41420	1	≤38
28	1Cr–⅕Mo	Bolting	SA–193	B7	G41400	...	$100 < t \le 180$
29	1Cr–⅕Mo	Bolting	SA–193	B7M	G41400	...	≤100
30	1Cr–⅕Mo	Bolting	SA–320	L7M	G41400	...	≤65
31	1Cr–⅕Mo	Bolting	SA–193	B7	G41400	...	$64 < t \le 100$
32	1Cr–⅕Mo	Bolting	SA–193	B7	G41400	...	≤64
33	1Cr–⅕Mo	Bolting	SA–320	L7	G41400	...	≤65
34	1Cr–⅕Mo	Bolting	SA–574	4137	G41370	...	≥16
35	1Cr–⅕Mo	Bolting	SA–574	4140	G41400	...	≥16
36	1Cr–⅕Mo	Bolting	SA–574	4142	G41420	...	≥16
37	1Cr–⅕Mo	Bolting	SA–574	4145	G41450	...	≥16
38	1Cr–⅕Mo	Bolting	SA–574	4137	G41370	...	≤13
39	1Cr–⅕Mo	Bolting	SA–574	4140	G41400	...	≤13
40	1Cr–⅕Mo	Bolting	SA–574	4142	G41420	...	≤13
41	1Cr–⅕Mo	Bolting	SA–574	4145	G41450	...	≤13
42	1Cr–½Mo–V	Bolting	SA–193	B16	K14072	...	$100 < t \le 200$
43	1Cr–½Mo–V	Bolting	SA–193	B16	K14072	...	$64 < t \le 100$
44	1Cr–½Mo–V	Bolting	SA–540	B21	K14073	5	$50 < t \le 205$
45	1Cr–½Mo–V	Bolting	SA–540	B21	K14073	5	≤50

Table 3
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) III	VIII-1	VIII-2	XII	Notes
							Ferrous Materials
1	415	...	NP	232	NP	NP	G12
2	415	...	204	232	NP	232	...
3	620	400	371	343	343	343	...
4	725	560	343	343	343	NP	...
5	725	560	NP	343	343	343	...
6	725	560	371	371	371	343	...
7	795	685	343	343	343	343	...
8	825	635	NP	343	343	343	...
9	825	635	371	343	343	343	...
10	860	750	343	343	343	343	...
11	965	795	343	343	343	343	...
12	1035	895	343	343	343	343	...
13	860	725	NP	343	343	343	W3
14	1170	930	288	288	NP	288	G7, G11, W1
15	1170	930	288	288	NP	288	G7, G11, W1
16	1240	965	288	288	NP	288	G7, G11, W1
17	1240	965	288	288	NP	288	G7, G11, W1
18	1170	930	288	288	NP	NP	G7, G11, W1
19	1170	930	288	288	NP	NP	G7, G11, W1
20	1240	965	288	288	NP	NP	G7, G11, W1
21	1240	965	288	288	NP	NP	G7, G11, W1
22	795	690	371	NP	NP	NP	...
23	825	725	371	NP	NP	NP	...
24	930	825	371	NP	NP	NP	...
25	1000	895	371	371	NP	343	...
26	1070	965	371	NP	NP	NP	...
27	1140	1035	371	NP	NP	NP	...
28	690	515	427	538	427	343	T5
29	690	550	NP	538	427	343	T5
30	690	550	NP	538	427	343	T5
31	795	655	427	538	427	343	T5
32	860	725	427	538	427	343	T5
33	860	725	371	427	427	343	...
34	1170	930	288	NP	NP	NP	G7, G11, W1
35	1170	930	288	288	NP	288	G7, G11, W1
36	1170	930	288	NP	NP	NP	G7, G11, W1
37	1170	930	288	NP	NP	NP	G7, G11, W1
38	1240	965	288	NP	NP	NP	G7, G11, W1
39	1240	965	288	NP	NP	NP	G7, G11, W1
40	1240	965	288	NP	NP	NP	G7, G11, W1
41	1240	965	288	NP	NP	NP	G7, G11, W1
42	690	585	427	593	427	343	T8
43	760	655	427	593	427	343	T8
44	795	690	371	371	371	NP	...
45	825	725	371	371	371	NP	...

Table 3
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
	Ferrous Materials																	
1	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	...	...	...	...	...	...	...	...	...
2	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	...	...	...	...	...	...	...	...	...
3	100	100	100	100	100	100	100	100	100	100	100	100	100	100	...	...	...	...
4	139	139	139	139	139	139	139	139	139	139	139	139	139	...	...	...	...	...
5	139	139	139	139	139	139	139	139	139	139	139	139	139	...	...	...	...	...
6	139	139	139	139	139	139	139	139	139	139	139	139	139	139	...	...	...	...
7	159	159	159	159	159	159	159	159	159	159	159	159	159	...	...	...	...	...
8	159	159	159	159	159	159	159	159	159	159	159	159	159	...	...	...	...	...
9	159	159	159	159	159	159	159	159	159	159	159	159	159	159	...	...	...	...
10	172	172	172	172	172	172	172	172	172	172	172	172	172	...	...	...	...	...
11	193	193	193	193	193	193	193	193	193	193	193	193	193	...	...	...	...	...
12	207	207	207	207	207	207	207	207	207	207	207	207	207	...	...	...	...	...
13	172	172	172	172	172	172	172	172	172	172	172	172	172	...	...	...	...	...
14	233	233	233	233	233	233	233	233	233	233	233	...	...	...	...	...	...	...
15	233	233	233	233	233	233	233	233	233	233	233	...	...	...	...	...	...	...
16	241	241	241	241	241	241	241	241	241	241	241	...	...	...	...	...	...	...
17	241	241	241	241	241	241	241	241	241	241	241	...	...	...	...	...	...	...
18	233	233	233	233	233	233	233	233	233	233	233	...	...	...	...	...	...	...
19	233	233	233	233	233	233	233	233	233	233	233	...	...	...	...	...	...	...
20	241	241	241	241	241	241	241	241	241	241	241	...	...	...	...	...	...	...
21	241	241	241	241	241	241	241	241	241	241	241	...	...	...	...	...	...	...
22	159	159	159	159	159	159	159	159	159	159	159	159	159	159	...	...	...	...
23	165	165	165	165	165	165	165	165	165	165	165	165	165	165	...	...	...	...
24	186	186	186	186	186	186	186	186	186	186	186	186	186	186	...	...	...	...
25	200	200	200	200	200	200	200	200	200	200	200	200	200	200	...	...	...	...
26	214	214	214	214	214	214	214	214	214	214	214	214	214	214	...	...	...	...
27	228	228	228	228	228	228	228	228	228	228	228	228	228	228	...	...	...	...
28	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	125	*115*	*93.7*
29	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	128	*115*	*93.6*
30	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	128	*115*	*93.6*
31	159	159	159	159	159	159	159	159	159	159	159	159	159	158	153	139	*117*	*93.0*
32	172	172	172	172	172	172	172	172	172	172	172	172	172	172	162	146	*118*	*92.7*
33	172	172	172	172	172	172	172	172	172	172	172	172	172	172	162	146	118	...
34	233	233	233	233	233	233	233	233	233	233	233	...	...	...	...	...	...	...
35	233	233	233	233	233	233	233	233	233	233	233	...	...	...	...	...	...	...
36	233	233	233	233	233	233	233	233	233	233	233	...	...	...	...	...	...	...
37	233	233	233	233	233	233	233	233	233	233	233	...	...	...	...	...	...	...
38	241	241	241	241	241	241	241	241	241	241	241	...	...	...	...	...	...	...
39	241	241	241	241	241	241	241	241	241	241	241	...	...	...	...	...	...	...
40	241	241	241	241	241	241	241	241	241	241	241	...	...	...	...	...	...	...
41	241	241	241	241	241	241	241	241	241	241	241	...	...	...	...	...	...	...
42	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	132	119
43	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	147	133
44	159	159	159	159	159	159	159	159	159	159	159	159	159	159	...	...	...	...
45	165	165	165	165	165	165	165	165	165	165	165	165	165	165	...	...	...	...

Table 3
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
																	Ferrous Materials
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	*68.4*	*43.8*	*18.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	*68.4*	*43.7*	*18.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	*68.4*	*43.7*	*18.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	*68.6*	*43.7*	*18.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	*68.8*	*43.6*	*18.9*	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	105	87.7	*61.7*	*34.3*	*13.8*	...	...	...	...	...	...	...	...	...	...	...	...
43	114	90.4	*61.1*	*34.5*	*13.7*	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm
		Ferrous Materials (Cont'd)						
	1	1Cr–½Mo–V	Bolting	SA–193	B16	K14072	...	≤64
	2	1Cr–½Mo–V	Bolting	SA–540	B21	K14073	4	≤150
	3	1Cr–½Mo–V	Bolting	SA–540	B21	K14073	3	≤150
	4	1Cr–½Mo–V	Bolting	SA–540	B21	K14073	2	≤100
	5	1Cr–½Mo–V	Bolting	SA–540	B21	K14073	1	≤100
	6	5Cr–½Mo	Bolting	SA–193	B5	K50100	...	≤100
	7	12Cr–1Mo–V–W	Bolting	SA–437	B4C	K91352	...	...
	8	12Cr–1Mo–V–W	Bolting	SA–437	B4B	K91352	...	...
	9	13Cr	Bolting	SA–193	B6	S41000	...	≤100
	10	17Cr–4Ni–4Cu	Bolting	SA–564	630	S17400	H1150	≤200
	11	17Cr–4Ni–4Cu	Bolting	SA–564	630	S17400	H1100	≤200
	12	17Cr–4Ni–4Cu	Bolting	SA–705	630	S17400	H1100	≤200
	13	½Ni–½Cr–¼Mo	Bolting	SA–574	8740	G87400	...	≥16
	14	½Ni–½Cr–¼Mo	Bolting	SA–574	8740	G87400	...	≤13
	15	1¾Ni–¾Cr–¼Mo	Bolting	SA–320	L43	G43400	...	≤100
	16	1¾Ni–¾Cr–¼Mo	Bolting	SA–574	4340	G43400	...	≥16
	17	1¾Ni–¾Cr–¼Mo	Bolting	SA–574	4340	G43400	...	≤13
(**23**)	18	2Ni–¾Cr–¼Mo	Bolting	SA–540	B23	H43400	5	≤150
(**23**)	19	2Ni–¾Cr–¼Mo	Bolting	SA–540	B23	H43400	5	150 < t ≤ 240
	20	2Ni–¾Cr–¼Mo	Bolting	SA–540	B23	H43400	4	≤240
	21	2Ni–¾Cr–¼Mo	Bolting	SA–540	B23	H43400	3	≤240
	22	2Ni–¾Cr–¼Mo	Bolting	SA–540	B23	H43400	2	≤240
	23	2Ni–¾Cr–¼Mo	Bolting	SA–540	B23	H43400	1	≤200
(**23**)	24	2Ni–¾Cr–⅓Mo	Bolting	SA–540	B24	K24064	5	≤150
(**23**)	25	2Ni–¾Cr–⅓Mo	Bolting	SA–540	B24	K24064	5	150 < t ≤ 240
	26	2Ni–¾Cr–⅓Mo	Bolting	SA–540	B24	K24064	4	≤240
	27	2Ni–¾Cr–⅓Mo	Bolting	SA–540	B24	K24064	3	≤240
	28	2Ni–¾Cr–⅓Mo	Bolting	SA–540	B24	K24064	2	≤240
	29	2Ni–¾Cr–⅓Mo	Bolting	SA–540	B24	K24064	1	≤200
	30	2Ni–¾Cr–⅓Mo–V	Bolting	SA–540	B24V	K24070	3	≤280
	31	3½Ni–1¾Cr–½Mo–V	Forgings	SA–508	5	K42365	2	...
	32	25Ni–15Cr–2Ti	Bolting	SA–453	660	S66286	A	...
	33	25Ni–15Cr–2Ti	Bolting	SA–453	660	S66286	B	...
	34	16Cr–12Ni–2Mo	Bolting	SA–193	B8M	S31600	1	...
	35	16Cr–12Ni–2Mo	Bolting	SA–320	B8M	S31600	1	...
	36	16Cr–12Ni–2Mo	Bolting	SA–320	B8MA	S31600	1A	...
(**23**)	37	16Cr–12Ni–2Mo	Bolting	SA–193	B8M2	S31600	2B	64 < t ≤ 72
	38	16Cr–12Ni–2Mo	Bolting	SA–193	B8M	S31600	2	30 < t ≤ 36
	39	16Cr–12Ni–2Mo	Bolting	SA–320	B8M	S31600	2	32 < t ≤ 40
(**23**)	40	16Cr–12Ni–2Mo	Bolting	SA–193	B8M2	S31600	2B	48 < t ≤ 64
	41	16Cr–12Ni–2Mo	Bolting	SA–193	B8M	S31600	2	24 < t ≤ 30
	42	16Cr–12Ni–2Mo	Bolting	SA–320	B8M	S31600	2	25 < t ≤ 32
(**23**)	43	16Cr–12Ni–2Mo	Bolting	SA–193	B8M2	S31600	2B	≤48
	44	16Cr–12Ni–2Mo	Bolting	SA–193	B8M	S31600	2	20 < t ≤ 24
	45	16Cr–12Ni–2Mo	Bolting	SA–320	B8M	S31600	2	20 < t ≤ 25

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) III	VIII-1	VIII-2	XII	Notes
							Ferrous Materials (Cont'd)
1	860	725	427	593	427	343	T8
2	930	825	371	371	371	343	...
3	1000	895	371	371	371	343	...
4	1070	965	371	371	371	343	...
5	1140	1035	371	371	371	343	...
6	690	550	427	649	427	343	T5
7	795	585	371	371	371	343	...
8	1000	725	371	371	371	343	...
9	760	585	427	482	427	343	T5
10	930	725	NP	343	343	NP	G4
11	965	795	343	343	343	343	G4
12	965	795	343	343	343	343	G4
13	1170	930	288	NP	NP	NP	G7, G11, W1
14	1240	965	288	NP	NP	NP	G7, G11, W1
15	860	725	204	204	371	204	...
16	1170	930	288	288	NP	NP	G7, G11, W1
17	1240	965	288	288	NP	NP	G7, G11, W1
18	825	725	371	371	371	343	...
19	795	690	371	371	371	343	...
20	930	825	371	371	371	343	...
21	1000	895	371	371	371	343	...
22	1070	965	371	371	371	343	...
23	1140	1035	371	371	371	343	...
24	825	725	371	371	371	343	...
25	795	690	371	371	371	343	...
26	930	825	371	371	371	343	...
27	1000	895	371	371	371	343	...
28	1070	965	371	371	371	343	...
29	1140	1035	371	371	371	343	...
30	1000	895	371	371	371	343	...
31	795	690	NP	38	38	38	...
32	895	585	427	538	427	343	...
33	895	585	427	538	427	343	...
34	515	205	427	816	427	343	G5, G6, T11
35	515	205	204	427	427	38	...
36	515	205	NP	427	427	38	...
37	550	380	NP	538	427	343	G8, G9
38	620	345	427	427	NP	343	G8
39	620	345	NP	427	427	38	G8, G9
40	620	450	NP	538	427	343	G8, G9
41	655	450	427	427	NP	343	G8
42	655	450	NP	427	427	38	G8
43	655	515	NP	538	427	343	G8, G9
44	690	550	427	427	NP	343	G8
45	690	550	NP	427	427	38	G8

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
	Ferrous Materials (Cont'd)																	
1	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	164	148
2	186	186	186	186	186	186	186	186	186	186	186	186	186	186	...	...	...	...
3	200	200	200	200	200	200	200	200	200	200	200	200	200	200	...	...	...	...
4	214	214	214	214	214	214	214	214	214	214	214	214	214	214	...	...	...	...
5	228	228	228	228	228	228	228	228	228	228	228	228	228	228	...	...	...	...
6	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	129	*105*	*78.3*
7	147	147	147	147	147	147	147	147	147	147	147	147	147	147	...	...	...	...
8	181	181	181	181	181	181	181	181	181	181	181	181	181	181	...	...	...	...
9	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	*125*	*92.4*
10	181	181	181	181	181	181	181	181	181	181	181	181	181	...	...	...	...	...
11	193	193	193	193	193	193	193	193	193	193	193	193	193	...	...	...	...	...
12	193	193	193	193	193	193	193	193	193	193	193	193	193	...	...	...	...	...
13	233	233	233	233	233	233	233	233	233	233	233	...	...	...	...	...	...	...
14	241	241	241	241	241	241	241	241	241	241	241	...	...	...	...	...	...	...
15	172	172	172	172	172	172	172	172	172	172	172	172	172	172	...	...	...	...
16	233	233	233	233	233	233	233	233	233	233	233	...	...	...	...	...	...	...
17	241	241	241	241	241	241	241	241	241	241	241	...	...	...	...	...	...	...
18	165	165	165	165	165	165	165	165	165	165	165	165	165	165	...	...	...	...
19	159	159	159	159	159	159	159	159	159	159	159	159	159	159	...	...	...	...
20	186	186	186	186	186	186	186	186	186	186	186	186	186	186	...	...	...	...
21	200	200	200	200	200	200	200	200	200	200	200	200	200	200	...	...	...	...
22	214	214	214	214	214	214	214	214	214	214	214	214	214	214	...	...	...	...
23	228	228	228	228	228	228	228	228	228	228	228	228	228	228	...	...	...	...
24	165	165	165	165	165	165	165	165	165	165	165	165	165	165	...	...	...	...
25	159	159	159	159	159	159	159	159	159	159	159	159	159	159	...	...	...	...
26	186	186	186	186	186	186	186	186	186	186	186	186	186	186	...	...	...	...
27	200	200	200	200	200	200	200	200	200	200	200	200	200	200	...	...	...	...
28	214	214	214	214	214	214	214	214	214	214	214	214	214	214	...	...	...	...
29	228	228	228	228	228	228	228	228	228	228	228	228	228	228	...	...	...	...
30	200	200	200	200	200	200	200	200	200	200	200	200	200	200	...	...	...	...
31	159	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147
33	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147	147
34	130	127	121	114	107	103	99.2	95.9	92.8	90.2	88.1	86.1	84.4	83.2	82.0	80.7	80.1	79.5
35	130	127	121	114	107	103	99.2	95.9	92.8	90.2	88.1	86.1	84.4	83.2	82.0	80.7	80.1	...
36	130	127	121	114	107	103	99.2	95.9	92.8	90.2	88.1	86.1	84.4	83.2	82.0	80.7	80.1	...
37	130	127	121	114	107	102	99.1	96.7	95.4	95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1
38	130	127	121	114	107	103	99.2	96.0	92.9	90.1	87.8	86.5	86.2	86.2	86.2	86.2	86.2	...
39	130	127	121	114	107	103	99.2	96.0	92.9	90.1	87.8	86.5	86.2	86.2	86.2	86.2	86.2	...
40	130	127	121	115	112	112	112	112	112	112	112	112	112	112	112	112	112	112
41	130	127	121	115	112	112	112	112	112	112	112	112	112	112	112	112	112	...
42	130	127	121	115	112	112	112	112	112	112	112	112	112	112	112	112	112	...
43	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
44	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	...
45	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	...

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
																		Ferrous Materials (Cont'd)
1	122	91.8	*60.8*	*34.6*	*13.7*	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	*58.5*	*44.4*	*33.9*	*26.3*	*19.5*	*13.0*	*8.79*	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	*68.4*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	147	147	147	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	147	147	147	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	78.8	78.2	77.6	77.1	74.7	*65.5*	*50.4*	*38.6*	*29.6*	*23.0*	*17.7*	*13.4*	*10.4*	*8.05*	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	95.1	95.1	95.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	112	112	112	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	130	130	130	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm
	Ferrous Materials (Cont'd)						
1	16Cr–12Ni–2Mo	Bolting	SA–193	B8M	S31600	2	≤20
2	16Cr–12Ni–2Mo	Bolting	SA–320	B8M	S31600	2	≤20
3	16Cr–12Ni–2Mo–N	Bolting	SA–193	B8MNA	S31651	1A	...
4	18Cr–8Ni	Bolting	SA–193	B8	S30400	1	...
5	18Cr–8Ni	Bolting	SA–320	B8	S30400	1	...
6	18Cr–8Ni	Bolting	SA–320	B8A	S30400	1A	...
7	18Cr–8Ni	Bolting	SA–193	B8	S30400	2	$30 < t \le 36$
8	18Cr–8Ni	Bolting	SA–320	B8	S30400	2	$32 < t \le 40$
9	18Cr–8Ni	Bolting	SA–193	B8	S30400	2	$24 < t \le 30$
10	18Cr–8Ni	Bolting	SA–320	B8	S30400	2	$25 < t \le 32$
11	18Cr–8Ni	Bolting	SA–193	B8	S30400	2	$20 < t \le 24$
12	18Cr–8Ni	Bolting	SA–320	B8	S30400	2	$20 < t \le 25$
13	18Cr–8Ni	Bolting	SA–193	B8	S30400	2	≤20
14	18Cr–8Ni	Bolting	SA–320	B8	S30400	2	≤20
15	18Cr–8Ni–N	Bolting	SA–193	B8NA	S30451	1A	...
16	18Cr–8Ni–Se	Bolting	SA–320	B8F	S30323	1	...
17	18Cr–8Ni–Se	Bolting	SA–320	B8FA	S30323	1A	...
18	18Cr–8Ni–4Si–N	Bolting	SA–193	B8S	S21800	...	...
19	18Cr–8Ni–4Si–N	Bolting	SA–193	B8SA	S21800	...	...
20	18Cr–10Ni–Cb	Bolting	SA–193	B8C	S34700	1	...
21	18Cr–10Ni–Cb	Bolting	SA–320	B8C	S34700	1	...
22	18Cr–10Ni–Cb	Bolting	SA–320	B8CA	S34700	1A	...
23	18Cr–10Ni–Cb	Bolting	SA–193	B8C	S34700	2	$30 < t \le 36$
24	18Cr–10Ni–Cb	Bolting	SA–320	B8C	S34700	2	$32 < t \le 40$
25	18Cr–10Ni–Cb	Bolting	SA–193	B8C	S34700	2	$24 < t \le 30$
26	18Cr–10Ni–Cb	Bolting	SA–320	B8C	S34700	2	$25 < t \le 32$
27	18Cr–10Ni–Cb	Bolting	SA–193	B8C	S34700	2	$20 < t \le 24$
28	18Cr–10Ni–Cb	Bolting	SA–320	B8C	S34700	2	$20 < t \le 25$
29	18Cr–10Ni–Cb	Bolting	SA–193	B8C	S34700	2	≤20
30	18Cr–10Ni–Cb	Bolting	SA–320	B8C	S34700	2	≤20
31	18Cr–10Ni–Ti	Bolting	SA–193	B8T	S32100	1	...
32	18Cr–10Ni–Ti	Bolting	SA–320	B8T	S32100	1	...
33	18Cr–10Ni–Ti	Bolting	SA–320	B8TA	S32100	1A	...
34	18Cr–10Ni–Ti	Bolting	SA–193	B8T	S32100	2	$30 < t \le 36$
35	18Cr–10Ni–Ti	Bolting	SA–320	B8T	S32100	2	$32 < t \le 40$
36	18Cr–10Ni–Ti	Bolting	SA–193	B8T	S32100	2	$24 < t \le 30$
37	18Cr–10Ni–Ti	Bolting	SA–320	B8T	S32100	2	$25 < t \le 32$
38	18Cr–10Ni–Ti	Bolting	SA–193	B8T	S32100	2	$20 < t \le 24$
39	18Cr–10Ni–Ti	Bolting	SA–320	B8T	S32100	2	$20 < t \le 25$
40	18Cr–10Ni–Ti	Bolting	SA–193	B8T	S32100	2	≤20
41	18Cr–10Ni–Ti	Bolting	SA–320	B8T	S32100	2	≤20
42	18Cr–11Ni	Bolting	SA–193	B8P	S30500	1	...
43	18Cr–11Ni	Bolting	SA–193	B8P	S30500	2	$30 < t \le 36$
44	18Cr–11Ni	Bolting	SA–193	B8P	S30500	2	$24 < t \le 30$
45	18Cr–11Ni	Bolting	SA–193	B8P	S30500	2	$20 < t \le 24$

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) III	VIII-1	VIII-2	XII	Notes
							Ferrous Materials (Cont'd)
1	760	655	427	427	NP	343	G8
2	760	655	NP	427	427	38	G8
3	515	205	427	538	427	343	G5
4	515	205	427	816	427	343	G5, G6, T10
5	515	205	204	427	427	38	...
6	515	205	NP	427	427	38	...
7	690	345	NP	538	427	343	G8, G9
8	690	345	NP	538	427	38	G8
9	725	450	NP	538	427	343	G8, G9
10	725	450	NP	538	427	38	G8
11	795	550	NP	538	427	343	G8, G9
12	795	550	NP	538	427	38	G8
13	860	690	NP	538	427	343	G8, G9
14	860	690	NP	538	427	38	G8
15	515	205	427	538	427	343	G5
16	515	205	204	204	204	38	...
17	515	205	NP	204	204	38	...
18	655	345	NP	510	427	343	...
19	655	345	NP	510	427	343	...
20	515	205	427	816	427	343	G5, G6, T9
21	515	205	204	427	427	38	...
22	515	205	NP	427	427	38	...
23	690	345	NP	38	38	38	G8
24	690	345	NP	38	38	38	G8
25	725	450	NP	38	38	38	G8
26	725	450	NP	38	38	38	G8
27	795	550	NP	38	38	38	G8
28	795	550	NP	38	38	38	G8
29	860	690	NP	38	38	38	G8
30	860	690	NP	38	38	38	G8
31	515	205	427	816	427	343	G5, G6, T9
32	515	205	204	427	427	38	...
33	515	205	NP	427	427	38	...
34	690	345	NP	538	427	343	G8
35	690	345	NP	427	427	38	G8
36	725	450	NP	538	427	343	G8
37	725	450	NP	427	427	38	G8
38	795	550	NP	538	427	343	G8
39	795	550	NP	427	427	38	G8
40	860	690	NP	538	427	343	G8
41	860	690	NP	427	427	38	G8
42	515	205	NP	816	427	343	T10
43	690	345	NP	538	427	343	G8
44	725	450	NP	538	427	343	G8
45	795	550	NP	538	427	343	G8

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
	Ferrous Materials (Cont'd)																	
1	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	...
2	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	152	...
3	130	127	122	117	112	108	105	102	99.1	96.2	93.7	91.7	89.8	87.9	86.1	84.9	83.0	81.7
4	130	122	114	108	103	99.1	95.7	92.8	90.1	87.2	84.5	83.1	82.5	81.1	79.2	77.3	76.0	74.8
5	130	122	114	108	103	99.1	95.7	92.8	90.1	87.2	84.5	83.1	82.5	81.1	79.2	77.3	76.0	...
6	130	122	114	108	103	99.1	95.7	92.8	90.1	87.2	84.5	83.1	82.5	81.1	79.2	77.3	76.0	...
7	130	122	114	108	103	99.2	95.7	92.6	89.9	87.8	86.5	86.2	86.2	86.2	86.2	86.2	86.2	86.2
8	130	122	114	108	103	99.2	95.7	92.6	89.9	87.8	86.5	86.2	86.2	86.2	86.2	86.2	86.2	86.2
9	130	121	115	114	112	112	112	112	112	112	112	112	112	112	112	112	112	112
10	130	121	115	114	112	112	112	112	112	112	112	112	112	112	112	112	112	112
11	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
12	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
13	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172
14	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172
15	130	122	112	105	99.0	93.8	89.6	86.3	83.7	81.4	79.6	78.1	76.9	75.6	74.4	73.2	71.9	70.8
16	130	115	101	96.6	93.6	90.6	87.4	84.3	...	...	...	...	...	...	...	...	...	...
17	130	115	101	96.6	93.6	90.6	87.4	84.3	...	...	...	...	...	...	...	...	...	...
18	164	163	160	156	150	143	137	132	129	126	123	121	119	118	116	115	115	115
19	164	163	160	156	150	143	137	132	129	126	123	121	119	118	116	115	115	115
20	130	127	122	118	113	109	107	106	104	102	99.7	98.1	96.7	95.0	94.4	93.8	93.1	93.1
21	130	127	122	118	113	109	107	106	104	102	99.7	98.1	96.7	95.0	94.4	93.8	93.1	...
22	130	127	122	118	113	109	107	106	104	102	99.7	98.1	96.7	95.0	94.4	93.8	95.1	...
23	130	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	130	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	130	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	130	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	138	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	138	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	172	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	172	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	130	126	122	118	114	110	106	103	99.8	96.8	94.2	92.7	91.1	88.7	87.5	86.3	85.6	85.1
32	130	126	122	118	114	110	106	103	99.8	96.8	94.2	92.7	91.1	88.7	87.5	86.3	85.6	...
33	130	126	122	118	114	110	106	103	99.8	96.8	94.2	92.7	91.1	88.7	87.5	86.3	85.6	...
34	130	126	122	118	114	110	106	103	99.8	96.8	94.2	92.7	91.1	88.7	87.5	86.2	86.2	86.2
35	130	126	122	118	114	110	106	103	99.8	96.8	94.2	92.7	91.1	88.7	87.5	86.2	86.2	...
36	130	127	122	117	114	113	112	112	112	112	112	112	112	112	112	112	112	112
37	130	127	122	117	114	113	112	112	112	112	112	112	112	112	112	112	112	...
38	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
39	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	...
40	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172
41	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	...
42	130	122	114	108	103	99.1	95.7	92.8	90.1	87.2	84.5	83.1	82.5	81.1	79.2	77.3	76.0	74.8
43	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	129	127	125
44	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
45	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
																	Ferrous Materials (Cont'd)
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	80.5	79.2	78.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	73.6	72.4	70.8	68.9	*65.4*	*51.0*	*41.0*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	86.2	86.2	86.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	86.2	86.2	86.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	112	112	112	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	112	112	112	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	138	138	138	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	138	138	138	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	172	169	164	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	172	169	164	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	69.0	67.4	66.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	115	115	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	115	115	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	92.6	92.4	90.3	*77.2*	*57.3*	*39.9*	*30.0*	*23.2*	*16.3*	*11.2*	*8.93*	*7.08*	*5.77*	*5.32*	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	86.2	86.2	86.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	112	112	112	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	138	138	138	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	172	172	172	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	73.6	72.4	70.8	68.9	*65.4*	*51.0*	*41.0*	*32.9*	*26.5*	*21.3*	*17.2*	*13.9*	*11.1*	*8.73*	...	...	...
43	123	121	118	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	130	130	130	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	138	138	138	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm
	Ferrous Materials (Cont'd)						
1	18Cr–11Ni	Bolting	SA–193	B8P	S30500	2	≤20
2	19Cr–9Ni–Mo–W	Bolting	SA–453	651	S63198	B	>76
3	19Cr–9Ni–Mo–W	Bolting	SA–453	651	S63198	B	>76
4	19Cr–9Ni–Mo–W	Bolting	SA–453	651	S63198	B	≤76
5	19Cr–9Ni–Mo–W	Bolting	SA–453	651	S63198	B	≤76
6	19Cr–9Ni–Mo–W	Bolting	SA–453	651	S63198	A	>76
7	19Cr–9Ni–Mo–W	Bolting	SA–453	651	S63198	A	>76
8	19Cr–9Ni–Mo–W	Bolting	SA–453	651	S63198	A	≤76
9	19Cr–9Ni–Mo–W	Bolting	SA–453	651	S63198	A	≤76
10	22Cr–13Ni–5Mn	Bolting	SA–479	XM–19	S20910	Annealed	...
11	22Cr–13Ni–5Mn	Bolting	SA–479	XM–19	S20910	Hot rolled	76.2 < t ≤ 203.2
12	22Cr–13Ni–5Mn	Bolting	SA–479	XM–19	S20910	Hot rolled	50.8 < t ≤ 76.2
13	22Cr–13Ni–5Mn	Bolting	SA–479	XM–19	S20910	Hot rolled	≤50.8
14	23Cr–25Ni–5.5Mo–N	Bolting	SA–193	...	S32053	...	...

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) III	VIII-1	VIII-2	XII	Notes
							Ferrous Materials (Cont'd)
1	860	690	NP	538	427	343	G8
2	655	345	427	NP	NP	NP	...
3	655	345	NP	538	427	343	...
4	655	415	427	NP	NP	NP	...
5	655	415	NP	538	427	343	...
6	690	415	427	NP	NP	NP	...
7	690	415	NP	538	427	343	...
8	690	485	427	NP	NP	NP	...
9	690	485	NP	538	427	343	...
10	690	380	NP	621	427	343	T9
11	690	415	NP	621	427	343	T9
12	795	515	NP	621	427	343	T9
13	930	725	NP	621	427	343	T9
14	640	295	NP	662	NP	NP	...

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
	Ferrous Materials (Cont'd)																	
1	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172
2	86.2	82.3	77.8	75.2	73.0	71.0	69.2	67.6	66.1	64.5	63.0	61.6	60.4	59.1	57.9	57.3	56.7	...
3	86.2	82.7	78.6	76.0	73.7	71.4	69.3	67.6	66.1	64.6	63.0	61.5	60.5	59.8	58.5	57.3	56.7	55.5
4	103	98.9	93.5	90.2	87.4	85.1	83.1	81.4	79.9	78.3	76.4	74.4	72.7	71.4	69.6	68.3	67.1	...
5	103	99.3	94.2	91.0	88.1	85.8	83.8	81.9	80.0	78.2	76.4	74.4	72.7	71.5	70.3	69.0	67.8	66.5
6	103	98.9	93.5	90.2	87.4	85.1	83.1	81.4	79.9	78.3	76.4	74.4	72.7	71.4	69.6	68.3	67.1	...
7	103	99.3	94.2	91.0	88.1	85.8	83.8	81.9	80.1	78.1	76.1	74.7	73.3	71.5	70.3	69.0	67.8	66.5
8	121	115	109	105	102	99.1	96.9	95.0	93.2	91.1	88.9	86.8	85.0	83.1	81.3	80.1	78.8	...
9	121	116	110	106	103	99.9	97.6	95.4	93.3	91.1	88.9	86.8	85.1	83.9	82.0	80.1	78.8	77.6
10	172	172	171	167	163	159	157	155	154	153	152	151	150	149	147	146	144	143
11	172	172	171	167	163	159	157	155	154	153	152	151	150	149	147	146	144	143
12	172	172	171	167	163	159	157	155	154	153	152	151	150	149	147	146	144	143
13	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181	181
14	183	177	164	...	151	...	141	...	134	...	129	127	125	...	...	...	...	...

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
																	Ferrous Materials (Cont'd)
1	172	169	164	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	54.7	53.8	52.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	65.3	64.1	62.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	65.3	64.1	62.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	76.4	74.8	72.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	141	139	134	*121*	*80.1*	*53.1*	...	...	...	...	...	...	...	...	...	...	...
11	141	139	134	*121*	*80.1*	*53.1*	...	...	...	...	...	...	...	...	...	...	...
12	141	139	134	*121*	*80.1*	*53.1*	...	...	...	...	...	...	...	...	...	...	...
13	181	181	165	*114*	*81.8*	*52.7*	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm
		Nonferrous Materials						
	1	...	Bolting	SB–211	2014	A92014	T6	3–200
	2	...	Bolting	SB–211	2014	A92014	T651	3–200
	3	...	Bolting	SB–211	2024	A92024	T4	3.18–12.69
	4	...	Bolting	SB–211	2024	A92024	T4	12.70–114.30
	5	...	Bolting	SB–211	2024	A92024	T4	114.31–165.10
	6	...	Bolting	SB–211	2024	A92024	T4	165.11–203.2
	7	...	Bolting	SB–211	6061	A96061	T6	3–200
	8	...	Bolting	SB–211	6061	A96061	T651	3–200
(**23**)	9	...	Bar, rod	SB–187	...	C10200	O60	All
(**23**)	10	...	Bar, rod	SB–187	...	C11000	O60	All
	11	...	Rod	SB–150	...	C61400	HR50	50 < t ≤ 80
	12	...	Rod	SB–150	...	C61400	HR50	25 < t ≤ 50
	13	...	Rod	SB–150	...	C61400	HR50	12 < t ≤ 25
	14	...	Rod	SB–150	...	C61400	HR50	≤12
	15	...	Round rod	SB–150	...	C62300	HR50	>80
	16	...	Bar, rod	SB–150	...	C62300	M20	>80
	17	...	Bar, rod	SB–150	...	C62300	M30	>80
	18	...	Bar, rod	SB–150	...	C62300	O20, O25, O30	>80
	19	...	Hex/oct rod & bar	SB–150	...	C62300	M20	>50
	20	...	Hex/oct rod & bar	SB–150	...	C62300	HR50	25 < t ≤ 50
	21	...	Hex/oct rod & bar	SB–150	...	C62300	HR50	≤25
	22	...	Round rod	SB–150	...	C62300	HR50	50 < t ≤ 80
	23	...	Round rod	SB–150	...	C62300	HR50	25 < t ≤ 50
	24	...	Round rod	SB–150	...	C62300	HR50	12 < t ≤ 25
	25	...	Round rod	SB–150	...	C62300	HR50	≤12
	26	...	Bar, rod	SB–150	...	C63000	M20, M30	>100
	27	...	Bar, rod	SB–150	...	C63000	O20, O25, O30	>100
	28	...	Bar, rod	SB–150	...	C63000	HR50	>100
	29	...	Bar, rod	SB–150	...	C63000	HR50	50 < t ≤ 100
	30	...	Bar, rod	SB–150	...	C63000	M20, M30	50 < t ≤ 100
	31	...	Bar, rod	SB–150	...	C63000	O20, O25, O30	50 < t ≤ 100
	32	...	Bar, rod	SB–150	...	C63000	HR50	25 < t ≤ 50
	33	...	Bar, rod	SB–150	...	C63000	HR50	12 < t ≤ 25
(**23**)	34	...	Bar, rod	SB–150	...	C64200	M10, M20, M30	>100
(**23**)	35	...	Bar, rod	SB–150	...	C64200	M10, M20, M30	80 < t ≤ 100
(**23**)	36	...	Bar, rod	SB–150	...	C64200	HR50	50 < t ≤ 80
(**23**)	37	...	Bar, rod	SB–150	...	C64200	HR50	25 < t ≤ 50
(**23**)	38	...	Bar, rod	SB–150	...	C64200	HR50	12 < t ≤ 25
(**23**)	39	...	Bar, rod	SB–150	...	C64200	HR50	≤12
	40	...	Rod	SB–98	...	C65100	O60	All
	41	...	Rod	SB–98	...	C65100	H06	25 < t ≤ 38
	42	...	Rod	SB–98	...	C65100	H06	12 < t ≤ 25
	43	...	Rod	SB–98	...	C65100	H06	≤12
	44	...	Rod	SB–98	...	C65500	O60	All
	45	...	Rod	SB–98	...	C65500	H01	All

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) III	VIII-1	VIII-2	XII	Notes
							Nonferrous Materials
1	450	380	204 (Cl. 3 only)	204	204	204	T1, W4
2	450	380	NP	204	204	204	G10, T1, W4
3	425	310	204 (Cl. 3 only)	204	204	204	T1, W4
4	425	290	204 (Cl. 3 only)	204	204	204	T1, W4
5	425	275	204 (Cl. 3 only)	204	204	204	T2, W4
6	400	260	204 (Cl. 3 only)	204	204	204	T2, W4
7	290	240	204 (Cl. 3 only)	204	204	204	T2, W4
8	290	240	NP	204	204	204	G10, T2, W4
9	195	55	NP	204	204	204	T2
10	195	55	NP	204	204	204	T2
11	485	205	260 (Cl. 3 only)	260	260	260	...
12	485	220	260 (Cl. 3 only)	260	260	260	...
13	515	240	260 (Cl. 3 only)	260	260	260	...
14	550	275	260 (Cl. 3 only)	260	260	260	...
15	515	205	204 (Cl. 3 only)	316	204	316	T3, W1
16	515	205	204 (Cl. 3 only)	316	204	316	T3, W1
17	515	205	204 (Cl. 3 only)	316	204	316	T3, W1
18	515	205	204 (Cl. 3 only)	316	204	316	T3, W1
19	515	205	204 (Cl. 3 only)	316	204	316	T3, W1
20	540	220	204 (Cl. 3 only)	316	204	316	T3, W1
21	550	240	204 (Cl. 3 only)	316	204	316	T3, W1
22	525	255	204 (Cl. 3 only)	316	204	316	T3, W1
23	580	275	204 (Cl. 3 only)	316	204	316	T3, W1
24	605	305	204 (Cl. 3 only)	316	204	316	T3, W1
25	620	345	204 (Cl. 3 only)	316	204	316	T3, W1
26	550	275	371 (Cl. 3 only)	371	260	343	T4, W4
27	550	275	371 (Cl. 3 only)	371	260	343	T4, W4
28	550	275	371 (Cl. 3 only)	371	260	343	T4, W4
29	585	295	371 (Cl. 3 only)	371	260	343	T4, W4
30	585	295	371 (Cl. 3 only)	371	260	343	T4, W4
31	585	295	371 (Cl. 3 only)	371	260	343	T4, W4
32	620	310	371 (Cl. 3 only)	371	260	343	T4, W4
33	690	345	371 (Cl. 3 only)	371	260	343	T4, W4
34	485	170	177 (Cl. 3 only)	316	177	316	T13, W1
35	485	205	177 (Cl. 3 only)	316	177	316	T13, W4
36	515	240	177 (Cl. 3 only)	316	177	316	T13, W1
37	550	290	177 (Cl. 3 only)	316	177	316	T13, W1
38	585	310	177 (Cl. 3 only)	316	177	316	T13, W1
39	620	310	177 (Cl. 3 only)	316	177	316	T13, W1
40	275	85	177 (Cl. 3 only)	177	177	177	G2
41	515	275	177 (Cl. 3 only)	177	177	177	G2, W2
42	515	310	177 (Cl. 3 only)	177	177	177	G2, W2
43	585	380	177 (Cl. 3 only)	177	177	177	G2, W2
44	360	105	177 (Cl. 3 only)	177	177	177	G2
45	380	165	177 (Cl. 3 only)	NP	177	NP	G2, W2

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
	Nonferrous Materials																	
1	89.6	89.6	89.6	89.3	*77.6*	*48.6*	*29.6*	*12.4*	...	...	...	...	...	...	...	...	...	...
2	89.6	89.6	89.6	89.3	*77.6*	*48.6*	*29.6*	*12.4*	...	...	...	...	...	...	...	...	...	...
3	77.9	77.9	77.9	77.2	*71.1*	*46.1*	*33.2*	*20.8*	...	...	...	...	...	...	...	...	...	...
4	72.4	72.4	72.4	72.3	*71.3*	*46.4*	*32.6*	*21.2*	...	...	...	...	...	...	...	...	...	...
5	68.9	68.9	68.9	68.9	68.6	*46.3*	*32.7*	*21.2*	...	...	...	...	...	...	...	...	...	...
6	65.5	65.5	65.5	65.5	65.2	*43.5*	*30.5*	*19.6*	...	...	...	...	...	...	...	...	...	...
7	57.9	57.9	57.9	57.9	57.7	*44.5*	*32.2*	*20.8*	...	...	...	...	...	...	...	...	...	...
8	57.9	57.9	57.9	57.9	57.7	*44.5*	*32.2*	*20.8*	...	...	...	...	...	...	...	...	...	...
9	36.8	32.3	32.3	32.3	32.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
10	36.8	32.3	32.3	32.3	32.2	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
11	121	121	121	121	121	121	119	116	112	109	...	...	...	...	...	...	...	...
12	121	121	121	121	121	121	119	116	112	109	...	...	...	...	...	...	...	...
13	121	121	121	121	121	121	119	116	112	109	...	...	...	...	...	...	...	...
14	121	121	121	121	121	121	119	116	112	109	...	...	...	...	...	...	...	...
15	130	130	130	130	129	125	123	115	*94.7*	*77.4*	*70.6*	*66.7*	...	...	...	...	...	...
16	130	130	130	130	129	125	123	115	*94.7*	*77.4*	*70.6*	*66.7*	...	...	...	...	...	...
17	130	130	130	130	129	125	123	115	*94.7*	*77.4*	*70.6*	*66.7*	...	...	...	...	...	...
18	130	130	130	130	129	125	123	115	*94.7*	*77.4*	*70.6*	*66.7*	...	...	...	...	...	...
19	130	130	130	130	129	125	123	115	*94.7*	*77.4*	*70.6*	*66.7*	...	...	...	...	...	...
20	130	130	130	130	129	125	123	115	*94.7*	*77.4*	*70.6*	*66.7*	...	...	...	...	...	...
21	130	130	130	130	129	125	123	115	*94.7*	*77.4*	*70.6*	*66.7*	...	...	...	...	...	...
22	130	130	130	130	129	125	123	115	*94.7*	*77.4*	*70.6*	*66.7*	...	...	...	...	...	...
23	130	130	130	130	129	125	123	115	*94.7*	*77.4*	*70.6*	*66.7*	...	...	...	...	...	...
24	130	130	130	130	129	125	123	115	*94.7*	*77.4*	*70.6*	*66.7*	...	...	...	...	...	...
25	130	130	130	130	129	125	123	115	*94.7*	*77.4*	*70.6*	*66.7*	...	...	...	...	...	...
26	138	138	138	138	138	138	138	138	138	137	*97.9*	*74.1*	*54.7*	*38.9*	...	...	...	...
27	138	138	138	138	138	138	138	138	138	137	*97.9*	*74.1*	*54.7*	*38.9*	...	...	...	...
28	138	138	138	138	138	138	138	138	138	137	*97.9*	*74.1*	*54.7*	*38.9*	...	...	...	...
29	138	138	138	138	138	138	138	138	138	137	*97.9*	*74.1*	*54.7*	*38.9*	...	...	...	...
30	147	147	147	147	147	147	147	147	147	145	*97.9*	*74.1*	*54.7*	*38.9*	...	...	...	...
31	147	147	147	147	147	147	147	147	147	145	*97.9*	*74.1*	*54.7*	*38.9*	...	...	...	...
32	138	138	138	138	138	138	138	138	138	137	*97.9*	*74.1*	*54.7*	*38.9*	...	...	...	...
33	138	138	138	138	138	138	138	138	138	137	*97.9*	*74.1*	*54.7*	*38.9*	...	...	...	...
34	115	108	106	106	106	106	*84.5*	*57.5*	*41.5*	*25.1*	*13.6*	*10.2*	...	...	...	...	...	...
35	115	121	121	121	121	121	*84.5*	*57.5*	*41.5*	*25.1*	*13.6*	*10.2*	...	...	...	...	...	...
36	121	108	106	106	106	106	*84.5*	*57.5*	*41.5*	*25.1*	*13.6*	*10.2*	...	...	...	...	...	...
37	115	108	106	106	106	106	*84.5*	*57.5*	*41.5*	*25.1*	*13.6*	*10.2*	...	...	...	...	...	...
38	115	108	106	106	106	106	*84.5*	*57.5*	*41.5*	*25.1*	*13.6*	*10.2*	...	...	...	...	...	...
39	115	108	106	106	106	106	*84.5*	*57.5*	*41.5*	*25.1*	*13.6*	*10.2*	...	...	...	...	...	...
40	55.0	54.8	54.3	54.0	53.6	53.1	50.8	...	...	...	...	...	...	...	...	...	...	...
41	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...	...	...	...	...	...	...
42	77.6	77.6	77.6	77.6	77.6	77.6	77.6	...	...	...	...	...	...	...	...	...	...	...
43	94.8	94.8	94.8	94.8	94.8	94.8	94.8	...	...	...	...	...	...	...	...	...	...	...
44	68.9	68.8	68.6	68.4	68.1	67.8	50.8	...	...	...	...	...	...	...	...	...	...	...
45	68.9	68.8	68.6	68.4	68.1	67.8	50.8	...	...	...	...	...	...	...	...	...	...	...

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
																	Nonferrous Materials	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm
		Nonferrous Materials (Cont'd)						
	1	...	Rod	SB–98	...	C65500	H02	≤50
	2	...	Rod	SB–98	...	C66100	O60	All
	3	...	Rod	SB–98	...	C66100	H01	All
	4	...	Rod	SB–98	...	C66100	H02	≤50
	5	99Ni	Bolting	SB–160	...	N02200	Annealed	...
	6	99Ni	Bolting	SB–160	...	N02200	Hot fin./ann.	...
	7	99Ni	Bolting	SB–160	...	N02200	Cold drawn	...
	8	99Ni–Low C	Bolting	SB–160	...	N02201	Hot fin./ann.	...
(**23**)	9	67Ni–30Cu	Bolting	SB–164	...	N04400	HW or CW ann.	All
(**23**)	10	67Ni–30Cu	Bolting	SB–164	...	N04400	Hot worked	305 < t ≤ 356
(**23**)	11	67Ni–30Cu	Bolting	SB–164	...	N04400	Hot worked	≤305
(**23**)	12	67Ni–30Cu	Bolting	SB–164	...	N04400	CD–str. rel.	≤12.7
(**23**)	13	67Ni–30Cu	Bolting	SB–164	...	N04400	Cold worked	≤12.7
(**23**)	14	67Ni–30Cu	Bolting	SB–164	...	N04400	CD–str. rel.	12.7 < t ≤ 88.9
	15	67Ni–30Cu–S	Bolting	SB–164	...	N04405	Annealed	...
	16	67Ni–30Cu–S	Bolting	SB–164	...	N04405	Annealed	...
	17	67Ni–30Cu–S	Bolting	SB–164	...	N04405	Hot worked	...
	18	67Ni–30Cu–S	Bolting	SB–164	...	N04405	Hot worked	...
	19	67Ni–30Cu–S	Bolting	SB–164	...	N04405	Cold worked	...
	20	67Ni–28Cu–3Al	Bolting	SF–468	...	N05500	Ann./aged	25–38
	21	67Ni–28Cu–3Al	Bolting	SF–468	...	N05500	Ann./aged	6–16
	22	47Ni–22Cr–9Mo–18Fe	Bolting	SB–572	...	N06002	Annealed	...
	23	47Ni–22Cr–19Fe–6Mo	Bolting	SB–581	...	N06007	Solution ann.	>19
	24	47Ni–22Cr–19Fe–6Mo	Bolting	SB–581	...	N06007	Solution ann.	<19
	25	55Ni–21Cr–13.5Mo	Bolting	SB–574	...	N06022	Solution ann.	...
	26	40Ni–29Cr–15Fe–5Mo	Bolting	SB–581	...	N06030	Solution ann.	...
	27	61Ni–16Mo–16Cr	Bolting	SB–574	...	N06455	Solution ann.	...
	28	72Ni–15Cr–8Fe	Bolting	SB–166	...	N06600	Annealed	...
	29	72Ni–15Cr–8Fe	Bolting	SB–166	...	N06600	Hot fin.	...
	30	72Ni–15Cr–8Fe	Bolting	SB–166	...	N06600	Cold drawn	...
	31	72Ni–15Cr–8Fe	Bolting	SB–166	...	N06600	Hot fin.	...
	32	72Ni–15Cr–8Fe	Bolting	SB–166	...	N06600	Hot fin.	...
	33	60Ni–22Cr–9Mo–3.5Cb	Bolting	SB–446	1	N06625	Annealed	...
	34	49Ni–25Cr–18Fe–6Mo	Bolting	SB–581	...	N06975	Solution ann.	...
	35	53Ni–19Cr–19Fe–Cb–Mo	Bolting	SB–637	...	N07718	Ann./aged	≤150
	36	70Ni–16Cr–7Fe–Ti–Al	Bolting	SB–637	2	N07750	Ann./aged	...
	37	26Ni–43Fe–22Cr–5Mo	Bolting	SB–621	...	N08320	Solution ann.	...
	38	46Fe–24Ni–21Cr–6Mo–N	Bolting	SB–691	...	N08367	Solution ann.	...
	39	33Ni–42Fe–21Cr	Bolting	SB–408	...	N08800	Annealed	...
	40	33Ni–42Fe–21Cr	Bolting	SB–408	...	N08810	Annealed	...
	41	42Ni–21.5Cr–3Mo–2.3Cu	Bolting	SB–425	...	N08825	Annealed	...
	42	62Ni–28Mo–5Fe	Bolting	SB–335	...	N10001	Annealed	38 < t ≤ 89
(**23**)	43	62Ni–28Mo–5Fe	Bolting	SB–335	...	N10001	Annealed	≤38
	44	70Ni–16Mo–7Cr–5Fe	Bolting	SB–573	...	N10003	Annealed	...
	45	54Ni–16Mo–15Cr	Bolting	SB–574	...	N10276	Solution ann.	...

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted) III	VIII-1	VIII-2	XII	Notes
							Nonferrous Materials (Cont'd)
1	485	260	177 (Cl. 3 only)	NP	177	NP	G2, W2
2	360	100	177 (Cl. 3 only)	177	177	177	G2
3	380	165	177 (Cl. 3 only)	NP	177	NP	G2, W2
4	485	260	177 (Cl. 3 only)	NP	177	NP	G2, W2
5	380	100	316 (Cl. 3 only)	316	316	316	...
6	415	100	316 (Cl. 3 only)	316	316	316	...
7	450	275	316 (Cl. 3 only)	316	316	316	...
8	345	69	316 (Cl. 3 only)	649	427	343	T5
9	480	170	427	482	427	343	T5
10	517	276	427	482	427	343	T5
11	552	276	427	482	427	343	T5
12	580	345	260	260	260	260	G3
13	585	380	260	260	260	260	G3
14	600	415	NP	260	260	260	G3
15	485	170	427	NP	NP	NP	...
16	485	170	NP	482	427	343	T5
17	515	240	427	NP	NP	NP	...
18	515	240	NP	482	427	343	T5
19	585	345	260	260	260	260	G3
20	895	585	NP	260	NP	NP	...
21	895	620	NP	260	NP	NP	...
22	655	240	NP	899	427	343	T11
23	585	205	NP	538	427	343	...
24	620	240	NP	538	427	343	...
25	690	310	NP	427	427	343	...
26	585	240	NP	427	427	343	...
27	690	275	NP	427	427	343	...
28	550	240	427	649	427	343	T6
29	585	240	427	649	427	343	T7
30	620	275	NP	260	260	260	G3, H1
31	620	275	427	NP	NP	NP	...
32	620	275	NP	649	427	343	T7
33	825	415	NP	649	427	343	G1, T11
34	585	220	NP	427	427	343	...
35	1275	1035	427	621	427	343	W4, W5
36	1170	795	427	427	427	343	...
37	515	195	NP	427	427	343	...
38	655	310	427	427	NP	NP	...
39	515	205	NP	816	427	343	T10
40	450	170	NP	899	427	343	T11
41	585	240	NP	538	427	343	...
42	690	315	427	427	427	343	...
43	795	315	427	427	427	343	...
44	690	275	NP	704	427	343	T10
45	690	285	NP	677	427	343	T10

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
	Nonferrous Materials (Cont'd)																	
1	68.9	68.8	68.6	68.4	68.1	67.8	50.8	...	...	...	...	...	...	...	...	...	...	...
2	68.9	68.8	68.6	68.4	68.1	67.8	50.8	...	...	...	...	...	...	...	...	...	...	...
3	68.9	68.8	68.6	68.4	68.1	67.8	50.8	...	...	...	...	...	...	...	...	...	...	...
4	68.9	68.8	68.6	68.4	68.1	67.8	50.8	...	...	...	...	...	...	...	...	...	...	...
5	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...	...
6	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.0	66.4	63.4	59.5	55.8	...	...	...	...	...	...
7	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...	...
8	46.2	45.5	43.9	43.4	43.4	42.8	42.7	42.7	42.7	42.7	42.7	42.7	42.7	42.7	41.3	40.7	*40.2*	*35.4*
9	115	107	99.4	95.9	93.7	92.1	91.1	90.6	90.4	90.3	90.3	90.3	90.3	90.2	88.9	87.9	*78.5*	*60.8*
10	115	107	99.4	95.9	93.7	92.1	91.1	90.6	90.4	90.3	90.3	90.3	90.3	90.2	88.9	87.9	*78.5*	*60.8*
11	115	107	99.4	95.9	93.7	92.1	91.1	90.6	90.4	90.3	90.3	90.3	90.3	89.4	89.1	88.4	*64.1*	*35.4*
12	115	107	99.4	95.9	93.7	92.1	91.1	90.6	90.4	90.3	...	...	...	...	...	...	...	...
13	115	107	99.5	96.4	95.1	95.1	95.1	95.1	95.1	95.1	...	...	...	...	...	...	...	...
14	115	107	103	103	103	103	103	103	103	103	...	...	...	...	...	...	...	...
15	114	107	99.5	96.0	93.7	92.1	91.1	90.6	90.4	90.3	90.3	90.3	90.3	90.2	88.9	87.6	86.4	...
16	114	107	99.5	96.0	93.7	92.1	91.1	90.6	90.3	90.3	90.3	90.3	90.3	90.3	89.6	87.9	*78.5*	*60.8*
17	129	129	129	129	129	129	129	129	129	129	129	128	127	123	112	101	89.6	...
18	129	129	129	129	129	129	129	129	129	129	129	129	128	123	118	102	*65.1*	*34.9*
19	86.2	86.2	86.2	86.2	86.2	86.2	86.2	86.2	86.2	86.2	...	...	...	...	...	...	...	...
20	147	147	147	147	147	147	147	147	147	147	...	...	...	...	...	...	...	...
21	155	155	155	155	155	155	155	155	155	155	...	...	...	...	...	...	...	...
22	161	152	142	137	132	128	123	119	115	112	109	107	105	103	103	101	101	100
23	138	137	136	125	114	109	108	106	104	102	100	98.8	97.6	96.4	95.8	95.2	94.6	93.9
24	155	150	143	139	134	130	126	123	121	119	117	115	114	113	112	111	110	110
25	172	172	172	171	169	164	158	152	148	144	141	137	134	132	130	128	127	...
26	147	143	137	131	126	122	119	116	114	112	110	108	106	105	103	101	98.9	...
27	172	172	169	164	158	154	150	147	145	143	140	138	136	135	134	132	130	...
28	138	138	138	138	138	138	138	138	138	138	138	138	136	135	134	132	130	118
29	146	146	146	146	146	146	146	146	146	146	146	146	146	145	145	141	140	135
30	138	138	138	138	138	138	138	138	138	138	...	...	...	...	...	...	...	...
31	68.9	67.2	65.2	64.1	63.4	62.9	62.8	62.7	62.7	62.7	62.7	62.6	61.8	61.3	61.4	60.7	60.1	...
32	146	146	146	146	146	146	146	146	146	146	146	146	146	145	145	141	140	135
33	207	207	207	207	207	203	196	190	187	185	183	182	180	179	179	170	168	166
34	147	141	134	130	127	124	122	119	115	112	109	107	105	104	103	101	100	...
35	255	252	247	245	243	241	239	237	236	235	234	233	232	232	231	230	228	227
36	198	198	198	198	198	198	198	198	198	198	198	198	198	198	198	198	198	...
37	129	124	118	116	113	109	106	104	102	98.9	95.9	93.9	92.7	90.7	88.9	88.3	87.7	...
38	164	164	163	158	155	151	149	147	143	139	136	133	130	128	126	124	122	...
39	129	129	129	126	123	121	119	117	116	114	113	112	111	109	108	107	106	104
40	112	109	105	103	99.8	96.5	93.5	91.4	89.7	87.7	85.5	83.3	81.7	80.4	78.5	76.6	75.4	74.1
41	146	146	146	144	140	137	133	130	127	125	123	122	121	119	119	118	117	116
42	172	172	172	172	172	172	171	169	168	166	165	163	161	158	157	155	153	...
43	198	198	191	185	181	177	174	171	168	166	163	161	160	159	157	156	155	...
44	172	169	165	162	158	152	146	141	138	138	138	137	134	131	127	124	122	121
45	172	172	171	164	158	152	147	143	139	136	132	128	125	122	120	118	116	115

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
																	Nonferrous Materials (Cont'd)	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	*27.9*	*22.7*	*18.7*	*15.6*	*13.0*	*9.96*	*8.20*	...	...	...	...	...	...	...	...	...	...	
9	*41.8*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
10	*41.8*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
11	*7.84*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	*41.8*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	*8.07*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	99.5	98.9	98.2	97.9	97.8	*95.9*	*77.1*	*64.8*	*54.9*	*44.8*	*36.1*	*29.2*	*23.7*	*19.0*	*14.8*	*11.2*	*8.14*	
23	93.8	93.5	92.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	110	109	109	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	*86.5*	*58.0*	*40.0*	*26.8*	*18.9*	*15.2*	*15.2*	...	...	...	...	...	...	...	...	...	...	
29	134	*119*	*85.4*	*62.9*	*46.2*	*39.4*	*37.9*	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	134	*119*	*85.4*	*62.9*	*46.2*	*39.4*	*37.9*	...	...	...	...	...	...	...	...	...	...	
33	165	164	163	163	160	*139*	*88.7*	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	226	224	222	218	209	202	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	103	102	101	98.1	*85.0*	*64.2*	*44.8*	*29.9*	*16.8*	*11.7*	*8.69*	*7.02*	*6.42*	*5.01*	...	...	...	
40	72.9	71.7	70.3	69.4	68.5	*62.6*	*50.5*	*41.2*	*33.6*	*27.7*	*22.6*	*18.3*	*15.0*	*12.1*	*9.78*	*8.04*	*6.70*	
41	115	115	114	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
44	120	119	114	100	*80.1*	*61.3*	*44.9*	*33.7*	*25.5*	*17.5*	...	...	...	...	...	...	...	
45	114	114	114	114	*98.5*	*81.5*	*67.1*	*54.6*	*43.1*	...	...	...	...	...	...	...	...	

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm
	Nonferrous Materials (Cont'd)						
1	65Ni–28Mo–2Fe	Bolting	SB–335	...	N10665	Solution ann.	...
2	21Ni–30Fe–22Cr–18Co–3Mo–3W	Bolting	SB–572	...	R30556	Annealed	...

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted)				Notes
			III	VIII-1	VIII-2	XII	
							Nonferrous Materials (Cont'd)
1	760	350	NP	427	427	343	...
2	690	310	NP	899	427	343	T12

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
	Nonferrous Materials (Cont'd)																	
1	190	190	190	190	190	190	190	190	190	189	189	187	184	183	180	177	174	...
2	172	172	172	166	159	153	148	143	140	137	134	132	130	129	127	126	124	123

Table 3 (Cont'd)
Section III, Division 1, Classes 2 and 3;* Section VIII, Divisions 1 and 2;† and Section XII
Maximum Allowable Stress Values, *S*, for Bolting Materials
(*See Maximum Temperature Limits for Restrictions on Class)
(†Use with Part 4.16 of Section VIII, Division 2)

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)																
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	122	121	119	118	118	115	*92.8*	*76.1*	*62.9*	*51.2*	*41.8*	*34.3*	*28.2*	*22.9*	*18.2*	*14.7*	*12.3*

NOTES TO TABLE 3

GENERAL NOTES

(a) The stress values in this Table may be interpolated to determine values for intermediate temperatures. The values at intermediate temperatures shall be rounded to the same number of decimal places as the value at the higher temperature between which values are being interpolated. The rounding rule is: when the next digit beyond the last place to be retained is less than 5, retain unchanged the digit in the last place retained; when the digit next beyond the last place to be retained is 5 or greater, increase by 1 the digit in the last place retained.

(b) The properties of steels are influenced by the processing history, heat treatment, melting practice, and level of residual elements. See Nonmandatory Appendix A for more information.

(c) Where a size limit appears in the Size/Thickness column, the limit applies to the dimension appropriate to the product form: wall thickness of tubing, pipe, pipe fittings, and hollow forgings; thickness of plate, flat bar and forgings, and polygonal bar; diameter of solid bar and bolting; and thickest cross–section of other pressure parts, e.g., castings and forgings.

(d) These stress values are established from a consideration of strength only and will be satisfactory for average service. For bolted joints where freedom from leakage over a long period of time without retightening is required, lower stress values may be necessary as determined from the relative flexibility of the flange and bolts, and corresponding relaxation properties.

(e) Stress values for 40°C are applicable for colder temperatures when toughness requirements of Section III or Section VIII are met.

(f) For bolting with a reported hardness exceeding 350 HB, user is cautioned that under certain conditions of temperature and environment or fatigue conditions, stress corrosion cracking of this high hardness bolting shall be considered.

(g) The following abbreviations are used: Ann., Annealed; ann., annealed; CD, Cold drawn; fin., finished; rel., relieved; str., stress; and wld., welded.

(h) Where specifications, grades, classes, and types are listed in this Table, and where the material specification in Section II, Part A or Part B is a dual–unit specification (e.g., SA–193/SA–193M), the values listed in this Table shall be applicable to either the customary U.S. version of the material specification or the SI units version of the material specification. For example, the values listed for SA–193 Grade B6 shall be used when SA–193M Grade B6 is used in construction.

(i) An alternative typeface is used for stress values obtained from time–dependent properties (see Notes T1 through T12).

NOTES – GENERAL REQUIREMENTS

G1 Alloy N06625 in the annealed condition is subject to severe loss of impact strength at room temperatures after exposure in the range of 550°C to 750°C.

G2 Copper–silicon alloys are not always suitable when exposed to certain media and high temperatures, particularly steam above 100°C. The owner, the owner's designated agent, or the user should ensure him/herself that the alloy selected is satisfactory for the service for which it is to be used.

G3 The maximum operating temperature is arbitrarily set at 250°C because harder temper adversely affects design stress in the creep rupture temperature range.

G4 This material has reduced toughness at room temperature after exposure for about 5000 h at 325°C and after shorter exposure above 350°C.

G5 At temperatures above 550°C, these stress values apply only when the carbon is 0.04% or higher on heat analysis.

G6 For temperatures above 550°C, these stress values may be used only if the material is heat treated by heating it to a minimum temperature of 1040°C.

G7 The user is cautioned that under certain conditions of temperature and environment or fatigue conditions, stress corrosion of this material shall be considered.

G8 For all design temperatures, the maximum hardness shall be Rockwell C35 immediately under thread roots. The hardness shall be taken on a flat area at least 3 mm across, prepared by removing threads; no more material than necessary shall be removed to prepare the flat area. Hardness determinations shall be made at the same frequency as the tensile tests.

G9 For Section VIII, Division 1 applications, use of external pressure charts for material in the form of bar stock is permitted for stiffening rings only.

G10 For stress relieved tempers, stress values for T3 temper can be used for T351, T3510, and T3511; stress values for T4 temper can be used for T451, T4510, and T4511; and stress values for T6 temper can be used for T651, T6510, and T6511.

G11 The shipping lot testing method of SA–574, 11.3, is prohibited.

G12 Since these bolts could be used in flanged joints, the maximum permitted temperature and maximum allowable stress are limited to reduce the potential for bolt relaxation and associated flange leakage.

NOTES – HEAT TREATMENT REQUIREMENTS

H1 Design stresses for the cold drawn temper based on hot rolled properties until required data on cold drawn is submitted.

NOTES – TIME–DEPENDENT PROPERTIES [See General Note (i)]

T1 Allowable stresses for temperatures of 150°C and above are values obtained from time–dependent properties.

T2 Allowable stresses for temperatures of 175°C and above are values obtained from time–dependent properties.

T3 Allowable stresses for temperatures of 230°C and above are values obtained from time–dependent properties.

T4 Allowable stresses for temperatures of 290°C and above are values obtained from time–dependent properties.

T5 Allowable stresses for temperatures of 450°C and above are values obtained from time–dependent properties.

T6 Allowable stresses for temperatures of 480°C and above are values obtained from time–dependent properties.

T7 Allowable stresses for temperatures of 510°C and above are values obtained from time–dependent properties.

T8 Allowable stresses for temperatures of 540°C and above are values obtained from time–dependent properties.

T9 Allowable stresses for temperatures of 565°C and above are values obtained from time–dependent properties.

T10 Allowable stresses for temperatures of 595°C and above are values obtained from time–dependent properties.

NOTES TO TABLE 3 (CONT'D)

NOTES – TIME–DEPENDENT PROPERTIES [See General Note (i)] (CONT'D)

T11 Allowable stresses for temperatures of 620°C and above are values obtained from time–dependent properties.

T12 Allowable stresses for temperatures of 650°C and above are values obtained from time–dependent properties.

(**23**) T13 Allowable stresses for temperatures of 200°C and above are values obtained from time–dependent properties.

NOTES – WELDING REQUIREMENTS

W1 Welding, brazing, and thermal cutting are not permitted.

W2 If welded, the allowable stress values for the annealed condition shall be used.

W3 This material may be welded by the resistance technique.

W4 The stress values given for this material are not applicable when either welding or thermal cutting is employed.

W5 Except for nonstructural tack welds used as a locking device, welding is prohibited for Section VIII, Division 1 use.

Table 4
Section III, Division 1, Classes 1 and MC; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2* Maximum Allowable Stress Values, S, for Bolting Materials
(*Use with Part 5 and Annex 5.F of Section VIII, Division 2)

Line No.	Nominal Composition	Spec. No.	Type/ Grade	Alloy Desig./ UNS No.	Class/Condition/ Temper	Size/ Thickness, mm
	Ferrous Materials					
1	1Cr–1Mn–¼Mo	SA–540	B22	K41420	5	50 < t ≤ 100
2	1Cr–1Mn–¼Mo	SA–540	B22	K41420	5	≤50
3	1Cr–1Mn–¼Mo	SA–540	B22	K41420	4	≤100
4	1Cr–1Mn–¼Mo	SA–540	B22	K41420	3	≤100
5	1Cr–1Mn–¼Mo	SA–540	B22	K41420	2	≤75
6	1Cr–1Mn–¼Mo	SA–540	B22	K41420	1	≤38
7	1Cr–⅕Mo	SA–193	B7	G41400	...	100 < t ≤ 180
8	1Cr–⅕Mo	SA–193	B7M	G41400	...	≤100
9	1Cr–⅕Mo	SA–193	B7	G41400	...	64 < t ≤ 100
10	1Cr–⅕Mo	SA–193	B7	G41400	...	≤64
11	1Cr–½Mo–V	SA–193	B16	K14072	...	100 < t ≤ 200
12	1Cr–½Mo–V	SA–193	B16	K14072	...	100 < t ≤ 200
13	1Cr–½Mo–V	SA–193	B16	K14072	...	64 < t ≤ 100
14	1Cr–½Mo–V	SA–193	B16	K14072	...	64 < t ≤ 100
15	1Cr–½Mo–V	SA–540	B21	K14073	5	50 < t ≤ 205
16	1Cr–½Mo–V	SA–540	B21	K14073	5	≤50
17	1Cr–½Mo–V	SA–193	B16	K14072	...	≤64
18	1Cr–½Mo–V	SA–193	B16	K14072	...	≤64
19	1Cr–½Mo–V	SA–540	B21	K14073	4	≤150
20	1Cr–½Mo–V	SA–540	B21	K14073	3	≤150
21	1Cr–½Mo–V	SA–540	B21	K14073	2	≤100
22	1Cr–½Mo–V	SA–540	B21	K14073	1	≤100
23	12Cr–1Mo–V–W	SA–437	B4C	K91352	...	...
24	12Cr–1Mo–V–W	SA–437	B4B	K91352	...	...
25	13Cr	SA–193	B6	S41000	...	≤100
26	17Cr–4Ni–4Cu	SA–564	630	S17400	H1100	≤200
27	17Cr–4Ni–4Cu	SA–705	630	S17400	H1100	≤200
28	1¾Ni–¾Cr–¼Mo	SA–320	L43	G43400	...	≤100
29	2Ni–¾Cr–¼Mo	SA–540	B23	H43400	5	150 < t ≤ 240
30	2Ni–¾Cr–¼Mo	SA–540	B23	H43400	5	150 < t ≤ 240
31	2Ni–¾Cr–¼Mo	SA–540	B23	H43400	5	≤150
32	2Ni–¾Cr–¼Mo	SA–540	B23	H43400	4	≤240
33	2Ni–¾Cr–¼Mo	SA–540	B23	H43400	3	≤240
34	2Ni–¾Cr–¼Mo	SA–540	B23	H43400	2	≤240
35	2Ni–¾Cr–¼Mo	SA–540	B23	H43400	1	≤200
36	2Ni–¾Cr–⅓Mo	SA–540	B24	K24064	5	150 < t ≤ 240
37	2Ni–¾Cr–⅓Mo	SA–540	B24	K24064	5	150 < t ≤ 240
38	2Ni–¾Cr–⅓Mo	SA–540	B24	K24064	5	≤150
39	2Ni–¾Cr–⅓Mo	SA–540	B24	K24064	4	≤240
40	2Ni–¾Cr–⅓Mo	SA–540	B24	K24064	3	≤240
41	2Ni–¾Cr–⅓Mo	SA–540	B24	K24064	2	≤240
42	2Ni–¾Cr–⅓Mo	SA–540	B24	K24064	1	≤200
43	2Ni–¾Cr–⅓Mo–V	SA–540	B24V	K24070	3	≤280
44	25Ni–15Cr–2Ti	SA–453	660	S66286	A	...
45	25Ni–15Cr–2Ti	SA–453	660	S66286	B	...

Table 4
Section III, Division 1, Classes 1 and MC; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2* Maximum Allowable Stress Values, S, for Bolting Materials
(*Use with Part 5 and Annex 5.F of Section VIII, Division 2)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted)		Notes
			III	VIII-2	
					Ferrous Materials
1	795	690	371	371	G4
2	825	725	371	371	G4
3	930	825	371	371	G4
4	1000	895	371	371	G3
5	1070	965	371	371	G3
6	1140	1035	316	316	G1
7	690	515	427	427	G4
8	690	550	NP	427	G4
9	795	655	427	427	G4
10	860	725	427	427	G4
11	690	585	427	NP	...
12	690	585	NP	427	...
13	760	655	427	NP	...
14	760	655	NP	427	...
15	795	690	371	371	G4
16	825	725	371	371	G4
17	860	725	427	NP	...
18	860	725	NP	427	...
19	930	825	371	371	G4
20	1000	895	371	371	G3
21	1070	965	371	371	G3
22	1140	1035	371	371	G1
23	795	585	371	371	...
24	1000	725	371	371	...
25	760	585	371	371	...
26	965	795	343	343	G2
27	965	795	343	343	G2
28	860	725	427	427	G4
29	795	690	371	NP	G4
30	795	690	NP	371	G4
31	825	725	371	371	G4
32	930	825	371	371	G4
33	1000	895	371	371	G3
34	1070	965	371	371	G3
35	1140	1035	316	316	G1
36	795	690	371	NP	G4
37	795	690	NP	371	G4
38	825	725	371	371	G4
39	930	825	371	371	G4
40	1000	895	371	371	G3
41	1070	965	371	371	G3
42	1140	1035	316	316	G1
43	1000	895	371	371	G3
44	895	585	427	427	...
45	895	585	427	427	...

Table 4
Section III, Division 1, Classes 1 and MC; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2* Maximum Allowable Stress Values, S, for Bolting Materials
(*Use with Part 5 and Annex 5.F of Section VIII, Division 2)

Line	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding										
No.	40	100	150	200	250	300	325	350	375	400	425
	Ferrous Materials										
1	230	218	213	206	200	193	188	183	178	...	...
2	241	229	223	216	210	203	198	192	187	...	...
3	276	262	254	248	241	232	226	220	213	...	...
4	299	284	277	268	261	251	245	238	231	...	...
5	322	306	297	289	281	271	264	257	249	...	...
6	345	328	318	310	301	289	283	...	...	...	...
7	172	160	154	151	146	142	139	136	132	127	122
8	184	171	165	160	156	151	148	145	141	136	130
9	219	202	196	191	185	179	176	171	167	161	154
10	241	223	216	211	205	198	194	190	185	178	170
11	195	188	183	179	175	170	168	166	163	160	156
12	195	189	185	182	178	174	171	168	163	159	155
13	219	210	205	200	195	190	188	185	182	179	175
14	219	211	207	203	199	194	191	187	183	178	173
15	230	221	216	211	206	200	198	195	192	...	...
16	241	232	226	221	216	211	208	205	201	...	...
17	241	232	226	221	216	211	208	205	201	197	193
18	241	234	229	224	220	215	212	207	202	197	191
19	276	266	258	253	247	241	237	234	230	...	...
20	299	288	280	274	268	261	257	253	249	...	...
21	322	310	302	295	288	281	277	273	268	...	...
22	345	332	323	316	308	301	297	292	287	...	...
23	195	187	181	177	173	170	169	167	165	...	...
24	241	230	223	218	214	210	207	206	205	...	...
25	195	185	180	175	170	166	164	162	160	...	...
26	264	242	234	226	220	215	212	210	...	...	...
27	264	242	234	226	220	215	212	210	...	...	...
28	241	226	220	212	205	197	192	187	181	174	167
29	230	218	213	206	200	193	188	183	178	...	...
30	230	218	212	206	201	193	188	183	178	...	...
31	241	229	223	216	210	203	198	192	187	...	...
32	276	262	254	248	241	232	226	220	213	...	...
33	299	284	277	268	261	251	245	238	231	...	...
34	322	306	297	289	281	271	264	257	249	...	...
35	345	328	318	310	301	289	283	...	...	...	...
36	230	218	213	206	200	193	188	183	178	...	...
37	230	218	212	206	201	193	188	183	178	...	...
38	241	229	223	216	210	203	198	192	187	...	...
39	276	262	254	248	241	232	226	220	213	...	...
40	299	284	277	268	261	251	245	238	231	...	...
41	322	306	297	289	281	271	264	257	249	...	...
42	345	328	318	310	301	289	283	...	...	...	...
43	299	284	277	268	261	251	245	238	231	...	...
44	195	191	188	186	183	180	179	177	176	174	172
45	195	191	188	186	183	180	179	177	176	174	172

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Table 4 (Cont'd)
Section III, Division 1, Classes 1 and MC; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2* Maximum Allowable Stress Values, S, for Bolting Materials
(*Use with Part 5 and Annex 5.F of Section VIII, Division 2)

Line No.	Nominal Composition	Spec. No.	Type/ Grade	Alloy Desig./ UNS No.	Class/Condition/ Temper	Size/ Thickness, mm
	Ferrous Materials (Cont'd)					
1	16Cr–12Ni–2Mo	SA–193	B8M	S31600	1/Sol. treat.	...
2	16Cr–12Ni–2Mo	SA–193	B8MA	S31600	1A/Sol. treat.	...
3	16Cr–12Ni–2Mo–N	SA–193	B8MNA	S31651	1A/Sol. treat.	...
4	18Cr–8Ni	SA–193	B8	S30400	1/Sol. treat.	...
5	18Cr–8Ni	SA–193	B8A	S30400	1A/Sol. treat.	...
6	18Cr–8Ni–N	SA–193	B8NA	S30451	1A/Sol. treat.	...
7	18Cr–8Ni–4Si–N	SA–193	B8S	S21800	Sol. treat.	...
8	18Cr–8Ni–4Si–N	SA–193	B8SA	S21800	Sol. treat.	...
9	18Cr–10Ni–Cb	SA–193	B8C	S34700	1/Sol. treat.	...
10	18Cr–10Ni–Ti	SA–193	B8T	S32100	1/Sol. treat.	...
11	19Cr–9Ni–Mo–W	SA–453	651	S63198	B	>76
12	19Cr–9Ni–Mo–W	SA–453	651	S63198	B	≤76
13	19Cr–9Ni–Mo–W	SA–453	651	S63198	A	>76
14	19Cr–9Ni–Mo–W	SA–453	651	S63198	A	≤76
15	22Cr–13Ni–5Mn	SA–193	B8R	S20910	1C/Sol. treat.	...
16	22Cr–13Ni–5Mn	SA–193	B8RA	S20910	Sol. treat.	...

Table 4 (Cont'd)
Section III, Division 1, Classes 1 and MC; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2* Maximum Allowable Stress Values, S, for Bolting Materials
(*Use with Part 5 and Annex 5.F of Section VIII, Division 2)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted)		Notes
			III	VIII-2	
					Ferrous Materials (Cont'd)
1	515	205	427	427	...
2	515	205	427	427	...
3	515	205	427	427	...
4	515	205	427	427	...
5	515	205	427	427	...
6	515	205	427	427	...
7	655	345	427	427	...
8	655	345	427	427	...
9	515	205	427	427	...
10	515	205	427	427	...
11	655	345	427	427	...
12	655	415	427	427	...
13	690	415	427	427	...
14	690	485	427	427	...
15	690	380	427	427	...
16	690	380	427	427	...

Table 4 (Cont'd)
Section III, Division 1, Classes 1 and MC; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2* Maximum Allowable Stress Values, S, for Bolting Materials
(*Use with Part 5 and Annex 5.F of Section VIII, Division 2)

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding										
	40	100	150	200	250	300	325	350	375	400	425
	Ferrous Materials (Cont'd)										
1	130	121	107	99.2	92.8	88.1	86.1	84.4	83.2	82.0	80.7
2	68.9	58.4	53.7	49.9	46.8	44.1	43.0	42.1	41.3	40.6	40.0
3	130	122	112	105	99.1	93.7	91.7	89.8	87.9	86.1	84.9
4	130	114	103	95.7	90.1	84.5	83.1	81.1	79.2	77.3	76.0
5	68.9	56.3	51.6	47.9	45.3	42.7	41.8	41.2	40.6	39.7	38.7
6	130	112	99.0	89.6	83.7	79.6	75.6	74.4	73.2	71.9	70.8
7	164	160	150	137	129	123	121	119	118	116	115
8	164	160	150	137	129	123	121	119	118	116	115
9	130	122	113	107	104	99.7	98.1	96.7	95.0	94.4	93.8
10	130	122	114	106	99.8	94.2	92.7	91.1	88.7	87.5	86.3
11	115	104	97.8	92.1	88.3	84.0	82.0	80.4	79.1	77.8	76.6
12	138	125	117	111	105	101	99.2	97.0	94.8	92.9	91.1
13	138	125	117	111	105	101	99.2	97.0	94.8	92.9	91.1
14	161	146	136	129	123	118	116	113	111	108	106
15	126	107	99.8	94.2	89.7	86.2	85.3	84.5	83.2	82.0	81.4
16	126	107	99.8	94.2	89.7	86.2	85.3	84.5	83.2	82.0	81.4

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Table 4 (Cont'd)
Section III, Division 1, Classes 1 and MC; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2* Maximum Allowable Stress Values, S, for Bolting Materials
(*Use with Part 5 and Annex 5.F of Section VIII, Division 2)

	Line No.	Nominal Composition	Spec. No.	Type/ Grade	Alloy Desig./ UNS No.	Class/Condition/ Temper	Size/ Thickness, mm
		Nonferrous Materials					
(**23**)	1	67Ni–30Cu	SB–164	...	N04400	HW or CW ann.	All
(**23**)	2	67Ni–30Cu	SB–164	...	N04400	Hot worked	305 < t ≤ 356
(**23**)	3	67Ni–30Cu	SB–164	...	N04400	Hot worked	≤305
(**23**)	4	67Ni–30Cu	SB–164	...	N04400	CD–str. rel.	≤12.7
(**23**)	5	67Ni–30Cu	SB–164	...	N04400	CD–str. rel.	88.9 < t ≤ 101.6
(**23**)	6	67Ni–30Cu	SB–164	...	N04400	As drawn	≤12.7
(**23**)	7	67Ni–30Cu	SB–164	...	N04400	CD–str. rel.	12.7 < t ≤ 88.9
(**23**)	8	67Ni–30Cu	SB–164	...	N04400	As drawn	≤12.7
	9	67Ni–30Cu–S	SB–164	...	N04405	Annealed	...
	10	67Ni–30Cu–S	SB–164	...	N04405	Hot worked	...
	11	67Ni–30Cu–S	SB–164	...	N04405	As drawn	...
	12	53Ni–19Cr–19Fe–Cb–Mo	SB–637	...	N07718	Sol. & precip. harden	≤150
	13	70Ni–16Cr–7Fe–Ti–Al	SB–637	2	N07750	...	<100

Table 4 (Cont'd)
Section III, Division 1, Classes 1 and MC; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2* Maximum Allowable Stress Values, S, for Bolting Materials
(*Use with Part 5 and Annex 5.F of Section VIII, Division 2)

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Applicability and Max. Temperature Limits (NP = Not Permitted)		Notes
			III	VIII-2	
					Nonferrous Materials
1	480	170	427	427	...
2	517	276	427	427	...
3	552	276	427	427	...
4	580	345	260	260	...
5	580	380	260	260	...
6	585	380	260	260	...
7	600	415	260	260	...
8	760	585	260	260	...
9	485	170	427	427	...
10	515	240	427	427	...
11	585	345	260	260	...
12	1275	1035	427	427	...
13	1170	795	427	427	...

Table 4 (Cont'd)
Section III, Division 1, Classes 1 and MC; Section III, Division 3; and Section III, Division 5 Design Stress Intensity Values, S_m, and Section VIII, Division 2* Maximum Allowable Stress Values, S, for Bolting Materials
(*Use with Part 5 and Annex 5.F of Section VIII, Division 2)

Line No.	Design Stress Intensity or Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding											
	40	100	150	200	250	300	325	350	375	400	425	
	Nonferrous Materials											
1	115	99.4	93.7	91.1	90.4	90.3	90.3	90.3	90.2	88.9	87.9	(**23**)
2	115	99.4	93.7	91.1	90.4	90.3	90.3	90.3	90.2	88.9	87.9	(**23**)
3	115	99.4	93.7	91.1	90.4	90.3	90.3	90.3	89.4	89.1	88.4	(**23**)
4	115	108	105	104	103	...	...	...	...	...	...	(**23**)
5	126	119	116	114	113	...	...	...	...	...	...	(**23**)
6	126	119	116	114	113	...	...	...	...	...	...	(**23**)
7	138	130	126	124	124	...	...	...	...	...	...	(**23**)
8	195	184	179	176	175	...	...	...	...	...	...	(**23**)
9	114	99.5	93.7	91.1	...	90.3	90.3	90.3	...	...	...	
10	129	129	129	129	129	129	...	...	123	...	...	
11	114	99.6	95.1	91.2	91.0	...	...	...	...	...	...	
12	345	330	323	318	315	312	311	310	309	308	306	
13	264	257	254	251	248	247	247	246	245	245	244	

NOTES TO TABLE 4
GENERAL NOTES

(a) The stress values for bolting materials given in this Table do not exceed the lesser of one–third of the specified minimum yield strength or one–third of the yield strength at temperature, with credit granted for the enhancement of properties produced by heat treatment. They are intended for Section VIII, Division 2 use where flanges are designed in accordance with the rules of Part 5 and Annex 5.F when the bolting requirements are determined in accordance with 5.7.1 and 5.7.2. They are intended for Section III use in the design equations. For allowable values of actual preload and service stresses, see Section III, Subsection NB, NB–3230 and Section III Appendices, Nonmandatory Appendix E.

(b) Stress values for 40°C are applicable for colder temperatures when toughness requirements of Section III or Section VIII are met.

(c) The following abbreviations are used: CD, Cold drawn; precip., precipitation; rel., relieved; Sol., Solution; str., stress; and treat., treated.

(d) Where specifications, grades, classes, and types are listed in this Table, and where the material specification in Section II, Part A or Part B is a dual–unit specification (e.g., SA–193/SA–193M), the values listed in this Table shall be applicable to either the customary U.S. version of the material specification or the SI units version of the material specification. For example, the values listed for SA–193 Grade B6 shall be used when SA–193M Grade B6 is used in construction.

(e) The values in this Table may be interpolated to determine values for intermediate temperatures. The values at intermediate temperatures shall be rounded to the same number of decimal places as the value at the higher temperature between which values are being interpolated. The rounding rule is: when the next digit beyond the last place to be retained is less than 5, retain unchanged the digit in the last place retained; when the digit next beyond the last place to be retained is 5 or greater, increase by 1 the digit in the last place retained.

(f) The properties of steels are influenced by the processing history, heat treatment, melting practice, and level of residual elements. See Nonmandatory Appendix A for more information.

(g) Where a size limit appears in the Size/Thickness column, the limit applies to the dimension appropriate to the product form: wall thickness of tubing, pipe, pipe fittings, and hollow forgings; thickness of plate, flat bar and forgings, and polygonal bar; diameter of solid bar and bolting; and thickest cross–section of other pressure parts, e.g., castings and forgings.

NOTES – GENERAL REQUIREMENTS

G1 Stress values may result in relaxation of the bolting materials after prolonged service at temperatures of 250°C and higher, and the designer is to investigate the effect of this relaxation on the application.

G2 This material has reduced toughness at room temperature after exposure for about 5000 h at 325°C and after shorter exposure above 350°C.

G3 Stress values may result in relaxation of the bolting materials after prolonged service at temperatures of 325°C and higher, and the designer is to investigate the effect of this relaxation on the application.

G4 Stress values may result in relaxation of the bolting materials after prolonged service at temperatures of 375°C and higher, and the designer is to investigate the effect of this relaxation on the application.

Table 5A
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	Carbon steel	Bar, shapes	SA–675	45	...	...	...	1	1
2	Carbon steel	Plate	SA–285	A	K01700	...	...	1	1
3	Carbon steel	Smls. pipe	SA–106	A	K02501	...	...	1	1
4	Carbon steel	Bar, shapes	SA–675	50	...	...	...	1	1
(**23**) 5	...	...	...	...	...	...	...	...	...
(**23**) 6	Carbon steel	Plate	SA–285	B	K02200	...	$t \le 50$	1	1
7	Carbon steel	Bar, shapes	SA–675	55	...	...	...	1	1
8	Carbon steel	Plate	SA–285	C	K02801	...	$t \le 50$	1	1
9	Carbon steel	Smls. pipe	SA–333	1	K03008	...	...	1	1
10	Carbon steel	Smls. tube	SA–334	1	K03008	...	...	1	1
11	Carbon steel	Plate	SA–516	55	K01800	...	...	1	1
12	Carbon steel	Smls. pipe	SA–524	II	K02104	...	...	1	1
13	Carbon steel	Plate, bar, shapes	SA–36	...	K02600	...	...	1	1
14	Carbon steel	Plate	SA–662	A	K01701	...	...	1	1
15	Carbon steel	Forgings	SA–181	...	K03502	60	...	1	1
16	Carbon steel	Castings	SA–216	WCA	J02502	...	...	1	1
17	Carbon steel	Forgings	SA–266	1	K03506	...	...	1	1
18	Carbon steel	Forgings	SA–350	LF1	K03009	1	...	1	1
19	Carbon steel	Bar, shapes	SA–675	60	...	...	...	1	1
20	Carbon steel	Forgings	SA–765	I	K03046	...	...	1	1
21	Carbon steel	Plate	SA–515	60	K02401	...	...	1	1
22	Carbon steel	Plate	SA–516	60	K02100	...	...	1	1
23	Carbon steel	Plate	SA–283	D	K02702	...	...	1	1
24	Carbon steel	Smls. pipe	SA–106	B	K03006	...	...	1	1
25	Carbon steel	Fittings	SA–234	WPB	K03006	...	...	1	1
26	Carbon steel	Smls. pipe	SA–333	6	K03006	...	...	1	1
27	Carbon steel	Forgings	SA–372	A	K03002	...	...	1	1
28	Carbon steel	Fittings	SA–420	WPL6	...	...	...	1	1
29	Carbon steel	Smls. pipe	SA–524	I	K02104	...	...	1	1
30	Carbon steel	Forgings	SA–727	...	K02506	...	...	1	1
31	Carbon steel	Wld. tube	SA–178	C	K03503	...	...	1	1
32	Carbon steel	Smls. tube	SA–210	A–1	K02707	...	...	1	1
33	Carbon steel	Bar, shapes	SA–675	65	...	...	...	1	1
34	Carbon steel	Castings	SA–352	LCB	J03003	...	...	1	1
35	Carbon steel	Plate	SA–515	65	K02800	...	...	1	1
36	Carbon steel	Plate	SA–516	65	K02403	...	...	1	1
(**23**) 37	Carbon steel	Plate	SA–662	B	K02203	...	...	1	1
(**23**) 38	Carbon steel	Plate	SA–537	...	K12437	1	$65 < t \le 100$	1	2
39	Carbon steel	Forgings	SA/EN 10222–2	P280GH	...	NT or QT	$35 < t \le 160$	1	1
40	Carbon steel	Forgings	SA/EN 10222–2	P280GH	...	Normalized	$t \le 35$	1	1
41	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	$150 < t \le 250$	1	2
42	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	$100 < t \le 150$	1	2
43	Carbon steel	Bar, shapes	SA–675	70	...	...	...	1	1
44	Carbon steel	Forgings	SA–105	...	K03504	...	...	1	2
45	Carbon steel	Forgings	SA–181	...	K03502	70	...	1	2

Table 5A
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	310	155	482	CS-6	G13, T4
2	310	165	482	CS-1	G13, T3
3	330	205	538	CS-2	G13, T1
4	345	170	482	CS-1	G13, T3
5	...	...	...	...	...
6	345	185	482	CS-1	T2
7	380	190	482	CS-1	G13, T4
8	380	205	538	CS-2	G13, T3
9	380	205	538	CS-2	T3
10	380	205	371	CS-2	...
11	380	205	538	CS-2	G13, T3
12	380	205	538	CS-2	G13, T3
13	400	250	371	CS-2	G13
14	400	275	371	CS-2	...
15	415	205	538	CS-2	G13, T3
16	415	205	538	CS-2	G13, T3
17	415	205	538	CS-2	G13, T3
18	415	205	371	CS-2	G13
19	415	205	482	CS-2	G13, T3
20	415	205	538	CS-2	G13, T3
21	415	220	538	CS-2	G13, T3
22	415	220	538	CS-2	G13, T3
23	415	230	343	CS-2	...
24	415	240	371	CS-2	G13
25	415	240	538	CS-2	G13, T2
26	415	240	538	CS-2	G13, T2
27	415	240	343	CS-2	G9, H2
28	415	240	454	CS-2	G13, T2
29	414	240	538	CS-2	G13, T2
30	415	250	538	CS-2	G13, T2
31	415	255	538	CS-2	G6, G13, T2
32	415	255	538	CS-2	G13, T2
33	450	225	538	CS-2	G13, T3
34	450	240	343	CS-2	...
35	450	240	538	CS-2	G13, T2
36	450	240	538	CS-2	G13, T2
37	450	275	371	CS-2	...
38	450	310	371	CS-2	T1
39	460	255	538	CS-2	G13, T3
40	460	280	538	CS-2	G13, T3
41	470	280	538	CS-2	G13, T2
42	480	295	538	CS-2	G13, T2
43	485	240	538	CS-2	G13, T3
44	485	250	538	CS-2	G13, T3
45	485	250	538	CS-2	G13, T3

Table 5A
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	103	97.3	94.3	92.8	91.4	90.1	88.6	87.0	85.1	83.0	80.7	78.4	76.0	73.7	71.5	*64.0*	*55.8*	*43.9*
2	110	104	101	98.9	97.5	96.1	94.6	92.8	90.8	88.5	86.1	83.6	81.1	78.6	*73.3*	*64.0*	*55.8*	*43.9*
3	138	130	126	124	122	120	118	116	113	111	108	105	*100*	*99.1*	*73.3*	*64.0*	*55.8*	*43.9*
4	115	108	105	103	102	100	98.5	96.6	94.5	92.2	89.7	87.1	84.5	81.9	*73.3*	*64.0*	*55.8*	*43.9*
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	124	117	113	111	110	108	106	104	102	99.6	96.9	94.1	91.2	*78.8*	*73.3*	*64.0*	*55.8*	*43.9*
7	126	119	115	113	112	110	108	106	104	101	98.7	95.8	92.9	90.1	87.4	*75.3*	*62.1*	*45.0*
8	138	130	126	124	122	120	118	116	113	111	108	105	101	98.3	*89.0*	*75.3*	*62.1*	*45.0*
9	138	130	126	124	122	120	118	116	113	111	108	105	101	98.3	*95.1*	*79.5*	*62.6*	*45.0*
10	138	130	126	124	122	120	118	116	113	111	108	105	101	98.3	...	...	...	...
11	138	130	126	124	122	120	118	116	113	111	108	105	101	98.3	*89.0*	*75.3*	*62.1*	*45.0*
12	138	130	126	124	122	120	118	116	113	111	108	105	101	98.3	*89.0*	*75.3*	*62.1*	*45.0*
13	165	156	151	148	146	144	142	139	136	133	129	125	122	119	...	...	...	...
14	167	167	167	165	163	160	158	155	151	148	144	139	135	132	...	...	...	...
15	138	130	126	124	122	120	118	116	113	111	108	105	101	98.3	*95.1*	*79.5*	*62.6*	*45.0*
16	138	130	126	124	122	120	118	116	113	111	108	105	101	98.3	*95.1*	*79.5*	*62.6*	*45.0*
17	138	130	126	124	122	120	118	116	113	111	108	105	101	98.3	*95.1*	*79.5*	*62.6*	*45.0*
18	138	130	126	124	122	120	118	116	113	111	108	105	101	98.3	...	...	...	...
19	138	130	126	124	122	120	118	116	113	111	108	105	101	98.3	*95.1*	*79.5*	*62.6*	*45.0*
20	138	130	126	124	122	120	118	116	113	111	108	105	101	98.3	*95.1*	*79.5*	*62.6*	*45.0*
21	147	138	134	132	130	128	126	124	121	118	115	111	108	105	*95.1*	*79.5*	*62.6*	*45.0*
22	147	138	134	132	130	128	126	124	121	118	115	111	108	105	*95.1*	*79.5*	*62.6*	*45.0*
23	152	143	138	136	134	132	130	128	125	122	118	115	111	...	...	...	...	...
24	161	151	147	144	142	140	138	135	132	129	126	122	118	115	...	...	...	...
25	161	151	147	144	142	140	138	135	132	129	126	122	118	*115*	*95.1*	*79.5*	*62.6*	*45.0*
26	161	151	147	144	142	140	138	135	132	129	126	122	118	*115*	*95.1*	*79.5*	*62.6*	*45.0*
27	161	154	146	139	133	127	122	118	115	112	110	109	107	...	...	...	...	...
28	161	151	147	144	142	140	138	135	132	129	126	122	118	*115*	*95.1*	*79.5*	*62.6*	*45.0*
29	161	151	147	144	142	140	138	135	132	129	126	122	118	*115*	*95.1*	*79.5*	*62.6*	*45.0*
30	165	156	151	148	146	144	142	139	136	133	129	125	122	*119*	*95.1*	*79.5*	*62.6*	*45.0*
31	145	136	132	130	128	126	124	122	119	116	113	110	106	*104*	*80.8*	*67.6*	*53.2*	*38.3*
32	170	160	155	153	150	148	146	143	140	136	133	129	125	*122*	*95.1*	*79.5*	*62.6*	*45.0*
33	149	140	136	134	132	130	128	126	123	120	117	113	110	106	*95.1*	*79.5*	*64.4*	*47.7*
34	161	151	147	144	142	140	138	135	132	129	126	122	118	...	...	...	...	...
35	161	151	147	144	142	140	138	135	132	129	126	122	118	*113*	*95.1*	*79.5*	*64.4*	*47.7*
36	161	151	147	144	142	140	138	135	132	129	126	122	118	*113*	*95.1*	*79.5*	*64.4*	*47.7*
37	184	173	168	165	163	160	158	155	151	148	144	139	135	132	...	...	...	...
38	188	188	188	186	183	180	177	174	170	166	161	157	*127*	*114*	...	...	...	...
39	170	159	154	152	149	147	145	142	139	135	132	128	124	120	*101*	*83.8*	*66.8*	*50.3*
40	187	175	169	166	164	161	159	156	152	149	145	141	136	132	*101*	*83.8*	*66.8*	*50.3*
41	187	175	170	167	165	163	160	157	154	150	146	141	137	*123*	*101*	*83.8*	*66.8*	*50.3*
42	197	184	179	176	174	171	169	166	162	158	154	149	144	*123*	*101*	*83.3*	*66.8*	*50.3*
43	161	151	147	144	142	140	138	135	132	129	126	122	118	115	*101*	*83.8*	*66.8*	*50.3*
44	165	156	151	148	146	144	142	139	136	133	129	125	122	118	*101*	*83.8*	*66.8*	*50.3*
45	165	156	151	148	146	144	142	139	136	133	129	125	122	118	*101*	*83.8*	*66.8*	*50.3*

Table 5A
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	
1	*31.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	*31.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	*31.7*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
4	*31.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
6	*31.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
7	*31.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	*31.7*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
9	*31.7*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	*31.7*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
12	*31.7*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	*31.7*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
16	*31.7*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
17	*31.7*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	*31.7*	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	*31.7*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
21	*31.7*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
22	*31.7*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	*31.7*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
26	*31.7*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	*31.7*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
30	*31.7*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
31	*27.0*	*18.2*	*12.0*	...	...	...	...	...	...	...	...	...	...	...	
32	*31.7*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
33	*32.5*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	*32.5*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
36	*32.5*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
39	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
40	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
41	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
42	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
43	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
44	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
45	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
	1	Carbon steel	Castings	SA–216	WCB	J03002	...	...	1	2
	2	Carbon steel	Forgings	SA–266	2	K03506	...	...	1	2
	3	Carbon steel	Forgings	SA–266	4	K03017	...	...	1	2
	4	Carbon steel	Forgings	SA–350	LF2	K03011	...	...	1	2
	5	Carbon steel	Forgings	SA–508	1	K13502	...	...	1	2
	6	Carbon steel	Forgings	SA–508	1A	K13502	...	...	1	2
	7	Carbon steel	Forgings	SA–541	1	K03506	...	...	1	2
	8	Carbon steel	Forgings	SA–541	1A	K03020	...	...	1	2
	9	Carbon steel	Forgings	SA–765	II	K03047	...	...	1	2
	10	Carbon steel	Plate	SA–515	70	K03101	...	...	1	2
	11	Carbon steel	Plate	SA–516	70	K02700	...	...	1	2
	12	Carbon steel	Smls. pipe	SA–106	C	K03501	...	...	1	2
	13	Carbon steel	Smls. tube	SA–210	C	K03501	...	...	1	2
	14	Carbon steel	Castings	SA–216	WCC	K02503	...	...	1	2
	15	Carbon steel	Fittings	SA–234	WPC	K03501	...	...	1	2
(**23**)	16	Carbon steel	Plate	SA–537	...	K12437	3	100 < *t* ≤ 150	1	3
	17	Carbon steel	Plate	SA–662	C	K02007	...	...	1	2
(**23**)	18	Carbon steel	Plate	SA–537	...	K12437	2	100 < *t* ≤ 150	1	3
	19	Carbon steel	Plate	SA–738	C	K02008	...	100 < *t* ≤ 150	1	3
(**23**)	20	Carbon steel	Plate	SA–537	...	K12437	1	*t* ≤ 65	1	2
	21	Carbon steel	Plate	SA–841	A	...	1	*t* ≤ 100	1	2
	22	Carbon steel	Forgings	SA/EN 10222–2	P305GH	...	NT	35 < *t* ≤ 160	1	2
	23	Carbon steel	Forgings	SA/EN 10222–2	P305GH	...	Normalized	*t* ≤ 35	1	2
	24	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	60 < *t* ≤ 100	1	2
	25	Carbon steel	Forgings	SA/EN 10222–2	P305GH	...	QT	*t* ≤ 70	1	2
	26	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	40 < *t* ≤ 60	1	2
	27	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	16 < *t* ≤ 40	1	2
	28	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	≤16	1	2
(**23**)	29	Carbon steel	Forgings	SA–266	3	K05001	...	...	1	2
	30	Carbon steel	Plate	SA–299	A	K02803	...	*t* > 25	1	2
	31	Carbon steel	Plate	SA–299	A	K02803	...	*t* ≤ 25	1	2
	32	Carbon steel	Forgings	SA–372	B	K04001	...	...	1	2
	33	Carbon steel	Plate	SA–738	A	K12447	Normalized	*t* ≤ 65	1	2
	34	Carbon steel	Plate	SA–738	A	K12447	QT	...	1	2
(**23**)	35	Carbon steel	Plate	SA–537	...	K12437	3	65 < *t* ≤ 100	1	3
(**23**)	36	Carbon steel	Plate	SA–537	...	K12437	2	65 < *t* ≤ 100	1	3
(**23**)	37	Carbon steel	Plate	SA–738	C	K02008	...	65 < *t* ≤ 100	1	3
	38	Carbon steel	Plate	SA–299	B	K02803	...	*t* > 25	1	3
	39	Carbon steel	Plate	SA–299	B	K02803	...	*t* ≤ 25	1	3
	40	Carbon steel	Forgings	SA–765	IV	K02009	...	...	1	3
(**23**)	41	Carbon steel	Plate	SA–537	...	K12437	3	*t* ≤ 65	1	3
(**23**)	42	Carbon steel	Plate	SA–537	...	K12437	2	*t* ≤ 65	1	3
	43	Carbon steel	Plate	SA–738	C	K02008	...	*t* ≤ 65	1	3
	44	Carbon steel	Plate	SA–841	B	...	2	*t* ≤ 65	1	3
(**23**)	45	Carbon steel	Plate	SA–612	...	K02900	Normalized	12.5 < *t* ≤ 25	10C	1

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	485	250	538	CS-2	G13, T3
2	485	250	538	CS-2	G13, T3
3	485	250	538	CS-2	G13, T3
4	485	250	538	CS-2	G13, T2
5	485	250	538	CS-2	G13, T3
6	485	250	538	CS-2	G13, T3
7	485	250	538	CS-2	G13, T3
8	485	250	538	CS-2	G13, T3
9	485	250	538	CS-2	G13, T3
10	485	260	538	CS-2	G13, T2
11	485	260	538	CS-2	G13, T2
12	485	275	538	CS-2	G13, T2
13	485	275	538	CS-2	G13, T2
14	485	275	538	CS-2	G13, T2
15	485	275	427	CS-2	G13, T2
16	485	275	371	CS-2	...
17	485	295	371	CS-3	...
18	485	315	343	CS-3	T1
19	485	315	343	CS-3	T1
20	485	345	371	CS-3	...
21	485	345	343	CS-3	...
22	490	280	538	CS-2	G13, T3
23	490	305	538	CS-2	G13, T2
24	490	315	538	CS-2	G13, T2
25	510	285	538	CS-2	G13, T3
26	510	335	538	CS-2	G13, T2
27	510	345	538	CS-2	G13, T2
28	510	355	538	CS-2	G13, T2
29	515	260	538	CS-2	G13, T3, W6
30	515	275	538	CS-2	G13, T3
31	515	290	538	CS-2	G13, T2
32	515	310	343	CS-3	G9, H2, W2, W6
33	515	310	371	CS-2	T2
34	515	310	371	CS-2	T2
35	515	345	371	CS-5	T1
36	515	380	343	CS-5	T1
37	515	380	343	CS-5	...
38	550	310	538	CS-3	G13, T2
39	550	325	538	CS-3	G13, T2
40	550	345	371	CS-3	T1
41	550	380	371	CS-5	T1
42	550	415	343	CS-5	T1
43	550	415	371	CS-5	...
44	550	415	343	CS-3	...
45	560	345	371	CS-3	T2

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	165	156	151	148	146	144	142	139	136	133	129	125	122	118	*101*	*83.8*	*66.8*	*50.3*
2	165	156	151	148	146	144	142	139	136	133	129	125	122	118	*101*	*83.8*	*66.8*	*50.3*
3	165	156	151	148	146	144	142	139	136	133	129	125	122	118	*101*	*83.8*	*66.8*	*50.3*
4	165	156	151	148	146	144	142	139	136	133	129	125	122	*113*	*95.1*	*79.5*	*62.6*	*45.0*
5	165	156	151	148	146	144	142	139	136	133	129	125	122	118	*101*	*83.8*	*66.8*	*50.3*
6	165	156	151	148	146	144	142	139	136	133	129	125	122	118	*101*	*83.8*	*66.8*	*50.3*
7	165	156	151	148	146	144	142	139	136	133	129	125	122	118	*101*	*83.8*	*66.8*	*50.3*
8	165	156	151	148	146	144	142	139	136	133	129	125	122	118	*101*	*83.8*	*66.8*	*50.3*
9	165	156	151	148	146	144	142	139	136	133	129	125	122	118	*101*	*83.8*	*66.8*	*50.3*
10	175	164	159	157	154	152	150	147	144	140	136	132	128	*122*	*101*	*83.8*	*66.8*	*50.3*
11	175	164	159	157	154	152	150	147	144	140	136	132	128	*122*	*101*	*83.8*	*66.8*	*50.3*
12	184	173	168	165	163	160	158	155	151	148	144	139	138	*136*	*101*	*83.8*	*66.8*	*50.3*
13	184	173	168	165	163	160	158	155	151	148	144	139	138	*136*	*101*	*83.8*	*66.8*	*50.3*
14	184	173	168	165	163	160	158	155	151	148	144	139	138	*136*	*101*	*83.8*	*66.8*	*50.3*
15	184	173	168	165	163	160	158	155	151	148	144	139	138	*136*	*101*	*83.8*	*66.8*	...
16	184	171	161	155	149	143	139	135	131	129	126	123	121	118	...	...	...	...
17	198	186	180	177	175	172	169	166	163	159	154	150	145	142	...	...	...	...
18	202	196	185	177	171	165	160	155	151	147	144	141	*133*	...	...	...	...	...
19	201	199	193	190	187	184	181	178	174	170	165	160	*148*	...	...	...	...	...
20	202	202	201	193	186	179	174	169	165	161	157	154	133	125	...	...	...	...
21	201	201	201	201	201	197	195	193	191	189	186	183	179	...	...	...	...	...
22	187	175	169	166	164	161	159	156	152	149	145	141	136	132	*101*	*83.8*	*66.8*	*50.3*
23	203	190	184	181	179	176	173	170	166	162	158	153	148	*136*	*101*	*83.8*	*66.8*	*50.3*
24	204	197	191	188	186	183	180	177	173	169	164	159	154	*123*	*101*	*83.8*	*66.8*	*50.3*
25	190	178	172	169	167	164	162	159	155	151	147	143	139	134	*101*	*83.8*	*66.8*	*50.3*
26	213	209	203	200	197	195	192	188	184	179	174	169	164	*123*	*101*	*83.8*	*66.8*	*50.3*
27	213	213	209	206	203	201	197	194	189	185	180	174	169	*123*	*101*	*83.8*	*66.8*	*50.3*
28	213	213	213	212	209	206	203	199	195	190	185	179	174	*123*	*101*	*83.8*	*66.8*	*50.3*
29	172	162	157	155	152	150	148	145	142	138	135	131	127	123	*107*	*88.0*	*67.3*	*50.3*
30	184	173	168	165	163	160	158	155	151	148	144	139	135	131	*107*	*88.1*	*67.6*	*50.8*
31	193	182	176	173	171	168	165	162	159	155	151	146	142	*133*	*107*	*88.1*	*67.6*	*50.8*
32	207	195	189	186	183	180	177	174	170	166	161	157	152	...	...	...	...	...
33	207	192	181	174	167	162	156	152	148	144	141	138	135	*131*	...	...	...	...
34	207	192	181	174	167	162	156	152	148	144	141	138	135	*131*	...	...	...	...
35	215	213	201	193	186	179	174	169	165	161	157	154	*142*	*123*	...	...	...	...
36	215	215	215	212	204	197	191	185	181	177	173	169	*143*	...	...	...	...	...
37	215	215	215	215	215	215	211	207	204	200	197	194	168	...	...	...	...	...
38	207	194	188	185	183	180	177	174	170	166	161	157	152	*133*	*107*	*88.1*	*67.6*	*50.8*
39	216	203	197	194	191	188	185	182	178	173	169	164	159	*133*	*107*	*88.1*	*67.6*	*50.8*
40	230	216	210	206	203	200	197	193	189	184	179	174	*160*	*131*	...	...	...	...
41	229	229	221	212	204	197	191	185	181	177	173	169	*151*	*132*	...	...	...	...
42	229	229	229	229	223	215	209	202	197	192	189	185	*151*	...	...	...	...	...
43	230	230	230	230	230	230	230	226	222	218	215	211	177	166	...	...	...	...
44	230	230	230	230	230	230	230	230	229	226	223	220	215	...	...	...	...	...
45	230	220	208	199	190	182	174	168	164	160	157	155	153	*133*	...	...	...	...

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding													
	500	525	550	575	600	625	650	675	700	725	750	775	800	825
1	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
2	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
3	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
4	*31.7*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
5	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
6	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
7	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
8	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
9	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
10	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
11	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
12	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
13	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
14	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
23	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
24	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
25	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
26	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
27	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
28	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	...
29	*33.2*	*21.4*	*14.2*	...	...	...	...	...	...	...	...	...	...	... (**23**)
30	*33.7*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...
31	*33.7*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
36	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
37	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
38	*33.7*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...
39	*33.7*	*21.3*	*12.9*	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
42	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
(**23**)	1	Carbon steel	Plate	SA–612	...	K02900	Normalized	$t \le 12.5$	10C	1
	2	Carbon steel	Plate	SA–738	B	K12007	...	...	1	3
	3	Carbon steel	Forgings	SA–372	C	K04801	...	...	...	...
	4	Carbon steel	Plate	SA–724	A	K11831	...	...	1	4
	5	Carbon steel	Plate	SA–724	C	K12037	...	...	1	4
	6	Carbon steel	Plate	SA–724	B	K12031	...	...	1	4
	7	C–Mn–Si–Cb	Plate	SA–737	B	K12001	...	...	1	2
	8	C–Mn–Si–V	Plate	SA–737	C	K12202	...	...	1	3
	9	C–½Mo	Smls. tube	SA–209	T1b	K11422	...	...	3	1
	10	C–½Mo	Smls. tube	SA–209	T1	K11522	...	...	3	1
	11	C–½Mo	Fittings	SA–234	WP1	K12821	...	...	3	1
	12	C–½Mo	Smls. pipe	SA–335	P1	K11522	...	...	3	1
	13	C–½Mo	Forged pipe	SA–369	FP1	K11522	...	...	3	1
	14	C–½Mo	Smls. tube	SA–209	T1a	K12023	...	...	3	1
	15	C–½Mo	Castings	SA–217	WC1	J12524	...	...	3	1
	16	C–½Mo	Castings	SA–352	LC1	J12522	...	...	3	1
	17	C–½Mo	Plate	SA–204	A	K11820	...	...	3	1
	18	C–½Mo	Forgings	SA–182	F1	K12822	...	...	3	2
	19	C–½Mo	Plate	SA–204	B	K12020	...	...	3	2
	20	C–½Mo	Forgings	SA–336	F1	K12520	...	...	3	2
	21	C–½Mo	Plate	SA–204	C	K12320	...	...	3	2
(**23**)	22	½Cr–⅕Mo	Forgings	SA–372	G	K13049	70	...	11B	...
(**23**)	23	½Cr–⅕Mo	Forgings	SA–372	H	K13547	70	...	11B	...
	24	½Cr–⅕Mo–V	Plate	SA–517	B	K11630	...	$t \le 32$	11B	4
	25	½Cr–¼Mo–Si	Plate	SA–517	A	K11856	...	$t \le 32$	11B	1
	26	½Cr–¼Mo–Si	Forgings	SA–592	A	K11856	...	$t \le 65$	11B	1
	27	½Cr–½Mo	Smls. pipe	SA–335	P2	K11547	...	...	3	1
	28	½Cr–½Mo	Forged pipe	SA–369	FP2	K11547	...	...	3	1
	29	½Cr–½Mo	Plate	SA–387	2	K12143	1	...	3	1
	30	½Cr–½Mo	Smls. tube	SA–213	T2	K11547	...	...	3	1
	31	½Cr–½Mo	Forgings	SA–182	F2	K12122	...	...	3	2
	32	½Cr–½Mo	Plate	SA–387	2	K12143	2/NT	...	3	2
	33	¾Cr–½Ni–Cu	Smls. tube	SA–423	1	K11535	...	...	4	2
	34	¾Cr–¾Ni–Cu–Al	Smls. pipe	SA–333	4	K11267	...	...	4	2
	35	1Cr–⅕Mo	Forgings	SA–372	E	K13047	70	...	11B	1
	36	1Cr–⅕Mo	Forgings	SA–372	F	G41350	70	...	11B	1
	37	1Cr–⅕Mo	Forgings	SA–372	J	K13548	70	...	11B	1
	38	1Cr–⅕Mo	Forgings	SA–372	J	G41370	110	...	11B	1
	39	1Cr–½Mo	Plate	SA–387	12	K11757	1	...	4	1
	40	1Cr–½Mo	Forgings	SA–182	F12	K11562	1	...	4	1
	41	1Cr–½Mo	Smls. tube	SA–213	T12	K11562	...	...	4	1
	42	1Cr–½Mo	Fittings	SA–234	WP12	K12062	1	...	4	1
	43	1Cr–½Mo	Smls. pipe	SA–335	P12	K11562	...	...	4	1
	44	1Cr–½Mo	Forged pipe	SA–369	FP12	K11562	...	...	4	1
	45	1Cr–½Mo	Forgings	SA/EN 10222–2	13CrMo4–5	...	NT or QT	$250 < t \le 500$	4	1

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	570	345	371	CS–3	T2
2	585	415	343	CS–5	T1
3	620	380	343	CS–3	G9, H2, T1, W2, W6
4	620	485	371	CS–5	...
5	620	485	371	CS–5	...
6	655	515	371	CS–5	...
7	485	345	371	CS–3	...
8	550	415	371	CS–3	...
9	365	195	538	CS–1	G14, T7
10	380	205	538	CS–2	G14, T7
11	380	205	538	CS–2	G14, T7
12	380	205	538	CS–2	G14, T7
13	380	210	538	CS–2	G14, T7
14	415	220	538	CS–2	G14, T7
15	450	240	538	CS–2	G14, T6
16	450	240	343	CS–2	...
17	450	255	538	CS–2	G14, T6
18	485	275	538	CS–2	G14, T6
19	485	275	538	CS–2	G14, T6
20	485	275	538	CS–2	G14, T6
21	515	295	538	CS–2	G14, T6
22	825	485	93	CS–3	G9, H4, W2, W6
23	825	485	93	CS–3	G9, H4, W2, W6
24	795	690	343	HT–1	...
25	795	690	343	HT–1	...
26	795	690	343	HT–1	...
27	380	205	538	CS–2	T7
28	380	210	538	CS–2	T7
29	380	230	538	CS–2	T7
30	415	205	538	CS–2	T7
31	485	275	538	CS–2	G14, T7
32	485	310	538	CS–3	T7
33	415	255	343	CS–2	...
34	415	240	343	CS–2	...
35	825	485	343	CS–5	G9, H4, W2, W6
36	825	485	343	CS–5	G9, H4, W2, W6
37	825	485	343	CS–5	G9, H4, W2, W6
38	930	760	343	HT–1	H4, W2, W6
39	380	230	649	CS–2	T7
40	415	220	649	CS–2	T7
41	415	220	649	CS–2	T7
42	415	220	649	CS–2	T7
43	415	220	649	CS–2	T7
44	415	220	649	CS–2	T7
45	420	240	649	CS–2	T7

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	230	220	208	199	190	182	174	168	164	160	157	155	153	*133*	...	...	...	...
2	244	244	244	244	240	235	230	226	222	218	215	211	*160*	...	...	...	...	...
3	253	242	229	219	209	200	192	185	180	176	173	171	*160*	...	...	...	...	...
4	259	259	259	259	259	254	244	236	229	224	220	217	180	178	...	...	...	...
5	259	259	259	259	259	254	244	236	229	224	220	217	180	178	...	...	...	...
6	273	273	273	273	273	272	261	253	246	240	236	233	180	178	...	...	...	...
7	201	201	201	199	190	182	174	168	164	160	157	155	153	152	...	...	...	...
8	230	230	230	230	228	218	209	202	196	192	189	186	180	178	...	...	...	...
9	129	124	120	118	116	114	112	111	109	108	106	105	103	101	98.8	96.4	93.7	90.6
10	138	133	129	126	124	122	120	119	117	115	114	112	110	108	106	103	100	97.1
11	138	133	129	126	124	122	120	119	117	115	114	112	110	108	106	103	100	97.1
12	138	133	129	126	124	122	120	119	117	115	114	112	110	108	106	103	100	97.1
13	138	133	129	126	124	122	120	119	117	115	114	112	110	108	106	103	100	97.1
14	147	142	138	135	133	130	128	127	125	123	121	120	118	115	113	110	107	104
15	161	155	150	148	145	143	140	138	137	135	133	131	129	126	123	120	117	*109*
16	161	155	150	148	145	143	140	138	137	135	133	131	129	...	...	...	...	...
17	170	164	159	156	153	151	148	146	144	142	140	138	136	133	131	127	124	*109*
18	184	177	172	169	166	163	161	158	156	154	152	149	147	144	141	138	134	*109*
19	184	177	172	169	166	163	161	158	156	154	152	149	147	144	141	138	134	*109*
20	184	177	172	169	166	163	161	158	156	154	152	149	147	144	141	138	134	*109*
21	198	190	185	181	178	175	173	170	168	165	163	161	158	155	152	148	144	*109*
22	322	322	322	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	322	322	322	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	330	330	330	330	330	330	330	330	330	330	330	330	330	...	...	...	...	...
25	330	330	330	330	330	330	330	330	330	330	330	330	330	...	...	...	...	...
26	330	330	330	330	330	330	330	330	330	330	330	330	330	...	...	...	...	...
27	138	133	129	126	124	122	120	119	117	115	114	112	110	108	106	103	100	97.1
28	138	133	129	126	124	122	120	119	117	115	114	112	110	108	106	103	100	97.1
29	152	146	142	139	137	134	132	131	129	127	125	123	121	119	116	114	110	107
30	138	133	129	126	124	122	120	119	117	115	114	112	110	108	106	103	100	97.1
31	184	177	172	169	166	163	161	158	156	154	152	149	147	144	141	138	134	129
32	201	199	193	190	186	183	181	178	176	173	171	168	165	162	159	155	151	146
33	170	161	156	154	152	150	149	147	146	145	143	141	140	...	...	...	...	...
34	161	152	148	145	144	142	141	139	138	137	135	134	132	...	...	...	...	...
35	322	307	298	293	288	284	280	277	273	269	264	259	253	...	...	...	...	...
36	322	307	298	293	288	284	280	277	273	269	264	259	253	...	...	...	...	...
37	322	307	298	293	288	284	280	277	273	269	264	259	253	...	...	...	...	...
38	388	388	388	388	388	388	388	388	388	388	388	388	388	...	...	...	...	...
39	152	142	136	132	129	126	124	121	120	118	116	115	114	112	110	109	106	104
40	147	138	132	128	125	122	120	118	116	114	113	112	110	109	107	105	103	101
41	147	138	132	128	125	122	120	118	116	114	113	112	110	109	107	105	103	101
42	147	138	132	128	125	122	120	118	116	114	113	112	110	109	107	105	103	101
43	147	138	132	128	125	122	120	118	116	114	113	112	110	109	107	105	103	101
44	147	138	132	128	125	122	120	118	116	114	113	112	110	109	107	105	103	101
45	160	151	144	140	136	133	131	128	127	125	123	122	120	119	117	115	113	110

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	*68.0*	*42.3*	*30.5*	...	...	...	...	...	...	...	...	...	...	...	
10	*68.0*	*42.3*	*30.5*	...	...	...	...	...	...	...	...	...	...	...	
11	*68.0*	*42.3*	*30.5*	...	...	...	...	...	...	...	...	...	...	...	
12	*68.0*	*42.3*	*30.5*	...	...	...	...	...	...	...	...	...	...	...	
13	*68.0*	*42.3*	*30.5*	...	...	...	...	...	...	...	...	...	...	...	
14	*68.0*	*42.3*	*30.5*	...	...	...	...	...	...	...	...	...	...	...	
15	*68.0*	*42.3*	*30.5*	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	*68.0*	*42.3*	*30.5*	...	...	...	...	...	...	...	...	...	...	...	
18	*68.0*	*42.3*	*30.5*	...	...	...	...	...	...	...	...	...	...	...	
19	*68.0*	*42.3*	*30.5*	...	...	...	...	...	...	...	...	...	...	...	
20	*68.0*	*42.3*	*30.5*	...	...	...	...	...	...	...	...	...	...	...	
21	*68.0*	*42.3*	*30.5*	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	*74.4*	*49.9*	*34.3*	...	...	...	...	...	...	...	...	...	...	...	
28	*74.4*	*49.9*	*34.3*	...	...	...	...	...	...	...	...	...	...	...	
29	*74.4*	*49.9*	*34.3*	...	...	...	...	...	...	...	...	...	...	...	
30	*74.4*	*49.9*	*34.3*	...	...	...	...	...	...	...	...	...	...	...	
31	*75.6*	*49.9*	*33.5*	...	...	...	...	...	...	...	...	...	...	...	
32	*78.8*	*53.7*	*35.4*	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	*92.1*	*61.1*	*40.4*	*26.4*	*17.4*	*11.6*	*7.44*	...	...	...	...	...	...	...	
40	*92.1*	*61.1*	*40.4*	*26.4*	*17.4*	*11.6*	*7.44*	...	...	...	...	...	...	...	
41	*92.1*	*61.1*	*40.4*	*26.4*	*17.4*	*11.6*	*7.44*	...	...	...	...	...	...	...	
42	*92.1*	*61.1*	*40.4*	*26.4*	*17.4*	*11.6*	*7.44*	...	...	...	...	...	...	...	
43	*92.1*	*61.1*	*40.4*	*26.4*	*17.4*	*11.6*	*7.44*	...	...	...	...	...	...	...	
44	*92.1*	*61.1*	*40.4*	*26.4*	*17.4*	*11.6*	*7.44*	...	...	...	...	...	...	...	
45	*97.2*	*59.3*	*41.0*	*26.2*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	1Cr–½Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...	150 < *t* ≤ 250	4	1
2	1Cr–½Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...	100 < *t* ≤ 150	4	1
3	1Cr–½Mo	Forgings	SA/EN 10222–2	13CrMo4–5	...	NT or QT	100 < *t* ≤ 250	4	1
4	1Cr–½Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...	60 < *t* ≤ 100	4	1
5	1Cr–½Mo	Forgings	SA/EN 10222–2	13CrMo4–5	...	NT or QT	70 < *t* ≤ 100	4	1
6	1Cr–½Mo	Forgings	SA/EN 10222–2	13CrMo4–5	...	NT	35 < *t* ≤ 70	4	1
7	1Cr–½Mo	Forgings	SA/EN 10222–2	13CrMo4–5	...	NT	*t* ≤ 35	4	1
8	1Cr–½Mo	Plate	SA–387	12	K11757	2	...	4	1
9	1Cr–½Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...	16 < *t* ≤ 60	4	1
10	1Cr–½Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...	*t* ≤ 16	4	1
11	1Cr–½Mo	Forgings	SA–182	F12	K11564	2	...	4	1
12	1Cr–½Mo	Forgings	SA–336	F12	K11564	...	...	4	1
(**23**) 13	1¼Cr–½Mo	Castings	SA–217	WC6	J12072	...	...	4	1
14	1¼Cr–½Mo	Bar	SA–739	B11	K11797	...	...	4	1
15	1¼Cr–½Mo–Si	Forgings	SA–182	F11	K11597	1	...	4	1
16	1¼Cr–½Mo–Si	Smls. tube	SA–213	T11	K11597	...	...	4	1
17	1¼Cr–½Mo–Si	Fittings	SA–234	WP11	...	1	...	4	1
18	1¼Cr–½Mo–Si	Smls. pipe	SA–335	P11	K11597	...	...	4	1
19	1¼Cr–½Mo–Si	Forged pipe	SA–369	FP11	K11597	...	...	4	1
20	1¼Cr–½Mo–Si	Plate	SA–387	11	K11789	1	...	4	1
21	1¼Cr–½Mo–Si	Forgings	SA–182	F11	K11572	2	...	4	1
22	1¼Cr–½Mo–Si	Forgings	SA–336	F11	K11572	2	...	4	1
23	1¼Cr–½Mo–Si	Plate	SA/EN 10028–2	13CrMoSi5–5	...	QT	100 < *t* ≤ 250	4	1
24	1¼Cr–½Mo–Si	Plate	SA/EN 10028–2	13CrMoSi5–5	...	QT	60 < *t* ≤ 100	4	1
25	1¼Cr–½Mo–Si	Plate	SA/EN 10028–2	13CrMoSi5–5	...	QT	≤60	4	1
26	1¼Cr–½Mo–Si	Forgings	SA–336	F11	K11572	3	...	4	1
27	1¼Cr–½Mo–Si	Plate	SA–387	11	K11789	2	...	4	1
(**23**) 28	1¾Cr–½Mo–Cu	Forgings	SA–592	E	K11695	...	65 < *t* ≤ 100	11B	2
(**23**) 29	1¾Cr–½Mo–Cu	Forgings	SA–592	E	K11695	...	*t* ≤ 65	11B	2
(**23**) 30	1¾Cr–½Mo–Ti	Plate	SA–517	E	K21604	...	65 < *t* ≤ 150	11B	2
(**23**) 31	1¾Cr–½Mo–Ti	Plate	SA–517	E	K21604	...	*t* ≤ 65	11B	2
32	2¼Cr–1Mo	Forgings	SA–182	F22	K21590	1	...	5A	1
33	2¼Cr–1Mo	Smls. tube	SA–213	T22	K21590	...	...	5A	1
34	2¼Cr–1Mo	Fittings	SA–234	WP22	K21590	1	...	5A	1
35	2¼Cr–1Mo	Smls. pipe	SA–335	P22	K21590	...	...	5A	1
36	2¼Cr–1Mo	Forgings	SA–336	F22	K21590	1	...	5A	1
37	2¼Cr–1Mo	Forged pipe	SA–369	FP22	K21590	...	...	5A	1
38	2¼Cr–1Mo	Plate	SA–387	22	K21590	1	...	5A	1
39	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...	150 < *t* ≤ 250	5A	1
40	2¼Cr–1Mo	Forgings	SA/EN 10222–2	11CrMo9–10	...	NT or QT	200 < *t* ≤ 500	5A	1
41	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...	100 < *t* ≤ 150	5A	1
42	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...	60 < *t* ≤ 100	5A	1
43	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...	40 < *t* ≤ 60	5A	1
44	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...	16 < *t* ≤ 40	5A	1
45	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...	*t* ≤ 16	5A	1

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	420	245	649	CS–2	T7
2	430	255	649	CS–2	T7
3	440	265	649	CS–2	T7
4	440	270	649	CS–2	T7
5	440	275	649	CS–2	T7
6	440	285	649	CS–2	T7
7	440	295	649	CS–2	T7
8	450	275	649	CS–2	T7
9	450	290	649	CS–2	T7
10	450	300	649	CS–2	T7
11	485	275	649	CS–2	T7
12	485	275	649	CS–2	T7
13	485	275	593	CS–2	T7
14	483	310	649	CS–3	T7
15	415	205	649	CS–2	T7
16	415	205	649	CS–2	T7
17	415	205	649	CS–2	T7
18	415	205	649	CS–2	T7
19	415	210	649	CS–2	T7
20	415	240	649	CS–2	T7
21	485	275	649	CS–2	T7
22	485	275	649	CS–2	T7
23	490	380	570	CS–3	G15, T6
24	500	390	570	CS–3	G15, T6
25	510	400	570	CS–3	G15, T6
26	515	310	649	CS–3	T7
27	515	310	649	CS–3	T7
28	725	620	343	CS–5	S1
29	795	690	343	HT–1	...
30	725	620	343	CS–5	...
31	795	690	343	HT–1	...
32	415	205	649	CS–2	T6, W5
33	415	205	649	CS–2	T6, W5
34	415	205	649	CS–2	T6, W5
35	415	205	649	CS–2	T6, W5
36	415	205	649	CS–2	T6, W5
37	415	210	649	CS–2	T6, W5
38	415	210	649	CS–2	H1, T6, W5
39	450	250	593	CS–3	T7, W5
40	450	265	649	CS–3	T6, W5
41	460	260	593	CS–3	T7, W5
42	470	280	593	CS–3	T6, W5
43	480	290	593	CS–3	T6, W5
44	480	300	593	CS–3	T6, W5
45	480	310	593	CS–3	T5, W5

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	163	153	147	142	139	136	133	131	129	127	125	124	122	121	119	117	115	112
2	170	160	153	148	145	141	139	136	134	132	131	129	127	126	124	122	119	116
3	177	167	159	155	151	147	144	142	140	138	136	135	133	131	129	127	124	121
4	180	169	161	157	153	150	147	144	142	140	138	137	135	133	131	129	126	123
5	183	173	165	161	156	153	150	147	145	143	141	140	138	136	134	132	129	126
6	183	179	171	166	162	158	155	152	150	148	146	145	143	141	139	136	134	130
7	183	183	177	172	168	164	161	158	155	153	152	150	148	146	144	141	138	135
8	184	173	165	160	156	153	150	147	145	143	141	139	138	136	134	132	129	126
9	188	181	173	169	164	161	158	155	152	150	148	147	145	143	141	138	136	132
10	188	188	179	174	170	166	163	160	158	156	154	152	150	148	146	143	140	137
11	184	173	165	160	156	153	150	147	145	143	141	139	138	136	134	132	129	126
12	184	173	165	160	156	153	150	147	145	143	141	139	138	136	134	132	129	126
13	184	175	169	165	161	158	155	153	150	148	146	143	141	138	136	133	130	106
14	201	197	190	185	181	178	175	172	169	166	164	161	159	156	153	149	146	108
15	138	131	126	124	121	119	116	115	113	111	109	107	106	104	102	99.6	97.2	94.5
16	138	131	126	124	121	119	116	115	113	111	109	107	106	104	102	99.6	97.2	94.5
17	138	131	126	124	121	119	116	115	113	111	109	107	106	104	102	99.6	97.2	94.5
18	138	131	126	124	121	119	116	115	113	111	109	107	106	104	102	99.6	97.2	94.5
19	138	131	126	124	121	119	116	115	113	111	109	107	106	104	102	99.6	97.2	94.5
20	161	153	148	144	141	138	136	134	131	129	127	125	123	121	119	116	113	106
21	184	175	169	165	161	158	155	153	150	148	146	143	141	138	136	133	130	105
22	184	175	169	165	161	158	155	153	150	148	146	143	141	138	136	133	130	105
23	204	204	204	204	204	204	204	204	204	204	204	204	204	202	198	194	189	*104*
24	208	208	208	208	208	208	208	208	208	208	208	208	208	208	203	199	194	*104*
25	213	213	213	213	213	213	213	213	213	213	213	213	213	213	209	204	199	*104*
26	207	197	190	185	181	178	175	172	169	166	164	161	159	156	153	149	146	105
27	207	197	190	185	181	178	175	172	169	166	164	161	159	156	153	149	146	105
28	302	302	302	302	302	302	302	302	302	302	302	302	302	...	...	...	...	...
29	330	330	330	330	330	330	330	330	330	330	330	330	330	...	...	...	...	...
30	302	302	302	302	302	302	302	302	302	302	302	302	302	...	...	...	...	...
31	330	330	330	330	330	330	330	330	330	330	330	330	330	...	...	...	...	...
32	138	132	128	126	125	124	124	124	124	124	124	124	124	124	123	122	121	*99.6*
33	138	132	128	126	125	124	124	124	124	124	124	124	124	124	123	122	121	*99.6*
34	138	132	128	126	125	124	124	124	124	124	124	124	124	124	123	122	121	*99.6*
35	138	132	128	126	125	124	124	124	124	124	124	124	124	124	123	122	121	*99.6*
36	138	132	128	126	125	124	124	124	124	124	124	124	124	124	123	122	121	*99.6*
37	138	132	128	126	125	124	124	124	124	124	124	124	124	124	123	122	121	*99.6*
38	138	132	128	126	125	124	124	124	124	124	124	124	124	124	123	122	121	*99.6*
39	167	157	152	148	146	143	142	140	139	137	136	135	133	132	130	127	124	121
40	177	167	161	157	154	152	150	148	147	146	144	143	142	140	138	135	132	*116*
41	173	164	158	154	151	149	147	146	144	143	142	140	139	137	135	132	129	126
42	187	176	170	166	163	161	158	157	155	154	152	151	149	148	145	143	139	*128*
43	193	183	176	172	169	166	164	162	161	159	158	156	155	153	150	148	144	*128*
44	200	189	182	178	175	172	170	168	166	165	163	162	160	158	156	153	149	*128*
45	200	195	188	184	181	178	175	174	172	170	169	167	165	163	161	158	*151*	*128*

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	
1	*94.4*	*60.2*	*40.8*	*26.3*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	
2	*94.4*	*60.2*	*40.8*	*26.3*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	
3	*97.2*	*59.3*	*41.0*	*26.2*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	
4	*94.4*	*60.2*	*40.8*	*26.3*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	
5	*97.2*	*59.3*	*41.0*	*26.2*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	
6	*97.2*	*59.3*	*41.0*	*26.2*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	
7	*97.2*	*59.3*	*41.0*	*26.2*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	
8	*92.1*	*61.1*	*40.4*	*26.4*	*17.4*	*11.6*	*7.44*	...	...	...	...	...	...	...	
9	*94.4*	*60.2*	*40.8*	*26.3*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	
10	*94.4*	*60.2*	*40.8*	*26.3*	*17.3*	*11.7*	*7.40*	...	...	...	...	...	...	...	
11	*92.1*	*61.1*	*40.4*	*26.4*	*17.4*	*11.6*	*7.44*	...	...	...	...	...	...	...	
12	*92.1*	*61.1*	*40.4*	*26.4*	*17.4*	*11.6*	*7.44*	...	...	...	...	...	...	...	
13	*73.7*	*52.0*	*36.3*	*25.2*	*17.6*	...	...	...	...	...	...	...	...	...	(**23**)
14	*73.7*	*52.0*	*36.3*	*25.2*	*17.6*	*12.3*	*8.12*	...	...	...	...	...	...	...	
15	*73.7*	*52.0*	*36.3*	*25.2*	*17.6*	*12.3*	*8.12*	...	...	...	...	...	...	...	
16	*73.7*	*52.0*	*36.3*	*25.2*	*17.6*	*12.3*	*8.12*	...	...	...	...	...	...	...	
17	*73.7*	*52.0*	*36.3*	*25.2*	*17.6*	*12.3*	*8.12*	...	...	...	...	...	...	...	
18	*73.7*	*52.0*	*36.3*	*25.2*	*17.6*	*12.3*	*8.12*	...	...	...	...	...	...	...	
19	*73.7*	*52.0*	*36.3*	*25.2*	*17.6*	*12.3*	*8.12*	...	...	...	...	...	...	...	
20	*73.7*	*52.0*	*36.3*	*25.2*	*17.6*	*12.3*	*8.12*	...	...	...	...	...	...	...	
21	*73.7*	*52.0*	*36.3*	*25.2*	*17.6*	*12.3*	*8.12*	...	...	...	...	...	...	...	
22	*73.7*	*52.0*	*36.3*	*25.2*	*17.6*	*12.3*	*8.12*	...	...	...	...	...	...	...	
23	*73.7*	*52.0*	*36.3*	*25.2*	...	...	...	...	...	...	...	...	...	...	
24	*73.7*	*52.0*	*36.3*	*25.2*	...	...	...	...	...	...	...	...	...	...	
25	*73.7*	*52.0*	*36.3*	*25.2*	...	...	...	...	...	...	...	...	...	...	
26	*73.7*	*52.0*	*36.3*	*25.2*	*17.6*	*12.3*	*8.12*	...	...	...	...	...	...	...	
27	*73.7*	*52.0*	*36.3*	*25.2*	*17.6*	*12.3*	*8.12*	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
32	*80.9*	*63.3*	*47.5*	*34.2*	*23.5*	*15.3*	*9.45*	...	...	...	...	...	...	...	
33	*80.9*	*63.3*	*47.5*	*34.2*	*23.5*	*15.3*	*9.45*	...	...	...	...	...	...	...	
34	*80.9*	*63.3*	*47.5*	*34.2*	*23.5*	*15.3*	*9.45*	...	...	...	...	...	...	...	
35	*80.9*	*63.3*	*47.5*	*34.2*	*23.5*	*15.3*	*9.45*	...	...	...	...	...	...	...	
36	*80.9*	*63.3*	*47.5*	*34.2*	*23.5*	*15.3*	*9.45*	...	...	...	...	...	...	...	
37	*80.9*	*63.3*	*47.5*	*34.2*	*23.5*	*15.3*	*9.45*	...	...	...	...	...	...	...	
38	*80.9*	*63.3*	*47.5*	*34.2*	*23.5*	*15.3*	*9.45*	...	...	...	...	...	...	...	
39	*88.4*	*64.0*	*44.6*	*30.0*	*19.7*	...	...	...	...	...	...	...	...	...	
40	*89.4*	*64.3*	*44.9*	*30.1*	*19.7*	*12.9*	*8.06*	...	...	...	...	...	...	...	
41	*88.4*	*64.0*	*44.6*	*30.0*	*19.7*	...	...	...	...	...	...	...	...	...	
42	*88.4*	*64.0*	*44.6*	*30.0*	*19.7*	...	...	...	...	...	...	...	...	...	
43	*88.4*	*64.0*	*44.6*	*30.0*	*19.7*	...	...	...	...	...	...	...	...	...	
44	*88.4*	*64.0*	*44.6*	*30.0*	*19.7*	...	...	...	...	...	...	...	...	...	
45	*88.4*	*64.0*	*44.6*	*30.0*	*19.7*	...	...	...	...	...	...	...	...	...	

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	2¼Cr–1Mo	Castings	SA–217	WC9	J21890	...	...	5A	1
2	2¼Cr–1Mo	Forgings	SA–182	F22	K21590	3	...	5A	1
3	2¼Cr–1Mo	Forgings	SA–336	F22	K21590	3	...	5A	1
4	2¼Cr–1Mo	Plate	SA–387	22	K21590	2	...	5A	1
5	2¼Cr–1Mo	Bar	SA–739	B22	K21390	...	...	5A	1
6	2¼Cr–1Mo	Forgings	SA/EN 10222–2	11CrMo9–10	...	NT	$t \le 200$	5A	1
(**23**) 7	2¼Cr–1Mo	Castings	SA–487	8	J22091	A	...	5C	1
(**23**) 8	2¼Cr–1Mo	Forgings	SA–508	22	K21590	3	...	5C	1
(**23**) 9	2¼Cr–1Mo	Forgings	SA–541	22	K21390	3	...	5C	1
(**23**) 10	2¼Cr–1Mo	Plate	SA–542	B	K21590	4	...	5C	1
11	2¼Cr–1Mo–V	Forgings	SA–182	F22V	K31835	...	...	5C	1
12	2¼Cr–1Mo–V	Forgings	SA–336	F22V	K31835	...	...	5C	1
13	2¼Cr–1Mo–V	Forgings	SA–541	22V	K31835	...	...	5C	1
14	2¼Cr–1Mo–V	Plate	SA–542	D	K31835	4a	...	5C	1
15	2¼Cr–1Mo–V	Plate	SA–832	22V	K31835	...	...	5C	1
16	3Cr–1Mo	Smls. tube	SA–213	T21	K31545	...	...	5A	1
17	3Cr–1Mo	Smls. pipe	SA–335	P21	K31545	...	...	5A	1
18	3Cr–1Mo	Forgings	SA–336	F21	K31545	1	...	5A	1
19	3Cr–1Mo	Forged pipe	SA–369	FP21	K31545	...	...	5A	1
20	3Cr–1Mo	Plate	SA–387	21	K31545	1	...	5A	1
21	3Cr–1Mo	Forgings	SA–182	F21	K31545	...	...	5A	1
22	3Cr–1Mo	Forgings	SA–336	F21	K31545	3	...	5A	1
23	3Cr–1Mo	Plate	SA–387	21	K31545	2	...	5A	1
24	3Cr–1Mo–¼V–Ti–B	Forgings	SA–182	F3V	K31830	...	...	5C	1
25	3Cr–1Mo–¼V–Ti–B	Forgings	SA–336	F3V	K31830	...	...	5C	1
26	3Cr–1Mo–¼V–Ti–B	Forgings	SA–508	3V	K31830	...	...	5C	1
27	3Cr–1Mo–¼V–Ti–B	Forgings	SA–541	3V	K31830	...	...	5C	1
28	3Cr–1Mo–¼V–Ti–B	Plate	SA–542	C	K31830	4a	...	5C	1
29	3Cr–1Mo–¼V–Ti–B	Plate	SA–832	21V	K31830	...	...	5C	1
30	3Cr–1Mo–¼V–Cb–Ca	Forgings	SA–182	F3VCb	K31390	...	...	5C	1
31	3Cr–1Mo–¼V–Cb–Ca	Forgings	SA–336	F3VCb	K31390	...	...	5C	1
32	3Cr–1Mo–¼V–Cb–Ca	Forgings	SA–508	3VCb	K31390	...	...	5C	1
33	3Cr–1Mo–¼V–Cb–Ca	Forgings	SA–541	3VCb	K31390	...	...	5C	1
34	3Cr–1Mo–¼V–Cb–Ca	Plate	SA–542	E	K31390	4a	...	5C	1
35	3Cr–1Mo–¼V–Cb–Ca	Plate	SA–832	23V	K31390	...	...	5C	1
36	5Cr–½Mo	Smls. tube	SA–213	T5	K41545	...	...	5B	1
37	5Cr–½Mo	Fittings	SA–234	WP5	K41545	...	...	5B	1
38	5Cr–½Mo	Smls. pipe	SA–335	P5	K41545	...	...	5B	1
39	5Cr–½Mo	Forged pipe	SA–369	FP5	K41545	...	...	5B	1
40	5Cr–½Mo	Plate	SA–387	5	K41545	1	...	5B	1
41	5Cr–½Mo	Forgings	SA–336	F5	K41545	...	...	5B	1
42	5Cr–½Mo	Forgings	SA–182	F5	K41545	...	...	5B	1
43	5Cr–½Mo	Plate	SA–387	5	K41545	2	...	5B	1
44	5Cr–½Mo	Forgings	SA–336	F5A	K42544	...	...	5B	1
45	5Cr–½Mo	Castings	SA–217	C5	J42045	NT	...	5B	1

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	485	275	649	CS-2	T6, W5
2	515	310	649	CS-3	T6, W5
3	515	310	649	CS-3	T6, W5
4	515	310	649	CS-3	T6, W5
5	517	310	649	CS-3	T6, W5
6	520	310	649	CS-3	T6, W5
7	585	380	538	CS-3	T6, W5
8	585	380	454	CS-2	G12, T6
9	585	380	454	CS-2	G12, T6
10	585	380	454	CS-2	G12, T6
11	585	415	482	CS-2	G12, T5
12	585	415	482	CS-2	G12, T5
13	585	415	482	CS-2	G12, T5
14	585	415	482	CS-2	G12, T5
15	585	415	482	CS-2	G12, T5
16	415	205	649	CS-2	T6
17	415	205	649	CS-2	T6
18	415	205	649	CS-2	T6
19	415	210	649	CS-2	T6
20	415	210	649	CS-2	T6
21	515	310	649	CS-3	T6
22	515	310	649	CS-3	T6
23	515	310	649	CS-3	T6
24	585	415	482	CS-3	G12, T5
25	585	415	482	CS-3	G12, T5
26	585	415	482	CS-3	G12, T5
27	585	415	482	CS-3	G12, T5
28	585	415	482	CS-3	G12, T5
29	585	415	482	CS-3	G12, T5
30	585	415	482	CS-3	G12, T5
31	585	415	482	CS-3	G12, T5
32	585	415	482	CS-3	G12, T5
33	585	415	482	CS-3	G12, T5
34	585	415	482	CS-3	G12, T5
35	585	415	482	CS-3	G12, T5
36	415	205	649	CS-2	T6
37	415	205	649	CS-2	T6
38	415	205	649	CS-2	T6
39	415	210	649	CS-2	T6
40	415	210	649	CS-2	T6
41	415	250	649	CS-2	T6
42	485	275	649	CS-2	T6
43	515	310	649	CS-3	T6
44	550	345	649	CS-3	T6
45	620	415	649	CS-3	T6

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	184	174	169	167	165	163	161	160	159	157	156	154	153	151	149	147	144	*119*
2	207	196	188	184	181	178	176	174	172	170	169	167	165	163	161	158	154	*128*
3	207	196	188	184	181	178	176	174	172	170	169	167	165	163	161	158	154	*128*
4	207	196	188	184	181	178	176	174	172	170	169	167	165	163	161	158	154	*128*
5	207	196	188	184	181	178	176	174	172	170	169	167	165	163	161	158	154	*128*
6	207	196	188	184	181	178	175	173	172	170	169	167	166	163	161	158	154	*116*
7	244	240	232	229	226	224	222	220	218	217	215	213	210	208	205	202	162	*119*
8	244	240	232	229	226	224	222	220	218	217	215	213	210	208	205	202	162	*119*
9	244	240	232	229	226	224	222	220	218	217	215	213	210	208	205	202	162	*119*
10	244	240	232	229	226	224	222	220	218	217	215	213	210	208	205	202	162	*119*
11	244	244	244	244	244	244	244	244	244	244	244	244	244	240	235	231	*205*	*173*
12	244	244	244	244	244	244	244	244	244	244	244	244	244	240	235	231	*205*	*173*
13	244	244	244	244	244	244	244	244	244	244	244	244	244	240	235	231	*205*	*173*
14	244	244	244	244	244	244	244	244	244	244	244	244	244	240	235	231	*205*	*173*
15	244	244	244	244	244	244	244	244	244	244	244	244	244	240	235	231	*205*	*173*
16	138	132	128	126	125	124	124	124	124	124	124	124	124	124	123	122	121	*89.2*
17	138	132	128	126	125	124	124	124	124	124	124	124	124	124	123	122	121	*89.2*
18	138	132	128	126	125	124	124	124	124	124	124	124	124	124	123	122	121	*89.2*
19	138	132	128	126	125	124	124	124	124	124	124	124	124	124	123	122	121	*89.2*
20	138	132	128	126	125	124	124	124	124	124	124	124	124	124	123	122	121	*89.2*
21	207	196	188	184	181	178	176	174	172	170	169	167	165	163	161	158	154	*98.2*
22	207	196	188	184	181	178	176	174	172	170	169	167	165	163	161	158	154	*98.2*
23	207	196	188	184	181	178	176	174	172	170	169	167	165	163	161	158	154	*98.2*
24	244	244	244	244	244	244	244	244	244	244	244	243	239	234	229	223	*183*	*153*
25	244	244	244	244	244	244	244	244	244	244	244	243	239	234	229	223	*183*	*153*
26	244	244	244	244	244	244	244	244	244	244	244	243	239	234	229	223	*183*	*153*
27	244	244	244	244	244	244	244	244	244	244	244	243	239	234	229	223	*183*	*153*
28	244	244	244	244	244	244	244	244	244	244	244	243	239	234	229	223	*183*	*153*
29	244	244	244	244	244	244	244	244	244	244	244	243	239	234	229	223	*183*	*153*
30	244	244	244	244	244	244	244	244	244	244	244	243	239	234	229	223	*183*	*153*
31	244	244	244	244	244	244	244	244	244	244	244	243	239	234	229	223	*183*	*153*
32	244	244	244	244	244	244	244	244	244	244	244	243	239	234	229	223	*183*	*153*
33	244	244	244	244	244	244	244	244	244	244	244	243	239	234	229	223	*183*	*153*
34	244	244	244	244	244	244	244	244	244	244	244	243	239	234	229	223	*183*	*153*
35	244	244	244	244	244	244	244	244	244	244	244	243	239	234	229	223	*183*	*153*
36	138	129	124	122	120	119	119	118	118	117	117	116	114	112	110	106	103	*80.6*
37	138	129	124	122	120	119	119	118	118	117	117	116	114	112	110	106	103	*80.6*
38	138	129	124	122	120	119	119	118	118	117	117	116	114	112	110	106	103	*80.6*
39	138	129	124	122	120	119	119	118	118	117	117	116	114	112	110	106	103	*80.6*
40	138	129	124	122	120	119	119	118	118	117	117	116	114	112	110	106	103	*80.6*
41	165	155	149	146	144	143	142	142	141	141	140	139	137	134	131	128	123	*80.6*
42	184	172	165	162	160	159	158	157	157	156	155	154	152	149	146	142	137	*80.6*
43	207	193	186	182	180	179	178	177	177	176	175	173	171	168	164	160	154	*80.6*
44	230	215	206	203	200	199	198	197	196	195	194	193	190	187	183	177	171	*80.6*
45	259	258	248	243	240	238	237	236	235	235	233	231	228	224	219	213	205	*80.6*

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	
1	*88.4*	*64.0*	*44.6*	*30.0*	*19.7*	*12.8*	*8.11*	...	...	...	...	...	...	...	
2	*88.4*	*64.0*	*44.6*	*30.0*	*19.7*	*12.8*	*8.11*	...	...	...	...	...	...	...	
3	*88.4*	*64.0*	*44.6*	*30.0*	*19.7*	*12.8*	*8.11*	...	...	...	...	...	...	...	
4	*88.4*	*64.0*	*44.6*	*30.0*	*19.7*	*12.8*	*8.11*	...	...	...	...	...	...	...	
5	*88.4*	*64.0*	*44.6*	*30.0*	*19.7*	*12.8*	*8.11*	...	...	...	...	...	...	...	
6	*89.4*	*64.3*	*44.9*	*30.1*	*19.7*	*12.9*	*8.06*	...	...	...	...	...	...	...	
7	*88.4*	*64.0*	*44.6*	...	...	...	...	...	...	...	...	...	...	...	(**23**)
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
11	*143*	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	*143*	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	*143*	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	*143*	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	*143*	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	*68.8*	*54.2*	*43.4*	*34.0*	*25.1*	*17.1*	*10.1*	...	...	...	...	...	...	...	
17	*68.8*	*54.2*	*43.4*	*34.0*	*25.1*	*17.1*	*10.1*	...	...	...	...	...	...	...	
18	*68.8*	*54.2*	*43.4*	*34.0*	*25.1*	*17.1*	*10.1*	...	...	...	...	...	...	...	
19	*68.8*	*54.2*	*43.4*	*34.0*	*25.1*	*17.1*	*10.1*	...	...	...	...	...	...	...	
20	*68.8*	*54.2*	*43.4*	*34.0*	*25.1*	*17.1*	*10.1*	...	...	...	...	...	...	...	
21	*73.5*	*54.7*	*40.6*	*29.2*	*20.6*	*15.2*	*8.75*	...	...	...	...	...	...	...	
22	*73.5*	*54.7*	*40.6*	*29.2*	*20.6*	*15.2*	*8.75*	...	...	...	...	...	...	...	
23	*73.5*	*54.7*	*40.6*	*29.2*	*20.6*	*15.2*	*8.75*	...	...	...	...	...	...	...	
24	*125*	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	*125*	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	*125*	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	*125*	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	*125*	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	*125*	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	*125*	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	*125*	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	*125*	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	*125*	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	*125*	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	*125*	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	*61.7*	*46.4*	*34.7*	*25.5*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
37	*61.7*	*46.4*	*34.7*	*25.5*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
38	*61.7*	*46.4*	*34.7*	*25.5*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
39	*61.7*	*46.4*	*34.7*	*25.5*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
40	*61.7*	*46.4*	*34.7*	*25.5*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
41	*61.7*	*46.4*	*34.7*	*25.5*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
42	*61.7*	*46.4*	*34.7*	*25.5*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
43	*61.7*	*46.4*	*34.7*	*25.5*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
44	*61.7*	*46.4*	*34.7*	*25.5*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
45	*61.7*	*46.4*	*34.7*	*25.5*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
	1	5Cr–½Mo	Forgings	SA–182	F5a	K42544	...	...	5B	1
	2	5Cr–½Mo–Si	Smls. tube	SA–213	T5b	K51545	...	...	5B	1
	3	5Cr–½Mo–Si	Smls. pipe	SA–335	P5b	K51545	...	...	5B	1
	4	5Cr–½Mo–Ti	Smls. tube	SA–213	T5c	K41245	...	...	5B	1
	5	5Cr–½Mo–Ti	Smls. pipe	SA–335	P5c	K41245	...	...	5B	1
	6	9Cr–1Mo	Smls. tube	SA–213	T9	K90941	...	...	5B	1
	7	9Cr–1Mo	Fittings	SA–234	WP9	K90941	...	...	5B	1
	8	9Cr–1Mo	Smls. pipe	SA–335	P9	K90941	...	...	5B	1
	9	9Cr–1Mo	Forged pipe	SA–369	FP9	K90941	...	...	5B	1
(**23**)	10	9Cr–1Mo	Forgings	SA–182	F9	K90941	...	...	5B	1
	11	9Cr–1Mo	Forgings	SA–336	F9	K90941	...	...	5B	1
	12	9Cr–1Mo	Castings	SA–217	C12	J82090	NT	...	5B	1
	13	9Cr–1Mo–V	Smls. tube	SA–213	T91 Type 1	K90901	...	...	15E	1
	14	9Cr–1Mo–V	Smls. pipe	SA–335	P91 Type 1	K90901	...	...	15E	1
	15	9Cr–1Mo–V	Plate	SA–387	91 Type 1	K90901	2	...	15E	1
	16	9Cr–1Mo–V	Forgings	SA–182	F91 Type 1	K90901	...	...	15E	1
	17	9Cr–1Mo–V	Forgings	SA–336	F91 Type 1	K90901	...	...	15E	1
	18	12Cr–Al	Plate	SA–240	405	S40500	...	...	7	1
	19	12Cr–Al	Smls. tube	SA–268	TP405	S40500	...	...	7	1
	20	13Cr	Plate	SA–240	410S	S41008	...	...	7	1
	21	13Cr	Smls. tube	SA–268	TP410	S41000	...	...	6	1
	22	13Cr	Plate	SA–240	410	S41000	...	...	6	1
	23	13Cr	Forgings	SA–182	F6a	S41000	1	...	6	3
	24	13Cr	Forgings	SA–182	F6a	S41000	2	...	6	3
	25	13Cr	Forgings	SA–336	F6	S41000	...	...	6	3
	26	13Cr	Castings	SA–217	CA15	J91150	...	...	6	3
	27	15Cr	Smls. tube	SA–268	TP429	S42900	...	...	6	2
	28	15Cr	Plate	SA–240	429	S42900	...	...	6	2
	29	17Cr	Smls. tube	SA–268	TP430	S43000	...	...	7	2
	30	17Cr	Plate	SA–240	430	S43000	...	...	7	2
	31	17Cr–4Ni–4Cu	Bar	SA–564	630	S17400	H1100	...	...	...
	32	17Cr–4Ni–4Cu	Plate	SA–693	630	S17400	H1100	...	...	...
	33	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H1100	...	...	...
(**23**)	34	26Cr–3Ni–3Mo	Plate	SA–240	26–3–3	S44660	...	$t \le 5$	10K	1
(**23**)	35	26Cr–3Ni–3Mo	Smls. tube	SA–268	26–3–3	S44660	...	$t \le 5$	10K	1
(**23**)	36	26Cr–3Ni–3Mo	Wld. tube	SA–268	26–3–3	S44660	...	$t \le 5$	10K	1
(**23**)	37	26Cr–3Ni–3Mo	Wld. tube	SA–803	26–3–3	S44660	...	$t \le 5$	10K	1
	38	29Cr–4Mo–Ti	Smls. tube	SA–268	...	S44735	...	...	10J	1
(**23**)	39	Mn–¼Mo	Forgings	SA–372	D	K14508	QT	...	11A	4
(**23**)	40	Mn–¼Mo	Forgings	SA–372	D	K14508	...	...	11A	4
	41	Mn–½Mo	Plate	SA–302	A	K12021	...	...	3	2
	42	Mn–½Mo	Plate	SA–302	B	K12022	...	...	3	3
	43	Mn–½Mo	Plate	SA–533	A	K12521	1	...	3	3
	44	Mn–½Mo	Plate	SA–533	A	K12521	2	...	3	3
	45	Mn–½Mo–¼Ni	Plate	SA–533	D	K12529	2	...	3	3

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	620	450	649	CS–5	T6
2	415	205	649	CS–2	T6
3	415	205	649	CS–2	T6
4	415	205	649	CS–2	T6
5	415	205	649	CS–2	T6
6	415	205	649	CS–2	T7
7	415	205	649	CS–2	T7
8	415	205	649	CS–2	T7
9	415	210	649	CS–2	T7
10	585	380	649	CS–3	T7
11	585	380	649	CS–3	T7
12	620	415	649	CS–3	T7
13	585	415	649	CS–3	T8
14	585	415	649	CS–3	T8
15	585	415	649	CS–3	T8
16	620	415	649	CS–3	T8
17	620	415	649	CS–3	T8
18	415	170	538	CS–1	G8, T7
19	415	205	538	CS–2	G8, T7
20	415	205	649	CS–2	T6
21	415	205	649	CS–2	T6
22	450	205	649	CS–2	T6
23	485	275	649	CS–3	T5
24	585	380	649	CS–3	T5
25	585	380	649	CS–3	T5
26	620	450	649	CS–5	T5
27	415	240	649	CS–2	G8, T6
28	450	205	649	CS–2	G8, T6
29	415	240	649	CS–2	G8, T6
30	450	205	649	CS–2	G8, T6
31	965	795	316	HT–1	G8, W1
32	965	795	316	HT–1	G8, W1
33	965	795	316	HT–1	G8, W1
34	585	450	371	HA–5	G8, H3
35	585	450	371	HA–5	G8, H3
36	585	450	371	HA–5	G6, G8, H3
37	585	450	316	HA–5	G6, G8, H3
38	515	415	427	HA–6	G8
39	725	450	343	CS–5	G9, T1, W2, W6
40	725	450	343	CS–5	G9, H2, W2, W6
41	515	319	538	CS–3	G14, T6
42	550	345	538	CS–3	G14, T6
43	550	345	538	CS–5	T6
44	620	485	427	CS–5	...
45	620	485	427	CS–5	...

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	259	259	259	259	259	258	257	256	255	254	253	250	247	243	237	230	222	*80.6*
2	138	129	124	122	120	119	119	118	118	117	117	116	114	112	110	106	103	*80.6*
3	138	129	124	122	120	119	119	118	118	117	117	116	114	112	110	106	103	*80.6*
4	138	129	124	122	120	119	119	118	118	117	117	116	114	112	110	106	103	*80.6*
5	138	129	124	122	120	119	119	118	118	117	117	116	114	112	110	106	103	*80.6*
6	138	129	124	122	120	119	119	118	118	117	117	116	114	112	110	106	103	98.3
7	138	129	124	122	120	119	119	118	118	117	117	116	114	112	110	106	103	98.3
8	138	129	124	122	120	119	119	118	118	117	117	116	114	112	110	106	103	98.3
9	138	129	124	122	120	119	119	118	118	117	117	116	114	112	110	106	103	98.3
10	244	236	227	223	220	218	217	217	216	215	214	212	209	205	201	195	188	180
11	244	236	227	223	220	218	217	217	216	215	214	212	209	205	201	195	188	180
12	259	258	248	243	240	238	237	236	235	235	233	231	228	224	219	213	205	197
13	244	244	244	244	244	244	244	244	244	244	244	244	244	244	239	232	224	215
14	244	244	244	244	244	244	244	244	244	244	244	244	244	244	239	232	224	215
15	244	244	244	244	244	244	244	244	244	244	244	244	244	244	239	232	224	215
16	259	...	256	...	252	...	251	...	251	...	251	250	247	242	238	232	225	215
17	259	...	256	...	252	...	251	...	251	...	251	250	247	242	238	232	225	215
18	115	109	105	103	102	101	100	99.7	99.1	98.4	97.5	96.2	94.7	92.6	90.1	87.0	83.4	79.2
19	138	130	126	124	122	121	120	120	119	118	117	115	114	111	108	104	100	95.0
20	138	130	126	124	122	121	120	120	119	118	117	115	114	111	108	104	100	*92.5*
21	138	130	126	124	122	121	120	120	119	118	117	115	114	111	108	104	100	*92.5*
22	138	130	126	124	122	121	120	120	119	118	117	115	114	111	108	104	100	*92.5*
23	244	244	244	244	244	244	244	244	244	244	244	244	244	244	244	244	*125*	*92.5*
24	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	*125*	*92.5*
25	244	244	244	244	244	244	244	244	244	244	244	244	244	244	244	244	*125*	*92.5*
26	259	259	259	259	259	259	259	259	259	259	259	259	259	259	259	259	*125*	*92.5*
27	161	152	147	145	143	141	140	140	139	138	136	135	133	130	126	122	117	*88.7*
28	138	130	126	124	122	121	120	120	119	118	117	115	114	111	108	104	100	*88.7*
29	161	152	147	145	143	141	140	140	139	138	136	135	133	130	126	122	117	*88.7*
30	138	130	126	124	122	121	120	120	119	118	117	115	114	111	108	104	100	*88.7*
31	402	402	402	402	402	402	402	402	402	402	402	402	...	...	...	...	...	...
32	402	402	402	402	402	402	402	402	402	402	402	402	...	...	...	...	...	...
33	402	402	402	402	402	402	402	402	402	402	402	402	...	...	...	...	...	...
34	244	244	244	244	244	244	241	237	234	231	229	228	227	226	...	...	...	...
35	244	244	244	244	244	244	241	237	234	231	229	228	227	226	...	...	...	...
36	208	208	208	208	208	208	205	201	199	197	195	194	193	192	...	...	...	...
37	208	208	208	208	208	208	205	201	199	197	195	194	...	...	...	...	...	...
38	215	215	215	214	204	194	186	179	174	169	166	164	163	162	161	157	150	...
39	299	289	283	278	271	264	256	248	242	236	232	230	*160*	...	...	...	...	...
40	299	287	280	275	272	268	265	262	259	256	253	250	247	...	...	...	...	...
41	207	199	194	191	188	186	183	181	179	177	175	173	171	168	165	160	154	*104*
42	230	221	215	212	209	206	204	201	199	197	195	192	190	187	183	178	172	*104*
43	230	221	215	212	209	206	204	201	199	197	195	192	190	187	183	178	172	*104*
44	259	259	259	259	259	259	259	259	259	259	259	259	259	259	256	249	240	...
45	259	259	259	259	259	259	259	259	259	259	259	259	259	259	256	249	240	...

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	
1	*61.7*	*46.4*	*34.7*	*25.5*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
2	*61.7*	*46.4*	*34.7*	*25.5*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
3	*61.7*	*46.4*	*34.7*	*25.5*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
4	*61.7*	*46.4*	*34.7*	*25.5*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
5	*61.7*	*46.4*	*34.7*	*25.5*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
6	*83.2*	*60.2*	*42.9*	*29.9*	*20.6*	*14.4*	*10.2*	...	...	...	...	...	...	...	
7	*83.2*	*60.2*	*42.9*	*29.9*	*20.6*	*14.4*	*10.2*	...	...	...	...	...	...	...	
8	*83.2*	*60.2*	*42.9*	*29.9*	*20.6*	*14.4*	*10.2*	...	...	...	...	...	...	...	
9	*83.2*	*60.2*	*42.9*	*29.9*	*20.6*	*14.4*	*10.2*	...	...	...	...	...	...	...	
10	*87.5*	*61.2*	*42.9*	*29.9*	*20.6*	*14.4*	*10.2*	...	...	...	...	...	...	...	(**23**)
11	*87.5*	*61.2*	*42.9*	*29.9*	*20.6*	*14.4*	*10.2*	...	...	...	...	...	...	...	
12	*87.5*	*61.2*	*42.9*	*29.9*	*20.6*	*14.4*	*10.2*	...	...	...	...	...	...	...	
13	204	*151*	*98.5*	*75.5*	*54.3*	*36.8*	*24.0*	...	...	...	...	...	...	...	
14	204	*151*	*98.5*	*75.5*	*54.3*	*36.8*	*24.0*	...	...	...	...	...	...	...	
15	204	*151*	*98.5*	*75.5*	*54.3*	*36.8*	*24.0*	...	...	...	...	...	...	...	
16	204	*151*	*98.5*	*75.5*	*54.3*	*36.8*	*24.0*	...	...	...	...	...	...	...	
17	204	*151*	*98.5*	*75.5*	*54.3*	*36.8*	*24.0*	...	...	...	...	...	...	...	
18	*70.1*	*38.8*	*19.9*	...	...	...	...	...	...	...	...	...	...	...	
19	*70.1*	*38.8*	*19.9*	...	...	...	...	...	...	...	...	...	...	...	
20	*68.4*	*51.1*	*37.4*	*26.3*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
21	*68.4*	*51.1*	*37.4*	*26.3*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
22	*68.4*	*51.1*	*37.4*	*26.3*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
23	*68.4*	*51.1*	*37.4*	*26.3*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
24	*68.4*	*51.1*	*37.4*	*26.3*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
25	*68.4*	*51.1*	*37.4*	*26.3*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
26	*68.4*	*51.1*	*37.4*	*26.3*	*17.8*	*11.4*	*6.73*	...	...	...	...	...	...	...	
27	*69.8*	*52.6*	*38.1*	*27.6*	*20.6*	*15.9*	*12.3*	...	...	...	...	...	...	...	
28	*69.8*	*52.6*	*38.1*	*27.6*	*20.6*	*15.9*	*12.3*	...	...	...	...	...	...	...	
29	*69.8*	*52.6*	*38.1*	*27.6*	*20.6*	*15.9*	*12.3*	...	...	...	...	...	...	...	
30	*69.8*	*52.6*	*38.1*	*27.6*	*20.6*	*15.9*	*12.3*	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
41	*68.0*	*42.3*	*26.1*	...	...	...	...	...	...	...	...	...	...	...	
42	*68.0*	*42.3*	*26.1*	...	...	...	...	...	...	...	...	...	...	...	
43	*68.0*	*42.3*	*26.1*	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
(**23**)	1	Mn–½Mo–¼Ni	Plate	SA–533	D	K12529	3	...	11A	4
	2	Mn–½Mo–½Ni	Plate	SA–302	C	K12039	...	...	3	3
	3	Mn–½Mo–½Ni	Plate	SA–533	B	K12539	1	...	3	3
	4	Mn–½Mo–½Ni	Plate	SA–533	B	K12539	2	...	3	3
	5	Mn–½Mo–½Ni	Plate	SA–533	B	K12539	3	...	11A	4
	6	Mn–½Mo–¾Ni	Plate	SA–302	D	K12054	...	...	3	3
	7	Mn–½Mo–¾Ni	Plate	SA–533	C	K12554	1	...	3	3
	8	Mn–½Mo–¾Ni	Plate	SA–533	E	K12554	1	...	3	3
	9	Mn–½Mo–¾Ni	Plate	SA–533	C	K12554	2	...	3	3
	10	Mn–½Mo–¾Ni	Plate	SA–533	E	K12554	2	...	3	3
	11	Mn–½Mo–¾Ni	Plate	SA–533	B	K12554	3	...	3	3
(**23**)	12	Mn–½Ni–V	Plate	SA–225	C	K12524	...	...	10A	1
(**23**)	13	Mn–V	Castings	SA–487	1	J13002	A/NT	...	10A	1
(**23**)	14	½Ni–½Cr–¼Mo–V	Castings	SA–487	4	J13047	A/NT	...	3	3
	15	½Ni–½Mo–V	Forgings	SA–541	3	K12045	1	...	3	3
(**23**)	16	½Ni–½Mo–V	Forgings	SA–541	3	K12045	2	...	3	3
(**23**)	17	¾Ni–½Cr–½Mo–V	Forgings	SA–592	F	K11576	...	65 < t ≤ 100	11B	3
(**23**)	18	¾Ni–½Cr–½Mo–V	Plate	SA–517	F	K11576	...	t ≤ 65	11B	3
(**23**)	19	¾Ni–½Cr–½Mo–V	Forgings	SA–592	F	K11576	...	t ≤ 65	11B	3
(**23**)	20	¾Ni–½Cu–Mo	Smls. tube	SA–423	2	K11540	...	...	4	2
	21	¾Ni–½Mo–⅓Cr–V	Forgings	SA–508	2	K12766	1	...	3	3
	22	¾Ni–½Mo–⅓Cr–V	Forgings	SA–541	2	K12765	1	...	3	3
(**23**)	23	¾Ni–½Mo–⅓Cr–V	Forgings	SA–508	2	K12766	2	...	3	3
(**23**)	24	¾Ni–½Mo–⅓Cr–V	Forgings	SA–541	2	K12765	2	...	3	3
	25	¾Ni–½Mo–Cr–V	Forgings	SA–508	3	K12042	1	...	3	3
(**23**)	26	¾Ni–½Mo–Cr–V	Forgings	SA–508	3	K12042	2	...	3	3
(**23**)	27	¾Ni–1Mo–¾Cr	Castings	SA–217	WC5	J22000	...	...	4	1
	28	1Ni–½Cr–½Mo	Castings	SA–217	WC4	J12082	...	...	4	1
	29	1¼Ni–1Cr–½Mo	Plate	SA–517	P	K21650	...	65 < t ≤ 100	11B	8
	30	1¼Ni–1Cr–½Mo	Plate	SA–517	P	K21650	...	t ≤ 65	11B	8
(**23**)	31	2Ni–1Cu	Forgings	SA–182	FR	K22035	...	...	9A	1
(**23**)	32	2Ni–1Cu	Smls. pipe	SA–333	9	K22035	...	...	9A	1
(**23**)	33	2Ni–1Cu	Smls. pipe	SA–334	9	K22035	...	...	9A	1
(**23**)	34	2Ni–1Cu	Forgings	SA–350	LF9	K22036	...	...	9A	1
(**23**)	35	2Ni–1Cu	Fittings	SA–420	WPL9	K22035	...	...	9A	1
	36	2Ni–1½Cr–¼Mo–V	Forgings	SA–723	1	K23550	1	...	11B	10
	37	2Ni–1½Cr–¼Mo–V	Forgings	SA–723	1	K23550	2	...	11B	10
	38	2½Ni	Plate	SA–203	A	K21703	...	...	9A	1
	39	2½Ni	Plate	SA–203	B	K22103	...	...	9A	1
	40	2½Ni	Castings	SA–352	LC2	J22500	...	...	9A	1
	41	2¾Ni–1½Cr–½Mo	Plate	SA–543	C	K34035	3	...	3	3
	42	2¾Ni–1½Cr–½Mo	Plate	SA–543	C	K34035	1	...	11A	5
	43	2¾Ni–1½Cr–½Mo	Plate	SA–543	C	K34035	2	...	11B	10
	44	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	1	...	11B	10
	45	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	2	...	11B	10

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	690	570	399	CS–5	...
2	550	345	538	CS–3	G14, T6
3	550	345	427	CS–5	...
4	620	485	427	CS–5	...
5	690	570	427	CS–5	...
6	550	345	538	CS–3	G14, T6
7	550	345	427	CS–5	...
8	550	345	427	CS–5	...
9	620	485	427	CS–5	...
10	620	485	427	CS–5	...
11	690	570	427	CS–5	...
12	725	485	371	CS–5	T1
13	585	380	343	CS–3	T1
14	620	415	343	CS–3	...
15	550	340	427	CS–5	...
16	620	450	371	CS–5	...
17	725	620	343	CS–5	S1
18	795	690	343	HT–1	...
19	795	690	343	HT–1	...
20	415	255	343	CS–2	...
21	550	345	427	CS–5	...
22	550	340	427	CS–5	...
23	620	450	371	CS–5	...
24	620	450	371	CS–5	...
25	550	345	427	CS–5	...
26	620	450	371	CS–5	...
27	485	275	593	CS–2	T6
28	485	275	538	CS–2	T7
29	725	620	343	CS–5	...
30	795	690	343	HT–1	...
31	435	315	40	CS–3	...
32	435	315	40	CS–3	...
33	435	315	40	CS–3	...
34	435	315	40	CS–3	...
35	435	315	40	CS–3	...
36	795	690	343	HT–1	G10, G11, W1
37	930	825	343	HT–1	G11, W1
38	450	255	538	CS–2	T2
39	485	275	538	CS–2	T2
40	485	275	343	CS–2	...
41	620	485	343	CS–5	...
42	725	585	343	CS–5	...
43	795	690	343	HT–1	...
44	795	690	343	HT–1	G10, G11, W1
45	930	825	343	HT–1	G11, W1

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	287	287	287	287	287	287	287	287	287	287	287	287	287	287	287	...	...	...
2	230	221	215	212	209	206	204	201	199	197	195	192	190	187	183	178	172	*104*
3	230	221	215	212	209	206	204	201	199	197	195	192	190	187	183	178	172	...
4	259	259	259	259	259	259	259	259	259	259	259	259	259	259	256	249	240	...
5	287	287	287	287	287	287	287	287	287	287	287	287	287	287	287	287	285	...
6	230	221	215	212	209	206	204	201	199	197	195	192	190	187	183	178	172	*104*
7	230	221	215	212	209	206	204	201	199	197	195	192	190	187	183	178	172	...
8	230	221	215	212	209	206	204	201	199	197	195	192	190	187	183	178	172	...
9	259	259	259	259	259	259	259	259	259	259	259	259	259	259	256	249	240	...
10	259	259	259	259	259	259	259	259	259	259	259	259	259	259	256	249	240	...
11	287	287	287	287	287	287	287	287	287	287	287	287	287	287	287	287	285	...
12	302	298	292	290	287	282	276	269	261	252	245	238	*160*	*131*	...	...	...	...
13	244	243	237	233	230	227	224	222	219	217	214	212	*160*	...	...	...	...	...
14	259	259	259	254	250	247	245	243	240	236	229	220	211	...	...	...	...	...
15	230	225	217	212	208	206	204	203	200	196	191	183	176	171	171	171	171	...
16	259	259	259	259	259	259	259	259	259	255	248	238	229	222	...	...	...	...
17	302	302	302	302	302	302	302	302	302	302	302	302	302	...	...	...	...	...
18	330	330	330	330	330	330	330	330	330	330	330	330	330	...	...	...	...	...
19	330	330	330	330	330	330	330	330	330	330	330	330	330	...	...	...	...	...
20	170	161	156	154	152	150	149	147	146	145	143	141	140	...	...	...	...	...
21	230	221	215	212	209	206	204	201	199	197	195	192	190	187	183	178	172	...
22	230	221	215	212	209	206	204	201	199	197	195	192	190	187	183	178	172	...
23	259	259	259	259	259	259	259	259	259	256	253	250	247	243	...	...	...	...
24	259	259	259	259	259	259	259	259	259	256	253	250	247	243	...	...	...	...
25	230	221	215	212	209	206	204	201	199	197	195	192	190	187	183	178	172	...
26	259	259	259	259	259	259	259	259	259	256	253	250	247	243	...	...	...	...
27	184	177	172	169	167	165	163	161	159	158	156	154	152	149	146	142	137	*124*
28	184	177	172	169	167	165	163	161	159	158	156	154	152	149	146	142	137	131
29	302	302	302	302	302	302	302	302	302	302	302	302	302	...	...	...	...	...
30	330	330	330	330	330	330	330	330	330	330	330	330	330	...	...	...	...	...
31	181	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	181	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	181	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	181	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	181	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	330	330	330	330	330	330	330	330	330	330	330	330	330	...	...	...	...	...
37	388	388	388	388	388	388	388	388	388	388	388	388	388	...	...	...	...	...
38	170	160	155	152	150	148	146	143	140	136	131	126	120	*113*	*95.1*	*79.5*	*64.4*	*48.8*
39	184	173	168	165	162	160	158	155	151	147	142	136	130	*113*	*95.1*	*79.5*	*64.4*	*48.8*
40	184	173	168	165	162	160	158	155	151	147	142	136	130	...	...	...	...	...
41	259	259	259	259	259	259	259	259	259	259	259	259	259	...	...	...	...	...
42	302	302	302	302	302	302	302	302	302	302	302	302	302	...	...	...	...	...
43	330	330	330	330	330	330	330	330	330	330	330	330	330	...	...	...	...	...
44	330	330	330	330	330	330	330	330	330	330	330	330	330	...	...	...	...	...
45	388	388	388	388	388	388	388	388	388	388	388	388	388	...	...	...	...	...

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
2	*68.0*	*42.3*	*26.1*	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	*68.0*	*42.3*	*26.1*	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
27	*87.4*	*59.0*	*39.8*	*26.8*	*17.1*	...	...	...	...	...	...	...	...	...	(**23**)
28	*75.6*	*49.9*	*33.5*	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	*35.4*	*22.6*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
39	*35.4*	*22.6*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	3Ni–1¾Cr–½Mo	Plate	SA–543	B	K42339	3	...	3	3
2	3Ni–1¾Cr–½Mo	Plate	SA–543	B	K42339	1	...	11A	5
3	3Ni–1¾Cr–½Mo	Plate	SA–543	B	K42339	2	...	11B	10
4	3½Ni	Smls. pipe	SA–333	3	K31918	...	...	9B	1
5	3½Ni	Smls. tube	SA–334	3	K31918	...	...	9B	1
6	3½Ni	Fittings	SA–420	WPL3	...	...	...	9B	1
7	3½Ni	Plate	SA–203	D	K31718	...	...	9B	1
8	3½Ni	Forgings	SA–350	LF3	K32025	...	...	9B	1
9	3½Ni	Forgings	SA–765	III	K32026	...	...	9B	1
10	3½Ni	Plate	SA–203	E	K32018	...	...	9B	1
11	3½Ni	Castings	SA–352	LC3	J31550	...	...	9B	1
12	3½Ni	Plate	SA–203	F	...	...	$t > 50$	9B	1
13	3½Ni	Plate	SA–203	F	...	...	$t \le 50$	9B	1
14	3½Ni–1¾Cr–½Mo–V	Forgings	SA–508	4N	K22375	3	...	3	3
15	3½Ni–1¾Cr–½Mo–V	Forgings	SA–508	4N	K22375	1	...	11A	5
16	3½Ni–1¾Cr–½Mo–V	Forgings	SA–508	4N	K22375	2	...	11B	10
17	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	1	...	11B	10
18	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	2	...	11B	10
19	5Ni–¼Mo	Plate	SA–645	A	K41583	...	...	11A	2
(**23**) 20	7Ni	Plate	SA–553	III	K61365	...	$t \le 50$	11A	1
(**23**) 21	7Ni	Plate	SA–553	III	K61365	...	$t \le 50$	11A	1
22	8Ni	Plate	SA–553	II	K71340	...	...	11A	1
23	8Ni	Plate	SA–553	II	K71340	...	...	11A	1
24	9Ni	Smls. pipe	SA–333	8	K81340	...	...	11A	1
25	9Ni	Smls. pipe	SA–333	8	K81340	...	...	11A	1
26	9Ni	Smls. tube	SA–334	8	K81340	...	...	11A	1
27	9Ni	Smls. tube	SA–334	8	K81340	...	...	11A	1
28	9Ni	Plate	SA–353	...	K81340	...	...	11A	1
29	9Ni	Plate	SA–353	...	K81340	...	...	11A	1
30	9Ni	Fittings	SA–420	WPL8	K81340	...	...	11A	1
31	9Ni	Fittings	SA–420	WPL8	K81340	...	...	11A	1
32	9Ni	Forgings	SA–522	I	K81340	...	...	11A	1
33	9Ni	Forgings	SA–522	I	K81340	...	...	11A	1
34	9Ni	Plate	SA–553	I	K81340	...	...	11A	1
35	9Ni	Plate	SA–553	I	K81340	...	...	11A	1
36	16Cr–4Ni–6Mn	Plate	SA–240	201LN	S20153	...	...	8	3
37	16Cr–4Ni–6Mn	Plate	SA–240	201LN	S20153	...	...	8	3
38	16Cr–12Ni–2Mo	Forgings	SA–182	F316L	S31603	...	$t > 130$	8	1
39	16Cr–12Ni–2Mo	Forgings	SA–965	F316L	S31603	...	...	8	1
40	16Cr–12Ni–2Mo	Forgings	SA–182	F316L	S31603	...	$t \le 130$	8	1
41	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316L	S31603	...	...	8	1
42	16Cr–12Ni–2Mo	Plate	SA–240	316L	S31603	...	...	8	1
43	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316L	S31603	...	...	8	1
44	16Cr–12Ni–2Mo	Smls. pipe	SA–312	TP316L	S31603	...	...	8	1
45	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316L	S31603	...	...	8	1

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	620	485	343	CS–5	...
2	725	585	343	CS–5	W7
3	795	690	343	HT–1	...
4	450	240	343	CS–2	...
5	450	240	343	CS–2	...
6	450	240	343	CS–2	...
7	450	255	538	CS–2	T2
8	485	260	343	CS–2	...
9	485	260	343	CS–2	...
10	485	275	538	CS–2	T2
11	485	275	343	CS–2	...
12	515	345	343	CS–3	T1
13	550	380	343	CS–3	...
14	620	485	343	CS–5	...
15	725	585	343	CS–5	W7
16	795	690	343	HT–1	...
17	795	690	343	HT–1	G10, G11, W1
18	930	825	343	HT–1	G11, W1
19	655	450	121	CS–3	W4
20	690	515	66	CS–3	G17, W3
21	690	515	66	CS–3	G17, W4
22	690	585	121	CS–3	W3
23	690	585	121	CS–3	W4
24	690	515	121	CS–3	W3
25	690	515	121	CS–3	W4
26	690	515	121	CS–3	W3
27	690	515	121	CS–3	W4
28	690	515	121	CS–3	W3
29	690	515	121	CS–3	W4
30	690	515	121	CS–3	W3
31	690	515	121	CS–3	W4
32	690	515	121	CS–3	G9, S2, W3
33	690	515	121	CS–3	G9, S2, W4
34	690	585	121	CS–3	W3
35	690	585	121	CS–3	W4
36	655	310	427	HA–6	...
37	655	310	427	HA–6	G2
38	450	170	454	HA–4	G2
39	450	170	454	HA–4	G2
40	485	170	454	HA–4	G2
41	485	170	454	HA–4	G2
42	485	170	454	HA–4	G2
43	485	170	454	HA–4	G2, G6
44	485	170	454	HA–4	G2
45	485	170	454	HA–4	G2, G6

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	259	259	259	259	259	259	259	259	259	259	259	259	259	...	...	...	...	...
2	302	302	302	302	302	302	302	302	302	302	302	302	302	...	...	...	...	...
3	330	330	330	330	330	330	330	330	330	330	330	330	330	...	...	...	...	...
4	161	151	147	144	142	140	138	135	132	128	124	119	113	...	...	...	...	...
5	161	151	147	144	142	140	138	135	132	128	124	119	113	...	...	...	...	...
6	161	151	147	144	142	140	138	135	132	128	124	119	113	...	...	...	...	...
7	170	160	155	152	150	148	146	143	140	136	131	126	120	*113*	*95.1*	*79.5*	*64.4*	*48.8*
8	172	162	157	154	152	150	148	145	141	137	133	127	121	...	...	...	...	...
9	172	162	157	154	152	150	148	145	141	137	133	127	121	...	...	...	...	...
10	184	173	168	165	162	160	158	155	151	147	142	136	130	*122*	*101*	*83.8*	*66.8*	*49.2*
11	184	173	168	165	162	160	158	155	151	147	142	136	130	...	...	...	...	...
12	215	215	209	206	203	200	197	193	189	183	177	170	*148*	...	...	...	...	...
13	230	230	230	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	259	259	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	302	302	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	330	330	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	330	330	330	330	330	330	330	330	330	330	330	330	330	...	...	...	...	...
18	388	388	388	388	388	388	388	388	388	388	388	388	388	...	...	...	...	...
19	273	273	273	273	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	287	287	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	273	273	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	287	287	287	287	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	273	273	273	273	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	287	287	287	287	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	273	273	273	273	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	287	287	287	287	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	273	273	273	273	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	287	287	287	287	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	273	273	273	273	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	287	287	287	287	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	273	273	273	273	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	287	287	287	287	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	273	273	273	273	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	287	287	287	287	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	273	273	273	273	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	207	179	164	157	151	147	143	141	139	137	134	131	127	123	119	115	112	...
37	207	207	207	207	203	198	194	190	187	185	181	176	172	167	161	156	151	...
38	115	115	115	115	115	113	109	106	103	100	98.1	96.1	94.3	92.6	90.9	89.3	87.6	85.9
39	115	115	115	115	115	113	109	106	103	100	98.1	96.1	94.3	92.6	90.9	89.3	87.6	85.9
40	115	115	115	115	115	113	109	106	103	100	98.1	96.1	94.3	92.6	90.9	89.3	87.6	85.9
41	115	115	115	115	115	113	109	106	103	100	98.1	96.1	94.3	92.6	90.9	89.3	87.6	85.9
42	115	115	115	115	115	113	109	106	103	100	98.1	96.1	94.3	92.6	90.9	89.3	87.6	85.9
43	97.7	97.7	97.7	97.7	97.7	96.2	92.8	89.9	87.4	85.2	83.4	81.7	80.2	78.7	77.3	75.9	74.4	73.0
44	115	115	115	115	115	113	109	106	103	100	98.1	96.1	94.3	92.6	90.9	89.3	87.6	85.9
45	97.7	97.7	97.7	97.7	97.7	96.2	92.8	89.9	87.4	85.2	83.4	81.7	80.2	78.7	77.3	75.9	74.4	73.0

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	*35.4*	*22.6*	*14.2*	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	*35.4*	*22.6*	*13.3*	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	16Cr–12Ni–2Mo	Fittings	SA–403	316L	S31603	CR	...	8	1
2	16Cr–12Ni–2Mo	Wld. fittings	SA–403	316L	S31603	WP–W	...	8	1
3	16Cr–12Ni–2Mo	Wld. fittings	SA–403	316L	S31603	WP–WX	...	8	1
4	16Cr–12Ni–2Mo	Wld. pipe	SA–688	TP316L	S31603	...	...	8	1
5	16Cr–12Ni–2Mo	Forgings	SA–182	F316	S31600	...	t > 130	8	1
6	16Cr–12Ni–2Mo	Forgings	SA–965	F316	S31600	...	...	8	1
7	16Cr–12Ni–2Mo	Forgings	SA–182	F316H	S31609	...	t > 130	8	1
8	16Cr–12Ni–2Mo	Forgings	SA–965	F316H	S31609	...	...	8	1
9	16Cr–12Ni–2Mo	Forgings	SA–182	F316	S31600	...	t ≤ 130	8	1
10	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316	S31600	...	...	8	1
11	16Cr–12Ni–2Mo	Plate	SA–240	316	S31600	...	...	8	1
12	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316	S31600	...	...	8	1
13	16Cr–12Ni–2Mo	Smls. pipe	SA–312	TP316	S31600	...	...	8	1
14	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316	S31600	...	...	8	1
15	16Cr–12Ni–2Mo	Smls. pipe	SA–376	TP316	S31600	...	...	8	1
16	16Cr–12Ni–2Mo	Fittings	SA–403	316	S31600	WP–S	...	8	1
17	16Cr–12Ni–2Mo	Wld. tube	SA–688	TP316	S31600	...	...	8	1
(**23**) 18	16Cr–12Ni–2Mo	Forgings	SA–182	F316H	S31609	...	t > 130	8	1
19	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316H	S31609	...	...	8	1
20	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316H	S31609	...	...	8	1
21	16Cr–12Ni–2Mo	Smls. pipe	SA–312	TP316H	S31609	...	...	8	1
22	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316H	S31609	...	...	8	1
23	16Cr–12Ni–2Mo	Smls. pipe	SA–376	TP316H	S31609	...	...	8	1
24	16Cr–12Ni–2Mo	Plate	SA/EN 10028–7	X2CrNiMo17–12–2	...	...	≤75	8	1
25	16Cr–12Ni–2Mo	Plate	SA/EN 10028–7	X5CrNiMo17–12–2	...	...	≤75	8	1
26	16Cr–12Ni–2Mo–N	Smls. tube	SA–213	TP316N	S31651	...	t ≤ 125	8	1
27	16Cr–12Ni–2Mo–N	Plate	SA–240	316N	S31651	...	t ≤ 125	8	1
28	16Cr–12Ni–2Mo–N	Wld. tube	SA–249	TP316N	S31651	...	...	8	1
29	16Cr–12Ni–2Mo–N	Smls. pipe	SA–312	TP316N	S31651	...	t ≤ 125	8	1
30	16Cr–12Ni–2Mo–N	Wld. pipe	SA–312	TP316N	S31651	...	t ≤ 125	8	1
31	16Cr–12Ni–2Mo–N	Smls. pipe	SA–376	TP316N	S31651	...	...	8	1
32	16Cr–12Ni–2Mo–N	Fittings	SA–403	316N	S31651	CR	...	8	1
33	16Cr–12Ni–2Mo–N	Wld. fittings	SA–403	316N	S31651	WP–W	...	8	1
34	16Cr–12Ni–2Mo–N	Wld. fittings	SA–403	316N	S31651	WP–WX	...	8	1
35	16Cr–12Ni–2Mo–N	Forgings	SA–965	F316N	S31651	...	...	8	1
36	16Cr–12Ni–2Mo–N	Plate	SA/EN 10028–7	X2CrNiMoN17–11–2	...	...	≤75	8	1
37	16Cr–12Ni–2Mo–N	Plate	SA/EN 10028–7	X2CrNiMoN17–13–3	...	...	≤75	8	1
38	17.5Cr–17.5Ni–5.3Si	Plate	SA–240	...	S30601	...	...	8	1
39	18Cr–3Ni–12Mn	Plate	SA–240	XM–29	S24000	...	t ≥ 5	8	3
40	18Cr–3Ni–12Mn	Plate	SA–240	XM–29	S24000	...	t < 5	8	3
41	18Cr–5Ni–3Mo	Smls. tube	SA–789	...	S31500	...	...	10H	1
42	18Cr–5Ni–3Mo	Wld. tube	SA–789	...	S31500	...	...	10H	1
43	18Cr–5Ni–3Mo	Smls. pipe	SA–790	...	S31500	...	...	10H	1
44	18Cr–5Ni–3Mo	Wld. pipe	SA–790	...	S31500	...	...	10H	1
45	18Cr–8Ni	Forgings	SA–182	F304L	S30403	...	t > 130	8	1

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	485	170	454	HA–4	G2, G6
2	485	170	454	HA–4	G2, G6
3	485	170	454	HA–4	G2, G6
4	485	175	454	HA–4	G2, G6
5	485	205	816	HA–2	G2, T10
6	485	205	816	HA–2	G2, T10
7	485	205	816	HA–2	G2, T10
8	485	205	816	HA–2	G2, T10
9	515	205	816	HA–2	G2, G3, T10
10	515	205	816	HA–2	G2, G3, T10
11	515	205	816	HA–2	G2, G3, G4, T10
12	515	205	816	HA–2	G2, G3, G6, T10
13	515	205	816	HA–2	G2, G3, G4, T10
14	515	205	816	HA–2	G2, G3, G4, G6, T10
15	515	205	816	HA–2	G2, G3, G4, T10
16	515	205	816	HA–2	G2, T10
17	515	205	816	HA–2	G2, G3, G6, T10
18	515	205	816	HA–2	G2
19	515	205	816	HA–2	G2, T10
20	515	205	816	HA–2	G2, G6, T10
21	515	205	816	HA–2	G2, T10
22	515	205	816	HA–2	G2, G6, T10
23	515	205	816	HA–2	G2, G4, T10
24	520	220	454	HA–4	G2, G16
25	520	220	550	HA–2	G2, G3, G4, G16
26	550	240	649	HA–2	G2, T10
27	550	240	649	HA–2	G2, T10
28	550	240	649	HA–2	G2, G6, T10
29	550	240	649	HA–2	G2, T10
30	550	240	649	HA–2	G2, G6, T10
31	550	240	649	HA–2	G2, G4, T10
32	550	240	649	HA–2	G2, G6, T10
33	550	240	649	HA–2	G2, G6, T10
34	550	240	649	HA–2	G2, G6, T10
35	550	240	649	HA–2	G2, T10
36	580	280	427	HA–2	G2, G16
37	580	280	427	HA–2	G2, G16
38	540	255	204	HA–1	...
39	690	380	427	HA–6	G2
40	690	415	427	HA–6	G2
41	630	440	343	HA–5	G8
42	630	440	343	HA–5	G6, G8
43	630	440	343	HA–5	G8
44	630	440	343	HA–5	G6, G8
45	450	170	649	HA–3	G2, T10

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	97.7	97.7	97.7	97.7	97.7	96.2	92.8	89.9	87.4	85.2	83.4	81.7	80.2	78.7	77.3	75.9	74.4	73.0
2	97.7	97.7	97.7	97.7	97.7	96.2	92.8	89.9	87.4	85.2	83.4	81.7	80.2	78.7	77.3	75.9	74.4	73.0
3	97.7	97.7	97.7	97.7	97.7	96.2	92.8	89.9	87.4	85.2	83.4	81.7	80.2	78.7	77.3	75.9	74.4	73.0
4	97.7	97.7	97.7	97.7	97.7	96.2	92.8	89.9	87.4	85.2	83.4	81.7	80.2	78.7	77.3	75.9	74.4	73.0
5	138	138	138	138	138	138	134	129	125	122	119	116	114	112	111	110	109	108
6	138	138	138	138	138	138	134	129	125	122	119	116	114	112	111	110	109	108
7	138	138	138	138	138	138	134	129	125	122	119	116	114	112	111	110	109	108
8	138	138	138	138	138	138	134	129	125	122	119	116	114	112	111	110	109	108
9	138	138	138	138	138	138	134	129	125	122	119	116	114	112	111	110	109	108
10	138	138	138	138	138	138	134	129	125	122	119	116	114	112	111	110	109	108
11	138	138	138	138	138	138	134	129	125	122	119	116	114	112	111	110	109	108
12	117	117	117	117	117	117	114	110	107	104	101	98.9	97.1	95.6	94.3	93.2	92.3	91.5
13	138	138	138	138	138	138	134	129	125	122	119	116	114	112	111	110	109	108
14	117	117	117	117	117	117	114	110	107	104	101	98.9	97.1	95.6	94.3	93.2	92.3	91.5
15	138	138	138	138	138	138	134	129	125	122	119	116	114	112	111	110	109	108
16	138	138	138	138	138	138	134	129	125	122	119	116	114	112	111	110	109	108
17	117	117	117	117	117	117	114	110	107	104	101	98.9	97.1	95.6	94.3	93.2	92.3	91.5
18	138	138	138	138	138	138	134	129	125	122	119	116	114	112	111	110	109	108
19	138	138	138	138	138	138	134	129	125	122	119	116	114	112	111	110	109	108
20	117	117	117	117	117	117	114	110	107	104	101	98.9	97.1	95.6	94.3	93.2	92.3	91.5
21	138	138	138	138	138	138	134	129	125	122	119	116	114	112	111	110	109	108
22	117	117	117	117	117	117	114	110	107	104	101	98.9	97.1	95.6	94.3	93.2	92.3	91.5
23	138	138	138	138	138	138	134	129	125	122	119	116	114	112	111	110	109	108
24	147	147	147	147	147	145	139	135	131	128	125	123	121	119	116	114	112	110
25	147	147	147	147	147	147	142	137	133	130	127	124	122	120	118	117	116	115
26	161	161	161	161	161	161	161	160	155	151	147	144	141	138	135	133	130	128
27	161	161	161	161	161	161	161	160	155	151	147	144	141	138	135	133	130	128
28	137	137	137	137	137	137	137	136	132	128	125	122	120	117	115	113	111	109
29	161	161	161	161	161	161	161	160	155	151	147	144	141	138	135	133	130	128
30	137	137	137	137	137	137	137	136	132	128	125	122	120	117	115	113	111	109
31	161	161	161	161	161	161	161	160	155	151	147	144	141	138	135	133	130	128
32	137	137	137	137	137	137	137	136	132	128	125	122	120	117	115	113	111	109
33	137	137	137	137	137	137	137	136	132	128	125	122	120	117	115	113	111	109
34	137	137	137	137	137	137	137	136	132	128	125	122	120	117	115	113	111	109
35	161	161	161	161	161	161	161	160	155	151	147	144	141	138	135	133	130	128
36	187	187	187	187	187	184	177	171	166	161	156	152	149	145	142	139	136	...
37	187	187	187	187	187	184	177	171	166	161	156	152	149	145	142	139	136	...
38	170	170	170	170	168	161	154	149	...	...	...	...	...	...	...	...	...	...
39	253	253	253	249	232	218	206	197	190	184	180	177	174	172	169	166	162	...
40	276	276	276	272	253	238	225	215	207	201	197	193	190	187	184	181	176	...
41	264	264	264	264	264	264	264	264	264	264	264	264	264	...	...	...	...	...
42	225	225	225	225	225	225	225	225	225	225	225	225	225	...	...	...	...	...
43	264	264	264	264	264	264	264	264	264	264	264	264	264	...	...	...	...	...
44	225	225	225	225	225	225	225	225	225	225	225	225	225	...	...	...	...	...
45	115	115	115	115	115	114	110	106	103	99.9	97.7	95.7	94.1	92.6	91.3	90.0	88.7	87.3

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	107	106	105	*97.8*	*80.8*	*65.0*	*50.5*	*39.2*	*30.4*	*23.6*	*18.4*	*14.3*	*11.1*	*8.60*	
6	107	106	105	*97.8*	*80.8*	*65.0*	*50.5*	*39.2*	*30.4*	*23.6*	*18.4*	*14.3*	*11.1*	*8.60*	
7	107	106	105	*97.8*	*80.8*	*65.0*	*50.4*	*38.6*	*29.6*	*23.0*	*17.4*	*13.3*	*10.4*	*8.18*	
8	107	106	105	*97.8*	*80.8*	*65.0*	*50.4*	*38.6*	*29.6*	*23.0*	*17.4*	*13.3*	*10.4*	*8.18*	
9	107	106	105	*97.8*	*80.8*	*65.0*	*50.5*	*39.2*	*30.4*	*23.6*	*18.4*	*14.3*	*11.1*	*8.60*	
10	107	106	105	*97.8*	*80.8*	*65.0*	*50.5*	*39.2*	*30.4*	*23.6*	*18.4*	*14.3*	*11.1*	*8.60*	
11	107	106	105	*97.8*	*80.8*	*65.0*	*50.5*	*39.2*	*30.4*	*23.6*	*18.4*	*14.3*	*11.1*	*8.60*	
12	90.7	90.0	89.2	*83.1*	*68.7*	*55.2*	*42.9*	*33.3*	*25.9*	*20.1*	*15.6*	*12.1*	*9.41*	*7.31*	
13	107	106	105	*97.8*	*80.8*	*65.0*	*50.5*	*39.2*	*30.4*	*23.6*	*18.4*	*14.3*	*11.1*	*8.60*	
14	90.7	90.0	89.2	*83.1*	*68.7*	*55.2*	*42.9*	*33.3*	*25.9*	*20.1*	*15.6*	*12.1*	*9.41*	*7.31*	
15	107	106	105	*97.8*	*80.8*	*65.0*	*50.5*	*39.2*	*30.4*	*23.6*	*18.4*	*14.3*	*11.1*	*8.60*	
16	107	106	105	*97.8*	*80.8*	*65.0*	*50.5*	*39.2*	*30.4*	*23.6*	*18.4*	*14.3*	*11.1*	*8.60*	
17	90.7	90.0	89.2	*83.1*	*68.7*	*55.2*	*42.9*	*33.3*	*25.9*	*20.1*	*15.6*	*12.1*	*9.41*	*7.31*	
18	107	106	105	97.8	80.8	65.0	50.5	39.2	30.4	23.6	18.4	14.3	11.1	8.60 (**23**)	
19	107	106	105	*97.8*	*80.8*	*65.0*	*50.4*	*38.6*	*29.6*	*23.0*	*17.4*	*13.3*	*10.4*	*8.18*	
20	90.7	90.0	89.2	*83.1*	*68.7*	*55.2*	*42.9*	*32.8*	*25.2*	*19.5*	*14.8*	*11.3*	*8.85*	*6.95*	
21	107	106	105	*97.8*	*80.8*	*65.0*	*50.4*	*38.6*	*29.6*	*23.0*	*17.4*	*13.3*	*10.4*	*8.18*	
22	90.7	90.0	89.2	*83.1*	*68.7*	*55.2*	*42.9*	*32.8*	*25.2*	*19.5*	*14.8*	*11.3*	*8.85*	*6.95*	
23	107	106	105	*97.8*	*80.8*	*65.0*	*50.4*	*38.6*	*29.6*	*23.0*	*17.4*	*13.3*	*10.4*	*8.18*	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	113	113	112	...	...	...	...	...	...	...	...	...	...	...	
26	126	124	122	*100*	*80.3*	*65.0*	*50.5*	...	...	...	...	...	...	...	
27	126	124	122	*100*	*80.3*	*65.0*	*50.5*	...	...	...	...	...	...	...	
28	107	105	103	*85.0*	*68.3*	*55.2*	*42.9*	...	...	...	...	...	...	...	
29	126	124	122	*100*	*80.3*	*65.0*	*50.5*	...	...	...	...	...	...	...	
30	107	105	103	*85.0*	*68.3*	*55.2*	*42.9*	...	...	...	...	...	...	...	
31	126	124	122	*100*	*80.3*	*65.0*	*50.5*	...	...	...	...	...	...	...	
32	107	105	103	*85.0*	*68.3*	*55.2*	*42.9*	...	...	...	...	...	...	...	
33	107	105	103	*85.0*	*68.3*	*55.2*	*42.9*	...	...	...	...	...	...	...	
34	107	105	103	*85.0*	*68.3*	*55.2*	*42.9*	...	...	...	...	...	...	...	
35	126	124	122	*100*	*80.3*	*65.0*	*50.5*	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	85.6	83.7	81.4	*40.4*	*33.2*	*26.7*	*21.9*	...	...	...	...	...	...	...	

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
	1	18Cr–8Ni	Forgings	SA–965	F304L	S30403	...	...	8	1
	2	18Cr–8Ni	Forgings	SA–182	F304L	S30403	...	$t \le 130$	8	1
	3	18Cr–8Ni	Smls. tube	SA–213	TP304L	S30403	...	...	8	1
	4	18Cr–8Ni	Plate	SA–240	304L	S30403	...	...	8	1
	5	18Cr–8Ni	Wld. tube	SA–249	TP304L	S30403	...	...	8	1
	6	18Cr–8Ni	Smls. pipe	SA–312	TP304L	S30403	...	...	8	1
	7	18Cr–8Ni	Wld. pipe	SA–312	TP304L	S30403	...	...	8	1
	8	18Cr–8Ni	Fittings	SA–403	304L	S30403	WP–S	...	8	1
	9	18Cr–8Ni	Wld. tube	SA–688	TP304L	S30403	...	...	8	1
	10	18Cr–8Ni	Castings	SA–351	CF3	J92500	...	...	8	1
	11	18Cr–8Ni	Castings	SA–351	CF10	J92590	...	...	8	1
	12	18Cr–8Ni	Castings	SA–351	CF8	J92600	...	...	8	1
	13	18Cr–8Ni	Forgings	SA–182	F304	S30400	...	$t > 130$	8	1
(**23**)	14	18Cr–8Ni	Smls. pipe	SA–376	TP304	S30400	...	≥200	8	1
	15	18Cr–8Ni	Forgings	SA–965	F304	S30400	...	...	8	1
	16	18Cr–8Ni	Forgings	SA–182	F304H	S30409	...	$t > 130$	8	1
	17	18Cr–8Ni	Forgings	SA–965	F304H	S30409	...	...	8	1
	18	18Cr–8Ni	Plate	SA/EN 10028–7	X2CrNi18–9	...	...	≤75	8	1
(**23**)	19	18Cr–8Ni	Plate	SA–240	302	S30200	...	...	8	1
	20	18Cr–8Ni	Forgings	SA–182	F304	S30400	...	$t \le 130$	8	1
	21	18Cr–8Ni	Smls. tube	SA–213	TP304	S30400	...	...	8	1
	22	18Cr–8Ni	Plate	SA–240	304	S30400	...	...	8	1
	23	18Cr–8Ni	Wld. tube	SA–249	TP304	S30400	...	...	8	1
	24	18Cr–8Ni	Smls. pipe	SA–312	TP304	S30400	...	...	8	1
	25	18Cr–8Ni	Wld. pipe	SA–312	TP304	S30400	...	...	8	1
(**23**)	26	18Cr–8Ni	Smls. pipe	SA–376	TP304	S30400	...	<200	8	1
	27	18Cr–8Ni	Fittings	SA–403	304	S30400	CR	...	8	1
	28	18Cr–8Ni	Fittings	SA–403	304	S30400	WP–S	...	8	1
	29	18Cr–8Ni	Wld. fittings	SA–403	304	S30400	WP–W	...	8	1
	30	18Cr–8Ni	Wld. fittings	SA–403	304	S30400	WP–WX	...	8	1
	31	18Cr–8Ni	Wld. tube	SA–688	TP304	S30400	...	...	8	1
	32	18Cr–8Ni	Forgings	SA–182	F304H	S30409	...	$t \le 130$	8	1
	33	18Cr–8Ni	Smls. tube	SA–213	TP304H	S30409	...	...	8	1
	34	18Cr–8Ni	Plate	SA–240	304H	S30409	...	...	8	1
	35	18Cr–8Ni	Wld. tube	SA–249	TP304H	S30409	...	...	8	1
	36	18Cr–8Ni	Smls. pipe	SA–312	TP304H	S30409	...	...	8	1
	37	18Cr–8Ni	Wld. pipe	SA–312	TP304H	S30409	...	...	8	1
	38	18Cr–8Ni	Smls. pipe	SA–376	TP304H	S30409	...	...	8	1
	39	18Cr–8Ni	Fittings	SA–403	304H	S30409	CR	...	8	1
	40	18Cr–8Ni	Fittings	SA–403	304H	S30409	WP–S	...	8	1
	41	18Cr–8Ni	Wld. fittings	SA–403	304H	S30409	WP–W	...	8	1
	42	18Cr–8Ni	Wld. fittings	SA–403	304H	S30409	WP–WX	...	8	1
	43	18Cr–8Ni	Plate	SA/EN 10028–7	X5CrNi18–10	...	...	≤75	8	1
	44	18Cr–8Ni–N	Smls. tube	SA–213	TP304N	S30451	...	...	8	1
	45	18Cr–8Ni–N	Plate	SA–240	304N	S30451	...	...	8	1

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	450	170	649	HA–3	G2, T10
2	485	170	649	HA–3	G2, T10
3	485	170	649	HA–3	G2, T10
4	485	170	649	HA–3	G2, T10
5	485	170	649	HA–3	G2, G6, T10
6	485	170	649	HA–3	G2, T10
7	485	170	649	HA–3	G2, G6, T10
8	485	170	649	HA–3	G2, T10
9	485	175	649	HA–3	G2, G6, T10
10	485	205	427	HA–3	G2, G8
11	485	205	816	HA–3	G2, G4, G8, T8
12	485	205	816	HA–1	G2, G3, G4, G8, T8
13	485	205	816	HA–1	G2, G3, G4, T10
14	485	205	816	HA–1	G2, G3, G4, S3, T10
15	485	205	816	HA–1	G2, G3, G4, T10
16	485	205	816	HA–1	G2, T10
17	485	205	816	HA–1	G2, T10
18	500	200	550	HA–3	G2, G16, T9
19	515	205	399	HA–1	G2, G3
20	515	205	816	HA–1	G2, G3, G4, T10
21	515	205	816	HA–1	G2, G3, T10
22	515	205	816	HA–1	G2, G3, G4, T10
23	515	205	816	HA–1	G2, G3, G6, T10
24	515	205	816	HA–1	G2, G3, G4, T10
25	515	205	816	HA–1	G2, G3, G4, G6, T10
26	515	205	816	HA–1	G2, G3, G4, S4, T10
27	515	205	816	HA–1	G2, G6, T10
28	515	205	816	HA–1	G2, T10
29	515	205	816	HA–1	G2, G6, T10
30	515	205	816	HA–1	G2, G6, T10
31	515	205	816	HA–1	G2, G3, G6, T10
32	515	205	816	HA–1	G2, T10
33	515	205	816	HA–1	G2, T10
34	515	205	816	HA–1	G2, T10
35	515	205	816	HA–1	G2, G6, T10
36	515	205	816	HA–1	G2, T10
37	515	205	816	HA–1	G2, G6, T10
38	515	205	816	HA–1	G2, G4, T10
39	515	205	816	HA–1	G2, G6, T10
40	515	205	816	HA–1	G2, T10
41	515	205	816	HA–1	G2, G6, T10
42	515	205	816	HA–1	G2, G6, T10
43	520	210	550	HA–1	G2, G3, G4, G16, T9
44	550	240	649	HA–1	G2, T9
45	550	240	649	HA–1	G2, T9

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	115	115	115	115	115	114	110	106	103	99.9	97.7	95.7	94.1	92.6	91.3	90.0	88.7	87.3
2	115	115	115	115	115	114	110	106	103	99.9	97.7	95.7	94.1	92.6	91.3	90.0	88.7	87.3
3	115	115	115	115	115	114	110	106	103	99.9	97.7	95.7	94.1	92.6	91.3	90.0	88.7	87.3
4	115	115	115	115	115	114	110	106	103	99.9	97.7	95.7	94.1	92.6	91.3	90.0	88.7	87.3
5	115	115	115	115	115	114	110	106	103	99.9	97.7	95.7	94.1	92.6	91.3	90.0	88.7	87.3
6	115	115	115	115	115	114	110	106	103	99.9	97.7	95.7	94.1	92.6	91.3	90.0	88.7	87.3
7	97.7	97.7	97.7	97.7	97.7	96.8	93.1	90.0	87.2	85.0	83.0	81.4	80.0	78.7	77.6	76.5	75.4	74.2
8	115	115	115	115	115	114	110	106	103	99.9	97.7	95.7	94.1	92.6	91.3	90.0	88.7	87.3
9	97.7	97.7	97.7	97.7	97.7	96.8	93.1	90.0	87.2	85.0	83.0	81.4	80.0	78.7	77.6	76.5	75.4	74.2
10	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	...
11	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
12	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
13	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
14	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
15	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
16	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
17	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
18	133	133	133	133	133	132	127	123	119	116	113	111	109	107	106	105	103	101
19	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	...	...	...
20	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
21	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
22	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
23	117	117	117	117	117	114	110	106	103	101	98.5	96.4	94.4	92.5	90.7	89.0	87.4	85.8
24	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
25	117	117	117	117	117	114	110	106	103	101	98.5	96.4	94.4	92.5	90.7	89.0	87.4	85.8
26	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
27	117	117	117	117	117	114	110	106	103	101	98.5	96.4	94.4	92.5	90.7	89.0	87.4	85.8
28	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
29	117	117	117	117	117	114	110	106	103	101	98.5	96.4	94.4	92.5	90.7	89.0	87.4	85.8
30	117	117	117	117	117	114	110	106	103	101	98.5	96.4	94.4	92.5	90.7	89.0	87.4	85.8
31	117	117	117	117	117	114	110	106	103	101	98.5	96.4	94.4	92.5	90.7	89.0	87.4	85.8
32	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
33	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
34	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
35	117	117	117	117	117	114	110	106	103	101	98.5	96.4	94.4	92.5	90.7	89.0	87.4	85.8
36	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
37	117	117	117	117	117	114	110	106	103	101	98.5	96.4	94.4	92.5	90.7	89.0	87.4	85.8
38	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
39	117	117	117	117	117	114	110	106	103	101	98.5	96.4	94.4	92.5	90.7	89.0	87.4	85.8
40	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
41	117	117	117	117	117	114	110	106	103	101	98.5	96.4	94.4	92.5	90.7	89.0	87.4	85.8
42	117	117	117	117	117	114	110	106	103	101	98.5	96.4	94.4	92.5	90.7	89.0	87.4	85.8
43	140	140	140	140	140	136	131	127	123	120	118	115	113	111	108	106	105	103
44	161	161	161	161	155	147	141	136	132	128	125	123	120	118	117	115	113	111
45	161	161	161	161	155	147	141	136	132	128	125	123	120	118	117	115	113	111

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	
1	85.6	83.7	81.4	*40.4*	*33.2*	*26.7*	*21.9*	...	...	...	...	...	...	...	
2	85.6	83.7	81.4	*40.4*	*33.2*	*26.7*	*21.9*	...	...	...	...	...	...	...	
3	85.6	83.7	81.4	*40.4*	*33.2*	*26.7*	*21.9*	...	...	...	...	...	...	...	
4	85.6	83.7	81.4	*40.4*	*33.2*	*26.7*	*21.9*	...	...	...	...	...	...	...	
5	85.6	83.7	81.4	*40.4*	*33.2*	*26.7*	*21.9*	...	...	...	...	...	...	...	
6	85.6	83.7	81.4	*40.4*	*33.2*	*26.7*	*21.9*	...	...	...	...	...	...	...	
7	72.8	71.1	69.2	*34.4*	*28.2*	*22.7*	*18.6*	...	...	...	...	...	...	...	
8	85.6	83.7	81.4	*40.4*	*33.2*	*26.7*	*21.9*	...	...	...	...	...	...	...	
9	72.8	71.1	69.2	*34.4*	*28.2*	*22.7*	*18.6*	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	99.1	*94.4*	*75.3*	*60.4*	*49.0*	*40.1*	*32.8*	*27.2*	*23.4*	*19.6*	*16.8*	*14.7*	*12.8*	*11.1*	
12	99.1	*94.4*	*75.3*	*60.4*	*49.0*	*40.1*	*32.8*	*27.2*	*23.4*	*19.6*	*16.8*	*14.7*	*12.8*	*11.1*	
13	99.1	97.3	95.5	*78.9*	*63.8*	*51.6*	*41.6*	*32.9*	*26.5*	*21.3*	*17.2*	*14.1*	*11.2*	*8.80*	
14	99.1	97.3	95.5	*78.9*	*63.8*	*51.6*	*41.6*	*32.9*	*26.5*	*21.3*	*17.2*	*14.1*	*11.2*	*8.80*	(**23**)
15	99.1	97.3	95.5	*78.9*	*63.8*	*51.6*	*41.6*	*32.9*	*26.5*	*21.3*	*17.2*	*14.1*	*11.2*	*8.80*	
16	99.1	97.3	95.5	*78.9*	*63.8*	*51.6*	*41.6*	*32.9*	*26.5*	*21.3*	*17.2*	*14.1*	*11.2*	*8.80*	
17	99.1	97.3	95.5	*78.9*	*63.8*	*51.6*	*41.6*	*32.9*	*26.5*	*21.3*	*17.2*	*14.1*	*11.2*	*8.80*	
18	99.0	96.7	*94.4*	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
20	99.1	97.3	95.5	*78.9*	*63.8*	*51.6*	*41.6*	*32.9*	*26.5*	*21.3*	*17.2*	*14.1*	*11.2*	*8.80*	
21	99.1	97.3	95.5	*78.9*	*63.8*	*51.6*	*41.6*	*32.9*	*26.5*	*21.3*	*17.2*	*14.1*	*11.2*	*8.80*	
22	99.1	97.3	95.5	*78.9*	*63.8*	*51.6*	*41.6*	*32.9*	*26.5*	*21.3*	*17.2*	*14.1*	*11.2*	*8.80*	
23	84.3	82.7	81.2	*67.1*	*54.3*	*43.9*	*35.4*	*28.0*	*22.5*	*18.1*	*14.7*	*11.9*	*9.56*	*7.48*	
24	99.1	97.3	95.5	*78.9*	*63.8*	*51.6*	*41.6*	*32.9*	*26.5*	*21.3*	*17.2*	*14.1*	*11.2*	*8.80*	
25	84.3	82.7	81.2	*67.1*	*54.3*	*43.9*	*35.4*	*28.0*	*22.5*	*18.1*	*14.7*	*11.9*	*9.56*	*7.48*	
26	99.1	97.3	95.5	*78.9*	*63.8*	*51.6*	*41.6*	*32.9*	*26.5*	*21.3*	*17.2*	*14.1*	*11.2*	*8.80*	(**23**)
27	84.3	82.7	81.2	*67.1*	*54.3*	*43.9*	*35.4*	*28.0*	*22.5*	*18.1*	*14.7*	*11.9*	*9.56*	*7.48*	
28	99.1	97.3	95.5	*78.9*	*63.8*	*51.6*	*41.6*	*32.9*	*26.5*	*21.3*	*17.2*	*14.1*	*11.2*	*8.80*	
29	84.3	82.7	81.2	*67.1*	*54.3*	*43.9*	*35.4*	*28.0*	*22.5*	*18.1*	*14.7*	*11.9*	*9.56*	*7.48*	
30	84.3	82.7	81.2	*67.1*	*54.3*	*43.9*	*35.4*	*28.0*	*22.5*	*18.1*	*14.7*	*11.9*	*9.56*	*7.48*	
31	84.3	82.7	81.2	*67.1*	*54.3*	*43.9*	*35.4*	*28.0*	*22.5*	*18.1*	*14.7*	*11.9*	*9.56*	*7.48*	
32	99.1	97.3	95.5	*78.9*	*63.8*	*51.6*	*41.6*	*32.9*	*26.5*	*21.3*	*17.2*	*14.1*	*11.2*	*8.80*	
33	99.1	97.3	95.5	*78.9*	*63.8*	*51.6*	*41.6*	*32.9*	*26.5*	*21.3*	*17.2*	*14.1*	*11.2*	*8.80*	
34	99.1	97.3	95.5	*78.9*	*63.8*	*51.6*	*41.6*	*32.9*	*26.5*	*21.3*	*17.2*	*14.1*	*11.2*	*8.80*	
35	84.3	82.7	81.2	*67.1*	*54.3*	*43.9*	*35.4*	*28.0*	*22.5*	*18.1*	*14.7*	*11.9*	*9.56*	*7.48*	
36	99.1	97.3	95.5	*78.9*	*63.8*	*51.6*	*41.6*	*32.9*	*26.5*	*21.3*	*17.2*	*14.1*	*11.2*	*8.80*	
37	84.3	82.7	81.2	*67.1*	*54.3*	*43.9*	*35.4*	*28.0*	*22.5*	*18.1*	*14.7*	*11.9*	*9.56*	*7.48*	
38	99.1	97.3	95.5	*78.9*	*63.8*	*51.6*	*41.6*	*32.9*	*26.5*	*21.3*	*17.2*	*14.1*	*11.2*	*8.80*	
39	84.3	82.7	81.2	*67.1*	*54.3*	*43.9*	*35.4*	*28.0*	*22.5*	*18.1*	*14.7*	*11.9*	*9.56*	*7.48*	
40	99.1	97.3	95.5	*78.9*	*63.8*	*51.6*	*41.6*	*32.9*	*26.5*	*21.3*	*17.2*	*14.1*	*11.2*	*8.80*	
41	84.3	82.7	81.2	*67.1*	*54.3*	*43.9*	*35.4*	*28.0*	*22.5*	*18.1*	*14.7*	*11.9*	*9.56*	*7.48*	
42	84.3	82.7	81.2	*67.1*	*54.3*	*43.9*	*35.4*	*28.0*	*22.5*	*18.1*	*14.7*	*11.9*	*9.56*	*7.48*	
43	101	98.9	*96.8*	...	...	...	...	...	...	...	...	...	...	...	
44	108	106	*97.5*	*78.9*	*63.8*	*51.6*	*41.6*	...	...	...	...	...	...	...	
45	108	106	*97.5*	*78.9*	*63.8*	*51.6*	*41.6*	...	...	...	...	...	...	...	

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	18Cr–8Ni–N	Wld. tube	SA–249	TP304N	S30451	...	...	8	1
2	18Cr–8Ni–N	Smls. pipe	SA–312	TP304N	S30451	...	...	8	1
3	18Cr–8Ni–N	Wld. pipe	SA–312	TP304N	S30451	...	...	8	1
4	18Cr–8Ni–N	Smls. pipe	SA–376	TP304N	S30451	...	...	8	1
5	18Cr–8Ni–N	Fittings	SA–403	304N	S30451	CR	...	8	1
6	18Cr–8Ni–N	Wld. fittings	SA–403	304N	S30451	WP–W	...	8	1
7	18Cr–8Ni–N	Wld. fittings	SA–403	304N	S30451	WP–WX	...	8	1
8	18Cr–8Ni–N	Forgings	SA–965	F304N	S30451	...	...	8	1
9	18Cr–8Ni–N	Plate	SA/EN 10028–7	X2CrNiN18–10	...	...	≤75	8	1
10	18Cr–8Ni–N	Plate	SA/EN 10028–7	X5CrNiN19–9	...	...	≤75	8	1
11	18Cr–10Ni–Cb	Castings	SA–351	CF8C	J92710	...	...	8	1
12	18Cr–10Ni–Cb	Forgings	SA–182	F347	S34700	...	t > 130	8	1
13	18Cr–10Ni–Cb	Forgings	SA–965	F347	S34700	...	...	8	1
14	18Cr–10Ni–Cb	Forgings	SA–182	F347H	S34709	...	t > 130	8	1
15	18Cr–10Ni–Cb	Forgings	SA–965	F347H	S34709	...	...	8	1
16	18Cr–10Ni–Cb	Forgings	SA–182	F348	S34800	...	t > 130	8	1
17	18Cr–10Ni–Cb	Forgings	SA–182	F348H	S34809	...	t > 130	8	1
18	18Cr–10Ni–Cb	Forgings	SA–182	F347	S34700	...	t ≤ 130	8	1
19	18Cr–10Ni–Cb	Smls. tube	SA–213	TP347	S34700	...	...	8	1
20	18Cr–10Ni–Cb	Plate	SA–240	347	S34700	...	...	8	1
21	18Cr–10Ni–Cb	Wld. tube	SA–249	TP347	S34700	...	...	8	1
22	18Cr–10Ni–Cb	Smls. pipe	SA–312	TP347	S34700	...	...	8	1
23	18Cr–10Ni–Cb	Wld. pipe	SA–312	TP347	S34700	...	...	8	1
24	18Cr–10Ni–Cb	Smls. pipe	SA–376	TP347	S34700	...	...	8	1
25	18Cr–10Ni–Cb	Fittings	SA–403	347	S34700	CR	...	8	1
26	18Cr–10Ni–Cb	Fittings	SA–403	347	S34700	WP–S	...	8	1
27	18Cr–10Ni–Cb	Wld. fittings	SA–403	347	S34700	WP–W	...	8	1
28	18Cr–10Ni–Cb	Wld. fittings	SA–403	347	S34700	WP–WX	...	8	1
(**23**) 29	18Cr–10Ni–Cb	Forgings	SA–182	F347H	S34709	...	t ≤ 130	8	1
30	18Cr–10Ni–Cb	Smls. tube	SA–213	TP347H	S34709	...	...	8	1
31	18Cr–10Ni–Cb	Plate	SA–240	347H	S34709	...	...	8	1
32	18Cr–10Ni–Cb	Wld. tube	SA–249	TP347H	S34709	...	...	8	1
33	18Cr–10Ni–Cb	Smls. pipe	SA–312	TP347H	S34709	...	...	8	1
34	18Cr–10Ni–Cb	Wld. pipe	SA–312	TP347H	S34709	...	...	8	1
35	18Cr–10Ni–Cb	Smls. pipe	SA–376	TP347H	S34709	...	...	8	1
36	18Cr–10Ni–Cb	Fittings	SA–403	347H	S34709	CR	...	8	1
37	18Cr–10Ni–Cb	Fittings	SA–403	347H	S34709	WP–S	...	8	1
38	18Cr–10Ni–Cb	Wld. fittings	SA–403	347H	S34709	WP–W	...	8	1
39	18Cr–10Ni–Cb	Wld. fittings	SA–403	347H	S34709	WP–WX	...	8	1
40	18Cr–10Ni–Cb	Forgings	SA–182	F348	S34800	...	t ≤ 130	8	1
41	18Cr–10Ni–Cb	Smls. tube	SA–213	TP348	S34800	...	...	8	1
42	18Cr–10Ni–Cb	Plate	SA–240	348	S34800	...	...	8	1
43	18Cr–10Ni–Cb	Wld. tube	SA–249	TP348	S34800	...	...	8	1
44	18Cr–10Ni–Cb	Smls. pipe	SA–312	TP348	S34800	...	...	8	1
45	18Cr–10Ni–Cb	Wld. pipe	SA–312	TP348	S34800	...	...	8	1

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	550	240	649	HA–1	G2, G6, T9
2	550	240	649	HA–1	G2, T9
3	550	240	649	HA–1	G2, G6, T9
4	550	240	649	HA–1	G2, G4, T9
5	550	240	649	HA–1	G2, G6, T9
6	550	240	649	HA–1	G2, G6, T9
7	550	240	649	HA–1	G2, G6, T9
8	550	240	649	HA–1	G2, T9
9	550	270	427	HA–1	G2, G16
10	550	270	550	HA–1	G2, G16, T9
11	485	205	816	HA–2	G2, G3, G8, T9
12	485	205	816	HA–2	G2, G3, T9
13	485	205	816	HA–2	G2, G3, T9
14	485	205	816	HA–2	G1, G2, T10
15	485	205	816	HA–2	G1, G2, T10
16	515	205	816	HA–2	G2, G3, T9
17	515	205	816	HA–2	G2, T10
18	515	205	816	HA–2	G2, G3, G4, T9
19	515	205	816	HA–2	G2, G3, G4, T9
20	515	205	816	HA–2	G2, G3, T9
21	515	205	816	HA–2	G2, G3, G6, T9
22	515	205	816	HA–2	G2, G3, T9
23	515	205	816	HA–2	G2, G3, G6, T9
24	515	205	816	HA–2	G2, G3, G4, T9
25	515	205	816	HA–2	G2, G6, T9
26	515	205	816	HA–2	G2, T9
27	515	205	816	HA–2	G2, G6, T9
28	515	205	816	HA–2	G2, G6, T9
29	515	205	816	HA–2	G1, G2, T10
30	515	205	816	HA–2	G1, G2, T10
31	515	205	816	HA–2	G1, G2, T10
32	515	205	816	HA–2	G2, G6, T10
33	515	205	816	HA–2	G1, G2, T10
34	515	205	816	HA–2	G1, G2, G6, T10
35	515	205	816	HA–2	G1, G2, T10
36	515	205	816	HA–2	G1, G2, G6, T10
37	515	205	816	HA–2	G1, G2, T10
38	515	205	816	HA–2	G1, G2, G6, T10
39	515	205	816	HA–2	G1, G2, G6, T10
40	515	205	816	HA–2	G2, G3, T9
41	515	205	816	HA–2	G2, G3, T9
42	515	205	816	HA–2	G2, G3, T9
43	515	205	816	HA–2	G2, G3, G6, T9
44	515	205	816	HA–2	G2, G3, T9
45	515	205	816	HA–2	G2, G3, G6, T9

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	137	137	137	137	132	125	120	116	112	109	106	104	102	101	99.0	97.4	95.8	94.0
2	161	161	161	161	155	147	141	136	132	128	125	123	120	118	117	115	113	111
3	137	137	137	137	132	125	120	116	112	109	106	104	102	101	99.0	97.4	95.8	94.0
4	161	161	161	161	155	147	141	136	132	128	125	123	120	118	117	115	113	111
5	137	137	137	137	132	125	120	116	112	109	106	104	102	101	99.0	97.4	95.8	94.0
6	137	137	137	137	132	125	120	116	112	109	106	104	102	101	99.0	97.4	95.8	94.0
7	137	137	137	137	132	125	120	116	112	109	106	104	102	101	99.0	97.4	95.8	94.0
8	161	161	161	161	155	147	141	136	132	128	125	123	120	118	117	115	113	111
9	180	180	180	180	179	174	168	163	159	155	151	148	145	142	139	137	134	...
10	180	180	180	180	174	165	158	152	147	143	140	137	135	133	130	128	126	124
11	138	138	138	138	138	138	138	138	138	138	135	132	130	128	127	126	126	125
12	138	138	138	138	138	138	138	138	138	138	135	132	130	128	127	126	126	125
13	138	138	138	138	138	138	138	138	138	138	135	132	130	128	127	126	126	125
14	138	138	138	138	138	138	138	138	138	138	135	132	130	129	127	126	126	125
15	138	138	138	138	138	138	138	138	138	138	135	132	130	129	127	126	126	125
16	138	138	138	138	138	138	138	138	138	138	135	132	130	128	127	126	126	125
17	138	138	138	138	138	138	138	138	138	138	135	132	130	129	127	126	126	125
18	138	138	138	138	138	138	138	138	138	138	135	132	130	128	127	126	126	125
19	138	138	138	138	138	138	138	138	138	138	135	132	130	128	127	126	126	125
20	138	138	138	138	138	138	138	138	138	138	135	132	130	128	127	126	126	125
21	117	117	117	117	117	117	117	117	117	117	115	112	111	109	108	107	107	106
22	138	138	138	138	138	138	138	138	138	138	135	132	130	128	127	126	126	125
23	117	117	117	117	117	117	117	117	117	117	115	112	111	109	108	107	107	106
24	138	138	138	138	138	138	138	138	138	138	135	132	130	128	127	126	126	125
25	117	117	117	117	117	117	117	117	117	117	115	112	111	109	108	107	107	106
26	138	138	138	138	138	138	138	138	138	138	135	132	130	128	127	126	126	125
27	117	117	117	117	117	117	117	117	117	117	115	112	111	109	108	107	107	106
28	117	117	117	117	117	117	117	117	117	117	115	112	111	109	108	107	107	106
29	138	138	138	138	138	138	138	138	138	138	135	132	130	129	127	126	126	125
30	138	138	138	138	138	138	138	138	138	138	135	132	130	129	127	126	126	125
31	138	138	138	138	138	138	138	138	138	138	135	132	130	129	127	126	126	125
32	117	117	117	117	117	117	117	117	117	117	115	112	111	109	108	107	107	106
33	138	138	138	138	138	138	138	138	138	138	135	132	130	129	127	126	126	125
34	117	117	117	117	117	117	117	117	117	117	115	112	111	109	108	107	107	106
35	138	138	138	138	138	138	138	138	138	138	135	132	130	129	127	126	126	125
36	117	117	117	117	117	117	117	117	117	117	115	112	111	109	108	107	107	106
37	138	138	138	138	138	138	138	138	138	138	135	132	130	129	127	126	126	125
38	117	117	117	117	117	117	117	117	117	117	115	112	111	109	108	107	107	106
39	117	117	117	117	117	117	117	117	117	117	115	112	111	109	108	107	107	106
40	138	138	138	138	138	138	138	138	138	138	135	132	130	128	127	126	126	125
41	138	138	138	138	138	138	138	138	138	138	135	132	130	128	127	126	126	125
42	138	138	138	138	138	138	138	138	138	138	135	132	130	128	127	126	126	125
43	117	117	117	117	117	117	117	117	117	117	115	112	111	109	108	107	107	106
44	138	138	138	138	138	138	138	138	138	138	135	132	130	128	127	126	126	125
45	117	117	117	117	117	117	117	117	117	117	115	112	111	109	108	107	107	106

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding													
	500	525	550	575	600	625	650	675	700	725	750	775	800	825
1	92.2	90.3	*82.9*	*67.1*	*54.3*	*43.9*	*35.4*	...	...	...	...	...	...	...
2	108	106	*97.5*	*78.9*	*63.8*	*51.6*	*41.6*	...	...	...	...	...	...	...
3	92.2	90.3	*82.9*	*67.1*	*54.3*	*43.9*	*35.4*	...	...	...	...	...	...	...
4	108	106	*97.5*	*78.9*	*63.8*	*51.6*	*41.6*	...	...	...	...	...	...	...
5	92.2	90.3	*82.9*	*67.1*	*54.3*	*43.9*	*35.4*	...	...	...	...	...	...	...
6	92.2	90.3	*82.9*	*67.1*	*54.3*	*43.9*	*35.4*	...	...	...	...	...	...	...
7	92.2	90.3	*82.9*	*67.1*	*54.3*	*43.9*	*35.4*	...	...	...	...	...	...	...
8	108	106	*97.5*	*78.9*	*63.8*	*51.6*	*41.6*	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	121	119	*97.5*	...	...	...	...	...	...	...	...	...	...	...
11	125	125	*97.6*	*75.9*	*57.2*	*40.2*	*30.3*	*23.2*	*16.2*	*11.4*	*8.97*	*7.08*	*5.89*	*5.30*
12	125	125	*97.6*	*75.9*	*57.2*	*40.2*	*30.3*	*23.2*	*16.2*	*11.4*	*8.97*	*7.08*	*5.89*	*5.30*
13	125	125	*97.6*	*75.9*	*57.2*	*40.2*	*30.3*	*23.2*	*16.2*	*11.4*	*8.97*	*7.08*	*5.89*	*5.30*
14	125	125	125	*112*	*90.6*	*69.6*	*53.8*	*41.4*	*31.8*	*24.0*	*18.8*	*14.6*	*10.9*	*7.96*
15	125	125	125	*112*	*90.6*	*69.6*	*53.8*	*41.4*	*31.8*	*24.0*	*18.8*	*14.6*	*10.9*	*7.96*
16	125	125	*97.6*	*75.9*	*57.2*	*40.2*	*30.3*	*23.2*	*16.2*	*11.4*	*8.97*	*7.08*	*5.89*	*5.30*
17	125	125	125	*112*	*90.6*	*69.6*	*53.8*	*41.4*	*31.8*	*24.0*	*18.8*	*14.6*	*10.9*	*7.96*
18	125	125	*97.6*	*75.9*	*57.2*	*40.2*	*30.3*	*23.2*	*16.2*	*11.4*	*8.97*	*7.08*	*5.89*	*5.30*
19	125	125	*97.6*	*75.9*	*57.2*	*40.2*	*30.3*	*23.2*	*16.2*	*11.4*	*8.97*	*7.08*	*5.89*	*5.30*
20	125	125	*97.6*	*75.9*	*57.2*	*40.2*	*30.3*	*23.2*	*16.2*	*11.4*	*8.97*	*7.08*	*5.89*	*5.30*
21	106	106	*82.9*	*64.5*	*48.6*	*34.2*	*25.8*	*19.7*	*13.8*	*9.71*	*7.62*	*6.02*	*5.01*	*4.50*
22	125	125	*97.6*	*75.9*	*57.2*	*40.2*	*30.3*	*23.2*	*16.2*	*11.4*	*8.97*	*7.08*	*5.89*	*5.30*
23	106	106	*82.9*	*64.5*	*48.6*	*34.2*	*25.8*	*19.7*	*13.8*	*9.71*	*7.62*	*6.02*	*5.01*	*4.50*
24	125	125	*97.6*	*75.9*	*57.2*	*40.2*	*30.3*	*23.2*	*16.2*	*11.4*	*8.97*	*7.08*	*5.89*	*5.30*
25	106	106	*82.9*	*64.5*	*48.6*	*34.2*	*25.8*	*19.7*	*13.8*	*9.71*	*7.62*	*6.02*	*5.01*	*4.50*
26	125	125	*97.6*	*75.9*	*57.2*	*40.2*	*30.3*	*23.2*	*16.2*	*11.4*	*8.97*	*7.08*	*5.89*	*5.30*
27	106	106	*82.9*	*64.5*	*48.6*	*34.2*	*25.8*	*19.7*	*13.8*	*9.71*	*7.62*	*6.02*	*5.01*	*4.50*
28	106	106	*82.9*	*64.5*	*48.6*	*34.2*	*25.8*	*19.7*	*13.8*	*9.71*	*7.62*	*6.02*	*5.01*	*4.50*
29	125	125	125	*112*	*90.6*	*69.6*	*53.8*	*41.4*	*31.8*	*24.0*	*18.8*	*14.6*	*10.9*	*7.96* (**23**)
30	125	125	125	*112*	*90.6*	*69.6*	*53.8*	*41.4*	*31.8*	*24.0*	*18.8*	*14.6*	*10.9*	*7.96*
31	125	125	125	*112*	*90.6*	*69.6*	*53.8*	*41.4*	*31.8*	*24.0*	*18.8*	*14.6*	*10.9*	*7.96*
32	106	106	106	*94.8*	*77.0*	*59.1*	*45.8*	*35.2*	*27.0*	*20.4*	*16.0*	*12.4*	*9.25*	*6.77*
33	125	125	125	*112*	*90.6*	*69.6*	*53.8*	*41.4*	*31.8*	*24.0*	*18.8*	*14.6*	*10.9*	*7.96*
34	106	106	106	*94.8*	*77.0*	*59.1*	*45.8*	*35.2*	*27.0*	*20.4*	*16.0*	*12.4*	*9.25*	*6.77*
35	125	125	125	*112*	*90.6*	*69.6*	*53.8*	*41.4*	*31.8*	*24.0*	*18.8*	*14.6*	*10.9*	*7.96*
36	106	106	106	*94.8*	*77.0*	*59.1*	*45.8*	*35.2*	*27.0*	*20.4*	*16.0*	*12.4*	*9.25*	*6.77*
37	125	125	125	*112*	*90.6*	*69.6*	*53.8*	*41.4*	*31.8*	*24.0*	*18.8*	*14.6*	*10.9*	*7.96*
38	106	106	106	*94.8*	*77.0*	*59.1*	*45.8*	*35.2*	*27.0*	*20.4*	*16.0*	*12.4*	*9.25*	*6.77*
39	106	106	106	*94.8*	*77.0*	*59.1*	*45.8*	*35.2*	*27.0*	*20.4*	*16.0*	*12.4*	*9.25*	*6.77*
40	125	125	*97.6*	*75.9*	*57.2*	*40.2*	*30.3*	*23.2*	*16.2*	*11.4*	*8.97*	*7.08*	*5.89*	*5.30*
41	125	125	*97.6*	*75.9*	*57.2*	*40.2*	*30.3*	*23.2*	*16.2*	*11.4*	*8.97*	*7.08*	*5.89*	*5.30*
42	125	125	*97.6*	*75.9*	*57.2*	*40.2*	*30.3*	*23.2*	*16.2*	*11.4*	*8.97*	*7.08*	*5.89*	*5.30*
43	106	106	*82.9*	*64.5*	*48.6*	*34.2*	*25.8*	*19.7*	*13.8*	*9.71*	*7.62*	*6.02*	*5.01*	*4.50*
44	125	125	*97.6*	*75.9*	*57.2*	*40.2*	*30.3*	*23.2*	*16.2*	*11.4*	*8.97*	*7.08*	*5.89*	*5.30*
45	106	106	*82.9*	*64.5*	*48.6*	*34.2*	*25.8*	*19.7*	*13.8*	*9.71*	*7.62*	*6.02*	*5.01*	*4.50*

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	18Cr–10Ni–Cb	Smls. pipe	SA–376	TP348	S34800	...	...	8	1
2	18Cr–10Ni–Cb	Fittings	SA–403	348	S34800	CR	...	8	1
3	18Cr–10Ni–Cb	Fittings	SA–403	348	S34800	WP–S	...	8	1
4	18Cr–10Ni–Cb	Wld. fittings	SA–403	348	S34800	WP–W	...	8	1
5	18Cr–10Ni–Cb	Wld. fittings	SA–403	348	S34800	WP–WX	...	8	1
6	18Cr–10Ni–Cb	Forgings	SA–182	F348H	S34809	...	$t \le 130$	8	1
7	18Cr–10Ni–Cb	Smls. tube	SA–213	TP348H	S34809	...	...	8	1
8	18Cr–10Ni–Cb	Wld. tube	SA–249	TP348H	S34809	...	...	8	1
9	18Cr–10Ni–Cb	Smls. pipe	SA–312	TP348H	S34809	...	...	8	1
10	18Cr–10Ni–Cb	Wld. pipe	SA–312	TP348H	S34809	...	...	8	1
11	18Cr–10Ni–Cb	Fittings	SA–403	348H	S34809	CR	...	8	1
12	18Cr–10Ni–Cb	Fittings	SA–403	348H	S34809	WP–S	...	8	1
13	18Cr–10Ni–Cb	Wld. fittings	SA–403	348H	S34809	WP–W	...	8	1
14	18Cr–10Ni–Cb	Wld. fittings	SA–403	348H	S34809	WP–WX	...	8	1
15	18Cr–10Ni–Ti	Smls. pipe	SA–312	TP321	S32100	...	$t > 9.5$	8	1
16	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321	S32100	...	$t > 9.5$	8	1
(**23**) 17	18Cr–10Ni–Ti	Smls. pipe	SA–312	TP321H	S32109	...	$t > 9.5$	8	1
18	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321H	S32109	...	$t > 9.5$	8	1
19	18Cr–10Ni–Ti	Forgings	SA–182	F321	S32100	...	$t > 130$	8	1
20	18Cr–10Ni–Ti	Forgings	SA–965	F321	S32100	...	...	8	1
21	18Cr–10Ni–Ti	Forgings	SA–182	F321H	S32109	...	$t > 130$	8	1
22	18Cr–10Ni–Ti	Forgings	SA–965	F321H	S32109	...	...	8	1
23	18Cr–10Ni–Ti	Plate	SA/EN 10028–7	X6CrNiTi18–10	...	...	≤75	8	1
24	18Cr–10Ni–Ti	Forgings	SA–182	F321	S32100	...	$t \le 130$	8	1
25	18Cr–10Ni–Ti	Smls. tube	SA–213	TP321	S32100	...	...	8	1
26	18Cr–10Ni–Ti	Plate	SA–240	321	S32100	...	...	8	1
27	18Cr–10Ni–Ti	Wld. tube	SA–249	TP321	S32100	...	...	8	1
28	18Cr–10Ni–Ti	Smls. pipe	SA–312	TP321	S32100	...	$t \le 9.5$	8	1
29	18Cr–10Ni–Ti	Wld. pipe	SA–312	TP321	S32100	...	...	8	1
30	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321	S32100	...	$t \le 9.5$	8	1
31	18Cr–10Ni–Ti	Fittings	SA–403	321	S32100	CR	...	8	1
32	18Cr–10Ni–Ti	Fittings	SA–403	321	S32100	WP–S	...	8	1
33	18Cr–10Ni–Ti	Wld. fittings	SA–403	321	S32100	WP–W	...	8	1
34	18Cr–10Ni–Ti	Wld. fittings	SA–403	321	S32100	WP–WX	...	8	1
35	18Cr–10Ni–Ti	Forgings	SA–182	F321H	S32109	...	$t \le 130$	8	1
(**23**) 36	18Cr–10Ni–Ti	Smls. tube	SA–213	TP321H	S32109	...	...	8	1
37	18Cr–10Ni–Ti	Plate	SA–240	321H	S32109	...	...	8	1
38	18Cr–10Ni–Ti	Wld. tube	SA–249	TP321H	S32109	...	...	8	1
(**23**) 39	18Cr–10Ni–Ti	Smls. pipe	SA–312	TP321H	S32109	...	$t \le 9.5$	8	1
40	18Cr–10Ni–Ti	Wld. pipe	SA–312	TP321H	S32109	...	$t \le 9.5$	8	1
41	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321H	S32109	...	$t \le 9.5$	8	1
42	18Cr–10Ni–Ti	Fittings	SA–403	321H	S32109	CR	...	8	1
43	18Cr–10Ni–Ti	Fittings	SA–403	321H	S32109	WP–S	...	8	1
44	18Cr–10Ni–Ti	Wld. fittings	SA–403	321H	S32109	WP–W	...	8	1
45	18Cr–10Ni–Ti	Wld. fittings	SA–403	321H	S32109	WP–WX	...	8	1

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	515	205	816	HA–2	G2, G3, G4, T9
2	515	205	816	HA–2	G1, G2, G6, T9
3	515	205	816	HA–2	G1, G2, T9
4	515	205	816	HA–2	G1, G2, G6, T9
5	515	205	816	HA–2	G1, G2, G6, T9
6	515	205	816	HA–2	G2, T10
7	515	205	816	HA–2	G1, G2, T10
8	515	205	816	HA–2	G2, G6, T10
9	515	205	816	HA–2	G1, G2, T10
10	515	205	816	HA–2	G1, G2, G6, T10
11	515	205	816	HA–2	G1, G2, G6, T10
12	515	205	816	HA–2	G1, G2, T10
13	515	205	816	HA–2	G1, G2, G6, T10
14	515	205	816	HA–2	G1, G2, G6, T10
15	485	170	816	HA–2	G2, G3, T9
16	480	170	816	HA–2	G2, G3, G4, T9
17	480	170	816	HA–2	G2, T10
18	480	170	816	HA–2	G1, G2, T10
19	485	205	816	HA–2	G2, G3, T9
20	485	205	816	HA–2	G2, G3, T9
21	485	205	816	HA–2	G1, G2, T9
22	485	205	816	HA–2	G1, G2, G3, T9
23	500	200	550	HA–2	G2, G3, G16, T9
24	515	205	816	HA–2	G2, G3, T9
25	515	205	816	HA–2	G2, G3, T9
26	515	205	816	HA–2	G2, G3, T9
27	515	205	816	HA–2	G2, G3, G6, T9
28	515	205	816	HA–2	G2, G3, T9
29	515	205	816	HA–2	G2, G3, G6, T9
30	515	205	816	HA–2	G2, G3, G4, T9
31	515	205	816	HA–2	G2, G6, T9
32	515	205	816	HA–2	G2, T9
33	515	205	816	HA–2	G2, G6, T9
34	515	205	816	HA–2	G2, G6, T9
35	515	205	816	HA–2	G1, G2, T9
36	515	205	816	HA–2	G1, G2, T9
37	515	205	816	HA–2	G1, G2, T9
38	515	205	816	HA–2	G2, G6, T9
39	515	205	816	HA–2	G2, T9
40	515	205	816	HA–2	G2, G6, T9
41	515	205	816	HA–2	G1, G2, T9
42	515	205	816	HA–2	G1, G2, G6, T9
43	515	205	816	HA–2	G1, G2, T9
44	515	205	816	HA–2	G1, G2, G6, T9
45	515	205	816	HA–2	G1, G2, G6, T9

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	138	138	138	138	138	138	138	138	138	138	135	132	130	128	127	126	126	125
2	117	117	117	117	117	117	117	117	117	117	115	112	111	109	108	107	107	106
3	138	138	138	138	138	138	138	138	138	138	135	132	130	128	127	126	126	125
4	117	117	117	117	117	117	117	117	117	117	115	112	111	109	108	107	107	106
5	117	117	117	117	117	117	117	117	117	117	115	112	111	109	108	107	107	106
6	138	138	138	138	138	138	138	138	138	138	135	132	130	129	127	126	126	125
7	138	138	138	138	138	138	138	138	138	138	135	132	130	129	127	126	126	125
8	117	117	117	117	117	117	117	117	117	117	115	112	111	109	108	107	107	106
9	138	138	138	138	138	138	138	138	138	138	135	132	130	129	127	126	126	125
10	117	117	117	117	117	117	117	117	117	117	115	112	111	109	108	107	107	106
11	117	117	117	117	117	117	117	117	117	117	115	112	111	109	108	107	107	106
12	138	138	138	138	138	138	138	138	138	138	135	132	130	129	127	126	126	125
13	117	117	117	117	117	117	117	117	117	117	115	112	111	109	108	107	107	106
14	117	117	117	117	117	117	117	117	117	117	115	112	111	109	108	107	107	106
15	115	115	115	115	115	115	115	115	112	109	107	104	102	100	98.8	97.5	96.3	95.3
16	115	115	115	115	115	115	115	115	112	109	107	104	102	100	98.8	97.5	96.3	95.3
17	115	115	115	115	115	115	115	115	112	109	107	104	102	100	98.8	97.5	96.3	95.3
18	115	115	115	115	115	115	115	115	112	109	107	104	102	100	98.8	97.5	96.3	95.3
19	138	138	138	138	138	138	138	138	135	131	128	125	123	120	119	117	116	114
20	138	138	138	138	138	138	138	138	135	131	128	125	123	120	119	117	116	114
21	138	138	138	138	138	138	138	138	135	131	128	125	123	120	119	117	116	114
22	138	138	138	138	138	138	138	138	135	131	128	125	123	120	119	117	116	114
23	133	133	133	133	133	133	133	133	130	127	124	121	118	116	114	113	112	111
24	138	138	138	138	138	138	138	138	135	131	128	125	123	120	119	117	116	114
25	138	138	138	138	138	138	138	138	135	131	128	125	123	120	119	117	116	114
26	138	138	138	138	138	138	138	138	135	131	128	125	123	120	119	117	116	114
27	117	117	117	117	117	117	117	117	115	111	109	106	104	102	101	99.4	98.2	97.2
28	138	138	138	138	138	138	138	138	135	131	128	125	123	120	119	117	116	114
29	117	117	117	117	117	117	117	117	115	111	109	106	104	102	101	99.4	98.2	97.2
30	138	138	138	138	138	138	138	138	135	131	128	125	123	120	119	117	116	114
31	117	117	117	117	117	117	117	117	115	111	109	106	104	102	101	99.4	98.2	97.2
32	138	138	138	138	138	138	138	138	135	131	128	125	123	120	119	117	116	114
33	117	117	117	117	117	117	117	117	115	111	109	106	104	102	101	99.4	98.2	97.2
34	117	117	117	117	117	117	117	117	115	111	109	106	104	102	101	99.4	98.2	97.2
35	138	138	138	138	138	138	138	138	135	131	128	125	123	120	119	117	116	114
36	138	138	138	138	138	138	138	138	135	131	128	125	123	120	119	117	116	114
37	138	138	138	138	138	138	138	138	135	131	128	125	123	120	119	117	116	114
38	117	117	117	117	117	117	117	117	115	111	109	106	104	102	101	99.4	98.2	97.2
39	115	115	115	115	115	115	115	115	112	109	107	104	102	100	98.8	97.5	96.3	95.3
40	117	117	117	117	117	117	117	117	115	111	109	106	104	102	101	99.4	98.2	97.2
41	138	138	138	138	138	138	138	138	135	131	128	125	123	120	119	117	116	114
42	117	117	117	117	117	117	117	117	115	111	109	106	104	102	101	99.4	98.2	97.2
43	138	138	138	138	138	138	138	138	135	131	128	125	123	120	119	117	116	114
44	117	117	117	117	117	117	117	117	115	111	109	106	104	102	101	99.4	98.2	97.2
45	117	117	117	117	117	117	117	117	115	111	109	106	104	102	101	99.4	98.2	97.2

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	500	**525**	**550**	**575**	**600**	**625**	**650**	**675**	**700**	**725**	**750**	**775**	**800**	**825**	
1	125	125	*97.6*	*75.9*	*57.2*	*40.2*	*30.3*	*23.2*	*16.2*	*11.4*	*8.97*	*7.08*	*5.89*	*5.30*	
2	106	106	*82.9*	*64.5*	*48.6*	*34.2*	*25.8*	*19.7*	*13.8*	*9.71*	*7.62*	*6.02*	*5.01*	*4.50*	
3	125	125	*97.6*	*75.9*	*57.2*	*40.2*	*30.3*	*23.2*	*16.2*	*11.4*	*8.97*	*7.08*	*5.89*	*5.30*	
4	106	106	*82.9*	*64.5*	*48.6*	*34.2*	*25.8*	*19.7*	*13.8*	*9.71*	*7.62*	*6.02*	*5.01*	*4.50*	
5	106	106	*82.9*	*64.5*	*48.6*	*34.2*	*25.8*	*19.7*	*13.8*	*9.71*	*7.62*	*6.02*	*5.01*	*4.50*	
6	125	125	125	*112*	*90.6*	*69.6*	*53.8*	*41.4*	*31.8*	*24.0*	*18.8*	*14.6*	*10.9*	*7.96*	
7	125	125	125	*112*	*90.6*	*69.6*	*53.8*	*41.4*	*31.8*	*24.0*	*18.8*	*14.6*	*10.9*	*7.96*	
8	106	106	106	*94.8*	*77.0*	*59.1*	*45.8*	*35.2*	*27.0*	*20.4*	*16.0*	*12.4*	*9.25*	*6.77*	
9	125	125	125	*112*	*90.6*	*69.6*	*53.8*	*41.4*	*31.8*	*24.0*	*18.8*	*14.6*	*10.9*	*7.96*	
10	106	106	106	*94.8*	*77.0*	*59.1*	*45.8*	*35.2*	*27.0*	*20.4*	*16.0*	*12.4*	*9.25*	*6.77*	
11	106	106	106	*94.8*	*77.0*	*59.1*	*45.8*	*35.2*	*27.0*	*20.4*	*16.0*	*12.4*	*9.25*	*6.77*	
12	125	125	125	*112*	*90.6*	*69.6*	*53.8*	*41.4*	*31.8*	*24.0*	*18.8*	*14.6*	*10.9*	*7.96*	
13	106	106	106	*94.8*	*77.0*	*59.1*	*45.8*	*35.2*	*27.0*	*20.4*	*16.0*	*12.4*	*9.25*	*6.77*	
14	106	106	106	*94.8*	*77.0*	*59.1*	*45.8*	*35.2*	*27.0*	*20.4*	*16.0*	*12.4*	*9.25*	*6.77*	
15	94.4	93.6	*88.7*	*59.2*	*44.0*	*32.9*	*24.5*	*18.3*	*12.5*	*8.49*	*6.19*	*4.28*	*2.75*	*1.74*	
16	94.4	93.6	*88.7*	*59.2*	*44.0*	*32.9*	*24.5*	*18.3*	*12.5*	*8.49*	*6.19*	*4.28*	*2.75*	*1.74*	
17	94.4	93.6	92.7	*76.5*	*58.7*	*46.0*	*36.8*	*28.7*	*23.0*	*18.4*	*14.5*	*11.5*	*9.02*	*6.83*	(**23**)
18	94.4	93.6	92.7	*76.5*	*58.7*	*46.0*	*36.8*	*28.7*	*23.0*	*18.4*	*14.5*	*11.5*	*9.02*	*6.83*	
19	113	112	*88.7*	*59.2*	*44.0*	*32.9*	*24.5*	*18.3*	*12.5*	*8.49*	*6.19*	*4.28*	*2.75*	*1.74*	
20	113	112	*88.7*	*59.2*	*44.0*	*32.9*	*24.5*	*18.3*	*12.5*	*8.49*	*6.19*	*4.28*	*2.75*	*1.74*	
21	113	112	*100*	*76.5*	*58.7*	*46.0*	*36.8*	*28.7*	*23.0*	*18.4*	*14.5*	*11.5*	*9.02*	*6.83*	
22	113	112	*100*	*76.5*	*58.7*	*46.0*	*36.8*	*28.7*	*23.0*	*18.4*	*14.5*	*11.5*	*9.02*	*6.83*	
23	110	109	*88.7*	...	...	...	...	...	...	...	...	...	...	...	
24	113	112	*88.7*	*59.2*	*44.0*	*32.9*	*24.5*	*18.3*	*12.5*	*8.49*	*6.19*	*4.28*	*2.75*	*1.74*	
25	113	112	*88.7*	*59.2*	*44.0*	*32.9*	*24.5*	*18.3*	*12.5*	*8.49*	*6.19*	*4.28*	*2.75*	*1.74*	
26	113	112	*88.7*	*59.2*	*44.0*	*32.9*	*24.5*	*18.3*	*12.5*	*8.49*	*6.19*	*4.28*	*2.75*	*1.74*	
27	96.3	95.5	*75.4*	*50.3*	*37.4*	*28.0*	*20.8*	*15.5*	*10.7*	*7.22*	*5.26*	*3.64*	*2.34*	*1.48*	
28	113	112	*88.7*	*59.2*	*44.0*	*32.9*	*24.5*	*18.3*	*12.5*	*8.49*	*6.19*	*4.28*	*2.75*	*1.74*	
29	96.3	95.5	*75.4*	*50.3*	*37.4*	*28.0*	*20.8*	*15.5*	*10.7*	*7.22*	*5.26*	*3.64*	*2.34*	*1.48*	
30	113	112	*88.7*	*59.2*	*44.0*	*32.9*	*24.5*	*18.3*	*12.5*	*8.49*	*6.19*	*4.28*	*2.75*	*1.74*	
31	96.3	95.5	*75.4*	*50.3*	*37.4*	*28.0*	*20.8*	*15.5*	*10.7*	*7.22*	*5.26*	*3.64*	*2.34*	*1.48*	
32	113	112	*88.7*	*59.2*	*44.0*	*32.9*	*24.5*	*18.3*	*12.5*	*8.49*	*6.19*	*4.28*	*2.75*	*1.74*	
33	96.3	95.5	*75.4*	*50.3*	*37.4*	*28.0*	*20.8*	*15.5*	*10.7*	*7.22*	*5.26*	*3.64*	*2.34*	*1.48*	
34	96.3	95.5	*75.4*	*50.3*	*37.4*	*28.0*	*20.8*	*15.5*	*10.7*	*7.22*	*5.26*	*3.64*	*2.34*	*1.48*	
35	113	112	*100*	*76.5*	*58.7*	*46.0*	*36.8*	*28.7*	*23.0*	*18.4*	*14.5*	*11.5*	*9.02*	*6.83*	
36	113	112	*100*	*76.5*	*58.7*	*46.0*	*36.8*	*28.7*	*23.0*	*18.4*	*14.5*	*11.5*	*9.02*	*6.83*	(**23**)
37	113	112	*100*	*76.5*	*58.7*	*46.0*	*36.8*	*28.7*	*23.0*	*18.4*	*14.5*	*11.5*	*9.02*	*6.83*	
38	96.3	95.5	*85.3*	*65.1*	*49.9*	*39.1*	*31.3*	*24.4*	*19.5*	*15.6*	*12.3*	*9.80*	*7.67*	*5.80*	
39	94.4	93.6	*88.7*	*59.2*	*44.0*	*32.9*	*24.5*	*18.3*	*12.5*	*8.49*	*6.19*	*4.28*	*2.75*	*1.74*	(**23**)
40	96.3	95.5	*85.3*	*65.1*	*49.9*	*39.1*	*31.3*	*24.4*	*19.5*	*15.6*	*12.3*	*9.80*	*7.67*	*5.80*	
41	113	112	*100*	*76.5*	*58.7*	*46.0*	*36.8*	*28.7*	*23.0*	*18.4*	*14.5*	*11.5*	*9.02*	*6.83*	
42	96.3	95.5	*85.3*	*65.1*	*49.9*	*39.1*	*31.3*	*24.4*	*19.5*	*15.6*	*12.3*	*9.80*	*7.67*	*5.80*	
43	113	112	*100*	*76.5*	*58.7*	*46.0*	*36.8*	*28.7*	*23.0*	*18.4*	*14.5*	*11.5*	*9.02*	*6.83*	
44	96.3	95.5	*85.3*	*65.1*	*49.9*	*39.1*	*31.3*	*24.4*	*19.5*	*15.6*	*12.3*	*9.80*	*7.67*	*5.80*	
45	96.3	95.5	*85.3*	*65.1*	*49.9*	*39.1*	*31.3*	*24.4*	*19.5*	*15.6*	*12.3*	*9.80*	*7.67*	*5.80*	

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
(**23**)	1	18Cr–12Ni–2Mo	Castings	SA–351	CF8M	J92900	...	...	8	1
	2	18Cr–13Ni–3Mo	Plate	SA–240	317	S31700	...	$t \le 125$	8	1
	3	18Cr–13Ni–3Mo	Wld. tube	SA–249	TP317	S31700	...	...	8	1
	4	18Cr–13Ni–3Mo	Smls. pipe	SA–312	TP317	S31700	...	$t \le 125$	8	1
	5	18Cr–13Ni–3Mo	Wld. pipe	SA–312	TP317	S31700	...	$t \le 125$	8	1
	6	18Cr–13Ni–3Mo	Fittings	SA–403	317	S31700	WP–S	...	8	1
	7	18Cr–13Ni–3Mo	Plate	SA–240	317L	S31703	...	...	8	1
	8	18Cr–13Ni–3Mo	Fittings	SA–403	317L	S31703	WP–S	...	8	1
	9	18Cr–18Ni–2Si	Smls. tube	SA–213	XM–15	S38100	...	$t \le 125$	8	1
	10	18Cr–18Ni–2Si	Plate	SA–240	XM–15	S38100	...	$t \le 125$	8	1
	11	18Cr–18Ni–2Si	Wld. tube	SA–249	TPXM–15	S38100	...	$t \le 125$	8	1
	12	18Cr–18Ni–2Si	Smls. pipe	SA–312	TPXM–15	S38100	...	$t \le 125$	8	1
	13	18Cr–18Ni–2Si	Wld. pipe	SA–312	TPXM–15	S38100	...	$t \le 125$	8	1
(**23**)	14	21Cr–6Ni–9Mn	Forgings	SA–182	FXM–11	S21904	...	...	8	3
(**23**)	15	21Cr–6Ni–9Mn	Smls. pipe	SA–312	TPXM–11	S21904	...	...	8	3
(**23**)	16	21Cr–6Ni–9Mn	Wld. pipe	SA–312	TPXM–11	S21904	...	...	8	3
(**23**)	17	21Cr–6Ni–9Mn	Plate	SA–666	XM–11	S21904	...	...	8	3
(**23**)	18	21Cr–6Ni–9Mn	Forgings	SA–965	FXM–11	S21904	...	...	8	3
	19	22Cr–5Ni–3Mo–N	Forgings	SA–182	F51	S31803	...	...	10H	1
	20	22Cr–5Ni–3Mo–N	Plate	SA–240	...	S31803	...	...	10H	1
	21	22Cr–5Ni–3Mo–N	Smls. tube	SA–789	...	S31803	...	...	10H	1
	22	22Cr–5Ni–3Mo–N	Wld. tube	SA–789	...	S31803	...	...	10H	1
	23	22Cr–5Ni–3Mo–N	Smls. pipe	SA–790	...	S31803	...	...	10H	1
	24	22Cr–5Ni–3Mo–N	Wld. pipe	SA–790	...	S31803	...	...	10H	1
	25	22Cr–5Ni–3Mo–N	Plate	SA–240	...	S32205	...	...	10H	1
	26	22Cr–5Ni–3Mo–N	Smls. pipe	SA–790	...	S32205	...	...	10H	1
	27	22Cr–5Ni–3Mo–N	Wld. pipe	SA–790	...	S32205	...	...	10H	1
	28	22Cr–5Ni–3Mo–N	Forgings	SA–182	F60	S32205	...	...	10H	1
	29	22Cr–5Ni–3Mo–N	Smls. tube	SA–789	...	S32205	...	O.D. ≤ 200	10H	1
	30	22Cr–5Ni–3Mo–N	Wld. tube	SA–789	...	S32205	...	O.D. ≤ 200	10H	1
	31	22Cr–13Ni–5Mn	Forgings	SA–182	FXM–19	S20910	...	...	8	3
	32	22Cr–13Ni–5Mn	Plate	SA–240	XM–19	S20910	...	...	8	3
	33	22Cr–13Ni–5Mn	Wld. tube	SA–249	TPXM–19	S20910	...	...	8	3
	34	22Cr–13Ni–5Mn	Smls. pipe	SA–312	TPXM–19	S20910	...	...	8	3
	35	22Cr–13Ni–5Mn	Wld. pipe	SA–312	TPXM–19	S20910	...	...	8	3
	36	22Cr–13Ni–5Mn	Fittings	SA–403	XM–19	S20910	CR	...	8	3
	37	22Cr–13Ni–5Mn	Wld. fittings	SA–403	XM–19	S20910	WP–W	...	8	3
	38	22Cr–13Ni–5Mn	Wld. fittings	SA–403	XM–19	S20910	WP–WX	...	8	3
	39	22Cr–13Ni–5Mn	Bar	SA–479	XM–19	S20910	...	...	8	3
	40	22Cr–13Ni–5Mn	Forgings	SA–965	FXM–19	S20910	...	...	8	3
	41	23Cr–4Ni–Mo–Cu–N	Plate	SA–240	...	S32304	...	...	10H	1
	42	23Cr–12Ni	Fittings	SA–403	309	S30900	...	...	8	2
	43	23Cr–12Ni	Fittings	SA–403	309	S30900	WP–S	...	8	2
	44	23Cr–12Ni	Wld. fittings	SA–403	309	S30900	WP–W	...	8	2
	45	23Cr–12Ni	Wld. fittings	SA–403	309	S30900	WP–WX	...	8	2

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	485	205	816	HA–2	G2, G3, G4, G8, T10
2	515	205	816	HA–2	G2, G3, T10
3	515	205	816	HA–2	G2, G3, G6, T10
4	515	205	816	HA–2	G2, G3, T10
5	515	205	816	HA–2	G2, G3, G6, T10
6	515	205	816	HA–2	G2, T10
7	515	205	454	HA–4	G2
8	515	205	454	HA–4	G2
9	515	205	538	HA–2	G2, G3
10	515	205	538	HA–2	G2, G3
11	515	205	538	HA–2	G2, G3, G6
12	515	205	538	HA–2	G2, G3
13	515	205	538	HA–2	G2, G3, G6
14	620	345	316	HA–6	G2
15	620	345	316	HA–6	G2
16	620	345	316	HA–6	G2, G6
17	620	345	316	HA–6	G2
18	620	345	316	HA–6	G2
19	620	450	204	HA–5	G8
20	620	450	204	HA–5	G8
21	620	450	204	HA–5	G8
22	620	450	204	HA–5	G6, G8
23	620	450	204	HA–5	G8
24	620	450	204	HA–5	G6, G8
25	650	450	204	HA–5	G8
26	650	450	204	HA–5	G8
27	650	450	204	HA–5	G6, G8
28	650	480	204	HA–5	G8
29	650	480	204	HA–5	G8
30	650	480	204	HA–5	G6, G8
31	690	380	649	HA–6	G2, T11
32	690	380	649	HA–6	G2, T11
33	690	380	649	HA–6	G2, G6, T11
34	690	380	649	HA–6	G2, T11
35	690	380	649	HA–6	G2, G6, T11
36	690	380	649	HA–6	G2, G6, T11
37	690	380	649	HA–6	G2, G6, T11
38	690	380	649	HA–6	G2, G6, T11
39	690	380	649	HA–6	G2, T11
40	690	380	649	HA–6	G2, T11
41	600	400	316	HA–6	G2, G8
42	515	205	816	HA–2	G2, G6, T8
43	515	205	816	HA–2	G2, T8
44	515	205	816	HA–2	G2, G6, T8
45	515	205	816	HA–2	G2, G6, T8

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	138	138	138	138	138	138	134	129	125	122	119	116	114	112	111	110	109	108
2	138	138	138	138	138	138	134	129	125	122	119	116	114	112	111	110	109	108
3	117	117	117	117	117	117	114	110	107	104	101	98.9	97.1	95.6	94.3	93.2	92.3	91.5
4	138	138	138	138	138	138	134	129	125	122	119	116	114	112	111	110	109	108
5	117	117	117	117	117	117	114	110	107	104	101	98.9	97.1	95.6	94.3	93.2	92.3	91.5
6	138	138	138	138	138	138	134	129	125	122	119	116	114	112	111	110	109	108
7	138	138	138	138	138	136	131	127	123	120	118	115	113	111	109	107	105	103
8	138	138	138	138	138	136	131	127	123	120	118	115	113	111	109	107	105	103
9	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
10	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
11	117	117	117	117	117	114	110	106	103	101	98.5	96.4	94.4	92.5	90.7	89.0	87.4	85.8
12	138	138	138	138	138	134	129	125	122	119	116	113	111	109	107	105	103	101
13	117	117	117	117	117	114	110	106	103	101	98.5	96.4	94.4	92.5	90.7	89.0	87.4	85.8
14	230	230	230	218	204	193	184	176	170	165	161	159	...	...	...	...	...	...
15	230	230	230	218	204	193	184	176	170	165	161	159	...	...	...	...	...	...
16	195	195	195	185	174	164	156	150	145	140	137	135	...	...	...	...	...	...
17	230	230	230	218	204	193	184	176	170	165	161	159	...	...	...	...	...	...
18	230	230	230	218	204	193	184	176	170	165	161	159	...	...	...	...	...	...
19	259	259	259	254	247	241	236	232	...	...	...	...	...	...	...	...	...	...
20	259	259	259	254	247	241	236	232	...	...	...	...	...	...	...	...	...	...
21	259	259	259	254	247	241	236	232	...	...	...	...	...	...	...	...	...	...
22	220	220	220	216	210	205	201	198	...	...	...	...	...	...	...	...	...	...
23	259	259	259	254	247	241	236	232	...	...	...	...	...	...	...	...	...	...
24	220	220	220	220	220	220	220	219	...	...	...	...	...	...	...	...	...	...
25	273	273	263	254	247	241	236	232	...	...	...	...	...	...	...	...	...	...
26	273	273	263	254	247	241	236	232	...	...	...	...	...	...	...	...	...	...
27	232	232	224	216	210	205	201	198	...	...	...	...	...	...	...	...	...	...
28	273	273	273	273	266	259	255	251	...	...	...	...	...	...	...	...	...	...
29	273	273	273	273	266	259	255	251	...	...	...	...	...	...	...	...	...	...
30	232	232	232	232	226	220	216	213	...	...	...	...	...	...	...	...	...	...
31	253	253	253	253	253	253	253	248	243	239	234	231	227	225	222	219	217	215
32	253	253	253	253	253	253	253	248	243	239	234	231	227	225	222	219	217	215
33	215	215	215	215	215	215	215	211	207	203	199	196	193	191	189	187	185	183
34	253	253	253	253	253	253	253	248	243	239	234	231	227	225	222	219	217	215
35	215	215	215	215	215	215	215	211	207	203	199	196	193	191	189	187	185	183
36	215	215	215	215	215	215	215	211	207	203	199	196	193	191	189	187	185	183
37	215	215	215	215	215	215	215	211	207	203	199	196	193	191	189	187	185	183
38	215	215	215	215	215	215	215	211	207	203	199	196	193	191	189	187	185	183
39	253	253	253	253	253	253	253	248	243	239	234	231	227	225	222	219	217	215
40	253	253	253	253	253	253	253	248	243	239	234	231	227	225	222	219	217	215
41	250	242	227	219	213	208	205	202	200	198	195	192	...	...	...	...	...	...
42	117	117	117	117	117	117	117	117	115	113	111	109	108	106	105	104	103	101
43	138	138	138	138	138	138	138	138	135	133	131	129	127	125	124	122	121	119
44	117	117	117	117	117	117	117	117	115	113	111	109	108	106	105	104	103	101
45	117	117	117	117	117	117	117	117	115	113	111	109	108	106	105	104	103	101

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	
1	107	106	105	*97.8*	*80.8*	*65.0*	*50.5*	*39.2*	*30.4*	*23.6*	*18.4*	*14.3*	*11.1*	*8.60*	(**23**)
2	107	106	105	*99.9*	*80.8*	*65.0*	*50.4*	*38.6*	*29.6*	*23.0*	*17.5*	*13.5*	*10.6*	*8.12*	
3	90.7	90.0	89.2	*84.9*	*68.7*	*55.2*	*42.9*	*32.8*	*25.2*	*19.5*	*14.8*	*11.5*	*8.97*	*6.90*	
4	107	106	105	*99.9*	*80.8*	*65.0*	*50.4*	*38.6*	*29.6*	*23.0*	*17.5*	*13.5*	*10.6*	*8.12*	
5	90.7	90.0	89.2	*84.9*	*68.7*	*55.2*	*42.9*	*32.8*	*25.2*	*19.5*	*14.8*	*11.5*	*8.97*	*6.90*	
6	107	106	105	*99.9*	*80.8*	*65.0*	*50.4*	*38.6*	*29.6*	*23.0*	*17.5*	*13.5*	*10.6*	*8.12*	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	99.1	97.3	95.5	...	...	...	...	...	...	...	...	...	...	...	
10	99.1	97.3	95.5	...	...	...	...	...	...	...	...	...	...	...	
11	84.3	82.7	81.2	...	...	...	...	...	...	...	...	...	...	...	
12	99.1	97.3	95.5	...	...	...	...	...	...	...	...	...	...	...	
13	84.3	82.7	81.2	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	213	210	207	203	*126*	*84.2*	*56.2*	...	...	...	...	...	...	...	
32	213	210	207	203	*126*	*84.2*	*56.2*	...	...	...	...	...	...	...	
33	181	179	176	172	*107*	*71.5*	*47.8*	...	...	...	...	...	...	...	
34	213	210	207	203	*126*	*84.2*	*56.2*	...	...	...	...	...	...	...	
35	181	179	176	172	*107*	*71.5*	*47.8*	...	...	...	...	...	...	...	
36	181	179	176	172	*107*	*71.5*	*47.8*	...	...	...	...	...	...	...	
37	181	179	176	172	*107*	*71.5*	*47.8*	...	...	...	...	...	...	...	
38	181	179	176	172	*107*	*71.5*	*47.8*	...	...	...	...	...	...	...	
39	213	210	207	203	*126*	*84.2*	*56.2*	...	...	...	...	...	...	...	
40	213	210	207	203	*126*	*84.2*	*56.2*	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	99.7	*72.1*	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*	
43	117	*84.9*	*59.0*	*43.5*	*31.9*	*23.6*	*16.9*	*10.7*	*6.10*	*3.90*	*2.99*	*2.36*	*1.73*	*1.20*	
44	99.7	*72.1*	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*	
45	99.7	*72.1*	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*	

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	23Cr–12Ni	Smls. tube	SA–213	TP309S	S30908	...	...	8	2
2	23Cr–12Ni	Plate	SA–240	309S	S30908	...	...	8	2
3	23Cr–12Ni	Wld. tube	SA–249	TP309S	S30908	...	...	8	2
4	23Cr–12Ni	Smls. pipe	SA–312	TP309S	S30908	...	...	8	2
5	23Cr–12Ni	Wld. pipe	SA–312	TP309S	S30908	...	...	8	2
6	23Cr–12Ni	Wld. pipe	SA–813	TP309S	S30908	...	...	8	2
7	23Cr–12Ni	Wld. pipe	SA–814	TP309S	S30908	...	...	8	2
8	23Cr–12Ni	Smls. tube	SA–213	TP309H	S30909	...	...	8	2
9	23Cr–12Ni	Plate	SA–240	309H	S30909	...	...	8	2
10	23Cr–12Ni	Wld. tube	SA–249	TP309H	S30909	...	...	8	2
11	23Cr–12Ni	Smls. pipe	SA–312	TP309H	S30909	...	...	8	2
12	23Cr–12Ni	Wld. pipe	SA–312	TP309H	S30909	...	...	8	2
13	23Cr–12Ni	Bar	SA–479	309H	S30909	...	...	8	2
14	23Cr–12Ni–Cb	Smls. tube	SA–213	TP309Cb	S30940	...	...	8	2
15	23Cr–12Ni–Cb	Plate	SA–240	309Cb	S30940	...	...	8	2
16	23Cr–12Ni–Cb	Wld. tube	SA–249	TP309Cb	S30940	...	...	8	2
17	23Cr–12Ni–Cb	Smls. pipe	SA–312	TP309Cb	S30940	...	...	8	2
18	23Cr–12Ni–Cb	Wld. pipe	SA–312	TP309Cb	S30940	...	...	8	2
19	23Cr–12Ni–Cb	Wld. pipe	SA–813	TP309Cb	S30940	...	...	8	2
20	23Cr–12Ni–Cb	Wld. pipe	SA–814	TP309Cb	S30940	...	...	8	2
21	24Cr–22Ni–6Mo–2W–Cu–N	Forgings	SA–182	F58	S31266	...	...	45	...
22	24Cr–22Ni–6Mo–2W–Cu–N	Smls. tube	SA–213	...	S31266	...	...	45	...
23	24Cr–22Ni–6Mo–2W–Cu–N	Plate	SA–240	...	S31266	...	...	45	...
24	24Cr–22Ni–6Mo–2W–Cu–N	Wld. tube	SA–249	...	S31266	...	...	45	...
25	24Cr–22Ni–6Mo–2W–Cu–N	Smls. pipe	SA–312	...	S31266	...	...	45	...
26	24Cr–22Ni–6Mo–2W–Cu–N	Wld. pipe	SA–312	...	S31266	...	...	45	...
27	24Cr–22Ni–6Mo–2W–Cu–N	Wld. pipe	SA–358	...	S31266	...	...	45	...
28	24Cr–22Ni–6Mo–2W–Cu–N	Smls. fittings	SA–403	...	S31266	...	...	45	...
29	24Cr–22Ni–6Mo–2W–Cu–N	Wld. fittings	SA–403	...	S31266	...	...	45	...
30	24Cr–22Ni–6Mo–2W–Cu–N	Bar, shapes	SA–479	...	S31266	...	...	45	...
31	24Cr–22Ni–6Mo–2W–Cu–N	Wld. pipe	SA–813	...	S31266	...	...	45	...
32	25Cr–5Ni–3Mo–2Cu	Plate	SA–240	255	S32550	...	...	10H	1
33	25Cr–6Ni–Mo–N	Plate	SA–240	...	S31200	...	...	10H	1
34	25Cr–12Ni	Castings	SA–351	CH8	J93400	...	...	8	2
35	25Cr–12Ni	Castings	SA–351	CH20	J93402	...	...	8	2
36	25Cr–20Ni	Castings	SA–351	CK20	J94202	...	...	8	2
37	25Cr–20Ni	Forgings	SA–182	F310	S31000	...	$t \le 130$	8	2
38	25Cr–20Ni	Forgings	SA–965	F310	S31000	...	...	8	2
39	25Cr–20Ni	Smls. tube	SA–213	TP310S	S31008	...	...	8	2
40	25Cr–20Ni	Plate	SA–240	310S	S31008	...	...	8	2
41	25Cr–20Ni	Wld. tube	SA–249	TP310S	S31008	...	...	8	2
42	25Cr–20Ni	Smls. pipe	SA–312	TP310S	S31008	...	...	8	2
43	25Cr–20Ni	Wld. pipe	SA–312	TP310S	S31008	...	...	8	2
44	25Cr–20Ni	Fittings	SA–403	310S	S31008	CR	...	8	2
45	25Cr–20Ni	Fittings	SA–403	310S	S31008	WP–S	...	8	2

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	515	205	816	HA–2	G2, G3, T8
2	515	205	816	HA–2	G2, G3, T8
3	515	205	816	HA–2	G2, G6, T8
4	515	205	816	HA–2	G2, G3, T8
5	515	205	816	HA–2	G2, G3, G6, T8
6	515	205	816	HA–2	G2, G3, G6, T8
7	515	205	816	HA–2	G2, G3, G6, T8
8	515	205	816	HA–2	G2, T8
9	515	205	816	HA–2	G2, G4, T8
10	515	205	816	HA–2	G2, G6, T8
11	515	205	816	HA–2	G2, T8
12	515	205	816	HA–2	G2, G6, T8
13	515	205	816	HA–2	G2, T8
14	515	205	816	HA–2	G2, G3, T8
15	515	205	816	HA–2	G2, G3, T8
16	515	205	816	HA–2	G2, G3, G6, T8
17	515	205	816	HA–2	G2, G3, T8
18	515	205	816	HA–2	G2, G3, G6, T8
19	515	205	816	HA–2	G2, G3, G6, T8
20	515	205	816	HA–2	G2, G3, G6, T8
21	750	420	427	HA–10	G2, G8
22	752	421	426	HA–10	G2, G8
23	750	420	427	HA–10	G2, G8
24	752	421	426	HA–10	G2, G6, G8
25	752	421	426	HA–10	G2, G8
26	752	421	426	HA–10	G2, G6, G8
27	750	420	427	HA–10	G2, G6, G8
28	752	421	426	HA–10	G2, G8
29	752	421	426	HA–10	G2, G6, G8
30	752	421	426	HA–10	G2, G8
31	752	421	426	HA–10	G2, G6, G8
32	760	550	260	HA–5	G8
33	690	450	343	HA–5	G2, G8
34	450	195	816	HA–3	G2, G3, G4, G8, T9
35	485	205	816	HA–2	G2, T9
36	485	205	816	HA–3	G2, T9
37	515	205	816	HA–2	G2, G3, G5, G7, T8
38	515	205	816	HA–2	G2, G3, G5, G7, T8
39	515	205	816	HA–2	G2, G3, G5, G7, T8
40	515	205	816	HA–2	G2, G3, G5, G7, T8
41	515	205	816	HA–2	G2, G3, G5, G6, G7, T6
42	515	205	816	HA–2	G2, G3, G5, G7, T8
43	515	205	40	HA–2	G2, G3, G5, G6, G7
44	515	205	816	HA–2	G2, G6, T6
45	515	205	816	HA–2	G2, T8

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	138	138	138	138	138	138	138	138	135	133	131	129	127	125	124	122	121	119
2	138	138	138	138	138	138	138	138	135	133	131	129	127	125	124	122	121	119
3	117	117	117	117	117	117	117	117	115	113	111	109	108	106	105	104	103	101
4	138	138	138	138	138	138	138	138	135	133	131	129	127	125	124	122	121	119
5	117	117	117	117	117	117	117	117	115	113	111	109	108	106	105	104	103	101
6	117	117	117	117	117	117	117	117	115	113	111	109	108	106	105	104	103	101
7	117	117	117	117	117	117	117	117	115	113	111	109	108	106	105	104	103	101
8	138	138	138	138	138	138	138	138	135	133	131	129	127	125	124	122	121	119
9	138	138	138	138	138	138	138	138	135	133	131	129	127	125	124	122	121	119
10	117	117	117	117	117	117	117	117	115	113	111	109	108	106	105	104	103	101
11	138	138	138	138	138	138	138	138	135	133	131	129	127	125	124	122	121	119
12	117	117	117	117	117	117	117	117	115	113	111	109	108	106	105	104	103	101
13	138	138	138	138	138	138	138	138	135	133	131	129	127	125	124	122	121	119
14	138	138	138	138	138	138	138	138	135	133	131	129	127	125	124	122	121	119
15	138	138	138	138	138	138	138	138	135	133	131	129	127	125	124	122	121	119
16	117	117	117	117	117	117	117	117	115	113	111	109	108	106	105	104	103	101
17	138	138	138	138	138	138	138	138	135	133	131	129	127	125	124	122	121	119
18	117	117	117	117	117	117	117	117	115	113	111	109	108	106	105	104	103	101
19	117	117	117	117	117	117	117	117	115	113	111	109	108	106	105	104	103	101
20	117	117	117	117	117	117	117	117	115	113	111	109	108	106	105	104	103	101
21	280	280	280	280	280	280	280	280	280	280	280	280	280	279	278	277	275	...
22	280	280	280	280	280	280	280	280	280	280	280	280	280	279	278	277	275	...
23	280	280	280	280	280	280	280	280	280	280	280	280	280	279	278	277	275	...
24	238	238	238	238	238	238	238	238	238	238	238	238	238	237	236	235	234	...
25	280	280	280	280	280	280	280	280	280	280	280	280	280	279	278	277	275	...
26	238	238	238	238	238	238	238	238	238	238	238	238	238	237	236	235	234	...
27	238	238	238	238	238	238	238	238	238	238	238	238	238	237	236	235	234	...
28	280	280	280	280	280	280	280	280	280	280	280	280	280	279	278	277	275	...
29	238	238	238	238	238	238	238	238	238	238	238	238	238	237	236	235	234	...
30	280	280	280	280	280	280	280	280	280	280	280	280	280	279	278	277	275	...
31	238	238	238	238	238	238	238	238	238	238	238	238	238	237	236	235	234	...
32	316	316	316	306	295	286	279	274	271	269	...	...	...	...	...	...	...	...
33	287	287	287	287	287	287	287	287	284	279	274	268	260	...	...	...	...	...
34	129	129	129	129	129	128	126	124	123	121	119	117	115	112	109	106	103	100
35	138	138	138	138	138	137	135	133	131	129	128	125	123	120	117	114	111	107
36	129	129	129	129	129	128	126	124	123	121	119	117	115	112	109	106	103	100
37	138	138	138	138	138	138	138	137	134	131	129	127	125	123	122	120	119	117
38	138	138	138	138	138	138	138	137	134	131	129	127	125	123	122	120	119	117
39	138	138	138	138	138	138	138	137	134	131	129	127	125	123	122	120	119	117
40	138	138	138	138	138	138	138	137	134	131	129	127	125	123	122	120	119	117
41	117	117	117	117	117	117	114	112	110	108	106	105	104	102	101	99.6	98.2	*72.1*
42	138	138	138	138	138	138	138	137	134	131	129	127	125	123	122	120	119	117
43	117	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	117	117	117	117	117	117	114	112	110	108	106	105	104	102	101	99.6	98.2	*72.1*
45	138	138	138	138	138	138	138	137	134	131	129	127	125	123	122	120	119	117

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding													
	500	525	550	575	600	625	650	675	700	725	750	775	800	825
1	117	*84.9*	*59.0*	*43.5*	*31.9*	*23.6*	*16.9*	*10.7*	*6.10*	*3.90*	*2.99*	*2.36*	*1.73*	*1.20*
2	117	*84.9*	*59.0*	*43.5*	*31.9*	*23.6*	*16.9*	*10.7*	*6.10*	*3.90*	*2.99*	*2.36*	*1.73*	*1.20*
3	99.7	*72.1*	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*
4	117	*84.9*	*59.0*	*43.5*	*31.9*	*23.6*	*16.9*	*10.7*	*6.10*	*3.90*	*2.99*	*2.36*	*1.73*	*1.20*
5	99.7	*72.1*	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*
6	99.7	*72.1*	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*
7	99.7	*72.1*	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*
8	117	*108*	*83.7*	*64.0*	*48.5*	*36.3*	*27.3*	*21.0*	*15.9*	*12.5*	*9.87*	*7.65*	*5.97*	*4.74*
9	117	*108*	*83.7*	*64.0*	*48.5*	*36.3*	*27.3*	*21.0*	*15.9*	*12.5*	*9.87*	*7.65*	*5.97*	*4.74*
10	99.7	*91.6*	*71.1*	*54.4*	*41.2*	*30.8*	*23.2*	*17.9*	*13.5*	*10.7*	*8.39*	*6.50*	*5.08*	*4.03*
11	117	*108*	*83.7*	*64.0*	*48.5*	*36.3*	*27.3*	*21.0*	*15.9*	*12.5*	*9.87*	*7.65*	*5.97*	*4.74*
12	99.7	*91.6*	*71.1*	*54.4*	*41.2*	*30.8*	*23.2*	*17.9*	*13.5*	*10.7*	*8.39*	*6.50*	*5.08*	*4.03*
13	117	*108*	*83.7*	*64.0*	*48.5*	*36.3*	*27.3*	*21.0*	*15.9*	*12.5*	*9.87*	*7.65*	*5.97*	*4.74*
14	117	*84.9*	*59.0*	*43.5*	*31.9*	*23.6*	*16.9*	*10.7*	*6.10*	*3.90*	*2.99*	*2.36*	*1.73*	*1.20*
15	117	*84.9*	*59.0*	*43.5*	*31.9*	*23.6*	*16.9*	*10.7*	*6.10*	*3.90*	*2.99*	*2.36*	*1.73*	*1.20*
16	99.7	*72.1*	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*
17	117	*84.9*	*59.0*	*43.5*	*31.9*	*23.6*	*16.9*	*10.7*	*6.10*	*3.90*	*2.99*	*2.36*	*1.73*	*1.20*
18	99.7	*72.1*	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*
19	99.7	*72.1*	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*
20	99.7	*72.1*	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	96.9	93.7	*68.1*	*53.5*	*42.1*	*33.2*	*25.9*	*20.3*	*16.5*	*13.2*	*10.1*	*7.35*	*5.89*	*5.30*
35	104	100	*68.1*	*53.5*	*42.1*	*33.2*	*25.9*	*20.3*	*16.5*	*13.2*	*10.1*	*7.35*	*5.89*	*5.30*
36	96.9	93.7	*73.2*	*64.4*	*56.5*	*49.0*	*41.0*	*33.5*	*25.4*	*18.3*	*12.8*	*9.01*	*6.59*	*4.95*
37	116	*84.9*	*59.0*	*43.5*	*31.9*	*23.6*	*16.9*	*10.7*	*6.10*	*3.90*	*2.99*	*2.36*	*1.73*	*1.20*
38	116	*84.9*	*59.0*	*43.5*	*31.9*	*23.6*	*16.9*	*10.7*	*6.10*	*3.90*	*2.99*	*2.36*	*1.73*	*1.20*
39	116	*84.9*	*59.0*	*43.5*	*31.9*	*23.6*	*16.9*	*10.7*	*6.10*	*3.90*	*2.99*	*2.36*	*1.73*	*1.20*
40	116	*84.9*	*59.0*	*43.5*	*31.9*	*23.6*	*16.9*	*10.7*	*6.10*	*3.90*	*2.99*	*2.36*	*1.73*	*1.20*
41	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*	*0.71*	*1.02*
42	116	*84.9*	*59.0*	*43.5*	*31.9*	*23.6*	*16.9*	*10.7*	*6.10*	*3.90*	*2.99*	*2.36*	*1.73*	*1.20*
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*	*0.71*	*1.20*
45	116	*84.9*	*59.0*	*43.5*	*31.9*	*23.6*	*16.9*	*10.7*	*6.10*	*3.90*	*2.99*	*2.36*	*1.73*	*1.20*

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Condition/ Temper	Size/ Thickness, mm	P-No.	Group No.
1	25Cr–20Ni	Wld. fittings	SA–403	310S	S31008	WP–W	...	8	2
2	25Cr–20Ni	Wld. fittings	SA–403	310S	S31008	WP–WX	...	8	2
3	25Cr–20Ni	Wld. pipe	SA–813	TP310S	S31008	...	...	8	2
4	25Cr–20Ni	Wld. pipe	SA–814	TP310S	S31008	...	...	8	2
5	25Cr–20Ni	Smls. tube	SA–213	TP310H	S31009	...	...	8	2
6	25Cr–20Ni	Plate	SA–240	310H	S31009	...	...	8	2
7	25Cr–20Ni	Wld. tube	SA–249	TP310H	S31009	...	...	8	2
8	25Cr–20Ni	Smls. pipe	SA–312	TP310H	S31009	...	...	8	2
9	25Cr–20Ni	Wld. pipe	SA–312	TP310H	S31009	...	...	8	2
10	25Cr–20Ni–Cb	Wld. tube	SA–249	TP310Cb	S31040	...	...	8	2
11	25Cr–20Ni–Cb	Wld. pipe	SA–312	TP310Cb	S31040	...	...	8	2
12	25Cr–20Ni–Cb	Wld. pipe	SA–813	TP310Cb	S31040	...	...	8	2
13	25Cr–20Ni–Cb	Wld. pipe	SA–814	TP310Cb	S31040	...	...	8	2
14	25Cr–22Ni–2Mo–N	Forgings	SA–182	F310MoLN	S31050	...	...	8	2
15	25Cr–22Ni–2Mo–N	Smls. tube	SA–213	TP310MoLN	S31050	...	$6 < t \leq 32$	8	2
16	25Cr–22Ni–2Mo–N	Wld. tube	SA–249	TP310MoLN	S31050	...	$6 < t \leq 32$	8	2
17	25Cr–22Ni–2Mo–N	Wld. pipe	SA–312	TP310MoLN	S31050	...	$6 < t \leq 32$	8	2
18	25Cr–22Ni–2Mo–N	Plate	SA–240	310MoLN	S31050	...	...	8	2
19	25Cr–22Ni–2Mo–N	Smls. tube	SA–213	TP310MoLN	S31050	...	$t \leq 6$	8	2
20	25Cr–22Ni–2Mo–N	Wld. tube	SA–249	TP310MoLN	S31050	...	$t \leq 6$	8	2
21	25Cr–22Ni–2Mo–N	Wld. pipe	SA–312	TP310MoLN	S31050	...	$t \leq 6$	8	2
22	29Cr–6.5Ni–2Mo–N	Plate, sheet, strip	SA–240	...	S32906	...	$t \geq 10$	10H	1
23	29Cr–6.5Ni–2Mo–N	Bar	SA–479	...	S32906	...	...	10H	1
24	29Cr–6.5Ni–2Mo–N	Smls. tube	SA–789	...	S32906	...	$t \geq 10$	10H	1
25	29Cr–6.5Ni–2Mo–N	Smls. pipe	SA–790	...	S32906	...	$t \geq 10$	10H	1
26	29Cr–6.5Ni–2Mo–N	Plate, sheet, strip	SA–240	...	S32906	...	$t < 10$	10H	1
27	29Cr–6.5Ni–2Mo–N	Smls. tube	SA–789	...	S32906	...	$t < 10$	10H	1
28	29Cr–6.5Ni–2Mo–N	Smls. pipe	SA–790	...	S32906	...	$t < 10$	10H	1

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	515	205	816	HA–2	G2, G6, T6
2	515	205	816	HA–2	G2, G6, T6
3	515	205	816	HA–2	G2, G3, G5, G6, G7, T8
4	515	205	816	HA–2	G2, G3, G5, G6, G7, T8
5	515	205	816	HA–2	G2, T8
6	515	205	816	HA–2	G2, T8
7	515	205	816	HA–2	G2, G6, T8
8	515	205	816	HA–2	G2, T8
9	515	205	816	HA–2	G2, G6, T8
10	515	205	816	HA–2	G2, G3, G5, G6, G7, T8
11	515	205	816	HA–2	G2, G3, G5, G6, G7, T8
12	515	205	816	HA–2	G2, G3, G5, G6, G7, T8
13	515	205	816	HA–2	G2, G3, G5, G6, G7, T8
14	540	255	482	HA–2	...
15	540	255	482	HA–2	...
16	540	255	482	HA–2	G6
17	540	255	482	HA–2	G6
18	550	240	316	HA–2	...
19	580	270	482	HA–2	...
20	580	270	482	HA–2	G6
21	580	270	482	HA–2	G6
22	750	550	316	HA–5	G8
23	750	550	316	HA–5	G8
24	750	550	316	HA–5	G8
25	750	550	316	HA–5	G8
26	800	650	316	HA–5	G8
27	800	650	316	HA–5	G8
28	800	650	316	HA–5	G8

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature,°C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	117	117	117	117	117	117	114	112	110	108	106	105	104	102	101	99.6	98.2	*72.1*
2	117	117	117	117	117	117	114	112	110	108	106	105	104	102	101	99.6	98.2	*72.1*
3	117	117	117	117	117	117	117	117	114	112	110	108	106	105	104	102	101	99.6
4	117	117	117	117	117	117	117	117	114	112	110	108	106	105	104	102	101	99.6
5	138	138	138	138	138	138	138	137	134	131	129	127	125	123	122	120	119	117
6	138	138	138	138	138	138	138	137	134	131	129	127	125	123	122	120	119	117
7	117	117	117	117	117	117	117	117	114	112	110	108	106	105	104	102	101	99.6
8	138	138	138	138	138	138	138	137	134	131	129	127	125	123	122	120	119	117
9	117	117	117	117	117	117	117	117	114	112	110	108	106	105	104	102	101	99.6
10	117	117	117	117	117	117	117	117	114	112	110	108	106	105	104	102	101	99.6
11	117	117	117	117	117	117	117	117	114	112	110	108	106	105	104	102	101	99.6
12	117	117	117	117	117	117	117	117	114	112	110	108	106	105	104	102	101	99.6
13	117	117	117	117	117	117	117	117	114	112	110	108	106	105	104	102	101	99.6
14	170	170	170	170	170	170	166	162	158	154	150	147	144	140	137	134	131	128
15	170	170	170	170	170	170	166	162	158	154	150	147	144	140	137	134	131	128
16	145	145	145	145	145	145	141	138	134	131	128	125	122	119	117	114	111	109
17	145	145	145	145	145	145	141	138	134	131	128	125	122	119	117	114	111	109
18	161	161	161	161	161	161	157	153	149	146	142	139	...	...	...	...	...	...
19	179	179	179	179	179	179	175	171	166	162	159	155	151	148	145	141	138	135
20	152	152	152	152	152	152	149	145	141	138	135	132	129	126	123	120	117	115
21	152	152	152	152	152	152	149	145	141	138	135	132	129	126	123	120	117	115
22	313	313	313	297	287	280	276	272	265	257	253	253	...	...	...	...	...	...
23	313	313	312	297	287	280	276	272	265	257	253	253	...	...	...	...	...	...
24	313	313	312	297	287	280	276	272	265	257	253	253	...	...	...	...	...	...
25	313	313	312	297	287	280	276	272	265	257	253	253	...	...	...	...	...	...
26	333	333	333	333	333	329	325	319	311	302	297	297	...	...	...	...	...	...
27	333	333	333	333	333	329	325	319	311	302	297	297	...	...	...	...	...	...
28	333	333	333	333	333	329	325	319	311	302	297	297	...	...	...	...	...	...

Table 5A (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding													
	500	525	550	575	600	625	650	675	700	725	750	775	800	825
1	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*	*0.71*	*1.02*
2	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*	*0.71*	*1.20*
3	98.2	*72.1*	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*
4	98.2	*72.1*	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*
5	116	*108*	*83.7*	*64.0*	*48.5*	*36.3*	*27.3*	*21.0*	*15.9*	*12.5*	*9.87*	*7.65*	*5.97*	*4.74*
6	116	*108*	*83.7*	*64.0*	*48.5*	*36.3*	*27.3*	*21.0*	*15.9*	*12.5*	*9.87*	*7.65*	*5.97*	*4.74*
7	98.2	*91.6*	*71.1*	*54.4*	*41.2*	*30.8*	*23.2*	*17.9*	*13.5*	*10.7*	*8.39*	*6.50*	*5.08*	*4.03*
8	116	*108*	*83.7*	*64.0*	*48.5*	*36.3*	*27.3*	*21.0*	*15.9*	*12.5*	*9.87*	*7.65*	*5.97*	*4.74*
9	98.2	*91.6*	*71.1*	*54.4*	*41.2*	*30.8*	*23.2*	*17.9*	*13.5*	*10.7*	*8.39*	*6.50*	*5.08*	*4.03*
10	98.2	*72.1*	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*
11	98.2	*72.1*	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*
12	98.2	*72.1*	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*
13	98.2	*72.1*	*50.1*	*36.9*	*27.1*	*20.0*	*14.4*	*9.06*	*5.18*	*3.31*	*2.54*	*2.01*	*1.47*	*1.02*
14	126	...	...	...	...	...	...	...	...	...	...	...	...	...
15	126	...	...	...	...	...	...	...	...	...	...	...	...	...
16	107	...	...	...	...	...	...	...	...	...	...	...	...	...
17	107	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	133	...	...	...	...	...	...	...	...	...	...	...	...	...
20	113	...	...	...	...	...	...	...	...	...	...	...	...	...
21	113	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...

NOTES TO TABLE 5A

GENERAL NOTES

(a) The following abbreviations are used: NT, Normalized and tempered; QT, Quenched and tempered; Smls., Seamless; Temp., Temperature; and Wld., Welded.

(b) An alternative typeface is used for stress values obtained from time–dependent properties (see Notes T1 through T11).

(c) Where specifications, grades, classes, and types are listed in this Table, and where the material specification in Section II, Part A or Part B is a dual–unit specification (e.g., SA–516/SA–516M), the values listed in this Table shall be applicable to either the customary U.S. version of the material specification or the SI units version of the material specification. For example, the values listed for SA–516 Grade 70 shall be used when SA–516M Grade 485 is used in construction.

(d) The values in this Table may be interpolated to determine values for intermediate temperatures. The values at intermediate temperatures shall be rounded to the same number of decimal places as the value at the higher temperature between which values are being interpolated. The rounding rule is: when the next digit beyond the last place to be retained is less than 5, retain unchanged the digit in the last place retained; when the digit next beyond the last place to be retained is 5 or greater, increase by 1 the digit in the last place retained.

(e) The properties of steels are influenced by the processing history, heat treatment, melting practice, and level of residual elements. See Nonmandatory Appendix A for more information.

(f) Where a size limit appears in the Size/Thickness column, the limit applies to the dimension appropriate to the product form: wall thickness of tubing, pipe, pipe fittings, and hollow forgings; thickness of plate, flat bar and forgings, and polygonal bar; diameter of solid bar and bolting; and thickest cross–section of other pressure parts, e.g., castings and forgings.

NOTES – GENERAL REQUIREMENTS

G1 For temperatures above 550°C, these stress values may be used only if the material is heat treated by heating to a minimum temperature of 1095°C, and quenching in water or rapidly cooling by other means.

G2 Due to the relatively low yield strength of these materials, these higher stress values were established at temperatures where the short–time tensile properties govern to permit the use of these alloys where slightly greater deformation is acceptable. The stress values in this range exceed $66\frac{2}{3}$% but do not exceed 90% of the yield strength at temperature. Use of these stresses may result in dimensional changes due to permanent strain. These stress values are not recommended for the flanges of gasketed joints or other applications where slight amounts of distortion can cause leakage or malfunction. Table Y–2 lists multiplying factors that, when applied to the yield strength values shown in Table Y–1, will give allowable stress values that will result in lower levels of permanent strain.

G3 At temperatures over 550°C, these stress values apply only when the carbon is 0.04% or higher. This note is applicable only when stresses above 550°C are published.

G4 For temperatures above 550°C, these stress values may be used only if the material has been heat treated by heating to a minimum temperature of 1040°C and quenching in water or rapidly cooling by other means. This note is applicable only when stresses above 550°C are published.

G5 These stress values at temperatures of 575°C and above should be used only when assurance is provided that the steel has a predominant grain size not finer than ASTM No. 6. This note is applicable only when stresses above 550°C are published.

G6 A quality factor of 0.85 has been applied in arriving at the maximum allowable stress values for this material.

G7 These stress values shall be considered basic values to be used when no effort is made to control or check the grain size of the steel.

G8 This steel may be expected to develop embrittlement after service at moderately elevated temperature; see Nonmandatory Appendix A, A–207 and A–208.

G9 The tensile strength shall not be in excess of 140 MPa above the specified minimum.

G10 All forgings shall have a maximum tensile strength not in excess of 175 MPa above the specified minimum.

G11 SA–723 is exempt from the requirement in Section VIII, Division 2, 6.7.6.3(b) that the average of the individual Brinell hardness numbers shall not be more than 10% below or 25% above the number corresponding to the tensile strength.

G12 See Section VIII, Division 2, 3.4.

G13 Upon prolonged exposure to temperatures above 425°C, the carbide phase of carbon steel may be converted to graphite. See Nonmandatory Appendix A, A–201 and A–202.

G14 Upon prolonged exposure to temperatures above 475°C, the carbide phase of carbon–molybdenum steel may be converted to graphite. See Nonmandatory Appendix A, A–201 and A–202.

G15 This material may be susceptible to temper embrittlement. See Nonmandatory Appendix A, A–203.

G16 These stresses apply to all product forms (C, H, and P) as defined in SA/EN 10028–7.

(**23**) G17 The allowable stress value at 65°C shall be used at 66°C.

NOTES – HEAT TREATMENT REQUIREMENTS

H1 Annealed.

H2 Normalized, normalized and tempered, or quenched and tempered.

H3 For applications involving consideration of heat treatment after forming or welding, see Section VIII, Division 2, Table 6.15 for P–No. 10K, Group No. 1 materials.

H4 Liquid quenched and tempered.

NOTES – SIZE REQUIREMENTS

S1 The maximum thickness of forgings shall not exceed 95 mm (100 mm as heat treated).

S2 The maximum section thickness shall not exceed 75 mm for double–normalized–and–tempered forgings, or 125 mm for quenched–and–tempered forgings.

S3 Both DN 200 and larger, and schedule 140 and heavier.

S4 Either DN 200 and larger and less than schedule 140 wall, or less than DN 200 and all wall thicknesses.

NOTES TO TABLE 5A (CONT'D)

NOTES – TIME–DEPENDENT PROPERTIES

T1 Allowable stresses for temperatures of 350°C and above are values obtained from time–dependent properties.
T2 Allowable stresses for temperatures of 375°C and above are values obtained from time–dependent properties.
T3 Allowable stresses for temperatures of 400°C and above are values obtained from time–dependent properties.
T4 Allowable stresses for temperatures of 425°C and above are values obtained from time–dependent properties.
T5 Allowable stresses for temperatures of 450°C and above are values obtained from time–dependent properties.
T6 Allowable stresses for temperatures of 475°C and above are values obtained from time–dependent properties.
T7 Allowable stresses for temperatures of 500°C and above are values obtained from time–dependent properties.
T8 Allowable stresses for temperatures of 525°C and above are values obtained from time–dependent properties.
T9 Allowable stresses for temperatures of 550°C and above are values obtained from time–dependent properties.
T10 Allowable stresses for temperatures of 575°C and above are values obtained from time–dependent properties.
T11 Allowable stresses for temperatures of 600°C and above are values obtained from time–dependent properties.

NOTES – WELDING REQUIREMENTS

W1 Not for welded construction.
W2 Welding is not permitted when carbon content exceeds 0.35% by ladle analysis except for limited types of welding, as allowed in Section VIII, Division 2, Part 6.
W3 Nonwelded, or welded if the tensile strength of the Section IX reduced section tension test is not less than 690 MPa.
W4 Welded, with the tensile strength of the Section IX reduced section tension test less than 690 MPa but not less than 655 MPa.
W5 In welded construction, for temperatures above 450°C, the weld metal shall have a carbon content of greater than 0.05%.
W6 Section IX, QW–250 Variables QW–404.12, QW–406.3, QW–407.2, and QW–409.1 shall also apply to this material. These variables shall be applied in accordance with the rules for welding of Section VIII, Division 2, Part 6.
W7 The following, in addition to the variables in Section IX, QW–250, shall be considered as essential variables requiring requalification of the welding procedure:

(a) An increase in the maximum or a decrease in the minimum specified preheat or interpass temperatures. The specified range of preheat temperatures shall not exceed 85°C.

(b) A change in the thickness *T* of the welding procedure qualification test plate as follows:

(1) For welded joints that are quenched and tempered after welding, any increase in thickness (the minimum thickness qualified in all cases is 6 mm).

(2) For welded joints that are not quenched and tempered after welding, any change as follows:

(–a) for *T* less than 16 mm, any decrease in thickness (the maximum thickness qualified is 2*T*);

(–b) for *T* equal to 16 mm and over, any departure from the range of 16 mm to 2*T*.

(**23**)

Table 5B
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
1	...	Drawn smls. tube	SB–210	...	Alclad 3003	O
2	...	Drawn smls. tube	SB–210	...	Alclad 3003	H113
3	...	Smls. extr. tube	SB–241	...	Alclad 3003	O
4	...	Smls. extr. tube	SB–241	...	Alclad 3003	H112
5	...	Plate, sheet	SB–209	...	A93003	O
6	...	Plate, sheet	SB–209	...	A93003	H112
(**23**) 7	...	Plate, sheet	SB–209	...	A93003	H112
8	...	Plate, sheet	SB–209	...	A93003	H112
9	...	Drawn smls. tube	SB–210	...	A93003	O
10	...	Drawn smls. tube	SB–210	...	A93003	H113
11	...	Bar, rod, shapes	SB–221	...	A93003	O
12	...	Bar, rod, shapes	SB–221	...	A93003	H112
13	...	Smls. extr. tube	SB–241	...	A93003	O
14	...	Smls. pipe	SB–241	...	A93003	H112
15	...	Smls. extr. tube	SB–241	...	A93003	H112
16	...	Plate, sheet	SB–209	...	A93004	O
17	...	Plate, sheet	SB–209	...	A93004	H112
18	...	Plate, sheet	SB–209	...	A95052	O
19	...	Plate, sheet	SB–209	...	A95052	H112
20	...	Plate, sheet	SB–209	...	A95052	H112
(**23**) 21	...	Plate, sheet	SB–209	...	A95083	O
(**23**) 22	...	Plate, sheet	SB–209	...	A95083	O
(**23**) 23	...	Plate, sheet	SB–209	...	A95083	O
(**23**) 24	...	Plate, sheet	SB–209	...	A95083	O
(**23**) 25	...	Plate, sheet	SB–209	...	A95083	O
(**23**) 26	...	Plate, sheet	SB–209	...	A95083	H112
(**23**) 27	...	Plate, sheet	SB–209	...	A95083	H112
(**23**) 28	...	Bar, rod, shapes	SB–221	...	A95083	H111
(**23**) 29	...	Smls. extr. tube	SB–241	...	A95083	H111
(**23**) 30	...	Plate, sheet	SB–209	...	A95086	O
(**23**) 31	...	Plate, sheet	SB–209	...	A95086	H112
(**23**) 32	...	Plate, sheet	SB–209	...	A95086	H112
(**23**) 33	...	Plate, sheet	SB–209	...	A95086	H112
(**23**) 34	...	Plate, sheet	SB–209	...	A95086	H112
35	...	Plate, sheet	SB–209	...	A95454	O
36	...	Plate, sheet	SB–209	...	A95454	H112
37	...	Plate, sheet	SB–209	...	A95454	H112
38	...	Bar, rod, shapes	SB–221	...	A95454	O
39	...	Bar, rod, shapes	SB–221	...	A95454	H112
40	...	Smls. extr. tube	SB–241	...	A95454	O
41	...	Smls. extr. tube	SB–241	...	A95454	H112
42	...	Plate, sheet	SB–209	...	A96061	T4
43	...	Plate, sheet	SB–209	...	A96061	T451
44	...	Plate, sheet	SB–209	...	A96061	T6
45	...	Plate, sheet	SB–209	...	A96061	T651

Table 5B
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	0.254 ≤ *t* ≤ 13	21	90	30	204	NFA–7	G4, T3
2	1.27 ≤ *t* ≤ 13	21	90	30	204	NFA–7	G4, T3, W2
3	...	21	90	30	204	NFA–7	G4, T3
4	...	21	90	30	204	NFA–7	G4, T3, W2
5	0.15 ≤ *t* ≤ 80.00	21	95	35	204	NFA–1	G4, T4
6	6.30 ≤ *t* < 12.50	21	115	70	204	NFA–1	G4, T2, W2
7	12.50 ≤ *t* ≤ 40.00	21	105	40	204	NFA–1	G4, T2, W2
8	40.00 < *t* ≤ 80.00	21	100	40	204	NFA–1	G4, T2, W2
9	0.254 ≤ *t* ≤ 13	21	95	35	204	NFA–1	G4, T2
10	0.254 ≤ *t* ≤ 13	21	95	35	204	NFA–1	G4, T2, W2
11	...	21	95	35	204	NFA–1	G2, G4, T2
12	...	21	95	35	204	NFA–1	G2, G4, T2, W2
13	...	21	95	35	204	NFA–1	G4, T2
14	*t* ≥ 25	21	95	35	204	NFA–1	G4, T2
15	...	21	95	35	204	NFA–1	G4, T2, W2
16	0.152 ≤ *t* ≤ 75	22	150	60	204	NFA–3	G4, T2
17	6 ≤ *t* ≤ 75	22	160	60	204	NFA–3	G4, T2, W2
18	1.295 ≤ *t* ≤ 75	22	170	65	204	NFA–8	G4, T2
19	6 ≤ *t* < 13	22	195	110	204	NFA–8	G4, T2, W2
20	13 ≤ *t* ≤ 75	22	170	65	204	NFA–8	G4, T2, W2
21	1.295 ≤ *t* ≤ 38	25	275	125	66	NFA–11	G4, G6, G14
22	38 < *t* ≤ 76	25	270	115	66	NFA–11	G4, G6, G14
23	76 < *t* ≤ 125	25	260	110	66	NFA–11	G4, G6, G14
24	125 ≤ *t* ≤ 178	25	255	105	66	NFA–11	G4, G6, G14
25	178 < *t* ≤ 204	25	250	95	66	NFA–11	G4, G6, G14
26	6 ≤ *t* ≤ 38	25	275	125	66	NFA–11	G4, G6, G14, W2
27	38 < *t* ≤ 76	25	270	115	66	NFA–11	G4, G6, G14, W2
28	*t* ≤ 125	25	275	165	66	NFA–11	G2, G4, G6, G14, W2
29	...	25	275	165	66	NFA–11	G4, G6, G14, W2
30	1.295 ≤ *t* ≤ 50	25	240	95	66	NFA–9	G4, G6, G14
31	1.6002 ≤ *t* < 13	25	250	125	66	NFA–9	G4, G6, G14, W2
32	13 ≤ *t* < 25	25	240	110	66	NFA–9	G4, G6, G14, W2
33	25 < *t* ≤ 50	25	240	95	66	NFA–9	G4, G6, G14, W2
34	50 < *t* ≤ 76	25	235	95	66	NFA–9	G4, G6, G14, W2
35	1.295 ≤ *t* ≤ 75	22	215	85	204	NFA–6	G4, T1
36	6 ≤ *t* ≤ 13	22	220	125	204	NFA–6	G4, T2, W2
37	13 ≤ *t* ≤ 75	22	215	85	204	NFA–6	G4, T1, W2
38	*t* ≤ 125	22	215	85	204	NFA–6	G2, G4, T1
39	*t* ≤ 125	22	215	85	204	NFA–6	G2, G4, T1, W2
40	*t* ≤ 125	22	215	85	204	NFA–6	G4, T1
41	*t* ≤ 125	22	215	85	204	NFA–6	G4, T1, W2
42	1.295 ≤ *t* ≤ 6	23	205	110	204	NFA–13	G4, G8, T4, W3
43	6 ≤ *t* ≤ 75	23	205	110	204	NFA–13	G4, G8, T4, W3
44	1.295 ≤ *t* ≤ 6	23	290	240	204	NFA–12	G4, G8, T2, W3
45	6 ≤ *t* ≤ 100	23	290	240	204	NFA–12,13	G4, G8, T2, W3, W4

Table 5B
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	20.7	19.9	19.3	18.4	17.3	*13.6*	*10.9*	*8.88*	...	...	...	...	...	...	...	...	...	...
2	20.7	19.9	19.3	18.4	17.3	*13.6*	*10.9*	*8.88*	...	...	...	...	...	...	...	...	...	...
3	20.7	19.9	19.3	18.4	17.3	*13.6*	*10.9*	*8.88*	...	...	...	...	...	...	...	...	...	...
4	20.7	19.9	19.3	18.4	17.3	*13.6*	*10.9*	*8.88*	...	...	...	...	...	...	...	...	...	...
5	23.0	22.3	21.3	20.3	19.2	17.9	*16.7*	*8.88*	...	...	...	...	...	...	...	...	...	...
6	46.0	44.4	42.7	40.7	*18.2*	*13.6*	*10.9*	*8.88*	...	...	...	...	...	...	...	...	...	...
7	27.6	26.6	25.6	24.4	*18.2*	*13.6*	*10.9*	*8.88*	...	...	...	...	...	...	...	...	...	...
8	27.6	26.5	25.7	24.6	*18.2*	*13.6*	*10.9*	*8.88*	...	...	...	...	...	...	...	...	...	...
9	23.0	22.1	21.4	20.5	*18.2*	*13.6*	*10.9*	*8.88*	...	...	...	...	...	...	...	...	...	...
10	23.0	22.1	21.4	20.5	*18.2*	*13.6*	*10.9*	*8.88*	...	...	...	...	...	...	...	...	...	...
11	23.0	22.1	21.4	20.5	*18.2*	*13.6*	*10.9*	*8.88*	...	...	...	...	...	...	...	...	...	...
12	23.0	22.1	21.4	20.5	*18.2*	*13.6*	*10.9*	*8.88*	...	...	...	...	...	...	...	...	...	...
13	23.0	22.1	21.4	20.5	*18.2*	*13.6*	*10.9*	*8.88*	...	...	...	...	...	...	...	...	...	...
14	23.0	22.1	21.4	20.5	*18.2*	*13.6*	*10.9*	*8.88*	...	...	...	...	...	...	...	...	...	...
15	23.0	22.1	21.4	20.5	*18.2*	*13.6*	*10.9*	*8.88*	...	...	...	...	...	...	...	...	...	...
16	39.1	39.1	39.1	39.1	*38.9*	*26.9*	*17.4*	*11.2*	...	...	...	...	...	...	...	...	...	...
17	41.4	41.4	41.4	41.4	*38.9*	*26.9*	*17.4*	*11.2*	...	...	...	...	...	...	...	...	...	...
18	43.7	43.7	43.7	43.6	*41.6*	*28.8*	*17.6*	*10.6*	...	...	...	...	...	...	...	...	...	...
19	73.5	73.5	73.5	73.5	*41.6*	*28.8*	*17.6*	*10.6*	...	...	...	...	...	...	...	...	...	...
20	43.7	43.7	43.7	43.6	*41.6*	*28.8*	*17.6*	*10.6*	...	...	...	...	...	...	...	...	...	...
21	82.7	82.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	78.1	78.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	73.5	73.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	68.9	68.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	64.4	64.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	82.7	82.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	78.1	78.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	110	110	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	110	110	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	64.4	64.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	82.7	82.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	73.5	73.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	64.4	64.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	64.4	64.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	55.2	55.2	55.2	*50.7*	*37.5*	*28.6*	*21.7*	*16.5*	...	...	...	...	...	...	...	...	...	...
36	82.7	82.7	82.7	82.7	*37.5*	*28.6*	*21.7*	*16.5*	...	...	...	...	...	...	...	...	...	...
37	55.2	55.2	55.2	*50.7*	*37.5*	*28.6*	*21.7*	*16.5*	...	...	...	...	...	...	...	...	...	...
38	55.2	55.2	55.2	*50.7*	*37.5*	*28.6*	*21.7*	*16.5*	...	...	...	...	...	...	...	...	...	...
39	55.2	55.2	55.2	*50.7*	*37.5*	*28.6*	*21.7*	*16.5*	...	...	...	...	...	...	...	...	...	...
40	55.2	55.2	55.2	*50.7*	*37.5*	*28.6*	*21.7*	*16.5*	...	...	...	...	...	...	...	...	...	...
41	55.2	55.2	55.2	*50.7*	*37.5*	*28.6*	*21.7*	*16.5*	...	...	...	...	...	...	...	...	...	...
42	73.5	72.1	71.1	70.0	70.0	70.0	*40.2*	*21.1*	...	...	...	...	...	...	...	...	...	...
43	73.5	72.1	71.1	70.0	70.0	70.0	*40.2*	*21.1*	...	...	...	...	...	...	...	...	...	...
44	121	121	121	121	*113*	*75.6*	*40.2*	*21.1*	...	...	...	...	...	...	...	...	...	...
45	121	121	121	121	*113*	*75.6*	*40.2*	*21.1*	...	...	...	...	...	...	...	...	...	...

Table 5B
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 5B (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
1	...	Plate, sheet	SB–209	...	A96061	T651
2	...	Plate, sheet	SB–209	...	A96061	T6 wld.
3	...	Drawn smls. tube	SB–210	...	A96061	T4
4	...	Drawn smls. tube	SB–210	...	A96061	T6
5	...	Drawn smls. tube	SB–210	...	A96061	T6 wld.
6	...	Bar, rod, shapes	SB–221	...	A96061	T4
7	...	Bar, rod, shapes	SB–221	...	A96061	T6
8	...	Bar, rod, shapes	SB–221	...	A96061	T6 wld.
9	...	Smls. extr. tube/pipe	SB–241	...	A96061	T4
10	...	Smls. extr. tube/pipe	SB–241	...	A96061	T6
11	...	Smls. drawn pipe	SB–241	...	A96061	T6
12	...	Smls. drawn pipe	SB–241	...	A96061	T6
13	...	Smls. extr. tube/pipe	SB–241	...	A96061	T6 wld.
14	...	Smls. drawn pipe	SB–241	...	A96061	T6 wld.
15	...	Shapes	SB–308	...	A96061	T6
16	...	Shapes	SB–308	...	A96061	T6 wld.
17	...	Drawn smls. tube	SB–210	...	A96063	T6
18	...	Bar, rod, shapes	SB–221	...	A96063	T5
19	...	Bar, rod, shapes	SB–221	...	A96063	T5
20	...	Bar, rod, shapes	SB–221	...	A96063	T6
21	...	Smls. extr. tube	SB–241	...	A96063	T5
22	...	Smls. extr. tube	SB–241	...	A96063	T5
23	...	Smls. extr. tube	SB–241	...	A96063	T6
24	...	Bar, rod	SB–187	...	C10200	O60
25	...	Bar, rod	SB–187	...	C11000	O60
26	...	Smls. tube	SB–111	...	C28000	O61
27	...	Smls. tube	SB–111	...	C44300	O61
28	...	Smls. tube	SB–111	...	C44400	O61
29	...	Smls. tube	SB–111	...	C44500	O61
30	...	Plate	SB–171	...	C46400	M10, M20, O20, O25
31	...	Plate	SB–171	...	C46400	M10, M20, O20, O25
32	...	Smls. tube	SB–111	...	C60800	O61
33	...	Plate, sheet	SB–169	...	C61400	O25 or O60
34	...	Plate, sheet	SB–169	...	C61400	O25 or O60
35	...	Plate, sheet	SB–169	...	C61400	O25 or O60
(**23**) 36	...	Bar, rod	SB–98	...	C65100	O60
(**23**) 37	...	Bar, rod	SB–98	...	C65100	H02
(**23**) 38	...	Plate, sheet	SB–96	...	C65500	O61
(**23**) 39	...	Bar, rod	SB–98	...	C65500	O60
(**23**) 40	...	Bar, rod	SB–98	...	C65500	H02
(**23**) 41	...	Bar, rod	SB–98	...	C66100	O60
(**23**) 42	...	Bar, rod	SB–98	...	C66100	H02
43	...	Plate	SB–171	...	C70600	M10, M20, O20, O25
44	...	Condenser tubes	SB–111	...	C70600	O61
45	...	Smls. U-bend tube	SB–395	...	C70600	O61

Table 5B (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	100 < *t* ≤ 150	23	275	240	204	NFA-12,13	G4, G8, T2, W3, W4
2	...	23	165	...	204	NFA-12	G4, G8, T4
3	0.635 ≤ *t* ≤ 13	23	205	110	204	NFA-13	G4, T4, W3
4	0.635 ≤ *t* ≤ 13	23	290	240	204	NFA-12,13	G4, T2, W3, W4
5	...	23	165	...	204	NFA-12,13	G4, T2
6	...	23	180	110	204	NFA-13	G2, G4, G8, T4, W3
7	...	23	260	240	204	NFA-12,13	G2, G4, G8, T3, W3, W4
8	...	23	165	...	204	NFA-12,13	G2, G4, G8, T4, W4
9	...	23	180	110	204	NFA-13	G4, G8, T4, W3
10	...	23	260	240	204	NFA-12,13	G4, G8, T3, W3, W4
11	DN < 25	23	290	240	204	NFA-12,13	G4, T2, W3, W4
12	DN ≥ 25	23	260	240	204	NFA-12,13	G4, T3, W3, W4
13	...	23	165	...	204	NFA-12,13	G4, T4, W4
14	...	23	165	...	204	NFA-12,13	G4, T4, W4
15	...	23	260	240	204	NFA-12,13	G2, G4, T3, W3, W4
16	...	23	165	...	204	NFA-12,13	G2, G4, T4, W4
17	0.635 ≤ *t* ≤ 13	23	225	195	204	NFA-1	G4, T1, W3
18	*t* ≤ 13	23	150	110	204	NFA-1	G2, G4, T1, W3
19	13 < *t* ≤ 25	23	145	105	204	NFA-1	G2, G4, T1, W3
20	*t* ≤ 25	23	205	170	204	NFA-1	G2, G4, T1, W3
21	*t* ≤ 13	23	150	110	204	NFA-1	G4, T1, W3
22	13 < *t* ≤ 25	23	145	105	204	NFA-1	G4, T1, W3
23	*t* ≤ 25	23	205	170	204	NFA-1	G4, T1, W3
24	All	31	195	55	204	NFC-1	G1, G3, T3
25	All	31	195	55	204	NFC-1	G1, G3, T3
26	...	32	345	140	204	NFC-3	G3, G5, T4
27	...	32	310	105	204	NFC-2	G3, G5, T4
28	...	32	310	105	204	NFC-2	G3, G5, T4
29	...	32	310	105	204	NFC-2	G3, G5, T4
30	80 < *t* ≤ 140	32	345	125	204	NFC-2	G3, T3
31	*t* ≤ 80	32	345	140	204	NFC-2	G3, T3
32	...	35	345	130	260	NFC-3	G1, G3, G5, T3
33	50 < *t* ≤ 150	35	450	195	260	NFC-8	G3
34	12 < *t* ≤ 50	35	485	205	260	NFC-8	G3
35	*t* ≤ 12	35	495	220	260	NFC-8	G3
36	All	33	275	83	177	NFC-1	G1, G3, G9, T4
37	≤50	33	380	140	177	NFC-2	G3, G9, W2
38	≤50	33	345	125	177	NFC-2	G1, G3, G9, T3
39	All	33	360	100	177	NFC-2	G1, G3, G9, T4
40	≤50	33	485	260	177	NFC-2	G1, G3, G9, W2
41	All	33	360	100	177	NFC-2	G1, G3, G9, T4
42	≤50	33	485	260	177	NFC-2	G1, G3, G9, W2
43	*t* ≤ 140	34	275	105	316	NFC-3	G1, G3, T15
44	...	34	275	105	316	NFC-3	G1, G3, T15
45	...	34	275	105	316	NFC-3	G1, G3, T15

Table 5B (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	115	115	115	115	*113*	*75.6*	*40.2*	*21.1*	...	...	...	...	...	...	...	...	...	...
2	68.8	68.8	68.8	68.8	68.8	68.8	*40.2*	*21.1*	...	...	...	...	...	...	...	...	...	...
3	73.5	72.1	71.1	70.0	70.0	70.0	*40.2*	*21.1*	...	...	...	...	...	...	...	...	...	...
4	121	121	121	121	*113*	*75.6*	*40.2*	*21.1*	...	...	...	...	...	...	...	...	...	...
5	68.8	68.8	68.8	68.8	*68.8*	*68.8*	*40.2*	*21.1*	...	...	...	...	...	...	...	...	...	...
6	73.5	72.9	70.8	70.8	70.8	70.8	*40.2*	*21.1*	...	...	...	...	...	...	...	...	...	...
7	109	109	109	109	109	*75.6*	*40.2*	*21.1*	...	...	...	...	...	...	...	...	...	...
8	68.8	68.8	68.8	68.8	68.8	68.8	*40.2*	*21.1*	...	...	...	...	...	...	...	...	...	...
9	73.5	72.9	70.8	70.8	70.8	70.8	*40.2*	*21.1*	...	...	...	...	...	...	...	...	...	...
10	109	109	109	109	109	*75.6*	*40.2*	*21.1*	...	...	...	...	...	...	...	...	...	...
11	121	121	121	121	*113*	*75.6*	*40.2*	*21.1*	...	...	...	...	...	...	...	...	...	...
12	109	109	109	109	109	*75.6*	*40.2*	*21.1*	...	...	...	...	...	...	...	...	...	...
13	68.8	68.8	68.8	68.8	68.8	68.8	*40.2*	*21.1*	...	...	...	...	...	...	...	...	...	...
14	68.8	68.8	68.8	68.8	68.8	68.8	*40.2*	*21.1*	...	...	...	...	...	...	...	...	...	...
15	109	109	109	109	109	*75.6*	*40.2*	*21.1*	...	...	...	...	...	...	...	...	...	...
16	68.8	68.8	68.8	68.8	68.8	68.8	*40.2*	*21.1*	...	...	...	...	...	...	...	...	...	...
17	94.8	94.8	94.8	*64.0*	*49.2*	*27.5*	*15.3*	*8.53*	...	...	...	...	...	...	...	...	...	...
18	63.2	63.2	63.2	*59.4*	*31.6*	*24.0*	*15.3*	*8.53*	...	...	...	...	...	...	...	...	...	...
19	60.3	60.3	60.3	*59.4*	*31.6*	*24.0*	*15.3*	*8.53*	...	...	...	...	...	...	...	...	...	...
20	86.2	86.2	86.2	*64.0*	*49.2*	*27.5*	*15.3*	*8.53*	...	...	...	...	...	...	...	...	...	...
21	63.2	63.2	63.2	*59.4*	*31.6*	*24.0*	*15.3*	*8.53*	...	...	...	...	...	...	...	...	...	...
22	60.3	60.3	60.3	*59.4*	*31.6*	*24.0*	*15.3*	*8.53*	...	...	...	...	...	...	...	...	...	...
23	86.2	86.2	86.2	*64.0*	*49.2*	*27.5*	*15.3*	*8.53*	...	...	...	...	...	...	...	...	...	...
24	36.8	36.8	36.8	36.8	36.8	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
25	36.8	36.8	36.8	36.8	36.8	*31.1*	*21.9*	*14.8*	...	...	...	...	...	...	...	...	...	...
26	91.9	91.9	91.9	91.9	91.9	91.9	*41.0*	*19.1*	...	...	...	...	...	...	...	...	...	...
27	68.9	68.9	68.9	68.9	68.9	68.9	*41.5*	*18.3*	...	...	...	...	...	...	...	...	...	...
28	68.9	68.9	68.9	68.9	68.9	68.9	*41.5*	*18.3*	...	...	...	...	...	...	...	...	...	...
29	68.9	68.9	68.9	68.9	68.9	68.9	*41.5*	*18.3*	...	...	...	...	...	...	...	...	...	...
30	82.7	82.7	82.7	82.4	82.4	*46.1*	*21.6*	*8.70*	...	...	...	...	...	...	...	...	...	...
31	91.9	91.9	91.9	91.5	91.5	*46.1*	*21.6*	*8.70*	...	...	...	...	...	...	...	...	...	...
32	87.3	87.3	87.3	87.3	87.3	*70.4*	*44.9*	*30.6*	*17.7*	*9.48*	...	...	...	...	...	...	...	...
33	129	128	127	127	126	125	124	123	122	121	...	...	...	...	...	...	...	...
34	138	137	136	136	135	134	133	131	130	129	...	...	...	...	...	...	...	...
35	147	147	145	144	144	143	142	140	139	137	...	...	...	...	...	...	...	...
36	55.2	55.2	55.2	55.2	55.2	55.2	*50.8*	...	...	...	...	...	...	...	...	...	...	...
37	91.9	91.9	91.9	91.9	91.9	91.9	91.9	...	...	...	...	...	...	...	...	...	...	...
38	82.7	82.7	82.7	82.7	82.7	*75.4*	*50.8*	...	...	...	...	...	...	...	...	...	...	...
39	68.9	68.9	68.9	68.9	68.9	68.9	*50.8*	...	...	...	...	...	...	...	...	...	...	...
40	175	175	175	175	175	175	175	...	...	...	...	...	...	...	...	...	...	...
41	68.9	68.9	68.9	68.9	68.9	68.9	*50.8*	...	...	...	...	...	...	...	...	...	...	...
42	175	175	175	175	175	175	175	...	...	...	...	...	...	...	...	...	...	...
43	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	*60.4*	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
44	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	*60.4*	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
45	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	*60.4*	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...

Table 5B (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 5B (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
1	...	Plate	SB–171	...	C70620	M10, M20, O20, O25
2	...	Condenser tubes	SB–111	...	C70620	O61
3	...	Smls. U-bend tube	SB–395	...	C70620	O61
4	...	Plate	SB–171	...	C71500	M10, M20, O20, O25
5	...	Plate	SB–171	...	C71500	M10, M20, O20, O25
6	...	Condenser tubes	SB–111	...	C71500	O61
7	...	Smls. U-bend tube	SB–395	...	C71500	O61
(**23**) 8	...	Plate	SB–171	...	C71520	M10, M20, O20, O25
(**23**) 9	...	Plate	SB–171	...	C71520	M10, M20, O20, O25
10	...	Condenser tubes	SB–111	...	C71520	O61
11	...	Smls. U-bend tube	SB–395	...	C71520	O61
12	99Ni	Smls. pipe & tube	SB–161	...	N02200	Annealed
13	99Ni	Bar, rod	SB–160	...	N02200	Annealed
14	99Ni	Smls. pipe & tube	SB–161	...	N02200	Annealed
15	99Ni	Plate, sheet, strip	SB–162	...	N02200	Annealed
16	99Ni	Smls. tube	SB–163	...	N02200	Annealed
17	99Ni	Plate, sheet, strip	SB–162	...	N02200	As rolled
18	99Ni–Low C	Bar, rod	SB–160	...	N02201	Annealed
19	99Ni–Low C	Smls. pipe & tube	SB–161	...	N02201	Annealed
20	99Ni–Low C	Bar, rod	SB–160	...	N02201	Hot fin.
21	99Ni–Low C	Smls. pipe & tube	SB–161	...	N02201	Annealed
22	99Ni–Low C	Plate, sheet, strip	SB–162	...	N02201	Annealed
23	99Ni–Low C	Smls. tube	SB–163	...	N02201	Annealed
24	67Ni–30Cu	Bar, rod	SB–164	...	N04400	Annealed
25	67Ni–30Cu	Smls. pipe & tube	SB–165	...	N04400	Annealed
26	67Ni–30Cu	Forgings	SB–564	...	N04400	Annealed
27	67Ni–30Cu	Plate	SB–127	...	N04400	Annealed
28	67Ni–30Cu	Smls. tube	SB–163	...	N04400	Annealed
29	67Ni–30Cu	Smls. pipe & tube	SB–165	...	N04400	Annealed
30	67Ni–30Cu	Plate	SB–127	...	N04400	As rolled
31	67Ni–30Cu	Smls. tube	SB–163	...	N04400	Stress rel.
32	67Ni–30Cu–S	Bar, rod	SB–164	...	N04405	Annealed
33	47Ni–22Cr–9Mo–18Fe	Plate	SB–435	...	N06002	Annealed
34	47Ni–22Cr–9Mo–18Fe	Sheet	SB–435	...	N06002	Annealed
35	47Ni–22Cr–9Mo–18Fe	Rod	SB–572	...	N06002	Solution ann.
36	47Ni–22Cr–9Mo–18Fe	Wld. pipe	SB–619	...	N06002	Solution ann.
37	47Ni–22Cr–9Mo–18Fe	Smls. pipe & tube	SB–622	...	N06002	Solution ann.
38	47Ni–22Cr–9Mo–18Fe	Wld. tube	SB–626	...	N06002	Solution ann.
39	47Ni–22Cr–19Fe–6Mo	Rod	SB–581	...	N06007	Solution ann.
40	47Ni–22Cr–19Fe–6Mo	Plate, sheet, strip	SB–582	...	N06007	Solution ann.
41	47Ni–22Cr–19Fe–6Mo	Rod	SB–581	...	N06007	Solution ann.
42	47Ni–22Cr–19Fe–6Mo	Plate, sheet, strip	SB–582	...	N06007	Solution ann.
43	47Ni–22Cr–19Fe–6Mo	Wld. pipe	SB–619	...	N06007	Solution ann.
44	47Ni–22Cr–19Fe–6Mo	Smls. pipe & tube	SB–622	...	N06007	Solution ann.
45	47Ni–22Cr–19Fe–6Mo	Wld. tube	SB–626	...	N06007	Solution ann.

Table 5B (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	$t \le 140$	34	275	105	316	NFC–3	G1, G3, T15
2	...	34	275	105	316	NFC–3	G1, G3, T15
3	...	34	275	105	316	NFC–3	G1, G3, T15
4	$60 < t \le 140$	34	310	125	371	NFC–4	G1, G3
5	$t \le 60$	34	345	140	371	NFC–4	G1, G3
6	...	34	360	125	371	NFC–4	G1, G3
7	...	34	360	125	371	NFC–4	G1, G3
8	$60 < t \le 140$	34	310	125	371	NFC–4	G1, G3
9	$t \le 60$	34	345	140	371	NFC–4	G1, G3
10	...	34	360	125	371	NFC–4	G1, G3
11	...	34	360	125	371	NFC–4	G1, G3
12	O.D. > 125	41	380	80	316	NFN–2	G3
13	...	41	380	105	316	NFN–2	G2, G3
14	O.D. ≤ 125	41	380	105	316	NFN–2	G3
15	...	41	380	100	316	NFN–2	G3
16	...	41	380	100	316	NFN–2	G3
17	...	41	380	135	316	NFN–2	G3
18	...	41	345	70	316	NFN–1	G2, G3
19	O.D. > 125	41	345	70	649	NFN–1	G3, T10
20	...	41	345	70	316	NFN–1	G2, G3
21	O.D. ≤ 125	41	345	80	649	NFN–1	G3, T9
22	...	41	345	80	316	NFN–1	G3
23	...	41	345	80	649	NFN–1	G3, T9
24	...	42	480	170	482	NFN–3	G1, G2, G3, T9
25	O.D. > 125	42	480	170	482	NFN–3	G1, G3, T9
26	...	42	480	170	482	NFN–3	G1, G2, G3, T9
27	...	42	485	195	482	NFN–3	G1, G3, T9
28	...	42	485	195	482	NFN–3	G1, G3, T9
29	O.D. ≤ 125	42	480	195	482	NFN–3	G1, G3, T9
30	...	42	515	275	482	NFN–3	G1, G3, T8
31	...	42	585	380	427	NFN–3	G1, G3, T8, W1
32	...	42	480	170	482	NFN–3	G1, G2, G3, T9
33	$5 < t \le 64$	43	655	240	482	NFN–15	G1, G3, G13
34	$1.5 < t \le 5$	43	655	240	482	NFN–15	G1, G3, G13
35	$t > 5$	43	660	240	482	NFN–15	G1, G2, G3, G13
36	...	43	690	275	899	NFN–15	G1, G3, G7, G13, T11
37	...	43	690	275	899	NFN–15	G1, G3, G13, T11
38	...	43	690	275	899	NFN–15	G1, G3, G7, G13, T11
39	$t > 19$	45	585	205	538	NFN–11	G1, G2, G3
40	$t > 19$	45	585	205	538	NFN–11	G1, G3
41	$8 < t \le 19$	45	620	240	538	NFN–11	G1, G2, G3, T11
42	$5 < t \le 19$	45	620	240	538	NFN–11	G1, G3, T11
43	...	45	620	240	538	NFN–11	G1, G3, G7, T11
44	...	45	620	240	538	NFN–11	G1, G3, T11
45	...	45	620	240	538	NFN–11	G1, G3, G7, T11

Table 5B (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	*60.4*	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
2	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	*60.4*	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
3	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	*60.4*	*51.7*	*45.2*	*39.0*	...	...	...	...	...	...
4	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	...
5	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	...	...	...	...
6	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	...
7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	...
8	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	...
9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	...	...	...	...
10	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	...
11	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	...	...	...	...
12	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	...	...	...	...	...	...
13	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...	...
14	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...	...
15	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...	...
16	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...	...
17	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	91.9	...	...	...	...	...	...
18	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	...	...	...	...	...	...
19	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	*41.4*	*33.1*
20	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	46.0	...	...	...	...	...	...
21	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	*50.3*	*41.4*	*33.1*
22	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	...	...	...	...	...	...
23	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	*50.3*	*41.4*	*33.1*
24	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	*105*	*79.7*	*59.9*
25	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	*105*	*79.7*	*59.9*
26	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	*105*	*79.7*	*59.9*
27	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	*105*	*79.7*	*59.9*
28	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	*105*	*79.7*	*59.9*
29	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	*105*	*79.7*	*59.9*
30	184	184	184	184	184	184	184	184	184	184	184	184	184	184	*144*	*102*	*63.8*	*33.5*
31	244	244	244	244	244	244	244	244	244	244	244	244	244	244	*122*	*89.4*	*65.3*	...
32	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	*105*	*79.7*	*59.9*
33	161	161	161	161	161	161	161	161	156	152	148	145	142	140	138	137	136	135
34	161	161	161	161	161	161	161	161	156	152	148	145	142	140	138	137	136	135
35	161	161	161	161	161	161	161	161	156	152	148	145	142	140	138	137	136	135
36	156	156	156	156	156	156	156	156	151	147	144	141	138	136	134	133	132	131
37	184	184	184	184	184	184	184	184	178	173	169	165	162	160	158	157	155	154
38	156	156	156	156	156	156	156	156	151	147	144	141	138	136	134	133	132	131
39	138	138	138	138	138	138	138	138	138	138	135	134	132	131	130	129	128	128
40	138	138	138	138	138	138	138	138	138	138	135	134	132	131	130	129	128	128
41	161	161	161	161	161	161	161	161	161	160	158	156	154	153	152	151	150	149
42	161	161	161	161	161	161	161	161	161	160	158	156	154	153	152	151	150	149
43	137	137	137	137	137	137	137	137	137	136	134	132	131	130	129	128	127	127
44	161	161	161	161	161	161	161	161	161	160	158	156	154	153	152	151	150	149
45	137	137	137	137	137	137	137	137	137	136	134	132	131	130	129	128	127	127

Table 5B (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	*27.4*	*22.8*	*18.7*	*15.6*	*12.9*	*10.0*	*8.20*	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	*27.4*	*22.8*	*18.7*	*15.6*	*12.9*	*10.0*	*8.20*	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	*27.4*	*22.8*	*18.7*	*15.6*	*12.9*	*10.0*	*8.20*	...	...	...	...	...	...	...	...	...	...	
24	*40.8*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	*40.8*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	*40.8*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	*40.8*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	*40.8*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	*40.8*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	*17.0*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	*40.8*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	134	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	134	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	134	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	*114*	*114*	*113*	*109*	*97.4*	*80.1*	*65.7*	*55.1*	*46.5*	*38.0*	*30.7*	*24.8*	*20.1*	*16.2*	*13.1*	*10.6*	*8.57*	
37	*135*	*134*	*133*	*129*	*115*	*94.2*	*77.3*	*64.9*	*54.7*	*44.7*	*36.1*	*29.2*	*23.6*	*19.1*	*15.4*	*12.5*	*10.1*	
38	*114*	*114*	*113*	*109*	*97.4*	*80.1*	*65.7*	*55.1*	*46.5*	*38.0*	*30.7*	*24.8*	*20.1*	*16.2*	*13.1*	*10.6*	*8.57*	
39	127	127	126	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	127	127	126	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	*136*	*132*	*129*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	*136*	*132*	*129*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	*115*	*112*	*109*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	*136*	*132*	*129*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	*115*	*112*	*109*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

Table 5B (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
1	55Ni–21Cr–13.5Mo	Smls. & wld. fittings	SB–366	...	N06022	Solution ann.
2	55Ni–21Cr–13.5Mo	Forgings	SB–462	...	N06022	Solution ann.
3	55Ni–21Cr–13.5Mo	Forgings	SB–564	...	N06022	Solution ann.
4	55Ni–21Cr–13.5Mo	Rod	SB–574	...	N06022	Solution ann.
5	55Ni–21Cr–13.5Mo	Plate, sheet, strip	SB–575	...	N06022	Solution ann.
6	55Ni–21Cr–13.5Mo	Wld. pipe	SB–619	...	N06022	Solution ann.
7	55Ni–21Cr–13.5Mo	Smls. pipe & tube	SB–622	...	N06022	Solution ann.
8	55Ni–21Cr–13.5Mo	Wld. tube	SB–626	...	N06022	Solution ann.
9	59Ni–23Cr–16Mo	Wld. fittings	SB–366	...	N06059	Solution ann.
10	59Ni–23Cr–16Mo	Smls. fittings	SB–366	...	N06059	Solution ann.
11	59Ni–23Cr–16Mo	Forged fittings	SB–462	...	N06059	Solution ann.
12	59Ni–23Cr–16Mo	Forgings	SB–564	...	N06059	Solution ann.
13	59Ni–23Cr–16Mo	Bar, rod	SB–574	...	N06059	Solution ann.
14	59Ni–23Cr–16Mo	Plate, sheet, strip	SB–575	...	N06059	Solution ann.
15	59Ni–23Cr–16Mo	Wld. pipe	SB–619	...	N06059	Solution ann.
16	59Ni–23Cr–16Mo	Smls. pipe & tube	SB–622	...	N06059	Solution ann.
17	59Ni–23Cr–16Mo	Wld. tube	SB–626	...	N06059	Solution ann.
18	61Ni–16Mo–16Cr	Rod	SB–574	...	N06455	Solution ann.
19	61Ni–16Mo–16Cr	Plate, sheet, strip	SB–575	...	N06455	Solution ann.
20	61Ni–16Mo–16Cr	Wld. pipe	SB–619	...	N06455	Solution ann.
21	61Ni–16Mo–16Cr	Smls. pipe & tube	SB–622	...	N06455	Solution ann.
22	61Ni–16Mo–16Cr	Wld. tube	SB–626	...	N06455	Solution ann.
23	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Cold worked/ann.
24	72Ni–15Cr–8Fe	Smls. tube	SB–163	...	N06600	Annealed
25	72Ni–15Cr–8Fe	Bar, rod	SB–166	...	N06600	Annealed
26	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Cold worked/ann.
27	72Ni–15Cr–8Fe	Plate	SB–168	...	N06600	Annealed
28	72Ni–15Cr–8Fe	Forgings	SB–564	...	N06600	Annealed
29	72Ni–15Cr–8Fe	Wld. tube	SB–516	...	N06600	Cold drawn/ann.
30	72Ni–15Cr–8Fe	Wld. pipe	SB–517	...	N06600	Cold drawn/ann.
31	35Ni–19Cr–1¼Si	Bar	SB–511	...	N08330	Annealed
32	35Ni–19Cr–1¼Si	Smls. & wld. pipe	SB–535	...	N08330	Annealed
33	35Ni–19Cr–1¼Si	Plate, sheet, strip	SB–536	...	N08330	Annealed
34	42Fe–33Ni–21Cr	Smls. tube	SB–163	...	N08800	Annealed
35	42Fe–33Ni–21Cr	Smls. pipe & tube	SB–407	...	N08800	Annealed
36	42Fe–33Ni–21Cr	Plate	SB–409	...	N08800	Annealed
37	42Fe–33Ni–21Cr	Wld. pipe	SB–514	...	N08800	Annealed
38	42Fe–33Ni–21Cr	Wld. tube	SB–515	...	N08800	Annealed
39	42Fe–33Ni–21Cr	Forgings	SB–564	...	N08800	Annealed
40	42Fe–33Ni–21Cr	Bar, rod	SB–408	...	N08800	Hot fin.
41	42Fe–33Ni–21Cr	Smls. tube	SB–163	...	N08810	Annealed
42	42Fe–33Ni–21Cr	Smls. pipe & tube	SB–407	...	N08810	Annealed
43	42Fe–33Ni–21Cr	Bar, rod	SB–408	...	N08810	Annealed
44	42Fe–33Ni–21Cr	Plate	SB–409	...	N08810	Annealed
45	42Fe–33Ni–21Cr	Wld. pipe	SB–514	...	N08810	Annealed

Table 5B (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	...	43	690	310	677	NFN–10	G1, G12, T14
2	...	43	690	310	677	NFN–10	G1, G12, T14
3	...	43	690	310	677	NFN–10	G1, G12, T14
4	...	43	690	310	677	NFN–10	G1, G12, T14
5	...	43	690	310	677	NFN–10	G1, G12, T14
6	...	43	690	310	677	NFN–10	G1, G7, G12, T14
7	...	43	690	310	677	NFN–10	G1, G12, T14
8	...	43	690	310	677	NFN–10	G1, G7, G12, T14
9	...	43	690	310	760	NFN–14	G1, G3, G7, G11, T14
10	...	43	690	310	760	NFN–14	G1, G3, G11, T14
11	...	43	690	310	760	NFN–14	G1, G3, G11, T14
12	...	43	690	310	760	NFN–14	G1, G3, G11, T14
13	...	43	690	310	760	NFN–14	G1, G3, G11, T14
14	...	43	690	310	760	NFN–14	G1, G3, G11, T14
15	...	43	690	310	760	NFN–14	G1, G3, G7, G11, T14
16	...	43	690	310	760	NFN–14	G1, G3, G11, T14
17	...	43	690	310	760	NFN–14	G1, G3, G7, G11, T14
18	...	43	690	275	427	NFN–14	G1, G2, G3
19	...	43	690	275	427	NFN–14	G1, G3
20	...	43	690	275	427	NFN–14	G1, G3, G7
21	...	43	690	275	427	NFN–14	G1, G3
22	...	43	690	275	427	NFN–14	G1, G3, G7
23	O.D. > 125	43	550	205	649	NFN–4	G1, G3, T11
24	...	43	550	240	649	NFN–4	G1, G3, T11
25	...	43	550	240	649	NFN–4	G1, G2, G3, T11
26	O.D. ≤ 125	43	550	240	649	NFN–4	G1, G3, T11
27	...	43	550	240	649	NFN–4	G1, G3, T11
28	...	43	550	240	649	NFN–4	G1, G2, G3, T11
29	O.D. ≤ 114	43	550	240	649	NFN–4	G1, G3, G7, T11
30	O.D. ≤ 114	43	550	240	649	NFN–4	G1, G3, G7, T11
31	...	46	485	205	899	NFN–13	G1, G2, G3, G13, H1, T12
32	...	46	485	205	899	NFN–13	G1, G3, G7, G10, H2, T12
33	...	46	485	205	899	NFN–13	G1, G3, G10, H2, T12
34	...	45	520	205	816	NFN–8	G1, G3, T13
35	...	45	520	205	816	NFN–8	G1, G3, T13
36	...	45	520	205	816	NFN–8	G1, G3, T13
37	...	45	520	205	816	NFN–8	G1, G3, G7, T13
38	...	45	520	205	816	NFN–8	G1, G3, G7, T13
39	...	45	520	205	816	NFN–8	G1, G2, G3, T13
40	...	45	520	205	816	NFN–8	G1, G2, G3, T13
41	...	45	450	170	899	NFN–9	G1, G3, G13, T14
42	...	45	450	170	899	NFN–9	G1, G3, G13, T14
43	...	45	450	170	899	NFN–9	G1, G2, G3, G13, T14
44	...	45	450	170	899	NFN–9	G1, G3, G13, T14
45	...	45	450	170	899	NFN–9	G1, G3, G7, G13, T14

Table 5B (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	207	207	207	207	207	207	207	207	202	197	193	189	185	182	180	177	175	174
2	207	207	207	207	207	207	207	207	202	197	193	189	185	182	180	177	175	174
3	207	207	207	207	207	207	207	207	202	197	193	189	185	182	180	177	175	174
4	207	207	207	207	207	207	207	207	202	197	193	189	185	182	180	177	175	174
5	207	207	207	207	207	207	207	207	202	197	193	189	185	182	180	177	175	174
6	176	176	176	176	176	176	176	176	172	168	164	160	157	155	153	151	149	148
7	207	207	207	207	207	207	207	207	202	197	193	189	185	182	180	177	175	174
8	176	176	176	176	176	176	176	176	172	168	164	160	157	155	153	151	149	148
9	176	176	176	176	176	176	176	176	175	171	167	164	160	156	153	150	147	144
10	207	207	207	207	207	207	207	207	206	202	197	192	188	184	180	176	173	170
11	207	207	207	207	207	207	207	207	206	202	197	192	188	184	180	176	173	170
12	207	207	207	207	207	207	207	207	206	202	197	192	188	184	180	176	173	170
13	207	207	207	207	207	207	207	207	206	202	197	192	188	184	180	176	173	170
14	207	207	207	207	207	207	207	207	206	202	197	192	188	184	180	176	173	170
15	176	176	176	176	176	176	176	176	175	171	167	164	160	156	153	150	147	144
16	207	207	207	207	207	207	207	207	206	202	197	192	188	184	180	176	173	170
17	176	176	176	176	176	176	176	176	175	171	167	164	160	156	153	150	147	144
18	184	184	184	184	184	184	184	184	184	184	184	184	184	182	180	178	176	...
19	184	184	184	184	184	184	184	184	184	184	184	184	184	182	180	178	176	...
20	156	156	156	156	156	156	156	156	156	156	156	156	156	155	153	151	150	...
21	184	184	184	184	184	184	184	184	184	184	184	184	184	182	180	178	176	...
22	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	154	...
23	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
24	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
25	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
26	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
27	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
28	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161	161
29	137	137	137	137	137	137	137	137	137	137	137	137	137	137	137	137	137	137
30	137	137	137	137	137	137	137	137	137	137	137	137	137	137	137	137	137	137
31	138	138	138	138	138	138	138	138	138	135	132	129	127	124	122	120	118	116
32	138	138	138	138	138	138	138	138	138	135	132	129	127	124	122	120	118	116
33	138	138	138	138	138	138	138	138	138	135	132	129	127	124	122	120	118	116
34	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
35	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
36	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
37	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
38	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
39	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
40	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138
41	115	115	115	115	115	115	115	115	115	115	115	113	110	108	106	104	102	100
42	115	115	115	115	115	115	115	115	115	115	115	113	110	108	106	104	102	100
43	115	115	115	115	115	115	115	115	115	115	115	113	110	108	106	104	102	100
44	115	115	115	115	115	115	115	115	115	115	115	113	110	108	106	104	102	100
45	97.7	97.7	97.7	97.7	97.7	97.7	97.7	97.7	97.7	97.7	97.7	95.7	93.6	91.7	89.9	88.2	86.6	85.2

Table 5B (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
1	172	171	170	*149*	*112*	*84.2*	*65.6*	*53.1*	*41.2*	...	...	...	...	...	...	...	...
2	172	171	170	*149*	*112*	*84.2*	*65.6*	*53.1*	*41.2*	...	...	...	...	...	...	...	...
3	172	171	170	*149*	*112*	*84.2*	*65.6*	*53.1*	*41.2*	...	...	...	...	...	...	...	...
4	172	171	170	*149*	*112*	*84.2*	*65.6*	*53.1*	*41.2*	...	...	...	...	...	...	...	...
5	172	171	170	*149*	*112*	*84.2*	*65.6*	*53.1*	*41.2*	...	...	...	...	...	...	...	...
6	146	145	145	*127*	*95.0*	*71.6*	*55.7*	*45.2*	*35.0*	...	...	...	...	...	...	...	...
7	172	171	170	*149*	*112*	*84.2*	*65.6*	*53.1*	*41.2*	...	...	...	...	...	...	...	...
8	146	145	145	*127*	*95.0*	*71.6*	*55.7*	*45.2*	*35.0*	...	...	...	...	...	...	...	...
9	142	141	140	*130*	*104*	*82.9*	*67.4*	*55.8*	*45.1*	*36.7*	*30.3*	*25.2*	...	...	...	...	...
10	167	166	165	*153*	*122*	*97.5*	*79.3*	*65.6*	*53.0*	*43.1*	*35.6*	*29.6*	...	...	...	...	...
11	167	166	165	*153*	*122*	*97.5*	*79.3*	*65.6*	*53.0*	*43.1*	*35.6*	*29.6*	...	...	...	...	...
12	167	166	165	*153*	*122*	*97.5*	*79.3*	*65.6*	*53.0*	*43.1*	*35.6*	*29.6*	...	...	...	...	...
13	167	166	165	*153*	*122*	*97.5*	*79.3*	*65.6*	*53.0*	*43.1*	*35.6*	*29.6*	...	...	...	...	...
14	167	166	165	*153*	*122*	*97.5*	*79.3*	*65.6*	*53.0*	*43.1*	*35.6*	*29.6*	...	...	...	...	...
15	142	141	140	*130*	*104*	*82.9*	*67.4*	*55.8*	*45.1*	*36.7*	*30.3*	*25.2*	...	...	...	...	...
16	167	166	165	*153*	*122*	*97.5*	*79.3*	*65.6*	*53.0*	*43.1*	*35.6*	*29.6*	...	...	...	...	...
17	142	141	140	*130*	*104*	*82.9*	*67.4*	*55.8*	*45.1*	*36.7*	*30.3*	*25.2*	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	*84.8*	*58.4*	*39.7*	*27.0*	*19.2*	*15.0*	*13.7*	...	...	...	...	...	...	...	...	...	...
24	*84.8*	*58.4*	*39.7*	*27.0*	*19.2*	*15.0*	*13.7*	...	...	...	...	...	...	...	...	...	...
25	*84.8*	*58.4*	*39.7*	*27.0*	*19.2*	*15.0*	*13.7*	...	...	...	...	...	...	...	...	...	...
26	*84.8*	*58.4*	*39.7*	*27.0*	*19.2*	*15.0*	*13.7*	...	...	...	...	...	...	...	...	...	...
27	*84.8*	*58.4*	*39.7*	*27.0*	*19.2*	*15.0*	*13.7*	...	...	...	...	...	...	...	...	...	...
28	*84.8*	*58.4*	*39.7*	*27.0*	*19.2*	*15.0*	*13.7*	...	...	...	...	...	...	...	...	...	...
29	*72.0*	*49.6*	*33.8*	*23.0*	*16.3*	*12.7*	*11.7*	...	...	...	...	...	...	...	...	...	...
30	*72.0*	*49.6*	*33.8*	*23.0*	*16.3*	*12.7*	*11.7*	...	...	...	...	...	...	...	...	...	...
31	114	*97.7*	*78.8*	*63.4*	*50.5*	*40.0*	*32.1*	*26.5*	*22.1*	*17.7*	*13.8*	*11.2*	*9.02*	*7.08*	*5.80*	*4.47*	*3.26*
32	114	*97.7*	*78.8*	*63.4*	*50.5*	*40.0*	*32.1*	*26.5*	*22.1*	*17.7*	*13.8*	*11.2*	*9.02*	*7.08*	*5.80*	*4.47*	*3.26*
33	114	*97.7*	*78.8*	*63.4*	*50.5*	*40.0*	*32.1*	*26.5*	*22.1*	*17.7*	*13.8*	*11.2*	*9.02*	*7.08*	*5.80*	*4.47*	*3.26*
34	138	138	*116*	*91.3*	*71.4*	*54.2*	*37.9*	*25.5*	*13.2*	*10.2*	*7.48*	*6.14*	*5.31*	...	...	...	...
35	138	138	*116*	*91.3*	*71.4*	*54.2*	*37.9*	*25.5*	*13.2*	*10.2*	*7.48*	*6.14*	*5.31*	...	...	...	...
36	138	138	*116*	*91.3*	*71.4*	*54.2*	*37.9*	*25.5*	*13.2*	*10.2*	*7.48*	*6.14*	*5.31*	...	...	...	...
37	117	117	*98.7*	*77.6*	*60.7*	*46.0*	*32.2*	*21.7*	*11.2*	*8.63*	*6.36*	*5.22*	*4.52*	...	...	...	...
38	117	117	*98.7*	*77.6*	*60.7*	*46.0*	*32.2*	*21.7*	*11.2*	*8.63*	*6.36*	*5.22*	*4.52*	...	...	...	...
39	138	138	*116*	*91.3*	*71.4*	*54.2*	*37.9*	*25.5*	*13.2*	*10.2*	*7.48*	*6.14*	*5.31*	...	...	...	...
40	138	138	*116*	*91.3*	*71.4*	*54.2*	*37.9*	*25.5*	*13.2*	*10.2*	*7.48*	*6.14*	*5.31*	...	...	...	...
41	98.6	97.1	95.7	*91.8*	*75.8*	*62.1*	*50.6*	*41.2*	*33.6*	*27.7*	*22.5*	*18.3*	*14.9*	*12.1*	*9.80*	*8.04*	*6.70*
42	98.6	97.1	95.7	*91.8*	*75.8*	*62.1*	*50.6*	*41.2*	*33.6*	*27.7*	*22.5*	*18.3*	*14.9*	*12.1*	*9.80*	*8.04*	*6.70*
43	98.6	97.1	95.7	*91.8*	*75.8*	*62.1*	*50.6*	*41.2*	*33.6*	*27.7*	*22.5*	*18.3*	*14.9*	*12.1*	*9.80*	*8.04*	*6.70*
44	98.6	97.1	95.7	*91.8*	*75.8*	*62.1*	*50.6*	*41.2*	*33.6*	*27.7*	*22.5*	*18.3*	*14.9*	*12.1*	*9.80*	*8.04*	*6.70*
45	83.8	82.6	81.3	*78.1*	*64.5*	*52.8*	*43.0*	*35.1*	*28.6*	*23.5*	*19.1*	*15.6*	*12.7*	*10.3*	*8.33*	*6.84*	*5.70*

Table 5B (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
1	42Fe–33Ni–21Cr	Wld. tube	SB–515	...	N08810	Annealed
2	42Fe–33Ni–21Cr	Forgings	SB–564	...	N08810	Annealed
3	42Ni–21.5Cr–3Mo–2.3Cu	Smls. tube	SB–163	...	N08825	Annealed
4	42Ni–21.5Cr–3Mo–2.3Cu	Smls. pipe & tube	SB–423	...	N08825	Annealed
5	42Ni–21.5Cr–3Mo–2.3Cu	Plate, sheet, strip	SB–424	...	N08825	Annealed
6	42Ni–21.5Cr–3Mo–2.3Cu	Bar, rod	SB–425	...	N08825	Annealed
7	42Ni–21.5Cr–3Mo–2.3Cu	Forgings	SB–564	...	N08825	Annealed
8	62Ni–28Mo–5Fe	Plate	SB–333	...	N10001	Solution ann.
9	62Ni–28Mo–5Fe	Wld. pipe	SB–619	...	N10001	Solution ann.
10	62Ni–28Mo–5Fe	Smls. pipe & tube	SB–622	...	N10001	Solution ann.
11	62Ni–28Mo–5Fe	Wld. tube	SB–626	...	N10001	Solution ann.
12	62Ni–28Mo–5Fe	Rod	SB–335	...	N10001	Solution ann.
13	62Ni–28Mo–5Fe	Rod	SB–335	...	N10001	Solution ann.
14	62Ni–28Mo–5Fe	Sheet, strip	SB–333	...	N10001	Solution ann.
15	70Ni–16Mo–7Cr–5Fe	Plate, sheet, strip	SB–434	...	N10003	Annealed
16	70Ni–16Mo–7Cr–5Fe	Rod	SB–573	...	N10003	Solution ann.
17	54Ni–16Mo–15Cr	Smls. fittings	SB–366	...	N10276	Solution ann.
18	54Ni–16Mo–15Cr	Wld. fittings	SB–366	...	N10276	Solution ann.
19	54Ni–16Mo–15Cr	Forgings	SB–462	...	N10276	Solution ann.
20	54Ni–16Mo–15Cr	Rod	SB–574	...	N10276	Solution ann.
21	54Ni–16Mo–15Cr	Plate, sheet, strip	SB–575	...	N10276	Solution ann.
22	54Ni–16Mo–15Cr	Wld. pipe	SB–619	...	N10276	Solution ann.
23	54Ni–16Mo–15Cr	Smls. pipe & tube	SB–622	...	N10276	Solution ann.
24	54Ni–16Mo–15Cr	Wld. tube	SB–626	...	N10276	Solution ann.
25	65Ni–28Mo–2Fe	Plate, sheet, strip	SB–333	...	N10665	Solution ann.
26	65Ni–28Mo–2Fe	Rod	SB–335	...	N10665	Solution ann.
27	65Ni–28Mo–2Fe	Smls. fittings	SB–366	...	N10665	Solution ann.
28	65Ni–28Mo–2Fe	Wld. fittings	SB–366	...	N10665	Solution ann.
29	65Ni–28Mo–2Fe	Forgings	SB–462	...	N10665	Solution ann.
30	65Ni–28Mo–2Fe	Wld. pipe	SB–619	...	N10665	Solution ann.
31	65Ni–28Mo–2Fe	Smls. pipe & tube	SB–622	...	N10665	Solution ann.
32	65Ni–28Mo–2Fe	Wld. tube	SB–626	...	N10665	Solution ann.
(**23**) 33	Ti	Plate, sheet, strip	SB–265	1	R50250	Annealed
(**23**) 34	Ti	Bar, billet	SB–348	1	R50250	Annealed
(**23**) 35	Ti	Forgings	SB–381	1	R50250	Annealed
(**23**) 36	Ti	Smls. tube	SB–338	1	R50250	Smls. ann.
(**23**) 37	Ti	Smls. pipe	SB–861	1	R50250	Smls. ann.
(**23**) 38	Ti	Wld. tube	SB–338	1	R50250	Wld. ann.
(**23**) 39	Ti	Wld. pipe	SB–862	1	R50250	Wld. ann.
(**23**) 40	Ti	Plate, sheet, strip	SB–265	2	R50400	Annealed
(**23**) 41	Ti	Bar, billet	SB–348	2	R50400	Annealed
(**23**) 42	Ti	Forgings	SB–381	2	R50400	Annealed
(**23**) 43	Ti	Smls. tube	SB–338	2	R50400	Smls. ann.
(**23**) 44	Ti	Smls. pipe	SB–861	2	R50400	Smls. ann.
(**23**) 45	Ti	Wld. tube	SB–338	2	R50400	Wld. ann.

Table 5B (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	...	45	450	170	899	NFN–9	G1, G3, G7, G13, T14
2	...	45	448	172	899	NFN–9	G1, G2, G3, G13, T14
3	...	45	585	240	538	NFN–7	G1, G3
4	...	45	585	240	538	NFN–7	G1, G3
5	...	45	585	240	538	NFN–7	G1, G3
6	...	45	585	240	538	NFN–7	G1, G2, G3
7	...	45	585	240	538	NFN–7	G1, G3
8	$5 \le t \le 64$	44	690	310	427	NFN–5	G1, G3
9	...	44	690	310	427	NFN–5	G1, G3, G7
10	...	44	690	310	427	NFN–5	G1, G3
11	...	44	690	310	427	NFN–5	G1, G3, G7
12	$38 < t \le 89$	44	690	315	427	NFN–5	G1, G2, G3
13	$8 \le t \le 38$	44	795	315	427	NFN–5	G1, G2, G3
14	$t < 5$	44	795	345	427	NFN–5	G1, G3
15	$t < 64$	44	690	280	427	NFN–6	G3
16	...	44	690	280	427	NFN–6	G1, G2, G3
17	...	43	690	285	427	NFN–10	G1, G3
18	...	43	690	285	427	NFN–10	G1, G3, G7
19	...	43	690	285	427	NFN–10	G1, G3
20	...	43	690	285	677	NFN–10	G1, G2, G3, T13
21	...	43	690	285	677	NFN–10	G1, G3, T13
22	...	43	690	285	677	NFN–10	G1, G3, G7, T13
23	...	43	690	285	677	NFN–10	G1, G3, T13
24	...	43	690	285	677	NFN–10	G1, G3, G7, T13
25	...	44	760	350	427	NFN–16	G1, G3
26	...	44	760	350	427	NFN–16	G1, G2, G3
27	...	44	760	350	427	NFN–16	G1, G3
28	...	44	760	350	427	NFN–16	G1, G3, G7
29	...	44	760	350	427	NFN–16	G1, G3
30	...	44	760	350	427	NFN–16	G1, G3, G7
31	...	44	760	350	427	NFN–16	G1, G3
32	...	44	760	350	427	NFN–16	G1, G3, G7
33	...	51	240	170	316	NFT–3	...
34	...	51	240	170	316	NFT–3	...
35	...	51	240	170	316	NFT–3	...
36	...	51	240	170	316	NFT–3	...
37	...	51	240	170	316	NFT–3	...
38	...	51	240	170	316	NFT–3	G7
39	...	51	240	170	316	NFT–3	G7
40	...	51	345	275	316	NFT–2	...
41	...	51	345	275	316	NFT–2	...
42	...	51	345	275	316	NFT–2	...
43	...	51	345	275	316	NFT–2	...
44	...	51	345	275	316	NFT–2	...
45	...	51	345	275	316	NFT–2	G7

Table 5B (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	97.7	97.7	97.7	97.7	97.7	97.7	97.7	97.7	97.7	97.7	97.7	95.7	93.6	91.7	89.9	88.2	86.6	85.2
2	115	115	115	115	115	115	115	115	115	115	115	113	110	108	106	104	102	100
3	161	161	161	161	161	161	161	161	161	161	161	161	161	161	160	159	158	157
4	161	161	161	161	161	161	161	161	161	161	161	161	161	161	160	159	158	157
5	161	161	161	161	161	161	161	161	161	161	161	161	161	161	160	159	158	157
6	161	161	161	161	161	161	161	161	161	161	161	161	161	161	160	159	158	157
7	161	161	161	161	161	161	161	161	161	161	161	161	161	161	160	159	158	157
8	207	207	207	207	207	207	207	207	207	207	207	207	207	207	207	206	205	...
9	176	176	176	176	176	176	176	176	176	176	176	176	176	176	176	175	174	...
10	207	207	207	207	207	207	207	207	207	207	207	207	207	207	207	206	205	...
11	176	176	176	176	176	176	176	176	176	176	176	176	176	176	176	175	174	...
12	211	211	211	211	211	211	211	211	211	211	211	211	211	211	211	211	205	...
13	211	211	211	211	211	211	211	211	211	211	211	211	211	211	211	211	205	...
14	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	229	228	...
15	184	184	184	184	184	184	184	184	184	184	181	179	177	176	174	172	169	...
16	184	184	184	184	184	184	184	184	184	184	181	179	177	176	174	172	169	...
17	188	188	188	188	188	188	188	188	187	182	177	172	168	165	162	159	157	...
18	160	160	160	160	160	160	160	160	159	155	150	147	143	140	138	136	134	...
19	188	188	188	188	188	188	188	188	187	182	177	172	168	165	162	159	157	...
20	188	188	188	188	188	188	188	188	187	182	177	172	168	165	162	159	157	156
21	188	188	188	188	188	188	188	188	187	182	177	172	168	165	162	159	157	156
22	160	160	160	160	160	160	160	160	159	155	150	147	143	140	138	136	134	133
23	188	188	188	188	188	188	188	188	187	182	177	172	168	165	162	159	157	156
24	160	160	160	160	160	160	160	160	159	155	150	147	143	140	138	136	134	133
25	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	...
26	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	...
27	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	...
28	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	...
29	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	...
30	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	...
31	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	...
32	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	...
33	101	92.5	78.1	69.3	61.5	54.4	48.1	42.5	37.7	34.0	31.5	30.1	...	...	...	...	...	...
34	101	92.5	78.1	69.3	61.5	54.4	48.1	42.5	37.7	34.0	31.5	30.1	...	...	...	...	...	...
35	101	92.5	78.1	69.3	61.5	54.4	48.1	42.5	37.7	34.0	31.5	30.1	...	...	...	...	...	...
36	101	92.5	78.1	69.3	61.5	54.4	48.1	42.5	37.7	34.0	31.5	30.1	...	...	...	...	...	...
37	101	92.5	78.1	69.3	61.5	54.4	48.1	42.5	37.7	34.0	31.5	30.1	...	...	...	...	...	...
38	85.5	78.6	66.3	58.9	52.3	46.3	40.9	36.1	32.1	28.9	26.7	25.6	...	...	...	...	...	...
39	85.5	78.6	66.3	58.9	52.3	46.3	40.9	36.1	32.1	28.9	26.7	25.6	...	...	...	...	...	...
40	144	144	142	129	117	105	92.4	81.1	71.2	63.4	57.7	53.9	...	...	...	...	...	...
41	144	144	142	129	117	105	92.4	81.1	71.2	63.4	57.7	53.9	...	...	...	...	...	...
42	144	144	142	129	117	105	92.4	81.1	71.2	63.4	57.7	53.9	...	...	...	...	...	...
43	144	144	142	129	117	105	92.4	81.1	71.2	63.4	57.7	53.9	...	...	...	...	...	...
44	144	144	142	129	117	105	92.4	81.1	71.2	63.4	57.7	53.9	...	...	...	...	...	...
45	122	122	120	110	100	88.9	78.5	68.9	60.6	53.9	49.1	45.8	...	...	...	...	...	...

Table 5B (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	83.8	82.6	81.3	*78.1*	*64.5*	*52.8*	*43.0*	*35.1*	*28.6*	*23.5*	*19.1*	*15.6*	*12.7*	*10.3*	*8.33*	*6.84*	*5.70*	
2	98.6	97.1	95.7	*91.8*	*75.8*	*62.1*	*50.6*	*41.2*	*33.6*	*27.7*	*22.5*	*18.3*	*14.9*	*12.1*	*9.80*	*8.04*	*6.70*	
3	156	155	152	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	156	155	152	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	156	155	152	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	156	155	152	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	156	155	152	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	155	154	*143*	*119*	*98.4*	*81.6*	*67.0*	*54.5*	*44.4*	...	...	...	...	...	...	...	...	
21	155	154	*143*	*119*	*98.4*	*81.6*	*67.0*	*54.5*	*44.4*	...	...	...	...	...	...	...	...	
22	132	131	*122*	*101*	*83.7*	*69.3*	*56.9*	*46.3*	*37.7*	...	...	...	...	...	...	...	...	
23	155	154	*143*	*119*	*98.4*	*81.6*	*67.0*	*54.5*	*44.4*	...	...	...	...	...	...	...	...	
24	132	131	*122*	*101*	*83.7*	*69.3*	*56.9*	*46.3*	*37.7*	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)

Table 5B (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
(**23**)	1	Ti	Wld. pipe	SB–862	2	R50400	Wld. ann.
(**23**)	2	Ti	Plate, sheet, strip	SB–265	3	R50550	Annealed
(**23**)	3	Ti	Bar, billet	SB–348	3	R50550	Annealed
(**23**)	4	Ti	Forgings	SB–381	3	R50550	Annealed
(**23**)	5	Ti	Smls. tube	SB–338	3	R50550	Smls. ann.
(**23**)	6	Ti	Smls. pipe	SB–861	3	R50550	Smls. ann.
(**23**)	7	Ti	Wld. tube	SB–338	3	R50550	Wld. ann.
(**23**)	8	Ti	Wld. pipe	SB–862	3	R50550	Wld. ann.
(**23**)	9	Ti–Pd	Plate, sheet, strip	SB–265	7	R52400	Annealed
(**23**)	10	Ti–Pd	Bar, billet	SB–348	7	R52400	Annealed
(**23**)	11	Ti–Pd	Forgings	SB–381	F–7	R52400	Annealed
(**23**)	12	Ti–Pd	Smls. tube	SB–338	7	R52400	Smls. ann.
(**23**)	13	Ti–Pd	Smls. pipe	SB–861	7	R52400	Smls. ann.
(**23**)	14	Ti–Pd	Wld. tube	SB–338	7	R52400	Wld. ann.
(**23**)	15	Ti–Pd	Wld. pipe	SB–862	7	R52400	Wld. ann.
(**23**)	16	Ti–Pd	Plate, sheet, strip	SB–265	16	R52402	Annealed
(**23**)	17	Ti–Pd	Smls. tube	SB–338	16	R52402	Annealed
(**23**)	18	Ti–Pd	Wld. tube	SB–338	16	R52402	Annealed
(**23**)	19	Ti–Pd	Bar, billet	SB–348	16	R52402	Annealed
(**23**)	20	Ti–Pd	Forgings	SB–381	F–16	R52402	Annealed
(**23**)	21	Ti–0.3Mo–0.8Ni	Plate, sheet, strip	SB–265	12	R53400	Annealed
(**23**)	22	Ti–0.3Mo–0.8Ni	Bar, billet	SB–348	12	R53400	Annealed
(**23**)	23	Ti–0.3Mo–0.8Ni	Forgings	SB–381	F–12	R53400	Annealed
(**23**)	24	Ti–0.3Mo–0.8Ni	Smls. tube	SB–338	12	R53400	Smls. ann.
(**23**)	25	Ti–0.3Mo–0.8Ni	Smls. pipe	SB–861	12	R53400	Smls. ann.
(**23**)	26	Ti–0.3Mo–0.8Ni	Wld. tube	SB–338	12	R53400	Wld. ann.
(**23**)	27	Ti–0.3Mo–0.8Ni	Wld. pipe	SB–862	12	R53400	Wld. ann.

Table 5B (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Size/Thickness, mm	P-No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Maximum Use Temperature, °C	External Pressure Chart No.	Notes
1	...	51	345	275	316	NFT–2	G7
2	...	52	450	380	316	NFT–1	...
3	...	52	450	380	316	NFT–1	...
4	...	52	450	380	316	NFT–1	...
5	...	52	450	380	316	NFT–1	...
6	...	52	450	380	316	NFT–1	...
7	...	52	450	380	316	NFT–1	G7
8	...	52	450	380	316	NFT–1	G7
9	...	51	345	275	316	NFT–2	...
10	...	51	345	275	316	NFT–2	...
11	...	51	345	275	316	NFT–2	...
12	...	51	345	275	316	NFT–2	...
13	...	51	345	275	316	NFT–2	...
14	...	51	345	275	316	NFT–2	G7
15	...	51	345	275	316	NFT–2	G7
16	...	51	345	275	316	NFT–2	...
17	...	51	345	275	316	NFT–2	...
18	...	51	345	275	316	NFT–2	...
19	...	51	345	275	316	NFT–2	...
20	...	51	345	275	316	NFT–2	...
21	...	52	483	345	316	NFT–5	...
22	...	52	483	345	316	NFT–5	...
23	...	52	483	345	316	NFT–5	...
24	...	52	483	345	316	NFT–5	...
25	...	52	483	345	316	NFT–5	...
26	...	52	483	345	316	NFT–5	G7
27	...	52	483	345	316	NFT–5	G7

Table 5B (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	40	65	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475
1	122	122	120	110	100	88.9	78.5	68.9	60.6	53.9	49.1	45.8	...	...	...	...	...	...
2	187	187	187	180	164	148	134	121	108	96.7	85.4	74.0	...	...	...	...	...	...
3	187	187	187	180	164	148	134	121	108	96.7	85.4	74.0	...	...	...	...	...	...
4	187	187	187	180	164	148	134	121	108	96.7	85.4	74.0	...	...	...	...	...	...
5	187	187	187	180	164	148	134	121	108	96.7	85.4	74.0	...	...	...	...	...	...
6	187	187	187	180	164	148	134	121	108	96.7	85.4	74.0	...	...	...	...	...	...
7	159	159	159	153	139	126	114	103	92.1	82.2	72.6	62.9	...	...	...	...	...	...
8	159	159	159	153	139	126	114	103	92.1	82.2	72.6	62.9	...	...	...	...	...	...
9	144	144	142	129	117	105	92.4	81.1	71.2	63.4	57.7	53.9	...	...	...	...	...	...
10	144	144	142	129	117	105	92.4	81.1	71.2	63.4	57.7	53.9	...	...	...	...	...	...
11	144	144	142	129	117	105	92.4	81.1	71.2	63.4	57.7	53.9	...	...	...	...	...	...
12	144	144	142	129	117	105	92.4	81.1	71.2	63.4	57.7	53.9	...	...	...	...	...	...
13	144	144	142	129	117	105	92.4	81.1	71.2	63.4	57.7	53.9	...	...	...	...	...	...
14	122	122	120	110	100	88.9	78.5	68.9	60.6	53.9	49.1	45.8	...	...	...	...	...	...
15	122	122	120	110	100	88.9	78.5	68.9	60.6	53.9	49.1	45.8	...	...	...	...	...	...
16	144	144	142	129	117	105	92.4	81.1	71.2	63.4	57.7	53.9	...	...	...	...	...	...
17	144	144	142	129	117	105	92.4	81.1	71.2	63.4	57.7	53.9	...	...	...	...	...	...
18	122	122	120	110	100	88.9	78.5	68.9	60.6	53.9	49.1	45.8	...	...	...	...	...	...
19	144	144	142	129	117	105	92.4	81.1	71.2	63.4	57.7	53.9	...	...	...	...	...	...
20	144	144	142	129	117	105	92.4	81.1	71.2	63.4	57.7	53.9	...	...	...	...	...	...
21	201	201	188	172	159	148	138	130	122	116	111	111	...	...	...	...	...	...
22	201	201	188	172	159	148	138	130	122	116	111	111	...	...	...	...	...	...
23	201	201	188	172	159	148	138	130	122	116	111	111	...	...	...	...	...	...
24	201	201	188	172	159	148	138	130	122	116	111	111	...	...	...	...	...	...
25	201	201	188	172	159	148	138	130	122	116	111	111	...	...	...	...	...	...
26	171	171	159	146	135	126	118	110	104	98.0	95.0	95.0	...	...	...	...	...	...
27	171	171	159	146	135	126	118	110	104	98.0	95.0	95.0	...	...	...	...	...	...

Table 5B (Cont'd)
Section VIII, Division 2, Class 2
Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding																	
	500	525	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)

NOTES TO TABLE 5B

GENERAL NOTES

(a) The following abbreviations are used: ann., annealed; extr., extruded; fin., finished; rel., relieved; Smls., Seamless; and Wld., Welded.

(**23**) (b) An alternative typeface is used for stress values obtained from time–dependent properties (see Notes T1 through T15).

(c) Where specifications, grades, classes, and types are listed in this Table, and where the material specification in Section II, Part A or Part B is a dual–unit specification (e.g., SB–407/SB–407M), the values listed in this Table shall be applicable to either the customary U.S. version of the material specification or the SI units version of the material specification. For example, the values listed for SB–407 Grade N08800 shall be used when SB–407M Grade N08800 is used in construction.

(d) The values in this Table may be interpolated to determine values for intermediate temperatures. The values at intermediate temperatures shall be rounded to the same number of decimal places as the value at the higher temperature between which values are being interpolated. The rounding rule is: when the next digit beyond the last place to be retained is less than 5, retain unchanged the digit in the last place retained; when the digit next beyond the last place to be retained is 5 or greater, increase by 1 the digit in the last place retained.

(e) The properties of steels are influenced by the processing history, heat treatment, melting practice, and level of residual elements. See Nonmandatory Appendix A for more information.

(f) Where a size limit appears in the Size/Thickness column, the limit applies to the dimension appropriate to the product form: wall thickness of tubing, pipe, pipe fittings, and hollow forgings; thickness of plate, flat bar and forgings, and polygonal bar; diameter of solid bar and bolting; and thickest cross–section of other pressure parts, e.g., castings and forgings.

NOTES – GENERAL REQUIREMENTS

G1 Due to the relatively low yield strength of these materials, these higher stress values were established at temperatures where the short–time tensile properties govern to permit the use of these alloys where slightly greater deformation is acceptable. The stress values in this range exceed $66\frac{2}{3}$% but do not exceed 90% of the yield strength at temperature. Use of these stresses may result in dimensional changes due to permanent strain. These stress values are not recommended for the flanges of gasketed joints or other applications where slight amounts of distortion can cause leakage or malfunction. Table Y–2 lists multiplying factors that, when applied to the yield strength values shown in Table Y–1, will give allowable stress values that will result in lower levels of permanent strain.

G2 Use of external pressure charts for material in the form of bar stock is permitted for stiffening rings only.

G3 Maximum allowable stress values for 40°C may be used at temperatures down to –200°C without additional specification requirements.

G4 Maximum allowable stress values for 40°C may be used at temperatures down to –270°C without additional specification requirements.

G5 Maximum temperature for external pressure design not to exceed 175°C.

G6 These alloys are occasionally subject to the hazard of stress corrosion cracking. Even though they are suitable for engineering use under a wide variety of corrosive conditions, with no particular hazard with respect to stress corrosion, the supplier of the material should be consulted before applying them.

G7 A joint efficiency factor of 0.85 has been applied in arriving at the maximum allowable stress values for this material.

G8 For stress relieved tempers (T451, T4510, T4511, T651, T6510, T6511), stress values for materials in the basic temper shall be used.

G9 Copper–silicon alloys are not always suitable when exposed to certain media and high temperature, particularly steam above 100°C. The user should satisfy him/herself that the alloy selected is satisfactory for the service for which it is to be used.

G10 At temperatures over 550°C, these stress values apply only when the carbon is 0.04% or higher.

G11 This alloy is subject to severe loss of impact strength at room temperatures after exposure in the range of 550°C to 750°C.

G12 Alloy N06022 in the solution annealed condition is subject to severe loss of impact strength at room temperatures after exposure in the range of 550°C to 675°C.

G13 Creep–fatigue, thermal ratcheting, and environmental effects are increasingly significant failure modes at temperatures in excess of 825°C and shall be considered in the design.

(**23**) G14 The allowable stress value at 65°C shall be used at 66°C.

NOTES – HEAT TREATMENT REQUIREMENTS

H1 For temperatures above 550°C, these stress values may be used only if the material is annealed at a minimum temperature of 1040°C and has a carbon content of 0.04% or higher.

H2 For temperatures above 550°C, these stress values may be used only if the material is heat treated by heating it to a minimum temperature of 1040°C and quenching in water or rapidly cooling by other means.

NOTES – TIME–DEPENDENT PROPERTIES

T1 Allowable stresses for temperatures of 125°C and above are values obtained from time–dependent properties.

T2 Allowable stresses for temperatures of 150°C and above are values obtained from time–dependent properties.

T3 Allowable stresses for temperatures of 175°C and above are values obtained from time–dependent properties.

T4 Allowable stresses for temperatures of 200°C and above are values obtained from time–dependent properties.

T5 Allowable stresses for temperatures of 275°C and above are values obtained from time–dependent properties.

T6 Allowable stresses for temperatures of 325°C and above are values obtained from time–dependent properties.

T7 Allowable stresses for temperatures of 375°C and above are values obtained from time–dependent properties.

T8 Allowable stresses for temperatures of 400°C and above are values obtained from time–dependent properties.

T9 Allowable stresses for temperatures of 425°C and above are values obtained from time–dependent properties.

T10 Allowable stresses for temperatures of 450°C and above are values obtained from time–dependent properties.

T11 Allowable stresses for temperatures of 500°C and above are values obtained from time–dependent properties.

T12 Allowable stresses for temperatures of 525°C and above are values obtained from time–dependent properties.

T13 Allowable stresses for temperatures of 550°C and above are values obtained from time–dependent properties.

T14 Allowable stresses for temperatures of 575°C and above are values obtained from time–dependent properties.

NOTES TO TABLE 5B (CONT'D)

NOTES – TIME–DEPENDENT PROPERTIES (CONT'D)

T15 Allowable stresses for temperatures of 250°C and above are values obtained from time–dependent properties.

NOTES – WELDING REQUIREMENTS

W1 Welding except for seal welds is not permitted.

W2 For welded construction, stress values for material at O temper shall be used.

W3 The stress values given for this material are not applicable when either welding or thermal cutting is employed.

W4 Use NFA–12 when welded with 5356 or 5556 filler metal, all thicknesses, or 4043 or 5554 filler metal, thickness ≤ 10 mm. Use NFA–13 when welded with 4043 or 5554 filler metal, thickness > 10 mm.

Table 6A
Section IV Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Cond./ Temper	Size/ Thickness, mm	P-No.	Group No.
1	Carbon steel	Bar, stay	SA–675	45	...	...	...	1	1
2	Carbon steel	Plate	SA–285	A	K01700	...	...	1	1
3	Carbon steel	Sheet	SA–414	A	K01501	...	...	1	1
4	Carbon steel	Wld. pipe & tube	SA–178	A	K01200	...	...	1	1
5	Carbon steel	Smls. pipe & tube	SA–192	...	K01201	...	...	1	1
6	Carbon steel	Smls. pipe & tube	SA–53	A	K02504	...	...	1	1
7	Carbon steel	Wld. pipe & tube	SA–53	A	K02504	...	...	1	1
8	Carbon steel	Butt–wld. pipe	SA–53	F	...	...	...	1	1
9	Carbon steel	Smls. pipe & tube	SA–106	A	K02501	...	...	1	1
10	Carbon steel	Wld. pipe & tube	SA–135	A	...	...	...	1	1
11	Carbon steel	Bar, stay	SA–675	50	...	...	...	1	1
12	Carbon steel	Plate	SA–285	B	K02200	...	...	1	1
13	Carbon steel	Sheet	SA–414	B	K02201	...	...	1	1
14	Carbon steel	Plate	SA/EN 10025–2	S235JR	...	...	$t \le 100$	1	1
15	Carbon steel	Wld. pipe & tube	SA/EN 10217–1	P235TR2	...	...	$t \le 40$	1	1
16	Carbon steel	Bar, stay	SA–675	55	...	...	...	1	1
17	Carbon steel	Plate	SA–285	C	K02801	...	...	1	1
18	Carbon steel	Plate	SA–516	55	K01800	...	...	1	1
19	Carbon steel	Sheet	SA–414	C	K02503	...	...	1	1
20	Carbon steel	Plate	SA–36	...	K02600	...	...	1	1
21	Carbon steel	Bar, stay	SA–36	...	K02600	...	...	1	1
22	Carbon steel	Forgings	SA–181	...	K03502	60	...	1	1
23	Carbon steel	Castings	SA–216	WCA	J02502	...	...	1	1
24	Carbon steel	Forgings	SA–266	1	K03506	...	...	1	1
25	Carbon steel	Bar, stay	SA–675	60	...	...	...	1	1
26	Carbon steel	Plate	SA–515	60	K02401	...	...	1	1
27	Carbon steel	Plate	SA–516	60	K02100	...	...	1	1
28	Carbon steel	Smls. pipe & tube	SA–53	B	K03005	...	...	1	1
29	Carbon steel	Wld. pipe & tube	SA–53	B	K03005	...	...	1	1
30	Carbon steel	Smls. pipe & tube	SA–106	B	K03006	...	...	1	1
31	Carbon steel	Wld. pipe & tube	SA–135	B	...	...	...	1	1
32	Carbon steel	Sheet	SA–414	D	K02505	...	...	1	1
33	Carbon steel	Wld. pipe & tube	SA–178	C	K03503	...	...	1	1
34	Carbon steel	Smls. pipe & tube	SA–210	A–1	K02707	...	...	1	1
35	Carbon steel	Bolting	SA–307	B	...	...	...	...	...
36	Carbon steel	Bar, stay	SA–675	65	...	...	...	1	1
37	Carbon steel	Plate	SA–515	65	K02800	...	...	1	1
38	Carbon steel	Plate	SA–516	65	K02403	...	...	1	1
39	Carbon steel	Sheet	SA–414	E	K02704	...	...	1	1
40	Carbon steel	Plate	SA/CSA–G40.21	44W	...	...	...	1	1
41	Carbon steel	Plate	SA/CSA–G40.21	50W	...	...	...	1	1
42	Carbon steel	Bolting	SA–311	1018	...	A	...	...	...
43	Carbon steel	Plate	SA–455	...	K03300	...	$15 < t \le 19$	1	2
44	Carbon steel	Bar, stay	SA–675	70	...	...	...	1	2
45	Carbon steel	Forgings	SA–105	...	K03504	...	...	1	2

Table 6A
Section IV Maximum Allowable Stress Values, S, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	External Pressure Chart No.	Notes	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
					40	65	100	125	150	175	200	225	250	275
1	310	155	...	...	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1
2	310	165	CS–1	...	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1
3	310	170	CS–1	...	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1
4	325	180	CS–1	G3, G4	55.1	55.1	55.1	55.1	55.1	55.1	55.1	55.1	55.1	55.1
5	325	180	CS–1	G3	64.8	64.8	64.8	64.8	64.8	64.8	64.8	64.8	64.8	64.8
6	330	205	CS–2	G4	66.2	66.2	66.2	66.2	66.2	66.2	66.2	66.2	66.2	66.2
7	330	205	CS–2	...	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3
8	330	205	...	G5	39.7	39.7	39.7	39.7	39.7	39.7	39.7	39.7	39.7	39.7
9	330	205	CS–2	...	66.2	66.2	66.2	66.2	66.2	66.2	66.2	66.2	66.2	66.2
10	330	205	CS–2	G4	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3
11	345	170	...	...	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9
12	345	185	CS–1	...	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9
13	345	205	CS–2	...	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9
14	360	215	CS–2	...	72.0	...	72.0	...	72.0	...	72.0	...	72.0	72.0
15	360	225	CS–2	G4	61.2	...	61.2	...	61.2	...	61.2	...	61.2	61.2
16	380	390	...	...	75.8	75.8	75.8	75.8	75.8	75.8	75.8	75.8	75.8	75.8
17	380	205	CS–2	...	75.8	75.8	75.8	75.8	75.8	75.8	75.8	75.8	75.8	75.8
18	380	205	CS–2	...	75.8	75.8	75.8	75.8	75.8	75.8	75.8	75.8	75.8	75.8
19	380	230	CS–2	...	75.8	75.8	75.8	75.8	75.8	75.8	75.8	75.8	75.8	75.8
20	400	250	CS–2	G1, G2	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
21	400	250	...	G1	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
22	415	205	CS–2	...	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7
23	415	205	CS–2	G6	66.2	66.2	66.2	66.2	66.2	66.2	66.2	66.2	66.2	66.2
24	415	205	CS–2	...	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7
25	415	205	...	...	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7
26	415	220	CS–2	...	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7
27	415	220	CS–2	...	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7
28	415	240	CS–2	...	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7
29	415	240	CS–2	G4	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3
30	415	240	CS–2	...	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7
31	415	240	CS–2	G4	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3
32	415	240	CS–2	...	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7
33	415	255	CS–2	...	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3
34	415	255	CS–2	...	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7
35	415	...	...	G7	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	...	...
36	450	225	...	...	89.6	89.6	89.6	89.6	89.6	89.6	89.6	89.6	89.6	89.6
37	450	240	CS–2	...	89.6	89.6	89.6	89.6	89.6	89.6	89.6	89.6	89.6	89.6
38	450	240	CS–2	...	89.6	89.6	89.6	89.6	89.6	89.6	89.6	89.6	89.6	89.6
39	450	260	CS–2	...	89.6	89.6	89.6	89.6	89.6	89.6	89.6	89.6	89.6	89.6
40	450	305	CS–2	...	89.6	...	89.6	...	89.6	...	89.6	...	89.6	89.6
41	450	345	CS–2	...	89.6	...	89.6	...	89.6	...	89.6	...	89.6	89.6
42	450	380	...	G8, W1, W3	89.6	89.6	89.6	89.6	89.6	89.6	89.6	89.6	89.6	89.6
43	485	240	CS–2	...	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5
44	485	240	...	...	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5
45	485	250	...	...	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5

Table 6A (Cont'd)
Section IV Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Cond./ Temper	Size/ Thickness, mm	P-No.	Group No.
1	Carbon steel	Forgings	SA–181	...	K03502	70	...	1	2
2	Carbon steel	Castings	SA–216	WCB	J03002	...	...	1	2
3	Carbon steel	Forgings	SA–266	2	K03506	...	...	1	2
4	Carbon steel	Plate	SA–515	70	K03101	...	...	1	2
5	Carbon steel	Plate	SA–516	70	K02700	...	...	1	2
6	Carbon steel	Smls. pipe & tube	SA–106	C	K03501	...	...	1	2
7	Carbon steel	Sheet	SA–414	F	K03102	...	...	1	2
8	Carbon steel	Bolting	SA–311	1018	...	A	...	...	...
9	Carbon steel	Plate	SA–455	...	K03300	...	$10 < t \le 15$	1	2
10	Carbon steel	Forgings	SA–266	3	K05001	...	...	1	2
11	Carbon steel	Plate	SA–455	...	K03300	...	$t \le 10$	1	2
12	Carbon steel	Sheet	SA–414	G	K03103	...	...	1	2
13	Carbon steel	Bolting	SA–311	1035	...	A	...	...	...
14	Carbon steel	Bolting	SA–311	1035	...	A	...	...	...
15	Carbon steel	Bolting	SA–311	1045	...	A	...	...	...
16	Carbon steel	Bolting	SA–311	1045	...	A	...	...	...
17	Carbon steel	Bolting	SA–311	1050	...	A	...	...	...
18	Carbon steel	Bolting	SA–311	1050	...	A	...	...	...
19	Carbon steel	Bolting	SA–325	1	...	...	...	...	...
20	Carbon steel	Bolting	SA–311	1045	...	B	...	...	...
21	Carbon steel	Bolting	SA–354	BC	...	...	...	...	...
22	Carbon steel	Bolting	SA–354	BD	...	...	...	...	...
23	Carbon steel	Bolting	SF–568M	10.9	...	...	...	...	...
24	1Cr–0.2Mo	Bolting	SA–193	B7	G41400	...	...	...	...
25	1Cr–0.2Mo	Bolting	SA–320	L7	...	...	...	...	...
26	5Cr–$\frac{1}{2}$Mo	Bolting	SA–193	B5	K50100	...	...	...	...
27	18Cr–2Mo	Plate	SA–240	...	S44400	...	$t \le 10$	7	2
(**23**) 28	18Cr–2Mo	Tube	SA–268	...	S44400	...	$t \le 10$	7	2
29	18Cr–2Mo	Bar	SA–479	...	S44400	...	$t \le 10$	7	2
30	18Cr–Ti	Plate	SA–240	439	...	...	$t \le 10$	7	2
(**23**) 31	18Cr–Ti	Plate	SA–240	...	S43932	...	$t \le 10$	7	2
32	18Cr–Ti	Tube	SA–268	TP439	S43035	...	$t \le 10$	7	2
33	18Cr–Ti	Bar	SA–479	439	S43035	...	$t \le 10$	7	2
(**23**) 34	...	...	...	...	...	...	...	...	...
35	29Cr–4Mo	Smls. tube	SA–268	...	S44700	...	...	10J	1
36	29Cr–4Mo	Wld. tube	SA–268	...	S44700	...	...	10J	1
37	1$\frac{3}{4}$Ni–$\frac{3}{4}$Cr–$\frac{1}{4}$Mo	Bolting	SA–320	L43	G43400	...	$t \le 100$	...	...
38	16Cr–12Ni–2Mo	Forgings	SA–182	F316L	S31603	...	...	8	1
39	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316L	S31603	...	...	8	1
40	16Cr–12Ni–2Mo	Plate	SA–240	316L	S31603	...	...	8	1
41	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316L	S31603	...	...	8	1
42	16Cr–12Ni–2Mo	Smls. pipe	SA–312	TP316L	S31603	...	...	8	1
43	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316L	S31603	...	...	8	1
44	16Cr–12Ni–2Mo	Bar	SA–479	316L	S31603	...	...	8	1
45	16Cr–12Ni–2Mo	Castings	SA–351	CF3M	J92800	...	$t \ge 2.6$	8	1

Table 6A (Cont'd)
Section IV Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	External Pressure Chart No.	Notes	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
					40	65	100	125	150	175	200	225	250	275
1	485	250	CS-2	...	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5
2	485	250	CS-2	G6	77.2	77.2	77.2	77.2	77.2	77.2	77.2	77.2	77.2	77.2
3	485	250	CS-2	...	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5
4	485	260	CS-2	...	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5
5	485	260	CS-2	...	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5
6	485	275	CS-3	...	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5
7	485	290	CS-3	...	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5
8	485	415	...	G8, W1, W2	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5
9	505	255	CS-2	...	101	101	101	101	101	101	101	101	101	101
10	515	260	CS-2	...	103	103	103	103	103	103	103	103	103	103
11	515	260	CS-2	...	103	103	103	103	103	103	103	103	103	103
12	515	310	CS-3	...	103	103	103	103	103	103	103	103	103	103
13	550	485	...	G8, W1, W3	110	110	110	110	110	110	110	110	110	110
14	590	520	...	G8, W1, W2	117	117	117	117	117	117	117	117	117	117
15	620	550	...	G8, W1, W3	124	124	124	124	124	124	124	124	124	124
16	655	585	...	G8, W1, W2	131	131	131	131	131	131	131	131	131	131
17	655	585	...	G8, W1, W3	131	131	131	131	131	131	131	131	131	131
18	690	620	...	G8, W1, W2	138	138	138	138	138	138	138	138	138	138
19	725	560	...	G7	139	139	139	139	139	139	139	139	139	139
20	795	690	...	G8, W1, W2	159	159	159	159	159	159	159	159	159	159
21	860	750	...	G7	172	172	172	172	172	172	172	172	172	172
22	1035	900	...	G7	207	207	207	207	207	207	207	207	207	207
23	1040	...	...	G7	208	208	208	208	208	208	208	208	208	208
24	690	515	...	G7	129	129	129	129	129	129	129	129	129	129
25	860	725	...	G7	172	172	172	172	172	172	172	172	172	172
26	690	550	...	G7	138	138	138	138	138	138	138	138	138	138
27	415	275	CS-2	...	82.7	82.7	82.7	81.3	80.2	79.3	78.5	77.7	76.9	76.0
28	415	275	CS-2	...	82.7	82.7	82.7	81.3	80.0	79.3	78.5	77.7	76.9	76.0
29	415	310	...	...	82.7	82.7	82.7	81.3	80.2	79.3	78.5	77.7	76.9	76.0
30	415	205	...	G9	82.7	82.7	82.7	81.1	79.8	78.8	77.9	77.1	76.4	75.6
31	415	205	CS-2	G9	82.8	82.7	82.6	81.2	79.8	78.8	77.8	77.1	76.4	75.6
32	415	205	CS-2	G9	82.7	82.7	82.7	81.1	78.8	78.8	77.9	77.1	76.4	75.6
33	485	275	CS-2	G9	96.5	96.5	96.5	94.7	93.2	91.9	90.9	90.0	89.1	88.2
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	550	415	HA-6	G12	103	103	103	101	99.8	99.3	99.2	99.2	99.2	99.2
36	550	415	HA-6	G4, G12	87.9	87.9	87.2	85.7	84.8	84.4	84.4	84.4	84.4	84.4
37	860	725	...	G7	172	172	172	172	172	172	172	172	172	172
38	485	170	HA-4	G9, G11	96.5	96.5	93.0	90.2	87.3	83.8	80.8	78.3	76.1	74.3
39	485	170	HA-4	G9, G10, G11	96.5	96.5	93.0	90.2	87.3	83.8	80.8	78.3	76.1	74.3
40	485	170	HA-4	G9	96.5	96.5	93.0	90.2	87.3	83.3	80.8	78.3	76.1	74.3
41	485	170	HA-4	G4, G9, G10, G11	82.0	82.0	79.0	76.7	74.2	71.2	68.7	66.6	64.7	63.1
42	485	170	HA-4	G9, G11	96.5	96.5	93.0	90.2	87.3	83.8	80.8	78.3	76.1	74.3
43	485	170	HA-4	G4, G9, G11	82.0	82.0	79.0	76.7	74.2	71.2	68.7	66.6	64.7	63.1
44	485	170	HA-4	G9, G10	96.5	96.5	93.0	90.2	87.3	83.8	80.8	78.3	76.1	74.3
45	485	205	...	G6, G9	77.2	77.2	77.2	75.9	75.0	74.4	74.1	74.1	74.1	74.1

Table 6A (Cont'd)
Section IV Maximum Allowable Stress Values, *S*, for Ferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Cond./ Temper	Size/ Thickness, mm	P-No.	Group No.
	1	16Cr–12Ni–2Mo	Forgings	SA–182	F316	S31600	...	...	8	1
	2	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316	S31600	...	...	8	1
	3	16Cr–12Ni–2Mo	Plate	SA–240	316	S31600	...	...	8	1
	4	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316	S31600	...	...	8	1
	5	16Cr–12Ni–2Mo	Smls. pipe	SA–312	TP316	S31600	...	...	8	1
	6	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316	S31600	...	...	8	1
	7	16Cr–12Ni–2Mo	Bar	SA–479	316	S31600	...	...	8	1
(**23**)	8	16Cr–12Ni–2Mo–Ti	Smls. tube	SA–213	TP316Ti	S31635	...	...	8	1
(**23**)	9	16Cr–12Ni–2Mo–Ti	Plate	SA–240	316Ti	S31635	...	...	8	1
(**23**)	10	16Cr–12Ni–2Mo–Ti	Smls. pipe	SA–312	TP316Ti	S31635	...	...	8	1
(**23**)	11	16Cr–12Ni–2Mo–Ti	Wld. pipe	SA–312	TP316Ti	S31635	...	...	8	1
	12	16Cr–12Ni–2Mo–Ti	Plate	SA/EN 10088–2	X6CrNiMoTi17–12–2	...	...	$t \le 8$	8	1
	13	18Cr–8Ni	Forgings	SA–182	F304L	S30403	...	$t \le 127$	8	1
	14	18Cr–8Ni	Smls. tube	SA–213	TP304L	S30403	...	...	8	1
	15	18Cr–8Ni	Plate	SA–240	304L	S30403	...	...	8	1
	16	18Cr–8Ni	Wld. tube	SA–249	TP304L	S30403	...	...	8	1
	17	18Cr–8Ni	Smls. pipe	SA–312	TP304L	S30403	...	...	8	1
	18	18Cr–8Ni	Wld. pipe	SA–312	TP304L	S30403	...	...	8	1
	19	18Cr–8Ni	Bar	SA–479	304L	S30403	...	...	8	1
	20	18Cr–8Ni	Forgings	SA–182	F304	S30400	...	$t \le 127$	8	1
	21	18Cr–8Ni	Smls. tube	SA–213	TP304	S30400	...	...	8	1
	22	18Cr–8Ni	Plate	SA–240	304	S30400	...	...	8	1
	23	18Cr–8Ni	Wld. tube	SA–249	TP304	S30400	...	...	8	1
	24	18Cr–8Ni	Smls. pipe	SA–312	TP304	S30400	...	...	8	1
	25	18Cr–8Ni	Wld. pipe	SA–312	TP304	S30400	...	...	8	1
	26	18Cr–8Ni	Bar	SA–479	304	S30400	...	...	8	1
	27	18Cr–10Ni–Cb	Castings	SA–351	CF8C	J92710	...	$t \ge 2.6$	8	1
	28	...	Plate	SA/EN 10088–2	X6CrNiMoTi17–12–2	...	...	$t < 8$	8	1
	29	20Cr–10Ni	Bar	SA–479	ER308	S30880	...	...	...	...
(**23**)	30	21Cr–5Mn–1.5Ni–Cu–N	Plate	SA–240	...	S32101	...	$t > 5$	10H	1
(**23**)	31	21Cr–5Mn–1.5Ni–Cu–N	Smls. tube	SA–789	...	S32101	...	$t > 5$	10H	1
(**23**)	32	21Cr–5Mn–1.5Ni–Cu–N	Wld. tube	SA–789	...	S32101	...	$t > 5$	10H	1
(**23**)	33	21Cr–5Mn–1.5Ni–Cu–N	Smls. pipe	SA–790	...	S32101	...	$t > 5$	10H	1
(**23**)	34	21Cr–5Mn–1.5Ni–Cu–N	Wld. pipe	SA–790	...	S32101	...	$t > 5$	10H	1
(**23**)	35	21Cr–5Mn–1.5Ni–Cu–N	Plate	SA–240	...	S32101	...	$t \le 5$	10H	1
(**23**)	36	21Cr–5Mn–1.5Ni–Cu–N	Smls. tube	SA–789	...	S32101	...	$t \le 5$	10H	1
(**23**)	37	21Cr–5Mn–1.5Ni–Cu–N	Wld. tube	SA–789	...	S32101	...	$t \le 5$	10H	1
(**23**)	38	21Cr–5Mn–1.5Ni–Cu–N	Smls. pipe	SA–790	...	S32101	...	$t \le 5$	10H	1
(**23**)	39	21Cr–5Mn–1.5Ni–Cu–N	Wld. pipe	SA–790	...	S32101	...	$t \le 5$	10H	1
	40	22Cr–5Ni–3Mo–N	Plate	SA–240	...	S31803	...	...	10H	1
	41	22Cr–5Ni–3Mo–N	Smls. tube	SA–789	...	S31803	...	...	10H	1
	42	22Cr–5Ni–3Mo–N	Wld. tube	SA–789	...	S31803	...	...	10H	1
	43	22Cr–5Ni–3Mo–N	Smls. pipe	SA–790	...	S31803	...	...	10H	1
	44	22Cr–5Ni–3Mo–N	Wld. pipe	SA–790	...	S31803	...	...	10H	1
	45	23Cr–12Ni	Bar	SA–479	309S	S30908	...	...	8	2

Table 6A (Cont'd)
Section IV Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	External Pressure Chart No.	Notes	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
					40	65	100	125	150	175	200	225	250	275
1	515	205	HA–2	G9, G11	103	103	103	102	100	99.6	99.1	95.8	92.8	90.3
2	515	205	HA–2	G9, G10, G11	103	103	103	102	100	99.6	99.1	95.8	92.8	90.3
3	515	205	HA–2	G9	103	103	103	102	100	99.6	99.1	95.8	92.8	90.3
4	515	205	HA–2	G4, G9, G10, G11	87.9	87.9	87.9	86.4	85.3	84.7	84.3	81.4	78.9	76.6
5	515	205	HA–2	G9, G11	103	103	103	102	100	99.6	99.1	95.8	92.8	90.3
6	515	205	HA–2	G4, G9, G11	87.9	87.9	87.9	86.4	85.4	84.7	84.3	81.4	78.9	76.7
7	515	205	HA–2	G7, G9, G13	103	103	103	102	100	99.6	99.1	95.8	92.8	90.3
8	515	205	HA–2	G9	103	102	95.0	91.0	87.8	85.3	83.4	82.1	81.3	80.8
9	515	205	HA–2	G9	103	102	95.0	91.0	87.8	85.3	83.4	82.1	81.3	80.8
10	515	205	HA–2	G9	103	102	95.0	91.0	87.8	85.3	83.4	82.1	81.3	80.8
11	515	205	HA–2	G4, G9	87.9	86.8	80.7	77.3	74.6	72.5	70.9	69.8	69.1	68.7
12	540	240	HA–2	G14	108	...	108	...	105	...	104	...	103	101
13	485	170	HA–3	G9, G11	96.5	96.2	90.1	86.8	84.4	82.5	81.2	78.4	76.0	74.0
14	485	170	HA–3	G9, G10, G11	96.5	96.5	90.1	86.8	84.4	82.5	81.1	78.4	76.0	74.0
15	485	170	HA–3	G9	96.5	96.2	90.2	86.8	84.8	82.5	81.2	78.4	76.0	74.0
16	485	170	HA–3	G4, G9, G10, G11	82.0	82.0	76.6	73.8	71.7	70.1	69.0	66.6	64.6	62.9
17	485	170	HA–3	G9, G11	96.5	96.2	90.1	86.8	84.4	82.5	81.2	78.4	76.0	74.0
18	485	170	HA–3	G4, G9, G11	82.0	81.8	77.1	73.8	71.1	70.1	69.0	66.6	64.6	62.9
19	485	170	HA–3	G9, G10	96.5	96.2	90.1	86.8	84.4	82.2	81.2	78.4	76.0	74.0
20	515	205	HA–1	G9, G11	103	103	96.9	93.6	91.2	89.5	88.4	87.7	87.5	87.4
21	515	205	HA–1	G9, G10, G11	103	103	96.8	93.6	91.2	89.5	88.4	87.7	87.5	87.4
22	515	205	HA–1	G9	103	103	96.9	93.9	91.9	89.5	88.4	87.7	87.5	87.4
23	515	205	HA–1	G4, G9, G10, G11	87.9	87.9	82.4	79.6	77.5	76.1	75.1	74.6	74.3	74.3
24	515	205	HA–1	G9, G11	103	103	96.9	93.6	91.2	89.5	88.4	87.7	87.5	87.4
25	515	205	HA–1	G4, G9, G11	87.9	87.7	82.4	79.6	77.5	76.1	75.1	74.6	74.3	74.3
26	515	205	HA–1	G7, G9, G13	103	103	96.9	93.6	91.2	89.5	88.4	87.7	87.5	87.4
27	485	205	...	G6, G9	77.2	77.2	72.9	70.1	67.8	65.8	64.3	63.0	62.1	61.2
28	540	240	HA–2	G14	108	...	108	...	105	...	104	...	103	101
29	515	205	HA–2	G7, G9, G13	103	103	96.9	93.6	91.2	89.5	88.4	87.7	87.5	87.4
30	650	450	HA–5	...	130	130	130	127	124	121	119	119	119	119
31	650	450	HA–5	...	130	130	130	127	124	121	119	119	119	119
32	650	450	HA–5	...	110	110	110	108	105	103	102	101	101	101
33	650	450	HA–5	...	130	130	130	127	124	121	119	119	119	119
34	650	450	HA–5	...	110	110	110	108	105	103	102	101	101	101
35	695	530	HA–5	...	139	139	139	136	133	130	128	127	127	127
36	695	530	HA–5	...	139	139	139	136	133	130	128	127	127	127
37	695	530	HA–5	...	118	118	118	116	113	111	109	108	108	108
38	695	530	HA–5	...	139	139	139	136	133	130	128	127	127	127
39	695	530	HA–5	...	118	118	118	116	113	111	109	108	108	108
40	620	450	HA–5	...	124	124	124	122	120	117	116	114	113	112
41	620	450	HA–5	...	124	124	124	122	120	117	116	114	113	112
42	620	450	HA–5	...	106	106	106	104	102	99.8	98.2	96.9	96.0	95.3
43	620	450	HA–5	...	124	124	124	122	120	117	116	114	113	112
44	620	450	HA–5	...	106	106	106	104	102	99.8	98.2	96.9	96.0	95.3
45	515	205	HA–2	G7, G9, G13	103	103	103	103	103	102	101	100	99.1	98.3

Table 6A (Cont'd)
Section IV Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./ UNS No.	Class/ Cond./ Temper	Size/ Thickness, mm	P-No.	Group No.
1	23Cr–12Ni	Bar	SA–479	309H	S30909	...	...	8	2
2	25Cr–20Ni	Bar	SA–479	310S	S31008	...	...	8	2
3	44Fe–25Ni–21Cr–Mo	Plate	SA–240	904L	N08904	...	...	45	...

Table 6A (Cont'd)
Section IV Maximum Allowable Stress Values, *S*, for Ferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	External Pressure Chart No.	Notes	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
					40	65	100	125	150	175	200	225	250	275
1	515	205	HA–2	G7, G9, G13	103	103	103	103	103	102	101	100	99.1	98.3
2	515	205	HA–2	G7, G9, G13	103	103	103	103	103	102	101	100	99.1	98.3
3	490	220	NFN–9	...	98.0	98.0	97.8	95.3	93.4	91.8	90.4	89.1	88.1	85.8

NOTES TO TABLE 6A

GENERAL NOTES

(a) The stress values in this Table may be interpolated to determine values for intermediate temperatures. The values at intermediate temperatures shall be rounded to the same number of decimal places as the value at the higher temperature between which values are being interpolated. The rounding rule is: when the next digit beyond the last place to be retained is less than 5, retain unchanged the digit in the last place retained; when the digit next beyond the last place to be retained is 5 or greater, increase by 1 the digit in the last place retained.

(b) Where a size limit appears in the Size/Thickness column, the limit applies to the dimension appropriate to the product form: wall thickness of tubing, pipe, pipe fittings, and hollow forgings; thickness of plate, flat bar and forgings, and polygonal bar; diameter of solid bar and bolting; and thickest cross–section of other pressure parts, e.g., castings and forgings.

(c) The following abbreviations are used: Smls., Seamless; and Wld., Welded.

(d) The maximum allowable use temperature is 260°C. The values for 275°C are provided for interpolation only.

NOTES – GENERAL REQUIREMENTS

G1 These allowable stress values apply also to structural shapes.

G2 SA/CSA–G40.21 as specified in ASME BPVC, Section II, Part A, grade 38W may be used in lieu of SA–36 for plates and bars not exceeding 19 mm.

G3 Tensile value is expected minimum.

G4 The stress value includes a joint factor of 0.85.

G5 The stress value includes a joint factor of 0.60.

G6 The stress value includes a casting quality factor of 0.80. Increased casting quality factors as a result of material examination beyond the requirements of the material specifications shall not be permitted.

G7 The stress value is established from a consideration of strength only and will be satisfactory for average service. For bolted joints, where freedom from leakage over a long period of time without retightening is required, lower stress values may be necessary as determined from the relative flexibility of the flange and bolts, and corresponding relaxation properties.

G8 For tie–rods and draw bolts on cast–iron sectional boilers subject to system pressure.

G9 The water temperature shall not exceed 99°C.

G10 Tubing material shall be fully annealed.

G11 The limitations of ASME BPVC, Section IV, HF–204.2 and HF–204.3 apply.

G12 Heat treatment after forming or fabrication is neither required nor prohibited.

G13 For arc or resistance welded studs only.

G14 For cold–rolled strips only.

NOTES – WELDING REQUIREMENTS

W1 Welding or brazing is not permitted.

W2 For tie–rods and draw bolts up to 22 mm diameter subject to system pressure, welding is not permitted.

W3 For tie–rods and draw bolts over 22 mm diameter and up to 32 mm diameter subject to system pressure, welding is not permitted.

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Table 6B
Section IV Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./ UNS No.	Class/ Cond./ Temper	Size/ Thickness, mm	P-No.
1	...	Castings	SB–26	...	A13560	T6	...	...
2	...	Smls. extr. tube	SB–241	...	A91100	O	...	21
3	...	Drawn smls. tube	SB–210	...	A93003	O	...	21
4	...	Plate, sheet	SB–209	...	A95052	H32 wld.	...	22
5	...	Drawn smls. tube	SB–210	...	A95052	H32 wld.	...	22
6	...	Smls. extr. tube	SB–241	...	A95052	H32 wld.	...	22
7	...	Plate, sheet	SB–209	...	A96061	T6 wld.	...	23
8	...	Plate, sheet	SB–209	...	A96061	T651 wld.	...	23
9	...	Drawn smls. tube	SB–210	...	A96061	T6	...	23
10	...	Drawn smls. tube	SB–210	...	A96061	T6 wld.	...	23
11	...	Bar, rod, wire	SB–211	...	A96061	T6 wld.	...	23
12	...	Bar, rod, wire	SB–211	...	A96061	T651 wld.	...	23
13	...	Bar, rod, shapes	SB–221	...	A96061	T6 wld.	...	23
14	...	Smls. extr. tube	SB–241	...	A96061	T6 wld.	...	23
15	...	Smls. extr. tube	SB–241	...	A96063	O	...	23
16	...	Bar, rod, shapes	SB–221	...	A96063	T5	$t > 12.7$	23
17	...	Bar, rod, shapes	SB–221	...	A96063	T5	$t \leq 12.7$	23
18	...	Bar, rod, shapes	SB–221	...	A96063	T6	...	23
(**23**) 19	...	Castings	SB/EN 1706	...	AC–42000	F	...	...
(**23**) 20	...	Castings	SB/EN 1706	...	AC–43000	F	...	...
(**23**) 21	...	Castings	SB/EN 1706	...	AC–44300	F	...	...
(**23**) 22	...	Smls. tube	SB–75	...	C10200	O50	All	31
23	...	Smls. tube	SB–75	...	C10200	O60	All	31
24	...	Smls. pipe	SB–42	...	C10200	O61	All	31
25	...	Plate, sheet, strip	SB–152	...	C10200	O25	...	31
26	...	Smls. pipe	SB–42	...	C10200	H55	50 < DN ≤ 300	31
27	...	Smls. tube	SB–75	...	C10200	H55	All	31
28	...	Smls. cond. tube	SB–111	...	C10200	H55	...	31
29	...	Smls. U–bend tube	SB–395	...	C10200	H55	...	31
30	...	Smls. pipe	SB–42	...	C10200	H80	6 < DN ≤50	31
31	...	Smls. tube	SB–75	...	C10200	H80	$t < 100$	31
32	...	Smls. cond. tube	SB–111	...	C10200	H80	...	31
33	...	Plate, sheet, strip	SB–152	...	C10400	O25	...	31
34	...	Plate, sheet, strip	SB–152	...	C10500	O25	...	31
35	...	Plate, sheet, strip	SB–152	...	C10700	O25	...	31
36	...	Plate, sheet, strip	SB–152	...	C11000	O25	...	31
(**23**) 37	...	Smls. tube	SB–75	...	C12000	O50	All	31
38	...	Smls. tube	SB–75	...	C12000	O60	All	31
39	...	Smls. pipe	SB–42	...	C12000	O61	All	31
40	...	Smls. pipe	SB–42	...	C12000	H55	50 < DN ≤ 300	31
41	...	Smls. tube	SB–75	...	C12000	H55	All	31
42	...	Smls. cond. tube	SB–111	...	C12000	H55	...	31
43	...	Smls. U–bend tube	SB–395	...	C12000	H55	...	31
44	...	Smls. pipe	SB–42	...	C12000	H80	6 < DN ≤ 50	31
45	...	Smls. tube	SB–75	...	C12000	H80	$t < 100$	31

Table 6B
Section IV Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	External Pressure Chart No.	Notes	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
					40	65	100	125	150	175	200	225	250	275
1	235	165	...	G6, W1	37.5	37.5	37.5	37.0	...	...	...	...	...	...
2	75	20	NFA-7	...	13.8	13.8	13.8	12.6	11.2	...	...	...	...	...
3	97	34	NFA-1	...	19.3	19.1	17.4	15.9	14.4	...	...	...	...	...
4	172	69	NFA-8	...	34.5	34.5	34.5	34.5	32.8	...	...	...	...	...
5	172	69	NFA-12	...	34.5	34.5	34.5	34.5	32.8	...	...	...	...	...
6	172	69	NFA-8	...	34.5	34.5	34.5	34.5	32.8	...	...	...	...	...
7	165	75	NFA-12	...	33.1	33.1	33.1	32.6	31.2	...	...	...	...	...
8	165	75	NFA-12,13	...	33.1	33.1	33.1	32.6	31.2	...	...	...	...	...
9	290	241	NFA-12,13	W1	57.9	57.9	57.9	55.5	47.9	...	...	...	...	...
10	165	75	NFA-12,13	...	33.1	33.1	33.1	32.6	31.2	...	...	...	...	...
11	165	75	NFA-12	...	33.1	33.1	33.1	32.6	31.2	...	...	...	...	...
12	165	75	NFA-12,13	...	33.1	33.1	33.1	32.6	31.2	...	...	...	...	...
13	165	75	NFA-12,13	...	33.1	33.1	33.1	32.6	31.2	...	...	...	...	...
14	165	75	NFA-12,13	...	33.1	33.1	33.1	32.6	31.2	...	...	...	...	...
15	110	35	NFA-1	...	22.1	22.1	21.6	20.3	19.2	...	...	...	...	...
16	144	105	NFA-1	W1	29.0	29.0	28.1	26.6	23.8	...	...	...	...	...
17	151	110	NFA-1	W1	30.3	30.3	29.2	27.8	24.8	...	...	...	...	...
18	207	172	NFA-1	...	41.4	41.4	40.4	35.3	27.7	...	...	...	...	...
19	140	80	...	G9	11.2	11.0	10.8	10.7	10.5	...	...	...	...	...
20	150	80	...	G6	24.0	24.0	24.0	24.0	24.0	...	...	...	...	...
21	240	130	...	G8, W1	24.0	24.0	20.7	20.7	20.7	...	...	...	...	...
22	205	62	NFC-1	G1	41.4	40.7	36.4	36.4	36.2	...	...	...	...	...
23	205	62	NFC-1	G1	41.4	40.7	36.4	36.4	36.2	...	...	...	...	...
24	205	60	NFC-1	G1	41.4	40.7	36.4	36.4	36.2	...	...	...	...	...
25	205	70	NFC-1	G1	41.4	40.7	40.0	38.7	37.5	...	...	...	...	...
26	250	205	NFC-3	G1, G2, G11	49.6	49.6	49.6	49.6	48.1	46.9	45.7	43.6	...	...
27	250	205	NFC-3	G1, G2, G11	49.6	49.6	49.6	49.6	48.1	46.9	45.7	43.6	...	...
28	250	205	NFC-6	G1, G2, G11	49.6	49.6	49.6	49.6	48.1	46.9	45.7	43.6	...	...
29	250	205	NFC-6	G1, G2, G11	49.6	49.6	49.6	49.6	48.1	46.9	45.7	43.6	...	...
30	310	275	NFC-4	G1, G2	62.1	62.1	62.1	62.1	60.3	57.1	...	...	...	...
31	310	275	NFC-4	G1, G2	62.1	62.1	62.1	62.1	60.3	57.1	...	...	...	...
32	310	275	NFC-4	G1, G2	62.1	62.1	62.1	62.1	60.3	57.1	...	...	...	...
33	205	70	NFC-1	G1	41.4	40.7	40.0	38.7	37.5	...	...	...	...	...
34	205	70	NFC-1	G1	41.4	40.7	40.0	38.7	37.5	...	...	...	...	...
35	205	70	NFC-1	G1	41.4	40.7	40.0	38.7	37.5	...	...	...	...	...
36	205	70	NFC-1	G1	41.4	40.7	40.0	38.7	37.5	...	...	...	...	...
37	205	62	NFC-1	G1	41.1	40.7	36.4	36.4	36.2	...	...	...	...	...
38	205	62	NFC-1	G1	41.1	40.7	36.4	36.4	36.2	...	...	...	...	...
39	205	60	NFC-1	G1	41.4	40.7	36.4	36.4	36.2	...	...	...	...	...
40	250	205	NFC-3	G1, G2	49.6	49.6	49.6	49.6	48.1	46.9	45.7	...	...	...
41	250	205	NFC-3	G1, G2	49.6	49.6	49.6	49.6	48.1	46.9	45.7	...	...	...
42	250	205	NFC-6	G1, G2	49.6	49.6	49.6	49.6	48.1	46.9	45.7	...	...	...
43	250	205	NFC-6	G1, G2	49.6	49.6	49.6	49.6	48.1	46.9	45.7	...	...	...
44	310	275	NFC-4	G1, G2	62.1	62.1	62.1	62.1	60.3	57.1	...	...	...	...
45	310	275	NFC-4	G1, G2	62.1	62.1	62.1	62.1	60.3	57.1	...	...	...	...

Table 6B (Cont'd)
Section IV Maximum Allowable Stress Values, *S*, for Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./ UNS No.	Class/ Cond./ Temper	Size/ Thickness, mm	P-No.
	1	...	Smls. cond. tube	SB–111	...	C12000	H80	...	31
	2	...	Finned tube	SB–359	...	C12200	O62	...	31
(**23**)	3	...	Smls. tube	SB–75	...	C12200	O50	All	31
	4	...	Smls. tube	SB–75	...	C12200	O60	All	31
	5	...	Smls. pipe	SB–42	...	C12200	O61	All	31
	6	...	Finned tube	SB–359	...	C12200	O61	...	31
	7	...	Plate, sheet, strip	SB–152	...	C12200	O25	...	31
	8	...	Smls. pipe	SB–42	...	C12200	H55	50 < DN ≤ 300	31
	9	...	Smls. tube	SB–75	...	C12200	H55	All	31
	10	...	Smls. cond. tube	SB–111	...	C12200	H55	...	31
	11	...	Finned tube	SB–359	...	C12200	H55	...	31
	12	...	Smls. U–bend tube	SB–395	...	C12200	H55	...	31
	13	...	Smls. pipe	SB–42	...	C12200	H80	6 < DN ≤50	31
	14	...	Smls. tube	SB–75	...	C12200	H80	*t* < 100	31
	15	...	Smls. cond. tube	SB–111	...	C12200	H80	...	31
	16	...	Plate, sheet, strip	SB–152	...	C12300	O25	...	31
	17	...	Plate, sheet, strip	SB–152	...	C14200	O25	...	31
	18	...	Smls. cond. tube	SB–111	...	C14200	H55	...	31
	19	...	Smls. U–bend tube	SB–395	...	C14200	H55	...	31
	20	...	Smls. cond. tube	SB–111	...	C14200	H80	...	31
	21	...	Smls. tube	SB–43	...	C23000	O61	...	32
	22	...	Smls. cond. tube	SB–111	...	C23000	O61	...	32
	23	...	Smls. U–bend tube	SB–395	...	C23000	O61	...	32
(**23**)	24	...	Forgings	SB–283	...	C37700	M10, M11	*t* > 38	...
(**23**)	25	...	Forgings	SB–283	...	C37700	M10, M11	≤38	...
	26	...	Plate	SB–171	...	C44300	M20, O25	*t* ≤ 100	32
	27	...	Finned tube	SB–359	...	C44300	O61	...	32
	28	...	Smls. U–bend tube	SB–395	...	C44300	...	...	32
	29	...	Plate	SB–171	...	C44400	M20, O25	*t* ≤ 100	32
	30	...	Finned tube	SB–359	...	C44400	O61	...	32
	31	...	Smls. U–bend tube	SB–395	...	C44400	...	...	32
	32	...	Plate	SB–171	...	C44500	M20, O25	*t* ≤ 100	32
	33	...	Finned tube	SB–359	...	C44500	O61	...	32
	34	...	Smls. U–bend tube	SB–395	...	C44500	...	...	32
	35	...	Plate	SB–171	...	C46400	M20, O25	*t* ≤ 75	32
	36	...	Smls. cond. tube	SB–111	...	C60800	O61	...	35
	37	...	Bar, rod	SB–98	...	C65100	O60	All	33
	38	...	Bar, rod	SB–98	...	C65100	H02	*t* < 50	33
(**23**)	39	...	Smls. pipe & tube	SB–315	...	C65500	O61	...	33
	40	...	Plate, sheet	SB–96	...	C65500	O61	*t* ≤ 50	33
	41	...	Bar, rod	SB–98	...	C65500	O60	All	33
	42	...	Rod	SB–98	...	C65500	H01	...	33
(**23**)	43	...	Smls. pipe & tube	SB–466	...	C70600	O60	...	34
(**23**)	44	...	Plate	SB–171	...	C70600	M20, O25	*t* ≤ 140	34
(**23**)	45	...	Smls. cond. tube	SB–111	...	C70600	O61	...	34

Table 6B (Cont'd)
Section IV Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	External Pressure Chart No.	Notes	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
					40	65	100	125	150	175	200	225	250	275
1	310	275	NFC–4	G1	62.1	62.1	62.1	62.1	60.3	57.1	...	...	...	...
2	205	45	NFC–1	G1	29.9	26.4	26.4	26.4	26.3	...	...	...	...	...
3	205	62	NFC–7	G1	41.4	40.7	36.4	36.4	36.2	...	...	...	...	...
4	205	62	NFC–1	G1	41.4	40.7	36.4	36.4	36.2	...	...	...	...	...
5	205	60	NFC–1	G1	41.4	40.7	36.4	36.4	36.2	...	...	...	...	...
6	205	62	NFC–1	G1	41.4	40.7	36.4	36.4	36.2	...	...	...	...	...
7	205	70	NFC–1	G1	41.4	40.7	40.0	38.7	37.5	...	...	...	...	...
8	250	205	NFC–3	G1, G2	49.6	49.6	49.6	49.6	48.1	46.9	45.7	...	...	...
9	250	205	NFC–3	G1, G2	49.6	49.6	49.6	49.6	48.1	46.9	45.7	...	...	...
10	250	205	NFC–6	G1, G2	49.6	49.6	49.6	49.6	48.1	46.9	45.7	...	...	...
11	250	205	NFC–6	G1, G2	49.6	49.6	49.6	48.8	48.0	46.8	45.6	...	...	...
12	250	205	NFC–6	G1, G2	49.6	49.6	49.6	49.6	48.1	46.9	45.7	...	...	...
13	310	275	NFC–4	G1, G2	62.1	62.1	62.1	62.1	60.3	57.1	...	...	...	...
14	310	275	NFC–4	G1, G2	62.1	62.1	62.1	62.1	60.3	57.1	...	...	...	...
15	310	275	NFC–4	G1, G2	62.1	62.1	62.1	62.1	60.3	57.1	...	...	...	...
16	205	70	NFC–1	G1	41.4	40.7	40.0	38.7	37.5	...	...	...	...	...
17	205	70	NFC–1	G1	41.4	40.7	40.0	38.7	37.5	...	...	...	...	...
18	250	205	NFC–6	G1, G2	49.6	49.6	49.6	49.6	48.1	46.9	45.7	...	...	...
19	250	205	NFC–6	G1, G2	49.6	49.6	49.6	49.6	48.1	46.9	45.7	...	...	...
20	310	275	NFC–4	G1, G2	62.1	62.1	62.1	62.1	60.3	57.1	...	...	...	...
21	275	85	NFC–2	...	55.2	55.1	55.1	55.1	55.1	...	...	...	...	...
22	275	85	NFC–2	...	55.2	55.1	55.1	55.1	55.1	...	...	...	...	...
23	275	85	NFC–2	...	55.2	55.1	55.1	55.1	55.1	...	...	...	...	...
24	310	103	...	G3, W1	63.4	57.4	57.4	...	...	...	...	...	...	...
25	345	125	...	G3, W1	68.9	68.9	67.4	...	...	...	...	...	...	...
26	310	105	NFC–2	...	62.0	62.0	62.0	61.2	60.4	59.3	...	...	...	...
27	310	105	NFC–2	...	62.0	62.0	62.0	61.2	60.4	59.3	...	...	...	...
28	310	105	NFC–2	...	62.0	62.0	62.0	61.2	60.4	59.3	...	...	...	...
29	310	105	NFC–2	...	62.0	62.0	62.0	61.2	60.4	59.3	...	...	...	...
30	310	105	NFC–2	...	62.0	62.0	62.0	61.2	60.4	59.3	...	...	...	...
31	310	105	NFC–2	...	62.0	62.0	62.0	61.2	60.4	59.3	...	...	...	...
32	310	105	NFC–2	...	62.0	62.0	62.0	61.2	60.4	59.3	...	...	...	...
33	310	105	NFC–2	...	62.0	62.0	62.0	61.2	60.4	59.3	...	...	...	...
34	310	105	NFC–2	...	62.0	62.0	62.0	61.2	60.4	59.3	...	...	...	...
35	345	140	NFC–2	...	68.9	68.9	68.9	68.9	68.9	...	...	...	...	...
36	345	130	NFC–2	...	68.9	68.9	68.9	68.9	68.9	68.4	65.8	...	...	...
37	275	85	...	G4	55.0	54.8	54.3	54.0	53.6	53.1	...	...	...	...
38	380	140	...	G2, G4	75.8	75.8	75.8	75.8	75.8	75.8	...	...	...	...
39	345	103	NFC–2	G4	68.9	68.8	68.6	68.4	68.1	67.8	...	...	...	...
40	345	125	NFC–2	G4	68.9	68.9	68.9	68.9	68.9	67.9	...	...	...	...
41	360	105	...	G4	71.7	71.7	71.7	71.7	71.7	70.6	...	...	...	...
42	380	165	...	G2, G4	75.8	75.8	75.8	75.8	75.8	75.8	...	...	...	...
43	260	90	NFC–3	G10	52.4	52.4	52.4	52.4	52.4	51.5	49.9	48.6	47.6	46.9
44	275	105	NFC–3	G10	55.2	55.2	55.2	55.2	55.2	54.2	52.6	51.2	50.1	49.4
45	275	105	NFC–3	G10	55.2	55.2	55.2	55.2	55.2	54.2	52.6	51.2	50.1	49.4

Table 6B (Cont'd)
Section IV Maximum Allowable Stress Values, *S*, for Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./ UNS No.	Class/ Cond./ Temper	Size/ Thickness, mm	P-No.
(**23**)	1	...	Finned tube	SB–359	...	C70600	O61	...	34
(**23**)	2	...	Smls. U–bend tube	SB–395	...	C70600	O61	...	34
(**23**)	3	...	Wld. tube	SB–543	...	C70600	WO61	...	34
(**23**)	4	...	Smls. pipe & tube	SB–466	...	C70620	O60	...	34
(**23**)	5	...	Plate	SB–171	...	C70620	M20, O25	$t \le 140$	34
(**23**)	6	...	Smls. cond. tube	SB–111	...	C70620	O61	...	34
(**23**)	7	...	Finned tube	SB–395	...	C70620	O61	...	34
(**23**)	8	...	Smls. U–bend tube	SB–395	...	C70620	O61	...	34
(**23**)	9	...	Wld. tube	SB–543	...	C70620	WO61	...	34
	10	...	Smls. tube	SB–466	...	C71000	O60	...	34
	11	...	Smls. cond. tube	SB–111	...	C71000	O61	...	34
	12	...	Smls. U–bend tube	SB–395	...	C71000	O61	...	34
(**23**)	13	...	Plate	SB–171	...	C71500	M20, O25	$t \le 60$	34
	14	...	Smls. pipe & tube	SB–466	...	C71500	O60	...	34
	15	...	Smls. cond. tube	SB–111	...	C71500	O61	...	34
	16	...	Smls. U–bend tube	SB–395	...	C71500	O61	...	34
(**23**)	17	...	Plate	SB–171	...	C71520	M20, O25	$t \le 60$	34
(**23**)	18	...	Smls. pipe & tube	SB–466	...	C71520	O60	...	34
(**23**)	19	...	Smls. cond. tube	SB–111	...	C71520	O61	...	34
(**23**)	20	...	Smls. U–bend tube	SB–395	...	C71520	O61	...	34
	21	...	Castings	SB–62	...	C83600	...	...	...
	22	...	Castings	SB–584	...	C84400	...	...	...
	23	...	Castings	SB–584	...	C90300	...	...	...
	24	...	Castings	SB–61	...	C92200	...	...	...
	25	67Ni–30Cu	Bar	SB–164	...	N04400	Annealed	...	42
	26	67Ni–30Cu	Smls. pipe & tube	SB–165	...	N04400	Annealed	>125 O.D.	42
	27	67Ni–30Cu	Smls. pipe & tube	SB–165	...	N04400	Annealed	≤125 O.D.	42
	28	67Ni–30Cu	Rod	SB–164	...	N04400	Hot worked	...	42
	29	67Ni–30Cu	Smls. pipe & tube	SB–165	...	N04400	Stress rel.	...	42
	30	57Ni–22Cr–14W–2Mo–La	Smls. & wld. fittings	SB–366	...	N06230	Solution ann.	...	43
	31	57Ni–22Cr–14W–2Mo–La	Plate, sheet, strip	SB–435	...	N06230	Solution ann.	...	43
	32	57Ni–22Cr–14W–2Mo–La	Forgings	SB–564	...	N06230	Solution ann.	...	43
	33	57Ni–22Cr–14W–2Mo–La	Bar	SB–572	...	N06230	Solution ann.	...	43
	34	57Ni–22Cr–14W–2Mo–La	Wld. pipe	SB–619	...	N06230	Solution ann.	...	43
	35	57Ni–22Cr–14W–2Mo–La	Smls. pipe & tube	SB–622	...	N06230	Solution ann.	...	43
	36	57Ni–22Cr–14W–2Mo–La	Wld. tube	SB–626	...	N06230	Solution ann.	...	43
	37	33Ni–42Fe–21Cr	Plate	SB–409	...	N08800	Annealed	...	45
	38	33Ni–42Fe–21Cr	Plate	SB–409	...	N08810	Annealed	...	45

Table 6B (Cont'd)
Section IV Maximum Allowable Stress Values, *S*, for Nonferrous Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	External Pressure Chart No.	Notes	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
					40	65	100	125	150	175	200	225	250	275
1	275	105	NFC–3	G10	55.2	54.8	55.2	55.2	55.2	54.2	52.6	51.2	50.1	49.4
2	275	105	NFC–3	G10	55.2	55.2	55.2	55.2	55.2	54.2	52.6	51.2	50.1	49.4
3	275	105	NFC–3	G10	46.9	46.9	46.9	46.9	46.9	46.1	44.7	43.5	42.6	42.0
4	260	90	NFC–3	G10	52.4	52.4	52.4	52.4	52.4	51.5	49.9	48.6	47.6	46.9
5	275	105	NFC–3	G10	55.2	55.2	55.2	55.2	55.2	54.2	52.6	51.2	50.1	49.4
6	275	105	NFC–3	G10	55.2	55.2	55.2	55.2	55.2	54.2	52.6	51.2	50.1	49.4
7	275	105	NFC–3	G10	55.2	54.8	55.2	55.2	55.2	55.2	52.6	51.2	50.1	49.4
8	275	105	NFC–3	G10	55.2	55.2	55.2	55.2	55.2	54.2	52.6	51.2	50.1	49.4
9	275	105	NFC–3	G10	46.9	46.9	46.9	46.9	46.9	46.1	44.7	43.5	42.6	42.0
10	310	110	NFC–3	G10	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1
11	310	110	NFC–3	G10	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1
12	310	110	NFC–3	G10	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1	62.1
13	345	140	NFC–4	G10	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9
14	360	125	NFC–4	G10	71.7	71.7	71.7	71.7	71.7	71.7	71.4	70.1	68.9	67.8
15	360	125	NFC–4	G10	71.7	71.7	71.7	71.7	71.7	71.7	71.4	70.1	68.9	67.8
16	360	125	NFC–4	G10	71.7	71.7	71.7	71.7	71.7	71.7	71.4	70.1	68.9	67.8
17	345	140	NFC–4	G10	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9
18	360	125	NFC–4	G10	71.7	71.7	71.7	71.7	71.7	71.7	71.4	70.1	68.9	67.8
19	360	125	NFC–4	G10	71.7	71.7	71.7	71.7	71.7	71.7	71.4	70.1	68.9	67.8
20	360	125	NFC–4	G10	71.7	71.7	71.7	71.7	71.7	71.7	71.4	70.1	68.9	67.8
21	205	95	NFC–1	G6, G12	33.1	33.1	33.1	33.1	33.1	33.1	31.5	31.1	29.4	...
22	200	90	...	G6	32.0	32.0	31.9	30.6	29.3	28.3	27.2	...	...	...
23	276	124	...	G6	44.1	44.1	44.1	44.1	44.1	44.1	44.1	...	...	...
24	235	110	NFN–1	G6	37.5	37.5	37.5	37.5	37.5	37.5	33.4	...	...	...
25	485	170	NFN–3	G5, G10	96.5	96.5	96.5	96.2	93.6	91.9	90.9	90.4	90.4	90.4
26	485	170	NFN–3	G5, G10	96.5	96.5	96.5	96.2	93.6	91.9	90.9	90.4	90.4	90.4
27	485	195	NFN–3	G5, G10	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5
28	550	275	NFN–3	G5, G10	110	110	110	110	110	110	110	110	110	110
29	585	380	NFN–3	G5, G10	117	117	117	117	117	117	117	117	117	117
30	758	310	NFN–24	...	152	152	152	152	152	151	149	147	145	...
31	758	310	NFN–24	...	152	152	152	152	152	151	149	147	145	...
32	758	310	NFN–24	...	152	152	152	152	152	151	149	147	145	...
33	758	310	NFN–24	...	152	152	152	152	152	151	149	147	145	...
34	758	310	NFN–24	...	129	129	129	129	129	128	127	125	123	...
35	758	310	NFN–24	...	152	152	152	152	152	151	149	147	145	...
36	758	310	NFN–24	...	129	129	129	129	129	128	127	125	123	...
37	515	205	NFN–8	G7	103	103	103	103	103	103	103	103	103	103
38	450	170	NFN–9	G7	89.6	89.6	89.6	89.6	89.6	89.6	89.2	88.7	88.3	...

NOTES TO TABLE 6B

GENERAL NOTES

(a) The stress values in this Table may be interpolated to determine values for intermediate temperatures. The values at intermediate temperatures shall be rounded to the same number of decimal places as the value at the higher temperature between which values are being interpolated. The rounding rule is: when the next digit beyond the last place to be retained is less than 5, retain unchanged the digit in the last place retained; when the digit next beyond the last place to be retained is 5 or greater, increase by 1 the digit in the last place retained.

(b) Where a size limit appears in the Size/Thickness column, the limit applies to the dimension appropriate to the product form: wall thickness of tubing, pipe, pipe fittings, and hollow forgings; thickness of plate, flat bar and forgings, and polygonal bar; diameter of solid bar and bolting; and thickest cross–section of other pressure parts, e.g., castings and forgings.

(c) The following abbreviations are used: cond., condenser; Smls., Seamless; and Wld., Welded.

NOTES – GENERAL REQUIREMENTS

G1 When material is to be welded, the phosphorous deoxidized types should be specified.

G2 When nonferrous materials conforming to Section II specifications are used in welded or brazed construction, the maximum allowable working stresses shall not exceed the values given herein for the material in the annealed condition.

G3 For use in ASME BPVC, Section IV, eq. HG–307.2(b)(2), the maximum allowable stress at room temperature (40°C max.) shall be 68.9 MPa (through 38 mm thickness) and 63.4 MPa over 38 mm thickness.

G4 Copper–silicon alloys are not always suitable when exposed to certain median and high temperatures, particularly steam above 100°C. Therefore, this material is limited to the construction of hot water boilers to be operated at a temperature not to exceed 93°C.

G5 To be used for HLW connections only.

G6 The stress value includes a casting quality factor of 0.8. Increased casting quality factors as a result of material examination beyond the requirement of the material specification shall not be permitted. This is not intended to apply to valves and fittings made to recognized standards.

G7 The maximum water temperature shall not exceed 96°C.

G8 The castings shall not be repaired.

G9 When proof testing is required to establish design pressure, that testing shall comply with ASME BPVC, Section IV, HG–501 and HG–502.3, except that in the equation in HG–502.3, the design factor shall be 10 in lieu of 5.

G10 The maximum allowable use temperature is 260°C. The values for 275°C are provided for interpolation only.

G11 The maximum allowable use temperature is 204°C. The values for 225°C are provided for interpolation only.

G12 The maximum allowable use temperature is 232°C. The values for 250°C are provided for interpolation only.

NOTES – WELDING REQUIREMENTS

W1 Welding or brazing is not permitted.

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Table 6C
Section IV Maximum Allowable Stress Values, *S*, for Lined Water Heater Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./ UNS No.	Class/ Cond./ Temper	Size/ Thickness, mm	P-No.	Group No.
1	Carbon steel	Castings	SA–278	20	...	...	...	...	...
2	Carbon steel	Castings	SA–278	25	...	...	...	...	...
3	Carbon steel	Castings	SA–278	30	...	...	...	...	...
4	Carbon steel	Castings	SA–278	35	...	...	...	...	...
5	Carbon steel	Castings	SA–278	40	...	...	...	...	...
6	Carbon steel	Wld. tube	SA–513	1008	...	...	...	1	1
7	Carbon steel	Bar	SA–675	45	...	...	...	1	1
8	Carbon steel	Plate	SA–285	A	K01700	...	...	1	1
9	Carbon steel	Plate	SA–285 AISI C–1012	...	...	...	...	1	1
10	Carbon steel	Sheet	SA–414	A	K01501	...	...	1	1
11	Carbon steel	Sheet	SA–414 AISI C–1012	...	...	...	...	1	1
12	Carbon steel	Wld. tube	SA–513	1010	...	...	...	1	1
13	Carbon steel	Wld. tube	SA–178	E/A	K01200	...	...	1	1
14	Carbon steel	Smls. pipe	SA–53	A	K02504	...	...	1	1
15	Carbon steel	Wld. pipe	SA–53	E/A	K02504	...	...	1	1
16	Carbon steel	Smls. pipe	SA–106	A	K02501	...	...	1	1
17	Carbon steel	Wld. pipe	SA–135	E/A	...	...	...	1	1
18	Carbon steel	Wld. tube	SA–513	1015	...	...	...	1	1
19	Carbon steel	Bar	SA–675	50	...	...	...	1	1
20	Carbon steel	Plate	SA–285	B	K02200	...	...	1	1
21	Carbon steel	Plate	SA–285 AISI C–1015d	...	...	...	...	1	1
22	Carbon steel	Sheet	SA–414	B	K02201	...	...	1	1
23	Carbon steel	Sheet	SA–414 AISI C–1015d	...	...	...	...	1	1
24	Carbon steel	Bar	SA–675	55	...	...	...	1	1
25	Carbon steel	Plate	SA–285	C	K02801	...	...	1	1
26	Carbon steel	Plate	SA–516	55	K01800	...	...	1	1
27	Carbon steel	Plate	SA–285 AISI C–1023	...	...	...	...	1	1
28	Carbon steel	Sheet	SA–414	C	K02503	...	...	1	1
29	Carbon steel	Sheet	SA–414 AISI C–1023	...	...	...	...	1	1
30	Carbon steel	Plate	SA–36	...	K02600	...	...	1	1
31	Carbon steel	Bar, shapes	SA–36	...	K02600	...	...	1	1
32	Carbon steel	Forgings	SA–181	...	K03502	60	...	1	1
33	Carbon steel	Bar	SA–675	60	...	...	...	1	1
34	Carbon steel	Plate	SA–515	60	K02401	...	...	1	1
35	Carbon steel	Plate	SA–516	60	K02100	...	...	1	1
36	Carbon steel	Smls. pipe	SA–53	B	K03005	...	...	1	1
37	Carbon steel	Wld. pipe	SA–53	E/B	K03005	...	...	1	1
38	Carbon steel	Smls. pipe	SA–106	B	K03006	...	...	1	1
39	Carbon steel	Wld. pipe	SA–135	E/B	...	...	...	1	1
40	Carbon steel	Sheet	SA–414	D	K02505	...	...	1	1
41	Carbon steel	Wld. tube	SA–178	E/C	K03503	...	...	1	1
42	Carbon steel	Bar	SA–675	65	...	...	...	1	1
43	Carbon steel	Plate	SA–515	65	K02800	...	...	1	1
44	Carbon steel	Plate	SA–516	65	K02403	...	...	1	1
45	Carbon steel	Sheet	SA–414	E	K02704	...	...	1	1

Table 6C
Section IV Maximum Allowable Stress Values, *S*, for Lined Water Heater Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	External Pressure Chart No.	Notes	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
					40	65	100	125	150	175	200	225	250	275
1	138	124	CI–1	W1	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5
2	173	154	CI–1	W1	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
3	207	186	CI–1	W1	51.8	51.8	51.8	51.8	51.8	51.8	51.8	51.8	51.8	51.8
4	241	217	CI–1	W1	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3
5	276	248	CI–1	W1	69.0	69.0	69.0	69.0	69.0	69.0	69.0	69.0	69.0	69.0
6	290	207	...	G1, G2	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6	61.6
7	310	155	CS–6	...	77.6	77.6	77.6	77.6	77.6	77.6	77.6	77.6	77.6	77.6
8	310	165	CS–1	...	77.6	77.6	77.6	77.6	77.6	77.6	77.6	77.6	77.6	77.6
9	310	170	...	...	77.5	77.5	77.5	77.5	77.5	77.5	77.5	77.5	77.5	77.5
10	310	170	CS–1	...	77.6	77.6	77.6	77.6	77.6	77.6	77.6	77.6	77.6	77.6
11	310	170	...	...	77.5	77.5	77.5	77.5	77.5	77.5	77.5	77.5	77.5	77.5
12	310	221	...	G1, G2	65.9	65.9	65.9	65.9	65.9	65.9	65.9	65.9	65.9	65.9
13	325	180	...	G1, G2	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9	68.9
14	330	205	CS–2	...	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7
15	330	205	CS–2	G1	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3
16	330	205	CS–2	...	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7
17	330	205	CS–2	G1	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3
18	330	241	...	G1, G2	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3	70.3
19	345	170	CS–1	...	86.2	86.2	86.2	86.2	86.2	86.2	86.2	86.2	86.2	86.2
20	345	185	CS–1	...	86.2	86.2	86.2	86.2	86.2	86.2	86.2	86.2	86.2	86.2
21	345	205	...	...	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3
22	345	205	CS–2	...	86.2	86.2	86.2	86.2	86.2	86.2	86.2	86.2	86.2	86.2
23	345	205	...	...	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3
24	380	190	CS–1	...	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8
25	380	205	CS–2	...	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8
26	380	205	CS–2	...	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8
27	380	230	...	...	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8
28	380	230	CS–2	...	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8
29	380	230	...	...	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8	94.8
30	400	250	CS–2	...	100	100	100	100	100	100	100	100	100	100
31	400	250	...	...	100	100	100	100	100	100	100	100	100	100
32	415	205	CS–2	...	103	103	103	103	103	103	103	103	103	103
33	415	205	CS–2	...	103	103	103	103	103	103	103	103	103	103
34	415	220	CS–2	...	103	103	103	103	103	103	103	103	103	103
35	415	220	CS–2	...	103	103	103	103	103	103	103	103	103	103
36	415	240	CS–2	...	103	103	103	103	103	103	103	103	103	103
37	415	240	CS–2	G1	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9
38	415	240	CS–2	...	103	103	103	103	103	103	103	103	103	103
39	415	240	CS–2	G1	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9
40	415	240	CS–2	...	103	103	103	103	103	103	103	103	103	103
41	415	255	...	G1	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9
42	450	225	CS–2	...	112	112	112	112	112	112	112	112	112	112
43	450	240	CS–2	...	112	112	112	112	112	112	112	112	112	112
44	450	240	CS–2	...	112	112	112	112	112	112	112	112	112	112
45	450	260	CS–2	...	112	112	112	112	112	112	112	112	112	112

Table 6C (Cont'd)
Section IV Maximum Allowable Stress Values, *S*, for Lined Water Heater Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./ UNS No.	Class/ Cond./ Temper	Size/ Thickness, mm	P-No.	Group No.
1	Carbon steel	Plate	SA/CSA–G40.21	44W	...	...	$t \le 200$	1	1
2	Carbon steel	Plate	SA/CSA–G40.21	50W	...	...	$t \le 150$	1	1
3	Carbon steel	Plate	SA–455	...	K03300	...	$15 < t \le 20$	1	2
4	Carbon steel	Bars	SA–675	70	...	...	...	1	2
5	Carbon steel	Forgings	SA–105	...	K03504	...	...	1	2
6	Carbon steel	Forgings	SA–181	...	K03502	70	...	1	2
7	Carbon steel	Plate	SA–515	70	K03101	...	...	1	2
8	Carbon steel	Plate	SA–516	70	K02700	...	...	1	2
9	Carbon steel	Smls. pipe	SA–106	C	K03501	...	...	1	2
10	Carbon steel	Sheet	SA–414	F	K03102	...	...	1	2
11	Carbon steel	Plate	SA–455	...	K03300	...	$9.5 < t \le 15$	1	2
12	Carbon steel	Plate	SA–455	...	K03300	...	$t \le 9.5$	1	2
13	Carbon steel	Sheet	SA–414	G	K03103	...	...	1	2

Table 6C (Cont'd)
Section IV Maximum Allowable Stress Values, *S*, for Lined Water Heater Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	External Pressure Chart No.	Notes	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
					40	65	100	125	150	175	200	225	250	275
1	450	305	CS–2	...	112	112	112	112	112	112	112	112	112	112
2	450	345	CS–2	...	112	112	112	112	112	112	112	112	112	112
3	485	240	CS–2	...	121	121	121	121	121	121	121	121	121	121
4	485	240	CS–2	...	121	121	121	121	121	121	121	121	121	121
5	485	250	CS–2	...	121	121	121	121	121	121	121	121	121	121
6	485	250	CS–2	...	121	121	121	121	121	121	121	121	121	121
7	485	260	CS–2	...	121	121	121	121	121	121	121	121	121	121
8	485	260	CS–2	...	121	121	121	121	121	121	121	121	121	121
9	485	275	CS–2	...	121	121	121	121	121	121	121	121	121	121
10	485	290	CS–2	...	121	121	121	121	121	121	121	121	121	121
11	505	255	CS–2	...	126	126	126	126	126	126	126	126	126	126
12	515	260	CS–2	...	129	129	129	129	129	129	129	129	129	129
13	515	310	CS–3	...	129	129	129	129	129	129	129	129	129	129

NOTES TO TABLE 6C
GENERAL NOTES

(a) The stress values in this Table may be interpolated to determine values for intermediate temperatures. The values at intermediate temperatures shall be rounded to the same number of decimal places as the value at the higher temperature between which values are being interpolated. The rounding rule is: when the next digit beyond the last place to be retained is less than 5, retain unchanged the digit in the last place retained; when the digit next beyond the last place to be retained is 5 or greater, increase by 1 the digit in the last place retained.

(b) Where a size limit appears in the Size/Thickness column, the limit applies to the dimension appropriate to the product form: wall thickness of tubing, pipe, pipe fittings, and hollow forgings; thickness of plate, flat bar and forgings, and polygonal bar; diameter of solid bar and bolting; and thickest cross–section of other pressure parts, e.g., castings and forgings.

NOTES – GENERAL REQUIREMENTS

G1 The stress value includes a joint factor of 0.85.
G2 Tensile value is expected minimum.

NOTES – WELDING REQUIREMENTS

W1 Welding or brazing is not permitted.

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Table 6D
Section IV Maximum Allowable Stress Values, *S*, for Unlined Water Heater Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./ UNS No.	Size/ Thickness, mm	P-No.	Group No.
1	18Cr–2Mo	Plate	SA–240	...	S44400	$t \le 10$	7	2
2	18Cr–2Mo	Smls. tube	SA–268	...	S44400	$t \le 10$	7	2
3	18Cr–2Mo	Wld. tube	SA–268	...	S44400	$t \le 10$	7	2
4	18Cr–2Mo	Bar	SA–479	...	S44400	$t \le 10$	7	2
5	18Cr–Ti	Plate	SA–240	439	S43035	$t \le 10$	7	2
6	18Cr–Ti	Smls. tube	SA–268	TP439	S43035	$t \le 10$	7	2
7	18Cr–Ti	Bar	SA–479	439	S43035	$t \le 10$	7	2
8	29Cr–4Mo	Smls. tube	SA–268	29–4	S44700	...	10J	1
9	29Cr–4Mo	Wld. tube	SA–268	29–4	S44700	...	10J	1
10	16Cr–12Ni–2Mo	Forgings	SA–182	F316L	S31603	$t \le 13$	8	1
11	16Cr–12Ni–2Mo	Forgings	SA–182	F316L	S31603	$t \le 13$	8	1
12	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316L	S31603	$t \le 13$	8	1
13	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316L	S31603	$t \le 13$	8	1
14	16Cr–12Ni–2Mo	Plate	SA–240	316L	S31603	$t \le 13$	8	1
15	16Cr–12Ni–2Mo	Plate	SA–240	316L	S31603	$t \le 13$	8	1
16	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316L	S31603	$t \le 13$	8	1
17	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316L	S31603	$t \le 13$	8	1
18	16Cr–12Ni–2Mo	Smls. pipe	SA–312	TP316L	S31603	$t \le 13$	8	1
19	16Cr–12Ni–2Mo	Smls. pipe	SA–312	TP316L	S31603	$t \le 13$	8	1
20	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316L	S31603	$t \le 13$	8	1
21	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316L	S31603	$t \le 13$	8	1
22	16Cr–12Ni–2Mo	Bar	SA–479	316L	S31603	$t \le 13$	8	1
23	16Cr–12Ni–2Mo	Bar	SA–479	316L	S31603	$t \le 13$	8	1
24	16Cr–12Ni–2Mo	Forgings	SA–182	F316	S31600	$t \le 13$	8	1
25	16Cr–12Ni–2Mo	Forgings	SA–182	F316	S31600	$t \le 13$	8	1
26	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316	S31600	$t \le 13$	8	1
27	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316	S31600	$t \le 13$	8	1
28	16Cr–12Ni–2Mo	Plate	SA–240	316	S31600	$t \le 13$	8	1
29	16Cr–12Ni–2Mo	Plate	SA–240	316	S31600	$t \le 13$	8	1
30	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316	S31600	$t \le 13$	8	1
31	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316	S31600	$t \le 13$	8	1
32	16Cr–12Ni–2Mo	Smls. pipe	SA–312	TP316	S31600	$t \le 13$	8	1
33	16Cr–12Ni–2Mo	Smls. pipe	SA–312	TP316	S31600	$t \le 13$	8	1
34	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316	S31600	$t \le 13$	8	1
35	16Cr–12Ni–2Mo	Wld. pipe	SA–312	TP316	S31600	$t \le 13$	8	1
36	16Cr–12Ni–2Mo	Bar	SA–479	316	S31600	$t \le 13$	8	1
37	16Cr–12Ni–2Mo	Bar	SA–479	316	S31600	$t \le 13$	8	1
38	18Cr–8Ni	Forgings	SA–182	F304L	S30403	$t \le 13$	8	1
39	18Cr–8Ni	Forgings	SA–182	F304L	S30403	$t \le 13$	8	1
40	18Cr–8Ni	Smls. tube	SA–213	TP304L	S30403	$t \le 13$	8	1
41	18Cr–8Ni	Smls. tube	SA–213	TP304L	S30403	$t \le 13$	8	1
42	18Cr–8Ni	Plate	SA–240	304L	S30403	$t \le 13$	8	1
43	18Cr–8Ni	Plate	SA–240	304L	S30403	$t \le 13$	8	1
44	18Cr–8Ni	Wld. tube	SA–249	TP304L	S30403	$t \le 13$	8	1
45	18Cr–8Ni	Wld. tube	SA–249	TP304L	S30403	$t \le 13$	8	1

Table 6D
Section IV Maximum Allowable Stress Values, *S*, for Unlined Water Heater Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	External Pressure Chart No.	Notes	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
					40	65	100	125	150	175	200	225	250	275
1	415	275	CS–2	...	104	103	103	102	100	99.1	98.0	97.0	96.0	94.9
2	415	275	CS–2	...	104	103	103	102	100	99.1	98.0	97.0	96.0	94.9
3	415	275	CS–2	G1	88.0	87.9	87.8	86.5	85.2	84.3	83.3	82.5	81.6	80.6
4	415	...	CS–2	...	104	103	103	102	100	99.1	98.0	97.0	96.0	94.9
5	415	205	CS–2	...	104	103	103	102	99.8	98.5	97.3	96.4	95.5	94.5
6	415	205	CS–2	...	104	103	103	102	99.8	98.5	97.3	96.4	95.5	94.5
7	485	225	CS–2	...	121	121	117	114	112	109	108	106	104	94.5
8	550	415	HA–6	G2	138	138	137	135	133	133	133	133	133	133
9	550	415	HA–6	G1, G2	117	117	116	115	113	113	113	113	113	113
10	485	170	HA–4	...	115	105	96.7	91.3	87.3	83.3	80.7	78.7	76.0	74.0
11	485	170	HA–4	G3	121	119	117	114	110	109	107	106	103	99.9
12	485	170	HA–4	...	115	105	96.7	91.3	87.3	83.3	80.7	78.7	76.0	74.0
13	485	170	HA–4	G3	121	119	117	114	110	109	107	106	103	99.9
14	485	170	HA–4	...	115	105	96.7	91.3	87.3	83.3	80.7	78.7	76.0	74.0
15	485	170	HA–4	G3	121	119	117	114	110	109	107	106	103	99.9
16	485	170	HA–4	G1	97.5	89.0	82.2	77.6	74.2	70.8	68.6	66.9	64.6	62.9
17	485	170	HA–4	G1, G3	103	101	99.2	96.5	93.7	92.4	91.2	90.3	87.2	84.9
18	485	170	HA–4	...	115	105	96.7	91.3	87.3	83.3	80.7	78.7	76.0	74.0
19	485	170	HA–4	G3	121	119	117	114	110	109	107	106	103	99.9
20	485	170	HA–4	G1	97.5	89.0	82.2	77.6	74.2	70.8	68.6	66.9	64.6	62.9
21	485	170	HA–4	G1, G3	103	101	99.2	96.5	93.7	92.4	91.2	90.3	87.2	84.9
22	485	170	HA–4	...	115	105	96.7	91.3	87.3	83.3	80.7	78.7	76.0	74.0
23	485	170	HA–4	G3	121	119	117	114	110	109	107	106	103	99.9
24	515	205	HA–2	...	129	126	117	112	107	103	98.7	96.0	92.7	90.7
25	515	205	HA–2	G3	129	129	129	127	126	125	124	124	124	122
26	515	205	HA–2	...	129	126	117	112	107	103	98.7	96.0	92.7	90.7
27	515	205	HA–2	G3	129	129	129	127	126	125	124	124	124	122
28	515	205	HA–2	...	129	126	117	112	107	103	98.7	96.0	92.7	90.7
29	515	205	HA–2	G3	129	129	129	127	126	125	124	124	124	122
30	515	205	HA–2	G1	110	107	99.7	95.2	91.2	87.3	83.9	81.6	78.8	77.1
31	515	205	HA–2	G1, G3	110	110	110	108	107	106	105	105	105	104
32	515	205	HA–2	...	129	126	117	112	107	103	98.7	96.0	92.7	90.7
33	515	205	HA–2	G3	129	129	129	127	126	125	124	124	124	122
34	515	205	HA–2	G1	110	107	99.7	95.2	91.2	87.3	83.9	81.6	78.8	77.1
35	515	205	HA–2	G1, G3	110	110	110	108	107	106	105	105	105	104
36	515	205	HA–2	...	129	126	117	112	107	103	98.7	96.0	92.7	90.7
37	515	205	HA–2	G3	129	129	129	127	126	125	124	124	124	122
38	485	170	HA–3	...	115	105	97.3	92.0	88.0	84.0	80.7	78.0	76.0	74.0
39	485	170	HA–3	G3	121	117	113	109	105	103	102	101	99.5	98.9
40	485	170	HA–3	...	115	105	97.3	92.0	88.0	84.0	80.7	78.0	76.0	74.0
41	485	170	HA–3	G3	121	117	113	109	105	103	102	101	99.5	98.9
42	485	170	HA–3	...	115	105	97.3	92.0	88.0	84.0	80.7	78.0	76.0	74.0
43	485	170	HA–3	G3	121	117	113	109	105	103	102	101	99.5	98.9
44	485	170	HA–3	G1	97.5	89.0	82.7	78.2	74.8	71.4	68.6	66.3	64.6	62.9
45	485	170	HA–3	G1, G3	103	99.3	96.1	92.8	89.5	87.9	86.3	85.4	84.6	84.0

Table 6D (Cont'd)
Section IV Maximum Allowable Stress Values, *S*, for Unlined Water Heater Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/ Grade	Alloy Desig./ UNS No.	Size/ Thickness, mm	P-No.	Group No.
1	18Cr–8Ni	Smls. pipe	SA–312	TP304L	S30403	$t \le 13$	8	1
2	18Cr–8Ni	Smls. pipe	SA–312	TP304L	S30403	$t \le 13$	8	1
3	18Cr–8Ni	Wld. pipe	SA–312	TP304L	S30403	$t \le 13$	8	1
4	18Cr–8Ni	Wld. pipe	SA–312	TP304L	S30403	$t \le 13$	8	1
5	18Cr–8Ni	Bar	SA–479	304L	S30403	$t \le 13$	8	1
6	18Cr–8Ni	Bar	SA–479	304L	S30403	$t \le 13$	8	1
7	18Cr–8Ni	Forgings	SA–182	F304	S30400	...	8	1
8	18Cr–8Ni	Forgings	SA–182	F304	S30400	...	8	1
9	18Cr–8Ni	Smls. tube	SA–213	TP304	S30400	$t \le 13$	8	1
10	18Cr–8Ni	Smls. tube	SA–213	TP304	S30400	$t \le 13$	8	1
11	18Cr–8Ni	Plate	SA–240	304	S30400	$t \le 13$	8	1
12	18Cr–8Ni	Plate	SA–240	304	S30400	$t \le 13$	8	1
13	18Cr–8Ni	Wld. tube	SA–249	TP304	S30400	$t \le 13$	8	1
14	18Cr–8Ni	Wld. tube	SA–249	TP304	S30400	$t \le 13$	8	1
15	18Cr–8Ni	Smls. pipe	SA–312	TP304	S30400	$t \le 13$	8	1
16	18Cr–8Ni	Smls. pipe	SA–312	TP304	S30400	$t \le 13$	8	1
17	18Cr–8Ni	Wld. pipe	SA–312	TP304	S30400	$t \le 13$	8	1
18	18Cr–8Ni	Wld. pipe	SA–312	TP304	S30400	$t \le 13$	8	1
19	18Cr–8Ni	Bar	SA–479	304	S30400	$t \le 13$	8	1
20	18Cr–8Ni	Bar	SA–479	304	S30400	$t \le 13$	8	1
21	22Cr–5Ni–3Mo–N	Plate	SA–240	...	S31803	...	10H	1
22	22Cr–5Ni–3Mo–N	Smls. tube	SA–789	...	S31803	...	10H	1
23	22Cr–5Ni–3Mo–N	Wld. tube	SA–789	...	S31803	...	10H	1
24	22Cr–5Ni–3Mo–N	Smls. pipe	SA–790	...	S31803	...	10H	1
25	22Cr–5Ni–3Mo–N	Wld. pipe	SA–790	...	S31803	...	10H	1

Table 6D (Cont'd)
Section IV Maximum Allowable Stress Values, *S*, for Unlined Water Heater Materials

Line No.	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	External Pressure Chart No.	Notes	Maximum Allowable Stress, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
					40	65	100	125	150	175	200	225	250	275
1	485	170	HA–3	...	115	105	97.3	92.0	88.0	84.0	80.7	78.0	76.0	74.0
2	485	170	HA–3	G3	121	117	113	109	105	103	102	101	99.5	98.9
3	485	170	HA–3	G1	97.5	89.0	82.7	78.2	74.8	71.4	68.6	66.3	64.6	62.9
4	485	170	HA–3	G1, G3	103	99.3	96.1	92.8	89.5	87.9	86.3	85.4	84.6	84.0
5	485	170	HA–3	...	115	105	97.3	92.0	88.0	84.0	80.7	78.0	76.0	74.0
6	485	170	HA–3	G3	121	117	113	109	105	103	102	101	99.5	98.9
7	515	205	HA–1	...	129	123	113	107	103	98.7	96.0	92.7	90.0	88.0
8	515	205	HA–1	G3	129	125	121	118	114	112	111	110	109	109
9	515	205	HA–1	...	129	123	113	107	103	98.7	96.0	92.7	90.0	88.0
10	515	205	HA–1	G3	129	125	121	118	114	112	111	110	109	109
11	515	205	HA–1	...	129	123	113	107	103	98.7	96.0	92.7	90.0	88.0
12	515	205	HA–1	G3	129	125	121	118	114	112	111	110	109	109
13	515	205	HA–1	G1	110	104	96.3	91.2	87.3	83.9	81.6	78.8	76.5	74.8
14	515	205	HA–1	G1, G3	110	106	103	100	96.9	95.4	93.9	93.4	92.9	92.9
15	515	205	HA–1	...	129	123	113	107	103	98.7	96.0	92.7	90.0	88.0
16	515	205	HA–1	G3	129	125	121	118	114	112	111	110	109	109
17	515	205	HA–1	G1	110	104	96.3	91.2	87.3	83.9	81.6	78.8	76.5	74.8
18	515	205	HA–1	G1, G3	110	106	103	100	96.9	95.4	93.9	93.4	92.9	92.9
19	515	205	HA–1	...	129	123	113	107	103	98.7	96.0	92.7	90.0	88.0
20	515	205	HA–1	G3	129	125	121	118	114	112	111	110	109	109
21	620	450	HA–5	...	155	155	155	152	150	147	144	143	141	140
22	620	450	HA–5	...	155	155	155	152	150	147	144	143	141	140
23	620	450	HA–5	G1	132	132	132	129	128	125	122	122	120	119
24	620	450	HA–5	...	155	155	155	152	150	147	144	143	141	140
25	620	450	HA–5	G1	132	132	132	129	128	125	122	122	120	119

NOTES TO TABLE 6D
GENERAL NOTES

(a) The following abbreviations are used: Smls., Seamless; and Wld., Welded.

(b) The stress values in this Table may be interpolated to determine values for intermediate temperatures. The values at intermediate temperatures shall be rounded to the same number of decimal places as the value at the higher temperature between which values are being interpolated. The rounding rule is: when the next digit beyond the last place to be retained is less than 5, retain unchanged the digit in the last place retained; when the digit next beyond the last place to be retained is 5 or greater, increase by 1 the digit in the last place retained.

(c) The properties of steels are influenced by the processing history, heat treatment, melting practice, and level of residual elements. See Nonmandatory Appendix A for more information.

(d) Where a size limit appears in the Size/Thickness column, the limit applies to the dimension appropriate to the product form: wall thickness of tubing, pipe, pipe fittings, and hollow forgings; thickness of plate, flat bar and forgings, and polygonal bar; diameter of solid bar and bolting; and thickest cross–section of other pressure parts, e.g., castings and forgings.

NOTES – GENERAL REQUIREMENTS

G1 The stress value includes a joint factor of 0.85.

G2 Heat treatment after forming or fabrication is neither required nor prohibited.

G3 Due to the relatively low yield strength of these materials, these higher stress values were established at temperatures where the short–time tensile properties govern to permit the use of these alloys where slightly greater deformation is acceptable. The stress values in this range exceed $66\frac{2}{3}\%$ but do not exceed 90% of the yield strength at temperature. Use of these stresses may result in dimensional changes due to permanent strain. These stress values are not recommended for the flanges of gasketed joints or other applications where slight amounts of distortion can cause leakage or malfunction.

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Table U
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials							
1	Carbon steel	Sheet	SA–1008	CS–A	...	...	...	275
2	Carbon steel	Sheet	SA–1008	CS–B	...	...	...	275
3	Carbon steel	Bar	SA–675	45	...	...	...	310
4	Carbon steel	Wld. pipe	SA–134	A283A	...	...	...	310
(**23**) 5	...	...	...	...	...	...	...	...
6	Carbon steel	Plate	SA–285	A	K01700	...	...	310
7	Carbon steel	Wld. pipe	SA–672	A45	K01700	...	...	310
8	Carbon steel	Sheet	SA–414	A	K01501	...	...	310
9	Carbon steel	Wld. tube	SA–178	A	K01200	...	...	325
10	Carbon steel	Smls. tube	SA–179	...	K01200	...	...	325
11	Carbon steel	Smls. tube	SA–192	...	K01201	...	...	325
12	Carbon steel	Wld. tube	SA–214	...	K01807	...	...	325
13	Carbon steel	Smls. tube	SA–556	A2	K01807	...	...	325
14	Carbon steel	Wld. tube	SA–557	A2	K01807	...	...	325
15	Carbon steel	Wld. pipe	SA–53	E/A	K02504	...	...	330
16	Carbon steel	Smls. pipe	SA–53	S/A	K02504	...	...	330
17	Carbon steel	Smls. pipe	SA–106	A	K02501	...	...	330
18	Carbon steel	Wld. pipe	SA–135	A	...	...	...	330
19	Carbon steel	Forged pipe	SA–369	FPA	K02501	...	...	330
20	Carbon steel	Wld. pipe	SA–587	...	K11500	...	...	330
21	Carbon steel	Bar	SA–675	50	...	...	...	345
22	Carbon steel	Wld. pipe	SA–134	A283B	...	...	...	345
(**23**) 23	...	...	...	...	...	...	...	...
24	Carbon steel	Plate	SA–285	B	K02200	...	...	345
25	Carbon steel	Wld. pipe	SA–672	A50	K02200	...	...	345
26	Carbon steel	Sheet	SA–414	B	K02201	...	...	345
27	Carbon steel	Plate	SA/EN 10028–3	P275NH	...	...	$150 < t \le 250$	350
28	Carbon steel	Plate	SA/EN 10028–2	P235GH	...	...	≤60	360
29	Carbon steel	Plate	SA/EN 10028–3	P275NH	...	...	$100 < t \le 150$	360
30	Carbon steel	Smls. tube	SA/EN 10216–2	P235GH	...	...	$t \le 60$	360
31	Carbon steel	Sheet, strip	SA–1011	36	SS	Type 1	$t \le 6$	365
32	Carbon steel	Plate	SA/EN 10028–3	P275NH	...	...	$60 < t \le 100$	370
33	Carbon steel	Bar	SA–675	55	...	...	...	380
34	Carbon steel	Wld. pipe	SA–134	A283C	K02401	...	...	380
35	Carbon steel	Plate	SA–283	C	K02401	...	...	380
36	Carbon steel	Plate	SA–285	C	K02801	...	...	380
37	Carbon steel	Smls. & wld. pipe	SA–333	1	K03008	...	...	380
38	Carbon steel	Smls. & wld. tube	SA–334	1	K03008	...	...	380
39	Carbon steel	Plate	SA–516	55	K01800	...	...	380
40	Carbon steel	Smls. pipe	SA–524	II	K02104	...	...	380
41	Carbon steel	Wld. pipe	SA–671	CA55	K02801	...	...	380
42	Carbon steel	Wld. pipe	SA–671	CE55	K02202	...	...	380
43	Carbon steel	Wld. pipe	SA–672	A55	K02801	...	...	380
44	Carbon steel	Wld. pipe	SA–672	B55	K02001	...	...	380
45	Carbon steel	Wld. pipe	SA–672	C55	K01800	...	...	380

Table U
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials
1	276	276	276	276	276	276	276	276	276	272	255	235	213	189	169
2	276	276	276	276	276	276	276	276	276	272	255	235	213	189	169
3	310	310	310	310	310	310	310	310	310	306	286	264	239	213	190
4	310	310	310	310	310	310	310	310	310	306	286	264	239	213	190
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	310	310	310	310	310	310	310	310	310	306	286	264	239	213	190
7	310	310	310	310	310	310	310	310	310	306	286	264	239	213	190
8	310	310	310	310	310	310	310	310	310	306	286	264	239	213	190
9	324	324	324	324	324	324	324	324	324	319	299	275	250	223	198
10	324	324	324	324	324	324	324	324	324	319	299	275	250	223	198
11	324	324	324	324	324	324	324	324	324	319	299	275	250	223	198
12	324	324	324	324	324	324	324	324	324	319	299	275	250	223	198
13	324	324	324	324	324	324	324	324	324	319	299	275	250	223	198
14	324	324	324	324	324	324	324	324	324	319	299	275	250	223	198
15	331	331	331	331	331	331	331	331	331	326	306	282	255	227	203
16	331	331	331	331	331	331	331	331	331	326	306	282	255	227	203
17	331	331	331	331	331	331	331	331	331	326	306	282	255	227	203
18	331	331	331	331	331	331	331	331	331	326	306	282	255	227	203
19	331	331	331	331	331	331	331	331	331	326	306	282	255	227	203
20	331	331	331	331	331	331	331	331	331	326	306	282	255	227	203
21	345	345	345	345	345	345	345	345	345	340	318	293	265	237	211
22	345	345	345	345	345	345	345	345	345	340	318	293	265	237	211
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	345	345	345	345	345	345	345	345	345	340	318	293	265	237	211
25	345	345	345	345	345	345	345	345	345	340	318	293	265	237	211
26	345	345	345	345	345	345	345	345	345	340	318	293	265	237	211
27	350	350	350	350	350	350	350	350	350	345	323	298	270	241	214
28	360	360	360	360	360	360	360	360	360	355	332	306	277	248	220
29	360	360	360	360	360	360	360	360	360	355	332	306	277	248	220
30	360	360	360	360	360	360	360	360	360	355	332	306	277	248	220
31	366	366	364	362	362	362	362	362	...	...	...	...	...	...	...
32	369	369	369	369	369	369	369	369	369	365	343	316	286	255	225
33	379	379	379	379	379	379	379	379	379	374	350	322	292	261	232
34	379	379	379	379	379	379	379	379	379	374	350	322	292	261	232
35	379	379	379	379	379	379	379	379	379	374	350	322	292	261	232
36	379	379	379	379	379	379	379	379	379	374	350	322	292	261	232
37	379	379	379	379	379	379	379	379	379	374	350	322	292	261	232
38	379	379	379	379	379	379	379	379	379	374	350	322	292	261	232
39	379	379	379	379	379	379	379	379	379	374	350	322	292	261	232
40	379	379	379	379	379	379	379	379	379	374	350	322	292	261	232
41	379	379	379	379	379	379	379	379	379	374	350	322	292	261	232
42	379	379	379	379	379	379	379	379	379	374	350	322	292	261	232
43	379	379	379	379	379	379	379	379	379	374	350	322	292	261	232
44	379	379	379	379	379	379	379	379	379	374	350	322	292	261	232
45	379	379	379	379	379	379	379	379	379	374	350	322	292	261	232

Table U
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Ferrous Materials															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	Carbon steel	Wld. pipe	SA–672	E55	K02202	...	...	380
2	Carbon steel	Sheet	SA–414	C	K02503	...	...	380
3	Carbon steel	Sheet, strip	SA–1011	40	SS	...	$t \le 6$	380
4	Carbon steel	Sheet, strip	SA–1011	45	HSLAS	2	...	380
5	Carbon steel	Plate	SA/EN 10028–3	P275NH	...	...	≤60	390
6	Carbon steel	Plate, sheet, bar	SA–36	...	K02600	...	...	400
7	Carbon steel	Plate, sheet	SA–662	A	K01701	...	...	400
8	Carbon steel	Sheet, strip	SA–1011	36	SS	Type 2	$t \le 6$	400
9	Carbon steel	Plate	SA/EN 10028–2	P265GH	...	...	≤60	410
10	Carbon steel	Smls. tube	SA/EN 10216–2	P265GH	...	...	$t \le 60$	410
11	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250A	...	...	...	410
12	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250BR	...	...	...	410
(**23**) 13	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250 B0	...	...	...	410
14	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250C	...	...	...	410
15	Carbon steel	Forgings	SA–181	...	K03502	60	...	415
16	Carbon steel	Castings	SA–216	WCA	J02502	...	...	415
17	Carbon steel	Forgings	SA–266	1	K03506	...	...	415
18	Carbon steel	Bolting	SA–307	A	...	...	$6 \le t \le 100$	415
19	Carbon steel	Bolting	SA–307	B	...	...	...	415
20	Carbon steel	Forgings	SA–350	LF1	K03009	1	...	415
21	Carbon steel	Castings	SA–352	LCA	J02504	...	...	415
22	Carbon steel	Cast pipe	SA–660	WCA	J02504	...	...	415
23	Carbon steel	Bar	SA–675	60	...	...	...	415
24	Carbon steel	Forgings	SA–765	I	K03046	...	...	415
25	Carbon steel	Plate	SA–515	60	K02401	...	...	415
26	Carbon steel	Plate	SA–516	60	K02100	...	...	415
27	Carbon steel	Wld. pipe	SA–671	CB60	K02401	...	...	415
28	Carbon steel	Wld. pipe	SA–671	CC60	K02100	...	...	415
29	Carbon steel	Wld. pipe	SA–671	CE60	K02402	...	...	415
30	Carbon steel	Wld. pipe	SA–672	B60	K02401	...	...	415
31	Carbon steel	Wld. pipe	SA–672	C60	K02100	...	...	415
32	Carbon steel	Wld. pipe	SA–672	E60	K02402	...	...	415
33	Carbon steel	Wld. pipe	SA–134	A283D	K02702	...	...	415
34	Carbon steel	Plate	SA–283	D	K02702	...	...	415
35	Carbon steel	Wld. pipe	SA–53	E/B	K03005	...	...	415
36	Carbon steel	Smls. pipe	SA–53	S/B	K03005	...	...	415
37	Carbon steel	Smls. pipe	SA–106	B	K03006	...	...	415
38	Carbon steel	Wld. pipe	SA–135	B	...	...	...	415
39	Carbon steel	Smls. & wld. ftgs.	SA–234	WPB	K03006	...	...	415
40	Carbon steel	Smls. & wld. pipe	SA–333	6	K03006	...	...	415
41	Carbon steel	Smls. & wld. tube	SA–334	6	K03006	...	...	415
42	Carbon steel	Forged pipe	SA–369	FPB	K03006	...	...	415
43	Carbon steel	Forgings	SA–372	A	K03002	...	...	415
44	Carbon steel	Sheet	SA–414	D	K02505	...	...	415
45	Carbon steel	Smls. & wld. ftgs.	SA–420	WPL6	...	...	...	415

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	379	379	379	379	379	379	379	379	379	374	350	322	292	261	232
2	379	379	379	379	379	379	379	379	379	374	350	322	292	261	232
3	379	379	379	379	379	379	379	379	...	...	...	...	...	...	...
4	379	379	379	379	379	379	379	379	...	...	...	...	...	...	...
5	390	390	390	390	390	390	390	390	390	385	361	333	302	269	238
6	400	400	400	400	400	400	400	400	400	394	369	340	308	275	245
7	400	400	400	400	400	400	400	400	400	394	369	340	308	275	245
8	402	400	400	400	400	400	...	...	...	...	...	...	...	...	...
9	410	410	410	410	410	410	410	410	410	404	379	349	316	282	250
10	410	410	410	410	410	410	410	410	410	404	379	349	316	282	250
11	410	410	410	410	410	410	410	410	...	...	...	...	...	...	...
12	410	410	410	410	410	410	410	410	...	...	...	...	...	...	...
13	410	410	410	410	410	410	410	410	...	...	...	...	...	...	...
14	410	410	410	410	410	410	410	410	...	...	...	...	...	...	...
15	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
16	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
17	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
18	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
19	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
20	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
21	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
22	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
23	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
24	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
25	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
26	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
27	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
28	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
29	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
30	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
31	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
32	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
33	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
34	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
35	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
36	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
37	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
38	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
39	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
40	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
41	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
42	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
43	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
44	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
45	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	Carbon steel	Smls. pipe	SA–524	I	K02104	...	...	415
2	Carbon steel	Bar	SA–696	B	K03200	...	...	415
3	Carbon steel	Forgings	SA–727	...	K02506	...	...	415
4	Carbon steel	Wld. tube	SA–178	C	K03503	...	...	415
5	Carbon steel	Smls. tube	SA–210	A–1	K02707	...	...	415
6	Carbon steel	Smls. tube	SA–556	B2	K02707	...	...	415
7	Carbon steel	Wld. tube	SA–557	B2	K03007	...	...	415
8	Carbon steel	Plate, bar	SA/CSA–G40.21	38W	...	...	...	415
9	Carbon steel	Plate, sheet, bar	SA–572	42	...	...	$t \le 150$	415
10	Carbon steel	Sheet, strip	SA–1011	45	HSLAS	1	...	410
11	Carbon steel	Sheet, strip	SA–1011	45	SS	...	$t \le 6$	410
12	Carbon steel	Sheet, strip	SA–1011	50	HSLAS	2	...	410
13	Carbon steel	Plate	SA/AS 1548	PT430	...	...	≤150	430
14	Carbon steel	Plate	SA/EN 10028–2	P295GH	...	...	$150 < t \le 250$	430
15	Carbon steel	Plate	SA/EN 10028–2	P295GH	...	...	$100 < t \le 150$	440
16	Carbon steel	Bar	SA–675	65	...	...	...	450
17	Carbon steel	Castings	SA–352	LCB	J03003	...	...	450
18	Carbon steel	Plate	SA–515	65	K02800	...	...	450
19	Carbon steel	Plate	SA–516	65	K02403	...	...	450
20	Carbon steel	Wld. pipe	SA–671	CB65	K02800	...	...	450
21	Carbon steel	Wld. pipe	SA–671	CC65	K02403	...	...	450
22	Carbon steel	Wld. pipe	SA–672	B65	K02800	...	...	450
23	Carbon steel	Wld. pipe	SA–672	C65	K02403	...	...	450
24	Carbon steel	Sheet	SA–414	E	K02704	...	...	450
25	Carbon steel	Plate	SA–662	B	K02203	...	...	450
26	Carbon steel	Plate	SA–537	...	K12437	1	$65 < t \le 100$	450
27	Carbon steel	Wld. pipe	SA–691	CMSH–70	K12437	...	$65 < t \le 100$	450
28	Carbon steel	Plate, bar	SA/CSA–G40.21	44W	...	...	$t \le 200$	450
29	Carbon steel	Plate, bar	SA/CSA–G40.21	50W	...	...	$t \le 150$	450
30	Carbon steel	Plate, sheet, bar	SA–572	50	...	...	$t \le 100$	450
31	Carbon steel	Round bar	SA–572	50	...	...	$t \le 275$	450
32	Carbon steel	Sheet, strip	SA–1011	50	SS	...	$t \le 6$	450
33	Carbon steel	Sheet, strip	SA–1011	50	HSLAS	1	...	450
34	Carbon steel	Sheet, strip	SA–1011	55	HSLAS	2	...	450
35	Carbon steel	Plate	SA/AS 1548	PT460	...	...	≤150	460
36	Carbon steel	Plate	SA/EN 10028–2	P295GH	...	...	≤100	460
37	Carbon steel	Forgings	SA/EN 10222–2	P280GH	...	N, NT, or QT	$t \le 160$	460
38	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	$150 < t \le 250$	470
39	Carbon steel	Plate	SA/GB 713	Q345R	...	...	$150 < t \le 250$	470
40	Carbon steel	Plate	SA/EN 10025–2	S355J2+N	...	...	$3 \le t \le 80$	470
41	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	$100 < t \le 150$	480
42	Carbon steel	Plate	SA/GB 713	Q345R	...	...	$100 < t \le 150$	480
43	Carbon steel	Plate	SA–455	...	K03300	...	$15 < t \le 20$	485
44	Carbon steel	Bar	SA–675	70	...	...	...	485
45	Carbon steel	Forgings	SA–105	...	K03504	...	...	485

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
2	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
3	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
4	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
5	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
6	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
7	414	414	414	414	414	414	414	414	414	408	382	352	319	285	253
8	414	400	400	400	400	400	400	400	399	395	370	340	308	275	245
9	414	414	414	414	414	414	414	414	...	...	...	...	...	...	...
10	414	414	414	414	414	414	414	414	...	...	...	...	...	...	...
11	414	414	414	414	414	414	414	414	...	...	...	...	...	...	...
12	414	414	414	414	414	414	414	414	...	...	...	...	...	...	...
13	431	431	431	431	431	431	431	431	431	425	398	366	332	296	264
14	430	430	430	430	430	430	430	430	430	424	397	366	331	296	263
15	441	441	441	441	441	441	441	441	441	435	408	375	338	303	270
16	448	448	448	448	448	448	448	448	448	442	414	381	345	308	274
17	448	448	448	448	448	448	448	448	448	442	414	381	345	308	274
18	448	448	448	448	448	448	448	448	448	442	414	381	345	308	274
19	448	448	448	448	448	448	448	448	448	442	414	381	345	308	274
20	448	448	448	448	448	448	448	448	448	442	414	381	345	308	274
21	448	448	448	448	448	448	448	448	448	442	414	381	345	308	274
22	448	448	448	448	448	448	448	448	448	442	414	381	345	308	274
23	448	448	448	448	448	448	448	448	448	442	414	381	345	308	274
24	448	448	448	448	448	448	448	448	448	442	414	381	345	308	274
25	448	448	448	448	448	448	448	448	448	442	414	381	345	308	274
26	448	448	448	448	448	448	448	448	448	442	414	381	345	308	274
27	448	448	448	448	448	448	448	448	448	442	414	381	345	308	274
28	448	448	448	448	448	448	448	448	448	441	414	382	346	309	274
29	448	448	448	448	448	448	448	448	448	441	414	382	346	309	274
30	452	448	448	448	448	448	448	448	...	...	...	...	...	...	...
31	452	448	448	448	448	448	448	448	...	...	...	...	...	...	...
32	452	448	448	448	448	448	448	448	...	...	...	...	...	...	...
33	452	448	448	448	448	448	448	448	...	...	...	...	...	...	...
34	452	448	448	448	448	448	448	448	...	...	...	...	...	...	...
35	458	458	458	458	458	458	458	458	458	452	424	389	353	315	281
36	458	458	458	458	458	458	458	458	458	452	424	389	353	315	281
37	460	460	460	460	460	460	460	460	460	452	424	391	354	316	279
38	470	470	470	470	470	470	470	470	470	451	430	402	368	327	283
39	470	470	470	470	470	470	470	470	470	463	433	399	361	322	286
40	470	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	480	480	480	480	480	480	480	480	480	461	439	411	376	334	289
42	480	480	480	480	480	480	480	480	480	473	443	407	368	329	293
43	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
44	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
45	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	Carbon steel	Forgings	SA–181	...	K03502	70	...	485
2	Carbon steel	Castings	SA–216	WCB	J03002	...	...	485
3	Carbon steel	Forgings	SA–266	2	K03506	...	...	485
4	Carbon steel	Forgings	SA–266	4	K03017	...	...	485
5	Carbon steel	Forgings	SA–350	LF2	K03011	...	...	485
6	Carbon steel	Forgings	SA–508	1	K13502	...	...	485
7	Carbon steel	Forgings	SA–508	1A	K13502	...	...	485
8	Carbon steel	Forgings	SA–541	1	K03506	...	...	485
9	Carbon steel	Forgings	SA–541	1A	K03020	...	...	485
10	Carbon steel	Cast pipe	SA–660	WCB	J03003	...	...	485
11	Carbon steel	Forgings	SA–765	II	K03047	...	...	485
12	Carbon steel	Plate	SA–515	70	K03101	...	...	485
13	Carbon steel	Plate	SA–516	70	K02700	...	...	485
14	Carbon steel	Wld. pipe	SA–671	CB70	K03101	...	...	485
15	Carbon steel	Wld. pipe	SA–671	CC70	K02700	...	...	485
16	Carbon steel	Wld. pipe	SA–672	B70	K03101	...	...	485
17	Carbon steel	Wld. pipe	SA–672	C70	K02700	...	...	485
18	Carbon steel	Smls. pipe	SA–106	C	K03501	...	...	485
19	Carbon steel	Wld. tube	SA–178	D	...	...	...	485
20	Carbon steel	Smls. tube	SA–210	C	K03501	...	...	485
21	Carbon steel	Castings	SA–216	WCC	J02503	...	...	485
22	Carbon steel	Smls. & wld. fittings	SA–234	WPC	K03501	...	...	485
23	Carbon steel	Castings	SA–352	LCC	J02505	...	...	485
24	Carbon steel	Castings	SA–487	16	...	A	...	485
25	Carbon steel	Plate	SA–537	...	K12437	3	$100 < t \le 150$	485
26	Carbon steel	Smls. tube	SA–556	C2	K03006	...	...	485
27	Carbon steel	Tube	SA–557	C2	K03505	...	...	485
28	Carbon steel	Cast pipe	SA–660	WCC	J02505	...	...	485
29	Carbon steel	Bar	SA–696	C	K03200	...	...	485
30	Carbon steel	Sheet	SA–414	F	K03102	...	...	485
31	Carbon steel	Plate	SA–662	C	K02007	...	...	485
32	Carbon steel	Plate	SA–537	...	K12437	2	$100 < t \le 150$	485
33	Carbon steel	Plate	SA–738	C	K02008	...	$100 < t \le 150$	485
34	Carbon steel	Plate	SA–537	...	K12437	1	≤65	485
35	Carbon steel	Wld. pipe	SA–671	CD70	K12437	...	≤65	485
36	Carbon steel	Wld. pipe	SA–672	D70	K12437	...	≤65	485
37	Carbon steel	Wld. pipe	SA–691	CMSH–70	K12437	...	≤65	485
38	Carbon steel	Plate	SA–841	A	...	1	≤65	485
39	Carbon steel	Plate, sheet, bar	SA–572	55	...	...	$t \le 50$	485
40	Carbon steel	Round bar	SA–572	55	...	...	$t \le 90$	485
41	Carbon steel	Sheet, strip	SA–1011	55	HSLAS	1	...	480
42	Carbon steel	Sheet, strip	SA–1011	60	HSLAS	2	...	480
43	Carbon steel	Forgings	SA/EN 10222–2	P305GH	...	N or NT	$t \le 160$	490
44	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	$60 < t \le 100$	490
45	Carbon steel	Plate	SA/GB 713	Q345R	...	...	$36 < t \le 100$	490

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
													Ferrous Materials (Cont'd)		
1	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
2	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
3	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
4	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
5	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
6	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
7	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
8	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
9	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
10	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
11	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
12	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
13	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
14	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
15	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
16	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
17	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
18	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
19	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
20	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
21	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
22	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
23	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
24	483	477	452	437	432	432	432	432	431	429	410	390	...	...	...
25	483	482	476	472	472	472	472	472	471	466	452	437	...	...	...
26	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
27	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
28	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
29	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
30	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
31	483	483	483	483	483	483	483	483	483	476	446	411	372	332	296
32	483	482	476	472	472	472	472	472	471	466	452	437	...	...	...
33	483	482	476	472	472	472	472	472	471	466	452	437	...	...	...
34	483	482	476	472	472	472	472	472	471	466	452	437	...	...	...
35	483	482	476	472	472	472	472	472	471	466	452	437	...	...	...
36	483	482	476	472	472	472	472	472	471	466	452	437	...	...	...
37	483	482	476	472	472	472	472	472	471	466	452	437	...	...	...
38	483	483	483	483	483	483	480	468	448	421	...	...	...	...	...
39	487	483	483	483	483	483	483	483	...	...	...	...	...	...	...
40	487	483	483	483	483	483	483	483	...	...	...	...	...	...	...
41	482	483	483	483	483	483	483	483	...	...	...	...	...	...	...
42	482	483	483	483	483	483	483	483	...	...	...	...	...	...	...
43	490	490	490	490	490	490	490	490	490	482	452	416	377	336	298
44	490	490	490	490	490	490	490	490	490	470	449	419	383	341	295
45	490	490	490	490	490	490	490	490	490	482	452	416	376	336	299

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	Carbon steel	Plate	SA/GB 713	Q345R	...	...	16 < t ≤ 36	500
2	Carbon steel	Plate	SA–455	...	K03300	...	9.5 < t ≤ 15	505
3	Carbon steel	Forgings	SA/EN 10222–2	P305GH	...	QT	t ≤ 70	510
4	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...	≤60	510
5	Carbon steel	Plate	SA/GB 713	Q345R	...	...	3 ≤ t ≤ 16	510
6	Carbon steel	Plate	SA/EN 10025–2	S355J2+N	...	...	t < 3	510
7	Carbon steel	Forgings	SA–266	3	K05001	...	...	515
8	Carbon steel	Plate	SA–455	...	K03300	...	≤9.5	515
9	Carbon steel	Plate	SA–299	A	K02803	...	>25	515
10	Carbon steel	Wld. pipe	SA–671	CK75	K02803	...	>25	515
11	Carbon steel	Wld. pipe	SA–672	N75	K02803	...	>25	515
12	Carbon steel	Wld. pipe	SA–691	CMS–75	K02803	...	>25	515
13	Carbon steel	Plate	SA–299	A	K02803	...	≤25	515
14	Carbon steel	Wld. pipe	SA–691	CMS–75	K02803	...	≤25	515
15	Carbon steel	Forgings	SA–372	B	K04001	...	...	515
16	Carbon steel	Sheet	SA–414	G	K03103	...	...	515
17	Carbon steel	Plate	SA–738	A	K12447	...	...	515
18	Carbon steel	Plate	SA–537	...	K12437	3	65 < t ≤ 100	515
19	Carbon steel	Plate	SA–537	...	K12437	2	65 < t ≤ 100	515
20	Carbon steel	Wld. pipe	SA–691	CMSH–80	K12437	...	65 < t ≤ 100	515
21	Carbon steel	Plate	SA–738	C	K02008	...	65 < t ≤ 100	515
22	Carbon steel	Plate, sheet, bar	SA–572	60	...	...	t ≤ 32	520
23	Carbon steel	Round bar	SA–572	60	...	...	t ≤ 90	520
24	Carbon steel	Sheet, strip	SA–1011	60	HSLAS	1	...	520
25	Carbon steel	Plate	SA–299	B	K02803	...	>25	550
26	Carbon steel	Plate	SA–299	B	K02803	...	≤25	550
27	Carbon steel	Forgings	SA–765	IV	K02009	...	...	550
28	Carbon steel	Plate	SA–537	...	K12437	3	≤65	550
29	Carbon steel	Plate	SA–537	...	K12437	2	≤65	550
30	Carbon steel	Wld. pipe	SA–671	CD80	K12437	...	≤65	550
31	Carbon steel	Wld. pipe	SA–672	D80	K12437	...	≤65	550
32	Carbon steel	Plate	SA–738	C	K02008	...	≤65	550
33	Carbon steel	Wld. pipe	SA–691	CMSH–80	K12437	...	≤65	550
34	Carbon steel	Plate	SA–841	B	...	2	≤65	550
35	Carbon steel	Plate, sheet, bar	SA–572	65	...	...	t ≤ 32	550
36	Carbon steel	Plate	SA–612	...	K02900	...	≤12.5	560
37	Carbon steel	Plate	SA–841	F	...	6	t ≤ 32	565
38	Carbon steel	Plate	SA–612	...	K02900	...	≤12.5	570
39	Carbon steel	Plate	SA–738	B	K12007	...	...	585
40	Carbon steel	Plate	SA–841	F	...	7	t ≤ 25	593
41	Carbon steel	Forgings	SA–372	C	K04801	...	...	620
42	Carbon steel	Bolting	SA–449	...	K04200	...	38 < t ≤ 75	620
43	Carbon steel	Plate	SA–724	A	K11831	...	...	620
44	Carbon steel	Plate	SA–724	C	K12037	...	...	620
45	Carbon steel	Plate	SA–724	B	K12031	...	...	655

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	500	500	500	500	500	500	500	500	500	492	461	424	384	342	305
2	503	503	503	503	503	503	503	503	503	496	465	428	388	346	308
3	510	510	510	510	510	510	510	510	510	501	470	433	393	350	310
4	510	510	510	510	510	510	510	510	510	490	467	437	399	355	307
5	510	510	510	510	510	510	510	510	510	502	470	433	391	349	311
6	510	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	517	517	517	517	517	517	517	517	516	510	478	440	399	356	316
8	517	517	517	517	517	517	517	517	516	510	478	440	399	356	316
9	517	517	517	517	517	517	517	517	516	510	478	440	399	356	316
10	517	517	517	517	517	517	517	517	516	510	478	440	399	356	316
11	517	517	517	517	517	517	517	517	516	510	478	440	399	356	316
12	517	517	517	517	517	517	517	517	516	510	478	440	399	356	316
13	517	517	517	517	517	517	517	517	516	510	478	440	399	356	316
14	517	517	517	517	517	517	517	517	516	510	478	440	399	356	316
15	517	517	517	517	517	517	517	517	516	510	478	440	399	356	316
16	517	517	517	517	517	517	517	517	516	510	478	440	399	356	316
17	517	517	517	517	517	517	517	517	516	510	478	440	399	356	316
18	517	517	510	506	505	505	505	505	505	499	484	469	...	...	...
19	517	517	510	506	505	505	505	505	505	499	484	469	...	...	...
20	517	517	510	506	505	505	505	505	505	499	484	469	...	...	...
21	517	517	510	506	505	505	505	505	505	499	484	469	...	...	...
22	522	522	518	516	516	516	516	516	...	...	...	...	...	...	...
23	522	522	518	516	516	516	516	516	...	...	...	...	...	...	...
24	522	522	518	516	516	516	516	516	...	...	...	...	...	...	...
25	552	552	552	552	552	552	552	552	552	543	509	469	425	379	337
26	552	552	552	552	552	552	552	552	552	543	509	469	425	379	337
27	552	552	551	546	545	545	545	542	535	...	...	...	...	...	...
28	552	551	544	539	538	538	538	538	538	533	517	500	...	...	...
29	552	551	544	539	538	538	538	538	538	533	517	500	...	...	...
30	552	551	544	539	538	538	538	538	538	533	517	500	...	...	...
31	552	551	544	539	538	538	538	538	538	533	517	500	...	...	...
32	552	551	544	539	538	538	538	538	538	533	517	500	...	...	...
33	552	551	544	539	538	538	538	538	538	533	517	500	...	...	...
34	552	552	552	552	552	552	548	535	512	482	...	...	...	...	...
35	552	552	548	546	546	546	546	546	...	...	...	...	...	...	...
36	558	558	547	547	547	547	547	547	547	...	...	...	...	...	...
37	565	565	565	565	565	565	560	551	...	...	...	...	...	...	...
38	572	571	561	561	561	561	561	561	561	...	...	...	...	...	...
39	586	586	586	586	586	583	578	569	556	539	516	493	...	...	...
40	593	593	593	593	593	593	587	578	...	...	...	...	...	...	...
41	621	621	621	621	621	621	621	621	621	612	573	528	478	426	380
42	621	621	621	621	621	621	621	621	621	612	573	528	478	426	380
43	621	620	612	606	606	606	606	606	606	599	581	563	...	...	...
44	621	620	612	606	606	606	606	606	606	599	581	563	...	...	...
45	655	654	646	640	640	640	640	640	640	633	614	594	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	Carbon steel	Bolting	SA–325	...	...	...	...	725
(**23**) 2	Carbon steel	Bolting	SA–325	1	K02706	...	29 ≤ t ≤ 38	725
3	Carbon steel	Bolting	SA–449	...	K04200	...	25 < t ≤ 38	725
4	Carbon steel	Bolting	SA–354	BC	K04100	...	64 < t ≤ 100	795
5	Carbon steel	Bolting	SA–325	1	K02706	...	13 ≤ t ≤ 25	825
6	Carbon steel	Bolting	SA–449	...	K04200	...	≤25	825
7	Carbon steel	Bolting	SA–354	BC	K04100	...	6 < t ≤ 64	860
8	Carbon steel	Bolting	SA–354	BD	K04100	...	64 < t ≤ 100	965
9	Carbon steel	Bolting	SA–354	BD	K04100	...	6 < t ≤ 64	1035
10	Ductile cast iron	Castings	SA–874	...	...	...	300 < t < 530	300
11	Ductile cast iron	Castings	SA/JIS G5504	FCD 300 LT	...	...	300 < t < 530	300
12	C–Mn–Si–Cb	Plate	SA–737	B	K12001	...	...	485
13	C–Mn–Si–Cb	Plate	SA/AS 1548	PT490	...	...	≤150	490
14	C–Mn–Si–Cb	Plate	SA/GB 713	Q730R	...	Normalized	60 < t ≤ 100	510
15	C–Mn–Si–Cb	Plate	SA/GB 713	Q370R	...	Normalized	36 < t ≤ 60	520
16	C–Mn–Si–Cb	Plate	SA/GB 713	Q370R	...	Normalized	10 ≤ t ≤ 36	530
17	C–Mn–Si–V	Plate	SA–737	C	K12202	...	...	550
18	C–Mn–Si–V–Cb	Plate	SA–656	T3	...	...	≤50	414
19	C–Mn–Si–V–Cb	Plate	SA–656	T7	...	...	≤50	414
20	C–Mn–Si–V–Cb	Plate	SA–656	T3	...	...	≤40	483
21	C–Mn–Si–V–Cb	Plate	SA–656	T7	...	...	≤40	483
22	C–Mn–Si–V–Cb	Plate	SA–656	T3	...	...	≤25	552
23	C–Mn–Si–V–Cb	Plate	SA–656	T7	...	...	≤25	552
24	C–Mn–Si–V–Cb	Plate	SA–656	T3	...	...	≤20	621
25	C–Mn–Si–V–Cb	Plate	SA–656	T7	...	...	≤20	621
26	C–Mn–Ti	Plate, sheet	SA–562	...	K11224	...	...	380
27	C–Si–Ti	Forgings	SA–836	...	...	1	...	380
28	C–¼Mo	Bolting	SA–320	L7A	G40370	...	≤65	860
29	C–¼Mo	Bolting	SA–574	4037	G40370	...	≥16	1170
30	C–¼Mo	Bolting	SA–574	4042	G40420	...	≥16	1170
31	C–¼Mo	Bolting	SA–574	4140	G41400	...	≥16	1170
32	C–¼Mo	Bolting	SA–574	4037	G40370	...	≤13	1240
33	C–¼Mo	Bolting	SA–574	4042	G40420	...	≤13	1240
34	C–0.3Mo	Smls. tube	SA/EN 10216–2	16Mo3	...	...	t ≤ 60	450
35	C–½Mo	Smls. tube	SA–209	T1b	K11422	...	...	365
36	C–½Mo	Wld. tube	SA–250	T1b	K11422	...	...	365
37	C–½Mo	Smls. tube	SA–209	T1	K11522	...	...	380
38	C–½Mo	Smls. & wld. ftgs.	SA–234	WP1	K12821	...	...	380
39	C–½Mo	Wld. tube	SA–250	T1	K11522	...	...	380
40	C–½Mo	Smls. pipe	SA–335	P1	K11522	...	...	380
41	C–½Mo	Forged pipe	SA–369	FP1	K11522	...	...	380
42	C–½Mo	Smls. tube	SA–209	T1a	K12023	...	...	415
43	C–½Mo	Wld. tube	SA–250	T1a	K12023	...	...	415
44	C–½Mo	Castings	SA–217	WC1	J12524	...	...	450
45	C–½Mo	Castings	SA–352	LC1	J12522	...	...	450

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	724	723	714	708	707	707	707	707	706	699	678	640	577	483	335
2	724	723	714	708	707	707	707	707	706	699	678	640	577	483	335
3	724	723	714	708	707	707	707	707	706	699	678	640	577	483	335
4	793	793	793	793	793	793	793	791	779	726	667	603	538	479	423
5	827	827	816	809	808	808	808	808	808	800	775	732	660	552	384
6	827	827	816	809	808	808	808	808	808	800	775	732	660	552	384
7	862	862	862	862	862	862	862	862	862	850	796	733	664	592	528
8	965	965	965	965	965	965	965	965	965	952	891	820	744	663	591
9	1030	1030	1030	1030	1030	1030	1030	1030	1030	1020	952	875	792	706	627
10	300	297	285	276	270	267	263	257	...	...	...	...	...	...	...
11	300	297	285	276	270	267	263	257	...	...	...	...	...	...	...
12	483	483	483	483	483	483	483	482	477	459	436	407	373	338	303
13	490	490	490	490	490	490	490	489	484	466	442	413	379	343	308
14	510	510	510	510	510	510	510	510	510	487	460	428	392	356	321
15	520	520	520	520	520	520	520	520	520	497	469	436	400	363	327
16	530	530	530	530	530	530	530	530	530	507	478	444	408	370	334
17	552	552	552	552	552	552	552	552	545	525	498	465	427	387	346
18	414	414	414	414	414	414	414	414	...	...	...	...	...	...	...
19	414	414	414	414	414	414	414	414	...	...	...	...	...	...	...
20	483	483	483	483	483	483	483	483	...	...	...	...	...	...	...
21	483	483	483	483	483	483	483	483	...	...	...	...	...	...	...
22	552	552	552	552	552	552	552	552	...	...	...	...	...	...	...
23	552	552	552	552	552	552	552	552	...	...	...	...	...	...	...
24	621	621	621	621	621	621	621	621	...	...	...	...	...	...	...
25	621	621	621	621	621	621	621	621	...	...	...	...	...	...	...
26	379	301	286	273	264	257	253	249	245	240	...	...	...	...	...
27	379	372	349	334	323	314	309	304	299	293	...	...	...	...	...
28	862	862	862	862	862	862	862	862	862	850	796	733	664	592	528
29	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1150	1110	1050	982
30	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1150	1110	1050	982
31	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1150	1110	1050	982
32	1240	1240	1240	1240	1240	1240	1240	1240	1240	1240	1240	1220	1170	1110	1040
33	1240	1240	1240	1240	1240	1240	1240	1240	1240	1240	1240	1220	1170	1110	1040
34	450	450	450	450	450	450	450	450	450	450	450	442	424	403	377
35	365	365	365	365	365	365	365	365	365	365	365	359	345	327	306
36	365	365	365	365	365	365	365	365	365	365	365	359	345	327	306
37	379	379	379	379	379	379	379	379	379	379	379	372	357	339	318
38	379	379	379	379	379	379	379	379	379	379	379	372	357	339	318
39	379	379	379	379	379	379	379	379	379	379	379	372	357	339	318
40	379	379	379	379	379	379	379	379	379	379	379	372	357	339	318
41	379	379	379	379	379	379	379	379	379	379	379	372	357	339	318
42	414	414	414	414	414	414	414	414	414	414	414	406	390	370	347
43	414	414	414	414	414	414	414	414	414	414	414	406	390	370	347
44	448	448	448	448	448	448	448	448	448	448	448	440	422	401	376
45	448	448	448	448	448	448	448	448	448	448	448	440	422	401	376

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	C–½Mo	Cast pipe	SA–426	CP1	J12521	...	...	450
2	C–½Mo	Plate	SA–204	A	K11820	...	...	450
3	C–½Mo	Wld. pipe	SA–672	L65	K11820	...	...	450
4	C–½Mo	Wld. pipe	SA–691	CM–65	K11820	...	...	450
5	C–½Mo	Forgings	SA–182	F1	K12822	...	...	485
6	C–½Mo	Plate	SA–204	B	K12020	...	...	485
7	C–½Mo	Forgings	SA–336	F1	K12520	...	...	485
8	C–½Mo	Wld. pipe	SA–672	L70	K12020	...	...	485
9	C–½Mo	Wld. pipe	SA–691	CM–70	K12020	...	...	485
10	C–½Mo	Plate	SA–204	C	K12320	...	...	515
11	C–½Mo	Wld. pipe	SA–672	L75	K12320	...	...	515
12	C–½Mo	Wld. pipe	SA–691	CM–75	K12320	...	...	515
13	½Cr–1/5Mo	Forgings	SA–372	G	K13049	55	...	585
14	½Cr–1/5Mo	Forgings	SA–372	H	K13547	55	...	585
15	½Cr–1/5Mo	Forgings	SA–372	G	K13049	65	...	725
16	½Cr–1/5Mo	Forgings	SA–372	H	K13547	65	...	725
17	½Cr–1/5Mo	Forgings	SA–372	G	K13049	70	...	825
18	½Cr–1/5Mo	Forgings	SA–372	H	K13547	70	...	825
19	½Cr–1/5Mo–V	Plate	SA–517	B	K11630	...	≤32	795
20	½Cr–¼Mo–Si	Plate	SA–517	A	K11856	...	≤32	795
21	½Cr–¼Mo–Si	Forgings	SA–592	A	K11856	...	≤65	795
22	½Cr–½Mo	Smls. pipe	SA–335	P2	K11547	...	...	380
23	½Cr–½Mo	Forged pipe	SA–369	FP2	K11547	...	...	380
24	½Cr–½Mo	Plate	SA–387	2	K12143	1	...	380
25	½Cr–½Mo	Wld. pipe	SA–691	½CR	K12143	...	...	380
26	½Cr–½Mo	Smls. tube	SA–213	T2	K11547	...	...	415
27	½Cr–½Mo	Cast pipe	SA–426	CP2	J11547	...	...	415
28	½Cr–½Mo	Forgings	SA–182	F2	K12122	...	...	485
29	½Cr–½Mo	Plate	SA–387	2	K12143	2	...	485
30	½Cr–½Mo	Wld. pipe	SA–691	½CR	K12143	...	...	485
31	¾Cr–½Ni–Cu	Wld. tube	SA–423	1	K11535	...	...	415
32	¾Cr–¾Ni–Cu–Al	Pipe	SA–333	4	K11267	...	...	415
33	1Cr–1/5Mo	Forgings	SA–372	E	K13047	55	...	585
34	1Cr–1/5Mo	Forgings	SA–372	F	G41350	55	...	585
35	1Cr–1/5Mo	Forgings	SA–372	J	K13548	55	...	585
36	1Cr–1/5Mo	Bolting	SA–193	B7	G41400	...	$100 < t \le 180$	690
37	1Cr–1/5Mo	Bolting	SA–193	B7M	G41400	...	≤100	690
38	1Cr–1/5Mo	Bolting	SA–320	L7M	G41400	...	≤65	690
39	1Cr–1/5Mo	Forgings	SA–372	F	G41350	65	...	725
40	1Cr–1/5Mo	Bolting	SA–193	B7	G41400	...	$64 < t \le 100$	795
41	1Cr–1/5Mo	Forgings	SA–372	E	K13047	70	...	825
42	1Cr–1/5Mo	Forgings	SA–372	F	G41350	70	...	825
43	1Cr–1/5Mo	Forgings	SA–372	J	K13548	70	...	825
44	1Cr–1/5Mo	Bolting	SA–193	B7	G41400	...	≤64	860
45	1Cr–1/5Mo	Bolting	SA–320	L7	G41400	...	≤65	860

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	448	448	448	448	448	448	448	448	448	448	448	440	422	401	376
2	448	448	448	448	448	448	448	448	448	448	448	440	422	401	376
3	448	448	448	448	448	448	448	448	448	448	448	440	422	401	376
4	448	448	448	448	448	448	448	448	448	448	448	440	422	401	376
5	483	483	483	483	483	483	483	483	483	483	483	474	455	432	404
6	483	483	483	483	483	483	483	483	483	483	483	474	455	432	404
7	483	483	483	483	483	483	483	483	483	483	483	474	455	432	404
8	483	483	483	483	483	483	483	483	483	483	483	474	455	432	404
9	483	483	483	483	483	483	483	483	483	483	483	474	455	432	404
10	517	517	517	517	517	517	517	517	517	517	517	508	487	463	433
11	517	517	517	517	517	517	517	517	517	517	517	508	487	463	433
12	517	517	517	517	517	517	517	517	517	517	517	508	487	463	433
13	586	586	586	586	586	586	586	585	563	538	511	481	449	417	386
14	586	586	586	586	586	586	586	585	563	538	511	481	449	417	386
15	724	724	724	724	724	724	724	723	696	665	631	594	555	516	476
16	724	724	724	724	724	724	724	723	696	665	631	594	555	516	476
17	827	827	827	827	827	827	827	817	790	759	722	681	637	590	544
18	827	827	827	827	827	827	827	817	790	759	722	681	637	590	544
19	793	793	793	793	793	793	792	790	774	755	732	706	675	641	602
20	793	793	793	793	793	793	792	790	774	755	732	706	675	641	602
21	793	793	793	793	793	793	792	790	774	755	732	706	675	641	602
22	379	379	379	379	379	379	379	379	379	379	379	372	357	339	318
23	379	379	379	379	379	379	379	379	379	379	379	372	357	339	318
24	379	379	379	379	379	379	379	379	379	379	379	372	357	339	318
25	379	379	379	379	379	379	379	379	379	379	379	372	357	339	318
26	414	414	414	414	414	414	414	414	414	414	414	406	390	370	347
27	414	414	414	414	414	414	414	414	414	414	414	406	390	370	347
28	483	483	483	483	483	483	483	483	483	483	483	474	455	432	404
29	483	483	483	483	483	483	483	483	483	483	483	474	455	432	404
30	483	483	483	483	483	483	483	483	483	483	483	474	455	432	404
31	414	414	414	414	414	414	414	414	414	414	414	414	414	...	...
32	414	414	414	414	414	414	414	414	414	414	414	414	414	...	...
33	586	586	586	586	586	586	586	585	563	538	511	481	449	417	386
34	586	586	586	586	586	586	586	585	563	538	511	481	449	417	386
35	586	586	586	586	586	586	586	585	563	538	511	481	449	417	386
36	689	689	689	689	689	689	689	685	655	629	600	567	532	495	454
37	689	689	689	689	689	689	689	685	655	629	600	567	532	495	454
38	689	689	689	689	689	689	689	685	655	629	600	567	532	495	454
39	724	724	724	724	724	724	724	723	696	665	631	594	555	516	476
40	793	793	793	793	793	793	792	785	754	723	690	652	612	569	522
41	827	827	827	827	827	827	827	817	790	759	722	681	637	590	544
42	827	827	827	827	827	827	827	817	790	759	722	681	637	590	544
43	827	827	827	827	827	827	827	817	790	759	722	681	637	590	544
44	862	862	862	862	862	862	862	852	819	787	750	709	666	618	567
45	862	862	862	862	862	862	862	852	819	787	750	709	666	618	567

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	1Cr–½Mo	Forgings	SA–372	J	G41370	110	...	930
2	1Cr–½Mo	Plate	SA–387	12	K11757	1	...	380
3	1Cr–½Mo	Wld. pipe	SA–691	1CR	K11757	...	...	380
4	1Cr–½Mo	Cast pipe	SA–426	CP12	J11562	...	...	415
5	1Cr–½Mo	Forgings	SA–182	F12	K11562	1	...	415
6	1Cr–½Mo	Smls. tube	SA–213	T12	K11562	...	...	415
7	1Cr–½Mo	Smls. & wld. ftgs.	SA–234	WP12	K12062	1	...	415
8	1Cr–½Mo	Smls. pipe	SA–335	P12	K11562	...	...	415
9	1Cr–½Mo	Forged pipe	SA–369	FP12	K11562	...	...	415
10	1Cr–½Mo	Forgings	SA/EN 10222–2	13CrMo4–5	...	NT or QT	250 < t ≤ 500	420
11	1Cr–½Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...	150 < t ≤ 250	420
12	1Cr–½Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...	100 < t ≤ 150	430
13	1Cr–½Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...	60 < t ≤ 100	440
14	1Cr–½Mo	Smls. tube	SA/EN 10216–2	13CrMo4–5	...	...	t ≤ 60	440
15	1Cr–½Mo	Plate	SA/GB 713	15CrMoR	...	...	100 < t ≤ 200	440
16	1Cr–½Mo	Forgings	SA/EN 10222–2	13CrMo4–5	...	NT or QT	t ≤ 250	440
17	1Cr–½Mo	Plate	SA–387	12	K11757	2	...	450
18	1Cr–½Mo	Wld. pipe	SA–691	1CR	K11757	...	...	450
19	1Cr–½Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...	t ≤ 60	450
20	1Cr–½Mo	Plate	SA/GB 713	15CrMoR	...	...	6 ≤ t ≤ 100	450
21	1Cr–½Mo	Forgings	SA–182	F12	K11564	2	...	485
22	1Cr–½Mo	Forgings	SA–336	F12	K11564	...	...	485
23	1Cr–½Mo–V	Bolting	SA–193	B16	K14072	...	100 < t ≤ 200	690
24	1Cr–½Mo–V	Bolting	SA–193	B16	K14072	...	64 < t ≤ 100	760
25	1Cr–½Mo–V	Bolting	SA–540	B21	K14073	5	50 < t ≤ 205	795
26	1Cr–½Mo–V	Bolting	SA–540	B21	K14073	5	≤50	825
27	1Cr–½Mo–V	Bolting	SA–193	B16	K14072	...	≤64	860
28	1Cr–½Mo–V	Bolting	SA–540	B21	K14073	4	≤150	930
29	1Cr–½Mo–V	Bolting	SA–540	B21	K14073	3	≤150	1000
30	1Cr–½Mo–V	Bolting	SA–540	B21	K14073	2	≤100	1070
31	1Cr–½Mo–V	Bolting	SA–540	B21	K14073	1	≤100	1140
32	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	0.5	2060
33	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	0.5	2060
34	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	0.55	2050
35	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	0.55	2050
36	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	0.6	2030
37	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	0.6	2030
38	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	0.65	2010
39	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	0.65	2010
40	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	0.7	2000
41	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	0.7	2000
42	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	0.8	1980
43	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	0.8	1980
44	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	0.9	1960
45	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	0.9	1960

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
													Ferrous Materials (Cont'd)		
1	931	931	931	931	931	931	930	919	889	853	812	766	716	664	612
2	379	371	365	365	365	365	365	365	365	365	365	365	358	344	326
3	379	371	365	365	365	365	365	365	365	365	365	365	358	344	326
4	414	405	398	398	398	398	398	398	398	398	398	398	391	375	355
5	414	405	398	398	398	398	398	398	398	398	398	398	391	375	355
6	414	405	398	398	398	398	398	398	398	398	398	398	391	375	355
7	414	405	398	398	398	398	398	398	398	398	398	398	391	375	355
8	414	405	398	398	398	398	398	398	398	398	398	398	391	375	355
9	414	405	398	398	398	398	398	398	398	398	398	398	391	375	355
10	420	413	403	400	400	400	400	400	400	400	400	399	392	380	360
11	420	411	407	404	404	403	403	403	403	403	403	402	396	383	361
12	430	420	416	414	413	413	413	413	413	413	413	412	405	392	369
13	440	430	426	424	423	423	423	423	423	423	423	422	415	401	378
14	440	440	440	440	440	440	440	440	440	440	440	430	414	395	371
15	440	430	426	424	423	423	423	423	423	423	423	422	415	401	378
16	440	432	423	420	419	419	419	419	419	419	419	418	411	398	377
17	448	439	431	431	431	431	431	431	431	431	431	431	424	407	385
18	448	439	431	431	431	431	431	431	431	431	431	431	424	407	385
19	450	440	436	433	433	432	432	432	432	432	432	431	424	411	386
20	450	440	436	433	433	432	432	432	432	432	432	431	424	411	386
21	483	472	464	464	464	464	464	464	464	464	464	464	456	438	415
22	483	472	464	464	464	464	464	464	464	464	464	464	456	438	415
23	689	689	689	689	689	689	688	676	657	637	614	589	561	532	502
24	758	758	758	758	758	758	756	744	723	701	675	647	617	586	552
25	793	793	793	793	793	793	792	780	754	732	704	676	642	611	580
26	827	827	827	827	827	827	827	813	786	764	735	705	670	638	605
27	862	862	862	862	862	862	862	862	862	862	862	862	726	665	631
28	931	931	931	931	931	931	931	931	926	857	825	793	753	718	681
29	1000	1000	1000	1000	1000	1000	999	983	950	923	888	852	809	771	732
30	1070	1070	1070	1070	1070	1070	1070	1050	1020	986	949	910	865	824	782
31	1140	1140	1140	1140	1140	1140	1140	1120	1080	1050	1010	969	921	878	833
32	2060	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	2060	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	2050	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	2050	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	2030	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	2030	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	2010	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	2010	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	2000	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	2000	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	1980	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	1980	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	1960	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	1960	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	1	1940
2	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	1	1940
3	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	1.1	1920
4	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	1.1	1920
5	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	1.2	1900
6	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	1.2	1900
7	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	1.4	1860
8	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	1.4	1860
9	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	1.6	1820
10	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	1.6	1820
11	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	1.8	1800
12	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	1.8	1800
13	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	2	1780
14	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	2	1780
15	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	2.2	1750
16	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	2.2	1750
17	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	2.5	1720
18	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	2.5	1720
19	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	2.8	1680
20	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	2.8	1680
21	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	3	1660
22	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	3	1660
23	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	3.5	1620
24	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	3.5	1620
25	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	4	1580
26	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	4	1580
27	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	4.5	1560
28	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	4.5	1560
29	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	5	1520
30	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	5	1520
31	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	5.5	1480
32	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	5.5	1480
33	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	6	1460
34	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	6	1460
35	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	6.5	1440
36	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	6.5	1440
37	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	7	1420
38	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	7	1420
39	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	8	1400
40	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	8	1400
41	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	9	1380
42	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	9	1380
43	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	10	1360
44	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	10	1360
45	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	11	1340

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	1940	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	1940	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	1920	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	1920	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	1900	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	1900	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	1860	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	1860	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	1820	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	1820	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	1800	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	1800	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	1780	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	1780	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	1750	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	1750	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	1720	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	1720	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	1680	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	1680	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	1660	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	1660	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	1620	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	1620	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	1580	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	1580	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	1560	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	1560	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	1520	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	1520	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	1480	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	1480	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	1460	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	1460	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	1440	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	1440	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	1420	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	1420	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	1400	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	1400	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	1380	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	1380	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	1360	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	1360	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	1340	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	11	1340
2	1Cr–¼Si–V	Wire	SA–231	...	...	Oil	12	1320
3	1Cr–¼Si–V	Wire	SA–232	...	...	Oil	12	1320
4	1Cr–V	Smls. tube	SA–213	T17	K12047	...	...	415
5	1¼Cr–½Mo	Castings	SA–217	WC6	J12072	...	...	485
6	1¼Cr–½Mo	Cast pipe	SA–426	CP11	J12072	...	...	485
7	1¼Cr–½Mo	Bar	SA–739	B11	K11797	...	...	485
8	1¼Cr–½Mo–Si	Forgings	SA–182	F11	K11597	1	...	415
9	1¼Cr–½Mo–Si	Smls. tube	SA–213	T11	K11597	...	...	415
10	1¼Cr–½Mo–Si	Smls. & wld. ftgs.	SA–234	WP11	...	1	...	415
11	1¼Cr–½Mo–Si	Smls. pipe	SA–335	P11	K11597	...	...	415
12	1¼Cr–½Mo–Si	Forgings	SA–336	F11	K11597	1	...	415
13	1¼Cr–½Mo–Si	Forged pipe	SA–369	FP11	K11597	...	...	415
14	1¼Cr–½Mo–Si	Plate	SA–387	11	K11789	1	...	415
15	1¼Cr–½Mo–Si	Wld. pipe	SA–691	1¼CR	K11789	...	...	415
16	1¼Cr–½Mo–Si	Forgings	SA–182	F11	K11572	2	...	485
17	1¼Cr–½Mo–Si	Forgings	SA–336	F11	K11572	2	...	485
18	1¼Cr–½Mo–Si	Plate	SA/EN 10028–2	13CrMoSi5–5	...	QT	100 < t ≤ 250	490
19	1¼Cr–½Mo–Si	Plate	SA/EN 10028–2	13CrMoSi5–5	...	QT	60 < t ≤ 100	500
20	1¼Cr–½Mo–Si	Plate	SA/EN 10028–2	13CrMoSi5–5	...	QT	≤60	510
21	1¼Cr–½Mo–Si	Forgings	SA–336	F11	K11572	3	...	515
22	1¼Cr–½Mo–Si	Plate	SA–387	11	K11789	2	...	515
23	1¼Cr–½Mo–Si	Wld. pipe	SA–691	1¼CR	K11789	...	...	515
24	1¾Cr–½Mo–Cu	Forgings	SA–592	E	K11695	...	65 < t ≤ 100	725
25	1¾Cr–½Mo–Cu	Forgings	SA–592	E	K11695	...	≤65	795
26	1¾Cr–½Mo–Ti	Plate	SA–517	E	K21604	...	65 < t ≤ 150	725
27	1¾Cr–½Mo–Ti	Plate	SA–517	E	K21604	...	≤65	795
28	2¼Cr–1Mo	Forgings	SA–182	F22	K21590	1	...	415
29	2¼Cr–1Mo	Smls. tube	SA–213	T22	K21590	...	...	415
30	2¼Cr–1Mo	Smls. & wld. fittings	SA–234	WP22	K21590	1	...	415
31	2¼Cr–1Mo	Smls. pipe	SA–335	P22	K21590	...	...	415
32	2¼Cr–1Mo	Forgings	SA–336	F22	K21590	1	...	415
33	2¼Cr–1Mo	Forged pipe	SA–369	FP22	K21590	...	...	415
34	2¼Cr–1Mo	Plate	SA–387	22	K21590	1	...	415
35	2¼Cr–1Mo	Wld. pipe	SA–691	2¼CR	K21590	...	...	415
36	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...	150 < t ≤ 250	450
37	2¼Cr–1Mo	Forgings	SA/EN 10222–2	11CrMo9–10	...	NT or QT	200 < t ≤ 500	450
38	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...	100 < t ≤ 150	460
39	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...	60 < t ≤ 100	470
40	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...	t ≤ 60	480
41	2¼Cr–1Mo	Smls. tube	SA/EN 10216–2	10CrMo9–10	...	...	t ≤ 60	480
42	2¼Cr–1Mo	Castings	SA–217	WC9	J21890	...	...	485
43	2¼Cr–1Mo	Cast pipe	SA–426	CP22	J21890	...	...	485
44	2¼Cr–1Mo	Forgings	SA–182	F22	K21590	3	...	515
45	2¼Cr–1Mo	Forgings	SA–336	F22	K21590	3	...	515

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	1340	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	1320	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	1320	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	414	414	414	414	414	414	414	414	414	414	414	404	390	371	349
5	483	483	483	483	483	483	483	483	483	483	483	472	454	433	407
6	483	483	483	483	483	483	483	483	483	483	483	472	454	433	407
7	483	483	483	483	483	483	483	483	483	483	483	472	454	433	407
8	414	414	414	414	414	414	414	414	414	414	414	404	390	371	349
9	414	414	414	414	414	414	414	414	414	414	414	404	390	371	349
10	414	414	414	414	414	414	414	414	414	414	414	404	390	371	349
11	414	414	414	414	414	414	414	414	414	414	414	404	390	371	349
12	414	414	414	414	414	414	414	414	414	414	414	404	390	371	349
13	414	414	414	414	414	414	414	414	414	414	414	404	390	371	349
14	414	414	414	414	414	414	414	414	414	414	414	404	390	371	349
15	414	414	414	414	414	414	414	414	414	414	414	404	390	371	349
16	483	483	483	483	483	483	483	483	483	483	483	472	454	433	407
17	483	483	483	483	483	483	483	483	483	483	483	472	454	433	407
18	490	490	485	485	485	485	485	485	485	485	479	464	447	426	401
19	500	500	495	495	495	495	495	495	495	495	489	474	456	434	410
20	510	510	505	505	505	505	505	505	505	505	499	483	465	443	418
21	517	517	517	517	517	517	517	517	517	517	517	505	487	464	436
22	517	517	517	517	517	517	517	517	517	517	517	505	487	464	436
23	517	517	517	517	517	517	517	517	517	517	517	505	487	464	436
24	724	724	724	724	724	724	724	724	720	707	693	677	659	639	618
25	793	793	793	793	793	793	793	793	789	775	760	741	722	700	677
26	724	724	724	724	724	724	724	724	720	707	693	677	659	639	618
27	793	793	793	793	793	793	793	793	789	775	760	741	722	700	677
28	414	412	401	401	401	401	401	401	401	401	401	401	401	400	384
29	414	412	401	401	401	401	401	401	401	401	401	401	401	400	384
30	414	412	401	401	401	401	401	401	401	401	401	401	401	400	384
31	414	412	401	401	401	401	401	401	401	401	401	401	401	400	384
32	414	412	401	401	401	401	401	401	401	401	401	401	401	400	384
33	414	412	401	401	401	401	401	401	401	401	401	401	401	400	384
34	414	412	401	401	401	401	401	401	401	401	401	401	401	400	384
35	414	412	401	401	401	401	401	401	401	401	401	401	401	400	384
36	450	449	442	434	432	429	427	424	420	414	406	396	382	366	345
37	450	450	441	435	432	431	429	427	422	416	408	397	383	366	347
38	460	459	452	443	441	439	437	433	429	423	415	404	391	374	353
39	470	469	462	453	451	448	446	443	438	432	424	413	399	382	360
40	480	479	472	463	461	458	456	452	448	441	433	422	408	390	368
41	480	480	473	466	464	462	460	457	451	443	431	416	396	373	345
42	483	482	476	468	466	465	463	460	454	445	433	418	399	375	347
43	483	482	476	468	466	465	463	460	454	445	433	418	399	375	347
44	517	516	503	498	496	494	491	487	482	475	466	455	439	421	396
45	517	516	503	498	496	494	491	487	482	475	466	455	439	421	396

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	2¼Cr–1Mo	Plate	SA–387	22	K21590	2	...	515
2	2¼Cr–1Mo	Wld. pipe	SA–691	2¼CR	K21590	...	...	515
3	2¼Cr–1Mo	Bar	SA–739	B22	K21390	...	...	515
4	2¼Cr–1Mo	Forgings	SA/EN 10222–2	11CrMo9–10	...	NT	$t \le 200$	520
5	2¼Cr–1Mo	Castings	SA–487	8	J22091	A	...	585
6	2¼Cr–1Mo	Forgings	SA–508	22	K21590	3	...	585
7	2¼Cr–1Mo	Forgings	SA–541	22	K21390	3	...	585
8	2¼Cr–1Mo	Plate	SA–542	B	K21590	4	...	585
9	2¼Cr–1Mo	Forgings	SA–541	22	K21390	4	...	725
10	2¼Cr–1Mo–V	Forgings	SA–182	F22V	K31835	...	...	585
11	2¼Cr–1Mo–V	Forgings	SA–336	F22V	K31835	...	...	585
12	2¼Cr–1Mo–V	Forgings	SA–541	22V	K31835	...	...	585
13	2¼Cr–1Mo–V	Plate	SA–542	D	K31835	4a	...	585
14	2¼Cr–1Mo–V	Plate	SA–832	22V	K31835	...	...	585
15	3Cr–1Mo	Smls. tube	SA–213	T21	K31545	...	...	415
16	3Cr–1Mo	Smls. pipe	SA–335	P21	K31545	...	...	415
17	3Cr–1Mo	Forgings	SA–336	F21	K31545	1	...	415
18	3Cr–1Mo	Forged pipe	SA–369	FP21	K31545	...	...	415
19	3Cr–1Mo	Plate	SA–387	21	K31545	1	...	415
20	3Cr–1Mo	Cast pipe	SA–426	CP21	J31545	...	...	415
21	3Cr–1Mo	Forgings	SA–182	F21	K31545	...	...	515
22	3Cr–1Mo	Forgings	SA–336	F21	K31545	3	...	515
23	3Cr–1Mo	Plate	SA–387	21	K31545	2	...	515
24	3Cr–1Mo–¼V–Ti–B	Forgings	SA–182	F3V	K31830	...	...	585
25	3Cr–1Mo–¼V–Ti–B	Forgings	SA–336	F3V	K31830	...	...	585
26	3Cr–1Mo–¼V–Ti–B	Forgings	SA–508	3V	K31830	...	...	585
27	3Cr–1Mo–¼V–Ti–B	Forgings	SA–541	3V	K31830	...	...	585
28	3Cr–1Mo–¼V–Ti–B	Plate	SA–542	C	K31830	4a	...	585
29	3Cr–1Mo–¼V–Ti–B	Plate	SA–832	21V	K31830	...	...	585
30	3Cr–1Mo–¼V–Cb–Ca	Forgings	SA–182	F3VCb	...	...	...	585
31	3Cr–1Mo–¼V–Cb–Ca	Forgings	SA–336	F3VCb	...	...	...	585
32	3Cr–1Mo–¼V–Cb–Ca	Forgings	SA–508	3VCb	...	...	...	585
33	3Cr–1Mo–¼V–Cb–Ca	Forgings	SA–541	3VCb	...	...	...	585
34	3Cr–1Mo–¼V–Cb–Ca	Plate	SA–542	E	...	4a	...	585
35	3Cr–1Mo–¼V–Cb–Ca	Plate	SA–832	23V	...	...	...	585
36	5Cr–½Mo	Smls. tube	SA–213	T5	K41545	...	...	415
37	5Cr–½Mo	Smls. & wld. ftgs.	SA–234	WP5	K41545	...	...	415
38	5Cr–½Mo	Smls. pipe	SA–335	P5	K41545	...	...	415
39	5Cr–½Mo	Forged pipe	SA–369	FP5	K41545	...	...	415
40	5Cr–½Mo	Plate	SA–387	5	K41545	1	...	415
41	5Cr–½Mo	Wld. pipe	SA–691	5CR	K41545	...	...	415
42	5Cr–½Mo	Forgings	SA–336	F5	K41545	...	...	415
43	5Cr–½Mo	Forgings	SA–182	F5	K41545	...	...	485
44	5Cr–½Mo	Plate	SA–387	5	K41545	2	...	515
45	5Cr–½Mo	Forgings	SA–336	F5A	K42544	...	...	550

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	517	516	503	498	496	494	491	487	482	475	466	455	439	421	396
2	517	516	503	498	496	494	491	487	482	475	466	455	439	421	396
3	517	516	503	498	496	494	491	487	482	475	466	455	439	421	396
4	520	520	510	502	500	498	496	493	488	481	471	458	442	423	401
5	586	585	572	567	566	565	562	558	550	540	526	507	483	455	420
6	586	586	585	585	578	566	562	557	553	545	529	498	466	...	...
7	586	586	585	585	578	566	562	557	553	545	529	498	466	...	...
8	586	586	585	585	578	566	562	557	553	545	529	498	466	...	...
9	724	724	724	724	720	713	708	702	694	685	673	658	641	620	595
10	586	586	586	586	586	576	567	558	547	535	522	509	494	479	...
11	586	586	586	586	586	576	567	558	547	535	522	509	494	479	...
12	586	586	586	586	586	576	567	558	547	535	522	509	494	479	...
13	586	586	586	586	586	576	567	558	547	535	522	509	494	479	...
14	586	586	586	586	586	576	567	558	547	535	522	509	494	479	...
15	414	412	401	401	401	401	401	401	401	401	401	401	401	400	384
16	414	412	401	401	401	401	401	401	401	401	401	401	401	400	384
17	414	412	401	401	401	401	401	401	401	401	401	401	401	400	384
18	414	412	401	401	401	401	401	401	401	401	401	401	401	400	384
19	414	412	401	401	401	401	401	401	401	401	401	401	401	400	384
20	414	412	401	401	401	401	401	401	401	401	401	401	401	400	384
21	517	516	503	498	496	494	491	487	482	475	466	455	439	421	396
22	517	516	503	498	496	494	491	487	482	475	466	455	439	421	396
23	517	516	503	498	496	494	491	487	482	475	466	455	439	421	396
24	586	585	561	546	536	529	525	521	516	511	503	494	484	474	...
25	586	585	561	546	536	529	525	521	516	511	503	494	484	474	...
26	586	585	561	546	536	529	525	521	516	511	503	494	484	474	...
27	586	585	561	546	536	529	525	521	516	511	503	494	484	474	...
28	586	585	561	546	536	529	525	521	516	511	503	494	484	474	...
29	586	585	561	546	536	529	525	521	516	511	503	494	484	474	...
30	586	585	561	546	536	529	525	521	516	511	503	494	484	474	...
31	586	585	561	546	536	529	525	521	516	511	503	494	484	474	...
32	586	585	561	546	536	529	525	521	516	511	503	494	484	474	...
33	586	585	561	546	536	529	525	521	516	511	503	494	484	474	...
34	586	585	561	546	536	529	525	521	516	511	503	494	484	474	...
35	586	585	561	546	536	529	525	521	516	511	503	494	484	474	...
36	414	412	400	398	397	393	389	383	375	364	352	337	320	301	280
37	414	412	400	398	397	393	389	383	375	364	352	337	320	301	280
38	414	412	400	398	397	393	389	383	375	364	352	337	320	301	280
39	414	412	400	398	397	393	389	383	375	364	352	337	320	301	280
40	414	412	400	398	397	393	389	383	375	364	352	337	320	301	280
41	414	412	400	398	397	393	389	383	375	364	352	337	320	301	280
42	414	412	400	398	397	393	389	383	375	364	352	337	320	301	280
43	483	481	467	464	463	459	454	447	438	425	411	393	373	351	327
44	517	515	501	497	496	491	486	478	469	456	440	421	400	376	350
45	552	549	534	530	529	524	518	511	500	486	469	449	427	401	373

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	5Cr–½Mo	Castings	SA–217	C5	J42045	...	...	620
2	5Cr–½Mo	Cast pipe	SA–426	CP5	J42045	...	...	620
3	5Cr–½Mo	Forgings	SA–182	F5a	K42544	...	...	620
4	5Cr–½Mo	Bolting	SA–193	B5	K50100	...	≤100	690
5	5Cr–½Mo–Si	Smls. tube	SA–213	T5b	K51545	...	...	415
6	5Cr–½Mo–Si	Smls. pipe	SA–335	P5b	K51545	...	...	415
7	5Cr–½Mo–Ti	Smls. tube	SA–213	T5c	K41245	...	...	415
8	5Cr–½Mo–Ti	Smls. pipe	SA–335	P5c	K41245	...	...	415
9	9Cr–1Mo	Smls. tube	SA–213	T9	K90941	...	...	415
10	9Cr–1Mo	Fittings	SA–234	WP9	K90941	...	...	415
11	9Cr–1Mo	Smls. pipe	SA–335	P9	K90941	...	...	415
12	9Cr–1Mo	Forged pipe	SA–369	FP9	K90941	...	...	415
13	9Cr–1Mo	Forgings	SA–182	F9	K90941	...	...	585
14	9Cr–1Mo	Forgings	SA–336	F9	K90941	...	...	585
15	9Cr–1Mo	Castings	SA–217	C12	J82090	...	...	620
16	9Cr–1Mo	Cast pipe	SA–426	CP9	J82090	...	...	620
17	9Cr–1Mo–V	Smls. tube	SA–213	T91 Types 1 & 2	K90901	...	...	585
18	9Cr–1Mo–V	Fittings	SA–234	WP91 Types 1 & 2	K90901	...	...	620
19	9Cr–1Mo–V	Smls. pipe	SA–335	P91 Types 1 & 2	K90901	...	...	585
20	9Cr–1Mo–V	Forged pipe	SA–369	FP91 Types 1 & 2	K90901	...	...	585
21	9Cr–1Mo–V	Plate	SA–387	91 Types 1 & 2	K90901	2	...	585
22	9Cr–1Mo–V	Forgings	SA–182	F91 Types 1 & 2	K90901	...	...	620
23	9Cr–1Mo–V	Forgings	SA–336	F91 Types 1 & 2	K90901	...	...	620
24	11Cr–Ti	Plate	SA–240	...	S40910	...	...	380
25	11Cr–Ti	Plate	SA–240	...	S40920	...	...	380
26	11Cr–Ti	Plate	SA–240	...	S40930	...	...	380
27	11Cr–Ti	Smls. & wld. tube	SA–268	TP409	S40900	...	...	380
28	12Cr	Plate	SA–1010	40	S41003	...	≤19	455
29	12Cr	Bar	SA–479	403	S40300	A	...	485
30	12Cr	Bar	SA–479	403	S40300	1	...	485
31	12Cr	Plate	SA–1010	50	S41003	...	≤19	485
32	12Cr–Al	Bar	SA/JIS G4303	SUS405	...	...	...	410
33	12Cr–Al	Plate	SA–240	405	S40500	...	...	415
34	12Cr–Al	Smls. & wld. tube	SA–268	TP405	S40500	...	...	415
35	12Cr–Al	Bar	SA–479	405	S40500	...	...	415
36	12Cr–Ti	Smls. & wld. tube	SA–268	...	S40800	...	...	380
37	12Cr–9Ni–2Cu–1Ti	Bar	SA–564	XM–16	S45500	H1000	...	1415
38	12Cr–9Ni–2Cu–1Ti	Forgings	SA–705	XM–16	S45500	H1000	$t \geq 13$	1415
39	12Cr–9Ni–2Cu–1Ti	Bar	SA–564	XM–16	S45500	H950	...	1515
40	12Cr–9Ni–2Cu–1Ti	Forgings	SA–705	XM–16	S45500	H950	$t \geq 13$	1515
41	12Cr–9Ni–2Cu–1Ti	Bar	SA–564	XM–16	S45500	H900	...	1620
42	12Cr–9Ni–2Cu–1Ti	Forgings	SA–705	XM–16	S45500	H900	$t \geq 13$	1620
43	13Cr	Plate	SA–240	410S	S41008	...	...	415
44	13Cr	Smls. & wld. tube	SA–268	TP410	S41000	...	...	415
45	13Cr	Plate	SA–240	410	S41000	...	...	450

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	621	618	601	596	595	589	583	574	563	547	528	506	480	452	420
2	621	618	601	596	595	589	583	574	563	547	528	506	480	452	420
3	621	618	601	596	595	589	583	574	563	547	528	506	480	452	420
4	689	685	667	660	659	653	645	636	626	606	589	565	536	507	474
5	414	412	400	398	397	393	389	383	375	364	352	337	320	301	280
6	414	412	400	398	397	393	389	383	375	364	352	337	320	301	280
7	414	412	400	398	397	393	389	383	375	364	352	337	320	301	280
8	414	412	400	398	397	393	389	383	375	364	352	337	320	301	280
9	414	412	400	398	397	393	389	383	375	364	352	337	320	301	280
10	414	412	400	398	397	393	389	383	375	364	352	337	320	301	280
11	414	412	400	398	397	393	389	383	375	364	352	337	320	301	280
12	414	412	400	398	397	393	389	383	375	364	352	337	320	301	280
13	586	584	567	563	562	557	551	542	531	516	498	478	454	426	396
14	586	584	567	563	562	557	551	542	531	516	498	478	454	426	396
15	621	618	601	596	595	589	583	574	563	547	528	506	480	452	420
16	621	618	601	596	595	589	583	574	563	547	528	506	480	452	420
17	586	586	586	584	582	577	570	561	549	534	516	494	469	441	410
18	621	621	621	618	616	611	604	594	581	565	546	523	497	467	434
19	586	586	586	584	582	577	570	561	549	534	516	494	469	441	410
20	586	586	586	584	582	577	570	561	549	534	516	494	469	441	410
21	586	586	586	584	582	577	570	561	549	534	516	494	469	441	410
22	621	621	621	618	616	611	604	594	581	565	546	523	497	467	434
23	621	621	621	618	616	611	604	594	581	565	546	523	497	467	434
24	379	379	371	366	360	354	349	342	334	324	313	298	283	265	246
25	379	379	371	366	360	354	349	342	334	324	313	298	283	265	246
26	379	379	371	366	360	354	349	342	334	324	313	298	283	265	246
27	379	379	371	366	360	354	349	342	334	324	313	298	283	265	246
28	455	455	455	445	431	417	409	401	391	379	364	346	325	299	270
29	483	482	473	465	459	450	444	435	425	412	398	380	360	338	313
30	483	482	473	465	459	450	444	435	425	412	398	380	360	338	313
31	483	483	483	472	457	442	434	425	415	402	386	367	344	318	286
32	414	413	405	399	394	386	380	373	365	354	341	326	309	290	268
33	414	413	405	399	394	386	380	373	365	354	341	326	309	290	268
34	414	413	405	399	394	386	380	373	365	354	341	326	309	290	268
35	414	413	405	399	394	386	380	373	365	354	341	326	309	290	268
36	379	379	371	366	360	354	349	342	334	324	313	298	283	265	246
37	1415	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	1415	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	1515	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	1515	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	1620	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	1620	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	414	413	405	399	394	386	380	373	365	354	341	326	309	290	268
44	414	413	405	399	394	386	380	373	365	354	341	326	309	290	268
45	448	448	439	432	426	418	412	405	395	383	369	353	335	314	290

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	13Cr	Forgings	SA–182	F6a	S41000	1	...	485
2	13Cr	Bar	SA–479	410	S41000	...	...	485
3	13Cr	Bar	SA–479	410	S41000	A	...	485
4	13Cr	Bar	SA–479	410	S41000	1	...	485
5	13Cr	Forgings	SA–182	F6a	S41000	2	...	585
6	13Cr	Castings	SA–217	CA15	J91150	...	...	620
7	13Cr	Cast pipe	SA–426	CPCA15	J91150	...	...	620
8	13Cr	Bar	SA/EN 10088–3	X12Cr13	...	QT650	$t \le 160$	650
9	13Cr	Bolting	SA–193	B6	S41000	...	≤100	760
10	13Cr–4Ni	Castings	SA–487	CA6NM	J91540	A	...	760
11	13Cr–4Ni	Forgings	SA–182	F6NM	S41500	...	...	795
12	13Cr–4Ni	Bar	SA–479	...	S41500	...	...	795
13	13Cr–8Ni–2Mo	Bar	SA–564	XM–13	S13800	H1150M	...	860
14	13Cr–8Ni–2Mo	Forgings	SA–705	XM–13	S13800	H1150M	...	860
15	13Cr–8Ni–2Mo	Bar	SA–564	XM–13	S13800	H1150	...	930
16	13Cr–8Ni–2Mo	Forgings	SA–705	XM–13	S13800	H1150	...	930
17	13Cr–8Ni–2Mo	Bar	SA–564	XM–13	S13800	H1100	...	1035
18	13Cr–8Ni–2Mo	Forgings	SA–705	XM–13	S13800	H1100	...	1035
19	13Cr–8Ni–2Mo	Bar	SA–564	XM–13	S13800	H1050	...	1205
20	13Cr–8Ni–2Mo	Forgings	SA–705	XM–13	S13800	H1050	...	1205
21	13Cr–8Ni–2Mo	Bar	SA–564	XM–13	S13800	H1025	...	1275
22	13Cr–8Ni–2Mo	Forgings	SA–705	XM–13	S13800	H1025	...	1275
23	13Cr–8Ni–2Mo	Bar	SA–564	XM–13	S13800	H1000	...	1415
24	13Cr–8Ni–2Mo	Forgings	SA–705	XM–13	S13800	H1000	...	1415
25	13Cr–8Ni–2Mo	Bar	SA–564	XM–13	S13800	H950	...	1515
26	13Cr–8Ni–2Mo	Forgings	SA–705	XM–13	S13800	H950	...	1515
27	15Cr	Smls. & wld. tube	SA–268	TP429	S42900	...	...	415
28	15Cr	Plate	SA–240	429	S42900	...	...	450
29	15Cr–5Ni–3Cu	Bar	SA–564	XM–12	S15500	H1150M	...	795
30	15Cr–5Ni–3Cu	Forgings	SA–705	XM–12	S15500	H1150M	...	795
31	15Cr–5Ni–3Cu	Bar	SA–564	XM–12	S15500	H1150	...	930
32	15Cr–5Ni–3Cu	Forgings	SA–705	XM–12	S15500	H1150	...	930
33	15Cr–5Ni–3Cu	Bar	SA–564	XM–12	S15500	H1100	...	965
34	15Cr–5Ni–3Cu	Forgings	SA–705	XM–12	S15500	H1100	...	965
35	15Cr–5Ni–3Cu	Bar	SA–564	XM–12	S15500	H1075	...	1000
36	15Cr–5Ni–3Cu	Forgings	SA–705	XM–12	S15500	H1075	...	1000
37	15Cr–5Ni–3Cu	Bar	SA–564	XM–12	S15500	H1025	...	1070
38	15Cr–5Ni–3Cu	Forgings	SA–705	XM–12	S15500	H1025	...	1070
39	15Cr–5Ni–3Cu	Bar	SA–564	XM–12	S15500	H925	...	1170
40	15Cr–5Ni–3Cu	Forgings	SA–705	XM–12	S15500	H925	...	1170
41	15Cr–5Ni–3Cu	Bar	SA–564	XM–12	S15500	H900	...	1310
42	15Cr–5Ni–3Cu	Forgings	SA–705	XM–12	S15500	H900	...	1310
43	15Cr–6Ni–Cu–Mo	Bar	SA–564	XM–25	S45000	H1150	...	860
44	15Cr–6Ni–Cu–Mo	Forgings	SA–705	XM–25	S45000	H1150	$t \ge 13$	860
45	15Cr–6Ni–Cu–Mo	Bar	SA–564	XM–25	S45000	H1100	...	895

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	483	482	473	465	459	450	444	435	425	412	398	380	360	338	313
2	483	482	473	465	459	450	444	435	425	412	398	380	360	338	313
3	483	482	473	465	459	450	444	435	425	412	398	380	360	338	313
4	483	482	473	465	459	450	444	435	425	412	398	380	360	338	313
5	586	585	574	565	557	547	539	529	516	501	483	461	437	410	380
6	621	620	608	598	590	579	570	560	547	530	511	488	463	434	402
7	621	620	608	598	590	579	570	560	547	530	511	488	463	434	402
8	650	650	636	626	618	606	598	587	573	556	535	512	484	454	422
9	758	758	752	737	724	709	699	687	671	652	628	601	569	533	493
10	758	758	744	727	714	699	691	683	673	661	646	628	605	577	540
11	793	793	793	785	761	733	719	705	689	672	654	634	613	...	...
12	793	793	793	785	761	733	719	705	689	672	654	634	613	...	...
13	585	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	585	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	620	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	620	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	930	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	930	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	1140	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	1140	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	1205	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	1205	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	1310	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	1310	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	1415	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	1415	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	414	413	405	399	394	386	380	373	365	354	341	326	309	290	268
28	448	448	439	432	426	418	412	405	395	383	369	353	335	314	290
29	795	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	795	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	930	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	930	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	965	965	965	945	919	903	...	...	...	...	...	...	...	...	...
34	965	965	965	945	919	903	...	...	...	...	...	...	...	...	...
35	1000	1000	989	961	937	915	904	888	880	...	...	...	...	...	...
36	1000	1000	989	961	937	915	904	888	880	...	...	...	...	...	...
37	1070	1070	1057	1028	1002	978	966	950	941	...	...	...	...	...	...
38	1070	1070	1057	1028	1002	978	966	950	941	...	...	...	...	...	...
39	1170	1170	1159	1127	1099	1073	1059	1042	1032	...	...	...	...	...	...
40	1170	1170	1159	1127	1099	1073	1059	1042	1032	...	...	...	...	...	...
41	1310	1310	1296	1260	1228	1199	1184	1164	1154	...	...	...	...	...	...
42	1310	1310	1296	1260	1228	1199	1184	1164	1154	...	...	...	...	...	...
43	860	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	860	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	895	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	15Cr–6Ni–Cu–Mo	Forgings	SA–705	XM–25	S45000	H1100	$t \geq 13$	895
2	15Cr–6Ni–Cu–Mo	Bar	SA–564	XM–25	S45000	H1050	...	1000
3	15Cr–6Ni–Cu–Mo	Forgings	SA–705	XM–25	S45000	H1050	$t \geq 13$	1000
4	15Cr–6Ni–Cu–Mo	Bar	SA–564	XM–25	S45000	H1025	...	1035
5	15Cr–6Ni–Cu–Mo	Forgings	SA–705	XM–25	S45000	H1025	$t \geq 13$	1035
6	15Cr–6Ni–Cu–Mo	Bar	SA–564	XM–25	S45000	H1000	...	1105
7	15Cr–6Ni–Cu–Mo	Forgings	SA–705	XM–25	S45000	H1000	$t \geq 13$	1105
8	15Cr–6Ni–Cu–Mo	Bar	SA–564	XM–25	S45000	H950	...	1170
9	15Cr–6Ni–Cu–Mo	Forgings	SA–705	XM–25	S45000	H950	$t \geq 13$	1170
10	15Cr–6Ni–Cu–Mo	Bar	SA–564	XM–25	S45000	H900	...	1240
11	15Cr–6Ni–Cu–Mo	Forgings	SA–705	XM–25	S45000	H900	$t \geq 13$	1240
12	17Cr	Smls. & wld. tube	SA–268	TP430	S43000	...	...	415
13	17Cr	Plate	SA–240	430	S43000	...	...	450
14	17Cr	Bar	SA–479	430	S43000	...	...	485
15	17Cr–4Ni–4Cu	Bar	SA–564	630	S17400	H1150M	...	795
16	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H1150M	...	795
17	17Cr–4Ni–4Cu	Bar	SA–564	630	S17400	H1150	...	930
18	17Cr–4Ni–4Cu	Plate	SA–693	630	S17400	H1150	...	930
19	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H1150	...	930
20	17Cr–4Ni–4Cu	Bar	SA–564	630	S17400	H1100	...	965
21	17Cr–4Ni–4Cu	Plate	SA–693	630	S17400	H1100	...	965
22	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H1100	...	965
23	17Cr–4Ni–4Cu	Bar	SA–564	630	S17400	H1075	...	1000
24	17Cr–4Ni–4Cu	Plate	SA–693	630	S17400	H1075	...	1000
25	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H1075	...	1000
26	17Cr–4Ni–4Cu	Bar	SA–564	630	S17400	H1025	...	1070
27	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H1025	...	1070
28	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H925	...	1170
29	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H900	...	1310
30	17Cr–7Ni–1Al	Forgings	SA–705	631	S17700	TH1050	...	1170
31	17Cr–7Ni–1Al	Forgings	SA–705	631	S17700	RH950	...	1275
32	18Cr–2Mo	Plate	SA–240	...	S44400	...	...	415
33	18Cr–2Mo	Smls. & wld. tube	SA–268	...	S44400	...	...	415
(**23**) 34	18Cr–Ti	Plate	SA–240	...	S43932	...	...	415
35	18Cr–Ti	Smls. & wld. tube	SA–268	TP439	S43035	...	...	415
36	18Cr–Ti	Wld. tube	SA–803	TP439	S43035	...	...	415
37	18Cr–Ti	Smls. & wld. pipe	SA–731	TP439	S43035	...	...	415
38	18Cr–Ti	Smls. & wld. tube	SA–268	TP430 Ti	S43036	...	...	415
39	18Cr–Ti	Bar	SA–479	439	S43035	...	...	485
40	26Cr–3Ni–3Mo	Plate	SA–240	26–3–3	S44660	...	≤5	585
41	26Cr–3Ni–3Mo	Smls. & wld. tube	SA–268	26–3–3	S44660	...	≤5	585
42	26Cr–3Ni–3Mo	Wld. tube	SA–803	26–3–3	S44660	...	≤5	585
43	27Cr	Smls. tube	SA–268	TP446–1	S44600	...	...	485
44	27Cr–1Mo	Forgings	SA–182	FXM–27Cb	S44627	...	...	415
45	27Cr–1Mo	Plate	SA–240	XM–27	S44627	...	...	450

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	895	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	1000	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	1000	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	1035	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	1035	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	1105	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	1105	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	1170	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	1170	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	1240	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	1240	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	414	413	405	399	394	386	380	373	365	354	341	326	309	290	268
13	448	448	439	432	426	418	412	405	395	383	369	353	335	314	290
14	483	482	473	465	459	450	444	435	425	412	398	380	360	338	313
15	795	795	795	775	759	749	744	737	728	715	697	674	643	605	556
16	795	795	795	775	759	749	744	737	728	715	697	674	643	605	556
17	931	931	931	907	889	877	871	863	852	837	816	789	753	708	651
18	931	931	931	907	889	877	871	863	852	837	816	789	753	708	651
19	931	931	931	907	889	877	871	863	852	837	816	789	753	708	651
20	965	965	965	941	922	910	903	894	883	868	846	818	781	734	675
21	965	965	965	941	922	910	903	894	883	868	846	818	781	734	675
22	965	965	965	941	922	910	903	894	883	868	846	818	781	734	675
23	1000	1000	1000	974	955	943	936	927	915	899	877	847	809	761	699
24	1000	1000	1000	974	955	943	936	927	915	899	877	847	809	761	699
25	1000	1000	1000	974	955	943	936	927	915	899	877	847	809	761	699
26	1069	1069	1069	1041	1021	1007	...	...	...	...	...	...	...	...	...
27	1069	1069	1069	1041	1021	1007	991	981	978	...	...	...	...	...	...
28	1172	1172	1172	1142	1120	1105	1097	1086	1073	...	...	...	...	...	...
29	1310	1310	1310	1276	1252	1235	1226	1214	1199	...	...	...	...	...	...
30	1170	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	1275	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	414	413	401	392	384	375	369	363	356	347	338	327	314	298	279
33	414	413	401	392	384	375	369	363	356	347	338	327	314	298	279
34	414	413	339	389	382	374	369	364	357	349	340	328	315	299	280
35	414	413	399	389	382	374	369	364	357	349	340	328	315	299	280
36	414	413	399	389	382	374	369	364	357	349	340	328	315	299	280
37	414	413	399	389	382	374	369	364	357	349	340	328	315	299	280
38	414	414	399	390	382	374	369	364	357	349	340	328	315	299	280
39	483	482	466	454	446	436	431	424	417	407	396	383	367	348	326
40	586	586	585	578	574	572	570	567	563	...	...	...	...	...	...
41	586	586	585	578	574	572	570	567	563	...	...	...	...	...	...
42	586	586	585	578	574	572	570	567	563	...	...	...	...	...	...
43	483	482	466	454	446	436	431	424	417	407	396	383	367	348	326
44	414	413	400	390	390	390	390	390	...	...	...	...	...	...	...
45	448	448	441	438	438	438	438	438	438	438	438	438	438	438	438

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	27Cr–1Mo	Smls. & wld. tube	SA–268	TPXM–27	S44627	...	...	450
2	27Cr–1Mo	Bar	SA–479	XM–27	S44627	...	...	450
3	27Cr–1Mo	Smls. & wld. pipe	SA–731	TPXM–27	S44627	...	...	450
4	27Cr–1Mo–Ti	Smls. & wld. pipe	SA–731	TPXM–33	S44626	...	...	450
5	27Cr–1Mo–Ti	Plate	SA–240	XM–33	S44626	...	...	470
6	27Cr–1Mo–Ti	Smls. & wld. tube	SA–268	TPXM–33	S44626	...	...	470
7	29Cr–4Mo	Bar	SA–479	...	S44700	...	...	485
8	29Cr–4Mo	Plate	SA–240	...	S44700	...	...	550
9	29Cr–4Mo	Smls. & wld. tube	SA–268	29–4	S44700	...	...	550
10	29Cr–4Mo–2Ni	Bar	SA–479	...	S44800	...	...	485
11	29Cr–4Mo–2Ni	Plate	SA–240	...	S44800	...	...	550
12	29Cr–4Mo–2Ni	Smls. & wld. tube	SA–268	29–4–2	S44800	...	...	550
13	29Cr–4Mo–Ti	Smls. & wld. tube	SA–268	...	S44735	...	...	515
14	Mn–¼Mo	Forgings	SA–372	D	K14508	...	...	725
15	Mn–¼Mo–V	Castings	SA–487	2	J13005	A	...	585
16	Mn–¼Mo–V	Castings	SA–487	2	J13005	B	...	620
17	Mn–½Mo	Plate	SA–302	A	K12021	...	...	515
18	Mn–½Mo	Wld. pipe	SA–672	H75	K12021	...	...	515
19	Mn–½Mo	Plate	SA–302	B	K12022	...	...	550
20	Mn–½Mo	Plate	SA–533	A	K12521	1	...	550
21	Mn–½Mo	Plate	SA–533	A	K12521	2	...	620
22	Mn–½Mo	Plate	SA–533	A	K12521	3	...	690
23	Mn–½Mo–¼Ni	Plate	SA–533	D	K12529	1	...	550
24	Mn–½Mo–¼Ni	Plate	SA–533	D	K12529	2	...	620
25	Mn–½Mo–¼Ni	Plate	SA–533	D	K12529	3	...	690
26	Mn–½Mo–½Ni	Plate	SA–302	C	K12039	...	...	550
27	Mn–½Mo–½Ni	Plate	SA–533	B	K12539	1	...	550
28	Mn–½Mo–½Ni	Wld. pipe	SA–672	H80	K12039	...	...	550
29	Mn–½Mo–½Ni	Wld. pipe	SA–672	J80	K12539	...	...	550
30	Mn–½Mo–½Ni	Plate	SA–533	B	K12539	2	...	620
31	Mn–½Mo–½Ni	Wld. pipe	SA–672	J90	K12539	...	...	620
32	Mn–½Mo–½Ni	Plate	SA–533	B	K12539	3	...	690
33	Mn–½Mo–½Ni	Wld. pipe	SA–672	J100	K12539	...	...	690
34	Mn–½Mo–¾Ni	Plate	SA–302	D	K12054	...	...	550
35	Mn–½Mo–¾Ni	Plate	SA–533	C	K12554	1	...	550
36	Mn–½Mo–¾Ni	Plate	SA–533	E	K12554	1	...	550
37	Mn–½Mo–¾Ni	Plate	SA–533	C	K12554	2	...	620
38	Mn–½Mo–¾Ni	Plate	SA–533	E	K12554	2	...	620
39	Mn–½Mo–¾Ni	Plate	SA–533	C	K12554	3	...	690
40	Mn–½Ni–V	Plate	SA–225	C	K12524	...	...	725
41	Mn–V	Castings	SA–487	1	J13002	A	...	585
42	Mn–V	Castings	SA–487	1	J13002	B	...	620
43	1½Si–½Mo	Smls. pipe	SA–335	P15	K11578	...	...	415
44	½Ni–½Cr–¼Mo–V	Castings	SA–487	4	J13047	A	...	620
45	½Ni–½Cr–¼Mo–V	Castings	SA–487	4	J13047	B	...	725

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
													Ferrous Materials (Cont'd)		
1	448	448	441	438	438	438	438	438	438	438	438	438	438	438	438
2	448	448	441	438	438	438	438	438	438	438	438	438	438	438	438
3	448	448	441	438	438	438	438	438	438	438	438	438	438	438	438
4	448	448	445	439	435	428	423	416	407	394	377	359	...	...	...
5	469	469	466	459	455	448	443	436	426	412	394	376	...	...	...
6	469	469	466	459	455	448	443	436	426	412	394	376	...	...	...
7	483	480	466	463	463	463	463	463	463	463	...	...	...	...	...
8	552	548	532	530	530	530	530	530	530	530	...	...	...	...	...
9	552	548	532	530	530	530	530	530	530	530	...	...	...	...	...
10	483	473	466	463	458	452	449	446	443	438	...	...	...	...	...
11	552	541	533	529	523	516	513	510	506	500	...	...	...	...	...
12	552	541	533	529	523	516	513	510	506	500	...	...	...	...	...
13	517	507	500	496	490	484	481	478	474	469	...	...	...	...	...
14	724	724	724	724	724	724	724	724	723	707	662	611	560	513	484
15	586	586	586	583	583	583	583	583	583	...	...	...	...	...	...
16	621	621	620	617	617	617	617	617	617	...	...	...	...	...	...
17	517	517	517	517	517	517	517	517	517	517	517	503	480	452	418
18	517	517	517	517	517	517	517	517	517	517	517	503	480	452	418
19	552	552	552	552	552	552	552	552	552	552	552	537	512	482	446
20	552	552	552	552	552	552	552	552	552	552	552	537	512	482	446
21	621	621	621	621	621	621	621	621	621	621	621	604	576	543	501
22	689	689	689	689	689	689	689	689	689	689	689	671	640	603	557
23	552	552	552	552	552	552	552	552	552	552	552	537	512	482	446
24	621	621	621	621	621	621	621	621	621	621	621	604	576	543	501
25	689	689	689	689	689	689	689	689	689	689	689	671	640	603	557
26	552	552	552	552	552	552	552	552	552	552	552	537	512	482	446
27	552	552	552	552	552	552	552	552	552	552	552	537	512	482	446
28	552	552	552	552	552	552	552	552	552	552	552	537	512	482	446
29	552	552	552	552	552	552	552	552	552	552	552	537	512	482	446
30	621	621	621	621	621	621	621	621	621	621	621	604	576	543	501
31	621	621	621	621	621	621	621	621	621	621	621	604	576	543	501
32	689	689	689	689	689	689	689	689	689	689	689	671	640	603	557
33	689	689	689	689	689	689	689	689	689	689	689	671	640	603	557
34	552	552	552	552	552	552	552	552	552	552	552	537	512	482	446
35	552	552	552	552	552	552	552	552	552	552	552	537	512	482	446
36	552	552	552	552	552	552	552	552	552	552	552	537	512	482	446
37	621	621	621	621	621	621	621	621	621	621	621	604	576	543	501
38	621	621	621	621	621	621	621	621	621	621	621	604	576	543	501
39	689	689	689	689	689	689	689	689	689	689	689	671	640	603	557
40	724	724	724	724	724	724	724	724	723	718	667	616	...	...	...
41	586	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	621	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	414	414	414	414	414	414	414	414	414	414	414	402	384	362	334
44	621	621	621	621	621	621	621	621	621	...	...	...	...	...	...
45	724	724	724	724	724	724	724	724	724	...	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	1/2Ni–1/2Cr–1/4Mo–V	Castings	SA–487	4	J13047	E	...	795
2	1/2Ni–1/2Mo–V	Forgings	SA–541	3	K12045	1	...	550
3	1/2Ni–1/2Mo–V	Forgings	SA–541	3	K12045	2	...	620
4	3/4Ni–1/2Cr–1/2Mo–V	Forgings	SA–592	F	K11576	...	65 < t ≤ 100	725
5	3/4Ni–1/2Cr–1/2Mo–V	Plate	SA–517	F	K11576	...	≤65	795
6	3/4Ni–1/2Cr–1/2Mo–V	Forgings	SA–592	F	K11576	...	≤65	795
7	3/4Ni–1/2Cu–Mo	Smls. & wld. tube	SA–423	2	K11540	...	...	415
8	3/4Ni–1/2Mo–1/3Cr–V	Forgings	SA–508	2	K12766	1	...	550
9	3/4Ni–1/2Mo–1/3Cr–V	Forgings	SA–541	2	K12765	1	...	550
10	3/4Ni–1/2Mo–1/3Cr–V	Forgings	SA–508	2	K12766	2	...	620
11	3/4Ni–1/2Mo–1/3Cr–V	Forgings	SA–541	2	K12765	2	...	620
12	3/4Ni–1/2Mo–Cr–V	Forgings	SA–508	3	K12042	1	...	550
13	3/4Ni–1/2Mo–Cr–V	Forgings	SA–508	3	K12042	2	...	620
14	3/4Ni–1Mo–3/4Cr	Castings	SA–217	WC5	J22000	...	...	485
15	1Ni–1/2Cr–1/2Mo	Castings	SA–217	WC4	J12082	...	...	485
16	1 1/4Ni–1Cr–1/2Mo	Plate	SA–517	P	K21650	...	65 < t ≤ 100	725
17	1 1/4Ni–1Cr–1/2Mo	Plate	SA–517	P	K21650	...	≤65	795
18	1 1/2Ni	Forgings	SA–350	LF5	K13050	1	...	415
19	1 1/2Ni	Forgings	SA–350	LF5	K13050	2	...	485
20	1 3/4Ni–3/4Cr–1/4Mo	Forgings	SA–372	L	K24055	...	...	1070
21	1 3/4Ni–3/4Cr–1/4Mo	Bolting	SA–574	4340	G43400	...	≥16	1170
22	1 3/4Ni–3/4Cr–1/4Mo	Bolting	SA–574	4340	G43400	...	≤13	1240
23	2Ni–3/4Cr–1/4Mo	Bolting	SA–540	B23	H43400	5	150 < t ≤ 240	795
24	2Ni–3/4Cr–1/4Mo	Bolting	SA–540	B23	H43400	5	≤150	825
25	2Ni–3/4Cr–1/4Mo	Bolting	SA–540	B23	H43400	4	≤240	930
26	2Ni–3/4Cr–1/4Mo	Bolting	SA–540	B23	H43400	3	≤240	1000
27	2Ni–3/4Cr–1/4Mo	Bolting	SA–540	B23	H43400	2	≤240	1070
28	2Ni–3/4Cr–1/4Mo	Bolting	SA–540	B23	H43400	1	≤200	1140
29	2Ni–3/4Cr–1/3Mo	Bolting	SA–540	B24	K24064	5	150 < t ≤ 240	795
30	2Ni–3/4Cr–1/3Mo	Bolting	SA–540	B24	K24064	5	≤150	825
31	2Ni–3/4Cr–1/3Mo	Bolting	SA–540	B24	K24064	4	≤240	930
32	2Ni–3/4Cr–1/3Mo	Bolting	SA–540	B24	K24064	3	≤240	1000
33	2Ni–3/4Cr–1/3Mo	Bolting	SA–540	B24	K24064	2	≤240	1070
34	2Ni–3/4Cr–1/3Mo	Bolting	SA–540	B24	K24064	1	≤200	1140
35	2Ni–1Cu	Forgings	SA–182	FR	K22035	...	...	435
36	2Ni–1Cu	Fittings	SA–234	WPR	K22035	...	...	435
37	2Ni–1Cu	Smls. & wld. pipe	SA–333	9	K22035	...	...	435
38	2Ni–1Cu	Tube	SA–334	9	K22035	...	...	435
39	2Ni–1Cu	Forgings	SA–350	LF9	K22036	...	...	435
40	2Ni–1Cu	Smls. & wld. ftgs.	SA–420	WPL9	K22035	...	...	435
41	2Ni–1 1/2Cr–1/4Mo–V	Forgings	SA–723	1	K23550	1	...	795
42	2Ni–1 1/2Cr–1/4Mo–V	Forgings	SA–723	1	K23550	2	...	930
43	2Ni–1 1/2Cr–1/4Mo–V	Forgings	SA–723	1	K23550	2a	...	1000
44	2Ni–1 1/2Cr–1/4Mo–V	Forgings	SA–723	1	K23550	3	...	1070
45	2Ni–1 1/2Cr–1/4Mo–V	Forgings	SA–723	1	K23550	4	...	1205

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	793	793	793	793	793	793	793	793	793	...	...	...	...	...	...
2	552	552	552	552	552	552	552	552	552	552	552	537	512	482	446
3	621	621	621	621	621	621	621	621	620	611	596	576	550	518	479
4	724	724	724	724	724	724	723	721	706	689	669	645	617	585	550
5	793	793	793	793	793	793	792	790	774	755	732	706	675	641	602
6	793	793	793	793	793	793	792	790	774	755	732	706	675	641	602
7	414	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	552	552	552	552	552	552	552	552	552	552	552	537	512	482	446
9	552	552	552	552	552	552	552	552	552	552	552	537	512	482	446
10	621	621	621	621	621	621	621	621	621	621	621	604	576	543	501
11	621	621	621	621	621	621	621	621	621	621	621	604	576	543	501
12	552	552	552	552	552	552	552	552	552	552	552	537	512	482	446
13	621	621	621	621	621	621	621	621	621	621	621	604	576	543	501
14	483	483	483	483	483	483	483	483	483	483	483	470	448	422	390
15	483	483	483	483	483	483	483	483	483	483	483	470	448	422	390
16	724	724	724	724	724	724	723	721	706	689	669	645	617	585	550
17	793	793	793	793	793	793	792	790	774	755	732	706	675	641	602
18	414	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	483	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	1069	1069	1069	1069	1069	1069	1069	1069	1069	1069	1058	1021	986	958	942
21	1170	1170	1170	1170	1170	1170	1170	1150	1120	1090	1060	1020	984	954	941
22	1240	1240	1240	1240	1240	1240	1240	1220	1190	1150	1120	1080	1040	1010	996
23	793	793	793	793	793	793	790	776	759	737	714	689	665	646	636
24	827	827	827	827	827	827	825	811	792	770	745	719	695	674	664
25	931	931	931	931	931	931	928	911	891	866	838	809	781	758	747
26	1000	1000	1000	1000	1000	1000	997	979	957	930	900	869	839	814	803
27	1070	1070	1070	1070	1070	1070	1070	1050	1020	994	962	929	897	870	858
28	1140	1140	1140	1140	1140	1140	1140	1130	1090	1060	1020	989	955	927	913
29	793	793	793	793	793	793	790	776	759	737	714	689	665	646	636
30	827	827	827	827	827	827	825	811	792	770	745	719	695	674	664
31	931	931	931	931	931	931	928	911	891	866	838	809	781	758	747
32	1000	1000	1000	1000	1000	1000	997	979	957	930	900	869	839	814	803
33	1070	1070	1070	1070	1070	1070	1070	1050	1020	994	962	929	897	870	858
34	1140	1140	1140	1140	1140	1140	1140	1130	1090	1060	1020	989	955	927	913
35	434	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	434	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	434	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	434	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	434	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	434	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	793	793	793	793	793	793	790	776	759	737	714	689	...	...	...
42	931	931	931	931	931	931	928	911	891	866	838	809	...	...	...
43	1000	1000	1000	1000	1000	1000	997	979	957	930	900	869	...	...	...
44	1070	1070	1070	1070	1070	1070	1070	1050	1020	994	962	929	...	...	...
45	1210	1210	1210	1210	1210	1210	1200	1180	1160	1120	1090	1050	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	2Ni–1½Cr–¼Mo–V	Forgings	SA–723	1	K23550	5	...	1310
2	2½Ni	Pipe	SA–333	7	K21903	...	...	450
3	2½Ni	Tube	SA–334	7	K21903	...	...	450
4	2½Ni	Plate	SA–203	A	K21703	...	...	450
5	2½Ni	Plate	SA–203	B	K22103	...	...	485
6	2½Ni	Castings	SA–352	LC2	J22500	...	...	485
7	2¾Ni–1½Cr–½Mo	Plate	SA–543	C	...	3	...	620
8	2¾Ni–1½Cr–½Mo	Plate	SA–543	C	...	1	...	725
9	2¾Ni–1½Cr–½Mo	Plate	SA–543	C	...	2	...	795
10	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	1	...	795
11	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	2	...	930
12	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	2a	...	1000
13	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	3	...	1070
14	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	4	...	1205
15	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	5	...	1310
16	3Ni–1¾Cr–½Mo	Plate	SA–543	B	K42339	3	...	620
17	3Ni–1¾Cr–½Mo	Forgings	SA–372	M	K42365	85	...	725
18	3Ni–1¾Cr–½Mo	Plate	SA–543	B	K42339	1	...	725
19	3Ni–1¾Cr–½Mo	Plate	SA–543	B	K42339	2	...	795
20	3Ni–1¾Cr–½Mo	Forgings	SA–372	M	K42365	100	...	825
21	3½Ni	Pipe	SA–333	3	K31918	...	...	450
22	3½Ni	Tube	SA–334	3	K31918	...	...	450
23	3½Ni	Fittings	SA–420	WPL3	...	...	...	450
24	3½Ni	Plate	SA–203	D	K31718	...	...	450
25	3½Ni	Forgings	SA–350	LF3	K32025	...	...	485
26	3½Ni	Forgings	SA–765	III	K32026	...	...	485
27	3½Ni	Plate	SA–203	E	K32018	...	...	485
28	3½Ni	Castings	SA–352	LC3	J31550	...	...	485
29	3½Ni	Plate	SA–203	F	...	...	>50	515
30	3½Ni	Plate	SA–203	F	...	...	≤50	550
31	3½Ni–1¾Cr–½Mo–V	Forgings	SA–508	4N	K22375	3	...	620
32	3½Ni–1¾Cr–½Mo–V	Forgings	SA–508	4N	K22375	1	...	725
33	3½Ni–1¾Cr–½Mo–V	Forgings	SA–508	4N	K22375	2	...	795
34	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	1	...	795
35	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	2	...	930
36	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	2a	...	1000
37	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	3	...	1070
38	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	4	...	1205
39	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	5	...	1310
40	5Ni–¼Mo	Plate	SA–645	A	K41583	...	...	655
41	7Ni	Plate	SA–553	III	K61365	...	≤50	690
42	8Ni	Forgings	SA–522	II	K71340	...	...	690
43	8Ni	Plate	SA–553	II	K71340	...	...	690
44	9Ni	Plate	SA/EN 10028–4	X8Ni9	...	NNT640	≤50	640
45	9Ni	Plate	SA/EN 10028–4	X8Ni9	...	QT640	≤50	640

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
													Ferrous Materials (Cont'd)		
1	1310	1310	1310	1310	1310	1310	1310	1280	1250	1220	1180	1140	...	...	...
2	448	448	448	448	448	448	448	445	421	396	372	349	327	303	270
3	448	448	448	448	448	448	448	445	421	396	372	349	327	303	270
4	448	448	448	448	448	448	448	445	421	396	372	349	327	303	270
5	483	483	483	483	483	483	483	480	454	426	401	377	353	326	291
6	483	483	483	483	483	483	483	480	454	426	401	377	353	326	291
7	621	621	620	615	611	605	600	592	582	569	552	531	507	479	446
8	724	724	724	717	713	706	700	691	679	664	644	620	592	559	521
9	793	793	793	785	781	773	767	757	744	727	706	679	648	612	570
10	793	793	793	793	793	793	790	776	759	737	714	689	...	...	...
11	931	931	931	931	931	931	928	911	891	866	838	809	...	...	...
12	1000	1000	1000	1000	1000	1000	997	979	957	930	900	869	...	...	...
13	1070	1070	1070	1070	1070	1070	1070	1050	1020	994	962	929	...	...	...
14	1210	1210	1210	1210	1210	1210	1200	1180	1160	1120	1090	1050	...	...	...
15	1310	1310	1310	1310	1310	1310	1310	1280	1250	1220	1180	1140	...	...	...
16	621	621	620	615	611	605	600	592	582	569	552	531	507	479	446
17	724	724	724	717	713	706	700	691	679	664	644	620	592	559	521
18	724	724	724	717	713	706	700	691	679	664	644	620	592	559	521
19	793	793	793	785	781	773	767	757	744	727	706	679	648	612	570
20	827	827	827	819	815	807	800	790	776	758	736	709	677	639	595
21	448	448	448	448	448	448	448	445	421	396	372	349	327	303	270
22	448	448	448	448	448	448	448	445	421	396	372	349	327	303	270
23	448	448	448	448	448	448	448	445	421	396	372	349	327	303	270
24	448	448	448	448	448	448	448	445	421	396	372	349	327	303	270
25	483	483	483	483	483	483	483	480	454	426	401	377	353	326	291
26	483	483	483	483	483	483	483	480	454	426	401	377	353	326	291
27	483	483	483	483	483	483	483	480	454	426	401	377	353	326	291
28	483	483	483	483	483	483	483	480	454	426	401	377	353	326	291
29	517	517	517	517	517	517	517	514	486	457	429	404	378	350	311
30	552	552	552	552	552	552	552	547	519	487	458	430	403	373	332
31	621	621	620	615	611	605	600	592	582	569	552	531	507	479	446
32	724	724	724	717	713	706	700	691	679	664	644	620	592	559	521
33	793	793	793	785	781	773	767	757	744	727	706	679	648	612	570
34	793	793	793	793	793	793	790	776	759	737	714	689	...	...	...
35	931	931	931	931	931	931	928	911	891	866	838	809	...	...	...
36	1000	1000	1000	1000	1000	1000	997	979	957	930	900	869	...	...	...
37	1070	1070	1070	1070	1070	1070	1070	1050	1020	994	962	929	...	...	...
38	1210	1210	1210	1210	1210	1210	1200	1180	1160	1120	1090	1050	...	...	...
39	1310	1310	1310	1310	1310	1310	1310	1280	1250	1220	1180	1140	...	...	...
40	655	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	689	622	...	...	...	...	...	...	...	...	...	...	...	...	...
42	689	689	686	...	...	...	...	...	...	...	...	...	...	...	...
43	689	689	686	...	...	...	...	...	...	...	...	...	...	...	...
44	640	640	636	...	...	...	...	...	...	...	...	...	...	...	...
45	640	640	636	...	...	...	...	...	...	...	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	9Ni	Plate	SA/EN 10028–4	X7Ni9	...	QT	≤50	680
2	9Ni	Plate	SA/EN 10028–4	X8Ni9	...	QT680	≤50	680
3	9Ni	Smls. & wld. pipe	SA–333	8	K81340	...	...	690
4	9Ni	Smls. & wld. tube	SA–334	8	K81340	...	...	690
5	9Ni	Plate	SA–353	...	K81340	...	...	690
6	9Ni	Smls. & wld. ftgs.	SA–420	WPL8	K81340	...	...	690
7	9Ni	Forgings	SA–522	I	K81340	...	...	690
8	9Ni	Plate	SA–553	I	K81340	...	...	690
9	25Ni–15Cr–2Ti	Bolting	SA–453	660	S66286	A	...	895
10	25Ni–15Cr–2Ti	Bolting	SA–453	660	S66286	B	...	895
11	25Ni–15Cr–2Ti	Forgings, bar	SA–638	660	S66286	1	...	895
12	25Ni–15Cr–2Ti	Forgings, bar	SA–638	660	S66286	2	...	895
13	27Ni–22Cr–7Mo–Mn–Cu–N	Forgings	SA–182	...	S31277	...	...	772
14	27Ni–22Cr–7Mo–Mn–Cu–N	Smls. tube	SA–213	...	S31277	...	...	772
15	27Ni–22Cr–7Mo–Mn–Cu–N	Plate	SA–240	...	S31277	...	...	772
16	27Ni–22Cr–7Mo–Mn–Cu–N	Wld. tube	SA–249	...	S31277	...	...	772
17	29Ni–20Cr–3Cu–2Mo	Castings	SA–351	CN7M	J95150	...	...	425
18	14Cr–16Ni–6Si–Cu–Mo	Smls. tube	SA–213	...	S38815	...	...	540
19	14Cr–16Ni–6Si–Cu–Mo	Plate	SA–240	...	S38815	...	...	540
20	14Cr–16Ni–6Si–Cu–Mo	Wld. tube	SA–249	...	S38815	...	...	540
21	14Cr–16Ni–6Si–Cu–Mo	Wld. pipe	SA–312	...	S38815	...	...	540
22	14Cr–16Ni–6Si–Cu–Mo	Smls. & wld. fittings	SA–403	...	S38815	...	...	540
23	14Cr–16Ni–6Si–Cu–Mo	Bar	SA–479	...	S38815	...	...	540
24	16Cr–4Ni–6Mn	Plate	SA–240	201LN	S20153	...	...	655
25	16Cr–9Mn–2Ni–N	Plate	SA–240	204	S20400	...	...	655
26	16Cr–12Ni–2Mo	Forgings	SA–182	F316L	S31603	...	>130	450
27	16Cr–12Ni–2Mo	Forgings	SA–965	F316L	S31603	...	...	450
28	16Cr–12Ni–2Mo	Bar	SA/JIS G4303	SUS316L	...	...	...	480
29	16Cr–12Ni–2Mo	Forgings	SA–182	F316L	S31603	...	≤130	485
30	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316L	S31603	...	...	485
31	16Cr–12Ni–2Mo	Plate	SA–240	316L	S31603	...	...	485
32	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316L	S31603	...	...	485
33	16Cr–12Ni–2Mo	Smls. & wld. pipe	SA–312	TP316L	S31603	...	...	485
34	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316L	S31603	1	...	485
35	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316L	S31603	3	...	485
36	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316L	S31603	4	...	485
37	16Cr–12Ni–2Mo	Smls. & wld. ftgs.	SA–403	316L	S31603	...	...	485
38	16Cr–12Ni–2Mo	Wld. pipe	SA–409	TP316L	S31603	...	...	485
39	16Cr–12Ni–2Mo	Bar	SA–479	316L	S31603	Annealed	...	485
40	16Cr–12Ni–2Mo	Wld. tube	SA–688	TP316L	S31603	...	...	485
41	16Cr–12Ni–2Mo	Wld. pipe	SA–813	TP316L	S31603	...	...	485
42	16Cr–12Ni–2Mo	Wld. pipe	SA–814	TP316L	S31603	...	...	485
43	16Cr–12Ni–2Mo	Forgings	SA–182	F316	S31600	...	>130	485
44	16Cr–12Ni–2Mo	Forgings	SA–965	F316	S31600	...	...	485
45	16Cr–12Ni–2Mo	Forgings	SA–182	F316H	S31609	...	>130	485

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	680	680	676	...	...	...	...	...	...	...	...	...	...	...	...
2	680	680	676	...	...	...	...	...	...	...	...	...	...	...	...
3	689	689	686	...	...	...	...	...	...	...	...	...	...	...	...
4	689	689	686	...	...	...	...	...	...	...	...	...	...	...	...
5	689	689	686	...	...	...	...	...	...	...	...	...	...	...	...
6	689	689	686	...	...	...	...	...	...	...	...	...	...	...	...
7	689	689	686	...	...	...	...	...	...	...	...	...	...	...	...
8	689	689	686	...	...	...	...	...	...	...	...	...	...	...	...
9	896	896	896	895	880	864	858	851	844	836	827	817	806	794	780
10	896	896	896	895	880	864	858	851	844	836	827	817	806	794	780
11	896	896	896	896	884	868	860	853	845	836	827	816	805	794	780
12	896	896	896	896	884	868	860	853	845	836	827	816	805	794	780
13	772	707	673	644	626	609	601	593	586	581	576	575	...	...	...
14	772	707	673	644	626	609	601	593	586	581	576	575	...	...	...
15	772	707	673	644	626	609	601	593	586	581	576	575	...	...	...
16	772	707	673	644	626	609	601	593	586	581	576	575	...	...	...
17	427	356	328	309	295	283	278	274	270	...	...	...	...	...	...
18	538	538	536	521	509	501	499	497	497	497	496	494	...	...	...
19	538	538	536	521	509	501	499	497	497	497	496	494	...	...	...
20	538	538	536	521	509	501	499	497	497	497	496	494	...	...	...
21	538	538	536	521	509	501	499	497	497	497	496	494	...	...	...
22	538	538	536	521	509	501	499	497	497	497	496	494	...	...	...
23	538	538	536	521	509	501	499	497	497	497	496	494	...	...	...
24	655	562	511	486	477	475	473	471	467	462	455	446	437	429	422
25	655	560	497	459	440	433	432	432	431	429	426	421	411	398	379
26	448	433	410	399	395	395	395	394	393	391	388	383	377	369	360
27	448	433	410	399	395	395	395	394	393	391	388	383	377	369	360
28	483	467	441	429	426	426	425	425	424	421	417	413	406	398	387
29	483	467	441	429	426	426	425	425	424	421	417	413	406	398	387
30	483	467	441	429	426	426	425	425	424	421	417	413	406	398	387
31	483	467	441	429	426	426	425	425	424	421	417	413	406	398	387
32	483	467	441	429	426	426	425	425	424	421	417	413	406	398	387
33	483	467	441	429	426	426	425	425	424	421	417	413	406	398	387
34	483	467	441	429	426	426	425	425	424	421	417	413	406	398	387
35	483	467	441	429	426	426	425	425	424	421	417	413	406	398	387
36	483	467	441	429	426	426	425	425	424	421	417	413	406	398	387
37	483	467	441	429	426	426	425	425	424	421	417	413	406	398	387
38	483	467	441	429	426	426	425	425	424	421	417	413	406	398	387
39	483	467	441	429	426	426	425	425	424	421	417	413	406	398	387
40	483	467	441	429	426	426	425	425	424	421	417	413	406	398	387
41	483	467	441	429	426	426	425	425	424	421	417	413	406	398	387
42	483	467	441	429	426	426	425	425	424	421	417	413	406	398	387
43	483	482	469	463	462	462	462	462	462	460	456	450	442	433	421
44	483	482	469	463	462	462	462	462	462	460	456	450	442	433	421
45	483	482	469	463	462	462	462	462	462	460	456	450	442	433	421

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	352	344	333	322	308	...	...	...	...	...	...	...	...	...	...
27	352	344	333	322	308	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	379	370	359	347	332	...	...	...	...	...	...	...	...	...	...
30	379	370	359	347	332	...	...	...	...	...	...	...	...	...	...
31	379	370	359	347	332	...	...	...	...	...	...	...	...	...	...
32	379	370	359	347	332	...	...	...	...	...	...	...	...	...	...
33	379	370	359	347	332	...	...	...	...	...	...	...	...	...	...
34	379	370	359	347	332	...	...	...	...	...	...	...	...	...	...
35	379	370	359	347	332	...	...	...	...	...	...	...	...	...	...
36	379	370	359	347	332	...	...	...	...	...	...	...	...	...	...
37	379	370	359	347	332	...	...	...	...	...	...	...	...	...	...
38	379	370	359	347	332	...	...	...	...	...	...	...	...	...	...
39	379	370	359	347	332	...	...	...	...	...	...	...	...	...	...
40	379	370	359	347	332	...	...	...	...	...	...	...	...	...	...
41	379	370	359	347	332	...	...	...	...	...	...	...	...	...	...
42	379	370	359	347	332	...	...	...	...	...	...	...	...	...	...
43	406	380	355	331	307	285	263	242	222	202	184	166	...	...	...
44	406	380	355	331	307	285	263	242	222	202	184	166	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	16Cr–12Ni–2Mo	Forgings	SA–965	F316H	S31609	...	...	485
2	16Cr–12Ni–2Mo	Forgings	SA–182	F316	S31600	...	≤130	515
3	16Cr–12Ni–2Mo	Bolting	SA–193	B8M	S31600	1	...	515
4	16Cr–12Ni–2Mo	Bolting	SA–193	B8MA	S31600	1A	...	515
5	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316	S31600	...	...	515
6	16Cr–12Ni–2Mo	Plate	SA–240	316	S31600	...	...	515
7	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316	S31600	...	...	515
8	16Cr–12Ni–2Mo	Smls. & wld. pipe	SA–312	TP316	S31600	...	...	515
9	16Cr–12Ni–2Mo	Bolting	SA–320	B8M	S31600	1	...	515
10	16Cr–12Ni–2Mo	Bolting	SA–320	B8MA	S31600	1A	...	515
11	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316	S31600	1	...	515
12	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316	S31600	3	...	515
13	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316	S31600	4	...	515
14	16Cr–12Ni–2Mo	Smls. pipe	SA–376	TP316	S31600	...	...	515
15	16Cr–12Ni–2Mo	Smls. & wld. ftgs.	SA–403	316	S31600	...	...	515
16	16Cr–12Ni–2Mo	Wld. pipe	SA–409	TP316	S31600	...	...	515
17	16Cr–12Ni–2Mo	Bar	SA–479	316	S31600	Annealed	...	515
18	16Cr–12Ni–2Mo	Wld. tube	SA–688	TP316	S31600	...	...	515
19	16Cr–12Ni–2Mo	Wld. pipe	SA–813	TP316	S31600	...	...	515
20	16Cr–12Ni–2Mo	Wld. pipe	SA–814	TP316	S31600	...	...	515
21	16Cr–12Ni–2Mo	Bar	SA/JIS G4303	SUS316	...	...	...	520
22	16Cr–12Ni–2Mo	Plate	SA/EN 10028–7	X2CrNiMo17–12–2	...	...	≤75	520
23	16Cr–12Ni–2Mo	Plate	SA/EN 10028–7	X5CrNiMo17–12–2	...	...	≤75	520
24	16Cr–12Ni–2Mo	Forgings	SA–182	F316H	S31609	...	≤130	515
25	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316H	S31609	...	...	515
26	16Cr–12Ni–2Mo	Plate	SA–240	316H	S31609	...	...	515
27	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316H	S31609	...	...	515
28	16Cr–12Ni–2Mo	Smls. & wld. pipe	SA–312	TP316H	S31609	...	...	515
29	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316H	S31609	1	...	515
30	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316H	S31609	3	...	515
31	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316H	S31609	4	...	515
32	16Cr–12Ni–2Mo	Smls. pipe	SA–376	TP316H	S31609	...	...	515
33	16Cr–12Ni–2Mo	Smls. & wld. ftgs.	SA–403	316H	S31609	...	...	515
34	16Cr–12Ni–2Mo	Bar	SA–479	316H	S31609	...	...	515
35	16Cr–12Ni–2Mo	Wld. pipe	SA–813	TP316H	S31609	...	...	515
36	16Cr–12Ni–2Mo	Wld. pipe	SA–814	TP316H	S31609	...	...	515
37	16Cr–12Ni–2Mo	Bar	SA–276	316	S31600	S	$64 < t \le 75$	550
(**23**) 38	16Cr–12Ni–2Mo	Bolting	SA–193	B8M2	S31600	2B	$64 < t \le 72$	550
39	16Cr–12Ni–2Mo	Bolting	SA–193	B8M	S31600	2	$32 < t \le 36$	620
40	16Cr–12Ni–2Mo	Bolting	SA–320	B8M	S31600	2	$32 < t \le 40$	620
(**23**) 41	16Cr–12Ni–2Mo	Bolting	SA–193	B8M2	S31600	2B	$48 < t \le 64$	620
42	16Cr–12Ni–2Mo	Bar	SA–276	316	S31600	S	$50 < t \le 64$	620
43	16Cr–12Ni–2Mo	Bar	SA–276	316	S31600	B	$38 < t \le 44$	655
44	16Cr–12Ni–2Mo	Bolting	SA–193	B8M	S31600	2	$24 < t \le 30$	655
45	16Cr–12Ni–2Mo	Bolting	SA–320	B8M	S31600	2	$25 < t \le 32$	655

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	483	482	469	463	462	462	462	462	462	460	456	450	442	433	421
2	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
3	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
4	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
5	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
6	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
7	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
8	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
9	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
10	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
11	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
12	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
13	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
14	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
15	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
16	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
17	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
18	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
19	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
20	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
21	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
22	520	500	479	464	457	457	457	457	457	455	451	445	437	427	417
23	520	517	507	499	497	497	497	497	497	495	491	485	476	466	453
24	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
25	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
26	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
27	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
28	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
29	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
30	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
31	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
32	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
33	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
34	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
35	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
36	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
37	552	551	536	530	529	529	529	...	...	...	...	...	...	...	...
38	552	551	532	513	513	513	513	513	513	509	507	500	489	477	467
39	621	619	598	577	577	577	577	577	577	574	571	562	550	537	525
40	621	619	598	577	577	577	577	577	577	574	571	562	550	537	525
41	621	619	598	577	577	577	577	577	577	574	571	562	550	537	525
42	622	621	604	597	596	596	596	...	...	...	...	...	...	...	...
43	658	656	638	631	630	630	630	...	...	...	...	...	...	...	...
44	655	654	631	609	609	609	609	609	609	605	602	593	580	567	554
45	655	654	631	609	609	609	609	609	609	605	602	593	580	567	554

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Ferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
3	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
4	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
5	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
6	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
7	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
8	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
9	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
10	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
11	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
12	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
13	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
14	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
15	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
16	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
17	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
18	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
19	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
20	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
		Ferrous Materials (Cont'd)							
(**23**)	1	16Cr–12Ni–2Mo	Bolting	SA–193	B8M2	S31600	2B	≤48	655
	2	16Cr–12Ni–2Mo	Bar	SA–276	316	S31600	S	$t \le 50$	655
	3	16Cr–12Ni–2Mo	Bar	SA–276	316	S31600	B	$32 < t \le 38$	690
	4	16Cr–12Ni–2Mo	Bolting	SA–193	B8M	S31600	2	$20 < t \le 24$	690
	5	16Cr–12Ni–2Mo	Bolting	SA–320	B8M	S31600	2	$20 < t \le 25$	690
	6	16Cr–12Ni–2Mo	Bar	SA–276	316	S31600	B	$25 < t \le 32$	725
	7	16Cr–12Ni–2Mo	Bolting	SA–193	B8M	S31600	2	≤20	760
	8	16Cr–12Ni–2Mo	Bolting	SA–320	B8M	S31600	2	≤20	760
	9	16Cr–12Ni–2Mo	Bar	SA–276	316	S31600	B	$19 < t \le 25$	795
	10	16Cr–12Ni–2Mo	Bar	SA–276	316	S31600	B	$t \le 19$	860
	11	16Cr–12Ni–2Mo–Cb	Plate	SA–240	316Cb	S31640	...	...	515
	12	16Cr–12Ni–2Mo–N	Forgings	SA–182	F316LN	S31653	...	>130	485
	13	16Cr–12Ni–2Mo–N	Forgings	SA–965	F316LN	S31653	...	...	485
	14	16Cr–12Ni–2Mo–N	Forgings	SA–182	F316LN	S31653	...	≤130	515
	15	16Cr–12Ni–2Mo–N	Smls. tube	SA–213	TP316LN	S31653	...	...	515
	16	16Cr–12Ni–2Mo–N	Plate	SA–240	316LN	S31653	...	...	515
	17	16Cr–12Ni–2Mo–N	Wld. tube	SA–249	TP316LN	S31653	...	...	515
	18	16Cr–12Ni–2Mo–N	Smls. & wld. pipe	SA–312	TP316LN	S31653	...	...	515
	19	16Cr–12Ni–2Mo–N	Wld. pipe	SA–358	316LN	S31653	1	...	515
	20	16Cr–12Ni–2Mo–N	Wld. pipe	SA–358	316LN	S31653	3	...	515
	21	16Cr–12Ni–2Mo–N	Wld. pipe	SA–358	316LN	S31653	4	...	515
	22	16Cr–12Ni–2Mo–N	Smls. pipe	SA–376	TP316LN	S31653	...	...	515
	23	16Cr–12Ni–2Mo–N	Fittings	SA–403	316LN	S31653	...	...	515
	24	16Cr–12Ni–2Mo–N	Bar	SA–479	316LN	S31653	...	...	515
	25	16Cr–12Ni–2Mo–N	Wld. tube	SA–688	TP316LN	S31653	...	...	515
	26	16Cr–12Ni–2Mo–N	Forgings	SA–182	F316N	S31651	...	...	550
	27	16Cr–12Ni–2Mo–N	Smls. tube	SA–213	TP316N	S31651	...	...	550
	28	16Cr–12Ni–2Mo–N	Plate	SA–240	316N	S31651	...	...	550
	29	16Cr–12Ni–2Mo–N	Wld. tube	SA–249	TP316N	S31651	...	...	550
	30	16Cr–12Ni–2Mo–N	Smls. & wld. pipe	SA–312	TP316N	S31651	...	...	550
	31	16Cr–12Ni–2Mo–N	Wld. pipe	SA–358	316N	S31651	1	...	550
	32	16Cr–12Ni–2Mo–N	Wld. pipe	SA–358	316N	S31651	3	...	550
	33	16Cr–12Ni–2Mo–N	Wld. pipe	SA–358	316N	S31651	4	...	550
	34	16Cr–12Ni–2Mo–N	Smls. pipe	SA–376	TP316N	S31651	...	...	550
	35	16Cr–12Ni–2Mo–N	Smls. & wld. ftgs.	SA–403	316N	S31651	...	...	550
	36	16Cr–12Ni–2Mo–N	Bar	SA–479	316N	S31651	...	...	550
	37	16Cr–12Ni–2Mo–N	Wld. tube	SA–688	TP316N	S31651	...	...	550
	38	16Cr–12Ni–2Mo–N	Wld. pipe	SA–813	TP316N	S31651	...	...	550
	39	16Cr–12Ni–2Mo–N	Wld. pipe	SA–814	TP316N	S31651	...	...	550
	40	16Cr–12Ni–2Mo–N	Forgings	SA–965	F316N	S31651	...	...	550
	41	16Cr–12Ni–2Mo–N	Plate	SA/EN 10028–7	X2CrNiMoN17–11–2	...	...	≤75	580
	42	16Cr–12Ni–2Mo–N	Plate	SA/EN 10028–7	X2CrNiMoN17–13–3	...	...	≤75	580
(**23**)	43	16Cr–12Ni–2Mo–Ti	Smls. tube	SA–213	TP316Ti	S31635	...	...	515
(**23**)	44	16Cr–12Ni–2Mo–Ti	Plate	SA–240	316Ti	S31635	...	...	515
(**23**)	45	16Cr–12Ni–2Mo–Ti	Smls. & wld. pipe	SA–312	TP316Ti	S31635	...	...	515

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	655	654	631	609	609	609	609	609	609	605	602	593	580	567	554
2	658	656	638	631	630	630	630	...	...	...	...	...	...	...	...
3	693	691	673	665	663	663	663	...	...	...	...	...	...	...	...
4	689	689	680	665	660	660	660	660	660	657	651	643	632	618	601
5	689	689	680	665	660	660	660	660	660	657	651	643	632	618	601
6	728	726	707	698	697	697	697	...	...	...	...	...	...	...	...
7	758	758	747	731	726	726	726	726	726	722	716	707	695	680	661
8	758	758	747	731	726	726	726	726	726	722	716	707	695	680	661
9	798	797	775	766	764	764	764	...	...	...	...	...	...	...	...
10	863	862	838	828	827	827	827	...	...	...	...	...	...	...	...
11	517	517	517	517	517	517	517	517	517	517	517	517	517	...	...
12	483	482	454	433	418	409	406	404	402	399	397	394	390	385	380
13	483	482	454	433	418	409	406	404	402	399	397	394	390	385	380
14	517	516	487	464	448	438	435	432	430	428	426	422	418	413	407
15	517	516	487	464	448	438	435	432	430	428	426	422	418	413	407
16	517	516	487	464	448	438	435	432	430	428	426	422	418	413	407
17	517	516	487	464	448	438	435	432	430	428	426	422	418	413	407
18	517	516	487	464	448	438	435	432	430	428	426	422	418	413	407
19	517	516	487	464	448	438	435	432	430	428	426	422	418	413	407
20	517	516	487	464	448	438	435	432	430	428	426	422	418	413	407
21	517	516	487	464	448	438	435	432	430	428	426	422	418	413	407
22	517	516	487	464	448	438	435	432	430	428	426	422	418	413	407
23	517	516	487	464	448	438	435	432	430	428	426	422	418	413	407
24	517	516	487	464	448	438	435	432	430	428	426	422	418	413	407
25	517	516	487	464	448	438	435	432	430	428	426	422	418	413	407
26	552	550	530	518	513	512	512	512	512	512	510	506	501	494	484
27	552	550	530	518	513	512	512	512	512	512	510	506	501	494	484
28	552	550	530	518	513	512	512	512	512	512	510	506	501	494	484
29	552	550	530	518	513	512	512	512	512	512	510	506	501	494	484
30	552	550	530	518	513	512	512	512	512	512	510	506	501	494	484
31	552	550	530	518	513	512	512	512	512	512	510	506	501	494	484
32	552	550	530	518	513	512	512	512	512	512	510	506	501	494	484
33	552	550	530	518	513	512	512	512	512	512	510	506	501	494	484
34	552	550	530	518	513	512	512	512	512	512	510	506	501	494	484
35	552	550	530	518	513	512	512	512	512	512	510	506	501	494	484
36	552	550	530	518	513	512	512	512	512	512	510	506	501	494	484
37	552	550	530	518	513	512	512	512	512	512	510	506	501	494	484
38	552	550	530	518	513	512	512	512	512	512	510	506	501	494	484
39	552	550	530	518	513	512	512	512	512	512	510	506	501	494	484
40	552	550	530	518	513	512	512	512	512	512	510	506	501	494	484
41	580	573	547	522	503	491	487	485	483	480	477	474	469	463	456
42	580	573	547	522	503	491	487	485	483	480	477	474	469	463	456
43	517	475	439	417	406	403	403	403	403	403	403	403	403	399	394
44	517	475	439	417	406	403	403	403	403	403	403	403	403	399	394
45	517	475	439	417	406	403	403	403	403	403	403	403	403	399	394

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Ferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	387	377	366	352	337	319	299	278	255	231	207	183	...	...	...	(**23**)
44	387	377	366	352	337	319	299	278	255	231	207	183	...	...	...	(**23**)
45	387	377	366	352	337	319	299	278	255	231	207	183	...	...	...	(**23**)

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	17Cr–4Ni–6Mn	Plate	SA–240	201–1	S20100	...	...	515
2	17Cr–4Ni–6Mn	Plate	SA–666	201–1	S20100	...	...	515
3	17Cr–4Ni–6Mn	Plate	SA–240	201–2	S20100	...	...	655
4	17Cr–4Ni–6Mn	Plate	SA–666	201–2	S20100	...	...	655
5	17Cr–7Ni	Plate, sheet, strip	SA–240	301	S30100	...	...	515
(**23**) 6	17.5Cr–17.5Ni–5.3Si	Plate	SA–240	...	S30601	...	...	540
7	18Cr–3Ni–12Mn	Plate	SA–240	XM–29	S24000	...	...	690
8	18Cr–3Ni–12Mn	Wld. tube	SA–249	XM–29	S24000	...	...	690
9	18Cr–3Ni–12Mn	Wld. pipe	SA–312	XM–29	S24000	...	...	690
10	18Cr–3Ni–12Mn	Bar	SA–479	XM–29	S24000	...	...	690
11	18Cr–3Ni–12Mn	Wld. tube	SA–688	TPXM–29	S24000	...	...	690
12	18Cr–5Ni–3Mo	Smls. & wld. tube	SA–789	...	S31500	...	...	635
13	18Cr–5Ni–3Mo	Smls. & wld. pipe	SA–790	...	S31500	...	...	635
14	18Cr–8Ni	Forgings	SA–182	F304L	S30403	...	>130	450
15	18Cr–8Ni	Forgings	SA–965	F304L	S30403	...	...	450
16	18Cr–8Ni	Bar	SA/JIS G4303	SUS304L	...	...	...	480
17	18Cr–8Ni	Forgings	SA–182	F304L	S30403	...	≤130	485
18	18Cr–8Ni	Smls. tube	SA–213	TP304L	S30403	...	...	485
19	18Cr–8Ni	Plate	SA–240	304L	S30403	...	...	485
20	18Cr–8Ni	Wld. tube	SA–249	TP304L	S30403	...	...	485
21	18Cr–8Ni	Smls. & wld. pipe	SA–312	TP304L	S30403	...	...	485
22	18Cr–8Ni	Wld. pipe	SA–358	304L	S30403	1	...	485
23	18Cr–8Ni	Wld. pipe	SA–358	304L	S30403	3	...	485
24	18Cr–8Ni	Wld. pipe	SA–358	304L	S30403	4	...	485
25	18Cr–8Ni	Smls. & wld. ftgs.	SA–403	304L	S30403	...	...	485
26	18Cr–8Ni	Wld. pipe	SA–409	TP304L	S30403	...	...	485
27	18Cr–8Ni	Bar	SA–479	304L	S30403	Annealed	...	485
28	18Cr–8Ni	Wld. tube	SA–688	TP304L	S30403	...	...	485
29	18Cr–8Ni	Wld. pipe	SA–813	TP304L	S30403	...	...	485
30	18Cr–8Ni	Wld. pipe	SA–814	TP304L	S30403	...	...	485
31	18Cr–8Ni	Forgings	SA–182	F304	S30400	...	>130	485
32	18Cr–8Ni	Forgings	SA–182	F304H	S30409	...	>130	485
33	18Cr–8Ni	Castings	SA–351	CF3	J92500	...	...	485
34	18Cr–8Ni	Castings	SA–351	CF8	J92600	...	...	485
(**23**) 35	18Cr–8Ni	Smls. pipe	SA–376	TP304	S30400	...	≥200	485
36	18Cr–8Ni	Cast pipe	SA–451	CPF3	J92500	...	...	485
37	18Cr–8Ni	Cast pipe	SA–451	CPF8	J92600	...	...	485
38	18Cr–8Ni	Forgings	SA–965	F304	S30400	...	...	485
39	18Cr–8Ni	Forgings	SA–965	F304H	S30409	...	...	485
40	18Cr–8Ni	Plate	SA/EN 10028–7	X2CrNi18–9	...	...	≤75	500
41	18Cr–8Ni	Forgings	SA–182	F304	S30400	...	≤130	515
42	18Cr–8Ni	Forgings	SA–182	F304H	S30409	...	≤130	515
43	18Cr–8Ni	Bolting	SA–193	B8	S30400	1	...	515
44	18Cr–8Ni	Bolting	SA–193	B8A	S30400	1A	...	515
45	18Cr–8Ni	Smls. tube	SA–213	TP304	S30400	...	...	515

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	515	444	414	402	...	...	...	...	...	...	...	...	...	...	...
2	515	444	414	402	...	...	...	...	...	...	...	...	...	...	...
3	655	565	526	511	...	...	...	...	...	...	...	...	...	...	...
4	655	565	526	511	...	...	...	...	...	...	...	...	...	...	...
5	517	414	379	372	372	372	372	372	369	362	353	345	340	340	...
6	538	537	510	485	460	435	...	...	...	...	...	...	...	...	...
7	689	669	627	603	589	578	571	563	553	541	527	512	496	483	474
8	689	669	627	603	589	578	571	563	553	541	527	512	496	483	474
9	689	669	627	603	589	578	571	563	553	541	527	512	496	483	474
10	689	669	627	603	589	578	571	563	553	541	527	512	496	483	474
11	689	669	627	603	589	578	571	563	553	541	527	512	496	483	474
12	634	609	589	585	585	585	585	585	585	585	...	...	...	...	...
13	634	609	589	585	585	585	585	585	585	585	...	...	...	...	...
14	448	419	392	377	369	366	364	362	361	358	355	350	345	338	330
15	448	419	392	377	369	366	364	362	361	358	355	350	345	338	330
16	483	452	421	406	398	393	392	391	389	386	382	377	372	364	355
17	483	452	421	406	398	393	392	391	389	386	382	377	372	364	355
18	483	452	421	406	398	393	392	391	389	386	382	377	372	364	355
19	483	452	421	406	398	393	392	391	389	386	382	377	372	364	355
20	483	452	421	406	398	393	392	391	389	386	382	377	372	364	355
21	483	452	421	406	398	393	392	391	389	386	382	377	372	364	355
22	483	452	421	406	398	393	392	391	389	386	382	377	372	364	355
23	483	452	421	406	398	393	392	391	389	386	382	377	372	364	355
24	483	452	421	406	398	393	392	391	389	386	382	377	372	364	355
25	483	452	421	406	398	393	392	391	389	386	382	377	372	364	355
26	483	452	421	406	398	393	392	391	389	386	382	377	372	364	355
27	483	452	421	406	398	393	392	391	389	386	382	377	372	364	355
28	483	452	421	406	398	393	392	391	389	386	382	377	372	364	355
29	483	452	421	406	398	393	392	391	389	386	382	377	372	364	355
30	483	452	421	406	398	393	392	391	389	386	382	377	372	364	355
31	483	453	426	412	408	408	408	408	408	407	404	400	394	386	375
32	483	453	426	412	408	408	408	408	408	407	404	400	394	386	375
33	483	453	426	412	408	408	408	408	408	407	404	400	394	386	375
34	483	453	426	412	408	408	408	408	408	407	404	400	394	386	375
35	483	453	426	412	408	408	408	408	408	407	404	400	394	386	375
36	483	453	426	412	408	408	408	408	408	407	404	400	394	386	375
37	483	453	426	412	408	408	408	408	408	407	404	400	394	386	375
38	483	453	426	412	408	408	408	408	408	407	404	400	394	386	375
39	483	453	426	412	408	408	408	408	408	407	404	400	394	386	375
40	500	466	440	421	410	406	405	405	403	401	397	391	384	376	367
41	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
42	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
43	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
44	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
45	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Ferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	326	320	315	308	302	...	...	...	...	...	...	...	...	...	...	
15	326	320	315	308	302	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	352	345	339	332	325	...	...	...	...	...	...	...	...	...	...	
18	352	345	339	332	325	...	...	...	...	...	...	...	...	...	...	
19	352	345	339	332	325	...	...	...	...	...	...	...	...	...	...	
20	352	345	339	332	325	...	...	...	...	...	...	...	...	...	...	
21	352	345	339	332	325	...	...	...	...	...	...	...	...	...	...	
22	352	345	339	332	325	...	...	...	...	...	...	...	...	...	...	
23	352	345	339	332	325	...	...	...	...	...	...	...	...	...	...	
24	352	345	339	332	325	...	...	...	...	...	...	...	...	...	...	
25	352	345	339	332	325	...	...	...	...	...	...	...	...	...	...	
26	352	345	339	332	325	...	...	...	...	...	...	...	...	...	...	
27	352	345	339	332	325	...	...	...	...	...	...	...	...	...	...	
28	352	345	339	332	325	...	...	...	...	...	...	...	...	...	...	
29	352	345	339	332	325	...	...	...	...	...	...	...	...	...	...	
30	352	345	339	332	325	...	...	...	...	...	...	...	...	...	...	
31	370	358	343	325	305	283	259	234	209	186	166	150	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	370	358	343	325	305	283	259	234	209	186	166	150	...	...	...	(**23**)
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	370	358	343	325	305	283	259	234	209	186	166	150	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	393	380	364	346	324	300	275	248	222	197	176	159	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	393	380	364	346	324	300	275	248	222	197	176	159	...	...	...	
44	393	380	364	346	324	300	275	248	222	197	176	159	...	...	...	
45	393	380	364	346	324	300	275	248	222	197	176	159	...	...	...	

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	18Cr–8Ni	Smls. tube	SA–213	TP304H	S30409	...	...	515
2	18Cr–8Ni	Plate	SA–240	302	S30200	...	...	515
3	18Cr–8Ni	Plate	SA–240	304	S30400	...	...	515
4	18Cr–8Ni	Plate	SA–240	304H	S30409	...	...	515
5	18Cr–8Ni	Wld. tube	SA–249	TP304	S30400	...	...	515
6	18Cr–8Ni	Wld. tube	SA–249	TP304H	S30409	...	...	515
7	18Cr–8Ni	Smls. & wld. pipe	SA–312	TP304	S30400	...	...	515
8	18Cr–8Ni	Smls. & wld. pipe	SA–312	TP304H	S30409	...	...	515
9	18Cr–8Ni	Bolting	SA–320	B8	S30400	1	...	515
10	18Cr–8Ni	Bolting	SA–320	B8A	S30400	1A	...	515
11	18Cr–8Ni	Wld. pipe	SA–358	304	S30400	1	...	515
12	18Cr–8Ni	Wld. pipe	SA–358	304	S30400	3	...	515
13	18Cr–8Ni	Wld. pipe	SA–358	304	S30400	4	...	515
14	18Cr–8Ni	Wld. pipe	SA–358	304H	S30409	1	...	515
15	18Cr–8Ni	Wld. pipe	SA–358	304H	S30409	3	...	515
16	18Cr–8Ni	Wld. pipe	SA–358	304H	S30409	4	...	515
17	18Cr–8Ni	Wld. pipe	SA–358	304LN	S30453	1	...	515
18	18Cr–8Ni	Wld. pipe	SA–358	304LN	S30453	3	...	515
19	18Cr–8Ni	Wld. pipe	SA–358	304LN	S30453	4	...	515
(**23**) 20	18Cr–8Ni	Smls. pipe	SA–376	TP304	S30400	...	<200	515
21	18Cr–8Ni	Smls. pipe	SA–376	TP304H	S30409	...	...	515
22	18Cr–8Ni	Smls. & wld. ftgs.	SA–403	304	S30400	...	...	515
23	18Cr–8Ni	Smls. & wld. ftgs.	SA–403	304H	S30409	...	...	515
24	18Cr–8Ni	Wld. pipe	SA–409	TP304	S30400	...	...	515
25	18Cr–8Ni	Bar	SA–479	302	S30200	...	...	515
26	18Cr–8Ni	Bar	SA–479	304	S30400	Annealed	...	515
27	18Cr–8Ni	Bar	SA–479	304H	S30409	...	...	515
28	18Cr–8Ni	Wld. tube	SA–688	TP304	S30400	...	...	515
29	18Cr–8Ni	Wld. pipe	SA–813	TP304	S30400	...	...	515
30	18Cr–8Ni	Wld. pipe	SA–813	TP304H	S30409	...	...	515
31	18Cr–8Ni	Wld. pipe	SA–814	TP304	S30400	...	...	515
32	18Cr–8Ni	Wld. pipe	SA–814	TP304H	S30409	...	...	515
33	18Cr–8Ni	Bar	SA/JIS G4303	SUS302	...	...	...	520
34	18Cr–8Ni	Bar	SA/JIS G4303	SUS304	...	...	...	520
35	18Cr–8Ni	Plate	SA/EN 10028–7	X5CrNi18–10	...	...	≤75	520
36	18Cr–8Ni	Castings	SA–351	CF3A	J92500	...	...	530
37	18Cr–8Ni	Castings	SA–351	CF8A	J92600	...	...	530
38	18Cr–8Ni	Cast pipe	SA–451	CPF3A	J92500	...	...	530
39	18Cr–8Ni	Cast pipe	SA–451	CPF8A	J92600	...	...	530
40	18Cr–8Ni	Bolting	SA–320	B8	S30400	2	32 < t ≤ 40	690
41	18Cr–8Ni	Bolting	SA–320	B8	S30400	2	25 < t ≤ 32	725
42	18Cr–8Ni	Bolting	SA–320	B8	S30400	2	20 < t ≤ 25	795
43	18Cr–8Ni	Bolting	SA–320	B8	S30400	2	t ≤ 20	860
44	18Cr–8Ni–N	Forgings	SA–182	F304LN	S30453	...	>130	485
45	18Cr–8Ni–N	Forgings	SA–965	F304LN	S30453	...	...	485

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
2	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
3	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
4	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
5	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
6	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
7	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
8	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
9	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
10	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
11	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
12	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
13	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
14	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
15	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
16	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
17	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
18	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
19	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
20	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
21	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
22	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
23	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
24	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
25	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
26	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
27	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
28	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
29	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
30	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
31	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
32	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
33	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
34	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
35	520	486	462	445	438	438	438	438	438	438	436	431	424	414	404
36	531	499	468	454	449	449	449	449	449	448	445	440	433	424	413
37	531	499	468	454	449	449	449	449	449	448	445	440	433	424	413
38	531	499	468	454	449	449	449	449	449	448	445	440	433	424	413
39	531	499	468	454	449	449	449	449	449	448	445	440	433	424	413
40	690	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	725	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	795	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	860	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	483	453	426	412	408	408	408	408	408	407	404	400	394	386	375
45	483	453	426	412	408	408	408	408	408	407	404	400	394	386	375

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Ferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	393	380	364	346	324	300	275	248	222	197	176	159	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	393	380	364	346	324	300	275	248	222	197	176	159	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	393	380	364	346	324	300	275	248	222	197	176	159	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	393	380	364	346	324	300	275	248	222	197	176	159	...	...	...	
10	393	380	364	346	324	300	275	248	222	197	176	159	...	...	...	
11	393	380	364	346	324	300	275	248	222	197	176	159	...	...	...	
12	393	380	364	346	324	300	275	248	222	197	176	159	...	...	...	
13	393	380	364	346	324	300	275	248	222	197	176	159	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	393	380	364	346	324	300	275	248	222	197	176	159	...	...	...	(**23**)
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	393	380	364	346	324	300	275	248	222	197	176	159	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	393	380	364	346	324	300	275	248	222	197	176	159	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	393	380	364	346	324	300	275	248	222	197	176	159	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	393	380	364	346	324	300	275	248	222	197	176	159	...	...	...	
29	393	380	364	346	324	300	275	248	222	197	176	159	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	393	380	364	346	324	300	275	248	222	197	176	159	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	18Cr–8Ni–N	Forgings	SA–182	F304LN	S30453	...	≤130	515
2	18Cr–8Ni–N	Bolting	SA–193	B8NA	S30451	1A	...	515
3	18Cr–8Ni–N	Smls. tube	SA–213	TP304LN	S30453	...	...	515
4	18Cr–8Ni–N	Plate	SA–240	304LN	S30453	...	...	515
5	18Cr–8Ni–N	Wld. tube	SA–249	TP304LN	S30453	...	...	515
6	18Cr–8Ni–N	Smls. & wld. pipe	SA–312	TP304LN	S30453	...	...	515
7	18Cr–8Ni–N	Smls. pipe	SA–376	TP304LN	S30453	...	...	515
8	18Cr–8Ni–N	Smls. & wld. ftgs.	SA–403	304LN	S30453	WP	...	515
9	18Cr–8Ni–N	Bar	SA–479	304LN	S30453	...	...	515
10	18Cr–8Ni–N	Wld. tube	SA–688	TP304LN	S30453	...	...	515
11	18Cr–8Ni–N	Wld. pipe	SA–813	TP304LN	S30453	...	...	515
12	18Cr–8Ni–N	Wld. pipe	SA–814	TP304LN	S30453	...	...	515
13	18Cr–8Ni–N	Forgings	SA–182	F304N	S30451	...	...	550
14	18Cr–8Ni–N	Smls. tube	SA–213	TP304N	S30451	...	...	550
15	18Cr–8Ni–N	Plate	SA–240	304N	S30451	...	...	550
16	18Cr–8Ni–N	Wld. tube	SA–249	TP304N	S30451	...	...	550
17	18Cr–8Ni–N	Smls. & wld. pipe	SA–312	TP304N	S30451	...	...	550
18	18Cr–8Ni–N	Wld. pipe	SA–358	304N	S30451	1	...	550
19	18Cr–8Ni–N	Wld. pipe	SA–358	304N	S30451	3	...	550
20	18Cr–8Ni–N	Wld. pipe	SA–358	304N	S30451	4	...	550
21	18Cr–8Ni–N	Smls. pipe	SA–376	TP304N	S30451	...	...	550
22	18Cr–8Ni–N	Smls. & wld. ftgs.	SA–403	304N	S30451	...	...	550
23	18Cr–8Ni–N	Bar	SA–479	304N	S30451	...	...	550
24	18Cr–8Ni–N	Wld. tube	SA–688	TP304N	S30451	...	...	550
25	18Cr–8Ni–N	Wld. pipe	SA–813	TP304N	S30451	...	...	550
26	18Cr–8Ni–N	Wld. pipe	SA–814	TP304N	S30451	...	...	550
27	18Cr–8Ni–N	Forgings	SA–965	F304N	S30451	...	...	550
28	18Cr–8Ni–N	Plate	SA/EN 10028–7	X2CrNiN18–10	...	...	≤75	550
29	18Cr–8Ni–N	Plate	SA/EN 10028–7	X5CrNiN19–9	...	...	≤75	550
30	18Cr–8Ni–Se	Bolting	SA–320	B8F	S30323	1	...	515
31	18Cr–8Ni–Se	Bolting	SA–320	B8FA	S30323	1A	...	515
32	18Cr–8Ni–4Si–N	Bar	SA–479	...	S21800	...	...	655
33	18Cr–9Ni–3Cu–Cb–N	Smls. tube	SA–213	...	S30432	...	...	590
34	18Cr–10Ni–Cb	Forgings	SA–965	F348H	S34809	...	...	450
35	18Cr–10Ni–Cb	Castings	SA–351	CF8C	J92710	...	...	485
36	18Cr–10Ni–Cb	Cast pipe	SA–451	CPF8C	J92710	...	...	485
37	18Cr–10Ni–Cb	Forgings	SA–182	F347	S34700	...	>130	485
38	18Cr–10Ni–Cb	Forgings	SA–965	F347	S34700	...	...	485
39	18Cr–10Ni–Cb	Forgings	SA–182	F347H	S34709	...	>130	485
40	18Cr–10Ni–Cb	Forgings	SA–965	F347H	S34709	...	...	485
41	18Cr–10Ni–Cb	Forgings	SA–182	F348	S34800	...	>130	485
42	18Cr–10Ni–Cb	Forgings	SA–965	F348	S34800	...	...	485
43	18Cr–10Ni–Cb	Forgings	SA–182	F348H	S34809	...	>130	485
44	18Cr–10Ni–Cb	Forgings	SA–182	F347	S34700	...	≤130	515
45	18Cr–10Ni–Cb	Bolting	SA–193	B8C	S34700	1	...	515

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
2	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
3	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
4	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
5	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
6	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
7	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
8	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
9	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
10	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
11	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
12	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
13	552	550	524	506	493	483	479	476	472	468	464	460	453	447	439
14	552	550	524	506	493	483	479	476	472	468	464	460	453	447	439
15	552	550	524	506	493	483	479	476	472	468	464	460	453	447	439
16	552	550	524	506	493	483	479	476	472	468	464	460	453	447	439
17	552	550	524	506	493	483	479	476	472	468	464	460	453	447	439
18	552	550	524	506	493	483	479	476	472	468	464	460	453	447	439
19	552	550	524	506	493	483	479	476	472	468	464	460	453	447	439
20	552	550	524	506	493	483	479	476	472	468	464	460	453	447	439
21	552	550	524	506	493	483	479	476	472	468	464	460	453	447	439
22	552	550	524	506	493	483	479	476	472	468	464	460	453	447	439
23	552	550	524	506	493	483	479	476	472	468	464	460	453	447	439
24	552	550	524	506	493	483	479	476	472	468	464	460	453	447	439
25	552	550	524	506	493	483	479	476	472	468	464	460	453	447	439
26	552	550	524	506	493	483	479	476	472	468	464	460	453	447	439
27	552	550	524	506	493	483	479	476	472	468	464	460	453	447	439
28	550	515	489	470	463	463	463	463	463	463	461	456	448	438	427
29	550	544	525	506	491	481	477	474	471	468	463	458	452	445	438
30	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
31	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
32	655	644	599	568	550	539	536	534	531	529	526	521	517	510	503
33	590	585	563	551	546	543	542	541	540	537	533	528	522	513	503
34	448	425	393	373	360	354	352	352	352	352	352	351	350	348	345
35	483	457	423	401	388	381	380	379	379	379	379	378	377	375	372
36	483	458	423	401	388	381	379	379	379	379	379	378	377	375	372
37	483	457	423	401	388	381	380	379	379	379	379	378	377	375	372
38	483	457	423	401	388	381	380	379	379	379	379	378	377	375	372
39	483	458	423	401	388	381	379	379	379	379	379	378	377	375	372
40	483	458	423	401	388	381	379	379	379	379	379	378	377	375	372
41	483	457	423	401	388	381	380	379	379	379	379	378	377	375	372
42	483	457	423	401	388	381	380	379	379	379	379	378	377	375	372
43	483	458	423	401	388	381	379	379	379	379	379	378	377	375	372
44	517	490	454	430	416	409	407	406	405	405	405	405	404	402	398
45	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	370	356	340	321	302	281	259	237	215	193	171	151	...	...	...
38	370	356	340	321	302	281	259	237	215	193	171	151	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	370	356	340	321	302	281	259	237	215	193	171	151	...	...	...
42	370	356	340	321	302	281	259	237	215	193	171	151	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
45	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	18Cr–10Ni–Cb	Smls. tube	SA–213	TP347	S34700	...	...	515
2	18Cr–10Ni–Cb	Plate	SA–240	347	S34700	...	...	515
3	18Cr–10Ni–Cb	Wld. tube	SA–249	TP347	S34700	...	...	515
4	18Cr–10Ni–Cb	Smls. & wld. pipe	SA–312	TP347	S34700	...	...	515
5	18Cr–10Ni–Cb	Bolting	SA–320	B8C	S34700	1	...	515
6	18Cr–10Ni–Cb	Bolting	SA–320	B8CA	S34700	1A	...	515
7	18Cr–10Ni–Cb	Wld. pipe	SA–358	347	S34700	1	...	515
8	18Cr–10Ni–Cb	Wld. pipe	SA–358	347	S34700	3	...	515
9	18Cr–10Ni–Cb	Wld. pipe	SA–358	347	S34700	4	...	515
10	18Cr–10Ni–Cb	Smls. pipe	SA–376	TP347	S34700	...	...	515
11	18Cr–10Ni–Cb	Smls. & wld. ftgs.	SA–403	347	S34700	...	...	515
12	18Cr–10Ni–Cb	Wld. pipe	SA–409	TP347	S34700	...	...	515
13	18Cr–10Ni–Cb	Bar	SA–479	347	S34700	...	...	515
14	18Cr–10Ni–Cb	Wld. pipe	SA–813	TP347	S34700	...	...	515
15	18Cr–10Ni–Cb	Forgings	SA–182	F347H	S34709	...	≤130	515
16	18Cr–10Ni–Cb	Smls. tube	SA–213	TP347H	S34709	...	...	515
17	18Cr–10Ni–Cb	Plate	SA–240	347H	S34709	...	...	515
18	18Cr–10Ni–Cb	Wld. tube	SA–249	TP347H	S34709	...	...	515
19	18Cr–10Ni–Cb	Smls. & wld. pipe	SA–312	TP347H	S34709	...	...	515
20	18Cr–10Ni–Cb	Smls. pipe	SA–376	TP347H	S34709	...	...	515
21	18Cr–10Ni–Cb	Smls. & wld. ftgs.	SA–403	347H	S34709	...	...	515
22	18Cr–10Ni–Cb	Bar	SA–479	347H	S34709	...	...	515
23	18Cr–10Ni–Cb	Wld. pipe	SA–813	TP347H	S34709	...	...	515
24	18Cr–10Ni–Cb	Wld. pipe	SA–814	TP347H	S34709	...	...	515
25	18Cr–10Ni–Cb	Smls. tube	SA–213	TP347LN	S34751	...	...	515
26	18Cr–10Ni–Cb	Smls. pipe	SA–312	TP347LN	S34751	...	...	515
27	18Cr–10Ni–Cb	Forgings	SA–182	F348	S34800	...	≤130	515
28	18Cr–10Ni–Cb	Smls. tube	SA–213	TP348	S34800	...	...	515
29	18Cr–10Ni–Cb	Plate	SA–240	348	S34800	...	...	515
30	18Cr–10Ni–Cb	Wld. tube	SA–249	TP348	S34800	...	...	515
31	18Cr–10Ni–Cb	Smls. & wld. pipe	SA–312	TP348	S34800	...	...	515
32	18Cr–10Ni–Cb	Wld. pipe	SA–358	348	S34800	1	...	515
33	18Cr–10Ni–Cb	Wld. pipe	SA–358	348	S34800	3	...	515
34	18Cr–10Ni–Cb	Wld. pipe	SA–358	348	S34800	4	...	515
35	18Cr–10Ni–Cb	Smls. pipe	SA–376	TP348	S34800	...	...	515
36	18Cr–10Ni–Cb	Smls. & wld. ftgs.	SA–403	348	S34800	...	...	515
37	18Cr–10Ni–Cb	Wld. pipe	SA–409	TP348	S34800	...	...	515
38	18Cr–10Ni–Cb	Bar	SA–479	348	S34800	...	...	515
39	18Cr–10Ni–Cb	Wld. pipe	SA–813	TP348	S34800	...	...	515
40	18Cr–10Ni–Cb	Wld. pipe	SA–814	TP348	S34800	...	...	515
41	18Cr–10Ni–Cb	Forgings	SA–182	F348H	S34809	...	≤130	515
42	18Cr–10Ni–Cb	Smls. tube	SA–213	TP348H	S34809	...	...	515
43	18Cr–10Ni–Cb	Plate	SA–240	348H	S34809	...	...	515
44	18Cr–10Ni–Cb	Wld. tube	SA–249	TP348H	S34809	...	...	515
45	18Cr–10Ni–Cb	Smls. & wld. pipe	SA–312	TP348H	S34809	...	...	515

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	517	490	454	430	416	409	407	406	405	405	405	405	404	402	398
2	517	490	454	430	416	409	407	406	405	405	405	405	404	402	398
3	517	490	454	430	416	409	407	406	405	405	405	405	404	402	398
4	517	490	454	430	416	409	407	406	405	405	405	405	404	402	398
5	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
6	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
7	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
8	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
9	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
10	517	490	454	430	416	409	407	406	405	405	405	405	404	402	398
11	517	490	454	430	416	409	407	406	405	405	405	405	404	402	398
12	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
13	517	490	454	430	416	409	407	406	405	405	405	405	404	402	398
14	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
15	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
16	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
17	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
18	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
19	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
20	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
21	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
22	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
23	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
24	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
25	517	498	461	432	412	400	397	395	394	394	393	392	391	389	385
26	517	498	461	432	412	400	397	395	394	394	393	392	391	389	385
27	517	490	454	430	416	409	407	406	405	405	405	405	404	402	398
28	517	490	454	430	416	409	407	406	405	405	405	405	404	402	398
29	517	490	454	430	416	409	407	406	405	405	405	405	404	402	398
30	517	490	454	430	416	409	407	406	405	405	405	405	404	402	398
31	517	490	454	430	416	409	407	406	405	405	405	405	404	402	398
32	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
33	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
34	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
35	517	490	454	430	416	409	407	406	405	405	405	405	404	402	398
36	517	490	454	430	416	409	407	406	405	405	405	405	404	402	398
37	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
38	517	490	454	430	416	409	407	406	405	405	405	405	404	402	398
39	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
40	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
41	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
42	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
43	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
44	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
45	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
2	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
3	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
4	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
5	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
6	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
7	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
8	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
9	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
10	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
11	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
12	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
13	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
14	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
28	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
29	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
30	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
31	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
32	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
33	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
34	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
35	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
36	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
37	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
38	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
39	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
40	393	378	361	341	320	298	275	251	228	204	182	160	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	18Cr–10Ni–Cb	Smls. & wld. ftgs.	SA–403	348H	S34809	...	...	515
2	18Cr–10Ni–Cb	Bar	SA–479	348H	S34809	...	...	515
3	18Cr–10Ni–Cb	Wld. pipe	SA–813	TP348H	S34809	...	...	515
4	18Cr–10Ni–Cb	Wld. pipe	SA–814	TP348H	S34809	...	...	515
5	18Cr–10Ni–Cb	Bar	SA/JIS G4303	SUS347	...	...	...	520
6	18Cr–10Ni–Cb	Smls. tube	SA–213	TP347HFG	S34710	...	...	550
7	18Cr–10Ni–Cb	Bolting	SA–320	B8C	S34700	2	32 < t ≤ 40	690
8	18Cr–10Ni–Cb	Bolting	SA–320	B8C	S34700	2	25 < t ≤ 32	725
9	18Cr–10Ni–Cb	Bolting	SA–320	B8C	S34700	2	20 < t ≤ 25	795
10	18Cr–10Ni–Cb	Bolting	SA–320	B8C	S34700	2	t ≤ 20	860
11	18Cr–10Ni–Ti	Smls. & wld. pipe	SA–312	TP321	S32100	...	>9.5	485
12	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321	S32100	...	>9.5	485
13	18Cr–10Ni–Ti	Smls. & wld. pipe	SA–312	TP321H	S32109	...	>9.5	485
14	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321H	S32109	...	>9.5	485
15	18Cr–10Ni–Ti	Forgings	SA–182	F321	S32100	...	>130	485
16	18Cr–10Ni–Ti	Forgings	SA–965	F321	S32100	...	...	485
17	18Cr–10Ni–Ti	Forgings	SA–182	F321H	S32109	...	>130	485
18	18Cr–10Ni–Ti	Forgings	SA–965	F321H	S32109	...	...	485
19	18Cr–10Ni–Ti	Plate	SA/EN 10028–7	X6CrNiTi18–10	...	...	≤75	500
20	18Cr–10Ni–Ti	Forgings	SA–182	F321	S32100	...	≤130	515
21	18Cr–10Ni–Ti	Bolting	SA–193	B8T	S32100	1	...	515
22	18Cr–10Ni–Ti	Smls. tube	SA–213	TP321	S32100	...	...	515
23	18Cr–10Ni–Ti	Plate	SA–240	321	S32100	...	...	515
24	18Cr–10Ni–Ti	Wld. tube	SA–249	TP321	S32100	...	...	515
25	18Cr–10Ni–Ti	Smls. & wld. pipe	SA–312	TP321	S32100	...	≤9.5	515
26	18Cr–10Ni–Ti	Bolting	SA–320	B8T	S32100	1	...	515
27	18Cr–10Ni–Ti	Bolting	SA–320	B8TA	S32100	1A	...	515
28	18Cr–10Ni–Ti	Wld. pipe	SA–358	321	S32100	1	...	515
29	18Cr–10Ni–Ti	Wld. pipe	SA–358	321	S32100	3	...	515
30	18Cr–10Ni–Ti	Wld. pipe	SA–358	321	S32100	4	...	515
31	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321	S32100	...	≤9.5	515
32	18Cr–10Ni–Ti	Smls. & wld. ftgs.	SA–403	321	S32100	...	...	515
33	18Cr–10Ni–Ti	Wld. pipe	SA–409	TP321	S32100	...	...	515
34	18Cr–10Ni–Ti	Bar	SA–479	321	S32100	...	...	515
35	18Cr–10Ni–Ti	Wld. pipe	SA–813	TP321	S32100	...	...	515
36	18Cr–10Ni–Ti	Wld. pipe	SA–814	TP321	S32100	...	...	515
37	18Cr–10Ni–Ti	Forgings	SA–182	F321H	S32109	...	≤130	515
38	18Cr–10Ni–Ti	Smls. tube	SA–213	TP321H	S32109	...	...	515
39	18Cr–10Ni–Ti	Plate	SA–240	321H	S32109	...	...	515
40	18Cr–10Ni–Ti	Wld. tube	SA–249	TP321H	S32109	...	...	515
41	18Cr–10Ni–Ti	Smls. & wld. pipe	SA–312	TP321H	S32109	...	≤9.5	515
42	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321H	S32109	...	≤9.5	515
43	18Cr–10Ni–Ti	Smls. & wld. ftgs.	SA–403	321H	S32109	...	...	515
44	18Cr–10Ni–Ti	Bar	SA–479	321H	S32109	...	...	515
45	18Cr–10Ni–Ti	Wld. pipe	SA–813	TP321H	S32109	...	...	515

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
2	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
3	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
4	517	491	454	430	416	408	406	406	405	405	405	405	404	402	399
5	517	490	454	430	416	409	407	406	405	405	405	405	404	402	398
6	552	531	501	481	469	462	459	458	456	455	454	452	449	445	440
7	690	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	725	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	795	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	860	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	483	454	430	421	421	421	421	421	421	421	421	421	421	421	417
12	483	454	430	421	421	421	421	421	421	421	421	421	421	421	417
13	483	454	430	421	421	421	421	421	421	421	421	421	421	421	417
14	483	454	430	421	421	421	421	421	421	421	421	421	421	421	417
15	483	454	430	421	421	421	421	421	421	421	421	421	421	421	417
16	483	454	430	421	421	421	421	421	421	421	421	421	421	421	417
17	483	454	430	421	421	421	421	421	421	421	421	421	421	421	417
18	483	454	430	421	421	421	421	421	421	421	421	421	421	421	417
19	500	469	451	438	433	433	433	433	433	433	433	433	433	433	430
20	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
21	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
22	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
23	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
24	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
25	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
26	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
27	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
28	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
29	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
30	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
31	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
32	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
33	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
34	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
35	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
36	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
37	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
38	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
39	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
40	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
41	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
42	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
43	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
44	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
45	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	406	395	381	366	349	330	310	289	267	245	223	201	...	...	...
12	406	395	381	366	349	330	310	289	267	245	223	201	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	406	395	381	366	349	330	310	289	267	245	223	201	...	...	...
16	406	395	381	366	349	330	310	289	267	245	223	201	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	432	419	405	388	370	350	329	307	284	260	237	214	...	...	...
21	432	419	405	388	370	350	329	307	284	260	237	214	...	...	...
22	432	419	405	388	370	350	329	307	284	260	237	214	...	...	...
23	432	419	405	388	370	350	329	307	284	260	237	214	...	...	...
24	432	419	405	388	370	350	329	307	284	260	237	214	...	...	...
25	432	419	405	388	370	350	329	307	284	260	237	214	...	...	...
26	432	419	405	388	370	350	329	307	284	260	237	214	...	...	...
27	432	419	405	388	370	350	329	307	284	260	237	214	...	...	...
28	432	419	405	388	370	350	329	307	284	260	237	214	...	...	...
29	432	419	405	388	370	350	329	307	284	260	237	214	...	...	...
30	432	419	405	388	370	350	329	307	284	260	237	214	...	...	...
31	432	419	405	388	370	350	329	307	284	260	237	214	...	...	...
32	432	419	405	388	370	350	329	307	284	260	237	214	...	...	...
33	432	419	405	388	370	350	329	307	284	260	237	214	...	...	...
34	432	419	405	388	370	350	329	307	284	260	237	214	...	...	...
35	432	419	405	388	370	350	329	307	284	260	237	214	...	...	...
36	432	419	405	388	370	350	329	307	284	260	237	214	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
		Ferrous Materials (Cont'd)							
	1	18Cr–10Ni–Ti	Wld. pipe	SA–814	TP321H	S32109	...	...	515
	2	18Cr–10Ni–Ti	Bar	SA/JIS G4303	SUS321	...	...	...	520
	3	18Cr–10Ni–Ti	Bolting	SA–320	B8T	S32100	2	32 < t ≤ 40	690
	4	18Cr–10Ni–Ti	Bolting	SA–320	B8T	S32100	2	25 < t ≤ 32	725
	5	18Cr–10Ni–Ti	Bolting	SA–320	B8T	S32100	2	20 < t ≤ 25	795
	6	18Cr–10Ni–Ti	Bolting	SA–320	B8T	S32100	2	t ≤ 20	860
	7	18Cr–11Ni	Plate	SA–240	305	S30500	...	...	515
(**23**)	8	18Cr–12Ni–2Mo	Castings	SA–351	CF3M	J92800	...	...	485
(**23**)	9	18Cr–12Ni–2Mo	Cast pipe	SA–451	CPF3M	J92800	...	...	485
(**23**)	10	18Cr–12Ni–2Mo	Castings	SA–351	CF8M	J92900	...	...	485
(**23**)	11	18Cr–12Ni–2Mo	Cast pipe	SA–451	CPF8M	J92900	...	...	485
	12	18Cr–13Ni–3Mo	Forgings	SA–182	F317L	S31703	...	>130	450
	13	18Cr–13Ni–3Mo	Forgings	SA–182	F317L	S31703	...	≤130	485
	14	18Cr–13Ni–3Mo	Forgings	SA–182	F317	S31700	...	≤130	515
	15	18Cr–13Ni–3Mo	Plate	SA–240	317	S31700	...	...	515
	16	18Cr–13Ni–3Mo	Plate	SA–240	317L	S31703	...	...	515
	17	18Cr–13Ni–3Mo	Wld. tube	SA–249	TP317	S31700	...	...	515
	18	18Cr–13Ni–3Mo	Wld. tube	SA–249	TP317L	S31703	...	...	515
	19	18Cr–13Ni–3Mo	Smls. & wld. pipe	SA–312	TP317	S31700	...	...	515
	20	18Cr–13Ni–3Mo	Smls. & wld. pipe	SA–312	TP317L	S31703	...	...	515
	21	18Cr–13Ni–3Mo	Smls. & wld. ftgs.	SA–403	317	S31700	...	...	515
	22	18Cr–13Ni–3Mo	Fittings	SA–403	317L	S31703	...	...	515
(**23**)	23	18Cr–15Ni–4Si	Forgings	SA–182	...	S30600	Solution ann.	...	540
(**23**)	24	18Cr–15Ni–4Si	Plate	SA–240	...	S30600	Solution ann.	≤50	540
(**23**)	25	18Cr–15Ni–4Si	Smls. & wld. pipe	SA–312	...	S30600	Solution ann.	...	540
(**23**)	26	18Cr–15Ni–4Si	Bar	SA–479	...	S30600	Solution ann.	≤100	540
	27	18Cr–18Ni–2Si	Smls. tube	SA–213	XM–15	S38100	...	...	515
	28	18Cr–18Ni–2Si	Plate	SA–240	XM–15	S38100	...	...	515
	29	18Cr–18Ni–2Si	Wld. tube	SA–249	TPXM–15	S38100	...	...	515
	30	18Cr–18Ni–2Si	Wld. pipe	SA–312	TPXM–15	S38100	...	...	515
(**23**)	31	18Cr–20Ni–5.5Si	Smls. tube	SA–213	...	S32615	Solution ann.	...	550
(**23**)	32	18Cr–20Ni–5.5Si	Plate	SA–240	...	S32615	Solution ann.	...	550
(**23**)	33	18Cr–20Ni–5.5Si	Smls. & wld. pipe	SA–312	...	S32615	Solution ann.	...	550
(**23**)	34	18Cr–20Ni–5.5Si	Bar	SA–479	...	S32615	Solution ann.	...	550
	35	19Cr–9Ni–½Mo	Castings	SA–351	CF10	J92590	...	...	485
	36	19Cr–9Ni–Mo–W	Bolting	SA–453	651	S63198	B	...	655
	37	19Cr–9Ni–Mo–W	Bolting	SA–453	651	S63198	A	...	690
	38	19Cr–9Ni–2Mo	Castings	SA–351	CF10M	...	...	...	485
	39	19Cr–10Ni–3Mo	Castings	SA–351	CG8M	J93000	...	...	515
	40	19Cr–15Ni–4Mo	Smls. tube	SA–213	...	S31725	...	...	515
	41	19Cr–15Ni–4Mo	Plate	SA–240	...	S31725	...	...	515
	42	19Cr–15Ni–4Mo	Wld. tube	SA–249	...	S31725	...	...	515
	43	19Cr–15Ni–4Mo	Smls. & wld. pipe	SA–312	...	S31725	...	...	515
	44	19Cr–15Ni–4Mo	Wld. pipe	SA–358	...	S31725	...	...	515
	45	19Cr–15Ni–4Mo	Smls. pipe	SA–376	...	S31725	...	...	515

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
2	517	487	461	452	452	452	452	452	452	452	452	452	452	452	447
3	690	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	725	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	795	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	860	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
8	483	482	469	463	463	463	463	463	463	460	457	451	443	434	422
9	483	482	469	463	463	463	463	463	463	460	457	451	443	434	422
10	483	482	469	463	463	463	463	463	463	460	457	451	443	434	422
11	483	482	469	463	463	463	463	463	463	460	457	451	443	434	422
12	448	433	410	399	395	395	395	394	393	391	388	383	377	369	360
13	483	467	441	429	426	426	425	425	424	421	417	413	406	398	387
14	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
15	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
16	517	499	472	460	457	456	456	455	454	451	448	442	435	426	415
17	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
18	517	499	472	460	457	456	456	455	454	451	448	442	435	426	415
19	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
20	517	499	472	460	457	456	456	455	454	451	448	442	435	426	415
21	517	516	502	496	495	495	495	495	495	493	489	482	474	463	450
22	517	499	472	460	457	456	456	455	454	451	448	442	435	426	415
23	538	511	472	...	...	...	...	...	...	...	...	...	...	...	...
24	538	511	472	...	...	...	...	...	...	...	...	...	...	...	...
25	538	511	472	...	...	...	...	...	...	...	...	...	...	...	...
26	538	511	472	...	...	...	...	...	...	...	...	...	...	...	...
27	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
28	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
29	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
30	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
31	552	548	524	509	494	...	...	...	...	...	...	...	...	...	...
32	552	548	524	509	494	...	...	...	...	...	...	...	...	...	...
33	552	548	524	509	494	...	...	...	...	...	...	...	...	...	...
34	552	548	524	509	494	...	...	...	...	...	...	...	...	...	...
35	483	454	428	415	410	409	409	408	407	405	403	399	393	387	378
36	655	643	609	588	576	568	566	563	560	556	551	545	536	525	511
37	689	676	641	619	606	598	595	593	590	585	580	573	564	553	538
38	483	481	470	467	465	461	458	454	449	444	440	434	428	423	417
39	517	499	474	461	456	455	455	455	455	454	452	449	443	436	426
40	517	498	472	460	456	456	456	455	454	452	448	442	435	426	415
41	517	498	472	460	456	456	456	455	454	452	448	442	435	426	415
42	517	498	472	460	456	456	456	455	454	452	448	442	435	426	415
43	517	498	472	460	456	456	456	455	454	452	448	442	435	426	415
44	517	498	472	460	456	456	456	455	454	452	448	442	435	426	415
45	517	498	472	460	456	456	456	455	454	452	448	442	435	426	415

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Ferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
12	352	344	333	322	308	...	...	...	...	...	...	...	...	...	...	
13	379	370	359	347	332	...	...	...	...	...	...	...	...	...	...	
14	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
15	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
16	403	393	382	368	353	...	...	...	...	...	...	...	...	...	...	
17	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
18	403	393	382	368	353	...	...	...	...	...	...	...	...	...	...	
19	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
20	403	393	382	368	353	...	...	...	...	...	...	...	...	...	...	
21	431	404	377	351	326	302	279	257	235	215	195	176	...	...	...	
22	403	393	382	368	353	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	19Cr–15Ni–4Mo	Wld. pipe	SA–409	...	S31725	...	...	515
2	19Cr–15Ni–4Mo	Bar	SA–479	...	S31725	...	...	515
3	20Cr–3Ni–1.5Mo–N	Plate	SA–240	...	S32003	...	>5	655
4	20Cr–3Ni–1.5Mo–N	Wld. pipe	SA–790	...	S32003	...	...	655
5	20Cr–3Ni–1.5Mo–N	Sheet	SA–240	...	S32003	...	≤5	690
6	20Cr–3Ni–1.5Mo–N	Smls. & wld. tube	SA–789	...	S32003	...	...	690
7	20Cr–10Ni	Bar	SA–479	ER308	S30880	...	...	515
8	20Cr–18Ni–6Mo	Castings	SA–351	CK3MCuN	J93254	...	...	550
9	20Cr–18Ni–6Mo	Forgings	SA–182	F44	S31254	...	...	650
10	20Cr–18Ni–6Mo	Smls. tube	SA–213	...	S31254	...	$t > 5$	655
11	20Cr–18Ni–6Mo	Wld. tube	SA–249	...	S31254	...	$t > 5$	655
12	20Cr–18Ni–6Mo	Smls. & wld. pipe	SA–312	...	S31254	...	$t > 5$	655
13	20Cr–18Ni–6Mo	Wld. pipe	SA–358	...	S31254	...	$t \geq 5$	655
14	20Cr–18Ni–6Mo	Smls. tube	SA–213	...	S31254	...	$t \leq 5$	675
15	20Cr–18Ni–6Mo	Wld. tube	SA–249	...	S31254	...	$t \leq 5$	675
16	20Cr–18Ni–6Mo	Smls. & wld. pipe	SA–312	...	S31254	...	$t \leq 5$	675
17	20Cr–18Ni–6Mo	Plate	SA–240	...	S31254	...	$t < 5$	690
18	20Cr–18Ni–6Mo	Wld. pipe	SA–358	...	S31254	...	$t < 5$	690
(**23**) 19	20.5Cr–8.8Ni–Mo–N	Plate	SA–240	...	S31655	...	...	635
20	21Cr–5Mn–1.5Ni–Cu–N	Plate	SA–240	...	S32101	...	>5	650
21	21Cr–5Mn–1.5Ni–Cu–N	Bar	SA–479	...	S32101	...	...	650
22	21Cr–5Mn–1.5Ni–Cu–N	Smls. & wld. tube	SA–789	...	S32101	...	>5	650
23	21Cr–5Mn–1.5Ni–Cu–N	Smls. & wld. pipe	SA–790	...	S32101	...	>5	650
24	21Cr–5Mn–1.5Ni–Cu–N	Fittings	SA–815	...	S32101	...	...	650
25	21Cr–5Mn–1.5Ni–Cu–N	Sheet, strip	SA–240	...	S32101	...	≤5	700
26	21Cr–5Mn–1.5Ni–Cu–N	Smls. & wld. tube	SA–789	...	S32101	...	≤5	700
27	21Cr–5Mn–1.5Ni–Cu–N	Smls. & wld. pipe	SA–790	...	S32101	...	≤5	700
28	21Cr–6Ni–9Mn	Forgings	SA–182	FXM–11	S21904	...	...	620
29	21Cr–6Ni–9Mn	Smls. & wld. pipe	SA–312	TPXM–11	S21904	...	...	620
30	21Cr–6Ni–9Mn	Plate	SA–666	XM–11	S21904	...	...	620
31	21Cr–6Ni–9Mn	Forgings	SA–965	FXM–11	S21904	...	...	620
32	21Cr–11Ni–N	Forgings	SA–182	F45	S30815	...	...	600
33	21Cr–11Ni–N	Smls. tube	SA–213	...	S30815	...	...	600
34	21Cr–11Ni–N	Plate	SA–240	...	S30815	...	...	600
35	21Cr–11Ni–N	Wld. tube	SA–249	...	S30815	...	...	600
36	21Cr–11Ni–N	Smls. & wld. pipe	SA–312	...	S30815	...	...	600
37	21Cr–11Ni–N	Bar	SA–479	...	S30815	...	...	600
(**23**) 38	22Cr–2Ni–Mo–N	Forgings	SA–182	F66	S32202	...	...	650
(**23**) 39	22Cr–2Ni–Mo–N	Plate	SA–240	...	S32202	...	...	650
(**23**) 40	22Cr–2Ni–Mo–N	Bar	SA–479	...	S32202	...	...	650
(**23**) 41	22Cr–2Ni–Mo–N	Smls. & wld. tube	SA–789	...	S32202	...	...	650
(**23**) 42	22Cr–2Ni–Mo–N	Smls. & wld. pipe	SA–790	...	S32202	...	...	650
(**23**) 43	22Cr–2Ni–Mo–N	Smls. & wld. fittings	SA–815	...	S32202	...	...	650
44	22Cr–5Ni–3Mo–N	Castings	SA–995	4A	J92205	...	...	620
45	22Cr–5Ni–3Mo–N	Forgings	SA–182	F51	S31803	...	...	620

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
													Ferrous Materials (Cont'd)		
1	517	498	472	460	456	456	456	455	454	452	448	442	435	426	415
2	517	498	472	460	456	456	456	455	454	452	448	442	435	426	415
3	655	572	543	537	537	537	537	537	537	537	537	537	...	...	...
4	655	572	543	537	537	537	537	537	537	537	537	537	...	...	...
5	689	602	571	565	565	565	565	565	565	565	565	565	...	...	...
6	689	602	571	565	565	565	565	565	565	565	565	565	...	...	...
7	517	485	456	442	437	437	437	437	437	436	433	429	422	413	402
8	552	550	523	501	485	474	471	468	466	465	462	459	455	...	...
9	648	646	616	589	570	557	553	550	548	546	543	539	534	...	...
10	655	653	623	595	576	563	559	556	554	552	549	545	540	...	...
11	655	653	623	595	576	563	559	556	554	552	549	545	540	...	...
12	655	653	623	595	576	563	559	556	554	552	549	545	540	...	...
13	655	653	623	595	576	563	559	556	554	552	549	545	540	...	...
14	675	673	642	613	594	580	576	573	571	569	566	561	556	...	...
15	675	673	642	613	594	580	576	573	571	569	566	561	556	...	...
16	675	673	642	613	594	580	576	573	571	569	566	561	556	...	...
17	689	688	655	627	607	593	589	585	583	580	575	572	571	...	...
18	689	688	655	627	607	593	589	585	583	580	575	572	571	...	...
19	635	620	586	562	546	535	531	528	524	520	515	509	501	...	...
20	650	650	618	599	596	596	596	596	...	...	...	...	...	...	...
21	650	650	618	599	596	596	596	596	...	...	...	...	...	...	...
22	650	650	618	599	596	596	596	596	...	...	...	...	...	...	...
23	650	650	618	599	596	596	596	596	...	...	...	...	...	...	...
24	650	650	618	599	596	596	596	596	...	...	...	...	...	...	...
25	700	700	666	645	642	642	642	642	...	...	...	...	...	...	...
26	700	700	666	645	642	642	642	642	...	...	...	...	...	...	...
27	700	700	666	645	642	642	642	642	...	...	...	...	...	...	...
28	621	618	579	551	533	522	517	513	510	504	499	492	483	472	460
29	621	618	579	551	533	522	517	513	510	504	499	492	483	472	460
30	621	618	579	551	533	522	517	513	510	504	499	492	483	472	460
31	621	618	579	551	533	522	517	513	510	504	499	492	483	472	460
32	600	594	562	542	529	519	514	510	506	502	497	491	485	478	470
33	600	594	562	542	529	519	514	510	506	502	497	491	485	478	470
34	600	594	562	542	529	519	514	510	506	502	497	491	485	478	470
35	600	594	562	542	529	519	514	510	506	502	497	491	485	478	470
36	600	594	562	542	529	519	514	510	506	502	497	491	485	478	470
37	600	594	562	542	529	519	514	510	506	502	497	491	485	478	470
38	648	640	600	595	595	595	595	...	...	...	...	...	...	...	...
39	648	640	600	595	595	595	595	...	...	...	...	...	...	...	...
40	648	640	600	595	595	595	595	...	...	...	...	...	...	...	...
41	648	640	600	595	595	595	595	...	...	...	...	...	...	...	...
42	648	640	600	595	595	595	595	...	...	...	...	...	...	...	...
43	648	640	600	595	595	595	595	...	...	...	...	...	...	...	...
44	621	621	594	587	587	587	...	...	...	...	...	...	...	...	...
45	621	619	598	577	564	558	556	555	...	...	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Ferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	22Cr–5Ni–3Mo–N	Plate	SA–240	...	S31803	...	...	620
2	22Cr–5Ni–3Mo–N	Bar	SA–479	...	S31803	...	...	620
3	22Cr–5Ni–3Mo–N	Smls. & wld. tube	SA–789	...	S31803	...	...	620
4	22Cr–5Ni–3Mo–N	Smls. & wld. pipe	SA–790	...	S31803	...	...	620
5	22Cr–5Ni–3Mo–N	Smls. & wld. ftgs.	SA–815	...	S31803	...	...	620
6	22Cr–5Ni–3Mo–N	Forgings	SA–182	F60	S32205	...	...	655
7	22Cr–5Ni–3Mo–N	Plate	SA–240	...	S32205	...	...	655
8	22Cr–5Ni–3Mo–N	Bar	SA–479	...	S32205	...	...	655
9	22Cr–5Ni–3Mo–N	Smls. & wld. tube	SA–789	...	S32205	...	...	655
10	22Cr–5Ni–3Mo–N	Smls. & wld. pipe	SA–790	...	S32205	...	...	655
11	22Cr–5Ni–3Mo–N	Smls. & wld. ftgs.	SA–815	...	S32205	...	...	655
12	22Cr–13Ni–5Mn	Castings	SA–351	CG6MMN	J93790	...	...	585
13	22Cr–13Ni–5Mn	Forgings	SA–182	FXM–19	S20910	...	...	690
14	22Cr–13Ni–5Mn	Bolting	SA–193	B8R	S20910	Annealed	...	690
15	22Cr–13Ni–5Mn	Bolting	SA–193	B8RA	S20910	Annealed	...	690
16	22Cr–13Ni–5Mn	Smls. tube	SA–213	XM–19	S20910	...	...	690
17	22Cr–13Ni–5Mn	Plate	SA–240	XM–19	S20910	...	...	690
18	22Cr–13Ni–5Mn	Wld. tube	SA–249	TPXM–19	S20910	...	...	690
19	22Cr–13Ni–5Mn	Smls. & wld. pipe	SA–312	TPXM–19	S20910	...	...	690
20	22Cr–13Ni–5Mn	Wld. pipe	SA–358	XM–19	S20910	1	...	690
21	22Cr–13Ni–5Mn	Wld. pipe	SA–358	XM–19	S20910	3	...	690
22	22Cr–13Ni–5Mn	Wld. pipe	SA–358	XM–19	S20910	4	...	690
23	22Cr–13Ni–5Mn	Smls. & wld. ftgs.	SA–403	XM–19	S20910	...	...	690
24	22Cr–13Ni–5Mn	Bar	SA–479	XM–19	S20910	Annealed	...	690
25	22Cr–13Ni–5Mn	Bar	SA–479	XM–19	S20910	Hot rolled	$76.2 < t \le 203.2$	690
26	22Cr–13Ni–5Mn	Wld. pipe	SA–813	TPXM–19	S20910	...	...	690
27	22Cr–13Ni–5Mn	Wld. pipe	SA–814	TPXM–19	S20910	...	...	690
28	22Cr–13Ni–5Mn	Forgings	SA–965	FXM–19	S20910	...	...	690
29	22Cr–13Ni–5Mn	Bar	SA–479	XM–19	S20910	Hot rolled	$50.8 < t \le 76.2$	795
30	22Cr–13Ni–5Mn	Bar	SA–479	XM–19	S20910	Hot rolled	≤50.8	930
31	23Cr–4Ni–Mo–Cu–N	Plate	SA–240	...	S32304	...	...	600
32	23Cr–4Ni–Mo–Cu–N	Smls. & wld. tube	SA–789	...	S32304	...	>25	600
33	23Cr–4Ni–Mo–Cu–N	Smls. & wld. pipe	SA–790	...	S32304	...	...	600
34	23Cr–4Ni–Mo–Cu–N	Smls. & wld. tube	SA–789	...	S32304	...	≤25	690
35	23Cr–12Ni	Smls. & wld. ftgs.	SA–403	309	S30900	...	...	515
36	23Cr–12Ni	Smls. tube	SA–213	TP309S	S30908	...	...	515
37	23Cr–12Ni	Plate	SA–240	309S	S30908	...	...	515
38	23Cr–12Ni	Wld. tube	SA–249	TP309S	S30908	...	...	515
39	23Cr–12Ni	Smls. & wld. pipe	SA–312	TP309S	S30908	...	...	515
40	23Cr–12Ni	Wld. pipe	SA–358	309S	S30908	1	...	515
41	23Cr–12Ni	Wld. pipe	SA–358	309S	S30908	3	...	515
42	23Cr–12Ni	Wld. pipe	SA–358	309S	S30908	4	...	515
43	23Cr–12Ni	Bar	SA–479	309S	S30908	...	...	515
44	23Cr–12Ni	Wld. pipe	SA–813	TP309S	S30908	...	...	515
45	23Cr–12Ni	Wld. pipe	SA–814	TP309S	S30908	...	...	515

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	621	619	598	577	564	558	556	555	...	...	...	...	...	...	...
2	621	619	598	577	564	558	556	555	...	...	...	...	...	...	...
3	621	619	598	577	564	558	556	555	...	...	...	...	...	...	...
4	621	619	598	577	564	558	556	555	...	...	...	...	...	...	...
5	621	619	598	577	564	558	556	555	...	...	...	...	...	...	...
6	655	655	631	610	596	588	587	586	...	...	...	...	...	...	...
7	655	655	631	610	596	588	587	586	...	...	...	...	...	...	...
8	655	655	631	610	596	588	587	586	...	...	...	...	...	...	...
9	655	655	631	610	596	588	587	586	...	...	...	...	...	...	...
10	655	655	631	610	596	588	587	586	...	...	...	...	...	...	...
11	655	655	631	610	596	588	587	586	...	...	...	...	...	...	...
12	586	580	552	534	523	516	512	509	506	502	497	492	485	477	467
13	689	683	649	629	617	607	603	599	595	590	585	579	572	564	555
14	689	683	649	629	617	607	603	599	595	590	585	579	572	564	555
15	689	683	649	629	617	607	603	599	595	590	585	579	572	564	555
16	689	683	649	629	617	607	603	599	595	590	585	579	572	564	555
17	689	683	649	629	617	607	603	599	595	590	585	579	572	564	555
18	689	683	649	629	617	607	603	599	595	590	585	579	572	564	555
19	689	683	649	629	617	607	603	599	595	590	585	579	572	564	555
20	689	683	649	629	617	607	603	599	595	590	585	579	572	564	555
21	689	683	649	629	617	607	603	599	595	590	585	579	572	564	555
22	689	683	649	629	617	607	603	599	595	590	585	579	572	564	555
23	689	683	649	629	617	607	603	599	595	590	585	579	572	564	555
24	689	683	649	629	617	607	603	599	595	590	585	579	572	564	555
25	689	683	649	629	617	607	603	599	595	590	585	579	572	564	555
26	689	683	649	629	617	607	603	599	595	590	585	579	572	564	555
27	689	683	649	629	617	607	603	599	595	590	585	579	572	564	555
28	689	683	649	629	617	607	603	599	595	590	585	579	572	564	555
29	793	784	747	724	709	698	693	689	684	678	673	665	657	649	638
30	931	920	876	850	832	820	814	809	803	797	789	781	772	761	749
31	600	575	542	525	516	509	505	501	496	491	485	479	...	...	...
32	600	575	542	525	516	509	505	501	496	491	485	479	...	...	...
33	600	575	542	525	516	509	505	501	496	491	485	479	...	...	...
34	689	661	624	605	595	588	584	579	574	...	...	...	...	...	...
35	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
36	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
37	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
38	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
39	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
40	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
41	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
42	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
43	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
44	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
45	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	540	530	518	505	489	...	...	...	...	...	...	...	...	...	...
14	540	530	518	505	489	...	...	...	...	...	...	...	...	...	...
15	540	530	518	505	489	...	...	...	...	...	...	...	...	...	...
16	540	530	518	505	489	...	...	...	...	...	...	...	...	...	...
17	540	530	518	505	489	...	...	...	...	...	...	...	...	...	...
18	540	530	518	505	489	...	...	...	...	...	...	...	...	...	...
19	540	530	518	505	489	...	...	...	...	...	...	...	...	...	...
20	540	530	518	505	489	...	...	...	...	...	...	...	...	...	...
21	540	530	518	505	489	...	...	...	...	...	...	...	...	...	...
22	540	530	518	505	489	...	...	...	...	...	...	...	...	...	...
23	540	530	528	505	489	...	...	...	...	...	...	...	...	...	...
24	540	530	518	505	489	...	...	...	...	...	...	...	...	...	...
25	540	530	518	505	489	...	...	...	...	...	...	...	...	...	...
26	540	530	518	505	489	...	...	...	...	...	...	...	...	...	...
27	540	530	518	505	489	...	...	...	...	...	...	...	...	...	...
28	540	530	518	505	489	...	...	...	...	...	...	...	...	...	...
29	622	610	597	581	564	...	...	...	...	...	...	...	...	...	...
30	727	714	698	680	659	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	390	372	354	334	313	292	270	248	226	204	182	160	...	...	...
37	390	372	354	334	313	292	270	248	226	204	182	160	...	...	...
38	390	372	354	334	313	292	270	248	226	204	182	160	...	...	...
39	390	372	354	334	313	292	270	248	226	204	182	160	...	...	...
40	390	372	354	334	313	292	270	248	226	204	182	160	...	...	...
41	390	372	354	334	313	292	270	248	226	204	182	160	...	...	...
42	390	372	354	334	313	292	270	248	226	204	182	160	...	...	...
43	390	372	354	334	313	292	270	248	226	204	182	160	...	...	...
44	390	372	354	334	313	292	270	248	226	204	182	160	...	...	...
45	390	372	354	334	313	292	270	248	226	204	182	160	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	23Cr–12Ni	Smls. tube	SA–213	TP309H	S30909	...	...	515
2	23Cr–12Ni	Plate	SA–240	309H	S30909	...	...	515
3	23Cr–12Ni	Wld. tube	SA–249	TP309H	S30909	...	...	515
4	23Cr–12Ni	Smls. & wld. pipe	SA–312	TP309H	S30909	...	...	515
5	23Cr–12Ni	Bar	SA–479	309H	S30909	...	...	515
6	23Cr–12Ni	Bar	SA/JIS G4303	SUS309S	...	...	...	520
7	23Cr–12Ni–Cb	Smls. tube	SA–213	TP309Cb	S30940	...	...	515
8	23Cr–12Ni–Cb	Plate	SA–240	309Cb	S30940	...	...	515
9	23Cr–12Ni–Cb	Wld. tube	SA–249	TP309Cb	S30940	...	...	515
10	23Cr–12Ni–Cb	Smls. & wld. pipe	SA–312	TP309Cb	S30940	...	...	515
11	23Cr–12Ni–Cb	Bar	SA–479	309Cb	S30940	...	...	515
12	23Cr–12Ni–Cb	Wld. pipe	SA–813	TP309Cb	S30940	...	...	515
13	23Cr–12Ni–Cb	Wld. pipe	SA–814	TP309Cb	S30940	...	...	515
14	23Cr–25Ni–5.5Mo–N	Forgings	SA–182	...	S32053	...	...	640
15	23Cr–25Ni–5.5Mo–N	Bolting	SA–193	...	S32053	...	...	640
16	23Cr–25Ni–5.5Mo–N	Plate	SA–240	...	S32053	...	...	640
17	23Cr–25Ni–5.5Mo–N	Wld. tube	SA–249	...	S32053	...	...	640
18	23Cr–25Ni–5.5Mo–N	Smls. & wld. pipe	SA–312	...	S32053	...	...	640
19	23Cr–25Ni–5.5Mo–N	Wld. pipe	SA–358	...	S32053	...	...	640
20	23Cr–25Ni–5.5Mo–N	Fittings	SA–403	...	S32053	...	...	640
21	23Cr–25Ni–5.5Mo–N	Wld. pipe	SA–409	...	S32053	...	...	640
22	23Cr–25Ni–5.5Mo–N	Bar	SA–479	...	S32053	...	...	640
23	23Cr–25Ni–5.5Mo–N	Wld. pipe	SA–813	...	S32053	...	...	640
24	23Cr–25Ni–5.5Mo–N	Wld. pipe	SA–814	...	S32053	...	...	640
25	24Cr–10Ni–4Mo–N	Castings	SA–995	2A	J93345	...	...	655
26	24Cr–22Ni–6Mo–2W–Cu–N	Forgings	SA–182	F58	S31266	...	...	750
27	24Cr–22Ni–6Mo–2W–Cu–N	Smls. tube	SA–213	...	S31266	...	...	750
28	24Cr–22Ni–6Mo–2W–Cu–N	Plate	SA–240	...	S31266	...	...	750
29	24Cr–22Ni–6Mo–2W–Cu–N	Wld. tube	SA–249	...	S31266	...	...	750
30	24Cr–22Ni–6Mo–2W–Cu–N	Smls. & wld. pipe	SA–312	...	S31266	...	...	750
31	24Cr–22Ni–6Mo–2W–Cu–N	Wld. pipe	SA–358	...	S31266	...	...	750
32	24Cr–22Ni–6Mo–2W–Cu–N	Smls. & wld. fittings	SA–403	...	S31266	...	...	750
33	24Cr–22Ni–6Mo–2W–Cu–N	Bar, shapes	SA–479	...	S31266	...	...	750
34	24Cr–22Ni–6Mo–2W–Cu–N	Wld. pipe	SA–813	...	S31266	...	...	750
35	25Cr–4Ni–4Mo–Ti	Plate	SA–240	...	S44635	...	...	620
36	25Cr–4Ni–4Mo–Ti	Wld. tube	SA–268	...	S44635	...	...	620
37	25Cr–5Ni–3Mo–2Cu	Castings	SA–995	1B	J93372	...	...	690
38	25Cr–5Ni–3Mo–2Cu	Plate	SA–240	...	S32550	...	...	760
39	25Cr–5Ni–3Mo–2Cu	Bar	SA–479	...	S32550	...	...	760
40	25Cr–5Ni–3Mo–2Cu	Smls. & wld. tube	SA–789	...	S32550	...	...	760
41	25Cr–5Ni–3Mo–2Cu	Smls. & wld. pipe	SA–790	...	S32550	...	...	760
42	25Cr–6Ni–Mo–N	Forgings	SA–182	...	S32506	...	...	620
43	25Cr–6Ni–Mo–N	Plate, sheet	SA–240	...	S32506	...	...	620
44	25Cr–6Ni–Mo–N	Bar	SA–479	...	S32506	...	...	620
45	25Cr–6Ni–Mo–N	Smls. tube	SA–789	...	S32506	...	...	620

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
2	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
3	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
4	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
5	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
6	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
7	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
8	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
9	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
10	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
11	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
12	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
13	517	517	515	504	495	487	482	476	470	463	454	444	434	422	408
14	640	638	605	579	558	542	536	531	...	...	...	...	...	...	...
15	640	638	605	579	558	542	536	531	...	...	...	...	...	...	...
16	640	638	605	579	558	542	536	531	...	...	...	...	...	...	...
17	640	638	605	579	558	542	536	531	...	...	...	...	...	...	...
18	640	638	605	579	558	542	536	531	...	...	...	...	...	...	...
19	640	638	605	579	558	542	536	531	...	...	...	...	...	...	...
20	640	638	605	579	558	542	536	531	...	...	...	...	...	...	...
21	640	638	605	579	558	542	536	531	...	...	...	...	...	...	...
22	640	638	605	579	558	542	536	531	...	...	...	...	...	...	...
23	640	638	605	579	558	542	536	531	...	...	...	...	...	...	...
24	640	638	605	579	558	542	536	531	...	...	...	...	...	...	...
25	655	652	604	583	583	583	583	580	557	...	...	...	...	...	...
26	752	736	697	670	651	638	633	628	624	619	614	607	...	...	...
27	752	736	697	670	651	638	633	628	624	619	614	607	...	...	...
28	752	736	697	670	651	638	633	628	624	619	614	607	...	...	...
29	752	736	697	670	651	638	633	628	624	619	614	607	...	...	...
30	752	736	697	670	651	638	633	628	624	619	614	607	...	...	...
31	752	736	697	670	651	638	633	628	624	619	614	607	...	...	...
32	752	736	697	670	651	638	633	628	624	619	614	607	...	...	...
33	752	736	697	670	651	638	633	628	624	619	614	607	...	...	...
34	752	736	697	670	651	638	633	628	624	619	614	607	...	...	...
35	621	597	565	545	532	528	525	521	...	...	...	...	...	...	...
36	621	597	565	545	532	528	525	521	...	...	...	...	...	...	...
37	689	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	758	752	712	691	682	...	...	...	...	...	...	...	...	...	...
39	758	752	712	691	682	...	...	...	...	...	...	...	...	...	...
40	758	752	712	691	682	...	...	...	...	...	...	...	...	...	...
41	758	752	712	691	682	...	...	...	...	...	...	...	...	...	...
42	620	614	588	581	581	581	581	...	...	...	...	...	...	...	...
43	620	614	588	581	581	581	581	...	...	...	...	...	...	...	...
44	620	614	588	581	581	581	581	...	...	...	...	...	...	...	...
45	620	614	588	581	581	581	581	...	...	...	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	25Cr–6Ni–Mo–N	Wld. tube	SA–789	...	S32506	...	...	620
2	25Cr–6Ni–Mo–N	Smls. pipe	SA–790	...	S32506	...	...	620
3	25Cr–6Ni–Mo–N	Wld. pipe	SA–790	...	S32506	...	...	620
4	25Cr–6Ni–Mo–N	Plate	SA–240	...	S31200	...	...	690
5	25Cr–6.5Ni–3Mo–N	Smls. & wld. tube	SA–789	...	S31260	...	...	690
6	25Cr–6.5Ni–3Mo–N	Smls. & wld. pipe	SA–790	...	S31260	...	...	690
7	25Cr–6.5Ni–3Mo–N	Plate	SA–240	...	S31260	...	...	690
8	25Cr–7Ni–3Mo–W–Cu–N	Forgings	SA–182	F54	S39274	...	...	800
9	25Cr–7Ni–3Mo–W–Cu–N	Smls. & wld. tube	SA–789	...	S39274	...	...	800
10	25Cr–7Ni–3Mo–W–Cu–N	Smls. & wld. pipe	SA–790	...	S39274	...	...	800
11	25Cr–7Ni–4Mo–N	Forgings	SA–182	F53	S32750	...	...	800
12	25Cr–7Ni–4Mo–N	Plate	SA–240	...	S32750	...	...	800
13	25Cr–7Ni–4Mo–N	Smls. & wld. tube	SA–789	...	S32750	...	...	800
14	25Cr–7Ni–4Mo–N	Smls. & wld. pipe	SA–790	...	S32750	...	...	800
15	25Cr–7.5Ni–3.5Mo–N–Cu–W	Castings	SA–995	CD3MWCuN	J93380	...	...	690
16	25Cr–7.5Ni–3.5Mo–N–Cu–W	Forgings	SA–182	F55	S32760	...	...	750
17	25Cr–7.5Ni–3.5Mo–N–Cu–W	Plate	SA–240	...	S32760	...	...	750
18	25Cr–7.5Ni–3.5Mo–N–Cu–W	Bar	SA–479	...	S32760	Annealed	...	750
19	25Cr–7.5Ni–3.5Mo–N–Cu–W	Smls. & wld. tube	SA–789	...	S32760	...	...	750
20	25Cr–7.5Ni–3.5Mo–N–Cu–W	Smls. & wld. pipe	SA–790	...	S32760	...	...	750
21	25Cr–7.5Ni–3.5Mo–N–Cu–W	Smls. & wld. ftgs.	SA–815	...	S32760	...	...	750
22	25Cr–12Ni	Castings	SA–351	CH8	J93400	...	...	450
23	25Cr–12Ni	Cast pipe	SA–451	CPH8	J93400	...	...	450
24	25Cr–12Ni	Castings	SA–351	CH20	J93402	...	...	485
25	25Cr–12Ni	Cast pipe	SA–451	CPH20	J93402	...	...	485
26	25Cr–20Ni	Castings	SA–351	CK20	J94202	...	...	450
27	25Cr–20Ni	Cast pipe	SA–451	CPK20	J94202	...	...	450
28	25Cr–20Ni	Forgings	SA–182	F310	S31000	...	≤130	515
29	25Cr–20Ni	Forgings	SA–965	F310	S31000	...	...	515
(**23**) 30	25Cr–20Ni	Smls. tube	SA–213	...	S31002	...	...	500
(**23**) 31	25Cr–20Ni	Smls. pipe	SA–312	...	S31002	...	...	500
32	25Cr–20Ni	Smls. tube	SA–213	TP310S	S31008	...	...	515
33	25Cr–20Ni	Plate	SA–240	310S	S31008	...	...	515
34	25Cr–20Ni	Wld. tube	SA–249	TP310S	S31008	...	...	515
35	25Cr–20Ni	Smls. & wld. pipe	SA–312	TP310S	S31008	...	...	515
36	25Cr–20Ni	Wld. pipe	SA–358	310S	S31008	1	...	515
37	25Cr–20Ni	Wld. pipe	SA–358	310S	S31008	3	...	515
38	25Cr–20Ni	Wld. pipe	SA–358	310S	S31008	4	...	515
39	25Cr–20Ni	Smls. & wld. ftgs.	SA–403	310S	S31008	...	...	515
40	25Cr–20Ni	Bar	SA–479	310S	S31008	...	...	515
41	25Cr–20Ni	Wld. pipe	SA–813	TP310S	S31008	...	...	515
42	25Cr–20Ni	Wld. pipe	SA–814	TP310S	S31008	...	...	515
43	25Cr–20Ni	Smls. tube	SA–213	TP310H	S31009	...	...	515
44	25Cr–20Ni	Plate	SA–240	310H	S31009	...	...	515
45	25Cr–20Ni	Wld. tube	SA–249	TP310H	S31009	...	...	515

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Ferrous Materials (Cont'd)
1	620	614	588	581	581	581	581	...	...	...	...	...	...	...	...
2	620	614	588	581	581	581	581	...	...	...	...	...	...	...	...
3	620	614	588	581	581	581	581	...	...	...	...	...	...	...	...
4	689	687	653	635	631	631	631	...	...	...	...	...	...	...	...
5	689	687	654	638	636	636	636	636	...	...	...	...	...	...	...
6	689	687	654	638	636	636	636	636	...	...	...	...	...	...	...
7	689	687	654	638	636	636	636	636	...	...	...	...	...	...	...
8	800	796	762	756	756	756	756	756	756	756	...	...	...	...	...
9	800	796	762	756	756	756	756	756	756	756	...	...	...	...	...
10	800	796	762	756	756	756	756	756	756	756	...	...	...	...	...
11	800	792	752	729	715	711	709	...	...	...	...	...	...	...	...
12	800	792	752	729	715	711	709	...	...	...	...	...	...	...	...
13	800	792	752	729	715	711	709	...	...	...	...	...	...	...	...
14	800	792	752	729	715	711	709	...	...	...	...	...	...	...	...
15	690	680	649	642	642	642	642	...	...	...	...	...	...	...	...
16	750	698	647	638	638	638	638	...	...	...	...	...	...	...	...
17	750	698	647	638	638	638	638	...	...	...	...	...	...	...	...
18	750	698	647	638	638	638	638	...	...	...	...	...	...	...	...
19	750	698	647	638	638	638	638	...	...	...	...	...	...	...	...
20	750	698	647	638	638	638	638	...	...	...	...	...	...	...	...
21	750	698	647	638	638	638	638	...	...	...	...	...	...	...	...
22	448	406	382	372	371	371	371	370	367	362	356	348	338	325	310
23	448	406	382	372	371	371	371	370	367	362	356	348	338	325	310
24	483	437	411	401	399	399	399	398	395	391	384	375	364	350	334
25	483	437	411	401	399	399	399	398	395	391	384	375	364	350	334
26	448	406	382	372	371	371	371	370	367	362	356	348	338	325	310
27	448	406	382	372	371	371	371	370	367	362	356	348	338	325	310
28	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
29	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
30	503	503	489	468	454	444	441	436	432	426	421	417	414	414	...
31	503	503	489	468	454	444	441	436	432	426	421	417	414	414	...
32	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
33	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
34	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
35	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
36	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
37	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
38	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
39	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
40	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
41	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
42	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
43	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
44	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
45	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Ferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
32	410	393	373	352	328	303	277	250	223	195	169	144	...	...	...	
33	410	393	373	352	328	303	277	250	223	195	169	144	...	...	...	
34	410	393	373	352	328	303	277	250	223	195	169	144	...	...	...	
35	410	393	373	352	328	303	277	250	223	195	169	144	...	...	...	
36	410	393	373	352	328	303	277	250	223	195	169	144	...	...	...	
37	410	393	373	352	328	303	277	250	223	195	169	144	...	...	...	
38	410	393	373	352	328	303	277	250	223	195	169	144	...	...	...	
39	410	393	373	352	328	303	277	250	223	195	169	144	...	...	...	
40	410	393	373	352	328	303	277	250	223	195	169	144	...	...	...	
41	410	393	373	352	328	303	277	250	223	195	169	144	...	...	...	
42	410	393	373	352	328	303	277	250	223	195	169	144	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Ferrous Materials (Cont'd)							
1	25Cr–20Ni	Smls. & wld. pipe	SA–312	TP310H	S31009	...	...	515
2	25Cr–20Ni	Bar	SA–479	310H	S31009	...	...	515
3	25Cr–20Ni	Bar	SA/JIS G4303	SUS310S	...	...	...	520
4	25Cr–20Ni–Cb	Smls. tube	SA–213	TP310Cb	S31040	...	...	515
5	25Cr–20Ni–Cb	Plate	SA–240	310Cb	S31040	...	...	515
6	25Cr–20Ni–Cb	Wld. tube	SA–249	TP310Cb	S31040	...	...	515
7	25Cr–20Ni–Cb	Smls. & wld. pipe	SA–312	TP310Cb	S31040	...	...	515
8	25Cr–20Ni–Cb	Bar	SA–479	310Cb	S31040	...	...	515
9	25Cr–20Ni–Cb	Wld. pipe	SA–813	TP310Cb	S31040	...	...	515
10	25Cr–20Ni–Cb	Wld. pipe	SA–814	TP310Cb	S31040	...	...	515
11	25Cr–20Ni–Cb–N	Smls. tube	SA–213	TP310HCbN	S31042	...	...	655
12	25Cr–22Ni–2Mo–N	Forgings	SA–182	F310MoLN	S31050	...	...	540
13	25Cr–22Ni–2Mo–N	Smls. tube	SA–213	TP310MoLN	S31050	...	$6 < t \le 32$	540
14	25Cr–22Ni–2Mo–N	Plate	SA–240	310MoLN	S31050	...	$t > 6$	540
15	25Cr–22Ni–2Mo–N	Wld. tube	SA–249	TP310MoLN	S31050	...	$6 < t \le 32$	540
16	25Cr–22Ni–2Mo–N	Wld. pipe	SA–312	TP310MoLN	S31050	...	$6 < t \le 32$	540
17	25Cr–22Ni–2Mo–N	Smls. tube	SA–213	TP310MoLN	S31050	...	≤6	580
18	25Cr–22Ni–2Mo–N	Plate	SA–240	310MoLN	S31050	...	$t \le 6$	580
19	25Cr–22Ni–2Mo–N	Wld. tube	SA–249	TP310MoLN	S31050	...	≤6	580
20	25Cr–22Ni–2Mo–N	Wld. pipe	SA–312	TP310MoLN	S31050	...	≤6	580
21	26Cr–4Ni–Mo	Plate	SA–240	329	S32900	...	...	620
22	26Cr–4Ni–Mo	Smls. & wld. tube	SA–789	...	S32900	...	...	620
23	26Cr–4Ni–Mo	Smls. & wld. pipe	SA–790	...	S32900	...	...	620
24	26Cr–4Ni–Mo–N	Plate	SA–240	...	S32950	...	...	690
25	26Cr–4Ni–Mo–N	Smls. & wld. tube	SA–789	...	S32950	...	...	690
26	26Cr–4Ni–Mo–N	Smls. & wld. pipe	SA–790	...	S32950	...	...	690
(**23**) 27	27Cr–7.5Ni–4.5Mo–Co–N	Smls. tube	SA–789	...	S32707	...	...	920
(**23**) 28	27Cr–7.5Ni–4.5Mo–Co–N	Smls. pipe	SA–790	...	S32707	...	...	920
29	29Cr–6.5Ni–2Mo–N	Plate, sheet, strip	SA–240	...	S32906	...	≥10	750
30	29Cr–6.5Ni–2Mo–N	Bar	SA–479	...	S32906	...	...	750
31	29Cr–6.5Ni–2Mo–N	Smls. tube	SA–789	...	S32906	...	≥10	750
32	29Cr–6.5Ni–2Mo–N	Smls. pipe	SA–790	...	S32906	...	≥10	750
33	29Cr–6.5Ni–2Mo–N	Plate, sheet, strip	SA–240	...	S32906	...	<10	800
34	29Cr–6.5Ni–2Mo–N	Smls. tube	SA–789	...	S32906	...	<10	800
35	29Cr–6.5Ni–2Mo–N	Smls. pipe	SA–790	...	S32906	...	<10	800

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
													Ferrous Materials (Cont'd)		
1	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
2	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
3	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
4	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
5	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
6	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
7	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
8	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
9	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
10	517	509	488	480	479	479	479	479	477	474	469	463	454	444	432
11	655	643	613	594	584	579	577	576	574	572	570	568	561	555	547
12	538	528	502	485	472	462	458	454	450	447	444	439	435	428	418
13	538	528	502	485	472	462	458	454	450	447	444	439	435	428	418
14	538	528	502	485	472	462	458	454	450	447	444	439	435	428	418
15	538	528	502	485	472	462	458	454	450	447	444	439	435	428	418
16	538	528	502	485	472	462	458	454	450	447	444	439	435	428	418
17	579	569	541	522	508	497	493	488	485	482	478	473	468	460	450
18	579	569	541	522	508	497	493	488	485	482	478	473	468	460	450
19	579	569	541	522	508	497	493	488	485	482	478	473	468	460	450
20	579	569	541	522	508	497	493	488	485	482	478	473	468	460	450
21	621	620	597	586	585	585	585	585	585	...	...	...	...	...	...
22	621	620	597	586	585	585	585	585	585	...	...	...	...	...	...
23	621	620	597	586	585	585	585	585	585	...	...	...	...	...	...
24	689	685	652	638	638	638	638	638	638	...	...	...	...	...	...
25	689	685	652	638	638	638	638	638	638	...	...	...	...	...	...
26	689	685	652	638	638	638	638	638	638	...	...	...	...	...	...
27	917	917	910	893	859	851	...	...	...	...	...	...	...	...	...
28	917	917	910	893	859	851	...	...	...	...	...	...	...	...	...
29	752	746	714	694	684	683	683	...	...	...	...	...	...	...	...
30	752	746	714	694	684	683	683	...	...	...	...	...	...	...	...
31	752	746	714	694	684	683	683	...	...	...	...	...	...	...	...
32	752	746	714	694	684	683	683	...	...	...	...	...	...	...	...
33	800	794	760	739	728	726	726	...	...	...	...	...	...	...	...
34	800	794	760	739	728	726	726	...	...	...	...	...	...	...	...
35	800	794	760	739	728	726	726	...	...	...	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Ferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Nonferrous Materials							
1	...	Plate, sheet	SB–209	...	Alclad 3003	O	0.15–12.67	90.0
2	...	Plate, sheet	SB–209	...	Alclad 3003	O	12.70–76.20	95.0
3	...	Plate, sheet	SB–209	...	Alclad 3003	H112	6.35–12.67	110
4	...	Plate, sheet	SB–209	...	Alclad 3003	H112	12.70–50.80	105
5	...	Plate, sheet	SB–209	...	Alclad 3003	H112	50.83–76.20	100
6	...	Plate, sheet	SB–209	...	Alclad 3003	H12	0.43–12.67	110
7	...	Plate, sheet	SB–209	...	Alclad 3003	H12	12.70–50.80	115
8	...	Plate, sheet	SB–209	...	Alclad 3003	H14	0.23–12.67	130
9	...	Plate, sheet	SB–209	...	Alclad 3003	H14	12.70–25.40	140
10	...	Drawn smls. tube	SB–210	...	Alclad 3003	O	0.25–12.70	90.0
11	...	Drawn smls. tube	SB–210	...	Alclad 3003	H113	1.27–12.70	90.0
12	...	Drawn smls. tube	SB–210	...	Alclad 3003	H14	0.25–12.70	130
13	...	Drawn smls. tube	SB–210	...	Alclad 3003	H18	0.25–12.70	180
14	...	Cond. & heat exch. tubes	SB–234	...	Alclad 3003	H14	0.25–5.08	130
15	...	Cond. & heat exch. tubes	SB–234	...	Alclad 3003	H25	0.25–5.08	145
16	...	Smls. extr. tube	SB–241	...	Alclad 3003	O	...	90.0
17	...	Smls. extr. tube	SB–241	...	Alclad 3003	H112	...	90.0
18	...	Plate, sheet	SB–209	...	Alclad 3004	O	0.15–12.67	145
19	...	Plate, sheet	SB–209	...	Alclad 3004	O	12.70–76.20	150
20	...	Plate, sheet	SB–209	...	Alclad 3004	H112	6.35–12.67	150
21	...	Plate, sheet	SB–209	...	Alclad 3004	H112	12.70–76.20	160
22	...	Plate, sheet	SB–209	...	Alclad 3004	H32	0.43–12.67	185
23	...	Plate, sheet	SB–209	...	Alclad 3004	H32	12.70–50.80	195
24	...	Plate, sheet	SB–209	...	Alclad 3004	H34	0.23–12.67	215
25	...	Plate, sheet	SB–209	...	Alclad 3004	H34	12.70–25.40	220
26	...	Plate, sheet	SB–209	...	Alclad 6061	T4	0.25–6.34	185
27	...	Plate, sheet	SB–209	...	Alclad 6061	T451	6.35–12.69	185
28	...	Plate, sheet	SB–209	...	Alclad 6061	T451	12.70–76.20	205
29	...	Plate, sheet	SB–209	...	Alclad 6061	T4 wld.	0.25–6.34	165
30	...	Plate, sheet	SB–209	...	Alclad 6061	T451 wld.	6.35–76.20	165
31	...	Plate, sheet	SB–209	...	Alclad 6061	T6	0.25–6.34	260
32	...	Plate, sheet	SB–209	...	Alclad 6061	T651	6.35–12.69	260
33	...	Plate, sheet	SB–209	...	Alclad 6061	T651	12.70–101.60	290
34	...	Plate, sheet	SB–209	...	Alclad 6061	T651	101.61–127.00	275
35	...	Plate, sheet	SB–209	...	Alclad 6061	T6 wld.	0.25–6.34	165
36	...	Plate, sheet	SB–209	...	Alclad 6061	T651 wld.	6.35–127.00	165
37	...	Castings	SB/EN 1706	...	AC–42000–S	T6	...	220
38	...	Plate, sheet	SB–209	...	A91060	O	0.15–76.2	55.0
39	...	Plate, sheet	SB–209	...	A91060	H112	6.35–12.7	75.0
40	...	Plate, sheet	SB–209	...	A91060	H112	12.7–25.4	70.0
41	...	Plate, sheet	SB–209	...	A91060	H112	25.4–76.2	60.0
42	...	Plate, sheet	SB–209	...	A91060	H12	0.43–50.8	75.0
43	...	Plate, sheet	SB–209	...	A91060	H14	0.23–25.4	85.0
44	...	Drawn smls. tube	SB–210	...	A91060	O	0.46–12.7	60.0
45	...	Drawn smls. tube	SB–210	...	A91060	H14	0.46–12.7	85.0

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials
1	89.6	80.9	66.7	52.7	...	...	...	...	...	...	...	...	...	...	...
2	96.5	87.1	71.9	56.7	...	...	...	...	...	...	...	...	...	...	...
3	110	98.5	82.5	61.8	...	...	...	...	...	...	...	...	...	...	...
4	103	93.8	79.4	63.9	...	...	...	...	...	...	...	...	...	...	...
5	100	90.7	76.8	61.8	...	...	...	...	...	...	...	...	...	...	...
6	110	107	92.9	76.1	...	...	...	...	...	...	...	...	...	...	...
7	117	114	98.7	80.9	...	...	...	...	...	...	...	...	...	...	...
8	131	131	115	92.6	...	...	...	...	...	...	...	...	...	...	...
9	138	138	121	97.5	...	...	...	...	...	...	...	...	...	...	...
10	89.6	81.4	67.9	54.8	...	...	...	...	...	...	...	...	...	...	...
11	89.6	81.4	67.9	54.8	...	...	...	...	...	...	...	...	...	...	...
12	131	131	115	92.6	...	...	...	...	...	...	...	...	...	...	...
13	179	170	138	70.3	...	...	...	...	...	...	...	...	...	...	...
14	131	131	115	92.6	...	...	...	...	...	...	...	...	...	...	...
15	145	145	127	99.2	...	...	...	...	...	...	...	...	...	...	...
16	89.6	81.4	67.9	54.8	...	...	...	...	...	...	...	...	...	...	...
17	89.6	81.4	67.9	54.8	...	...	...	...	...	...	...	...	...	...	...
18	145	145	132	84.4	...	...	...	...	...	...	...	...	...	...	...
19	152	152	138	88.5	...	...	...	...	...	...	...	...	...	...	...
20	152	152	138	88.5	...	...	...	...	...	...	...	...	...	...	...
21	159	159	129	70.6	...	...	...	...	...	...	...	...	...	...	...
22	186	186	178	144	...	...	...	...	...	...	...	...	...	...	...
23	193	193	185	149	...	...	...	...	...	...	...	...	...	...	...
24	214	214	197	145	...	...	...	...	...	...	...	...	...	...	...
25	221	221	203	150	...	...	...	...	...	...	...	...	...	...	...
26	186	186	178	126	...	...	...	...	...	...	...	...	...	...	...
27	186	186	178	126	...	...	...	...	...	...	...	...	...	...	...
28	207	207	196	135	...	...	...	...	...	...	...	...	...	...	...
29	165	165	157	108	...	...	...	...	...	...	...	...	...	...	...
30	165	165	157	108	...	...	...	...	...	...	...	...	...	...	...
31	262	262	216	126	...	...	...	...	...	...	...	...	...	...	...
32	262	262	216	126	...	...	...	...	...	...	...	...	...	...	...
33	290	290	239	140	...	...	...	...	...	...	...	...	...	...	...
34	276	276	228	132	...	...	...	...	...	...	...	...	...	...	...
35	165	165	159	112	...	...	...	...	...	...	...	...	...	...	...
36	165	165	159	112	...	...	...	...	...	...	...	...	...	...	...
37	221	220	197	...	...	...	...	...	...	...	...	...	...	...	...
38	55.2	45.8	36.4	28.2	...	...	...	...	...	...	...	...	...	...	...
39	75.8	63.6	50.6	40.2	...	...	...	...	...	...	...	...	...	...	...
40	68.9	57.5	45.8	36.4	...	...	...	...	...	...	...	...	...	...	...
41	62.1	51.7	41.2	32.7	...	...	...	...	...	...	...	...	...	...	...
42	75.8	69.5	56.5	43.4	...	...	...	...	...	...	...	...	...	...	...
43	82.7	82.7	79.9	71.0	...	...	...	...	...	...	...	...	...	...	...
44	58.6	48.6	38.7	30.0	...	...	...	...	...	...	...	...	...	...	...
45	82.7	82.7	79.9	71.0	...	...	...	...	...	...	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Nonferrous Materials (Cont'd)							
1	...	Drawn smls. tube	SB–210	...	A91060	H113	0.46–12.7	60.0
2	...	Bar, rod, shapes	SB–221	...	A91060	O	...	60.0
3	...	Bar, rod, shapes	SB–221	...	A91060	H112	...	60.0
4	...	Cond. & heat exch. tubes	SB–234	...	A91060	H14	0.25–5.08	85.0
5	...	Smls. extr. tube	SB–241	...	A91060	O	...	60.0
6	...	Smls. extr. tube	SB–241	...	A91060	H112	...	60.0
7	...	Plate, sheet	SB–209	...	A91100	O	0.15–76.2	75.0
8	...	Plate, sheet	SB–209	...	A91100	H112	6.35–12.7	90.0
9	...	Plate, sheet	SB–209	...	A91100	H112	12.7–50.8	85.0
10	...	Plate, sheet	SB–209	...	A91100	H112	50.8–76.2	80.0
11	...	Plate, sheet	SB–209	...	A91100	H12	0.43–50.8	95.0
12	...	Plate, sheet	SB–209	...	A91100	H14	0.23–25.4	110
13	...	Bar, rod, shapes	SB–221	...	A91100	O	...	75.0
14	...	Bar, rod, shapes	SB–221	...	A91100	H112	...	75.0
15	...	Smls. extr. tube	SB–241	...	A91100	O	...	75.0
16	...	Smls. extr. tube	SB–241	...	A91100	H112	...	75.0
17	...	Plate, sheet	SB–209	...	A93003	O	0.15–76.20	95.0
18	...	Plate, sheet	SB–209	...	A93003	H112	6.35–12.67	115
19	...	Plate, sheet	SB–209	...	A93003	H112	12.70–50.80	105
20	...	Plate, sheet	SB–209	...	A93003	H112	50.83–76.20	100
21	...	Plate, sheet	SB–209	...	A93003	H12	0.43–50.80	115
22	...	Plate, sheet	SB–209	...	A93003	H14	0.23–25.40	140
23	...	Drawn smls. tube	SB–210	...	A93003	O	0.25–12.70	95.0
24	...	Drawn smls. tube	SB–210	...	A93003	H113	0.25–12.70	95.0
25	...	Drawn smls. tube	SB–210	...	A93003	H12	0.25–12.70	115
26	...	Drawn smls. tube	SB–210	...	A93003	H14	0.25–12.70	140
27	...	Drawn smls. tube	SB–210	...	A93003	H18	0.25–12.70	185
28	...	Bar, rod, shapes	SB–221	...	A93003	O	...	95.0
29	...	Bar, rod, shapes	SB–221	...	A93003	H112	...	95.0
30	...	Cond. & heat exch. tubes	SB–234	...	A93003	H14	0.25–5.08	140
31	...	Cond. & heat exch. tubes	SB–234	...	A93003	H25	0.25–5.08	150
32	...	Smls. extr. tube	SB–241	...	A93003	O	...	95.0
33	...	Smls. extr. tube	SB–241	...	A93003	H112	...	95.0
34	...	Smls. pipe	SB–241	...	A93003	H112	≥25.40	95.0
35	...	Smls. pipe	SB–241	...	A93003	H18	<25.40	185
36	...	Die forgings	SB–247	...	A93003	H112	≤101.60	95.0
37	...	Die forgings	SB–247	...	A93003	H112 wld.	≤101.60	95.0
38	...	Plate, sheet	SB–209	...	A93004	O	0.15–76.20	150
39	...	Plate, sheet	SB–209	...	A93004	H112	6.35–76.20	160
40	...	Plate, sheet	SB–209	...	A93004	H32	0.43–50.80	195
41	...	Plate, sheet	SB–209	...	A93004	H34	0.23–25.40	220
42	...	Plate, sheet	SB–209	...	A95052	O	0.15–76.20	170
43	...	Plate, sheet	SB–209	...	A95052	H112	6.35–12.69	195
44	...	Plate, sheet	SB–209	...	A95052	H112	12.70–76.20	170
45	...	Plate, sheet	SB–209	...	A95052	H32	0.43–50.80	215

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	58.6	48.6	38.7	30.0	...	...	...	...	...	...	...	...	...	...	...
2	58.6	48.6	38.7	30.0	...	...	...	...	...	...	...	...	...	...	...
3	58.6	48.6	38.7	30.0	...	...	...	...	...	...	...	...	...	...	...
4	82.7	82.7	79.9	71.0	...	...	...	...	...	...	...	...	...	...	...
5	58.6	48.6	38.7	30.0	...	...	...	...	...	...	...	...	...	...	...
6	58.6	48.6	38.7	30.0	...	...	...	...	...	...	...	...	...	...	...
7	75.8	68.6	55.1	38.4	...	...	...	...	...	...	...	...	...	...	...
8	89.6	81.4	65.7	49.6	...	...	...	...	...	...	...	...	...	...	...
9	82.7	75.2	60.5	44.2	...	...	...	...	...	...	...	...	...	...	...
10	79.3	72.0	58.1	43.7	...	...	...	...	...	...	...	...	...	...	...
11	96.5	93.6	79.0	61.6	...	...	...	...	...	...	...	...	...	...	...
12	110	108	90.4	69.5	...	...	...	...	...	...	...	...	...	...	...
13	75.8	68.6	55.1	38.4	...	...	...	...	...	...	...	...	...	...	...
14	75.8	68.6	55.1	38.4	...	...	...	...	...	...	...	...	...	...	...
15	75.8	68.6	55.1	38.4	...	...	...	...	...	...	...	...	...	...	...
16	75.8	68.6	55.1	38.4	...	...	...	...	...	...	...	...	...	...	...
17	96.5	87.7	73.1	59.1	...	...	...	...	...	...	...	...	...	...	...
18	117	105	87.6	65.7	...	...	...	...	...	...	...	...	...	...	...
19	103	93.8	79.4	63.9	...	...	...	...	...	...	...	...	...	...	...
20	100	91.0	77.1	62.5	...	...	...	...	...	...	...	...	...	...	...
21	117	114	98.7	80.9	...	...	...	...	...	...	...	...	...	...	...
22	138	138	121	97.5	...	...	...	...	...	...	...	...	...	...	...
23	96.5	87.7	73.1	59.1	...	...	...	...	...	...	...	...	...	...	...
24	96.5	87.7	73.1	59.1	...	...	...	...	...	...	...	...	...	...	...
25	117	114	98.7	80.9	...	...	...	...	...	...	...	...	...	...	...
26	138	138	121	97.5	...	...	...	...	...	...	...	...	...	...	...
27	186	176	144	73.0	...	...	...	...	...	...	...	...	...	...	...
28	96.5	87.7	73.1	59.1	...	...	...	...	...	...	...	...	...	...	...
29	96.5	87.7	73.1	59.1	...	...	...	...	...	...	...	...	...	...	...
30	138	138	121	97.5	...	...	...	...	...	...	...	...	...	...	...
31	152	152	133	104	...	...	...	...	...	...	...	...	...	...	...
32	96.5	87.7	73.1	59.1	...	...	...	...	...	...	...	...	...	...	...
33	96.5	87.7	73.1	59.1	...	...	...	...	...	...	...	...	...	...	...
34	96.5	87.7	73.1	59.1	...	...	...	...	...	...	...	...	...	...	...
35	186	176	144	73.0	...	...	...	...	...	...	...	...	...	...	...
36	96.5	87.7	73.1	59.1	...	...	...	...	...	...	...	...	...	...	...
37	96.5	87.7	73.1	59.1	...	...	...	...	...	...	...	...	...	...	...
38	152	152	138	88.5	...	...	...	...	...	...	...	...	...	...	...
39	159	159	129	70.6	...	...	...	...	...	...	...	...	...	...	...
40	193	193	185	149	...	...	...	...	...	...	...	...	...	...	...
41	221	221	203	150	...	...	...	...	...	...	...	...	...	...	...
42	172	172	164	121	...	...	...	...	...	...	...	...	...	...	...
43	193	193	182	134	...	...	...	...	...	...	...	...	...	...	...
44	172	172	164	121	...	...	...	...	...	...	...	...	...	...	...
45	214	214	206	178	...	...	...	...	...	...	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Nonferrous Materials (Cont'd)							
1	...	Plate, sheet	SB–209	...	A95052	H34	0.23–25.40	235
2	...	Drawn smls. tube	SB–210	...	A95052	O	0.25–11.43	170
3	...	Drawn smls. tube	SB–210	...	A95052	H32	0.25–11.43	215
4	...	Drawn smls. tube	SB–210	...	A95052	H34	0.25–11.43	235
5	...	Cond. & heat exch. tubes	SB–234	...	A95052	H32	0.25–5.08	215
6	...	Cond. & heat exch. tubes	SB–234	...	A95052	H34	0.25–5.08	235
7	...	Smls. extr. tube	SB–241	...	A95052	O	...	170
8	...	Plate, sheet	SB–209	...	A95083	O	1.30–38.10	275
9	...	Plate, sheet	SB–209	...	A95083	O	38.11–76.20	270
10	...	Plate, sheet	SB–209	...	A95083	O	76.21–127.00	260
11	...	Plate, sheet	SB–209	...	A95083	O	127.01–177.80	255
12	...	Plate, sheet	SB–209	...	A95083	O	177.81–203.20	250
13	...	Plate, sheet	SB–209	...	A95083	H112	6.35–38.10	275
14	...	Plate, sheet	SB–209	...	A95083	H112	38.11–76.20	270
15	...	Plate, sheet	SB–209	...	A95083	H32	$3.20 < t \le 40.00$	305
16	...	Plate, sheet	SB–209	...	A95083	H32	$40.00 < t \le 80.00$	285
17	...	Bar, rod, shapes	SB–221	...	A95083	O	≤127.00	270
18	...	Bar, rod, shapes	SB–221	...	A95083	H111	≤127.00	275
19	...	Bar, rod, shapes	SB–221	...	A95083	H112	≤127.00	270
20	...	Smls. extr. tube	SB–241	...	A95083	O	...	270
21	...	Smls. extr. tube	SB–241	...	A95083	H111	...	275
22	...	Smls. extr. tube	SB–241	...	A95083	H112	...	270
23	...	Die & hand forgings	SB–247	...	A95083	H111	≤101.60	270
24	...	Die & hand forgings	SB–247	...	A95083	H112	≤101.60	270
25	...	Die & hand forgings	SB–247	...	A95083	H111 wld.	≤101.60	260
26	...	Die & hand forgings	SB–247	...	A95083	H112 wld.	≤101.60	260
27	...	Plate, sheet	SB–928	...	A95083	H321	$3.20 < t \le 40.00$	305
28	...	Plate, sheet	SB–928	...	A95083	H321	$40.00 < t \le 80.00$	285
29	...	Plate, sheet	SB–209	...	A95086	O	0.51–50.80	240
30	...	Plate, sheet	SB–209	...	A95086	H112	4.78–12.69	250
31	...	Plate, sheet	SB–209	...	A95086	H112	12.70–50.80	240
32	...	Plate, sheet	SB–209	...	A95086	H112	50.81–76.20	235
33	...	Plate, sheet	SB–209	...	A95086	H32	0.51–50.80	275
34	...	Plate, sheet	SB–209	...	A95086	H34	0.23–25.40	305
35	...	Bar, rod, shapes	SB–221	...	A95086	H112	≤127.00	240
36	...	Smls. extr. tube	SB–241	...	A95086	O	...	240
37	...	Smls. extr. tube	SB–241	...	A95086	H111	...	250
38	...	Smls. extr. tube	SB–241	...	A95086	H112	...	240
39	...	Plate, sheet	SB–928	...	A95086	H116	$1.60 < t \le 50.00$	275
40	...	Plate, sheet	SB–209	...	A95154	O	0.51–76.2	205
41	...	Plate, sheet	SB–209	...	A95154	H112	6.35–12.7	220
42	...	Plate, sheet	SB–209	...	A95154	H112	12.7–76.2	205
43	...	Plate, sheet	SB–209	...	A95154	H32	0.51–50.8	250
44	...	Plate, sheet	SB–209	...	A95154	H34	0.23–25.4	270
45	...	Drawn smls. tube	SB–210	...	A95154	O	0.25–11.4	205

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	234	234	223	180	...	...	...	...	...	...	...	...	...	...	...
2	172	172	164	121	...	...	...	...	...	...	...	...	...	...	...
3	214	214	206	178	...	...	...	...	...	...	...	...	...	...	...
4	234	234	223	180	...	...	...	...	...	...	...	...	...	...	...
5	214	214	206	178	...	...	...	...	...	...	...	...	...	...	...
6	234	234	223	180	...	...	...	...	...	...	...	...	...	...	...
7	172	172	164	121	...	...	...	...	...	...	...	...	...	...	...
8	276	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	269	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	262	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	255	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	248	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	276	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	269	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	303	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	283	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	269	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	276	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	269	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	269	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	276	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	269	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	269	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	269	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	262	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	262	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	303	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	283	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	241	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	248	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	241	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	234	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	276	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	303	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	241	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	241	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	248	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	241	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	276	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	207	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	221	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	207	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	248	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	269	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	207	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Nonferrous Materials (Cont'd)							
1	...	Drawn smls. tube	SB–210	...	A95154	H34	0.25–11.4	270
2	...	Bar, rod, shapes	SB–221	...	A95154	O	...	205
3	...	Bar, rod, shapes	SB–221	...	A95154	H112	...	205
4	...	Plate, sheet	SB–209	...	A95254	O	1.30–76.2	205
5	...	Plate, sheet	SB–209	...	A95254	H112	6.35–12.7	220
6	...	Plate, sheet	SB–209	...	A95254	H112	12.7–76.2	205
7	...	Plate, sheet	SB–209	...	A95254	H32	1.30–50.8	250
8	...	Plate, sheet	SB–209	...	A95254	H34	1.30–25.4	270
9	...	Plate, sheet	SB–209	...	A95454	O	0.51–76.2	215
10	...	Plate, sheet	SB–209	...	A95454	H112	6.35–12.7	220
11	...	Plate, sheet	SB–209	...	A95454	H112	12.7–76.2	215
12	...	Plate, sheet	SB–209	...	A95454	H32	0.51–50.8	250
13	...	Plate, sheet	SB–209	...	A95454	H34	0.51–25.4	270
14	...	Bar, rod, shapes	SB–221	...	A95454	O	≤127	215
15	...	Bar, rod, shapes	SB–221	...	A95454	H111	≤127	230
16	...	Bar, rod, shapes	SB–221	...	A95454	H112	≤127	215
17	...	Cond. & heat exch. tubes	SB–234	...	A95454	H32	0.25–5.08	250
18	...	Cond. & heat exch. tubes	SB–234	...	A95454	H34	0.25–5.08	270
19	...	Smls. extr. tube	SB–241	...	A95454	O	...	215
20	...	Smls. extr. tube	SB–241	...	A95454	H111	...	230
21	...	Smls. extr. tube	SB–241	...	A95454	H112	...	215
22	...	Plate, sheet	SB–209	...	A95456	O	1.30–38.10	290
23	...	Plate, sheet	SB–209	...	A95456	O	38.13–76.20	285
24	...	Plate, sheet	SB–209	...	A95456	O	76.23–127.00	275
25	...	Plate, sheet	SB–209	...	A95456	O	127.03–177.80	270
26	...	Plate, sheet	SB–209	...	A95456	O	177.83–203.20	260
27	...	Plate, sheet	SB–209	...	A95456	H112	6.35–38.10	290
28	...	Plate, sheet	SB–209	...	A95456	H112	38.13–76.20	285
29	...	Plate, sheet	SB–209	...	A95456	H32	4.78–12.69	315
30	...	Plate, sheet	SB–209	...	A95456	H32	12.70–38.10	305
31	...	Plate, sheet	SB–209	...	A95456	H32	38.11–76.20	285
32	...	Bar, rod, shapes	SB–221	...	A95456	O	≤127.00	285
33	...	Bar, rod, shapes	SB–221	...	A95456	H111	≤127.00	290
34	...	Bar, rod, shapes	SB–221	...	A95456	H112	≤127.00	285
35	...	Smls. extr. tube	SB–241	...	A95456	O	...	285
36	...	Smls. extr. tube	SB–241	...	A95456	H111	...	290
37	...	Smls. extr. tube	SB–241	...	A95456	H112	...	285
38	...	Plate, sheet	SB–928	...	A95456	H321	4.00–12.50	315
39	...	Plate, sheet	SB–928	...	A95456	H321	12.51–40.00	305
40	...	Plate, sheet	SB–928	...	A95456	H321	40.01–80.00	285
41	...	Plate, sheet	SB–209	...	A96061	T4	0.15–6.34	205
42	...	Plate, sheet	SB–209	...	A96061	T451	6.35–76.20	205
43	...	Plate, sheet	SB–209	...	A96061	T6	0.15–6.34	290
44	...	Plate, sheet	SB–209	...	A96061	T651	6.35–101.60	290
45	...	Plate, sheet	SB–209	...	A96061	T651	101.61–152.40	275

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	269	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	207	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	207	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	207	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	221	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	207	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	248	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	269	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	214	214	184	120	...	...	...	...	...	...	...	...	...	...	...
10	221	221	206	180	...	...	...	...	...	...	...	...	...	...	...
11	214	214	184	120	...	...	...	...	...	...	...	...	...	...	...
12	248	248	223	166	...	...	...	...	...	...	...	...	...	...	...
13	269	269	236	165	...	...	...	...	...	...	...	...	...	...	...
14	214	214	184	120	...	...	...	...	...	...	...	...	...	...	...
15	228	228	214	188	...	...	...	...	...	...	...	...	...	...	...
16	214	214	184	120	...	...	...	...	...	...	...	...	...	...	...
17	248	248	223	166	...	...	...	...	...	...	...	...	...	...	...
18	269	269	236	165	...	...	...	...	...	...	...	...	...	...	...
19	214	214	184	120	...	...	...	...	...	...	...	...	...	...	...
20	228	228	214	188	...	...	...	...	...	...	...	...	...	...	...
21	214	214	184	120	...	...	...	...	...	...	...	...	...	...	...
22	290	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	283	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	276	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	269	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	262	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	290	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	283	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	317	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	303	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	283	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	283	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	290	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	283	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	283	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	290	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	283	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	317	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	303	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	283	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	207	207	196	135	...	...	...	...	...	...	...	...	...	...	...
42	207	207	196	135	...	...	...	...	...	...	...	...	...	...	...
43	290	290	239	138	...	...	...	...	...	...	...	...	...	...	...
44	290	290	239	138	...	...	...	...	...	...	...	...	...	...	...
45	276	276	228	134	...	...	...	...	...	...	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Nonferrous Materials (Cont'd)							
1	...	Plate, sheet	SB–209	...	A96061	T4 wld.	0.15–6.34	165
2	...	Plate, sheet	SB–209	...	A96061	T451 wld.	6.35–76.20	165
3	...	Plate, sheet	SB–209	...	A96061	T6 wld.	0.15–6.34	165
4	...	Plate, sheet	SB–209	...	A96061	T651 wld.	6.35–152.40	165
5	...	Drawn smls. tube	SB–210	...	A96061	T4	0.64–12.70	205
6	...	Drawn smls. tube	SB–210	...	A96061	T6	0.64–12.70	290
7	...	Drawn smls. tube	SB–210	...	A96061	T4 wld.	0.64–12.70	165
8	...	Drawn smls. tube	SB–210	...	A96061	T6 wld.	0.64–12.70	165
9	...	Bar, rod, wire	SB–211	...	A96061	T6	3.18–203.20	290
10	...	Bar, rod, wire	SB–211	...	A96061	T651	3.18–203.20	290
11	...	Bar, rod, wire	SB–211	...	A96061	T6 wld.	3.18–203.20	165
12	...	Bar, rod, wire	SB–211	...	A96061	T651 wld.	3.18–203.20	165
13	...	Bar, rod, shapes	SB–221	...	A96061	T4	...	180
14	...	Bar, rod, shapes	SB–221	...	A96061	T6	...	260
15	...	Bar, rod, shapes	SB–221	...	A96061	T4 wld.	...	165
16	...	Bar, rod, shapes	SB–221	...	A96061	T6 wld.	...	165
17	...	Cond. & heat exch. tubes	SB–234	...	A96061	T4	0.64–5.08	205
18	...	Cond. & heat exch. tubes	SB–234	...	A96061	T6	0.64–5.08	290
19	...	Cond. & heat exch. tubes	SB–234	...	A96061	T4 wld.	0.64–5.08	165
20	...	Cond. & heat exch. tubes	SB–234	...	A96061	T6 wld.	0.64–5.08	165
21	...	Smls. extr. tube	SB–241	...	A96061	T4	...	180
22	...	Smls. extr. tube	SB–241	...	A96061	T6	...	260
23	...	Smls. extr. tube	SB–241	...	A96061	T4 wld.	...	165
24	...	Smls. extr. tube	SB–241	...	A96061	T6 wld.	...	165
25	...	Smls. pipe	SB–241	...	A96061	T6 drawn	<25.40	290
26	...	Smls. pipe	SB–241	...	A96061	T6	≥25.40	260
27	...	Smls. pipe	SB–241	...	A96061	T6 wld.	...	165
28	...	Die forgings	SB–247	...	A96061	T6	≤101.60	260
29	...	Hand forgings	SB–247	...	A96061	T6	≤101.60	255
30	...	Hand forgings	SB–247	...	A96061	T6	101.61–203.20	240
31	...	Die & hand forgings	SB–247	...	A96061	T6 wld.	≤203.20	165
32	...	Shapes	SB–308	...	A96061	T6	...	260
33	...	Shapes	SB–308	...	A96061	T6 wld.	...	165
34	...	Drawn smls. tube	SB–210	...	A96063	T6	0.64–12.70	230
35	...	Drawn smls. tube	SB–210	...	A96063	T6 wld.	0.64–12.70	115
36	...	Bar, rod, shapes	SB–221	...	A96063	T1	≤12.70	115
37	...	Bar, rod, shapes	SB–221	...	A96063	T1	12.71–25.40	110
38	...	Bar, rod, shapes	SB–221	...	A96063	T5	≤12.70	150
39	...	Bar, rod, shapes	SB–221	...	A96063	T5	12.71–25.40	145
40	...	Bar, rod, shapes	SB–221	...	A96063	T6	≤25.40	205
41	...	Bar, rod, shapes	SB–221	...	A96063	T5 wld.	≤25.40	115
42	...	Bar, rod, shapes	SB–221	...	A96063	T6 wld.	≤25.40	115
43	...	Smls. extr. tube	SB–241	...	A96063	O	...	110
44	...	Smls. extr. tube	SB–241	...	A96063	T1	≤12.70	115
45	...	Smls. extr. tube	SB–241	...	A96063	T1	12.71–25.40	110

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	165	165	159	112	...	...	...	...	...	...	...	...	...	...	...
2	165	165	159	112	...	...	...	...	...	...	...	...	...	...	...
3	165	165	159	112	...	...	...	...	...	...	...	...	...	...	...
4	165	165	159	112	...	...	...	...	...	...	...	...	...	...	...
5	207	207	196	135	...	...	...	...	...	...	...	...	...	...	...
6	290	290	239	138	...	...	...	...	...	...	...	...	...	...	...
7	165	165	159	112	...	...	...	...	...	...	...	...	...	...	...
8	165	165	159	112	...	...	...	...	...	...	...	...	...	...	...
9	290	290	239	138	...	...	...	...	...	...	...	...	...	...	...
10	290	290	239	138	...	...	...	...	...	...	...	...	...	...	...
11	165	165	159	112	...	...	...	...	...	...	...	...	...	...	...
12	165	165	159	112	...	...	...	...	...	...	...	...	...	...	...
13	179	179	172	121	...	...	...	...	...	...	...	...	...	...	...
14	262	262	216	126	...	...	...	...	...	...	...	...	...	...	...
15	165	165	159	112	...	...	...	...	...	...	...	...	...	...	...
16	165	165	159	112	...	...	...	...	...	...	...	...	...	...	...
17	207	207	196	135	...	...	...	...	...	...	...	...	...	...	...
18	290	290	239	138	...	...	...	...	...	...	...	...	...	...	...
19	165	165	159	112	...	...	...	...	...	...	...	...	...	...	...
20	165	165	159	112	...	...	...	...	...	...	...	...	...	...	...
21	179	179	172	121	...	...	...	...	...	...	...	...	...	...	...
22	262	262	216	126	...	...	...	...	...	...	...	...	...	...	...
23	165	165	159	112	...	...	...	...	...	...	...	...	...	...	...
24	165	165	159	112	...	...	...	...	...	...	...	...	...	...	...
25	290	290	239	138	...	...	...	...	...	...	...	...	...	...	...
26	262	262	216	126	...	...	...	...	...	...	...	...	...	...	...
27	165	165	159	112	...	...	...	...	...	...	...	...	...	...	...
28	262	262	216	126	...	...	...	...	...	...	...	...	...	...	...
29	255	255	241	167	...	...	...	...	...	...	...	...	...	...	...
30	241	241	231	163	...	...	...	...	...	...	...	...	...	...	...
31	165	165	159	112	...	...	...	...	...	...	...	...	...	...	...
32	262	262	216	126	...	...	...	...	...	...	...	...	...	...	...
33	165	165	159	112	...	...	...	...	...	...	...	...	...	...	...
34	228	227	159	89.5	...	...	...	...	...	...	...	...	...	...	...
35	117	117	106	33.8	...	...	...	...	...	...	...	...	...	...	...
36	117	117	106	33.8	...	...	...	...	...	...	...	...	...	...	...
37	110	110	110	104	...	...	...	...	...	...	...	...	...	...	...
38	152	152	147	115	...	...	...	...	...	...	...	...	...	...	...
39	145	141	121	70.7	...	...	...	...	...	...	...	...	...	...	...
40	207	202	139	64.0	...	...	...	...	...	...	...	...	...	...	...
41	117	117	106	33.8	...	...	...	...	...	...	...	...	...	...	...
42	117	117	106	33.8	...	...	...	...	...	...	...	...	...	...	...
43	110	110	110	104	...	...	...	...	...	...	...	...	...	...	...
44	117	117	106	...	...	...	...	...	...	...	...	...	...	...	...
45	110	110	110	...	...	...	...	...	...	...	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Nonferrous Materials (Cont'd)							
1	...	Smls. extr. tube	SB–241	...	A96063	T5	≤12.70	150
2	...	Smls. extr. tube	SB–241	...	A96063	T5	12.71–25.40	145
3	...	Smls. extr. tube/pipe	SB–241	...	A96063	T6	≤25.40	205
4	...	Smls. extr. tube	SB–241	...	A96063	T5 wld.	≤25.40	115
5	...	Smls. extr. tube/pipe	SB–241	...	A96063	T6 wld.	≤25.40	115
6	...	Smls. pipe	SB–241	...	A96063	O	...	110
(**23**) 7	...	Castings	SB/EN 1706	AlSi7Mg	AC–42000	...	...	140
(**23**) 8	...	Castings	SB/EN 1706	...	AC–44300	F	...	240
(**23**) 9	...	Bar, rod	SB–187	...	C10200	O60	All	195
10	...	Smls. tube	SB–75	...	C10200	O60	All	205
11	...	Smls. pipe	SB–42	...	C10200	O61	All	205
12	...	Plate, sheet, strip	SB–152	...	C10200	H00	...	205
13	...	Plate, sheet, strip	SB–152	...	C10200	H01	...	205
14	...	Plate, sheet, strip	SB–152	...	C10200	H02	...	205
15	...	Plate, sheet, strip	SB–152	...	C10200	H03	...	205
16	...	Plate, sheet, strip	SB–152	...	C10200	H04	...	205
17	...	Plate, sheet, strip	SB–152	...	C10200	M20, O25	...	205
18	...	Smls. pipe	SB–42	...	C10200	H55	50 < DN ≤ 300	250
19	...	Smls. tube	SB–75	...	C10200	H55	All	250
20	...	Smls. cond. tube	SB–111	...	C10200	H55	...	250
21	...	Smls. U–bend tube	SB–395	...	C10200	H55	...	250
22	...	Smls. pipe	SB–42	...	C10200	H80	6 < DN ≤ 50	310
23	...	Smls. tube	SB–75	...	C10200	H80	<102	310
24	...	Smls. cond. tube	SB–111	...	C10200	H80	...	310
25	...	Plate, sheet, strip	SB–152	...	C10400	H00	...	205
26	...	Plate, sheet, strip	SB–152	...	C10400	H01	...	205
27	...	Plate, sheet, strip	SB–152	...	C10400	H02	...	205
28	...	Plate, sheet, strip	SB–152	...	C10400	H03	...	205
29	...	Plate, sheet, strip	SB–152	...	C10400	H04	...	205
30	...	Plate, sheet, strip	SB–152	...	C10400	M20, O25	...	205
31	...	Plate, sheet, strip	SB–152	...	C10500	H00	...	205
32	...	Plate, sheet, strip	SB–152	...	C10500	H01	...	205
33	...	Plate, sheet, strip	SB–152	...	C10500	H02	...	205
34	...	Plate, sheet, strip	SB–152	...	C10500	H03	...	205
35	...	Plate, sheet, strip	SB–152	...	C10500	H04	...	205
36	...	Plate, sheet, strip	SB–152	...	C10500	M20, O25	...	205
37	...	Plate, sheet, strip	SB–152	...	C10700	H00	...	205
38	...	Plate, sheet, strip	SB–152	...	C10700	H01	...	205
39	...	Plate, sheet, strip	SB–152	...	C10700	H02	...	205
40	...	Plate, sheet, strip	SB–152	...	C10700	H03	...	205
41	...	Plate, sheet, strip	SB–152	...	C10700	H04	...	205
42	...	Plate, sheet, strip	SB–152	...	C10700	M20, O25	...	205
(**23**) 43	...	Bar	SB–187	...	C11000	H04	All	195
44	...	Bar, rod	SB–187	...	C11000	O60	All	195
45	...	Plate, sheet, strip, bar	SB–152	...	C11000	H00	...	205

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	152	152	147	115	101	...	...	...	...	...	...	...	...	...	...
2	145	141	121	70.7	...	...	...	...	...	...	...	...	...	...	...
3	207	203	138	63.2	...	...	...	...	...	...	...	...	...	...	...
4	117	117	106	33.8	...	...	...	...	...	...	...	...	...	...	...
5	117	117	106	33.8	...	...	...	...	...	...	...	...	...	...	...
6	110	110	110	104	...	...	...	...	...	...	...	...	...	...	...
7	140	135	131	...	...	...	...	...	...	...	...	...	...	...	...
8	240	207	207	...	...	...	...	...	...	...	...	...	...	...	...
9	193	187	175	162	...	...	...	...	...	...	...	...	...	...	...
10	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
11	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
12	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
13	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
14	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
15	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
16	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
17	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
18	248	248	240	228	...	...	...	...	...	...	...	...	...	...	...
19	248	248	240	228	...	...	...	...	...	...	...	...	...	...	...
20	248	248	240	228	...	...	...	...	...	...	...	...	...	...	...
21	248	248	240	228	...	...	...	...	...	...	...	...	...	...	...
22	310	310	302	267	...	...	...	...	...	...	...	...	...	...	...
23	310	310	302	267	...	...	...	...	...	...	...	...	...	...	...
24	310	310	302	267	...	...	...	...	...	...	...	...	...	...	...
25	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
26	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
27	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
28	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
29	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
30	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
31	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
32	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
33	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
34	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
35	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
36	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
37	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
38	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
39	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
40	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
41	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
42	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
43	193	187	175	162	...	...	...	...	...	...	...	...	...	...	...
44	193	187	175	162	...	...	...	...	...	...	...	...	...	...	...
45	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Nonferrous Materials (Cont'd)							
1	...	Plate, sheet, strip, bar	SB–152	...	C11000	H01	...	205
2	...	Plate, sheet, strip, bar	SB–152	...	C11000	H02	...	205
3	...	Plate, sheet, strip, bar	SB–152	...	C11000	H03	...	205
4	...	Plate, sheet, strip, bar	SB–152	...	C11000	H04	...	205
5	...	Plate, sheet, strip, bar	SB–152	...	C11000	M20, O25	...	205
6	...	Smls. tube	SB–75	...	C12000	O50	All	205
7	...	Smls. tube	SB–75	...	C12000	O60	All	205
8	...	Smls. pipe	SB–42	...	C12000	O61	All	205
9	...	Smls. pipe	SB–42	...	C12000	H55	50 < DN ≤ 300	250
10	...	Smls. tube	SB–75	...	C12000	H55	All	250
11	...	Smls. cond. tube	SB–111	...	C12000	H55	...	250
12	...	Smls. U–bend tube	SB–395	...	C12000	H55	...	250
13	...	Smls. pipe	SB–42	...	C12000	H80	6 < DN ≤ 50	310
14	...	Smls. tube	SB–75	...	C12000	H80	<102	310
15	...	Smls. cond. tube	SB–111	...	C12000	H80	...	310
16	...	Smls. tube	SB–75	...	C12200	O50	All	205
17	...	Smls. tube	SB–75	...	C12200	O60	All	205
18	...	Smls. pipe	SB–42	...	C12200	O61	All	205
19	...	Finned tube	SB–359	...	C12200	O61	...	205
(**23**) 20	...	Finned tube	SB–359	...	C12200	O62	...	205
21	...	Wld. cond. tube	SB–543	...	C12200	WO61	...	205
22	...	Plate, sheet, strip	SB–152	...	C12200	H00	...	205
23	...	Plate, sheet, strip	SB–152	...	C12200	H01	...	205
24	...	Plate, sheet, strip	SB–152	...	C12200	H02	...	205
25	...	Plate, sheet, strip	SB–152	...	C12200	H03	...	205
26	...	Plate, sheet, strip	SB–152	...	C12200	H04	...	205
27	...	Plate, sheet, strip	SB–152	...	C12200	M20, O25	...	205
28	...	Wld. cond. tube	SB–543	...	C12200	WC55	...	220
29	...	Smls. pipe	SB–42	...	C12200	H55	50 < DN ≤ 300	250
30	...	Smls. tube	SB–75	...	C12200	H55	All	250
31	...	Smls. cond. tube	SB–111	...	C12200	H55	...	250
32	...	Finned tube	SB–359	...	C12200	H55	...	250
33	...	Smls. U–bend tube	SB–395	...	C12200	H55	...	250
34	...	Smls. pipe	SB–42	...	C12200	H80	6 < DN ≤50	310
35	...	Smls. cond. tube	SB–75	...	C12200	H80	<102	310
36	...	Smls. tube	SB–111	...	C12200	H80	...	310
37	...	Plate, sheet, strip, bar	SB–152	...	C12300	H00	...	205
38	...	Plate, sheet, strip, bar	SB–152	...	C12300	H01	...	205
39	...	Plate, sheet, strip, bar	SB–152	...	C12300	H02	...	205
40	...	Plate, sheet, strip, bar	SB–152	...	C12300	H03	...	205
41	...	Plate, sheet, strip, bar	SB–152	...	C12300	H04	...	205
42	...	Plate, sheet, strip, bar	SB–152	...	C12300	M20, O25	...	205
43	...	Plate, sheet, strip	SB–152	...	C14200	M20, O25	...	205
44	...	Smls. cond. tube	SB–111	...	C14200	H55	...	250
45	...	Smls. U–bend tube	SB–395	...	C14200	H55	...	250

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
2	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
3	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
4	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
5	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
6	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
7	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
8	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
9	248	248	240	228	...	...	...	...	...	...	...	...	...	...	...
10	248	248	240	228	...	...	...	...	...	...	...	...	...	...	...
11	248	248	240	228	...	...	...	...	...	...	...	...	...	...	...
12	248	248	240	228	...	...	...	...	...	...	...	...	...	...	...
13	310	310	302	267	...	...	...	...	...	...	...	...	...	...	...
14	310	310	302	267	...	...	...	...	...	...	...	...	...	...	...
15	310	310	302	267	...	...	...	...	...	...	...	...	...	...	...
16	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
17	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
18	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
19	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
20	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
21	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
22	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
23	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
24	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
25	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
26	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
27	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
28	221	220	214	203	...	...	...	...	...	...	...	...	...	...	...
29	248	248	240	228	...	...	...	...	...	...	...	...	...	...	...
30	248	248	240	228	...	...	...	...	...	...	...	...	...	...	...
31	248	248	240	228	...	...	...	...	...	...	...	...	...	...	...
32	248	248	240	228	...	...	...	...	...	...	...	...	...	...	...
33	248	248	240	228	...	...	...	...	...	...	...	...	...	...	...
34	310	310	302	267	...	...	...	...	...	...	...	...	...	...	...
35	310	310	302	267	...	...	...	...	...	...	...	...	...	...	...
36	310	310	302	267	...	...	...	...	...	...	...	...	...	...	...
37	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
38	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
39	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
40	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
41	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
42	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
43	207	200	187	174	...	...	...	...	...	...	...	...	...	...	...
44	248	248	240	228	...	...	...	...	...	...	...	...	...	...	...
45	248	248	240	228	...	...	...	...	...	...	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Nonferrous Materials (Cont'd)							
1	...	Smls. cond. tube	SB–111	...	C14200	H80	...	310
2	...	Smls. cond. tube	SB–111	...	C19200	O61	...	260
3	...	Smls. U–bend tube	SB–395	...	C19200	O61	...	260
4	...	Wld. cond. tube	SB–543	...	C19400	WO61	...	310
5	...	Wld. cond. tube	SB–543	...	C19400	WC55	...	310
6	...	Smls. pipe	SB–43	...	C23000	O61 and H58	...	275
7	...	Smls. cond. tube	SB–111	...	C23000	O61	...	275
8	...	Smls. tube	SB–135	...	C23000	O50 and O60	...	275
9	...	Smls. U–bend tube	SB–395	...	C23000	O61	...	275
10	...	Wld. cond. tube	SB–543	...	C23000	WO61 and WC55	...	275
11	...	Smls. tube	SB–111	...	C28000	O25	...	345
12	...	Plate	SB–171	...	C36500	O25 and M20	100 < t ≤ 140	275
13	...	Plate	SB–171	...	C36500	O25 and M20	50 < t ≤ 100	310
14	...	Plate	SB–171	...	C36500	O25 and M20	≤50	345
(**23**) 15	...	Forgings, brass	SB–283	...	C37700	M10	>38	315
(**23**) 16	...	Forgings, brass	SB–283	...	C37700	M11	>38	315
(**23**) 17	...	Forgings, brass	SB–283	...	C37700	O20	>38	315
(**23**) 18	...	Forgings, brass	SB–283	...	C37700	M10	≤38	345
(**23**) 19	...	Forgings, brass	SB–283	...	C37700	M11	≤38	345
(**23**) 20	...	Forgings, brass	SB–283	...	C37700	O20	≤38	345
21	...	Plate	SB–171	...	C44300	M10, M20	≤100	310
22	...	Plate	SB–171	...	C44300	O20, O25	≤100	310
23	...	Smls. cond. tube	SB–111	...	C44300	O61	...	310
24	...	Finned tube	SB–359	...	C44300	O61	...	310
25	...	Smls. U–bend tube	SB–395	...	C44300	O61	...	310
26	...	Wld. cond. tube	SB–543	...	C44300	WO61	...	310
27	...	Plate	SB–171	...	C44400	M10, M20	≤100	310
28	...	Plate	SB–171	...	C44400	O20, O25	≤100	310
29	...	Smls. cond. tube	SB–111	...	C44400	O61	...	310
30	...	Finned tube	SB–359	...	C44400	O61	...	310
31	...	Smls. U–bend tube	SB–395	...	C44400	O61	...	310
32	...	Wld. cond. tube	SB–543	...	C44400	WO61	...	310
33	...	Plate	SB–171	...	C44500	M10, M20	≤100	310
34	...	Plate	SB–171	...	C44500	O20, O25	≤100	310
35	...	Smls. cond. tube	SB–111	...	C44500	O61	...	310
36	...	Finned tube	SB–359	...	C44500	O61	...	310
37	...	Smls. U–bend tube	SB–395	...	C44500	O61	...	310
38	...	Wld. cond. tube	SB–543	...	C44500	WO61	...	310
39	...	Plate	SB–171	...	C46400	M10, M20, O20, O25	≤140	345
40	...	Plate	SB–171	...	C46500	M10, M20, O20, O25	≤140	345
41	...	Smls. cond. tube	SB–111	...	C60800	O61	...	345
42	...	Smls. U–bend tube	SB–395	...	C60800	O61	...	345
43	...	Plate, sheet	SB–169	...	C61400	O25 or O60	50 < t ≤ 140	450
44	...	Plate	SB–171	...	C61400	M10, M20, O20, O25	50 < t ≤ 140	450
45	...	Plate, sheet	SB–169	...	C61400	O25 or O60	12 < t ≤ 50	485

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	310	310	302	267	...	...	...	...	...	...	...	...	...	...	...
2	262	245	224	206	...	...	...	...	...	...	...	...	...	...	...
3	262	245	224	206	...	...	...	...	...	...	...	...	...	...	...
4	310	309	287	268	...	...	...	...	...	...	...	...	...	...	...
5	310	309	287	268	...	...	...	...	...	...	...	...	...	...	...
6	276	276	276	275	256	...	...	...	...	...	...	...	...	...	...
7	276	276	276	275	256	...	...	...	...	...	...	...	...	...	...
8	276	276	276	275	256	...	...	...	...	...	...	...	...	...	...
9	276	276	276	275	256	...	...	...	...	...	...	...	...	...	...
10	276	276	276	275	256	...	...	...	...	...	...	...	...	...	...
11	345	345	345	340	...	...	...	...	...	...	...	...	...	...	...
12	276	276	276	272	...	...	...	...	...	...	...	...	...	...	...
13	310	310	310	306	...	...	...	...	...	...	...	...	...	...	...
14	345	345	345	340	...	...	...	...	...	...	...	...	...	...	...
15	317	310	303	293	277	257	235	211	185	158	...	...	...	...	...
16	317	310	303	293	277	257	235	211	185	158	...	...	...	...	...
17	317	310	303	293	277	257	235	211	185	158	...	...	...	...	...
18	345	345	330	318	301	280	255	229	202	172	...	...	...	...	...
19	345	345	330	318	301	280	255	229	202	172	...	...	...	...	...
20	345	345	330	318	301	280	255	229	202	172	...	...	...	...	...
21	310	310	302	291	276	255	...	...	...	...	...	...	...	...	...
22	310	310	302	291	276	255	...	...	...	...	...	...	...	...	...
23	310	310	302	291	276	255	...	...	...	...	...	...	...	...	...
24	310	310	302	291	276	255	...	...	...	...	...	...	...	...	...
25	310	310	302	291	276	255	...	...	...	...	...	...	...	...	...
26	310	310	302	291	276	255	...	...	...	...	...	...	...	...	...
27	310	310	302	291	276	255	...	...	...	...	...	...	...	...	...
28	310	310	302	291	276	255	...	...	...	...	...	...	...	...	...
29	310	310	302	291	276	255	...	...	...	...	...	...	...	...	...
30	310	310	302	291	276	255	...	...	...	...	...	...	...	...	...
31	310	310	302	291	276	255	...	...	...	...	...	...	...	...	...
32	310	310	302	291	276	255	...	...	...	...	...	...	...	...	...
33	310	310	302	291	276	255	...	...	...	...	...	...	...	...	...
34	310	310	302	291	276	255	...	...	...	...	...	...	...	...	...
35	310	310	302	291	276	255	...	...	...	...	...	...	...	...	...
36	310	310	302	291	276	255	...	...	...	...	...	...	...	...	...
37	310	310	302	291	276	255	...	...	...	...	...	...	...	...	...
38	310	310	302	291	276	255	...	...	...	...	...	...	...	...	...
39	345	345	345	331	305	...	...	...	...	...	...	...	...	...	...
40	345	345	345	331	305	...	...	...	...	...	...	...	...	...	...
41	345	345	345	329	277	...	...	...	...	...	...	...	...	...	...
42	345	345	345	329	277	...	...	...	...	...	...	...	...	...	...
43	448	448	448	441	415	...	...	...	...	...	...	...	...	...	...
44	448	448	448	441	415	...	...	...	...	...	...	...	...	...	...
45	483	483	483	475	447	...	...	...	...	...	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Nonferrous Materials (Cont'd)							
1	...	Plate	SB–171	...	C61400	M10, M20, O20, O25	≤50	485
2	...	Plate, sheet	SB–169	...	C61400	O25 or O60	≤12	495
3	...	Plate	SB–171	...	C63000	M10, M20, O20, O25	100 < t ≤ 140	550
4	...	Bar, rod	SB–150	...	C63000	M20, M30	>100	550
5	...	Bar, rod	SB–150	...	C63000	O20, O25, O30	>100	550
6	...	Bar, rod	SB–150	...	C63000	HR50	>100	550
7	...	Plate	SB–171	...	C63000	M10, M20, O20, O25	50 < t ≤ 100	585
8	...	Bar, rod	SB–150	...	C63000	HR50	50 < t ≤ 100	585
9	...	Bar, rod	SB–150	...	C63000	M20, M30	50 < t ≤ 100	585
10	...	Bar, rod	SB–150	...	C63000	O20, O25, O30	50 < t ≤ 100	585
11	...	Plate	SB–171	...	C63000	O25 or M20	≤50	620
12	...	Bar, rod	SB–150	...	C63000	HR50	25 < t ≤ 50	620
13	...	Bar, rod	SB–150	...	C63000	HR50	12 < t ≤ 25	690
(**23**) 14	...	Forgings	SB–283	...	C64200	M10	>38	469
(**23**) 15	...	Forgings	SB–283	...	C64200	M10	≤38	483
(**23**) 16	...	Bar, rod	SB–150	...	C64200	M10, M20, M30	>100	485
(**23**) 17	...	Bar, rod	SB–150	...	C64200	M10, M20, M30	80 < t ≤ 100	485
(**23**) 18	...	Bar, rod	SB–150	...	C64200	HR50	50 < t ≤ 80	515
(**23**) 19	...	Bar, rod	SB–150	...	C64200	HR50	25 < t ≤ 50	550
(**23**) 20	...	Bar, rod	SB–150	...	C64200	HR50	12 < t ≤ 25	585
(**23**) 21	...	Bar, rod	SB–150	...	C64200	HR50	≤12	620
22	...	Bar, rod	SB–98	...	C65100	O60	All	275
23	...	Bar, rod	SB–98	...	C65100	H02	≤50	380
24	...	Rod	SB–98	...	C65100	H06	12 < t ≤ 38	515
25	...	Rod	SB–98	...	C65100	H06	t ≤ 12	585
26	...	Plate, sheet	SB–96	...	C65500	O61	≤50	345
27	...	Smls. pipe & tube	SB–315	...	C65500	O61	...	345
28	...	Bar, rod	SB–98	...	C65500	O60	All	360
29	...	Rod	SB–98	...	C65500	H01	All	380
30	...	Bar, rod	SB–98	...	C65500	H02	≤50	485
31	...	Rod	SB–98	...	C66100	O60	All	360
32	...	Rod	SB–98	...	C66100	H01	All	380
33	...	Rod	SB–98	...	C66100	H02	≤50	485
(**23**) 34	...	Smls. cond. tube	SB–111	...	C68700	O61	...	345
(**23**) 35	...	Smls. U–bend tube	SB–395	...	C68700	O61	...	345
(**23**) 36	...	Wld. cond. tube	SB–543	...	C68700	WO61	...	345
(**23**) 37	...	Smls. cond. tube	SB–111	...	C70400	O61	...	260
(**23**) 38	...	Wld. tube	SB–543	...	C70400	WO61	...	260
(**23**) 39	...	Smls. cond. tube	SB–111	...	C70400	H55	...	275
40	...	Smls. pipe & tube	SB–466	...	C70600	O60	...	260
41	...	Wld. pipe	SB–467	...	C70600	WO61	>114	260
42	...	Bar, rod	SB–151	...	C70600	O60	All	260
43	...	Plate, sheet	SB–171	...	C70600	M10, M20	≤140	275
44	...	Plate, sheet	SB–171	...	C70600	O20, O25	≤140	275
45	...	Smls. cond. tube	SB–111	...	C70600	O61	...	275

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	483	483	483	475	447	...	...	...	...	...	...	...	...	...	...
2	496	496	496	488	460	...	...	...	...	...	...	...	...	...	...
3	552	552	552	552	552	512	463	399	325	...	...	...	...	...	...
4	552	552	552	552	552	512	463	399	325	...	...	...	...	...	...
5	552	552	552	552	552	512	463	399	325	...	...	...	...	...	...
6	552	552	552	552	552	512	463	399	325	...	...	...	...	...	...
7	586	586	586	586	586	544	492	424	345	...	...	...	...	...	...
8	586	586	586	586	586	544	492	424	345	...	...	...	...	...	...
9	586	586	586	586	586	544	492	424	345	...	...	...	...	...	...
10	586	586	586	586	586	544	492	424	345	...	...	...	...	...	...
11	621	621	621	621	621	576	521	449	366	...	...	...	...	...	...
12	621	621	621	621	621	576	521	449	366	...	...	...	...	...	...
13	689	689	689	689	689	640	579	499	406	...	...	...	...	...	...
14	469	469	469	469	469	444	402	346	276	187	76	...	...	...	...
15	482	482	482	482	482	457	414	357	284	192	79	...	...	...	...
16	482	482	482	482	482	457	414	357	284	192	79	...	...	...	...
17	482	482	482	482	482	457	414	357	284	192	79	...	...	...	...
18	517	517	517	517	517	490	443	382	304	206	84	...	...	...	...
19	551	551	551	551	551	523	473	408	325	220	90	...	...	...	...
20	586	586	586	586	586	555	502	433	345	234	95	...	...	...	...
21	620	620	620	620	620	588	532	459	365	247	101	...	...	...	...
22	276	276	276	276	258	...	...	...	...	...	...	...	...	...	...
23	379	379	379	363	320	...	...	...	...	...	...	...	...	...	...
24	517	517	517	493	462	...	...	...	...	...	...	...	...	...	...
25	586	586	586	559	524	...	...	...	...	...	...	...	...	...	...
26	345	345	345	329	302	...	...	...	...	...	...	...	...	...	...
27	345	345	345	329	302	...	...	...	...	...	...	...	...	...	...
28	359	359	359	342	314	...	...	...	...	...	...	...	...	...	...
29	379	379	379	378	351	...	...	...	...	...	...	...	...	...	...
30	483	483	483	483	471	...	...	...	...	...	...	...	...	...	...
31	359	359	359	342	314	...	...	...	...	...	...	...	...	...	...
32	379	379	379	378	351	...	...	...	...	...	...	...	...	...	...
33	483	483	483	483	471	...	...	...	...	...	...	...	...	...	...
34	345	345	345	345	345	328	318	306	290	271	247	216	177	129	...
35	345	345	345	345	345	328	318	306	290	271	247	216	177	129	...
36	345	345	345	345	345	328	318	306	290	271	247	216	177	129	...
37	262	262	253	242	234	228	226	224	222	219	216	...	...	...	...
38	262	262	253	242	234	228	226	224	222	219	216	...	...	...	...
39	276	276	266	254	246	240	238	236	234	231	227	...	...	...	...
40	262	258	239	226	218	214	212	...	...	...	...	...	...	...	...
41	262	258	239	226	218	214	212	...	...	...	...	...	...	...	...
42	262	258	239	226	218	214	212	...	...	...	...	...	...	...	...
43	276	272	251	237	229	225	224	...	...	...	...	...	...	...	...
44	276	272	251	237	229	225	224	...	...	...	...	...	...	...	...
45	276	272	251	237	229	225	224	...	...	...	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Nonferrous Materials (Cont'd)							
1	...	Finned tube	SB–359	...	C70600	O61	...	275
2	...	Smls. U–bend tube	SB–395	...	C70600	O61	...	275
3	...	Wld. pipe	SB–467	...	C70600	WO61	≤114	275
4	...	Wld. tube	SB–543	...	C70600	WO61	...	275
5	...	Finned wld. tube	SB–956	...	C70600	WO61	...	275
6	...	Wld. pipe	SB–467	...	C70600	WM50	≤114	310
7	...	Smls. tube	SB–111	...	C70600	H55	...	310
8	...	Smls. pipe & tube	SB–466	...	C70600	H55	...	310
9	...	Wld. tube	SB–543	...	C70600	WC55	...	310
10	...	Finned wld. tube	SB–956	...	C70600	WC55	...	310
11	...	Wld. pipe	SB–467	...	C70600	Wld. fr. cold rld. strip	≤114	370
12	...	Smls. pipe & tube	SB–466	...	C70620	O60	...	260
13	...	Wld. pipe	SB–467	...	C70620	WO61	>114	260
14	...	Bar, rod	SB–151	...	C70620	O60	All	260
15	...	Forgings	SB–283	...	C70620	M10	>152	276
16	...	Plate, sheet	SB–171	...	C70620	M20	≤140	275
17	...	Forgings	SB–283	...	C70620	O20	...	276
18	...	Plate, sheet	SB–171	...	C70620	O25	≤140	275
19	...	Smls. cond. tube	SB–111	...	C70620	O61	...	275
20	...	Finned tube	SB–359	...	C70620	O61	...	275
21	...	Smls. U–bend tube	SB–395	...	C70620	O61	...	275
22	...	Wld. pipe	SB–467	...	C70620	WO61	≤114	275
23	...	Wld. tube	SB–543	...	C70620	WO61	...	275
24	...	Finned wld. tube	SB–956	...	C70620	WO61	...	275
25	...	Forgings	SB–283	...	C70620	M10	≤152	310
26	...	Wld. pipe	SB–467	...	C70620	WM50	≤114	310
27	...	Smls. tube	SB–111	...	C70620	H55	...	310
28	...	Smls. pipe & tube	SB–466	...	C70620	H55	...	310
29	...	Wld. tube	SB–543	...	C70620	WC55	...	310
30	...	Finned wld. tube	SB–956	...	C70620	WC55	...	310
31	...	Wld. pipe	SB–467	...	C70620	Wld. fr. cold rld. strip	≤114	370
(**23**) 32	...	Smls. tube	SB–466	...	C71000	O60	...	310
(**23**) 33	...	Smls. cond. tube	SB–111	...	C71000	O61	...	310
(**23**) 34	...	Finned tube	SB–359	...	C71000	O61	...	310
(**23**) 35	...	Smls. tube	SB–395	...	C71000	O61	...	310
36	...	Wld. pipe	SB–467	...	C71500	WO61	>114	310
37	...	Plate, sheet	SB–171	...	C71500	M10, M20, O20, O25	$60 < t \leq 140$	310
38	...	Plate, sheet	SB–171	...	C71500	M10, M20, O20, O25	≤60	345
39	...	Wld. pipe	SB–467	...	C71500	WO61	≤114	345
40	...	Smls. pipe & tube	SB–466	...	C71500	O60	...	360
41	...	Smls. cond. tube	SB–111	...	C71500	O61	...	360
42	...	Finned tube	SB–359	...	C71500	O61	...	360
43	...	Smls. U–bend tube	SB–395	...	C71500	O61	...	360
44	...	Wld. tube	SB–543	...	C71500	WO61	...	360
45	...	Finned wld. tube	SB–956	...	C71500	WO61	...	360

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	276	272	251	237	229	225	224	...	...	...	...	...	...	...	...
2	276	272	251	237	229	225	224	...	...	...	...	...	...	...	...
3	276	272	251	237	229	225	224	...	...	...	...	...	...	...	...
4	276	272	251	237	229	225	224	...	...	...	...	...	...	...	...
5	276	272	251	237	229	225	224	...	...	...	...	...	...	...	...
6	310	305	283	267	257	253	252	...	...	...	...	...	...	...	...
7	310	305	283	267	257	253	252	...	...	...	...	...	...	...	...
8	310	305	283	267	257	253	252	...	...	...	...	...	...	...	...
9	310	305	283	267	257	253	252	...	...	...	...	...	...	...	...
10	310	305	283	267	257	253	252	...	...	...	...	...	...	...	...
11	372	365	339	321	309	305	303	...	...	...	...	...	...	...	...
12	262	258	239	226	218	214	212	...	...	...	...	...	...	...	...
13	262	258	239	226	218	214	212	...	...	...	...	...	...	...	...
14	262	258	239	226	218	214	212	...	...	...	...	...	...	...	...
15	276	272	251	237	229	225	224	...	...	...	...	...	...	...	...
16	276	272	251	237	229	225	224	...	...	...	...	...	...	...	...
17	276	272	251	237	229	225	224	...	...	...	...	...	...	...	...
18	276	272	251	237	229	225	224	...	...	...	...	...	...	...	...
19	276	272	251	237	229	225	224	...	...	...	...	...	...	...	...
20	276	272	251	237	229	225	224	...	...	...	...	...	...	...	...
21	276	272	251	237	229	225	224	...	...	...	...	...	...	...	...
22	276	272	251	237	229	225	224	...	...	...	...	...	...	...	...
23	276	272	251	237	229	225	224	...	...	...	...	...	...	...	...
24	276	272	251	237	229	225	224	...	...	...	...	...	...	...	...
25	310	305	283	267	257	253	252	...	...	...	...	...	...	...	...
26	310	305	283	267	257	253	252	...	...	...	...	...	...	...	...
27	310	305	283	267	257	253	252	...	...	...	...	...	...	...	...
28	310	305	283	267	257	253	252	...	...	...	...	...	...	...	...
29	310	305	283	267	257	253	252	...	...	...	...	...	...	...	...
30	310	305	283	267	257	253	252	...	...	...	...	...	...	...	...
31	372	365	339	321	309	305	303	...	...	...	...	...	...	...	...
32	310	310	302	293	286	276	274	269	262	255	245	235	222	207	...
33	310	310	302	293	286	276	274	269	262	255	245	235	222	207	...
34	310	310	302	293	286	276	274	269	262	255	245	235	222	207	...
35	310	310	302	293	286	276	274	269	262	255	245	235	222	207	...
36	310	310	310	310	310	310	310	310	310	...	...	...	...	...	...
37	310	310	310	310	310	310	310	310	310	...	...	...	...	...	...
38	345	345	345	345	345	345	345	345	345	...	...	...	...	...	...
39	345	345	345	345	345	345	345	345	345	...	...	...	...	...	...
40	359	359	359	359	359	359	359	359	359	...	...	...	...	...	...
41	359	359	359	359	359	359	359	359	359	...	...	...	...	...	...
42	359	359	359	359	359	359	359	359	359	...	...	...	...	...	...
43	359	359	359	359	359	359	359	359	359	...	...	...	...	...	...
44	359	359	359	359	359	359	359	359	359	...	...	...	...	...	...
45	359	359	359	359	359	359	359	359	359	...	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
		Nonferrous Materials (Cont'd)							
(**23**)	1	...	Smls. cond. tube	SB–111	...	C71500	HR50	...	495
(**23**)	2	...	Smls. U–bend tube	SB–395	...	C71500	HR50	...	495
	3	...	Wld. pipe	SB–467	...	C71520	WO61	>114	310
	4	...	Forgings	SB–283	...	C71520	M10	>152	310
	5	...	Forgings	SB–283	...	C71520	O20	...	310
	6	...	Plate, sheet	SB–171	...	C71520	O25	60 < t ≤ 140	310
	7	...	Forgings	SB–283	...	C71520	M10	≤152	345
	8	...	Plate, sheet	SB–171	...	C71520	O25	≤60	345
	9	...	Wld. pipe	SB–467	...	C71520	WO61	≤114	345
	10	...	Smls. pipe & tube	SB–466	...	C71520	O60	...	360
	11	...	Smls. cond. tube	SB–111	...	C71520	O61	...	360
	12	...	Finned tube	SB–359	...	C71520	O61	...	360
	13	...	Smls. U–bend tube	SB–395	...	C71520	O61	...	360
	14	...	Wld. tube	SB–543	...	C71520	WO61	...	360
	15	...	Finned wld. tube	SB–956	...	C71520	WO61	...	360
(**23**)	16	...	Smls. cond. tube	SB–111	...	C71520	HR50	...	495
(**23**)	17	...	Smls. U–bend tube	SB–395	...	C71520	HR50	...	495
(**23**)	18	...	Smls. cond. tube	SB–111	...	C72200	O61	...	310
	19	...	Castings	SB–62	...	C83600	M01	...	205
	20	...	Castings	SB–61	...	C92200	M01	...	235
	21	...	Castings	SB–584	...	C92200	M01	...	234
	22	...	Castings	SB–584	...	C93700	M01	...	207
	23	...	Castings	SB–148	...	C95200	M01	...	450
	24	...	Castings	SB–271	...	C95200	M02	...	450
	25	...	Castings	SB–505	...	C95200	M07	...	470
	26	...	Castings	SB–148	...	C95400	M01	...	515
	27	...	Castings	SB–271	...	C95400	M02	...	515
	28	...	Castings	SB–148	...	C95800	M01	...	585
	29	...	Castings	SB–148	...	C95820	M01	...	650
	30	...	Castings	SB–369	...	C96200	M01	...	310
	31	...	Castings	SB–584	...	C97600	M01	...	276
	32	99Ni	Plate, sheet, strip	SB–162	...	N02200	As rolled	...	380
	33	99Ni	Smls. pipe & tube	SB–161	...	N02200	Stress rel.	...	450
	34	99Ni	Smls. tube	SB–163	...	N02200	Stress rel.	...	450
	35	99Ni–Low C	Smls. pipe & tube	SB–161	...	N02201	Annealed	>125 O.D.	345
	36	99Ni–Low C	Smls. & wld. ftgs.	SB–366	...	N02201	Annealed	...	345
	37	99Ni–Low C	Bar, rod	SB–160	...	N02201	Hot rolled/ann.	...	345
	38	99Ni–Low C	Smls. pipe & tube	SB–161	...	N02201	Annealed	≤125 O.D.	345
	39	99Ni–Low C	Smls. tube	SB–163	...	N02201	Annealed	...	345
	40	99Ni–Low C	Plate, sheet, strip	SB–162	...	N02201	Hot rolled/ann.	...	345
	41	67Ni–30Cu	Bar	SB–164	...	N04400	Annealed	...	485
	42	67Ni–30Cu	Smls. pipe & tube	SB–165	...	N04400	Annealed	>125 O.D.	485
	43	67Ni–30Cu	Forgings	SB–564	...	N04400	Annealed	...	485
	44	67Ni–30Cu	Plate	SB–127	...	N04400	Annealed	...	485
	45	67Ni–30Cu	Smls. tube	SB–163	...	N04400	Annealed	≤75	485

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	496	496	496	496	492	484	477	471	465	460	...	...	...	...	...
2	496	496	496	496	492	484	477	471	465	460	...	...	...	...	...
3	310	310	310	310	310	310	310	310	310	...	...	...	...	...	...
4	310	310	310	310	310	310	310	310	310	...	...	...	...	...	...
5	310	310	310	310	310	310	310	310	310	...	...	...	...	...	...
6	310	310	310	310	310	310	310	310	310	...	...	...	...	...	...
7	345	345	345	345	345	345	345	345	345	...	...	...	...	...	...
8	345	345	345	345	345	345	345	345	345	...	...	...	...	...	...
9	345	345	345	345	345	345	345	345	345	...	...	...	...	...	...
10	359	359	359	359	359	359	359	359	359	...	...	...	...	...	...
11	359	359	359	359	359	359	359	359	359	...	...	...	...	...	...
12	359	359	359	359	359	359	359	359	359	...	...	...	...	...	...
13	359	359	359	359	359	359	359	359	359	...	...	...	...	...	...
14	359	359	359	359	359	359	359	359	359	...	...	...	...	...	...
15	359	359	359	359	359	359	359	359	359	...	...	...	...	...	...
16	496	496	496	496	492	484	477	471	465	460	...	...	...	...	...
17	496	496	496	496	492	484	477	471	465	460	...	...	...	...	...
18	310	301	287	266	256	256	...	...	...	...	...	...	...	...	...
19	207	207	202	196	191	190	189	189	...	...	...	...	...	...	...
20	234	234	234	230	210	165	124	61.8	...	...	...	...	...	...	...
21	234	234	234	230	210	165	124	61.8	...	...	...	...	...	...	...
22	207	202	190	180	170	156	143	121	...	...	...	...	...	...	...
23	448	448	448	431	398	351	326	...	...	...	...	...	...	...	...
24	448	448	448	431	398	351	326	...	...	...	...	...	...	...	...
25	469	469	469	450	416	368	341	...	...	...	...	...	...	...	...
26	517	517	517	517	517	...	...	...	...	...	...	...	...	...	...
27	517	517	517	517	517	...	...	...	...	...	...	...	...	...	...
28	586	580	552	531	...	...	...	...	...	...	...	...	...	...	...
29	648	642	611	587	567	...	...	...	...	...	...	...	...	...	...
30	310	305	282	...	...	...	...	...	...	...	...	...	...	...	...
31	276	271	265	...	...	...	...	...	...	...	...	...	...	...	...
32	379	379	379	379	379	379	379	379	379	379	379	379	379	...	...
33	448	448	448	448	444	432	422	409	...	...	...	...	...	...	...
34	448	448	448	448	444	432	422	409	...	...	...	...	...	...	...
35	345	345	345	344	332	319	312	304	297	296	282	268	252	236	220
36	345	345	345	344	332	319	312	304	297	296	282	268	252	236	220
37	345	345	345	344	332	319	312	304	297	296	282	268	252	236	220
38	345	345	345	344	332	319	312	304	297	296	282	268	252	236	220
39	345	345	345	344	332	319	312	304	297	296	282	268	252	236	220
40	345	345	345	344	332	319	312	304	297	296	282	268	252	236	220
41	483	483	483	483	483	483	483	483	479	463	443	420	396	373	355
42	483	483	483	483	483	483	483	483	479	463	443	420	396	373	355
43	483	483	483	483	483	483	483	483	479	463	443	420	396	373	355
44	483	483	483	483	483	483	483	483	479	463	443	420	396	373	355
45	483	483	483	483	483	483	483	483	479	463	443	420	396	373	355

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	204	189	176	165	157	...	...	...	...	...	...	...	...	...	...	
36	204	189	176	165	157	...	...	...	...	...	...	...	...	...	...	
37	204	189	176	165	157	...	...	...	...	...	...	...	...	...	...	
38	204	189	176	165	157	...	...	...	...	...	...	...	...	...	...	
39	204	189	176	165	157	...	...	...	...	...	...	...	...	...	...	
40	204	189	176	165	157	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
		Nonferrous Materials (Cont'd)							
	1	67Ni–30Cu	Smls. pipe & tube	SB–165	...	N04400	Annealed	≤125 O.D.	485
	2	67Ni–30Cu	Smls. & wld. ftgs.	SB–366	...	N04400	Annealed	...	485
	3	67Ni–30Cu	Plate	SB–127	...	N04400	As rolled	...	515
	4	67Ni–30Cu	Rounds	SB–164	...	N04400	Hot worked	300 < t ≤ 350	515
	5	67Ni–30Cu	Rounds	SB–164	...	N04400	Hot worked	t ≤ 300	550
	6	67Ni–30Cu	Rounds	SB–164	...	N04400	CW & SR	t < 13	580
	7	67Ni–30Cu	Rounds	SB–164	...	N04400	CW & SR	89 < t ≤ 100	580
	8	67Ni–30Cu	Smls. tube	SB–163	...	N04400	Stress rel.	...	585
	9	67Ni–30Cu	Smls. pipe & tube	SB–165	...	N04400	Stress rel.	...	585
	10	67Ni–30Cu	Rounds	SB–164	...	N04400	CW & SR	13 ≤ t ≤ 89	600
	11	67Ni–30Cu	Rounds	SB–164	...	N04400	Cold worked	t < 13	760
	12	67Ni–30Cu–S	Bar	SB–164	...	N04405	Annealed	...	485
	13	67Ni–30Cu–S	Bar	SB–164	...	N04405	Hot worked	...	515
	14	67Ni–28Cu–3Al	Bolting	SF–468	...	N05500	Ann./aged	6–38	895
(**23**)	15	47Ni–22Cr–9Mo–18Fe	Plate	SB–435	...	N06002	Annealed	>5	655
(**23**)	16	47Ni–22Cr–9Mo–18Fe	Sheet	SB–435	...	N06002	Solution ann.	≤5	655
(**23**)	17	47Ni–22Cr–9Mo–18Fe	Rod	SB–572	...	N06002	Annealed	...	655
(**23**)	18	47Ni–22Cr–9Mo–18Fe	Smls. & wld. ftgs.	SB–366	...	N06002	Annealed	...	690
(**23**)	19	47Ni–22Cr–9Mo–18Fe	Sheet	SB–435	...	N06002	Annealed	1.5 < t ≤ 5	690
(**23**)	20	47Ni–22Cr–9Mo–18Fe	Wld. pipe	SB–619	...	N06002	Solution ann.	...	690
(**23**)	21	47Ni–22Cr–9Mo–18Fe	Smls. pipe & tube	SB–622	...	N06002	Solution ann.	...	690
(**23**)	22	47Ni–22Cr–9Mo–18Fe	Wld. tube	SB–626	...	N06002	Solution ann.	...	690
	23	47Ni–22Cr–19Fe–6Mo	Rod	SB–581	...	N06007	Solution ann.	>19	585
	24	47Ni–22Cr–19Fe–6Mo	Plate, sheet, strip	SB–582	...	N06007	Solution ann.	>19	585
	25	47Ni–22Cr–19Fe–6Mo	Smls. & wld. ftgs.	SB–366	...	N06007	Annealed	...	620
	26	47Ni–22Cr–19Fe–6Mo	Rod	SB–581	...	N06007	Solution ann.	≤19	620
	27	47Ni–22Cr–19Fe–6Mo	Plate, sheet, strip	SB–582	...	N06007	Solution ann.	≤19	620
	28	47Ni–22Cr–19Fe–6Mo	Wld. pipe	SB–619	...	N06007	Solution ann.	...	620
	29	47Ni–22Cr–19Fe–6Mo	Smls. pipe & tube	SB–622	...	N06007	Solution ann.	...	620
	30	47Ni–22Cr–19Fe–6Mo	Wld. tube	SB–626	...	N06007	Solution ann.	...	620
(**23**)	31	55Ni–21Cr–13.5Mo	Smls. & wld. ftgs.	SB–366	...	N06022	Solution ann.	...	690
(**23**)	32	55Ni–21Cr–13.5Mo	Forgings	SB–462	...	N06022	Solution ann.	...	690
(**23**)	33	55Ni–21Cr–13.5Mo	Forgings	SB–564	...	N06022	Solution ann.	...	690
(**23**)	34	55Ni–21Cr–13.5Mo	Rod	SB–574	...	N06022	Solution ann.	...	690
(**23**)	35	55Ni–21Cr–13.5Mo	Plate, sheet, strip	SB–575	...	N06022	Solution ann.	...	690
(**23**)	36	55Ni–21Cr–13.5Mo	Wld. pipe	SB–619	...	N06022	Solution ann.	...	690
(**23**)	37	55Ni–21Cr–13.5Mo	Smls. pipe & tube	SB–622	...	N06022	Solution ann.	...	690
(**23**)	38	55Ni–21Cr–13.5Mo	Wld. tube	SB–626	...	N06022	Solution ann.	...	690
	39	60Ni–25Cr–9.5Fe–2.1Al	Smls. tube	SB–163	...	N06025	Annealed	...	676
	40	60Ni–25Cr–9.5Fe–2.1Al	Plate, sheet, strip	SB–168	...	N06025	Annealed	...	676
	41	60Ni–25Cr–9.5Fe–2.1Al	Wrought fittings	SB–366	...	N06025	Annealed	...	676
	42	60Ni–25Cr–9.5Fe–2.1Al	Forgings	SB–462	...	N06025	Annealed	t ≤ 102	676
	43	60Ni–25Cr–9.5Fe–2.1Al	Wld. tube	SB–516	...	N06025	Annealed	...	676
	44	60Ni–25Cr–9.5Fe–2.1Al	Wld. pipe	SB–517	...	N06025	Annealed	...	676
	45	60Ni–25Cr–9.5Fe–2.1Al	Forgings	SB–564	...	N06025	Annealed	t ≤ 102	676

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	483	483	483	483	483	483	483	483	479	463	443	420	396	373	355
2	483	483	483	483	483	483	483	483	479	463	443	420	396	373	355
3	517	517	517	517	517	517	517	514	495	475	451	424	398	374	357
4	517	517	517	517	517	517	517	514	495	475	451	424	...	...	...
5	551	551	551	551	551	546	540	530	517	498	475	445	...	...	...
6	579	579	579	579	579	573	567	557	542	523	498	468	...	...	...
7	579	579	579	579	579	573	567	557	542	523	498	468	...	...	...
8	586	586	586	585	585	581	574	563	548	529	504	478	451	424	404
9	586	586	586	585	585	581	574	563	548	529	504	478	451	424	404
10	...	600	600	600	600	594	587	577	562	542	516	484	...	...	...
11	...	758	758	758	758	751	742	729	710	685	653	612	...	...	...
12	483	483	483	483	483	483	483	483	479	463	443	420	396	373	355
13	517	517	517	517	517	517	517	514	495	475	451	424	398	374	357
14	896	896	896	896	896	896	890	880	869	...	...	...	...	...	...
15	655	655	646	632	617	601	593	584	576	568	561	554	548	543	540
16	655	655	646	632	617	601	593	584	576	568	561	554	548	543	540
17	655	655	646	632	617	601	593	584	576	568	561	554	548	543	540
18	689	689	681	665	649	633	624	615	607	598	591	584	577	572	569
19	689	689	681	665	649	633	624	615	607	598	591	584	577	572	569
20	689	689	681	665	649	633	624	615	607	598	591	584	577	572	569
21	689	689	681	665	649	633	624	615	607	598	591	584	577	572	569
22	689	689	681	665	649	633	624	615	607	598	591	584	577	572	569
23	586	586	577	571	563	553	548	543	539	536	533	528	524	516	502
24	586	586	577	571	563	553	548	543	539	536	533	528	524	516	502
25	621	620	611	605	596	586	581	576	571	567	564	560	554	546	531
26	621	620	611	605	596	586	581	576	571	567	564	560	554	546	531
27	621	620	611	605	596	586	581	576	571	567	564	560	554	546	531
28	621	620	611	605	596	586	581	576	571	567	564	560	554	546	531
29	621	620	611	605	596	586	581	576	571	567	564	560	554	546	531
30	621	620	611	605	596	586	581	576	571	567	564	560	554	546	531
31	689	689	679	659	643	631	626	622	618	614	610	606	602	597	592
32	689	689	679	659	643	631	626	622	618	614	610	606	602	597	592
33	689	689	679	659	643	631	626	622	618	614	610	606	602	597	592
34	689	689	679	659	643	631	626	622	618	614	610	606	602	597	592
35	689	689	679	659	643	631	626	622	618	614	610	606	602	597	592
36	689	689	679	659	643	631	626	622	618	614	610	606	602	597	592
37	689	689	679	659	643	631	626	622	618	614	610	606	602	597	592
38	689	689	679	659	643	631	626	622	618	614	610	606	602	597	592
39	676	676	676	675	675	675	675	675	675	675	675	672	665	655	642
40	676	676	676	675	675	675	675	675	675	675	675	672	665	655	642
41	676	676	676	675	675	675	675	675	675	675	675	672	665	655	642
42	676	676	676	675	675	675	675	675	675	675	675	672	665	655	642
43	676	676	676	675	675	675	675	675	675	675	675	672	665	655	642
44	676	676	676	675	675	675	675	675	675	675	675	672	665	655	642
45	676	676	676	675	675	675	675	675	675	675	675	672	665	655	642

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	524	513	500	484	466	445	421	395	366	336	304	271	238	206	175	(**23**)
16	524	513	500	484	466	445	421	395	366	336	304	271	238	206	175	(**23**)
17	524	513	500	484	466	445	421	395	366	336	304	271	238	206	175	(**23**)
18	552	541	527	510	491	468	443	416	386	354	320	285	251	217	185	(**23**)
19	552	541	527	510	491	468	443	416	386	354	320	285	251	217	185	(**23**)
20	552	541	527	510	491	468	443	416	386	354	320	285	251	217	185	(**23**)
21	552	541	527	510	491	468	443	416	386	354	320	285	251	217	185	(**23**)
22	552	541	527	510	491	468	443	416	386	354	320	285	251	217	185	(**23**)
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	580	573	566	558	550	540	529	...	...	...	...	...	...	...	...	(**23**)
32	580	573	566	558	550	540	529	...	...	...	...	...	...	...	...	(**23**)
33	580	573	566	558	550	540	529	...	...	...	...	...	...	...	...	(**23**)
34	580	573	566	558	550	540	529	...	...	...	...	...	...	...	...	(**23**)
35	580	573	566	558	550	540	529	...	...	...	...	...	...	...	...	(**23**)
36	580	573	566	558	550	540	529	...	...	...	...	...	...	...	...	(**23**)
37	580	573	566	558	550	540	529	...	...	...	...	...	...	...	...	(**23**)
38	580	573	566	558	550	540	529	...	...	...	...	...	...	...	...	(**23**)
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Nonferrous Materials (Cont'd)							
1	60Ni–25Cr–9.5Fe–2.1Al	Bar	SB–166	...	N06025	HW or CW ann.	$t \le 102$	676
2	60Ni–25Cr–9.5Fe–2.1Al	Smls. pipe & tube	SB–167	...	N06025	HW or CW ann.	...	676
3	40Ni–29Cr–15Fe–5Mo	Smls. & wld. ftgs.	SB–366	...	N06030	Solution ann.	...	585
4	40Ni–29Cr–15Fe–5Mo	Forgings	SB–462	...	N06030	Solution ann.	...	585
5	40Ni–29Cr–15Fe–5Mo	Rod	SB–581	...	N06030	Solution ann.	...	585
6	40Ni–29Cr–15Fe–5Mo	Plate, sheet, strip	SB–582	...	N06030	Solution ann.	...	585
7	40Ni–29Cr–15Fe–5Mo	Wld. pipe	SB–619	...	N06030	Solution ann.	...	585
8	40Ni–29Cr–15Fe–5Mo	Smls. pipe & tube	SB–622	...	N06030	Solution ann.	...	585
9	40Ni–29Cr–15Fe–5Mo	Wld. tube	SB–626	...	N06030	Solution ann.	...	585
10	58Ni–33Cr–8Mo	Smls. & wld. ftgs.	SB–366	...	N06035	Solution ann.	...	586
11	58Ni–33Cr–8Mo	Forgings	SB–462	...	N06035	Solution ann.	...	586
12	58Ni–33Cr–8Mo	Forgings	SB–564	...	N06035	Solution ann.	...	586
13	58Ni–33Cr–8Mo	Rod	SB–574	...	N06035	Solution ann.	...	586
14	58Ni–33Cr–8Mo	Plate, sheet, strip	SB–575	...	N06035	Solution ann.	...	586
15	58Ni–33Cr–8Mo	Wld. pipe	SB–619	...	N06035	Solution ann.	...	586
16	58Ni–33Cr–8Mo	Smls. pipe & tube	SB–622	...	N06035	Solution ann.	...	586
17	58Ni–33Cr–8Mo	Wld. tube	SB–626	...	N06035	Solution ann.	...	586
18	46Ni–27Cr–23Fe–2.75Si	Rod	SB–166	...	N06045	...	...	620
19	46Ni–27Cr–23Fe–2.75Si	Smls. pipe & tube	SB–167	...	N06045	...	...	620
20	46Ni–27Cr–23Fe–2.75Si	Plate, sheet, strip	SB–168	...	N06045	...	...	620
21	46Ni–27Cr–23Fe–2.75Si	Smls. & wld. ftgs.	SB–366	...	N06045	...	...	620
22	46Ni–27Cr–23Fe–2.75Si	Wld. tube	SB–516	...	N06045	...	...	620
23	46Ni–27Cr–23Fe–2.75Si	Wld. pipe	SB–517	...	N06045	...	...	620
24	46Ni–27Cr–23Fe–2.75Si	Forgings	SB–564	...	N06045	...	...	620
25	59Ni–23Cr–16Mo	Fittings	SB–366	CR5923	N06059	Annealed	...	690
26	59Ni–23Cr–16Mo	Fittings	SB–366	WP5923	N06059	Annealed	...	690
27	59Ni–23Cr–16Mo	Wld. fittings	SB–366	WP5923W	N06059	Annealed	...	690
28	59Ni–23Cr–16Mo	Fittings	SB–366	WP5923WX	N06059	Annealed	...	690
29	59Ni–23Cr–16Mo	Forged fittings	SB–462	...	N06059	Solution ann.	...	690
30	59Ni–23Cr–16Mo	Forgings	SB–564	...	N06059	Solution ann.	...	690
31	59Ni–23Cr–16Mo	Rod	SB–574	...	N06059	Solution ann.	...	690
32	59Ni–23Cr–16Mo	Plate, sheet, strip	SB–575	...	N06059	Solution ann.	...	690
33	59Ni–23Cr–16Mo	Wld. pipe	SB–619	...	N06059	Solution ann.	...	690
34	59Ni–23Cr–16Mo	Smls. pipe & tube	SB–622	...	N06059	Solution ann.	...	690
35	59Ni–23Cr–16Mo	Wld. tube	SB–626	...	N06059	Solution ann.	...	690
36	59Ni–23Cr–16Mo–1.6Cu	Fittings	SB–366	...	N06200	Solution ann.	...	690
37	59Ni–23Cr–16Mo–1.6Cu	Forgings	SB–462	...	N06200	Solution ann.	...	690
38	59Ni–23Cr–16Mo–1.6Cu	Forgings	SB–564	...	N06200	Solution ann.	...	690
39	59Ni–23Cr–16Mo–1.6Cu	Rod	SB–574	...	N06200	Solution ann.	...	690
40	59Ni–23Cr–16Mo–1.6Cu	Plate, sheet, strip	SB–575	...	N06200	Solution ann.	...	690
41	59Ni–23Cr–16Mo–1.6Cu	Wld. pipe	SB–619	...	N06200	Solution ann.	...	690
42	59Ni–23Cr–16Mo–1.6Cu	Smls. pipe & tube	SB–622	...	N06200	Solution ann.	...	690
43	59Ni–23Cr–16Mo–1.6Cu	Wld. tube	SB–626	...	N06200	Solution ann.	...	690
44	60Ni–19Cr–19Mo–1.8Ta	Smls. & wld. ftgs.	SB–366	...	N06210	Solution ann.	...	690
45	60Ni–19Cr–19Mo–1.8Ta	Forgings	SB–564	...	N06210	Solution ann.	...	690

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	676	676	676	675	675	675	675	675	675	675	675	672	665	655	642
2	676	676	676	675	675	675	675	675	675	675	675	672	665	655	642
3	586	585	561	544	531	520	515	511	507	503	499	495	490	485	477
4	586	585	561	544	531	520	515	511	507	503	499	495	490	485	477
5	586	585	561	544	531	520	515	511	507	503	499	495	490	485	477
6	586	585	561	544	531	520	515	511	507	503	499	495	490	485	477
7	586	585	561	544	531	520	515	511	507	503	499	495	490	485	477
8	586	585	561	544	531	520	515	511	507	503	499	495	490	485	477
9	586	585	561	544	531	520	515	511	507	503	499	495	490	485	477
10	586	586	576	551	532	519	514	509	505	500	496	490	483	476	468
11	586	586	576	551	532	519	514	509	505	500	496	490	483	476	468
12	586	586	576	551	532	519	514	509	505	500	496	490	483	476	468
13	586	586	576	551	532	519	514	509	505	500	496	490	483	476	468
14	586	586	576	551	532	519	514	509	505	500	496	490	483	476	468
15	586	586	576	551	532	519	514	509	505	500	496	490	483	476	468
16	586	586	576	551	532	519	514	509	505	500	496	490	483	476	468
17	586	586	576	551	532	519	514	509	505	500	496	490	483	476	468
18	621	620	600	570	548	535	531	527	523	520	516	511	505	497	488
19	621	620	600	570	548	535	531	527	523	520	516	511	505	497	488
20	621	620	600	570	548	535	531	527	523	520	516	511	505	497	488
21	621	620	600	570	548	535	531	527	523	520	516	511	505	497	488
22	621	620	600	570	548	535	531	527	523	520	516	511	505	497	488
23	621	620	600	570	548	535	531	527	523	520	516	511	505	497	488
24	621	620	600	570	548	535	531	527	523	520	516	511	505	497	488
25	689	689	689	677	655	635	625	616	608	600	594	589	585	582	579
26	689	689	689	677	655	635	625	616	608	600	594	589	585	582	579
27	689	689	689	677	655	635	625	616	608	600	594	589	585	582	579
28	689	689	689	677	655	635	625	616	608	600	594	589	585	582	579
29	689	689	689	677	655	635	625	616	608	600	594	589	585	582	579
30	689	689	689	677	655	635	625	616	608	600	594	589	585	582	579
31	689	689	689	677	655	635	625	616	608	600	594	589	585	582	579
32	689	689	689	677	655	635	625	616	608	600	594	589	585	582	579
33	689	689	689	677	655	635	625	616	608	600	594	589	585	582	579
34	689	689	689	677	655	635	625	616	608	600	594	589	585	582	579
35	689	689	689	677	655	635	625	616	608	600	594	589	585	582	579
36	690	690	690	690	649	636	631	626	621	615	609	602	595	588	582
37	690	690	690	690	649	636	631	626	621	615	609	602	595	588	582
38	690	690	690	690	649	636	631	626	621	615	609	602	595	588	582
39	690	690	690	690	649	636	631	626	621	615	609	602	595	588	582
40	690	690	690	690	649	636	631	626	621	615	609	602	595	588	582
41	690	690	690	690	649	636	631	626	621	615	609	602	595	588	582
42	690	690	690	690	649	636	631	626	621	615	609	602	595	588	582
43	690	690	690	690	649	636	631	626	621	615	609	602	595	588	582
44	690	690	688	688	652	639	634	629	624	620	617	613	610	607	604
45	690	690	688	688	652	639	634	629	624	620	617	613	610	607	604

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
		Nonferrous Materials (Cont'd)							
	1	60Ni–19Cr–19Mo–1.8Ta	Rod	SB–574	...	N06210	Solution ann.	...	690
	2	60Ni–19Cr–19Mo–1.8Ta	Plate, sheet, strip	SB–575	...	N06210	Solution ann.	...	690
	3	60Ni–19Cr–19Mo–1.8Ta	Wld. pipe	SB–619	...	N06210	Solution ann.	...	690
	4	60Ni–19Cr–19Mo–1.8Ta	Smls. pipe & tube	SB–622	...	N06210	Solution ann.	...	690
	5	60Ni–19Cr–19Mo–1.8Ta	Wld. tube	SB–626	...	N06210	Solution ann.	...	690
	6	57Ni–22Cr–14W–2Mo–La	Plate, sheet, strip	SB–435	...	N06230	Solution ann.	...	760
	7	57Ni–22Cr–14W–2Mo–La	Forgings	SB–564	...	N06230	Solution ann.	...	760
	8	57Ni–22Cr–14W–2Mo–La	Bar	SB–572	...	N06230	Solution ann.	...	760
	9	57Ni–22Cr–14W–2Mo–La	Wld. pipe	SB–619	...	N06230	Solution ann.	...	760
	10	57Ni–22Cr–14W–2Mo–La	Smls. pipe & tube	SB–622	...	N06230	Solution ann.	...	760
	11	57Ni–22Cr–14W–2Mo–La	Wld. tube	SB–626	...	N06230	Solution ann.	...	760
	12	61Ni–16Mo–16Cr	Smls. & wld. ftgs.	SB–366	...	N06455	Annealed	...	690
	13	61Ni–16Mo–16Cr	Rod	SB–574	...	N06455	Solution ann.	...	690
	14	61Ni–16Mo–16Cr	Plate, sheet, strip	SB–575	...	N06455	Solution ann.	...	690
	15	61Ni–16Mo–16Cr	Wld. pipe	SB–619	...	N06455	Solution ann.	...	690
	16	61Ni–16Mo–16Cr	Smls. pipe & tube	SB–622	...	N06455	Solution ann.	...	690
	17	61Ni–16Mo–16Cr	Wld. tube	SB–626	...	N06455	Solution ann.	...	690
	18	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Hot fin./ann.	>125	515
(**23**)	19	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Hot fin./ann.	>125	550
	20	72Ni–15Cr–8Fe	Smls. & wld. ftgs.	SB–366	...	N06600	Annealed	...	550
(**23**)	21	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Cold drawn/ann.	>125	550
	22	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Hot fin./ann.	≤125	550
	23	72Ni–15Cr–8Fe	Smls. tube	SB–163	...	N06600	Annealed	≤75	550
	24	72Ni–15Cr–8Fe	Bar	SB–166	...	N06600	Annealed	...	550
	25	72Ni–15Cr–8Fe	Plate	SB–168	...	N06600	Annealed	...	550
	26	72Ni–15Cr–8Fe	Wld. tube	SB–516	...	N06600	Annealed	...	550
	27	72Ni–15Cr–8Fe	Forgings	SB–564	...	N06600	...	...	550
(**23**)	28	72Ni–15Cr–8Fe	Pipe, tube	SB–167	...	N06600	Cold drawn/ann.	≤125	550
(**23**)	29	72Ni–15Cr–8Fe	Wld. pipe	SB–517	...	N06600	Cold drawn/ann.	...	550
	30	72Ni–15Cr–8Fe	Bar, rod	SB–166	...	N06600	Hot fin.	...	585
(**23**)	31	72Ni–15Cr–8Fe	Plate, sheet, strip	SB–168	...	N06600	Hot rolled	...	585
(**23**)	32	72Ni–15Cr–8Fe	Rounds	SB–166	...	N06600	Hot worked	$t > 75$	585
(**23**)	33	72Ni–15Cr–8Fe	Rounds	SB–166	...	N06600	Hot worked	$13 < t \le 75$	620
(**23**)	34	72Ni–15Cr–8Fe	Rounds	SB–166	...	N06600	Hot worked	$6 \le t \le 13$	655
	35	60Ni–23Cr–Fe	Smls. tube	SB–163	...	N06601	Annealed	≤75 O.D.	552
	36	60Ni–23Cr–Fe	Bar	SB–166	...	N06601	Annealed	...	552
	37	60Ni–23Cr–Fe	Smls. pipe & tube	SB–167	...	N06601	Annealed	...	552
	38	60Ni–23Cr–Fe	Plate, sheet, strip	SB–168	...	N06601	Annealed	...	552
	39	52Ni–22Cr–13Co–9Mo	Bar, rod	SB–166	...	N06617	Annealed	...	655
	40	52Ni–22Cr–13Co–9Mo	Smls. pipe & tube	SB–167	...	N06617	Annealed	...	655
	41	52Ni–22Cr–13Co–9Mo	Plate, sheet, strip	SB–168	...	N06617	Annealed	...	655
	42	52Ni–22Cr–13Co–9Mo	Forgings	SB–564	...	N06617	Annealed	...	655
(**23**)	43	52Ni–22Cr–13Co–9Mo	Wld. tube	SB–626	...	N06617	Solution ann.	...	655
	44	60Ni–22Cr–9Mo–3.5Cb	Plate, sheet, strip	SB–443	2	N06625	Solution ann.	...	690
	45	60Ni–22Cr–9Mo–3.5Cb	Smls. pipe & tube	SB–444	2	N06625	Solution ann.	...	690

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	690	690	688	688	652	639	634	629	624	620	617	613	610	607	604
2	690	690	688	688	652	639	634	629	624	620	617	613	610	607	604
3	690	690	688	688	652	639	634	629	624	620	617	613	610	607	604
4	690	690	688	688	652	639	634	629	624	620	617	613	610	607	604
5	690	690	688	688	652	639	634	629	624	620	617	613	610	607	604
6	758	758	758	744	726	712	708	705	702	700	699	697	695	693	690
7	758	758	758	744	726	712	708	705	702	700	699	697	695	693	690
8	758	758	758	744	726	712	708	705	702	700	699	697	695	693	690
9	758	758	758	744	726	712	708	705	702	700	699	697	695	693	690
10	758	758	758	744	726	712	708	705	702	700	699	697	695	693	690
11	758	758	758	744	726	712	708	705	702	700	699	697	695	693	690
12	689	689	689	689	684	676	672	668	663	658	652	646	640	636	634
13	689	689	689	689	684	676	672	668	663	658	652	646	640	636	634
14	689	689	689	689	684	676	672	668	663	658	652	646	640	636	634
15	689	689	689	689	684	676	672	668	663	658	652	646	640	636	634
16	689	689	689	689	684	676	672	668	663	658	652	646	640	636	634
17	689	689	689	689	684	676	672	668	663	658	652	646	640	636	634
18	517	517	517	517	517	517	517	517	517	517	517	517	515	503	489
19	552	552	552	552	552	552	552	552	552	552	552	552	549	537	523
20	552	552	552	552	552	552	552	552	552	552	552	552	549	537	523
21	552	552	552	552	552	552	552	552	552	552	552	552	549	537	523
22	552	552	552	552	552	552	552	552	552	552	552	552	549	537	523
23	552	552	552	552	552	552	552	552	552	552	552	552	549	537	523
24	552	552	552	552	552	552	552	552	552	552	552	552	549	537	523
25	552	552	552	552	552	552	552	552	552	552	552	552	549	537	523
26	552	552	552	552	552	552	552	552	552	552	552	552	549	537	523
27	552	552	552	552	552	552	552	552	552	552	552	552	549	537	523
28	552	552	552	552	552	552	552	552	552	552	552	543	549	537	523
29	552	552	552	552	552	552	552	552	552	552	552	543	549	537	523
30	586	586	586	586	586	586	586	586	586	586	586	586	586	586	560
31	586	586	586	586	586	586	586	586	586	586	586	586	586	586	560
32	586	586	586	586	586	586	586	586	586	586	586	586	...	...	560
33	620	620	620	620	620	620	620	620	620	620	620	620	...	...	594
34	655	655	655	655	655	655	655	655	655	655	655	655	...	...	627
35	552	552	552	552	552	552	552	552	552	552	552	552	551	549	546
36	552	552	552	552	552	552	552	552	552	552	552	552	551	549	546
37	552	552	552	552	552	552	552	552	552	552	552	552	551	549	546
38	552	552	552	552	552	552	552	552	552	552	552	552	551	549	546
39	655	655	655	655	655	647	640	635	629	624	620	616	611	607	603
40	655	655	655	655	655	647	640	635	629	624	620	616	611	607	603
41	655	655	655	655	655	647	640	635	629	624	620	616	611	607	603
42	655	655	655	655	655	647	640	635	629	624	620	616	611	607	603
43	655	655	655	655	655	647	640	635	629	624	620	616	611	607	603
44	690	690	690	690	687	685	685	685	685	685	685	685	685	682	675
45	690	690	690	690	687	685	685	685	685	685	685	685	685	682	675

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	473	454	433	408	382	...	...	...	...	...	...	...	...	...	...	
19	505	485	462	436	407	...	...	...	...	...	...	...	...	...	...	(**23**)
20	505	485	462	436	407	...	...	...	...	...	...	...	...	...	...	
21	505	485	462	436	407	...	...	...	...	...	...	...	...	...	...	(**23**)
22	505	485	462	436	407	...	...	...	...	...	...	...	...	...	...	
23	505	485	462	436	407	...	...	...	...	...	...	...	...	...	...	
24	505	485	462	436	407	...	...	...	...	...	...	...	...	...	...	
25	505	485	462	436	407	...	...	...	...	...	...	...	...	...	...	
26	505	485	462	436	407	...	...	...	...	...	...	...	...	...	...	
27	505	485	462	436	407	...	...	...	...	...	...	...	...	...	...	
28	505	485	462	436	407	...	...	...	...	...	...	...	...	...	...	(**23**)
29	505	485	462	436	407	...	...	...	...	...	...	...	...	...	...	(**23**)
30	539	513	485	453	418	...	...	...	...	...	...	...	...	...	...	
31	539	513	485	453	418	...	...	...	...	...	...	...	...	...	...	(**23**)
32	539	513	485	453	418	...	...	...	...	...	...	...	...	...	...	(**23**)
33	571	544	514	480	443	...	...	...	...	...	...	...	...	...	...	(**23**)
34	603	575	543	507	468	...	...	...	...	...	...	...	...	...	...	(**23**)
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
44	666	654	639	620	597	570	539	505	467	426	383	337	291	245	...	
45	666	654	639	620	597	570	539	505	467	426	383	337	291	245	...	

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Nonferrous Materials (Cont'd)							
1	60Ni–22Cr–9Mo–3.5Cb	Bar	SB–446	2	N06625	Solution ann.	...	690
2	60Ni–22Cr–9Mo–3.5Cb	Smls. & wld. ftgs.	SB–366	...	N06625	Annealed	...	690
3	60Ni–22Cr–9Mo–3.5Cb	Bar	SB–446	1	N06625	Annealed	100 < t ≤ 250	760
4	60Ni–22Cr–9Mo–3.5Cb	Forgings	SB–564	...	N06625	Annealed	100 < t ≤ 250	760
(**23**) 5	60Ni–22Cr–9Mo–3.5Cb	Plate	SB–443	1	N06625	Cold rolled/ann.	≤9.5	758
6	60Ni–22Cr–9Mo–3.5Cb	Plate, sheet	SB–443	1	N06625	Hot rolled/ann.	≤70	758
7	60Ni–22Cr–9Mo–3.5Cb	Sheet, strip	SB–443	1	N06625	Cold rolled/ann.	...	827
8	60Ni–22Cr–9Mo–3.5Cb	Smls. pipe	SB–444	1	N06625	Annealed	...	825
9	60Ni–22Cr–9Mo–3.5Cb	Bar	SB–446	1	N06625	Annealed	≤100	825
10	60Ni–22Cr–9Mo–3.5Cb	Forgings	SB–564	...	N06625	Annealed	≤100	825
11	60Ni–22Cr–9Mo–3.5Cb	Wld. tube	SB–704	...	N06625	Annealed	...	825
12	60Ni–22Cr–9Mo–3.5Cb	Wld. pipe	SB–705	...	N06625	Annealed	...	825
13	Ni–Cr–Mo–W	Forgings	SB–564	...	N06686	Solution ann.	...	689
14	Ni–Cr–Mo–W	Rod	SB–574	...	N06686	Solution ann.	...	689
15	Ni–Cr–Mo–W	Plate, sheet, strip	SB–575	...	N06686	Solution ann.	...	689
16	Ni–Cr–Mo–W	Wld. pipe	SB–619	...	N06686	Solution ann.	...	689
17	Ni–Cr–Mo–W	Smls. pipe & tube	SB–622	...	N06686	Solution ann.	...	689
18	Ni–Cr–Mo–W	Wld. tube	SB–626	...	N06686	Solution ann.	...	689
19	58Ni–29Cr–9Fe	Smls. pipe & tube	SB–167	...	N06690	Hot worked/ann.	>127 O.D.	515
20	58Ni–29Cr–9Fe	Smls. tube	SB–163	...	N06690	Annealed	...	585
21	58Ni–29Cr–9Fe	Bar, rod	SB–166	...	N06690	Annealed	...	585
22	58Ni–29Cr–9Fe	Plate, sheet, strip	SB–168	...	N06690	Annealed	...	585
23	58Ni–29Cr–9Fe	Forgings	SB–564	...	N06690	Annealed	...	585
24	58Ni–29Cr–9Fe	Smls. pipe & tube	SB–167	...	N06690	Cold worked/ann.	≤127 O.D.	586
25	58Ni–29Cr–9Fe	Smls. pipe & tube	SB–167	...	N06690	Cold worked/ann.	>127 O.D.	586
26	58Ni–29Cr–9Fe	Smls. pipe & tube	SB–167	...	N06690	Hot worked/ann.	≤127 O.D.	586
27	49Ni–25Cr–18Fe–6Mo	Plate, sheet, strip	SB–582	...	N06975	Solution ann.	...	585
28	49Ni–25Cr–18Fe–6Mo	Wld. pipe	SB–619	...	N06975	Solution ann.	...	585
29	49Ni–25Cr–18Fe–6Mo	Smls. pipe & tube	SB–622	...	N06975	Solution ann.	...	585
30	49Ni–25Cr–18Fe–6Mo	Wld. tube	SB–626	...	N06975	Solution ann.	...	585
31	47Ni–22Cr–20Fe–7Mo	Rod	SB–581	...	N06985	Annealed	>19	585
32	47Ni–22Cr–20Fe–7Mo	Plate, sheet, strip	SB–582	...	N06985	Annealed	>19	585
33	47Ni–22Cr–20Fe–7Mo	Smls. & wld. ftgs.	SB–366	...	N06985	Annealed	...	620
34	47Ni–22Cr–20Fe–7Mo	Rod	SB–581	...	N06985	Annealed	≤19	620
35	47Ni–22Cr–20Fe–7Mo	Plate, sheet, strip	SB–582	...	N06985	Annealed	≤19	620
36	47Ni–22Cr–20Fe–7Mo	Wld. pipe	SB–619	...	N06985	Annealed	...	620
37	47Ni–22Cr–20Fe–7Mo	Smls. pipe & tube	SB–622	...	N06985	Annealed	...	620
38	47Ni–22Cr–20Fe–7Mo	Wld. tube	SB–626	...	N06985	Annealed	...	620
39	35Ni–35Fe–20Cr–Cb	Forgings	SB–462	...	N08020	Annealed	...	550
40	35Ni–35Fe–20Cr–Cb	Plate	SB–463	...	N08020	Annealed	...	550
41	35Ni–35Fe–20Cr–Cb	Bar	SB–473	...	N08020	Annealed	...	550
42	35Ni–35Fe–20Cr–Cb	Smls. pipe & tube	SB–729	...	N08020	Annealed	...	550
43	35Ni–35Fe–20Cr–Cb	Wld. pipe	SB–464	...	N08020	Wld. ann.	...	550
44	35Ni–35Fe–20Cr–Cb	Wld. tube	SB–468	...	N08020	Wld. ann.	...	550
45	35Ni–35Fe–20Cr–Cb	Smls. & wld. ftgs.	SB–366	...	N08020	Annealed	...	585

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	690	690	690	690	687	685	685	685	685	685	685	685	685	682	675
2	690	690	677	677	677	677	677	677	677	677	677	677	677	676	670
3	760	760	745	745	745	745	745	745	745	745	745	745	746	744	738
4	760	760	745	745	745	745	745	745	745	745	745	745	746	744	738
5	758	758	758	744	730	719	714	708	702	696	691	685	679	672	665
6	760	760	745	745	745	745	745	745	745	745	745	745	746	744	738
7	825	825	809	809	809	809	809	809	809	809	809	809	809	808	801
8	825	825	809	809	809	809	809	809	809	809	809	809	809	808	801
9	825	825	809	809	809	809	809	809	809	809	809	809	809	808	801
10	825	825	809	809	809	809	809	809	809	809	809	809	809	808	801
11	825	825	809	809	809	809	809	809	809	809	809	809	809	808	801
12	825	825	809	809	809	809	809	809	809	809	809	809	809	808	801
13	689	689	680	659	642	629	624	619	613	608	601	594	585	575	564
14	689	689	680	659	642	629	624	619	613	608	601	594	585	575	564
15	689	689	680	659	642	629	624	619	613	608	601	594	585	575	564
16	689	689	680	659	642	629	624	619	613	608	601	594	585	575	564
17	689	689	680	659	642	629	624	619	613	608	601	594	585	575	564
18	689	689	680	659	642	629	624	619	613	608	601	594	585	575	564
19	517	516	509	501	494	489	487	486	485	484	482	480	476	471	463
20	586	586	579	566	558	554	552	551	550	549	547	543	539	533	524
21	586	586	579	566	558	554	552	551	550	549	547	543	539	533	524
22	586	586	579	566	558	554	552	551	550	549	547	543	539	533	524
23	586	586	579	566	558	554	552	551	550	549	547	543	539	533	524
24	586	585	577	567	560	554	552	551	550	548	547	544	540	534	525
25	586	585	577	567	560	554	552	551	549	548	547	544	540	534	525
26	586	585	577	567	560	554	552	551	550	548	547	544	540	534	525
27	586	586	586	577	565	556	552	549	545	541	538	534	529	524	517
28	586	586	586	577	565	556	552	549	545	541	538	534	529	524	517
29	586	586	586	577	565	556	552	549	545	541	538	534	529	524	517
30	586	586	586	577	565	556	552	549	545	541	538	534	529	524	517
31	586	586	577	556	540	528	524	520	517	513	509	504	499	492	484
32	586	586	577	556	540	528	524	520	517	513	509	504	499	492	484
33	621	620	611	589	571	560	555	551	547	543	539	534	528	521	512
34	621	620	611	589	571	560	555	551	547	543	539	534	528	521	512
35	621	620	611	589	571	560	555	551	547	543	539	534	528	521	512
36	621	620	611	589	571	560	555	551	547	543	539	534	528	521	512
37	621	620	611	589	571	560	555	551	547	543	539	534	528	521	512
38	621	620	611	589	571	560	555	551	547	543	539	534	528	521	512
39	552	551	546	536	533	533	533	530	528	526	526	526	...	...	...
40	552	551	546	536	533	533	533	530	528	526	526	526	...	...	...
41	552	551	546	536	533	533	533	530	528	526	526	526	...	...	...
42	552	551	546	536	533	533	533	530	528	526	526	526	...	...	...
43	552	551	546	536	533	533	533	530	528	526	526	526	...	...	...
44	552	551	546	536	533	533	533	530	528	526	526	526	...	...	...
45	586	586	580	569	567	566	566	564	561	559	559	559	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	666	654	639	620	597	570	539	505	467	426	383	337	291	245	...	
2	662	650	634	614	589	561	528	491	450	407	360	312	263	214	...	
3	729	716	698	676	649	618	581	541	496	448	397	344	290	236	...	
4	729	716	698	676	649	618	581	541	496	448	397	344	290	236	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
6	729	716	698	676	649	618	581	541	496	448	397	344	290	236	...	
7	791	777	758	734	705	670	631	587	539	486	431	373	315	256	...	
8	791	777	758	734	705	670	631	587	539	486	431	373	315	256	...	
9	791	777	758	734	705	670	631	587	539	486	431	373	315	256	...	
10	791	777	758	734	705	670	631	587	539	486	431	373	315	256	...	
11	791	777	758	734	705	670	631	587	539	486	431	373	315	256	...	
12	791	777	758	734	705	670	631	587	539	486	431	373	315	256	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Nonferrous Materials (Cont'd)							
1	37Ni–33Fe–23Cr–4Mo–Cu	Wld. pipe	SB–464	...	N08024	Wld. ann.	...	550
2	37Ni–33Fe–23Cr–4Mo–Cu	Wld. tube	SB–468	...	N08024	Wld. ann.	...	550
3	35Ni–30Fe–24Cr–6Mo–Cu	Wld. pipe	SB–464	...	N08026	Wld. ann.	...	550
4	35Ni–30Fe–24Cr–6Mo–Cu	Wld. tube	SB–468	...	N08026	Wld. ann.	...	550
5	31Ni–31Fe–29Cr–Mo	Smls. tube	SB–668	...	N08028	Annealed	...	505
6	31Ni–31Fe–29Cr–Mo	Plate, sheet, strip	SB–709	...	N08028	Annealed	...	505
7	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Smls. & wld. ftgs.	SB–366	...	N08031	...	...	650
8	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Forgings	SB–564	...	N08031	...	...	650
9	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Rod	SB–581	...	N08031	...	...	650
10	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Wld. pipe	SB–619	...	N08031	...	...	650
11	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Smls. pipe & tube	SB–622	...	N08031	...	...	650
12	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Plate, sheet, strip	SB–625	...	N08031	...	...	650
13	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Wld. tube	SB–626	...	N08031	...	...	650
14	37Ni–33Fe–25Cr	Condenser tubes	SB–163	...	N08120	Solution ann.	...	621
15	37Ni–33Fe–25Cr	Smls. & wld. ftgs.	SB–366	...	N08120	Solution ann.	...	621
16	37Ni–33Fe–25Cr	Smls. pipe & tube	SB–407	...	N08120	Solution ann.	...	621
17	37Ni–33Fe–25Cr	Bar, rod	SB–408	...	N08120	Solution ann.	...	621
18	37Ni–33Fe–25Cr	Plate, sheet, strip	SB–409	...	N08120	Solution ann.	...	621
19	37Ni–33Fe–25Cr	Wld. pipe	SB–514	...	N08120	Solution ann.	...	621
20	37Ni–33Fe–25Cr	Wld. tube	SB–515	...	N08120	Solution ann.	...	621
21	37Ni–33Fe–25Cr	Forgings	SB–564	...	N08120	Solution ann.	...	621
22	26Ni–43Fe–22Cr–5Mo	Wld. pipe	SB–619	...	N08320	Solution ann.	...	515
23	26Ni–43Fe–22Cr–5Mo	Plate, sheet, strip	SB–620	...	N08320	Solution ann.	...	515
24	26Ni–43Fe–22Cr–5Mo	Rod	SB–621	...	N08320	Solution ann.	...	515
25	26Ni–43Fe–22Cr–5Mo	Smls. pipe & tube	SB–622	...	N08320	Solution ann.	...	515
26	26Ni–43Fe–22Cr–5Mo	Wld. tube	SB–626	...	N08320	Solution ann.	...	515
(**23**) 27	35Ni–19Cr–1¼Si	Bar	SB–511	...	N08330	...	...	485
(**23**) 28	35Ni–19Cr–1¼Si	Pipe	SB–535	...	N08330	...	...	485
(**23**) 29	35Ni–19Cr–1¼Si	Plate	SB–536	...	N08330	...	...	485
(**23**) 30	35Ni–19Cr–1¼Si	Smls. & wld. ftgs.	SB–366	...	N08330	Annealed	...	485
(**23**) 31	35Ni–19Cr–1¼Si	Smls. & wld. pipe	SB–535	...	N08330	Annealed	...	485
(**23**) 32	35Ni–19Cr–1¼Si	Plate, sheet, strip	SB–536	...	N08330	Annealed	...	485
(**23**) 33	35Ni–19Cr–1¼Si	Wld. pipe	SB–710	...	N08330	Annealed	...	485
34	35Ni–23Cr–7.5Mo–N	Plate, sheet, strip	SB–625	...	N08354	Solution ann.	...	640
35	35Ni–23Cr–7.5Mo–N	Bar, wire	SB–649	...	N08354	Solution ann.	...	640
36	35Ni–23Cr–7.5Mo–N	Wld. pipe	SB–673	...	N08354	Solution ann.	...	640
37	35Ni–23Cr–7.5Mo–N	Wld. tube	SB–674	...	N08354	Solution ann.	...	640
38	35Ni–23Cr–7.5Mo–N	Smls. pipe & tube	SB–677	...	N08354	Solution ann.	...	640
39	46Fe–24Ni–21Cr–6Mo–N	Forgings	SB–462	...	N08367	Solution ann.	...	655
40	46Fe–24Ni–21Cr–6Mo–N	Forgings	SB–564	...	N08367	Solution ann.	...	655
41	46Fe–24Ni–21Cr–6Mo–N	Wld. pipe	SB–675	...	N08367	Solution ann.	>5	655
42	46Fe–24Ni–21Cr–6Mo–N	Wld. tube	SB–676	...	N08367	Solution ann.	>5	655
43	46Fe–24Ni–21Cr–6Mo–N	Plate, sheet, strip	SB–688	...	N08367	Solution ann.	>5	655
44	46Fe–24Ni–21Cr–6Mo–N	Smls. pipe & tube	SB–690	...	N08367	Solution ann.	>5	655
45	46Fe–24Ni–21Cr–6Mo–N	Bar, rod, wire	SB–691	...	N08367	Solution ann.	...	655

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	552	551	544	531	518	506	501	496	492	488	485	482	480	478	475
2	552	551	544	531	518	506	501	496	492	488	485	482	480	478	475
3	552	551	542	527	513	501	495	489	482	476	470	464	459	455	450
4	552	551	542	527	513	501	495	489	482	476	470	464	459	455	450
5	503	503	485	467	453	442	437	432	427	423	419	414	408	403	397
6	503	503	485	467	453	442	437	432	427	423	419	414	408	403	397
7	648	647	623	594	567	545	535	527	520	515	510	506	500	493	...
8	648	647	623	594	567	545	535	527	520	515	510	506	500	493	...
9	648	647	623	594	567	545	535	527	520	515	510	506	500	493	...
10	648	647	623	594	567	545	535	527	520	515	510	506	500	493	...
11	648	647	623	594	567	545	535	527	520	515	510	506	500	493	...
12	648	647	623	594	567	545	535	527	520	515	510	506	500	493	...
13	648	647	623	594	567	545	535	527	520	515	510	506	500	493	...
14	621	621	604	586	574	568	566	565	564	563	561	559	555	551	544
15	621	621	604	586	574	568	566	565	564	563	561	559	555	551	544
16	621	621	604	586	574	568	566	565	564	563	561	559	555	551	544
17	621	621	604	586	574	568	566	565	564	563	561	559	555	551	544
18	621	621	604	586	574	568	566	565	564	563	561	559	555	551	544
19	621	621	604	586	574	568	566	565	564	563	561	559	555	551	544
20	621	621	604	586	574	568	566	565	564	563	561	559	555	551	544
21	621	621	604	586	574	568	566	565	564	563	561	559	555	551	544
22	517	517	511	496	486	483	482	482	482	481	479	477	...	...	...
23	517	517	511	496	486	483	482	482	482	481	479	477	...	...	...
24	517	517	511	496	486	483	482	482	482	481	479	477	...	...	...
25	517	517	511	496	486	483	482	482	482	481	479	477	...	...	...
26	517	517	511	496	486	483	482	482	482	481	479	477	...	...	...
27	483	483	483	474	469	469	469	469	469	469	469	469	468	464	453
28	483	483	483	474	469	469	469	469	469	469	469	469	468	464	453
29	483	483	483	474	469	469	469	469	469	469	469	469	468	464	453
30	483	483	483	474	469	469	469	469	469	469	469	469	468	464	453
31	483	483	483	474	469	469	469	469	469	469	469	469	468	464	453
32	483	483	483	474	469	469	469	469	469	469	469	469	468	464	453
33	483	483	483	474	469	469	469	469	469	469	469	469	468	464	453
34	640	637	602	577	559	546	542	537	533	529	524	519	...	...	...
35	640	637	602	577	559	546	542	537	533	529	524	519	...	...	...
36	640	637	602	577	559	546	542	537	533	529	524	519	...	...	...
37	640	637	602	577	559	546	542	537	533	529	524	519	...	...	...
38	640	637	602	577	559	546	542	537	533	529	524	519	...	...	...
39	655	654	618	594	577	565	560	556	552	549	546	543	539	535	...
40	655	654	618	594	577	565	560	556	552	549	546	543	539	535	...
41	655	654	618	594	577	565	560	556	552	549	546	543	539	535	...
42	655	654	618	594	577	565	560	556	552	549	546	543	539	535	...
43	655	654	618	594	577	565	560	556	552	549	546	543	539	535	...
44	655	654	618	594	577	565	560	556	552	549	546	543	539	535	...
45	655	654	618	594	577	565	560	556	552	549	546	543	539	535	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	440	425	407	388	366	342	316	288	260	232	203	176	157	132	111	(**23**)
28	440	425	407	388	366	342	316	288	260	232	203	176	157	132	111	(**23**)
29	440	425	407	388	366	342	316	288	260	232	203	176	157	132	111	(**23**)
30	440	425	407	388	366	342	316	288	260	232	203	176	157	132	111	(**23**)
31	440	425	407	388	366	342	316	288	260	232	203	176	157	132	111	(**23**)
32	440	425	407	388	366	342	316	288	260	232	203	176	157	132	111	(**23**)
33	440	425	407	388	366	342	316	288	260	232	203	176	157	132	111	(**23**)
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
		Nonferrous Materials (Cont'd)							
	1	46Fe–24Ni–21Cr–6Mo–N	Wld. pipe	SB–804	...	N08367	Solution ann.	>5	655
	2	46Fe–24Ni–21Cr–6Mo–N	Wld. pipe	SB–675	...	N08367	Solution ann.	≤5	690
	3	46Fe–24Ni–21Cr–6Mo–N	Wld. tube	SB–676	...	N08367	Solution ann.	≤5	690
	4	46Fe–24Ni–21Cr–6Mo–N	Plate, sheet, strip	SB–688	...	N08367	Solution ann.	≤5	690
	5	46Fe–24Ni–21Cr–6Mo–N	Smls. pipe & tube	SB–690	...	N08367	Solution ann.	≤5	690
	6	46Fe–24Ni–21Cr–6Mo–N	Wld. pipe	SB–804	...	N08367	Solution ann.	≤5	690
	7	46Fe–24Ni–21Cr–6Mo–N	Castings	SA–351	CN3MN	J94651	Solution ann.	...	550
	8	25Ni–47Fe–21Cr–5Mo	Plate, sheet, strip	SB–599	...	N08700	Solution ann.	...	550
	9	25Ni–47Fe–21Cr–5Mo	Bar, wire	SB–672	...	N08700	Solution ann.	...	550
	10	32Ni–45Fe–20Cr–Cb	Castings	SA–351	CT15C	...	As cast	...	435
(**23**)	11	33Ni–42Fe–21Cr	Smls. tube	SB–163	...	N08800	Annealed	...	515
(**23**)	12	33Ni–42Fe–21Cr	Smls. & wld. ftgs.	SB–366	...	N08800	Annealed	...	515
(**23**)	13	33Ni–42Fe–21Cr	Smls. pipe & tube	SB–407	...	N08800	Annealed	...	515
(**23**)	14	33Ni–42Fe–21Cr	Bar	SB–408	...	N08800	Annealed	...	515
(**23**)	15	33Ni–42Fe–21Cr	Plate	SB–409	...	N08800	Annealed	...	515
(**23**)	16	33Ni–42Fe–21Cr	Wld. pipe	SB–514	...	N08800	Annealed	...	515
(**23**)	17	33Ni–42Fe–21Cr	Wld. tube	SB–515	...	N08800	Annealed	...	515
(**23**)	18	33Ni–42Fe–21Cr	Forgings	SB–564	...	N08800	Annealed	...	515
(**23**)	19	33Ni–42Fe–21Cr	Smls. tube	SB–163	...	N08800	Cold worked	...	570
	20	32Ni–44Fe–21Cr	Smls. tube	SB–163	...	N08801	Ann./stabilized	...	450
	21	32Ni–44Fe–21Cr	Smls. pipe & tube	SB–407	...	N08801	Ann./stabilized	...	450
(**23**)	22	33Ni–42Fe–21Cr	Smls. tube	SB–163	...	N08810	Annealed	...	450
(**23**)	23	33Ni–42Fe–21Cr	Smls. pipe & tube	SB–407	...	N08810	Annealed	...	450
(**23**)	24	33Ni–42Fe–21Cr	Bar	SB–408	...	N08810	Annealed	...	450
(**23**)	25	33Ni–42Fe–21Cr	Plate	SB–409	...	N08810	Annealed	...	450
(**23**)	26	33Ni–42Fe–21Cr	Wld. pipe	SB–514	...	N08810	Annealed	...	450
(**23**)	27	33Ni–42Fe–21Cr	Wld. tube	SB–515	...	N08810	Annealed	...	450
(**23**)	28	33Ni–42Fe–21Cr	Forgings	SB–564	...	N08810	Annealed	...	450
(**23**)	29	33Ni–42Fe–21Cr	Smls. tube	SB–163	...	N08811	Annealed	...	450
(**23**)	30	33Ni–42Fe–21Cr	Smls. pipe & tube	SB–407	...	N08811	Annealed	...	450
(**23**)	31	33Ni–42Fe–21Cr	Bar	SB–408	...	N08811	Annealed	...	450
(**23**)	32	33Ni–42Fe–21Cr	Plate	SB–409	...	N08811	Annealed	...	450
(**23**)	33	33Ni–42Fe–21Cr	Wld. tube	SB–515	...	N08811	Annealed	...	450
(**23**)	34	33Ni–42Fe–21Cr	Forgings	SB–564	...	N08811	Annealed	...	450
	35	42Ni–21.5Cr–3Mo–2.3Cu	Smls. tube	SB–163	...	N08825	Annealed	...	585
	36	42Ni–21.5Cr–3Mo–2.3Cu	Smls. & wld. ftgs.	SB–366	...	N08825	Annealed	...	585
	37	42Ni–21.5Cr–3Mo–2.3Cu	Smls. pipe & tube	SB–423	...	N08825	Cold worked/ann.	...	585
	38	42Ni–21.5Cr–3Mo–2.3Cu	Plate	SB–424	...	N08825	Annealed	...	585
	39	42Ni–21.5Cr–3Mo–2.3Cu	Bar, rod	SB–425	...	N08825	Annealed	...	585
	40	42Ni–21.5Cr–3Mo–2.3Cu	Forgings	SB–564	...	N08825	Annealed	...	585
	41	42Ni–21.5Cr–3Mo–2.3Cu	Wld. tube	SB–704	...	N08825	Annealed	...	585
	42	42Ni–21.5Cr–3Mo–2.3Cu	Wld. pipe	SB–705	...	N08825	Annealed	...	585
	43	44Fe–25Ni–21Cr–Mo	Forgings	SA–182	...	N08904	Annealed	...	490
(**23**)	44	44Fe–25Ni–21Cr–Mo	Smls. tube	SA–213	...	N08904	Annealed	...	490
	45	44Fe–25Ni–21Cr–Mo	Plate, sheet, strip	SA–240	...	N08904	Annealed	...	490

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	655	654	618	594	577	565	560	556	552	549	546	543	539	535	...
2	689	688	651	626	608	595	590	586	581	578	575	572	568	564	...
3	689	688	651	626	608	595	590	586	581	578	575	572	568	564	...
4	689	688	651	626	608	595	590	586	581	578	575	572	568	564	...
5	689	688	651	626	608	595	590	586	581	578	575	572	568	564	...
6	689	688	651	626	608	595	590	586	581	578	575	572	568	564	...
7	552	516	479	455	437	423	417	411	405	400	395	390	386	383	379
8	552	551	546	534	520	517	517	515	...	...	...	...	...	...	...
9	552	551	546	534	520	517	517	515	...	...	...	...	...	...	...
10	434	434	434	434	434	434	434	434	434	434	434	434	434	...	...
11	517	517	517	517	515	514	514	514	513	512	510	506	501	495	487
12	517	517	517	517	515	514	514	514	513	512	510	506	501	495	487
13	517	517	517	517	515	514	514	514	513	512	510	506	501	495	487
14	517	517	517	517	515	514	514	514	513	512	510	506	501	495	487
15	517	517	517	517	515	514	514	514	513	512	510	506	501	495	487
16	517	517	517	517	515	514	514	514	513	512	510	506	501	495	487
17	517	517	517	517	515	514	514	514	513	512	510	506	501	495	487
18	517	517	517	517	515	514	514	514	513	512	510	506	501	495	487
19	572	572	572	570	558	552	551	551	...	...	...	...	...	...	...
20	448	448	448	446	442	440	440	440	440	440	440	440	439	437	432
21	448	448	448	446	442	440	440	440	440	440	440	440	439	437	432
22	448	448	448	446	442	440	440	440	440	440	440	440	439	437	432
23	448	448	448	446	442	440	440	440	440	440	440	440	439	437	432
24	448	448	448	446	442	440	440	440	440	440	440	440	439	437	432
25	448	448	448	446	442	440	440	440	440	440	440	440	439	437	432
26	448	448	448	446	442	440	440	440	440	440	440	440	439	437	432
27	448	448	448	446	442	440	440	440	440	440	440	440	439	437	432
28	448	448	448	446	442	440	440	440	440	440	440	440	439	437	432
29	448	448	448	446	442	440	440	440	440	440	440	440	439	437	432
30	448	448	448	446	442	440	440	440	440	440	440	440	439	437	432
31	448	448	448	446	442	440	440	440	440	440	440	440	439	437	432
32	448	448	448	446	442	440	440	440	440	440	440	440	439	437	432
33	448	448	448	446	442	440	440	440	440	440	440	440	439	437	432
34	448	448	448	446	442	440	440	440	440	440	440	440	439	437	432
35	586	586	586	586	586	586	585	583	580	577	573	569	564	557	549
36	586	586	586	586	586	586	585	583	580	577	573	569	564	557	549
37	586	586	586	586	586	586	585	583	580	577	573	569	564	557	549
38	586	586	586	586	586	586	585	583	580	577	573	569	564	557	549
39	586	586	586	586	586	586	585	583	580	577	573	569	564	557	549
40	585	585	585	585	585	585	...	582	579	576	572	568	563	557	549
41	586	586	586	586	586	586	585	583	580	577	573	569	564	557	549
42	586	586	586	586	586	586	585	583	580	577	573	569	564	557	549
43	490	489	467	452	441	431	427	424	420	417	...	...	...	...	...
44	490	489	467	452	441	431	427	424	420	417	...	...	...	...	...
45	490	489	467	452	441	431	427	424	420	417	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	465	445	421	393	363	330	296	263	231	204	184	173	175	194	...	(**23**)
12	465	445	421	393	363	330	296	263	231	204	184	173	175	194	...	(**23**)
13	465	445	421	393	363	330	296	263	231	204	184	173	175	194	...	(**23**)
14	465	445	421	393	363	330	296	263	231	204	184	173	175	194	...	(**23**)
15	465	445	421	393	363	330	296	263	231	204	184	173	175	194	...	(**23**)
16	465	445	421	393	363	330	296	263	231	204	184	173	175	194	...	(**23**)
17	465	445	421	393	363	330	296	263	231	204	184	173	175	194	...	(**23**)
18	465	445	421	393	363	330	296	263	231	204	184	173	175	194	...	(**23**)
19	515	492	466	485	401	365	328	291	256	226	203	191	193	214	...	(**23**)
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	423	410	395	379	360	340	319	296	273	249	224	200	176	153	131	(**23**)
23	423	410	395	379	360	340	319	296	273	249	224	200	176	153	131	(**23**)
24	423	410	395	379	360	340	319	296	273	249	224	200	176	153	131	(**23**)
25	423	410	395	379	360	340	319	296	273	249	224	200	176	153	131	(**23**)
26	423	410	395	379	360	340	319	296	273	249	224	200	176	153	131	(**23**)
27	423	410	395	379	360	340	319	296	273	249	224	200	176	153	131	(**23**)
28	423	410	395	379	360	340	319	296	273	249	224	200	176	153	131	(**23**)
29	423	410	395	379	360	340	319	296	273	249	224	200	176	153	131	(**23**)
30	423	410	395	379	360	340	319	296	273	249	224	200	176	153	131	(**23**)
31	423	410	395	379	360	340	319	296	273	249	224	200	176	153	131	(**23**)
32	423	410	395	379	360	340	319	296	273	249	224	200	176	153	131	(**23**)
33	423	410	395	379	360	340	319	296	273	249	224	200	176	153	131	(**23**)
34	423	410	395	379	360	340	319	296	273	249	224	200	176	153	131	(**23**)
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
		Nonferrous Materials (Cont'd)							
	1	44Fe–25Ni–21Cr–Mo	Wld. tube	SA–249	...	N08904	Annealed	...	490
	2	44Fe–25Ni–21Cr–Mo	Smls. & wld. pipe	SA–312	...	N08904	Annealed	...	490
	3	44Fe–25Ni–21Cr–Mo	Fittings	SA–403	...	N08904	Annealed	...	490
(**23**)	4	44Fe–25Ni–21Cr–Mo	Bar	SA–479	...	N08904	Annealed	...	490
	5	25Ni–20Cr–6Mo–Cu–N	Plate, sheet, strip	SB–625	...	N08925	Annealed	...	600
	6	25Ni–20Cr–6Mo–Cu–N	Bar, wire	SB–649	...	N08925	Annealed	...	600
	7	25Ni–20Cr–6Mo–Cu–N	Wld. pipe	SB–673	...	N08925	Annealed	...	600
	8	25Ni–20Cr–6Mo–Cu–N	Wld. tube	SB–674	...	N08925	Annealed	...	600
	9	25Ni–20Cr–6Mo–Cu–N	Smls. pipe & tube	SB–677	...	N08925	Annealed	...	600
	10	62Ni–28Mo–5Fe	Plate	SB–333	...	N10001	Annealed	...	690
	11	62Ni–28Mo–5Fe	Smls. & wld. ftgs.	SB–366	...	N10001	Annealed	...	690
	12	62Ni–28Mo–5Fe	Wld. pipe	SB–619	...	N10001	Solution ann.	...	690
	13	62Ni–28Mo–5Fe	Smls. pipe & tube	SB–622	...	N10001	Solution ann.	...	690
	14	62Ni–28Mo–5Fe	Wld. tube	SB–626	...	N10001	Solution ann.	...	690
	15	62Ni–28Mo–5Fe	Rod	SB–335	...	N10001	Annealed	...	690
	16	62Ni–28Mo–5Fe	Sheet, strip	SB–333	...	N10001	Annealed	...	795
	17	70Ni–16Mo–7Cr–5Fe	Smls. & wld. ftgs.	SB–366	...	N10003	Annealed	...	690
	18	70Ni–16Mo–7Cr–5Fe	Plate, sheet, strip	SB–434	...	N10003	Annealed	...	690
	19	70Ni–16Mo–7Cr–5Fe	Rod	SB–573	...	N10003	Annealed	...	690
	20	62Ni–25Mo–8Cr–2Fe	Smls. & wld. ftgs.	SB–366	...	N10242	Annealed	...	725
	21	62Ni–25Mo–8Cr–2Fe	Plate, sheet, strip	SB–434	...	N10242	Annealed	...	725
	22	62Ni–25Mo–8Cr–2Fe	Forgings	SB–564	...	N10242	Annealed	...	725
	23	62Ni–25Mo–8Cr–2Fe	Rod	SB–573	...	N10242	Annealed	...	725
	24	62Ni–25Mo–8Cr–2Fe	Wld. pipe	SB–619	...	N10242	Solution ann.	...	725
	25	62Ni–25Mo–8Cr–2Fe	Smls. pipe & tube	SB–622	...	N10242	Solution ann.	...	725
	26	62Ni–25Mo–8Cr–2Fe	Wld. tube	SB–626	...	N10242	Solution ann.	...	725
(**23**)	27	54Ni–16Mo–15Cr	Smls. & wld. ftgs.	SB–366	...	N10276	Solution ann.	...	690
(**23**)	28	54Ni–16Mo–15Cr	Forgings	SB–462	...	N10276	Solution ann.	...	690
(**23**)	29	54Ni–16Mo–15Cr	Forgings	SB–564	...	N10276	Solution ann.	...	690
(**23**)	30	54Ni–16Mo–15Cr	Rod	SB–574	...	N10276	Solution ann.	...	690
(**23**)	31	54Ni–16Mo–15Cr	Plate, sheet, strip	SB–575	...	N10276	Solution ann.	...	690
(**23**)	32	54Ni–16Mo–15Cr	Wld. pipe	SB–619	...	N10276	Solution ann.	...	690
(**23**)	33	54Ni–16Mo–15Cr	Smls. pipe & tube	SB–622	...	N10276	Solution ann.	...	690
(**23**)	34	54Ni–16Mo–15Cr	Wld. tube	SB–626	...	N10276	Solution ann.	...	690
	35	62Ni–22Mo–15Cr	Smls. & wld. fittings	SB–366	...	N10362	Solution ann.	...	725
	36	62Ni–22Mo–15Cr	Forgings	SB–462	...	N10362	Solution ann.	...	725
	37	62Ni–22Mo–15Cr	Forgings	SB–564	...	N10362	Solution ann.	...	725
	38	62Ni–22Mo–15Cr	Rod	SB–574	...	N10362	Solution ann.	...	725
	39	62Ni–22Mo–15Cr	Plate, sheet, strip	SB–575	...	N10362	Solution ann.	...	725
	40	62Ni–22Mo–15Cr	Wld. pipe	SB–619	...	N10362	Solution ann.	...	725
	41	62Ni–22Mo–15Cr	Smls. pipe & tube	SB–622	...	N10362	Solution ann.	...	725
	42	62Ni–22Mo–15Cr	Wld. tube	SB–626	...	N10362	Solution ann.	...	725
	43	Ni–28Mo–3Fe–1.3Cr–0.25Al	Plate, sheet, strip	SB–333	...	N10629	...	...	760
	44	Ni–28Mo–3Fe–1.3Cr–0.25Al	Rod	SB–335	...	N10629	...	...	760
	45	Ni–28Mo–3Fe–1.3Cr–0.25Al	Smls. & wld. ftgs.	SB–366	...	N10629	...	...	760

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	490	489	467	452	441	431	427	424	420	417	...	...	...	...	...
2	490	489	467	452	441	431	427	424	420	417	...	...	...	...	...
3	490	489	467	452	441	431	427	424	420	417	...	...	...	...	...
4	490	489	467	452	441	431	427	424	420	417	...	...	...	...	...
5	600	599	577	556	537	521	514	507	500	493	485	476	...	...	...
6	600	599	577	556	537	521	514	507	500	493	485	476	...	...	...
7	600	599	577	556	537	521	514	507	500	493	485	476	...	...	...
8	600	599	577	556	537	521	514	507	500	493	485	476	...	...	...
9	600	599	577	556	537	521	514	507	500	493	485	476	...	...	...
10	689	689	689	679	672	669	667	664	662	659	657	654	...	...	...
11	689	689	689	679	672	669	667	664	662	659	657	654	...	...	...
12	689	689	689	679	672	669	667	664	662	659	657	654	...	...	...
13	689	689	689	679	672	669	667	664	662	659	657	654	...	...	...
14	689	689	689	679	672	669	667	664	662	659	657	654	...	...	...
15	689	689	689	679	672	669	667	664	662	659	657	654	...	...	...
16	793	793	793	781	773	769	767	764	761	758	755	753	...	...	...
17	689	689	689	689	689	689	689	689	689	689	689	689	680	668	654
18	689	689	689	689	689	689	689	689	689	689	689	689	680	668	654
19	689	689	689	689	689	689	689	689	689	689	689	689	680	668	654
20	724	724	724	724	724	721	719	718	716	715	713	712	711	711	711
21	724	724	724	724	724	721	719	718	716	715	713	712	711	711	711
22	724	724	724	724	724	721	719	718	716	715	713	712	711	711	711
23	724	724	724	724	724	721	719	718	716	715	713	712	711	711	711
24	724	724	724	724	724	721	719	718	716	715	713	712	711	711	711
25	724	724	724	724	724	721	719	718	716	715	713	712	711	711	711
26	724	724	724	724	724	721	719	718	716	715	713	712	711	711	711
27	689	689	689	675	662	651	645	641	636	632	627	623	618	612	607
28	689	689	689	675	662	651	645	641	636	632	627	623	618	612	607
29	689	689	689	675	662	651	645	641	636	632	627	623	618	612	607
30	689	689	689	675	662	651	645	641	636	632	627	623	618	612	607
31	689	689	689	675	662	651	645	641	636	632	627	623	618	612	607
32	689	689	689	675	662	651	645	641	636	632	627	623	618	612	607
33	689	689	689	675	662	651	645	641	636	632	627	623	618	612	607
34	689	689	689	675	662	651	645	641	636	632	627	623	618	612	607
35	724	724	724	715	698	688	685	684	682	681	678	674	...	...	...
36	724	724	724	715	698	688	685	684	682	681	678	674	...	...	...
37	724	724	724	715	698	688	685	684	682	681	678	674	...	...	...
38	724	724	724	715	698	688	685	684	682	681	678	674	...	...	...
39	724	724	724	715	698	688	685	684	682	681	678	674	...	...	...
40	724	724	724	715	698	688	685	684	682	681	678	674	...	...	...
41	724	724	724	715	698	688	685	684	682	681	678	674	...	...	...
42	724	724	724	715	698	688	685	684	682	681	678	674	...	...	...
43	758	758	758	758	752	741	737	733	729	725	722	719	717	712	707
44	758	758	758	758	752	741	737	733	729	725	722	719	717	712	707
45	758	758	758	758	752	741	737	733	729	725	722	719	717	712	707

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	638	620	600	578	554	529	502	473	443	413	381	350	...	...	...	
18	638	620	600	578	554	529	502	473	443	413	381	350	...	...	...	
19	638	620	600	578	554	529	502	473	443	413	381	350	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	600	591	581	570	557	543	528	...	...	...	...	...	...	...	...	(**23**)
28	600	591	581	570	557	543	528	...	...	...	...	...	...	...	...	(**23**)
29	600	591	581	570	557	543	528	...	...	...	...	...	...	...	...	(**23**)
30	600	591	581	570	557	543	528	...	...	...	...	...	...	...	...	(**23**)
31	600	591	581	570	557	543	528	...	...	...	...	...	...	...	...	(**23**)
32	600	591	581	570	557	543	528	...	...	...	...	...	...	...	...	(**23**)
33	600	591	581	570	557	543	528	...	...	...	...	...	...	...	...	(**23**)
34	600	591	581	570	557	543	528	...	...	...	...	...	...	...	...	(**23**)
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Nonferrous Materials (Cont'd)							
1	Ni–28Mo–3Fe–1.3Cr–0.25Al	Forgings	SB–564	...	N10629	...	...	760
2	Ni–28Mo–3Fe–1.3Cr–0.25Al	Wld. pipe	SB–619	...	N10629	...	...	760
3	Ni–28Mo–3Fe–1.3Cr–0.25Al	Smls. pipe & tube	SB–622	...	N10629	...	...	760
4	Ni–28Mo–3Fe–1.3Cr–0.25Al	Wld. tube	SB–626	...	N10629	...	...	760
5	65Ni–28Mo–2Fe	Smls. & wld. ftgs.	SB–366	...	N10665	Annealed	...	760
6	65Ni–28Mo–2Fe	Wld. pipe	SB–619	...	N10665	Annealed	...	760
7	65Ni–28Mo–2Fe	Wld. tube	SB–626	...	N10665	Annealed	...	760
8	65Ni–28Mo–2Fe	Plate, sheet, strip	SB–333	...	N10665	Solution ann.	...	760
9	65Ni–28Mo–2Fe	Rod	SB–335	...	N10665	Solution ann.	...	760
10	65Ni–28Mo–2Fe	Forgings	SB–462	...	N10665	Solution ann.	...	760
11	65Ni–28Mo–2Fe	Forgings	SB–564	...	N10665	Solution ann.	...	760
12	65Ni–28Mo–2Fe	Wld. pipe	SB–619	...	N10665	Solution ann.	...	760
13	65Ni–28Mo–2Fe	Smls. pipe & tube	SB–622	...	N10665	Solution ann.	...	760
14	65Ni–28Mo–2Fe	Wld. tube	SB–626	...	N10665	Solution ann.	...	760
15	65Ni–29.5Mo–2Fe–2Cr	Plate, sheet, strip	SB–333	...	N10675	Solution ann.	...	760
16	65Ni–29.5Mo–2Fe–2Cr	Rod	SB–335	...	N10675	Solution ann.	...	760
17	65Ni–29.5Mo–2Fe–2Cr	Smls. & wld. ftgs.	SB–366	...	N10675	Solution ann.	...	760
18	65Ni–29.5Mo–2Fe–2Cr	Forgings	SB–462	...	N10675	Solution ann.	...	760
19	65Ni–29.5Mo–2Fe–2Cr	Forgings	SB–564	...	N10675	Solution ann.	...	760
20	65Ni–29.5Mo–2Fe–2Cr	Wld. pipe	SB–619	...	N10675	Solution ann.	...	760
21	65Ni–29.5Mo–2Fe–2Cr	Smls. pipe & tube	SB–622	...	N10675	Solution ann.	...	760
22	65Ni–29.5Mo–2Fe–2Cr	Wld. tube	SB–626	...	N10675	Solution ann.	...	760
23	37Ni–30Co–28Cr–2.7Si	Plate, sheet, strip	SB–435	...	N12160	Solution ann.	...	620
24	37Ni–30Co–28Cr–2.7Si	Forgings	SB–564	...	N12160	Solution ann.	...	620
25	37Ni–30Co–28Cr–2.7Si	Rod	SB–572	...	N12160	Solution ann.	...	620
26	37Ni–30Co–28Cr–2.7Si	Wld. pipe	SB–619	...	N12160	Solution ann.	...	620
27	37Ni–30Co–28Cr–2.7Si	Smls. pipe & tube	SB–622	...	N12160	Solution ann.	...	620
28	37Ni–30Co–28Cr–2.7Si	Wld. tube	SB–626	...	N12160	Solution ann.	...	620
29	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Smls. & wld. ftgs.	SB–366	...	R20033	...	...	750
30	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Forgings	SB–564	...	R20033	...	...	750
31	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Wld. pipe	SB–619	...	R20033	...	...	750
32	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Smls. pipe & tube	SB–622	...	R20033	...	...	750
33	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Plate, sheet, strip	SB–625	...	R20033	...	...	750
34	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Wld. tube	SB–626	...	R20033	...	...	750
35	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Rod	SB–649	...	R20033	...	...	750
36	21Ni–30Fe–22Cr–18Co–3Mo–3W	Plate, sheet, strip	SB–435	...	R30556	Annealed	...	690
37	21Ni–30Fe–22Cr–18Co–3Mo–3W	Rod	SB–572	...	R30556	Annealed	...	690
38	21Ni–30Fe–22Cr–18Co–3Mo–3W	Wld. pipe	SB–619	...	R30556	Annealed	...	690
39	21Ni–30Fe–22Cr–18Co–3Mo–3W	Smls. pipe & tube	SB–622	...	R30556	Annealed	...	690
40	21Ni–30Fe–22Cr–18Co–3Mo–3W	Wld. tube	SB–626	...	R30556	Annealed	...	690
41	Co–26Cr–9Ni–5Mo–3Fe–2W	Rod	SB–815	...	R31233	Solution ann.	...	896
42	Co–26Cr–9Ni–5Mo–3Fe–2W	Plate, sheet, strip	SB–818	...	R31233	Solution ann.	...	896
43	Ti	Plate, sheet, strip	SB–265	1	R50250	Annealed	...	240
44	Ti	Smls. & wld. tube	SB–338	1	R50250	Annealed	...	240
45	Ti	Bar, billet	SB–348	1	R50250	Annealed	...	240

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	758	758	758	758	752	741	737	733	729	725	722	719	717	712	707
2	758	758	758	758	752	741	737	733	729	725	722	719	717	712	707
3	758	758	758	758	752	741	737	733	729	725	722	719	717	712	707
4	758	758	758	758	752	741	737	733	729	725	722	719	717	712	707
5	758	758	758	758	758	755	752	748	745	742	738	735	731	728	727
6	758	758	758	758	758	755	752	748	745	742	738	735	731	728	727
7	758	758	758	758	758	755	752	748	745	742	738	735	731	728	727
8	758	758	758	758	758	755	752	748	745	742	738	735	731	728	727
9	758	758	758	758	758	755	752	748	745	742	738	735	731	728	727
10	758	758	758	758	758	755	752	748	745	742	738	735	731	728	727
11	758	758	758	758	758	755	752	748	745	742	738	735	731	728	727
12	758	758	758	758	758	755	752	748	745	742	738	735	731	728	727
13	758	758	758	758	758	755	752	748	745	742	738	735	731	728	727
14	758	758	758	758	758	755	752	748	745	742	738	735	731	728	727
15	758	758	758	758	752	741	737	733	729	725	722	719	716	714	710
16	758	758	758	758	752	741	737	733	729	725	722	719	716	714	710
17	758	758	758	758	752	741	737	733	729	725	722	719	716	714	710
18	758	758	758	758	752	741	737	733	729	725	722	719	716	714	710
19	758	758	758	758	752	741	737	733	729	725	722	719	716	714	710
20	758	758	758	758	752	741	737	733	729	725	722	719	716	714	710
21	758	758	758	758	752	741	737	733	729	725	722	719	716	714	710
22	758	758	758	758	752	741	737	733	729	725	722	719	716	714	710
23	621	621	620	607	592	579	572	565	558	551	544	538	530	523	515
24	621	621	620	607	592	579	572	565	558	551	544	538	530	523	515
25	621	621	620	607	592	579	572	565	558	551	544	538	530	523	515
26	621	621	620	607	592	579	572	565	558	551	544	538	530	523	515
27	621	621	620	607	592	579	572	565	558	551	544	538	530	523	515
28	621	621	620	607	592	579	572	565	558	551	544	538	530	523	515
29	752	749	711	677	651	630	621	614	607	600	593	587	578	569	...
30	752	749	711	677	651	630	621	614	607	600	593	587	578	569	...
31	752	749	711	677	651	630	621	614	607	600	593	587	578	569	...
32	752	749	711	677	651	630	621	614	607	600	593	587	578	569	...
33	752	749	711	677	651	630	621	614	607	600	593	587	578	569	...
34	752	749	711	677	651	630	621	614	607	600	593	587	578	569	...
35	752	749	711	677	651	630	621	614	607	600	593	587	578	569	...
36	689	689	675	655	640	631	627	623	621	618	616	613	609	605	600
37	689	689	675	655	640	631	627	623	621	618	616	613	609	605	600
38	689	689	675	655	640	631	627	623	621	618	616	613	609	605	600
39	689	689	675	655	640	631	627	623	621	618	616	613	609	605	600
40	689	689	675	655	640	631	627	623	621	618	616	613	609	605	600
41	896	896	896	896	896	896	896	894	883	872	864	856	850	843	835
42	896	896	896	896	896	896	896	894	883	872	864	856	850	843	835
43	241	194	159	135	116	93.8	81.7	...	...	...	...	...	...	...	...
44	241	194	159	135	116	93.8	81.7	...	...	...	...	...	...	...	...
45	241	194	159	135	116	93.8	81.7	...	...	...	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Nonferrous Materials (Cont'd)							
1	Ti	Smls. & wld. ftgs.	SB–363	WPT1	R50250	Annealed	...	240
2	Ti	Forgings	SB–381	F–1	R50250	Annealed	...	240
3	Ti	Smls. pipe	SB–861	1	R50250	Annealed	...	240
4	Ti	Wld. pipe	SB–862	1	R50250	Annealed	...	240
5	Ti	Castings	SB–367	C–2	R50400	...	...	345
6	Ti	Forgings	SB–381	F–2	R50400	Annealed	...	345
7	Ti	Plate, sheet, strip	SB–265	2H	R50400	Annealed	...	400
8	Ti	Smls. & wld. tube	SB–338	2H	R50400	Annealed	...	400
9	Ti	Bar, billet	SB–348	2H	R50400	Annealed	...	400
10	Ti	Smls. fittings	SB–363	WPT2H	R50400	Annealed	...	400
11	Ti	Wld. fittings	SB–363	WPT2HW	R50400	Annealed	...	400
12	Ti	Forgings	SB–381	F–2H	R50400	Annealed	...	400
13	Ti	Smls. pipe	SB–861	2H	R50400	Annealed	...	400
14	Ti	Wld. pipe	SB–862	2H	R50400	Annealed	...	400
15	Ti	Castings	SB–367	C–3	R50550	...	...	450
16	Ti	Plate, sheet, strip	SB–265	3	R50550	Annealed	...	450
17	Ti	Smls. & wld. tube	SB–338	3	R50550	Annealed	...	450
18	Ti	Bar, billet	SB–348	3	R50550	Annealed	...	450
19	Ti	Smls. & wld. ftgs.	SB–363	WPT3	R50550	Annealed	...	450
20	Ti	Forgings	SB–381	F–3	R50550	Annealed	...	450
21	Ti	Smls. pipe	SB–861	3	R50550	Annealed	...	450
22	Ti	Wld. pipe	SB–862	3	R50550	Annealed	...	450
23	Ti–Pd	Plate, sheet, strip	SB–265	11	R52250	Annealed	...	240
24	Ti–Pd	Plate, sheet, strip	SB–265	17	R52252	Annealed	...	240
25	Ti–Ru	Plate, sheet, strip	SB–265	27	R52254	Annealed	...	240
26	Ti–Pd	Plate, sheet, strip	SB–265	7	R52400	Annealed	...	345
27	Ti–0.15Pd	Plate, sheet, strip	SB–265	7H	R52400	Annealed	...	400
28	Ti–0.15Pd	Smls. & wld. tube	SB–338	7H	R52400	Annealed	...	400
29	Ti–0.15Pd	Bar, billet	SB–348	7H	R52400	Annealed	...	400
30	Ti–0.15Pd	Smls. fittings	SB–363	WPT7H	R52400	Annealed	...	400
31	Ti–0.15Pd	Wld. fittings	SB–363	WPT7HW	R52400	Annealed	...	400
32	Ti–0.15Pd	Forgings	SB–381	F–7H	R52400	Annealed	...	400
33	Ti–0.15Pd	Smls. pipe	SB–861	7H	R52400	Annealed	...	400
34	Ti–0.15Pd	Wld. pipe	SB–862	7H	R52400	Annealed	...	400
35	Ti–Pd	Plate, sheet, strip	SB–265	16	R52402	Annealed	...	345
36	Ti–Pd	Bar, billet	SB–348	16	R52402	Annealed	...	345
37	Ti–Pd	Forgings	SB–381	F–16	R52402	Annealed	...	345
38	Ti–0.05Pd	Plate, sheet, strip	SB–265	16H	R52402	Annealed	...	400
39	Ti–0.05Pd	Smls. & wld. tube	SB–338	16H	R52402	Annealed	...	400
40	Ti–0.05Pd	Bar, billet	SB–348	16H	R52402	Annealed	...	400
41	Ti–0.05Pd	Smls. fittings	SB–363	WPT16H	R52402	Annealed	...	400
42	Ti–0.05Pd	Wld. fittings	SB–363	WPT16HW	R52402	Annealed	...	400
43	Ti–0.05Pd	Forgings	SB–381	F–16H	R52402	Annealed	...	400
44	Ti–0.05Pd	Smls. pipe	SB–861	16H	R52402	Annealed	...	400
45	Ti–0.05Pd	Wld. pipe	SB–862	16H	R52402	Annealed	...	400

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	241	194	159	135	116	93.8	81.7	...	...	...	...	...	...	...	...
2	241	194	159	135	116	93.8	81.7	...	...	...	...	...	...	...	...
3	241	194	159	135	116	93.8	81.7	...	...	...	...	...	...	...	...
4	241	194	159	135	116	93.8	81.7	...	...	...	...	...	...	...	...
5	345	278	234	199	170	...	...	...	...	...	...	...	...	...	...
6	345	295	249	216	188	164	153	...	...	...	...	...	...	...	...
7	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
8	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
9	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
10	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
11	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
12	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
13	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
14	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
15	448	372	306	254	212	...	...	...	...	...	...	...	...	...	...
16	448	372	306	254	212	185	173	...	...	...	...	...	...	...	...
17	448	372	306	254	212	185	173	...	...	...	...	...	...	...	...
18	448	372	306	254	212	185	173	...	...	...	...	...	...	...	...
19	448	372	306	254	212	185	173	...	...	...	...	...	...	...	...
20	448	372	306	254	212	185	173	...	...	...	...	...	...	...	...
21	448	372	306	254	212	185	173	...	...	...	...	...	...	...	...
22	448	372	306	254	212	185	173	...	...	...	...	...	...	...	...
23	241	194	159	135	116	93.8	81.7	...	...	...	...	...	...	...	...
24	241	196	159	134	117	93.6	80.7	...	...	...	...	...	...	...	...
25	241	194	159	135	116	93.8	81.7	...	...	...	...	...	...	...	...
26	345	295	249	216	188	164	153	...	...	...	...	...	...	...	...
27	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
28	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
29	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
30	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
31	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
32	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
33	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
34	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
35	345	294	247	215	187	164	153	...	...	...	...	...	...	...	...
36	345	294	247	215	187	164	153	...	...	...	...	...	...	...	...
37	345	294	247	215	187	164	153	...	...	...	...	...	...	...	...
38	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
39	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
40	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
41	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
42	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
43	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
44	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
45	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
	Nonferrous Materials (Cont'd)							
1	Ti–Ru	Plate, sheet, strip	SB–265	26	R52404	Annealed	...	345
2	Ti–Ru	Smls. & wld. tube	SB–338	26	R52404	Annealed	...	345
3	Ti–Ru	Bar, billet	SB–348	26	R52404	Annealed	...	345
4	Ti–Ru	Smls. fittings	SB–363	WPT26	R52404	Annealed	...	345
5	Ti–Ru	Wld. fittings	SB–363	WPT26W	R52404	Annealed	...	345
6	Ti–Ru	Forgings	SB–381	F–26	R52404	Annealed	...	345
7	Ti–Ru	Smls. pipe	SB–861	26	R52404	Annealed	...	345
8	Ti–Ru	Wld. pipe	SB–862	26	R52404	Annealed	...	345
9	Ti–0.10Ru	Plate, sheet, strip	SB–265	26H	R52404	Annealed	...	400
10	Ti–0.10Ru	Smls. & wld. tube	SB–338	26H	R52404	Annealed	...	400
11	Ti–0.10Ru	Bar, billet	SB–348	26H	R52404	Annealed	...	400
12	Ti–0.10Ru	Smls. fittings	SB–363	WPT26H	R52404	Annealed	...	400
13	Ti–0.10Ru	Wld. fittings	SB–363	WPT26HW	R52404	Annealed	...	400
14	Ti–0.10Ru	Forgings	SB–381	F–26H	R52404	Annealed	...	400
15	Ti–0.10Ru	Smls. pipe	SB–861	26H	R52404	Annealed	...	400
16	Ti–0.10Ru	Wld. pipe	SB–862	26H	R52404	Annealed	...	400
17	Ti–0.3Mo–0.8Ni	Forgings	SB–381	F–12	R53400	Annealed	...	485
18	Ti–4Al–2.5V–1.5Fe	Plate, sheet, strip	SB–265	38	R54250	Annealed	...	895
19	Ti–4Al–2.5V–1.5Fe	Smls. tube	SB–338	38	R54250	Annealed	...	895
20	Ti–4Al–2.5V–1.5Fe	Wld. tube	SB–338	38	R54250	Annealed	...	895
21	Ti–4Al–2.5V–1.5Fe	Bar, billet	SB–348	38	R54250	Annealed	...	895
22	Ti–4Al–2.5V–1.5Fe	Smls. fittings	SB–363	WPT38	R54250	Annealed	...	895
23	Ti–4Al–2.5V–1.5Fe	Wld. fittings	SB–363	WPT38W	R54250	Annealed	...	895
24	Ti–4Al–2.5V–1.5Fe	Forgings	SB–381	F–38	R54250	Annealed	...	895
25	Ti–4Al–2.5V–1.5Fe	Smls. pipe	SB–861	38	R54250	Annealed	...	895
26	Ti–4Al–2.5V–1.5Fe	Wld. pipe	SB–862	38	R54250	Annealed	...	895
27	Ti–3Al–2.5V	Plate, sheet, strip	SB–265	9	R56320	Annealed	...	620
28	Ti–3Al–2.5V	Smls. & wld. tube	SB–338	9	R56320	Annealed	...	620
29	Ti–3Al–2.5V	Bar, billet	SB–348	9	R56320	Annealed	...	620
30	Ti–3Al–2.5V	Smls. fittings	SB–363	WPT9	R56320	Annealed	...	620
31	Ti–3Al–2.5V	Wld. fittings	SB–363	WPT9W	R56320	Annealed	...	620
32	Ti–3Al–2.5V	Forgings	SB–381	F–9	R56320	Annealed	...	620
33	Ti–3Al–2.5V	Smls. pipe	SB–861	9	R56320	Annealed	...	620
34	Ti–3Al–2.5V	Wld. pipe	SB–862	9	R56320	Annealed	...	620
35	Ti–3Al–2.5V–0.1Ru	Plate, sheet, strip	SB–265	28	R56323	Annealed	...	620
36	Ti–3Al–2.5V–0.1Ru	Smls. & wld. tube	SB–338	28	R56323	Annealed	...	620
37	Ti–3Al–2.5V–0.1Ru	Bar, billet	SB–348	28	R56323	Annealed	...	620
38	Ti–3Al–2.5V–0.1Ru	Smls. fittings	SB–363	WPT28	R56323	Annealed	...	620
39	Ti–3Al–2.5V–0.1Ru	Wld. fittings	SB–363	WPT28W	R56323	Annealed	...	620
40	Ti–3Al–2.5V–0.1Ru	Forgings	SB–381	F–28	R56323	Annealed	...	620
41	Ti–3Al–2.5V–0.1Ru	Smls. pipe	SB–861	28	R56323	Annealed	...	620
42	Ti–3Al–2.5V–0.1Ru	Wld. pipe	SB–862	28	R56323	Annealed	...	620
43	99.2Zr	Forgings	SB–493	...	R60702	Annealed	...	380
44	99.2Zr	Smls. & wld. tube	SB–523	...	R60702	Annealed	...	380
45	99.2Zr	Bar, wire	SB–550	...	R60702	Annealed	...	380

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	345	294	247	215	187	164	153	...	...	...	...	...	...	...	...
2	345	294	247	215	187	164	153	...	...	...	...	...	...	...	...
3	345	294	247	215	187	164	153	...	...	...	...	...	...	...	...
4	345	294	247	215	187	164	153	...	...	...	...	...	...	...	...
5	345	294	247	215	187	164	153	...	...	...	...	...	...	...	...
6	345	294	247	215	187	164	153	...	...	...	...	...	...	...	...
7	345	294	247	215	187	164	153	...	...	...	...	...	...	...	...
8	345	294	247	215	187	164	153	...	...	...	...	...	...	...	...
9	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
10	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
11	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
12	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
13	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
14	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
15	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
16	400	340	289	250	219	190	178	170	...	...	...	...	...	...	...
17	483	445	390	348	319	302	295	...	...	...	...	...	...	...	...
18	896	881	813	753	707	675	664	656	...	...	...	...	...	...	...
19	896	881	813	753	707	675	664	656	...	...	...	...	...	...	...
20	896	881	813	753	707	675	664	656	...	...	...	...	...	...	...
21	896	881	813	753	707	675	664	656	...	...	...	...	...	...	...
22	896	881	813	753	707	675	664	656	...	...	...	...	...	...	...
23	896	881	813	753	707	675	664	656	...	...	...	...	...	...	...
24	896	881	813	753	707	675	664	656	...	...	...	...	...	...	...
25	896	881	813	753	707	675	664	656	...	...	...	...	...	...	...
26	896	881	813	753	707	675	664	656	...	...	...	...	...	...	...
27	621	592	544	491	444	421	412	...	...	...	...	...	...	...	...
28	621	592	544	491	444	421	412	...	...	...	...	...	...	...	...
29	621	592	544	491	444	421	412	...	...	...	...	...	...	...	...
30	621	592	544	491	444	421	412	...	...	...	...	...	...	...	...
31	621	592	544	491	444	421	412	...	...	...	...	...	...	...	...
32	621	592	544	491	444	421	412	...	...	...	...	...	...	...	...
33	621	592	544	491	444	421	412	...	...	...	...	...	...	...	...
34	621	592	544	491	444	421	412	...	...	...	...	...	...	...	...
35	621	592	544	491	444	421	412	...	...	...	...	...	...	...	...
36	621	592	544	491	444	421	412	...	...	...	...	...	...	...	...
37	621	592	544	491	444	421	412	...	...	...	...	...	...	...	...
38	621	592	544	491	444	421	412	...	...	...	...	...	...	...	...
39	621	592	544	491	444	421	412	...	...	...	...	...	...	...	...
40	621	592	544	491	444	421	412	...	...	...	...	...	...	...	...
41	621	592	544	491	444	421	412	...	...	...	...	...	...	...	...
42	621	592	544	491	444	421	412	...	...	...	...	...	...	...	...
43	379	323	268	223	189	165	156	149	142	137	133	128	...	...	...
44	379	323	268	223	189	165	156	149	142	137	133	128	...	...	...
45	379	323	268	223	189	165	156	149	142	137	133	128	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper	Size/ Thickness, mm	Min. Tensile Strength, MPa
		Nonferrous Materials (Cont'd)							
	1	99.2Zr	Plate, sheet, strip	SB–551	...	R60702	Annealed	...	380
	2	99.2Zr	Smls. fittings	SB–653	PZ–2	R60702	Annealed	...	380
	3	99.2Zr	Wld. fittings	SB–653	PZ–2W	R60702	Annealed	...	380
	4	99.2Zr	Smls. & wld. pipe	SB–658	...	R60702	Annealed	...	380
(**23**)	5	95.5Zr + 2.5Nb	Forgings	SB–493	...	R60705	Annealed	...	485
(**23**)	6	95.5Zr + 2.5Nb	Smls. & wld. tube	SB–523	...	R60705	Annealed	...	550
(**23**)	7	95.5Zr + 2.5Nb	Bar, wire	SB–550	...	R60705	Annealed	...	550
(**23**)	8	95.5Zr + 2.5Nb	Plate, sheet, strip	SB–551	...	R60705	Annealed	...	550
(**23**)	9	95.5Zr + 2.5Nb	Smls. fittings	SB–653	PZ–5	R60705	Annealed	...	550
(**23**)	10	95.5Zr + 2.5Nb	Wld. fittings	SB–653	PZ–5W	R60705	Annealed	...	550
(**23**)	11	95.5Zr + 2.5Nb	Smls. & wld. pipe	SB–658	...	R60705	Annealed	...	550

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	40	100	150	200	250	300	325	350	375	400	425	450	475	500	525
															Nonferrous Materials (Cont'd)
1	379	323	268	223	189	165	156	149	142	137	133	128	...	...	...
2	379	323	268	223	189	165	156	149	142	137	133	128	...	...	...
3	379	323	268	223	189	165	156	149	142	137	133	128	...	...	...
4	379	323	268	223	189	165	156	149	142	137	133	128	...	...	...
5	483	391	336	302	284	276	272	267	259	247	229	203	...	...	...
6	552	446	384	345	325	315	311	305	296	282	262	232	...	...	...
7	552	446	384	345	325	315	311	305	296	282	262	232	...	...	...
8	552	446	384	345	325	315	311	305	296	282	262	232	...	...	...
9	552	446	384	345	325	315	311	305	296	282	262	232	...	...	...
10	552	446	384	345	325	315	311	305	296	282	262	232	...	...	...
11	552	446	384	345	325	315	311	305	296	282	262	232	...	...	...

Table U (Cont'd)
Tensile Strength Values, S_u, for Ferrous and Nonferrous Materials

Line No.	Tensile Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)

NOTES TO TABLE U
GENERAL NOTES

(a) The following abbreviations are used: ann., annealed; cond., condenser; CW, cold worked; fin., finished; fr., from; ftgs., fittings; HW, hot worked; N, Normalized; NT, Normalized and tempered; QT, Quenched and tempered; rel., relieved; rld., rolled; Smls., Seamless; Sol., Solution; SR, stress relieved; Str., Strength; treat., treated; and Wld., Welded.

(b) The tabulated values of tensile strength are those which the Committee believes are suitable for use in design calculations. At temperatures above room temperature, the values of tensile strength tend toward an average or expected value which may be as much as 10% above the tensile strength trend curve adjusted to the minimum specified room temperature tensile strength. The tensile strength values do not correspond exactly to "average" as this term is applied to a statistical treatment of a homogeneous set of data. Neither the ASME Material Specifications nor the rules of Sections I, III, VIII, or XII require elevated temperature testing for tensile strengths of production material for use in Code components. It is not intended that results of such tests, if performed, be compared with these tabulated tensile strength values for ASME Code acceptance/rejection purposes for materials. If some elevated temperature test results on production material appear lower than the tabulated values by a large amount (more than the typical variability of material and suggesting the possibility of some error), further investigation by retest or other means should be considered.

(c) Notes limiting applications of these materials appear in Tables 1A, 1B, 2A, 2B, 3, 4, 5A, and 5B.

(d) Where specifications, grades, classes, and types are listed in this Table, and where the material specification in Section II, Part A or Part B is a dual–unit specification (e.g., SA–516/SA–516M), the values listed in this Table shall be applicable to either the customary U.S. version of the material specification or the SI units version of the material specification. For example, the values listed for SA–516 Grade 70 shall be used when SA–516M Grade 485 is used in construction.

(e) The values in this Table may be interpolated to determine values for intermediate temperatures. The values at intermediate temperatures shall be rounded to the same number of decimal places as the value at the higher temperature between which values are being interpolated. The rounding rule is: when the next digit beyond the last place to be retained is less than 5, retain unchanged the digit in the last place retained; when the digit next beyond the last place to be retained is 5 or greater, increase by 1 the digit in the last place retained.

(f) Where a size limit appears in the Size/Thickness column, the limit applies to the dimension appropriate to the product form: wall thickness of tubing, pipe, pipe fittings, and hollow forgings; thickness of plate, flat bar and forgings, and polygonal bar; diameter of solid bar and bolting; and thickest cross–section of other pressure parts, e.g., castings and forgings.

Table Y-1
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials					
1	Carbon steel	Sheet	SA–1008	CS–A	...	...
2	Carbon steel	Sheet	SA–1008	CS–B	...	...
3	Carbon steel	Bar	SA–675	45	...	...
4	Carbon steel	Wld. pipe	SA–134	A283A	...	...
(**23**) 5	...	...	...	...	...	...
6	Carbon steel	Plate	SA–285	A	K01700	...
7	Carbon steel	Wld. pipe	SA–672	A45	K01700	...
8	Carbon steel	Sheet	SA–414	A	K01501	...
9	Carbon steel	Wld. tube	SA–178	A	K01200	...
10	Carbon steel	Smls. tube	SA–179	...	K01200	...
11	Carbon steel	Smls. tube	SA–192	...	K01201	...
12	Carbon steel	Wld. tube	SA–214	...	K01807	...
13	Carbon steel	Smls. tube	SA–556	A2	K01807	...
14	Carbon steel	Wld. tube	SA–557	A2	K01807	...
15	Carbon steel	Wld. pipe	SA–53	E/A	K02504	...
16	Carbon steel	Smls. pipe	SA–53	S/A	K02504	...
17	Carbon steel	Smls. pipe	SA–106	A	K02501	...
18	Carbon steel	Wld. pipe	SA–135	A	...	...
19	Carbon steel	Forged pipe	SA–369	FPA	K02501	...
20	Carbon steel	Wld. pipe	SA–587	...	K11500	...
21	Carbon steel	Bar	SA–675	50	...	...
22	Carbon steel	Wld. pipe	SA–134	A283B	...	...
(**23**) 23	...	...	...	...	...	...
24	Carbon steel	Plate	SA–285	B	K02200	...
25	Carbon steel	Wld. pipe	SA–672	A50	K02200	...
26	Carbon steel	Sheet	SA–414	B	K02201	...
27	Carbon steel	Plate	SA/EN 10028–3	P275NH	...	...
28	Carbon steel	Plate	SA/EN 10028–2	P235GH	...	...
29	Carbon steel	Smls. tube	SA/EN 10216–2	P235GH	...	...
30	Carbon steel	Plate	SA/EN 10028–3	P275NH	...	...
31	Carbon steel	Smls. tube	SA/EN 10216–2	P235GH	...	...
32	Carbon steel	Smls. tube	SA/EN 10216–2	P235GH	...	...
33	Carbon steel	Sheet, strip	SA–1011	36	SS	Type 1
34	Carbon steel	Plate	SA/EN 10028–3	P275NH	...	...
35	Carbon steel	Bar	SA–675	55	...	...
36	Carbon steel	Wld. pipe	SA–134	A283C	K02401	...
37	Carbon steel	Plate	SA–283	C	K02401	...
38	Carbon steel	Plate	SA–285	C	K02801	...
39	Carbon steel	Smls. & wld. pipe	SA–333	1	K03008	...
40	Carbon steel	Smls. & wld. tube	SA–334	1	K03008	...
41	Carbon steel	Plate	SA–516	55	K01800	...
42	Carbon steel	Smls. pipe	SA–524	II	K02104	...
43	Carbon steel	Wld. pipe	SA–671	CA55	K02801	...
44	Carbon steel	Wld. pipe	SA–671	CE55	K02202	...
45	Carbon steel	Wld. pipe	SA–672	A55	K02801	...

Table Y-1
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials
1	...	275	140	...
2	...	275	140	...
3	...	310	155	...
4	...	310	165	...
5	...	...	...	...
6	...	310	165	...
7	...	310	165	...
8	...	310	170	...
9	...	325	180	...
10	...	325	180	...
11	...	325	180	...
12	...	325	180	...
13	...	325	180	...
14	...	325	180	...
15	...	330	205	...
16	...	330	205	...
17	...	330	205	...
18	...	330	205	...
19	...	330	205	...
20	...	330	205	...
21	...	345	170	...
22	...	345	185	...
23	...	...	...	...
24	...	345	185	...
25	...	345	185	...
26	...	345	205	...
27	$150 < t \leq 250$	350	215	...
28	≤60	360	215	...
29	$40 < t \leq 60$	360	215	...
30	$100 < t \leq 150$	360	225	...
31	$16 < t \leq 40$	360	225	...
32	$t \leq 16$	360	235	...
33	$t \leq 6$	365	250	...
34	$60 < t \leq 100$	370	235	...
35	...	380	190	...
36	...	380	205	...
37	...	380	205	...
38	...	380	205	...
39	...	380	205	...
40	...	380	205	...
41	...	380	205	...
42	...	380	205	...
43	...	380	205	...
44	...	380	205	...
45	...	380	205	...

Table Y-1
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials									
1	138	130	126	124	122	120	118	116	114	111
2	138	130	126	124	122	120	118	116	114	111
3	155	146	141	139	137	135	133	130	127	124
4	165	156	151	149	146	144	142	139	136	133
5	...	...	...	...	...	...	...	...	...	...
6	165	156	151	149	146	144	142	139	136	133
7	165	156	151	149	146	144	142	139	136	133
8	172	162	157	155	152	150	148	145	142	139
9	179	168	163	161	158	156	154	151	148	144
10	179	168	163	161	158	156	154	151	148	144
11	179	168	163	161	158	156	154	151	148	144
12	179	168	163	161	158	156	154	151	148	144
13	179	168	163	161	158	156	154	151	148	144
14	179	168	163	161	158	156	154	151	148	144
15	207	195	189	186	183	180	177	174	170	166
16	207	195	189	186	183	180	177	174	170	166
17	207	195	189	186	183	180	177	174	170	166
18	207	195	189	186	183	180	177	174	170	166
19	207	195	189	186	183	180	177	174	170	166
20	207	195	189	186	183	180	177	174	170	166
21	172	162	157	155	152	150	148	145	142	139
22	186	175	170	167	165	162	160	157	153	149
23	...	...	...	...	...	...	...	...	...	...
24	186	175	170	167	165	162	160	157	153	149
25	186	175	170	167	165	162	160	157	153	149
26	207	195	189	186	183	180	177	174	170	166
27	215	202	196	193	190	187	184	181	177	172
28	215	202	196	193	190	187	184	181	177	173
29	215	202	196	193	190	187	184	181	177	173
30	225	212	205	202	199	196	193	189	185	181
31	225	212	205	202	199	196	193	189	185	181
32	235	221	214	211	208	205	201	198	193	189
33	248	233	227	223	219	216	213	209	204	199
34	234	221	213	210	207	204	201	198	193	188
35	190	178	173	170	167	165	163	159	156	152
36	207	195	189	186	183	180	177	174	170	166
37	207	195	189	186	183	180	177	174	170	166
38	207	195	189	186	183	180	177	174	170	166
39	207	195	189	186	183	180	177	174	170	166
40	207	195	189	186	183	180	177	174	170	166
41	207	195	189	186	183	180	177	174	170	166
42	207	195	189	186	183	180	177	174	170	166
43	207	195	189	186	183	180	177	174	170	166
44	207	195	189	186	183	180	177	174	170	166
45	207	195	189	186	183	180	177	174	170	166

Table Y-1
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials
1	107	104	101	98.1	95.0	92.5	90.1	87.5	85.6	83.4
2	107	104	101	98.1	95.0	92.5	90.1	87.5	85.6	83.4
3	121	117	114	110	107	104	101	98.6	96.2	93.7
4	129	125	122	118	114	111	108	106	103	99.8
5	...	...	...	...	...	...	...	...	...	...
6	129	125	122	118	114	111	108	106	103	99.8
7	129	125	122	118	114	111	108	106	103	99.8
8	135	131	127	123	119	116	113	110	107	104
9	140	136	132	128	124	120	117	114	111	109
10	140	136	132	128	124	120	117	114	111	109
11	140	136	132	128	124	120	117	114	111	109
12	140	136	132	128	124	120	117	114	111	109
13	140	136	132	128	124	120	117	114	111	109
14	140	136	132	128	124	120	117	114	111	109
15	161	157	152	148	143	139	135	132	128	125
16	161	157	152	148	143	139	135	132	128	125
17	161	157	152	148	143	139	135	132	128	125
18	161	157	152	148	143	139	135	132	128	125
19	161	157	152	148	143	139	135	132	128	125
20	161	157	152	148	143	139	135	132	128	125
21	135	131	127	123	119	116	113	110	107	104
22	145	141	137	132	129	125	122	119	116	112
23	...	...	...	...	...	...	...	...	...	...
24	145	141	137	132	129	125	122	119	116	112
25	145	141	137	132	129	125	122	119	116	112
26	161	157	152	148	143	139	135	132	128	125
27	168	163	158	153	149	144	141	137	133	130
28	168	163	158	153	149	144	141	137	133	130
29	168	163	158	153	149	144	141	137	133	130
30	176	171	165	160	156	151	147	143	140	136
31	176	171	165	160	156	151	147	143	140	136
32	183	178	173	167	162	158	154	150	146	142
33	194	188	183	...	...	...	...	...	...	...
34	183	178	173	168	163	158	154	150	146	142
35	148	144	139	135	131	127	124	121	118	114
36	161	157	152	148	143	139	135	132	128	125
37	161	157	152	148	143	139	135	132	128	125
38	161	157	152	148	143	139	135	132	128	125
39	161	157	152	148	143	139	135	132	128	125
40	161	157	152	148	143	139	135	132	128	125
41	161	157	152	148	143	139	135	132	128	125
42	161	157	152	148	143	139	135	132	128	125
43	161	157	152	148	143	139	135	132	128	125
44	161	157	152	148	143	139	135	132	128	125
45	161	157	152	148	143	139	135	132	128	125

Table Y-1
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Ferrous Materials															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	Carbon steel	Wld. pipe	SA–672	B55	K02001	...
2	Carbon steel	Wld. pipe	SA–672	C55	K01800	...
3	Carbon steel	Wld. pipe	SA–672	E55	K02202	...
4	Carbon steel	Sheet	SA–414	C	K02503	...
5	Carbon steel	Plate	SA/EN 10028–3	P275NH	...	...
6	Carbon steel	Sheet, strip	SA–1011	40	SS	...
7	Carbon steel	Sheet, strip	SA–1011	45	HSLAS	2
8	Carbon steel	Plate	SA/EN 10028–3	P275NH	...	...
9	Carbon steel	Plate	SA/EN 10028–3	P275NH	...	...
10	Carbon steel	Plate, sheet, bar	SA–36	...	K02600	...
11	Carbon steel	Plate, sheet	SA–662	A	K01701	...
12	Carbon steel	Sheet, strip	SA–1011	36	SS	Type 2
13	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250A	...	...
14	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250BR	...	...
(**23**) 15	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250 B0	...	...
16	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250C	...	...
17	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250A	...	...
18	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250BR	...	...
(**23**) 19	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250 B0	...	...
20	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250C	...	...
21	Carbon steel	Plate	SA/EN 10028–2	P265GH	...	...
22	Carbon steel	Smls. tube	SA/EN 10216–2	P265GH	...	...
23	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250A	...	...
24	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250BR	...	...
(**23**) 25	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250 B0	...	...
26	Carbon steel	Plate, bar, shapes	SA/IS 2062	E250C	...	...
27	Carbon steel	Smls. tube	SA/EN 10216–2	P265GH	...	...
28	Carbon steel	Smls. tube	SA/EN 10216–2	P265GH	...	...
29	Carbon steel	Forgings	SA–181	...	K03502	60
30	Carbon steel	Castings	SA–216	WCA	J02502	...
31	Carbon steel	Forgings	SA–266	1	K03506	...
32	Carbon steel	Forgings	SA–350	LF1	K03009	1
33	Carbon steel	Castings	SA–352	LCA	J02504	...
34	Carbon steel	Cast pipe	SA–660	WCA	J02504	...
35	Carbon steel	Bar	SA–675	60	...	...
36	Carbon steel	Forgings	SA–765	I	K03046	...
37	Carbon steel	Plate	SA–515	60	K02401	...
38	Carbon steel	Plate	SA–516	60	K02100	...
39	Carbon steel	Wld. pipe	SA–671	CB60	K02401	...
40	Carbon steel	Wld. pipe	SA–671	CC60	K02100	...
41	Carbon steel	Wld. pipe	SA–671	CE60	K02402	...
42	Carbon steel	Wld. pipe	SA–672	B60	K02401	...
43	Carbon steel	Wld. pipe	SA–672	C60	K02100	...
44	Carbon steel	Wld. pipe	SA–672	E60	K02402	...
45	Carbon steel	Wld. pipe	SA–134	A283D	K02702	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	380	205	...
2	...	380	205	...
3	...	380	205	...
4	...	380	230	...
5	$40 < t \leq 60$	390	255	...
6	$t \leq 6$	380	275	...
7	...	380	310	...
8	$16 < t \leq 40$	390	265	...
9	≤16	390	275	...
10	...	400	250	...
11	...	400	275	...
12	$t \leq 6$	400	250	...
13	$t > 40$	410	230	...
14	$t > 40$	410	230	...
15	$t > 40$	410	230	...
16	$t > 40$	410	230	...
17	$20 < t \leq 40$	410	240	...
18	$20 < t \leq 40$	410	240	...
19	$20 < t \leq 40$	410	240	...
20	$20 < t \leq 40$	410	240	...
21	≤60	410	245	...
22	$40 < t \leq 60$	410	245	...
23	$t \leq 20$	410	250	...
24	$t \leq 20$	410	250	...
25	$t \leq 20$	410	250	...
26	$t \leq 20$	410	250	...
27	$16 < t \leq 40$	410	255	...
28	$t \leq 16$	410	265	...
29	...	415	205	...
30	...	415	205	...
31	...	415	205	...
32	...	415	205	...
33	...	415	205	...
34	...	415	205	...
35	...	415	205	...
36	...	415	205	...
37	...	415	220	...
38	...	415	220	...
39	...	415	220	...
40	...	415	220	...
41	...	415	220	...
42	...	415	220	...
43	...	415	220	...
44	...	415	220	...
45	...	415	230	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	207	195	189	186	183	180	177	174	170	166
2	207	195	189	186	183	180	177	174	170	166
3	207	195	189	186	183	180	177	174	170	166
4	228	214	207	204	201	198	195	191	187	183
5	255	240	232	229	225	222	218	214	210	204
6	276	259	251	248	244	240	237	232	227	221
7	310	292	283	279	274	270	266	261	255	249
8	265	250	242	239	235	231	227	224	218	213
9	275	258	251	247	243	239	236	231	226	221
10	248	233	227	223	219	216	213	209	204	199
11	276	259	251	248	244	240	237	232	227	221
12	248	233	227	223	219	216	213	209	204	199
13	230	215	209	206	203	201	197	194	189	185
14	230	215	209	206	203	201	197	194	189	185
15	230	215	209	206	203	201	197	194	189	185
16	230	215	209	206	203	201	197	194	189	185
17	240	225	218	215	212	209	206	202	198	193
18	240	225	218	215	212	209	206	202	198	193
19	240	225	218	215	212	209	206	202	198	193
20	240	225	218	215	212	209	206	202	198	193
21	245	230	223	220	217	213	210	206	202	197
22	245	230	223	220	217	213	210	206	202	197
23	250	234	227	224	221	218	215	211	206	201
24	250	234	227	224	221	218	215	211	206	201
25	250	234	227	224	221	218	215	211	206	201
26	250	234	227	224	221	218	215	211	206	201
27	255	240	232	229	225	222	219	214	210	205
28	265	249	242	238	234	231	227	223	218	213
29	207	195	189	186	183	180	177	174	170	166
30	207	195	189	186	183	180	177	174	170	166
31	207	195	189	186	183	180	177	174	170	166
32	207	195	189	186	183	180	177	174	170	166
33	207	195	189	186	183	180	177	174	170	166
34	207	195	189	186	183	180	177	174	170	166
35	207	195	189	186	183	180	177	174	170	166
36	207	195	189	186	183	180	177	174	170	166
37	221	208	201	198	195	192	189	185	182	177
38	221	208	201	198	195	192	189	185	182	177
39	221	208	201	198	195	192	189	185	182	177
40	221	208	201	198	195	192	189	185	182	177
41	221	208	201	198	195	192	189	185	182	177
42	221	208	201	198	195	192	189	185	182	177
43	221	208	201	198	195	192	189	185	182	177
44	221	208	201	198	195	192	189	185	182	177
45	228	214	207	204	201	198	195	191	187	183

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	161	157	152	148	143	139	135	132	128	125
2	161	157	152	148	143	139	135	132	128	125
3	161	157	152	148	143	139	135	132	128	125
4	178	173	167	162	157	153	149	145	142	137
5	199	193	187	182	176	171	167	162	158	154
6	216	209	202	...	...	...	...	...	...	...
7	242	235	228	...	...	...	...	...	...	...
8	207	201	195	189	183	178	173	169	164	160
9	215	208	202	196	190	185	180	175	171	166
10	194	188	183	177	171	166	162	158	154	150
11	216	209	202	196	191	185	180	176	171	167
12	194	188	183	...	...	...	...	...	...	...
13	180	174	169	...	...	...	...	...	...	...
14	180	174	169	...	...	...	...	...	...	...
15	180	174	169	...	...	...	...	...	...	...
16	180	174	169	...	...	...	...	...	...	...
17	187	182	176	...	...	...	...	...	...	...
18	187	182	176	...	...	...	...	...	...	...
19	187	182	176	...	...	...	...	...	...	...
20	187	182	176	...	...	...	...	...	...	...
21	191	186	180	175	169	165	160	156	152	148
22	191	186	180	175	169	165	160	156	152	148
23	195	189	183	...	...	...	...	...	...	...
24	195	189	183	...	...	...	...	...	...	...
25	195	189	183	...	...	...	...	...	...	...
26	195	189	183	...	...	...	...	...	...	...
27	199	193	187	182	176	171	167	162	158	154
28	207	201	195	189	183	178	173	169	164	160
29	161	157	152	148	143	139	135	132	128	125
30	161	157	152	148	143	139	135	132	128	125
31	161	157	152	148	143	139	135	132	128	125
32	161	157	152	148	143	139	135	132	128	125
33	161	157	152	148	143	139	135	132	128	125
34	161	157	152	148	143	139	135	132	128	125
35	161	157	152	148	143	139	135	132	128	125
36	161	157	152	148	143	139	135	132	128	125
37	172	167	162	157	153	149	144	140	137	133
38	172	167	162	157	153	149	144	140	137	133
39	172	167	162	157	153	149	144	140	137	133
40	172	167	162	157	153	149	144	140	137	133
41	172	167	162	157	153	149	144	140	137	133
42	172	167	162	157	153	149	144	140	137	133
43	172	167	162	157	153	149	144	140	137	133
44	172	167	162	157	153	149	144	140	137	133
45	178	173	167	162	157	153	149	145	142	137

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Ferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	Carbon steel	Plate	SA–283	D	K02702	...
2	Carbon steel	Wld. pipe	SA–53	E/B	K03005	...
3	Carbon steel	Smls. pipe	SA–53	S/B	K03005	...
4	Carbon steel	Smls. pipe	SA–106	B	K03006	...
5	Carbon steel	Wld. pipe	SA–135	B	...	...
6	Carbon steel	Smls. & wld. fittings	SA–234	WPB	K03006	...
7	Carbon steel	Smls. & wld. pipe	SA–333	6	K03006	...
8	Carbon steel	Smls. & wld. tube	SA–334	6	K03006	...
9	Carbon steel	Forged pipe	SA–369	FPB	K03006	...
10	Carbon steel	Forgings	SA–372	A	K03002	...
11	Carbon steel	Sheet	SA–414	D	K02505	...
12	Carbon steel	Smls. & wld. fittings	SA–420	WPL6	...	...
13	Carbon steel	Smls. pipe	SA–524	I	K02104	...
14	Carbon steel	Bar	SA–696	B	K03200	...
15	Carbon steel	Bolting	SA–307	A	...	...
16	Carbon steel	Bolting	SA–307	B	...	...
17	Carbon steel	Forgings	SA–727	...	K02506	...
18	Carbon steel	Wld. tube	SA–178	C	K03503	...
19	Carbon steel	Smls. tube	SA–210	A–1	K02707	...
20	Carbon steel	Smls. tube	SA–556	B2	K02707	...
21	Carbon steel	Wld. tube	SA–557	B2	K03007	...
22	Carbon steel	Plate, bar	SA/CSA–G40.21	38W	...	...
(**23**) 23	Carbon steel	Plate, sheet, bar	SA–572	42	...	...
(**23**) 24	Carbon steel	Sheet, strip	SA–1011	45	HSLAS	1
(**23**) 25	Carbon steel	Sheet, strip	SA–1011	45	SS	...
(**23**) 26	Carbon steel	Sheet, strip	SA–1011	50	HSLAS	2
27	Carbon steel	Plate	SA/EN 10028–2	P295GH	...	...
28	Carbon steel	Plate	SA/AS 1548	PT430	...	...
29	Carbon steel	Plate	SA/AS 1548	PT430	...	...
30	Carbon steel	Plate	SA/AS 1548	PT430	...	...
31	Carbon steel	Plate	SA/AS 1548	PT430	...	...
32	Carbon steel	Plate	SA/EN 10028–2	P295GH	...	...
33	Carbon steel	Bar	SA–675	65	...	...
34	Carbon steel	Castings	SA–352	LCB	J03003	...
35	Carbon steel	Plate	SA–515	65	K02800	...
36	Carbon steel	Plate	SA–516	65	K02403	...
37	Carbon steel	Wld. pipe	SA–671	CB65	K02800	...
38	Carbon steel	Wld. pipe	SA–671	CC65	K02403	...
39	Carbon steel	Wld. pipe	SA–672	B65	K02800	...
40	Carbon steel	Wld. pipe	SA–672	C65	K02403	...
41	Carbon steel	Sheet	SA–414	E	K02704	...
42	Carbon steel	Plate	SA–662	B	K02203	...
43	Carbon steel	Plate, bar	SA/CSA–G40.21	44W	...	...
44	Carbon steel	Plate, bar	SA/CSA–G40.21	44W	...	...
45	Carbon steel	Plate	SA–537	...	K12437	1

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	415	230	...
2	...	415	240	...
3	...	415	240	...
4	...	415	240	...
5	...	415	240	...
6	...	415	240	...
7	...	415	240	...
8	...	415	240	...
9	...	415	240	...
10	...	415	240	...
11	...	415	240	...
12	...	415	240	...
13	...	415	240	...
14	...	415	240	...
15	$6 \le t \le 100$	415	250	...
16	...	415	250	...
17	...	415	250	...
18	...	415	255	...
19	...	415	255	...
20	...	415	255	...
21	...	415	255	...
22	...	415	260	...
23	$t \le 150$	415	290	...
24	...	410	310	...
25	$t \le 6$	410	310	...
26	...	410	340	...
27	$150 < t \le 250$	430	220	...
28	$80 < t \le 150$	430	250	...
29	$40 < t \le 80$	430	270	...
30	$16 < t \le 40$	430	280	...
31	≤16	430	300	...
32	$100 < t \le 150$	440	235	...
33	...	450	225	...
34	...	450	240	...
35	...	450	240	...
36	...	450	240	...
37	...	450	240	...
38	...	450	240	...
39	...	450	240	...
40	...	450	240	...
41	...	450	260	...
42	...	450	275	...
43	$64 < t \le 200$	450	275	...
44	$t \le 64$	450	305	...
45	$65 < t \le 100$	450	310	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	228	214	207	204	201	198	195	191	187	183
2	241	227	220	217	214	210	207	203	198	194
3	241	227	220	217	214	210	207	203	198	194
4	241	227	220	217	214	210	207	203	198	194
5	241	227	220	217	214	210	207	203	198	194
6	241	227	220	217	214	210	207	203	198	194
7	241	227	220	217	214	210	207	203	198	194
8	241	227	220	217	214	210	207	203	198	194
9	241	227	220	217	214	210	207	203	198	194
10	241	227	220	217	214	210	207	203	198	194
11	241	227	220	217	214	210	207	203	198	194
12	241	227	220	217	214	210	207	203	198	194
13	241	227	220	217	214	210	207	203	198	194
14	241	227	220	217	214	210	207	203	198	194
15	248	233	227	223	219	216	213	209	204	199
16	248	233	227	223	219	216	213	209	204	199
17	248	233	227	223	219	216	213	209	204	199
18	255	240	233	229	225	222	219	215	210	205
19	255	240	233	229	225	222	219	215	210	205
20	255	240	233	229	225	222	219	215	210	205
21	255	240	233	229	225	222	219	215	210	205
22	262	246	239	235	232	228	225	221	216	210
23	290	273	264	260	256	253	248	243	238	232
24	310	292	283	279	274	270	266	261	255	249
25	310	292	283	279	274	270	266	261	255	249
26	345	328	313	306	300	293	287	281	276	271
27	220	220	201	197	195	192	189	185	181	177
28	252	240	229	225	223	220	216	212	207	202
29	269	256	244	240	238	234	230	226	221	216
30	279	266	254	250	247	243	239	235	230	224
31	300	286	273	268	265	262	257	252	247	240
32	234	221	214	211	207	204	201	197	193	188
33	224	210	205	201	198	196	192	189	184	180
34	241	227	220	217	214	210	207	203	198	194
35	241	227	220	217	214	210	207	203	198	194
36	241	227	220	217	214	210	207	203	198	194
37	241	227	220	217	214	210	207	203	198	194
38	241	227	220	217	214	210	207	203	198	194
39	241	227	220	217	214	210	207	203	198	194
40	241	227	220	217	214	210	207	203	198	194
41	262	246	239	235	232	228	225	221	216	210
42	276	259	251	248	244	240	237	232	227	221
43	276	261	253	248	244	240	236	231	226	221
44	303	287	278	273	268	264	259	254	249	243
45	310	292	283	279	274	270	266	261	255	249

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	178	173	167	162	157	153	149	145	142	137
2	188	183	177	172	167	162	158	154	150	146
3	188	183	177	172	167	162	158	154	150	146
4	188	183	177	172	167	162	158	154	150	146
5	188	183	177	172	167	162	158	154	150	146
6	188	183	177	172	167	162	158	154	150	146
7	188	183	177	172	167	162	158	154	150	146
8	188	183	177	172	167	162	158	154	150	146
9	188	183	177	172	167	162	158	154	150	146
10	188	183	177	172	167	162	158	154	150	146
11	188	183	177	172	167	162	158	154	150	146
12	188	183	177	172	167	162	158	154	150	146
13	188	183	177	172	167	162	158	154	150	146
14	188	183	177	172	167	162	158	154	150	146
15	194	188	183	177	171	...	...	...	...	...
16	194	188	183	177	171	...	...	...	...	...
17	194	188	183	177	171	166	162	158	154	150
18	200	193	187	182	176	171	167	163	158	154
19	200	193	187	182	176	171	167	163	158	154
20	200	193	187	182	176	171	167	163	158	154
21	200	193	187	182	176	171	167	163	158	154
22	204	199	193	187	181	176	171	167	163	154
23	226	219	213	...	...	...	...	...	...	...
24	242	235	228	...	...	...	...	...	...	...
25	242	235	228	...	...	...	...	...	...	...
26	266	262	259	...	...	...	...	...	...	...
27	172	167	162	157	152	148	144	140	137	133
28	196	191	185	179	174	169	164	160	156	152
29	210	204	198	191	186	180	176	172	167	163
30	218	211	205	199	193	187	182	178	173	169
31	234	227	220	213	207	202	196	191	186	181
32	183	178	172	167	162	157	153	149	146	142
33	175	170	165	160	155	151	146	142	139	135
34	188	183	177	172	167	162	158	154	150	146
35	188	183	177	172	167	162	158	154	150	146
36	188	183	177	172	167	162	158	154	150	146
37	188	183	177	172	167	162	158	154	150	146
38	188	183	177	172	167	162	158	154	150	146
39	188	183	177	172	167	162	158	154	150	146
40	188	183	177	172	167	162	158	154	150	146
41	204	199	193	187	181	176	171	167	162	158
42	216	209	202	196	191	185	180	176	171	167
43	215	209	203	197	191	185	180	175	171	166
44	237	230	223	217	210	204	198	193	188	183
45	242	235	228	221	215	209	203	197	192	187

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Ferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	Carbon steel	Wld. pipe	SA–691	CMSH–70	K12437	...
2	Carbon steel	Plate, bar	SA/CSA–G40.21	50W	...	...
3	Carbon steel	Plate, bar	SA/CSA–G40.21	50W	...	...
4	Carbon steel	Plate, sheet, bar	SA–572	50	...	...
5	Carbon steel	Round bar	SA–572	50	...	...
6	Carbon steel	Sheet, strip	SA–1011	50	SS	...
7	Carbon steel	Sheet, strip	SA–1011	50	HSLAS	1
8	Carbon steel	Sheet, strip	SA–1011	55	HSLAS	2
9	Carbon steel	Forgings	SA/EN 10222–2	P280GH	...	NT or QT
10	Carbon steel	Plate	SA/EN 10028–2	P295GH	...	...
11	Carbon steel	Plate	SA/AS 1548	PT460	...	...
12	Carbon steel	Plate	SA/AS 1548	PT460	...	...
13	Carbon steel	Forgings	SA/EN 10222–2	P280GH	...	Normalized
14	Carbon steel	Plate	SA/EN 10028–2	P295GH	...	...
15	Carbon steel	Plate	SA/EN 10028–2	P295GH	...	...
16	Carbon steel	Plate	SA/AS 1548	PT460	...	...
17	Carbon steel	Plate	SA/EN 10028–2	P295GH	...	...
18	Carbon steel	Plate	SA/AS 1548	PT460	...	...
19	Carbon steel	Plate	SA/GB 713	Q345R	...	...
20	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...
21	Carbon steel	Plate	SA/EN 10025–2	S355J2+N	...	...
22	Carbon steel	Plate	SA/EN 10025–2	S355J2+N	...	...
23	Carbon steel	Plate	SA/EN 10025–2	S355J2+N	...	...
24	Carbon steel	Plate	SA/EN 10025–2	S355J2+N	...	...
25	Carbon steel	Plate	SA/GB 713	Q345R	...	...
26	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...
27	Carbon steel	Plate	SA–455	...	K03300	...
28	Carbon steel	Bar	SA–675	70	...	...
29	Carbon steel	Forgings	SA–105	...	K03504	...
30	Carbon steel	Forgings	SA–181	...	K03502	70
31	Carbon steel	Castings	SA–216	WCB	J03002	...
32	Carbon steel	Forgings	SA–266	2	K03506	...
33	Carbon steel	Forgings	SA–266	4	K03017	...
34	Carbon steel	Forgings	SA–350	LF2	K03011	...
35	Carbon steel	Forgings	SA–508	1	K13502	...
36	Carbon steel	Forgings	SA–508	1A	K13502	...
37	Carbon steel	Forgings	SA–541	1	K03506	...
38	Carbon steel	Forgings	SA–541	1A	K03020	...
39	Carbon steel	Cast pipe	SA–660	WCB	J03003	...
40	Carbon steel	Forgings	SA–765	II	K03047	...
41	Carbon steel	Plate	SA–515	70	K03101	...
42	Carbon steel	Plate	SA–516	70	K02700	...
43	Carbon steel	Wld. pipe	SA–671	CB70	K03101	...
44	Carbon steel	Wld. pipe	SA–671	CC70	K02700	...
45	Carbon steel	Wld. pipe	SA–672	B70	K03101	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	$65 < t \leq 100$	450	310	...
2	$64 < t \leq 150$	450	315	...
3	$t \leq 64$	450	345	...
4	$t \leq 100$	450	345	...
5	$t \leq 275$	450	345	...
6	$t \leq 6$	450	340	...
7	...	450	340	...
8	...	450	380	...
9	$35 < t \leq 160$	460	255	...
10	$60 < t \leq 100$	460	260	...
11	$80 < t \leq 150$	460	265	...
12	$40 < t \leq 80$	460	275	...
13	$t \leq 35$	460	280	...
14	$40 < t \leq 60$	460	285	...
15	$16 < t \leq 40$	460	290	...
16	$16 < t \leq 40$	460	295	...
17	≤16	460	295	...
18	≤16	460	305	...
19	$150 < t \leq 250$	470	265	...
20	$150 < t \leq 250$	470	280	...
21	$63 < t \leq 80$	470	325	...
22	$40 < t \leq 63$	470	335	...
23	$16 < t \leq 40$	470	345	...
24	$3 \leq t \leq 16$	470	355	...
25	$100 < t \leq 150$	480	285	...
26	$100 < t \leq 150$	480	295	...
27	$15 < t \leq 20$	485	240	...
28	...	485	240	...
29	...	485	250	...
30	...	485	250	...
31	...	485	250	...
32	...	485	250	...
33	...	485	250	...
34	...	485	250	...
35	...	485	250	...
36	...	485	250	...
37	...	485	250	...
38	...	485	250	...
39	...	485	250	...
40	...	485	250	...
41	...	485	260	...
42	...	485	260	...
43	...	485	260	...
44	...	485	260	...
45	...	485	260	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	310	292	283	279	274	270	266	261	255	249
2	317	300	291	285	281	276	271	266	260	254
3	345	326	316	310	305	300	295	289	283	276
4	345	328	313	306	300	293	287	281	276	271
5	345	328	313	306	300	293	287	281	276	271
6	345	328	313	306	300	293	287	281	276	271
7	345	328	313	306	300	293	287	281	276	271
8	379	352	331	318	306	296	286	278	271	265
9	255	239	231	227	224	221	217	213	208	203
10	259	243	236	232	229	225	221	217	213	208
11	265	253	242	238	235	232	228	223	219	213
12	276	263	251	247	244	241	237	232	227	221
13	280	262	254	250	246	242	238	234	229	223
14	286	269	261	257	253	249	246	241	235	229
15	290	273	264	260	256	253	248	243	238	232
16	296	283	270	265	262	258	254	249	244	238
17	296	279	271	266	262	258	254	249	244	238
18	303	289	276	271	268	264	260	255	250	244
19	265	249	242	238	235	231	227	223	218	213
20	280	262	255	251	248	244	240	236	231	225
21	325	...	...	...	...	...	...	...	...	...
22	335	...	...	...	...	...	...	...	...	...
23	345	...	...	...	...	...	...	...	...	...
24	355	...	...	...	...	...	...	...	...	...
25	285	268	260	256	252	249	245	240	235	229
26	295	276	268	264	261	257	253	248	243	237
27	241	227	220	217	214	210	207	203	198	194
28	241	227	220	217	214	210	207	203	198	194
29	248	233	227	223	219	216	213	209	204	199
30	248	233	227	223	219	216	213	209	204	199
31	248	233	227	223	219	216	213	209	204	199
32	248	233	227	223	219	216	213	209	204	199
33	248	233	227	223	219	216	213	209	204	199
34	248	233	227	223	219	216	213	209	204	199
35	248	233	227	223	219	216	213	209	204	199
36	248	233	227	223	219	216	213	209	204	199
37	248	233	227	223	219	216	213	209	204	199
38	248	233	227	223	219	216	213	209	204	199
39	248	233	227	223	219	216	213	209	204	199
40	248	233	227	223	219	216	213	209	204	199
41	262	246	239	235	232	228	225	221	216	210
42	262	246	239	235	232	228	225	221	216	210
43	262	246	239	235	232	228	225	221	216	210
44	262	246	239	235	232	228	225	221	216	210
45	262	246	239	235	232	228	225	221	216	210

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	242	235	228	221	215	209	203	197	192	187
2	247	241	234	227	220	213	207	201	196	191
3	269	261	254	246	239	232	225	219	213	208
4	266	262	259	...	...	...	...	...	...	...
5	266	262	259	...	...	...	...	...	...	...
6	266	262	259	...	...	...	...	...	...	...
7	266	262	259	...	...	...	...	...	...	...
8	259	254	249	...	...	...	...	...	...	...
9	198	192	186	180	175	170	165	161	157	153
10	202	196	190	185	179	173	169	165	160	156
11	207	201	195	189	184	178	173	169	164	160
12	216	209	202	196	191	185	180	176	171	167
13	217	211	204	198	192	186	181	177	172	168
14	223	217	211	204	198	192	187	182	178	173
15	226	219	213	207	200	195	189	184	180	175
16	232	225	218	211	205	199	194	189	184	179
17	232	225	218	211	205	199	194	189	184	179
18	237	230	223	216	210	204	198	193	188	183
19	207	201	195	189	183	178	173	169	164	160
20	219	212	205	199	193	188	183	178	174	169
21	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...
25	223	216	210	203	197	191	186	181	177	172
26	230	223	216	210	204	198	193	188	183	178
27	188	183	177	172	167	162	158	154	150	146
28	188	183	177	172	167	162	158	154	150	146
29	194	188	183	177	171	166	162	158	154	150
30	194	188	183	177	171	166	162	158	154	150
31	194	188	183	177	171	166	162	158	154	150
32	194	188	183	177	171	166	162	158	154	150
33	194	188	183	177	171	166	162	158	154	150
34	194	188	183	177	171	166	162	158	154	150
35	194	188	183	177	171	166	162	158	154	150
36	194	188	183	177	171	166	162	158	154	150
37	194	188	183	177	171	166	162	158	154	150
38	194	188	183	177	171	166	162	158	154	150
39	194	188	183	177	171	166	162	158	154	150
40	194	188	183	177	171	166	162	158	154	150
41	204	199	193	187	181	176	171	167	162	158
42	204	199	193	187	181	176	171	167	162	158
43	204	199	193	187	181	176	171	167	162	158
44	204	199	193	187	181	176	171	167	162	158
45	204	199	193	187	181	176	171	167	162	158

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	Carbon steel	Wld. pipe	SA–672	C70	K02700	...
2	Carbon steel	Smls. pipe	SA–106	C	K03501	...
3	Carbon steel	Wld. tube	SA–178	D	...	...
4	Carbon steel	Smls. tube	SA–210	C	K03501	...
5	Carbon steel	Castings	SA–216	WCC	J02503	...
6	Carbon steel	Smls. & wld. fittings	SA–234	WPC	K03501	...
7	Carbon steel	Castings	SA–352	LCC	J02505	...
8	Carbon steel	Castings	SA–487	16	...	A
9	Carbon steel	Plate	SA–537	...	K12437	3
10	Carbon steel	Smls. tube	SA–556	C2	K03006	...
11	Carbon steel	Tube	SA–557	C2	K03505	...
12	Carbon steel	Cast pipe	SA–660	WCC	J02505	...
13	Carbon steel	Bar	SA–696	C	K03200	...
14	Carbon steel	Sheet	SA–414	F	K03102	...
15	Carbon steel	Plate	SA–662	C	K02007	...
16	Carbon steel	Plate	SA–537	...	K12437	2
17	Carbon steel	Plate	SA–738	C	K02008	...
18	Carbon steel	Plate	SA–537	...	K12437	1
19	Carbon steel	Wld. pipe	SA–671	CD70	K12437	...
20	Carbon steel	Wld. pipe	SA–672	D70	K12437	...
21	Carbon steel	Wld. pipe	SA–691	CMSH–70	K12437	...
22	Carbon steel	Plate	SA–841	A	...	1
23	Carbon steel	Plate, sheet, bar	SA–572	55	...	...
24	Carbon steel	Round bar	SA–572	55	...	...
25	Carbon steel	Sheet, strip	SA–1011	55	HSLAS	1
26	Carbon steel	Sheet, strip	SA–1011	60	HSLAS	2
27	Carbon steel	Forgings	SA/EN 10222–2	P305GH	...	NT
28	Carbon steel	Forgings	SA/EN 10222–2	P305GH	...	Normalized
29	Carbon steel	Plate	SA/GB 713	Q345R	...	...
30	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...
31	Carbon steel	Plate	SA/GB 713	Q345R	...	...
32	Carbon steel	Plate	SA/GB 713	Q345R	...	...
33	Carbon steel	Plate	SA–455	...	K03300	...
34	Carbon steel	Forgings	SA/EN 10222–2	P305GH	...	QT
35	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...
36	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...
37	Carbon steel	Plate	SA/GB 713	Q345R	...	...
38	Carbon steel	Plate	SA/EN 10025–2	S355J2+N	...	...
39	Carbon steel	Plate	SA/EN 10028–2	P355GH	...	...
40	Carbon steel	Forgings	SA–266	3	K05001	...
41	Carbon steel	Plate	SA–455	...	K03300	...
42	Carbon steel	Plate	SA–299	A	K02803	...
43	Carbon steel	Wld. pipe	SA–671	CK75	K02803	...
44	Carbon steel	Wld. pipe	SA–672	N75	K02803	...
45	Carbon steel	Wld. pipe	SA–691	CMS–75	K02803	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	485	260	...
2	...	485	275	...
3	...	485	275	...
4	...	485	275	...
5	...	485	275	...
6	...	485	275	...
7	...	485	275	...
8	...	485	275	...
9	100 < t ≤ 150	485	275	...
10	...	485	275	...
11	...	485	275	...
12	...	485	275	...
13	...	485	275	...
14	...	485	290	...
15	...	485	295	...
16	100 < t ≤ 150	485	315	...
17	100 < t ≤ 150	485	315	...
18	≤65	485	345	...
19	≤65	485	345	...
20	≤65	485	345	...
21	≤65	485	345	...
22	≤100	485	345	...
23	t ≤ 50	485	380	...
24	t ≤ 90	485	380	...
25	...	480	380	...
26	...	480	410	...
27	35 < t ≤ 160	490	280	...
28	t ≤ 35	490	305	...
29	60 < t ≤ 100	490	305	...
30	60 < t ≤ 100	490	315	...
31	36 < t ≤ 60	490	315	...
32	16 < t ≤ 36	500	325	...
33	9.5 < t ≤ 15	505	255	...
34	t ≤ 70	510	285	...
35	40 < t ≤ 60	510	335	...
36	16 < t ≤ 40	510	345	...
37	3 ≤ t ≤ 16	510	345	...
38	t < 3	510	355	...
39	≤16	510	355	...
40	...	515	260	...
41	≤9.5	515	260	...
42	>25	515	275	...
43	>25	515	275	...
44	>25	515	275	...
45	>25	515	275	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	262	246	239	235	232	228	225	221	216	210
2	276	259	251	248	244	240	237	232	227	221
3	276	259	251	248	244	240	237	232	227	221
4	276	259	251	248	244	240	237	232	227	221
5	276	259	251	248	244	240	237	232	227	221
6	276	259	251	248	244	240	237	232	227	221
7	276	259	251	248	244	240	237	232	227	221
8	276	257	244	236	230	225	220	216	212	208
9	276	256	241	232	223	215	208	202	197	193
10	276	259	251	248	244	240	237	232	227	221
11	276	259	251	248	244	240	237	232	227	221
12	276	259	251	248	244	240	237	232	227	221
13	276	259	251	248	244	240	237	232	227	221
14	290	273	264	260	256	253	248	243	238	232
15	296	279	271	266	262	258	254	249	244	238
16	317	294	277	266	256	248	240	233	226	221
17	317	294	277	266	256	248	240	233	226	221
18	345	320	302	289	279	269	261	253	247	241
19	345	320	302	289	279	269	261	253	247	241
20	345	320	302	289	279	269	261	253	247	241
21	345	320	302	289	279	269	261	253	247	241
22	345	328	316	308	301	296	292	289	286	283
23	379	352	331	318	306	296	286	278	271	265
24	379	352	331	318	306	296	286	278	271	265
25	379	352	331	318	306	296	286	278	271	265
26	414	394	379	369	362	355	351	347	343	339
27	280	262	254	250	246	242	238	234	229	223
28	305	285	276	272	268	264	259	255	249	243
29	305	287	278	274	270	266	262	257	251	245
30	315	295	286	282	279	275	270	265	259	253
31	315	296	287	283	279	275	270	265	259	253
32	325	305	297	292	288	284	279	274	268	261
33	255	240	233	229	225	222	219	215	210	205
34	285	267	258	254	250	246	242	238	233	227
35	335	314	305	300	296	292	288	282	276	269
36	345	323	314	309	305	301	296	291	284	277
37	345	324	315	310	306	301	296	291	284	277
38	355	...	...	...	...	...	...	...	...	...
39	355	332	323	318	314	310	305	299	292	285
40	259	243	236	232	229	225	221	217	213	208
41	262	246	239	235	232	228	225	221	216	210
42	276	259	251	248	244	240	237	232	227	221
43	276	259	251	248	244	240	237	232	227	221
44	276	259	251	248	244	240	237	232	227	221
45	276	259	251	248	244	240	237	232	227	221

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	204	199	193	187	181	176	171	167	162	158
2	216	209	202	196	191	185	180	176	171	167
3	216	209	202	196	191	185	180	176	171	167
4	216	209	202	196	191	185	180	176	171	167
5	216	209	202	196	191	185	180	176	171	167
6	216	209	202	196	191	185	180	176	171	167
7	216	209	202	196	191	185	180	176	171	167
8	204	201	197	192	187	181	175	...	...	...
9	189	185	181	177	174	169	164	...	...	...
10	216	209	202	196	191	185	180	176	171	167
11	216	209	202	196	191	185	180	176	171	167
12	216	209	202	196	191	185	180	176	171	167
13	216	209	202	196	191	185	180	176	171	167
14	226	219	213	207	200	195	189	184	180	175
15	232	225	218	211	205	199	194	189	184	179
16	216	212	208	204	199	194	189	...	...	...
17	216	212	208	204	199	194	189	...	...	...
18	235	231	226	222	217	211	204	...	...	...
19	235	231	226	222	217	211	204	...	...	...
20	235	231	226	222	217	211	204	...	...	...
21	235	231	226	222	217	211	204	...	...	...
22	279	275	269	261	252	...	...	...	...	...
23	259	254	249	...	...	...	...	...	...	...
24	259	254	249	...	...	...	...	...	...	...
25	259	254	249	...	...	...	...	...	...	...
26	335	330	323	...	...	...	...	...	...	...
27	217	211	204	198	192	186	181	177	172	168
28	236	230	223	216	209	203	197	192	188	183
29	238	231	224	217	211	205	199	194	189	184
30	246	239	231	224	217	211	206	201	196	190
31	246	239	232	225	218	212	206	200	195	190
32	254	247	239	232	225	218	212	207	201	196
33	200	193	187	182	176	171	167	163	158	154
34	221	215	208	202	195	190	185	180	175	171
35	261	254	246	238	231	225	219	213	208	203
36	269	261	253	245	238	231	225	220	214	209
37	270	262	254	246	239	232	225	219	214	208
38	...	...	...	...	...	...	...	...	...	...
39	277	269	261	252	245	238	232	226	220	215
40	202	196	190	185	179	173	169	165	160	156
41	204	199	193	187	181	176	171	167	162	158
42	216	209	202	196	191	185	180	176	171	167
43	216	209	202	196	191	185	180	176	171	167
44	216	209	202	196	191	185	180	176	171	167
45	216	209	202	196	191	185	180	176	171	167

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	Carbon steel	Plate	SA–299	A	K02803	...
2	Carbon steel	Wld. pipe	SA–691	CMS–75	K02803	...
3	Carbon steel	Forgings	SA–372	B	K04001	...
4	Carbon steel	Sheet	SA–414	G	K03103	...
5	Carbon steel	Plate	SA–738	A	K12447	...
6	Carbon steel	Plate	SA–537	...	K12437	3
7	Carbon steel	Plate	SA–537	...	K12437	2
8	Carbon steel	Wld. pipe	SA–691	CMSH–80	K12437	...
9	Carbon steel	Plate	SA–738	C	K02008	...
10	Carbon steel	Plate, sheet, bar	SA–572	60	...	...
11	Carbon steel	Round bar	SA–572	60	...	...
12	Carbon steel	Sheet, strip	SA–1011	60	HSLAS	1
13	Carbon steel	Plate	SA–299	B	K02803	...
14	Carbon steel	Plate	SA–299	B	K02803	...
15	Carbon steel	Forgings	SA–765	IV	K02009	...
16	Carbon steel	Plate	SA–537	...	K12437	3
17	Carbon steel	Plate	SA–537	...	K12437	2
18	Carbon steel	Wld. pipe	SA–671	CD80	K12437	...
19	Carbon steel	Wld. pipe	SA–672	D80	K12437	...
20	Carbon steel	Wld. pipe	SA–691	CMSH–80	K12437	...
21	Carbon steel	Plate	SA–738	C	K02008	...
22	Carbon steel	Plate	SA–841	B	...	2
23	Carbon steel	Plate, sheet, bar	SA–572	65	...	...
24	Carbon steel	Plate	SA–612	...	K02900	...
25	Carbon steel	Plate	SA–841	F	...	6
26	Carbon steel	Plate	SA–612	...	K02900	...
27	Carbon steel	Plate	SA–738	B	K12007	...
28	Carbon steel	Plate	SA–841	F	...	7
29	Carbon steel	Forgings	SA–372	C	K04801	...
30	Carbon steel	Bolting	SA–449	...	K04200	...
31	Carbon steel	Plate	SA–724	A	K11831	...
32	Carbon steel	Plate	SA–724	C	K12037	...
33	Carbon steel	Plate	SA–724	B	K12031	...
34	Carbon steel	Bolting	SA–325	...	...	...
35	Carbon steel	Bolting	SA–325	1	K02706	...
36	Carbon steel	Bolting	SA–449	...	K04200	...
37	Carbon steel	Bolting	SA–354	BC	K04100	...
38	Carbon steel	Bolting	SA–325	1	K02706	...
39	Carbon steel	Bolting	SA–449	...	K04200	...
40	Carbon steel	Bolting	SA–354	BC	K04100	...
41	Carbon steel	Bolting	SA–354	BD	K04100	...
42	Carbon steel	Bolting	SA–354	BD	K04100	...
43	Carbon steel	Flat wire	SA–905	...	...	2
44	Carbon steel	Flat wire	SA–905	...	...	2
45	Carbon steel	Flat wire	SA–905	...	...	2

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	≤25	515	290	...
2	≤25	515	290	...
3	...	515	310	...
4	...	515	310	...
5	...	515	310	...
6	65 < t ≤ 100	515	345	...
7	65 < t ≤ 100	515	380	...
8	65 < t ≤ 100	515	380	...
9	65 < t ≤ 100	515	380	...
10	t ≤ 32	520	415	...
11	t ≤ 90	520	415	...
12	...	520	410	...
13	>25	550	310	...
14	≤25	550	325	...
15	...	550	345	...
16	≤65	550	380	...
17	≤65	550	415	...
18	≤65	550	415	...
19	≤65	550	415	...
20	≤65	550	415	...
21	≤65	550	415	...
22	≤65	550	415	...
23	t ≤ 32	550	450	...
24	12.5 < t ≤ 25	560	345	...
25	t ≤ 32	565	485	...
26	≤12.5	570	345	...
27	...	585	415	...
28	t ≤ 25	590	515	...
29	...	620	380	...
30	38 < t ≤ 75	620	400	...
31	...	620	485	...
32	...	620	485	...
33	...	655	515	...
34	...	725	560	...
35	29 ≤ t ≤ 38	725	560	...
36	25 < t ≤ 38	725	560	...
37	64 < t ≤ 100	795	685	...
38	13 ≤ t ≤ 25	825	635	...
39	≤25	825	635	...
40	6 < t ≤ 64	860	750	...
41	64 < t ≤ 100	965	795	...
42	6 < t ≤ 64	1035	895	...
43	1.5	1695	1450	(1)
44	1.3	1725	1475	(1)
45	1.02	1765	1525	(1)

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	290	273	264	260	256	253	248	243	238	232
2	290	273	264	260	256	253	248	243	238	232
3	310	292	283	279	274	270	266	261	255	249
4	310	292	283	279	274	270	266	261	255	249
5	310	292	283	279	274	270	266	261	255	249
6	345	320	302	289	279	269	261	253	247	241
7	379	352	331	318	306	296	286	278	271	265
8	379	352	331	318	306	296	286	278	271	265
9	379	352	331	318	306	296	286	278	271	265
10	414	394	379	369	362	355	351	347	343	339
11	414	394	379	369	362	355	351	347	343	339
12	414	394	379	369	362	355	351	347	343	339
13	310	292	283	278	274	270	266	261	255	249
14	324	305	295	291	287	282	278	273	267	260
15	345	328	313	306	300	293	287	281	276	271
16	379	352	331	318	306	296	286	278	271	265
17	414	384	362	347	335	323	313	303	295	288
18	414	384	362	347	335	323	313	303	295	288
19	414	384	362	347	335	323	313	303	295	288
20	414	384	362	347	335	323	313	303	295	288
21	414	384	362	347	335	323	313	303	295	288
22	414	394	379	369	362	355	351	347	343	339
23	448	427	413	398	372	340	321	305	292	281
24	345	323	300	289	279	270	260	252	245	241
25	483	463	443	431	422	415	410	406	402	397
26	345	323	300	289	279	270	260	252	245	241
27	414	393	378	368	360	353	345	339	333	328
28	517	496	475	462	452	444	439	435	430	425
29	379	357	346	340	336	331	325	319	312	304
30	400	381	364	357	354	349	343	337	329	321
31	483	448	422	405	390	377	365	354	345	337
32	483	448	422	405	390	377	365	354	345	337
33	517	480	452	434	418	403	390	379	370	361
34	558	525	488	468	452	436	422	409	399	390
35	558	525	488	468	452	436	422	409	399	390
36	558	525	488	468	452	436	422	409	399	390
37	683	651	621	611	604	595	585	574	562	548
38	634	596	554	531	513	495	479	465	453	443
39	634	596	554	531	513	495	479	465	453	443
40	752	717	684	672	664	655	644	632	618	603
41	793	757	722	709	701	691	680	667	652	636
42	896	855	816	802	792	781	768	753	737	719
43	1450	...	...	...	...	...	...	...	...	...
44	1480	...	...	...	...	...	...	...	...	...
45	1520	...	...	...	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	226	219	213	207	200	195	189	184	180	175
2	226	219	213	207	200	195	189	184	180	175
3	242	235	228	221	215	209	203	197	192	187
4	242	235	228	221	215	209	203	197	192	187
5	242	235	228	221	215	209	203	197	192	187
6	235	231	226	222	217	211	204	...	...	...
7	259	254	249	244	238	231	225	...	...	...
8	259	254	249	244	238	231	225	...	...	...
9	259	254	249	244	238	231	225	...	...	...
10	335	330	323	...	...	...	...	...	...	...
11	335	330	323	...	...	...	...	...	...	...
12	335	330	323	...	...	...	...	...	...	...
13	242	235	228	221	215	208	203	198	193	187
14	253	246	238	231	224	218	212	206	201	196
15	266	262	259	255	...	...	...	...	...	...
16	259	254	249	244	238	231	225	...	...	...
17	283	277	272	266	260	253	246	...	...	...
18	283	277	272	266	260	253	246	...	...	...
19	283	277	272	266	260	253	246	...	...	...
20	283	277	272	266	260	253	246	...	...	...
21	283	277	272	266	260	253	246	...	...	...
22	335	330	323	314	303	...	...	...	...	...
23	270	259	246	...	...	...	...	...	...	...
24	237	232	226	220	...	...	...	...	...	...
25	391	384	378	...	...	...	...	...	...	...
26	237	232	226	220	...	...	...	...	...	...
27	323	317	312	306	300	293	286	...	...	...
28	419	411	405	...	...	...	...	...	...	...
29	296	288	279	270	262	255	248	242	236	229
30	312	303	294	285	277	269	261	255	249	...
31	330	323	317	311	303	295	287	...	...	...
32	330	323	317	311	303	295	287	...	...	...
33	353	346	339	333	325	316	306	...	...	...
34	381	374	366	359	351	341	329	314	295	269
35	381	374	366	359	351	341	329	314	295	269
36	381	374	366	359	351	341	329	314	295	269
37	533	517	502	486	472	459	446	435	424	412
38	433	424	416	408	399	388	374	357	335	306
39	433	424	416	408	399	388	374	357	335	306
40	587	570	553	536	520	505	491	479	466	453
41	619	601	583	565	548	533	518	505	492	479
42	700	679	658	638	618	601	584	569	554	539
43	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	Carbon steel	Flat wire	SA–905	...	...	2
2	Carbon steel	Flat wire	SA–905	...	...	2
3	Carbon steel	Flat wire	SA–905	...	...	1
4	Carbon steel	Flat wire	SA–905	...	...	1
5	Carbon steel	Flat wire	SA–905	...	...	1
6	Carbon steel	Flat wire	SA–905	...	...	1
7	Carbon steel	Flat wire	SA–905	...	...	1
8	Ductile cast iron	Castings	SA–874	...	...	...
9	Ductile cast iron	Castings	SA/JIS G5504	FCD 300 LT	...	...
10	C–Mn–Si–Cb	Plate	SA–737	B	K12001	...
11	C–Mn–Si–Cb	Plate	SA/AS 1548	PT490	...	...
12	C–Mn–Si–Cb	Plate	SA/AS 1548	PT490	...	...
13	C–Mn–Si–Cb	Plate	SA/AS 1548	PT490	...	...
14	C–Mn–Si–Cb	Plate	SA/AS 1548	PT490	...	...
15	C–Mn–Si–Cb	Plate	SA/GB 713	Q370R	...	Normalized
16	C–Mn–Si–Cb	Plate	SA/GB 713	Q370R	...	Normalized
17	C–Mn–Si–Cb	Plate	SA/GB 713	Q370R	...	Normalized
18	C–Mn–Si–Cb	Plate	SA/GB 713	Q370R	...	Normalized
19	C–Mn–Si–V	Plate	SA–737	C	K12202	...
20	C–Mn–Si–V–Cb	Plate	SA–656	T3	...	...
21	C–Mn–Si–V–Cb	Plate	SA–656	T7	...	...
22	C–Mn–Si–V–Cb	Plate	SA–656	T3	...	...
23	C–Mn–Si–V–Cb	Plate	SA–656	T7	...	...
24	C–Mn–Si–V–Cb	Plate	SA–656	T3	...	...
25	C–Mn–Si–V–Cb	Plate	SA–656	T7	...	...
26	C–Mn–Si–V–Cb	Plate	SA–656	T3	...	...
27	C–Mn–Si–V–Cb	Plate	SA–656	T7	...	...
28	C–Mn–Ti	Plate, sheet	SA–562	...	K11224	...
29	C–Si–Ti	Forgings	SA–836	...	...	1
30	C–¼Mo	Bolting	SA–320	L7A	G40370	...
31	C–¼Mo	Bolting	SA–574	4037	G40370	...
32	C–¼Mo	Bolting	SA–574	4042	G40420	...
33	C–¼Mo	Bolting	SA–574	4140	G41400	...
34	C–¼Mo	Bolting	SA–574	4037	G40370	...
35	C–¼Mo	Bolting	SA–574	4042	G40420	...
36	C–0.3Mo	Smls. tube	SA/EN 10216–2	16Mo3	...	...
37	C–0.3Mo	Smls. tube	SA/EN 10216–2	16Mo3	...	...
38	C–0.3Mo	Smls. tube	SA/EN 10216–2	16Mo3	...	...
39	C–½Mo	Smls. tube	SA–209	T1b	K11422	...
40	C–½Mo	Wld. tube	SA–250	T1b	K11422	...
41	C–½Mo	Smls. tube	SA–209	T1	K11522	...
42	C–½Mo	Smls. & wld. fittings	SA–234	WP1	K12821	...
43	C–½Mo	Wld. tube	SA–250	T1	K11522	...
44	C–½Mo	Smls. pipe	SA–335	P1	K11522	...
45	C–½Mo	Forged pipe	SA–369	FP1	K11522	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	0.76	1805	1560	(1)
2	0.51	1850	1600	(1)
3	1.5	1895	1650	(1)
4	1.3	1930	1675	(1)
5	1.02	1965	1725	(1)
6	0.76	2000	1760	(1)
7	0.51	2040	1795	(1)
8	300 < t < 530	300	200	...
9	300 < t < 530	300	200	...
10	...	485	345	...
11	80 < t ≤ 150	490	320	...
12	40 < t ≤ 80	490	330	...
13	16 < t ≤ 40	490	340	...
14	≤16	490	360	...
15	60 < t ≤ 100	510	330	...
16	36 < t ≤ 60	520	340	...
17	16 < t ≤ 36	530	360	...
18	10 ≤ t ≤ 16	530	370	...
19	...	550	415	...
20	≤50	415	345	...
21	≤50	415	345	...
22	≤40	485	415	...
23	≤40	485	415	...
24	≤25	550	485	...
25	≤25	550	485	...
26	≤20	620	550	...
27	≤20	620	550	...
28	...	380	205	...
29	...	380	170	...
30	≤65	860	725	...
31	≥16	1170	930	...
32	≥16	1170	930	...
33	≥16	1170	930	...
34	≤13	1240	965	...
35	≤13	1240	965	...
36	40 < t ≤ 60	450	260	...
37	16 < t ≤ 40	450	270	...
38	t ≤ 16	450	280	...
39	...	365	195	...
40	...	365	195	...
41	...	380	205	...
42	...	380	205	...
43	...	380	205	...
44	...	380	205	...
45	...	380	205	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	1560	...	...	...	...	...	...	...	...	...
2	1600	...	...	...	...	...	...	...	...	...
3	1650	1600	1530	...	...	...	...	...	...	...
4	1680	1620	1560	...	...	...	...	...	...	...
5	1720	1670	1600	...	...	...	...	...	...	...
6	1760	1700	1630	...	...	...	...	...	...	...
7	1790	1740	1670	...	...	...	...	...	...	...
8	200	182	174	...	166	...	162	...	160	...
9	200	182	174	...	166	...	162	...	160	...
10	345	331	312	298	285	272	262	253	246	240
11	321	308	290	278	265	253	243	235	228	223
12	331	318	300	286	273	261	251	243	236	231
13	341	328	309	296	282	270	259	250	243	238
14	359	344	325	310	296	283	272	263	256	250
15	330	317	300	285	272	260	249	242	235	230
16	340	327	309	294	280	268	257	249	242	237
17	360	346	327	311	297	284	272	263	257	251
18	370	356	336	320	305	291	280	271	264	258
19	414	397	375	358	342	327	314	303	294	288
20	345	324	314	309	305	300	295	290	284	277
21	345	324	314	309	305	300	295	290	284	277
22	414	389	377	371	366	360	355	348	340	332
23	414	389	377	371	366	360	355	348	340	332
24	483	454	440	433	427	421	414	406	397	387
25	483	454	440	433	427	421	414	406	397	387
26	552	519	503	495	488	481	473	464	454	443
27	552	519	503	495	488	481	473	464	454	443
28	207	189	176	169	165	163	161	161	161	161
29	172	157	147	141	138	136	134	134	134	134
30	724	690	659	648	640	631	620	609	596	581
31	931	902	870	853	838	825	813	801	790	779
32	931	902	870	853	838	825	813	801	790	779
33	931	902	870	853	838	825	813	801	790	779
34	965	935	902	884	869	856	843	831	819	808
35	965	935	902	884	869	856	843	831	819	808
36	260	250	243	238	234	230	227	224	221	218
37	270	260	252	248	243	239	236	232	229	226
38	280	270	262	257	252	248	244	241	238	234
39	193	186	181	177	174	171	169	166	164	161
40	193	186	181	177	174	171	169	166	164	161
41	207	199	193	190	187	184	180	178	175	173
42	207	199	193	190	187	184	180	178	175	173
43	207	199	193	190	187	184	180	178	175	173
44	207	199	193	190	187	184	180	178	175	173
45	207	199	193	190	187	184	180	178	175	173

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...
8	157	154	151	...	...	...	...	...	...	...
9	157	154	151	...	...	...	...	...	...	...
10	236	233	230	226	222	216	208	198	182	179
11	220	217	214	210	206	200	193	183	171	157
12	227	224	221	217	213	207	199	190	177	162
13	234	230	227	224	220	214	206	195	183	164
14	246	242	239	235	231	225	216	205	192	175
15	227	223	220	216	212	206	198	188	179	169
16	234	230	227	223	218	212	204	194	184	174
17	247	244	240	236	231	224	216	206	195	184
18	254	251	247	243	237	230	222	212	200	189
19	283	279	276	272	266	259	249	237	218	214
20	269	261	253	...	...	...	...	...	...	...
21	269	261	253	...	...	...	...	...	...	...
22	323	314	304	...	...	...	...	...	...	...
23	323	314	304	...	...	...	...	...	...	...
24	377	366	355	...	...	...	...	...	...	...
25	377	366	355	...	...	...	...	...	...	...
26	431	418	405	...	...	...	...	...	...	...
27	431	418	405	...	...	...	...	...	...	...
28	161	161	161	160	158	...	...	...	...	...
29	134	134	134	134	132	...	...	...	...	...
30	565	549	532	516	501	486	473	461	450	437
31	768	757	744	730	714	697	677	656	631	604
32	768	757	744	730	714	697	677	656	631	604
33	768	757	744	730	714	697	677	656	631	604
34	797	785	771	757	741	722	702	679	654	626
35	797	785	771	757	741	722	702	679	654	626
36	215	211	208	204	200	195	189	183	176	169
37	223	219	216	212	207	202	196	190	183	175
38	231	228	224	220	215	210	204	197	190	182
39	159	157	154	151	148	144	141	136	131	125
40	159	157	154	151	148	144	141	136	131	125
41	170	168	165	162	159	155	150	146	140	134
42	170	168	165	162	159	155	150	146	140	134
43	170	168	165	162	159	155	150	146	140	134
44	170	168	165	162	159	155	150	146	140	134
45	170	168	165	162	159	155	150	146	140	134

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	C–½Mo	Smls. tube	SA–209	T1a	K12023	...
2	C–½Mo	Wld. tube	SA–250	T1a	K12023	...
3	C–½Mo	Castings	SA–217	WC1	J12524	...
4	C–½Mo	Castings	SA–352	LC1	J12522	...
5	C–½Mo	Cast pipe	SA–426	CP1	J12521	...
6	C–½Mo	Plate	SA–204	A	K11820	...
7	C–½Mo	Wld. pipe	SA–672	L65	K11820	...
8	C–½Mo	Wld. pipe	SA–691	CM–65	K11820	...
9	C–½Mo	Forgings	SA–182	F1	K12822	...
10	C–½Mo	Plate	SA–204	B	K12020	...
11	C–½Mo	Forgings	SA–336	F1	K12520	...
12	C–½Mo	Wld. pipe	SA–672	L70	K12020	...
13	C–½Mo	Wld. pipe	SA–691	CM–70	K12020	...
14	C–½Mo	Plate	SA–204	C	K12320	...
15	C–½Mo	Wld. pipe	SA–672	L75	K12320	...
16	C–½Mo	Wld. pipe	SA–691	CM–75	K12320	...
17	½Cr–⅕Mo	Forgings	SA–372	G	K13049	55
18	½Cr–⅕Mo	Forgings	SA–372	H	K13547	55
19	½Cr–⅕Mo	Forgings	SA–372	G	K13049	65
20	½Cr–⅕Mo	Forgings	SA–372	H	K13547	65
21	½Cr–⅕Mo	Forgings	SA–372	G	K13049	70
22	½Cr–⅕Mo	Forgings	SA–372	H	K13547	70
23	½Cr–⅕Mo–V	Plate	SA–517	B	K11630	...
24	½Cr–¼Mo–Si	Plate	SA–517	A	K11856	...
25	½Cr–¼Mo–Si	Forgings	SA–592	A	K11856	...
26	½Cr–½Mo	Smls. pipe	SA–335	P2	K11547	...
27	½Cr–½Mo	Forged pipe	SA–369	FP2	K11547	...
28	½Cr–½Mo	Plate	SA–387	2	K12143	1
29	½Cr–½Mo	Wld. pipe	SA–691	½CR	K12143	...
30	½Cr–½Mo	Smls. tube	SA–213	T2	K11547	...
31	½Cr–½Mo	Cast pipe	SA–426	CP2	J11547	...
32	½Cr–½Mo	Forgings	SA–182	F2	K12122	...
33	½Cr–½Mo	Plate	SA–387	2	K12143	2
34	½Cr–½Mo	Wld. pipe	SA–691	½CR	K12143	...
35	¾Cr–½Ni–Cu	Wld. tube	SA–423	1	K11535	...
36	¾Cr–¾Ni–Cu–Al	Pipe	SA–333	4	K11267	...
37	1Cr–⅕Mo	Forgings	SA–372	E	K13047	55
38	1Cr–⅕Mo	Forgings	SA–372	F	G41350	55
39	1Cr–⅕Mo	Forgings	SA–372	J	K13548	55
40	1Cr–⅕Mo	Bolting	SA–193	B7	G41400	...
41	1Cr–⅕Mo	Bolting	SA–193	B7M	G41400	...
42	1Cr–⅕Mo	Bolting	SA–320	L7M	G41400	...
43	1Cr–⅕Mo	Forgings	SA–372	F	G41350	65
44	1Cr–⅕Mo	Bolting	SA–193	B7	G41400	...
45	1Cr–⅕Mo	Forgings	SA–372	E	K13047	70

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	415	220	...
2	...	415	220	...
3	...	450	240	...
4	...	450	240	...
5	...	450	240	...
6	...	450	255	...
7	...	450	255	...
8	...	450	255	...
9	...	485	275	...
10	...	485	275	...
11	...	485	275	...
12	...	485	275	...
13	...	485	275	...
14	...	515	295	...
15	...	515	295	...
16	...	515	295	...
17	...	585	380	...
18	...	585	380	...
19	...	725	450	...
20	...	725	450	...
21	...	825	485	...
22	...	825	485	...
23	≤32	795	690	...
24	≤32	795	690	...
25	≤65	795	690	...
26	...	380	205	...
27	...	380	205	...
28	...	380	230	...
29	...	380	230	...
30	...	415	205	...
31	...	415	205	...
32	...	485	275	...
33	...	485	310	...
34	...	485	310	...
35	...	415	255	...
36	...	415	240	...
37	...	585	380	...
38	...	585	380	...
39	...	585	380	...
40	$100 < t \leq 180$	690	515	...
41	≤100	690	550	...
42	≤65	690	550	...
43	...	725	450	...
44	$64 < t \leq 100$	795	655	...
45	...	825	485	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	221	212	206	202	199	196	193	190	187	185
2	221	212	206	202	199	196	193	190	187	185
3	241	232	226	221	218	214	211	208	205	202
4	241	232	226	221	218	214	211	208	205	202
5	241	232	226	221	218	214	211	208	205	202
6	255	246	239	234	230	226	223	219	216	213
7	255	246	239	234	230	226	223	219	216	213
8	255	246	239	234	230	226	223	219	216	213
9	276	266	258	253	249	245	241	237	234	231
10	276	266	258	253	249	245	241	237	234	231
11	276	266	258	253	249	245	241	237	234	231
12	276	266	258	253	249	245	241	237	234	231
13	276	266	258	253	249	245	241	237	234	231
14	296	286	277	272	267	263	259	255	252	248
15	296	286	277	272	267	263	259	255	252	248
16	296	286	277	272	267	263	259	255	252	248
17	372	364	353	346	340	335	330	326	321	317
18	372	364	353	346	340	335	330	326	321	317
19	440	430	417	409	402	396	390	385	380	374
20	440	430	417	409	402	396	390	385	380	374
21	483	462	447	439	433	427	421	415	410	404
22	483	462	447	439	433	427	421	415	410	404
23	689	670	656	646	637	629	621	614	607	600
24	689	670	656	646	637	629	621	614	607	600
25	689	670	656	646	637	629	621	614	607	600
26	207	199	193	190	187	184	180	178	175	173
27	207	199	193	190	187	184	180	178	175	173
28	228	219	213	209	205	202	198	196	193	191
29	228	219	213	209	205	202	198	196	193	191
30	207	199	193	190	187	184	180	178	175	173
31	207	199	193	190	187	184	180	178	175	173
32	276	266	258	253	249	245	241	237	234	231
33	310	299	290	285	280	275	271	267	263	260
34	310	299	290	285	280	275	271	267	263	260
35	255	242	234	230	227	225	223	221	219	217
36	241	228	222	218	216	214	211	209	207	205
37	372	364	353	346	340	335	330	326	321	317
38	372	364	353	346	340	335	330	326	321	317
39	372	364	353	346	340	335	330	326	321	317
40	517	498	479	470	463	457	451	445	438	432
41	552	532	511	501	494	488	482	475	467	461
42	552	532	511	501	494	488	482	475	467	461
43	440	430	417	409	402	396	390	385	380	374
44	655	631	606	595	586	579	572	564	556	547
45	483	462	447	439	433	427	421	415	410	404

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	182	180	176	173	169	165	161	155	149	143
2	182	180	176	173	169	165	161	155	149	143
3	199	196	193	189	185	181	175	170	163	157
4	199	196	193	189	185	181	175	170	163	157
5	199	196	193	189	185	181	175	170	163	157
6	210	207	204	200	196	191	186	180	173	166
7	210	207	204	200	196	191	186	180	173	166
8	210	207	204	200	196	191	186	180	173	166
9	228	224	220	216	211	207	200	194	187	179
10	228	224	220	216	211	207	200	194	187	179
11	228	224	220	216	211	207	200	194	187	179
12	228	224	220	216	211	207	200	194	187	179
13	228	224	220	216	211	207	200	194	187	179
14	245	241	237	232	227	222	216	209	201	192
15	245	241	237	232	227	222	216	209	201	192
16	245	241	237	232	227	222	216	209	201	192
17	312	306	298	290	280	268	253	237	218	196
18	312	306	298	290	280	268	253	237	218	196
19	368	361	353	343	331	316	299	280	257	231
20	368	361	353	343	331	316	299	280	257	231
21	396	389	379	368	356	340	323	302	278	249
22	396	389	379	368	356	340	323	302	278	249
23	594	587	579	571	561	549	534	517	496	470
24	594	587	579	571	561	549	534	517	496	470
25	594	587	579	571	561	549	534	517	496	470
26	170	168	165	162	159	155	150	146	140	134
27	170	168	165	162	159	155	150	146	140	134
28	188	185	182	179	175	171	166	160	154	148
29	188	185	182	179	175	171	166	160	154	148
30	170	168	165	162	159	155	150	146	140	134
31	170	168	165	162	159	155	150	146	140	134
32	228	224	220	216	211	207	200	194	187	179
33	256	252	248	243	238	232	226	219	210	201
34	256	252	248	243	238	232	226	219	210	201
35	214	212	209	206	203	199	194	188	180	170
36	203	200	198	195	192	189	184	178	170	160
37	312	306	298	290	280	268	253	237	218	196
38	312	306	298	290	280	268	253	237	218	196
39	312	306	298	290	280	268	253	237	218	196
40	425	416	406	395	381	365	346	323	297	268
41	454	444	433	421	407	389	369	344	317	285
42	454	444	433	421	407	389	369	344	317	285
43	368	361	353	343	331	316	299	280	257	231
44	538	527	514	501	483	463	439	409	376	339
45	396	389	379	368	356	340	323	302	278	249

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	1Cr–1/5Mo	Forgings	SA–372	F	G41350	70
2	1Cr–1/5Mo	Forgings	SA–372	J	K13548	70
3	1Cr–1/5Mo	Bolting	SA–193	B7	G41400	...
4	1Cr–1/5Mo	Bolting	SA–320	L7	G41400	...
5	1Cr–1/5Mo	Forgings	SA–372	J	G41370	110
6	1Cr–1/5Mo	Bolting	SA–574	4137	G41370	...
7	1Cr–1/5Mo	Bolting	SA–574	4137	G41370	...
8	1Cr–1/2Mo	Plate	SA–387	12	K11757	1
9	1Cr–1/2Mo	Wld. pipe	SA–691	1CR	K11757	...
10	1Cr–1/2Mo	Cast pipe	SA–426	CP12	J11562	...
11	1Cr–1/2Mo	Forgings	SA–182	F12	K11562	1
12	1Cr–1/2Mo	Smls. tube	SA–213	T12	K11562	...
13	1Cr–1/2Mo	Smls. & wld. fittings	SA–234	WP12	K12062	1
14	1Cr–1/2Mo	Smls. pipe	SA–335	P12	K11562	...
15	1Cr–1/2Mo	Forged pipe	SA–369	FP12	K11562	...
16	1Cr–1/2Mo	Forgings	SA/EN 10222–2	13CrMo4–5	...	NT or QT
17	1Cr–1/2Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...
18	1Cr–1/2Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...
19	1Cr–1/2Mo	Plate	SA/GB 713	15CrMoR	...	NT
20	1Cr–1/2Mo	Forgings	SA/EN 10222–2	13CrMo4–5	...	NT or QT
21	1Cr–1/2Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...
22	1Cr–1/2Mo	Forgings	SA/EN 10222–2	13CrMo4–5	...	NT or QT
23	1Cr–1/2Mo	Smls. tube	SA/EN 10216–2	13CrMo4–5	...	...
24	1Cr–1/2Mo	Forgings	SA/EN 10222–2	13CrMo4–5	...	NT
25	1Cr–1/2Mo	Smls. tube	SA/EN 10216–2	13CrMo4–5	...	...
26	1Cr–1/2Mo	Forgings	SA/EN 10222–2	13CrMo4–5	...	NT
27	1Cr–1/2Mo	Plate	SA–387	12	K11757	2
28	1Cr–1/2Mo	Wld. pipe	SA–691	1CR	K11757	...
29	1Cr–1/2Mo	Plate	SA/GB 713	15CrMoR	...	NT
30	1Cr–1/2Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...
31	1Cr–1/2Mo	Plate	SA/GB 713	15CrMoR	...	NT
32	1Cr–1/2Mo	Plate	SA/EN 10028–2	13CrMo4–5	...	...
33	1Cr–1/2Mo	Forgings	SA–182	F12	K11564	2
34	1Cr–1/2Mo	Forgings	SA–336	F12	K11564	...
35	1Cr–1/2Mo–V	Bolting	SA–193	B16	K14072	...
36	1Cr–1/2Mo–V	Bolting	SA–193	B16	K14072	...
37	1Cr–1/2Mo–V	Bolting	SA–540	B21	K14073	5
38	1Cr–1/2Mo–V	Bolting	SA–540	B21	K14073	5
39	1Cr–1/2Mo–V	Bolting	SA–193	B16	K14072	...
40	1Cr–1/2Mo–V	Bolting	SA–540	B21	K14073	4
41	1Cr–1/2Mo–V	Bolting	SA–540	B21	K14073	3
42	1Cr–1/2Mo–V	Bolting	SA–540	B21	K14073	2
43	1Cr–1/2Mo–V	Bolting	SA–540	B21	K14073	1
44	1Cr–1Mn–1/4Mo	Bolting	SA–540	B22	K41420	5
45	1Cr–1Mn–1/4Mo	Bolting	SA–540	B22	K41420	5

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	825	485	...
2	...	825	485	...
3	≤64	860	725	...
4	≤65	860	725	...
5	...	930	760	...
6	≥16	1170	930	...
7	≤13	1240	1035	...
8	...	380	230	...
9	...	380	230	...
10	...	415	205	...
11	...	415	220	...
12	...	415	220	...
13	...	415	220	...
14	...	415	220	...
15	...	415	220	...
16	$250 < t \le 500$	420	240	...
17	$150 < t \le 250$	420	245	...
18	$100 < t \le 150$	430	255	...
19	$100 < t \le 200$	440	255	...
20	$100 < t \le 250$	440	265	...
21	$60 < t \le 100$	440	270	...
22	$70 < t \le 100$	440	275	...
23	$40 < t \le 60$	440	280	...
24	$35 < t \le 70$	440	285	...
25	$t \le 40$	440	290	...
26	$t \le 35$	440	295	...
27	...	450	275	...
28	...	450	275	...
29	$60 < t \le 100$	450	275	...
30	$16 < t \le 60$	450	290	...
31	$6 \le t \le 60$	450	295	...
32	$t \le 16$	450	300	...
33	...	485	275	...
34	...	485	275	...
35	$100 < t \le 200$	690	585	...
36	$64 < t \le 100$	760	655	...
37	$50 < t \le 205$	795	690	...
38	≤50	825	725	...
39	≤64	860	725	...
40	≤150	930	825	...
41	≤150	1000	895	...
42	≤100	1070	965	...
43	≤100	1140	1035	...
44	$50 < t \le 100$	795	690	...
45	≤50	825	725	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	483	462	447	439	433	427	421	415	410	404
2	483	462	447	439	433	427	421	415	410	404
3	724	698	671	658	648	640	632	623	614	605
4	724	698	671	658	648	640	632	623	614	605
5	758	725	703	690	679	670	661	652	644	634
6	930	890	863	847	833	822	811	800	790	778
7	1035	990	960	942	927	915	903	890	879	866
8	228	214	204	198	194	189	185	182	180	177
9	228	214	204	198	194	189	185	182	180	177
10	207	194	185	180	176	172	169	166	163	161
11	221	207	198	192	187	183	180	177	174	172
12	221	207	198	192	187	183	180	177	174	172
13	221	207	198	192	187	183	180	177	174	172
14	221	207	198	192	187	183	180	177	174	172
15	221	207	198	192	187	183	180	177	174	172
16	240	226	216	210	205	200	196	193	190	187
17	245	230	220	214	208	204	200	196	193	191
18	255	239	229	222	217	212	208	204	201	198
19	225	211	202	196	191	187	183	180	177	175
20	265	250	239	232	226	221	216	213	210	207
21	270	253	242	235	230	224	220	216	213	210
22	275	259	248	241	235	229	225	221	217	215
23	280	266	257	251	246	241	236	233	229	225
24	285	269	257	250	243	237	233	229	225	222
25	290	276	266	260	254	249	245	241	237	233
26	295	278	266	258	252	246	241	237	233	230
27	276	259	248	240	234	229	225	221	218	215
28	276	259	248	240	234	229	225	221	218	215
29	275	258	247	240	234	229	224	220	217	214
30	290	272	260	253	247	241	236	232	229	226
31	295	277	265	257	251	245	240	236	233	229
32	300	282	269	262	255	249	244	240	237	233
33	276	259	248	240	234	229	225	221	218	215
34	276	259	248	240	234	229	225	221	218	215
35	586	575	563	557	551	544	538	531	525	518
36	655	643	630	622	615	608	600	593	586	579
37	689	678	664	655	646	639	632	625	617	609
38	724	711	696	688	680	672	664	656	648	640
39	724	711	696	688	680	672	664	656	648	640
40	827	814	797	786	776	767	759	750	740	731
41	896	882	863	851	840	831	822	812	802	792
42	965	950	930	917	905	895	885	875	864	852
43	1030	1020	996	982	970	959	949	937	925	913
44	688	673	657	646	637	628	619	610	601	591
45	722	707	689	678	668	659	650	641	631	620

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	396	389	379	368	356	340	323	302	278	249
2	396	389	379	368	356	340	323	302	278	249
3	595	583	568	553	534	511	485	452	416	374
4	595	583	568	553	534	511	485	452	416	374
5	623	611	596	579	559	535	507	474	436	392
6	764	750	731	710	686	656	622	582	535	481
7	851	834	814	791	763	731	692	647	595	535
8	174	172	170	168	165	163	160	156	152	147
9	174	172	170	168	165	163	160	156	152	147
10	159	157	155	153	151	148	145	142	138	134
11	170	167	165	163	161	158	155	151	147	142
12	170	167	165	163	161	158	155	151	147	142
13	170	167	165	163	161	158	155	151	147	142
14	170	167	165	163	161	158	155	151	147	142
15	170	167	165	163	161	158	155	151	147	142
16	185	183	181	178	176	172	169	165	160	156
17	188	186	184	181	178	175	172	168	163	158
18	196	193	191	188	186	182	179	175	170	165
19	173	171	169	166	164	161	158	154	150	145
20	204	202	199	197	194	190	186	182	177	172
21	207	205	202	200	197	193	189	185	180	174
22	212	210	207	204	201	198	193	189	184	178
23	222	218	215	211	207	202	197	192	186	179
24	220	217	215	212	208	205	200	196	190	185
25	230	226	222	218	214	209	204	199	192	185
26	227	225	222	219	216	212	207	203	197	191
27	212	209	207	204	201	197	194	189	184	178
28	212	209	207	204	201	197	194	189	184	178
29	211	209	206	203	200	197	193	188	183	177
30	223	220	217	214	211	208	203	199	193	187
31	227	224	221	218	215	211	207	202	197	190
32	230	228	225	222	218	215	210	206	200	194
33	212	209	207	204	201	197	194	189	184	178
34	212	209	207	204	201	197	194	189	184	178
35	511	504	496	488	479	469	457	443	427	407
36	571	563	555	546	535	524	511	495	477	455
37	601	594	585	575	564	551	536	520	502	480
38	631	623	613	603	592	579	565	547	528	503
39	631	623	613	603	592	579	565	547	528	503
40	721	712	702	690	677	662	644	624	602	576
41	782	772	761	747	734	716	697	676	653	624
42	842	831	819	805	790	771	751	728	702	672
43	902	891	877	862	847	827	805	780	753	720
44	579	565	550	532	...	...	...	...	...	...
45	608	594	578	559	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	1Cr–1Mn–¼Mo	Bolting	SA–540	B22	K41420	4
2	1Cr–1Mn–¼Mo	Bolting	SA–540	B22	K41420	3
3	1Cr–1Mn–¼Mo	Bolting	SA–540	B22	K41420	2
4	1Cr–1Mn–¼Mo	Bolting	SA–540	B22	K41420	1
5	1Cr–V	Smls. tube	SA–213	T17	K12047	...
6	1¼Cr–½Mo	Castings	SA–217	WC6	J12072	...
7	1¼Cr–½Mo	Cast pipe	SA–426	CP11	J12072	...
8	1¼Cr–½Mo	Bar	SA–739	B11	K11797	...
9	1¼Cr–½Mo–Si	Forgings	SA–182	F11	K11597	1
10	1¼Cr–½Mo–Si	Smls. tube	SA–213	T11	K11597	...
11	1¼Cr–½Mo–Si	Smls. & wld. fittings	SA–234	WP11	...	1
12	1¼Cr–½Mo–Si	Smls. pipe	SA–335	P11	K11597	...
13	1¼Cr–½Mo–Si	Forgings	SA–336	F11	K11597	1
14	1¼Cr–½Mo–Si	Forged pipe	SA–369	FP11	K11597	...
15	1¼Cr–½Mo–Si	Plate	SA–387	11	K11789	1
16	1¼Cr–½Mo–Si	Wld. pipe	SA–691	1¼CR	K11789	...
17	1¼Cr–½Mo–Si	Forgings	SA–182	F11	K11572	2
18	1¼Cr–½Mo–Si	Forgings	SA–336	F11	K11572	2
19	1¼Cr–½Mo–Si	Plate	SA/EN 10028–2	13CrMoSi5–5	...	QT
20	1¼Cr–½Mo–Si	Plate	SA/EN 10028–2	13CrMoSi5–5	...	QT
21	1¼Cr–½Mo–Si	Plate	SA/EN 10028–2	13CrMoSi5–5	...	QT
22	1¼Cr–½Mo–Si	Forgings	SA–336	F11	K11572	3
23	1¼Cr–½Mo–Si	Plate	SA–387	11	K11789	2
24	1¼Cr–½Mo–Si	Wld. pipe	SA–691	1¼CR	K11789	...
25	1¾Cr–½Mo–Cu	Forgings	SA–592	E	K11695	...
26	1¾Cr–½Mo–Cu	Forgings	SA–592	E	K11695	...
27	1¾Cr–½Mo–Ti	Plate	SA–517	E	K21604	...
28	1¾Cr–½Mo–Ti	Plate	SA–517	E	K21604	...
29	2¼Cr–1Mo	Forgings	SA–182	F22	K21590	1
30	2¼Cr–1Mo	Smls. tube	SA–213	T22	K21590	...
31	2¼Cr–1Mo	Smls. & wld. fittings	SA–234	WP22	K21590	1
32	2¼Cr–1Mo	Smls. pipe	SA–335	P22	K21590	...
33	2¼Cr–1Mo	Forgings	SA–336	F22	K21590	1
34	2¼Cr–1Mo	Forged pipe	SA–369	FP22	K21590	...
35	2¼Cr–1Mo	Plate	SA–387	22	K21590	1
36	2¼Cr–1Mo	Wld. pipe	SA–691	2¼CR	K21590	...
37	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...
38	2¼Cr–1Mo	Forgings	SA/EN 10222–2	11CrMo9–10	...	NT or QT
39	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...
40	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...
41	2¼Cr–1Mo	Smls. tube	SA/EN 10216–2	10CrMo9–10	...	...
42	2¼Cr–1Mo	Smls. tube	SA/EN 10216–2	10CrMo9–10	...	...
43	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...
44	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...
45	2¼Cr–1Mo	Plate	SA/EN 10028–2	10CrMo9–10	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	≤100	930	825	...
2	≤100	1000	895	...
3	≤75	1070	965	...
4	≤38	1140	1035	...
5	...	415	205	...
6	...	485	275	...
7	...	485	275	...
8	...	485	310	...
9	...	415	205	...
10	...	415	205	...
11	...	415	205	...
12	...	415	205	...
13	...	415	205	...
14	...	415	205	...
15	...	415	240	...
16	...	415	240	...
17	...	485	275	...
18	...	485	275	...
19	$100 < t \le 250$	490	380	...
20	$60 < t \le 100$	500	390	...
21	≤60	510	400	...
22	...	515	310	...
23	...	515	310	...
24	...	515	310	...
25	$65 < t \le 100$	725	620	...
26	≤65	795	690	...
27	$65 < t \le 150$	725	620	...
28	≤65	795	690	...
29	...	415	205	...
30	...	415	205	...
31	...	415	205	...
32	...	415	205	...
33	...	415	205	...
34	...	415	205	...
35	...	415	205	...
36	...	415	205	...
37	$150 < t \le 250$	450	250	...
38	$200 < t \le 500$	450	265	...
39	$100 < t \le 150$	460	260	...
40	$60 < t \le 100$	470	280	...
41	$40 < t \le 60$	480	270	...
42	$t \le 40$	480	280	...
43	$40 < t \le 60$	480	290	...
44	$16 < t \le 40$	480	300	...
45	$t \le 16$	480	310	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	825	808	787	775	764	753	743	733	722	709
2	894	876	854	840	828	817	806	794	782	769
3	963	943	919	904	891	879	867	855	842	827
4	1032	1009	983	968	955	943	931	918	903	886
5	207	197	190	185	181	178	175	172	169	166
6	276	262	253	247	242	237	233	229	225	222
7	276	262	253	247	242	237	233	229	225	222
8	310	295	284	278	272	267	262	258	253	249
9	207	197	190	185	181	178	175	172	169	166
10	207	197	190	185	181	178	175	172	169	166
11	207	197	190	185	181	178	175	172	169	166
12	207	197	190	185	181	178	175	172	169	166
13	207	197	190	185	181	178	175	172	169	166
14	207	197	190	185	181	178	175	172	169	166
15	241	230	221	216	211	207	204	201	197	194
16	241	230	221	216	211	207	204	201	197	194
17	276	262	253	247	242	237	233	229	225	222
18	276	262	253	247	242	237	233	229	225	222
19	380	372	365	360	355	349	343	338	332	327
20	390	382	375	369	364	358	353	347	341	335
21	400	391	384	379	373	367	362	356	350	344
22	310	295	284	278	272	267	262	258	253	249
23	310	295	284	278	272	267	262	258	253	249
24	310	295	284	278	272	267	262	258	253	249
25	621	604	591	581	573	566	560	554	548	543
26	689	670	656	646	637	629	622	615	609	603
27	621	604	591	581	573	566	560	554	548	543
28	689	670	656	646	637	629	622	615	609	603
29	207	197	192	190	187	186	185	185	185	185
30	207	197	192	190	187	186	185	185	185	185
31	207	197	192	190	187	186	185	185	185	185
32	207	197	192	190	187	186	185	185	185	185
33	207	197	192	190	187	186	185	185	185	185
34	207	197	192	190	187	186	185	185	185	185
35	207	197	192	190	187	186	185	185	185	185
36	207	197	192	190	187	186	185	185	185	185
37	250	236	227	223	218	215	212	210	208	206
38	265	251	242	236	232	228	225	222	220	218
39	260	246	237	231	227	224	221	218	216	214
40	280	264	255	249	245	241	238	235	233	231
41	270	256	248	245	242	239	237	235	233	231
42	280	266	258	254	251	248	246	244	242	240
43	290	274	264	258	253	249	246	244	241	239
44	300	283	273	267	262	258	255	252	249	247
45	310	293	282	276	271	267	263	260	258	255

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	695	679	660	638	...	...	...	...	...	...
2	753	736	715	691	...	...	...	...	...	...
3	811	792	770	745	...	...	...	...	...	...
4	866	842	813	778	...	...	...	...	...	...
5	164	161	158	155	153	149	145	142	137	132
6	219	215	211	208	204	199	195	189	183	176
7	219	215	211	208	204	199	195	189	183	176
8	246	242	238	234	229	224	219	213	206	198
9	164	161	158	155	153	149	145	142	137	132
10	164	161	158	155	153	149	145	142	137	132
11	164	161	158	155	153	149	145	142	137	132
12	164	161	158	155	153	149	145	142	137	132
13	164	161	158	155	153	149	145	142	137	132
14	164	161	158	155	153	149	145	142	137	132
15	191	188	185	182	178	174	170	165	160	154
16	191	188	185	182	178	174	170	165	160	154
17	219	215	211	208	204	199	195	189	183	176
18	219	215	211	208	204	199	195	189	183	176
19	321	315	309	303	297	291	283	276	267	258
20	329	324	318	311	305	298	291	283	274	265
21	338	332	326	319	313	306	298	290	281	272
22	246	242	238	234	229	224	219	213	206	198
23	246	242	238	234	229	224	219	213	206	198
24	246	242	238	234	229	224	219	213	206	198
25	538	534	530	525	521	515	509	502	494	483
26	598	593	589	584	579	573	566	558	548	536
27	538	534	530	525	521	515	509	502	494	483
28	598	593	589	584	579	573	566	558	548	536
29	185	185	185	185	185	184	181	178	173	167
30	185	185	185	185	185	184	181	178	173	167
31	185	185	185	185	185	184	181	178	173	167
32	185	185	185	185	185	184	181	178	173	167
33	185	185	185	185	185	184	181	178	173	167
34	185	185	185	185	185	184	181	178	173	167
35	185	185	185	185	185	184	181	178	173	167
36	185	185	185	185	185	184	181	178	173	167
37	204	202	200	198	195	191	187	182	176	169
38	217	215	212	210	206	202	198	192	186	180
39	212	210	208	205	202	199	194	189	183	176
40	229	227	224	221	218	214	209	204	197	190
41	229	227	224	222	219	215	211	206	199	191
42	238	235	233	230	227	223	219	213	207	198
43	237	235	232	229	226	222	217	211	204	196
44	245	243	240	237	233	229	224	218	211	203
45	253	251	248	245	241	237	232	225	218	210

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	2¼Cr–1Mo	Castings	SA–217	WC9	J21890	...
2	2¼Cr–1Mo	Cast pipe	SA–426	CP22	J21890	...
3	2¼Cr–1Mo	Forgings	SA–182	F22	K21590	3
4	2¼Cr–1Mo	Forgings	SA–336	F22	K21590	3
5	2¼Cr–1Mo	Plate	SA–387	22	K21590	2
6	2¼Cr–1Mo	Wld. pipe	SA–691	2¼CR	K21590	...
7	2¼Cr–1Mo	Bar	SA–739	B22	K21390	...
8	2¼Cr–1Mo	Forgings	SA/EN 10222–2	11CrMo9–10	...	NT
9	2¼Cr–1Mo	Castings	SA–487	8	J22091	A
10	2¼Cr–1Mo	Forgings	SA–508	22	K21590	3
11	2¼Cr–1Mo	Forgings	SA–541	22	K21390	3
12	2¼Cr–1Mo	Plate	SA–542	B	K21590	4
13	2¼Cr–1Mo	Forgings	SA–541	22	K21390	4
14	2¼Cr–1Mo–V	Forgings	SA–182	F22V	K31835	...
15	2¼Cr–1Mo–V	Forgings	SA–336	F22V	K31835	...
16	2¼Cr–1Mo–V	Forgings	SA–541	22V	K31835	...
17	2¼Cr–1Mo–V	Plate	SA–542	D	K31835	4a
18	2¼Cr–1Mo–V	Plate	SA–832	22V	K31835	...
19	3Cr–1Mo	Smls. tube	SA–213	T21	K31545	...
20	3Cr–1Mo	Smls. pipe	SA–335	P21	K31545	...
21	3Cr–1Mo	Forgings	SA–336	F21	K31545	1
22	3Cr–1Mo	Forged pipe	SA–369	FP21	K31545	...
23	3Cr–1Mo	Plate	SA–387	21	K31545	1
24	3Cr–1Mo	Cast pipe	SA–426	CP21	J31545	...
25	3Cr–1Mo	Forgings	SA–182	F21	K31545	...
26	3Cr–1Mo	Forgings	SA–336	F21	K31545	3
27	3Cr–1Mo	Plate	SA–387	21	K31545	2
28	3Cr–1Mo–¼V–Ti–B	Forgings	SA–182	F3V	K31830	...
29	3Cr–1Mo–¼V–Ti–B	Forgings	SA–336	F3V	K31830	...
30	3Cr–1Mo–¼V–Ti–B	Forgings	SA–508	3V	K31830	...
31	3Cr–1Mo–¼V–Ti–B	Forgings	SA–541	3V	K31830	...
32	3Cr–1Mo–¼V–Ti–B	Plate	SA–542	C	K31830	4a
33	3Cr–1Mo–¼V–Ti–B	Plate	SA–832	21V	K31830	...
34	3Cr–1Mo–¼V–Cb–Ca	Forgings	SA–182	F3VCb	...	...
35	3Cr–1Mo–¼V–Cb–Ca	Forgings	SA–336	F3VCb	...	...
36	3Cr–1Mo–¼V–Cb–Ca	Forgings	SA–508	3VCb	...	...
37	3Cr–1Mo–¼V–Cb–Ca	Forgings	SA–541	3VCb	...	...
38	3Cr–1Mo–¼V–Cb–Ca	Plate	SA–542	E	...	4a
39	3Cr–1Mo–¼V–Cb–Ca	Plate	SA–832	23V	...	...
40	5Cr–½Mo	Smls. tube	SA–213	T5	K41545	...
41	5Cr–½Mo	Smls. & wld. fittings	SA–234	WP5	K41545	...
42	5Cr–½Mo	Smls. pipe	SA–335	P5	K41545	...
43	5Cr–½Mo	Forged pipe	SA–369	FP5	K41545	...
44	5Cr–½Mo	Plate	SA–387	5	K41545	1
45	5Cr–½Mo	Wld. pipe	SA–691	5CR	K41545	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	485	275	...
2	...	485	275	...
3	...	515	310	...
4	...	515	310	...
5	...	515	310	...
6	...	515	310	...
7	...	515	310	...
8	$t \le 200$	520	310	...
9	...	585	380	...
10	...	585	380	...
11	...	585	380	...
12	...	585	380	...
13	...	725	585	...
14	...	585	415	...
15	...	585	415	...
16	...	585	415	...
17	...	585	415	...
18	...	585	415	...
19	...	415	205	...
20	...	415	205	...
21	...	415	205	...
22	...	415	205	...
23	...	415	205	...
24	...	415	205	...
25	...	515	310	...
26	...	515	310	...
27	...	515	310	...
28	...	585	415	...
29	...	585	415	...
30	...	585	415	...
31	...	585	415	...
32	...	585	415	...
33	...	585	415	...
34	...	585	415	...
35	...	585	415	...
36	...	585	415	...
37	...	585	415	...
38	...	585	415	...
39	...	585	415	...
40	...	415	205	...
41	...	415	205	...
42	...	415	205	...
43	...	415	205	...
44	...	415	205	...
45	...	415	205	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	276	262	254	250	247	244	242	240	238	236
2	276	262	254	250	247	244	242	240	238	236
3	310	293	282	276	271	267	263	260	258	256
4	310	293	282	276	271	267	263	260	258	256
5	310	293	282	276	271	267	263	260	258	256
6	310	293	282	276	271	267	263	260	258	256
7	310	293	282	276	271	267	263	260	258	256
8	310	293	283	276	271	267	263	260	258	255
9	379	360	349	343	339	336	333	330	328	325
10	379	372	365	361	357	353	350	346	343	339
11	379	372	365	361	357	353	350	346	343	339
12	379	372	365	361	357	353	350	346	343	339
13	586	574	560	554	549	543	539	534	530	526
14	414	412	410	407	404	400	396	392	388	383
15	414	412	410	407	404	400	396	392	388	383
16	414	412	410	407	404	400	396	392	388	383
17	414	412	410	407	404	400	396	392	388	383
18	414	412	410	407	404	400	396	392	388	383
19	207	197	192	190	187	186	185	185	185	185
20	207	197	192	190	187	186	185	185	185	185
21	207	197	192	190	187	186	185	185	185	185
22	207	197	192	190	187	186	185	185	185	185
23	207	197	192	190	187	186	185	185	185	185
24	207	197	192	190	187	186	185	185	185	185
25	310	293	282	276	271	267	263	260	258	256
26	310	293	282	276	271	267	263	260	258	256
27	310	293	282	276	271	267	263	260	258	256
28	414	396	384	377	371	366	363	361	359	358
29	414	396	384	377	371	366	363	361	359	358
30	414	396	384	377	371	366	363	361	359	358
31	414	396	384	377	371	366	363	361	359	358
32	414	396	384	377	371	366	363	361	359	358
33	414	396	384	377	371	366	363	361	359	358
34	414	396	384	377	371	366	363	361	359	358
35	414	396	384	377	371	366	363	361	359	358
36	414	396	384	377	371	366	363	361	359	358
37	414	396	384	377	371	366	363	361	359	358
38	414	396	384	377	371	366	363	361	359	358
39	414	396	384	377	371	366	363	361	359	358
40	207	193	186	182	180	179	178	177	177	176
41	207	193	186	182	180	179	178	177	177	176
42	207	193	186	182	180	179	178	177	177	176
43	207	193	186	182	180	179	178	177	177	176
44	207	193	186	182	180	179	178	177	177	176
45	207	193	186	182	180	179	178	177	177	176

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	234	231	229	226	223	220	215	210	204	195
2	234	231	229	226	223	220	215	210	204	195
3	253	251	248	245	241	237	232	225	218	210
4	253	251	248	245	241	237	232	225	218	210
5	253	251	248	245	241	237	232	225	218	210
6	253	251	248	245	241	237	232	225	218	210
7	253	251	248	245	241	237	232	225	218	210
8	253	251	248	245	241	237	231	225	218	210
9	322	319	316	312	307	302	296	289	280	269
10	335	331	326	322	317	312	306	300	...	...
11	335	331	326	322	317	312	306	300	...	...
12	335	331	326	322	317	312	306	300	...	...
13	521	517	511	505	498	490	480	470	457	442
14	377	372	366	360	353	346	339	332	324	...
15	377	372	366	360	353	346	339	332	324	...
16	377	372	366	360	353	346	339	332	324	...
17	377	372	366	360	353	346	339	332	324	...
18	377	372	366	360	353	346	339	332	324	...
19	185	185	185	185	185	184	181	178	173	167
20	185	185	185	185	185	184	181	178	173	167
21	185	185	185	185	185	184	181	178	173	167
22	185	185	185	185	185	184	181	178	173	167
23	185	185	185	185	185	184	181	178	173	167
24	185	185	185	185	185	184	181	178	173	167
25	253	251	248	245	241	237	232	225	218	210
26	253	251	248	245	241	237	232	225	218	210
27	253	251	248	245	241	237	232	225	218	210
28	357	356	354	353	350	347	342	336	330	...
29	357	356	354	353	350	347	342	336	330	...
30	357	356	354	353	350	347	342	336	330	...
31	357	356	354	353	350	347	342	336	330	...
32	357	356	354	353	350	347	342	336	330	...
33	357	356	354	353	350	347	342	336	330	...
34	357	356	354	353	350	347	342	336	330	...
35	357	356	354	353	350	347	342	336	330	...
36	357	356	354	353	350	347	342	336	330	...
37	357	356	354	353	350	347	342	336	330	...
38	357	356	354	353	350	347	342	336	330	...
39	357	356	354	353	350	347	342	336	330	...
40	175	173	171	168	165	160	154	148	140	132
41	175	173	171	168	165	160	154	148	140	132
42	175	173	171	168	165	160	154	148	140	132
43	175	173	171	168	165	160	154	148	140	132
44	175	173	171	168	165	160	154	148	140	132
45	175	173	171	168	165	160	154	148	140	132

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	5Cr–½Mo	Forgings	SA–336	F5	K41545	...
2	5Cr–½Mo	Forgings	SA–182	F5	K41545	...
3	5Cr–½Mo	Plate	SA–387	5	K41545	2
4	5Cr–½Mo	Forgings	SA–336	F5A	K42544	...
5	5Cr–½Mo	Castings	SA–217	C5	J42045	...
6	5Cr–½Mo	Cast pipe	SA–426	CP5	J42045	...
7	5Cr–½Mo	Forgings	SA–182	F5a	K42544	...
8	5Cr–½Mo	Bolting	SA–193	B5	K50100	...
9	5Cr–½Mo–Si	Smls. tube	SA–213	T5b	K51545	...
10	5Cr–½Mo–Si	Smls. pipe	SA–335	P5b	K51545	...
11	5Cr–½Mo–Ti	Smls. tube	SA–213	T5c	K41245	...
12	5Cr–½Mo–Ti	Smls. pipe	SA–335	P5c	K41245	...
13	9Cr–1Mo	Smls. tube	SA–213	T9	K90941	...
14	9Cr–1Mo	Fittings	SA–234	WP9	K90941	...
15	9Cr–1Mo	Smls. pipe	SA–335	P9	K90941	...
16	9Cr–1Mo	Forged pipe	SA–369	FP9	K90941	...
17	9Cr–1Mo	Forgings	SA–182	F9	K90941	...
18	9Cr–1Mo	Forgings	SA–336	F9	K90941	...
19	9Cr–1Mo	Castings	SA–217	C12	J82090	...
20	9Cr–1Mo	Cast pipe	SA–426	CP9	J82090	...
21	9Cr–1Mo–V	Smls. tube	SA–213	T91 Types 1 & 2	K90901	...
22	9Cr–1Mo–V	Fittings	SA–234	WP91 Types 1 & 2	K90901	...
23	9Cr–1Mo–V	Smls. pipe	SA–335	P91 Types 1 & 2	K90901	...
24	9Cr–1Mo–V	Forged pipe	SA–369	FP91 Types 1 & 2	K90901	...
25	9Cr–1Mo–V	Plate	SA–387	91 Types 1 & 2	K90901	2
26	9Cr–1Mo–V	Forgings	SA–182	F91 Types 1 & 2	K90901	...
27	9Cr–1Mo–V	Forgings	SA–336	F91 Types 1 & 2	K90901	...
28	11Cr–Ti	Plate	SA–240	...	S40910	...
29	11Cr–Ti	Plate	SA–240	...	S40920	...
30	11Cr–Ti	Plate	SA–240	...	S40930	...
31	11Cr–Ti	Smls. & wld. tube	SA–268	TP409	S40900	...
32	12Cr	Plate	SA–1010	40	S41003	...
33	12Cr	Bar	SA–479	403	S40300	A
34	12Cr	Bar	SA–479	403	S40300	1
35	12Cr	Plate	SA–1010	50	S41003	...
36	12Cr–Al	Bar	SA/JIS G4303	SUS405	...	...
37	12Cr–Al	Plate	SA–240	405	S40500	...
38	12Cr–Al	Bar	SA–479	405	S40500	...
39	12Cr–Al	Smls. & wld. tube	SA–268	TP405	S40500	...
40	12Cr–1Mo–V–W	Bolting	SA–437	B4C	K91352	...
41	12Cr–1Mo–V–W	Bolting	SA–437	B4B	K91352	...
42	12Cr–9Ni–2Cu–1Ti	Bar	SA–564	XM–16	S45500	H1000
43	12Cr–9Ni–2Cu–1Ti	Forgings	SA–705	XM–16	S45500	H1000
44	12Cr–9Ni–2Cu–1Ti	Bar	SA–564	XM–16	S45500	H950
45	12Cr–9Ni–2Cu–1Ti	Forgings	SA–705	XM–16	S45500	H950

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	415	250	...
2	...	485	275	...
3	...	515	310	...
4	...	550	345	...
5	...	620	415	...
6	...	620	415	...
7	...	620	450	...
8	≤100	690	550	...
9	...	415	205	...
10	...	415	205	...
11	...	415	205	...
12	...	415	205	...
13	...	415	205	...
14	...	415	205	...
15	...	415	205	...
16	...	415	205	...
17	...	585	380	...
18	...	585	380	...
19	...	620	415	...
20	...	620	415	...
21	...	585	415	...
22	...	620	415	...
23	...	585	415	...
24	...	585	415	...
25	...	585	415	...
26	...	620	415	...
27	...	620	415	...
28	...	380	170	...
29	...	380	170	...
30	...	380	170	...
31	...	380	170	...
32	≤19	455	275	...
33	...	485	275	...
34	...	485	275	...
35	≤19	485	345	...
36	...	410	174	...
37	...	415	170	...
38	...	415	170	...
39	...	415	205	...
40	...	790	585	...
41	...	1000	720	...
42	...	1410	1280	...
43	≥13	1410	1280	...
44	...	1520	1410	...
45	≥13	1520	1410	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	248	232	223	219	216	215	213	212	212	211
2	276	257	248	243	240	238	237	237	236	234
3	310	290	279	274	270	268	267	266	265	264
4	345	322	310	304	300	298	296	295	294	293
5	414	387	372	365	360	357	355	354	353	352
6	414	387	372	365	360	357	355	354	353	352
7	448	419	403	395	390	387	385	384	382	381
8	552	517	486	477	475	474	474	474	474	473
9	207	193	186	182	180	179	178	177	177	176
10	207	193	186	182	180	179	178	177	177	176
11	207	193	186	182	180	179	178	177	177	176
12	207	193	186	182	180	179	178	177	177	176
13	207	193	186	182	180	179	178	177	177	176
14	207	193	186	182	180	179	178	177	177	176
15	207	193	186	182	180	179	178	177	177	176
16	207	193	186	182	180	179	178	177	177	176
17	379	354	341	334	330	327	326	325	324	322
18	379	354	341	334	330	327	326	325	324	322
19	414	387	372	365	360	357	355	354	353	352
20	414	387	372	365	360	357	355	354	353	352
21	414	394	384	380	378	378	377	377	377	377
22	414	394	384	380	378	378	377	377	377	377
23	414	394	384	380	378	378	377	377	377	377
24	414	394	384	380	378	378	377	377	377	377
25	414	394	384	380	378	378	377	377	377	377
26	414	394	384	380	378	378	377	377	377	377
27	414	394	384	380	378	378	377	377	377	377
28	172	159	148	141	135	130	125	122	120	118
29	172	159	148	141	135	130	125	122	120	118
30	172	159	148	141	135	130	125	122	120	118
31	172	159	148	141	135	130	125	122	120	118
32	276	276	274	263	253	248	235	229	224	220
33	276	261	252	248	245	243	241	239	238	236
34	276	261	252	248	245	243	241	239	238	236
35	345	345	342	329	316	304	294	286	280	275
36	172	163	158	155	153	152	150	150	149	147
37	172	163	158	155	153	152	150	150	149	147
38	172	163	158	155	153	152	150	150	149	147
39	207	196	189	186	183	182	181	180	178	177
40	585	574	560	551	544	537	531	525	520	515
41	722	708	691	680	670	662	654	647	641	635
42	1276	...	...	...	...	...	...	...	...	...
43	1276	...	...	...	...	...	...	...	...	...
44	1413	...	...	...	...	...	...	...	...	...
45	1413	...	...	...	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	210	208	205	201	197	191	185	177	168	158
2	233	231	228	224	219	213	206	197	187	176
3	262	260	257	252	247	239	231	221	210	198
4	291	289	285	280	274	266	256	245	233	220
5	350	347	342	336	329	319	308	295	280	263
6	350	347	342	336	329	319	308	295	280	263
7	379	376	371	364	356	346	333	319	303	285
8	473	472	466	459	448	435	419	400	379	355
9	175	173	171	168	165	160	154	148	140	132
10	175	173	171	168	165	160	154	148	140	132
11	175	173	171	168	165	160	154	148	140	132
12	175	173	171	168	165	160	154	148	140	132
13	175	173	171	168	165	160	154	148	140	132
14	175	173	171	168	165	160	154	148	140	132
15	175	173	171	168	165	160	154	148	140	132
16	175	173	171	168	165	160	154	148	140	132
17	320	318	314	308	301	292	282	270	257	242
18	320	318	314	308	301	292	282	270	257	242
19	350	347	342	336	329	319	308	295	280	263
20	350	347	342	336	329	319	308	295	280	263
21	377	375	371	366	358	348	337	322	306	288
22	377	375	371	366	358	348	337	322	306	288
23	377	375	371	366	358	348	337	322	306	288
24	377	375	371	366	358	348	337	322	306	288
25	377	375	371	366	358	348	337	322	306	288
26	377	375	371	366	358	348	337	322	306	288
27	377	375	371	366	358	348	337	322	306	288
28	118	117	117	116	116	115	113	110	107	103
29	118	117	117	116	116	115	113	110	107	103
30	118	117	117	116	116	115	113	110	107	103
31	118	117	117	116	116	115	113	110	107	103
32	217	213	208	202	193	183	172	161	151	146
33	234	231	227	223	216	209	200	190	179	166
34	234	231	227	223	216	209	200	190	179	166
35	271	266	260	252	242	229	215	201	189	182
36	146	144	142	139	135	131	125	119	111	103
37	146	144	142	139	135	131	125	119	111	103
38	146	144	142	139	135	131	125	119	111	103
39	176	173	170	167	162	157	150	142	134	124
40	511	506	501	496	...	...	...	...	...	...
41	629	624	618	612	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	12Cr–9Ni–2Cu–1Ti	Bar	SA–564	XM–16	S45500	H900
2	12Cr–9Ni–2Cu–1Ti	Forgings	SA–705	XM–16	S45500	H900
3	12Cr–Ti	Smls. & wld. tube	SA–268	...	S40800	...
4	13Cr	Plate	SA–240	410S	S41008	...
5	13Cr	Smls. & wld. tube	SA–268	TP410	S41000	...
6	13Cr	Plate	SA–240	410	S41000	...
7	13Cr	Forgings	SA–182	F6a	S41000	1
8	13Cr	Bar	SA–479	410	S41000	...
9	13Cr	Bar	SA–479	410	S41000	A
10	13Cr	Bar	SA–479	410	S41000	1
11	13Cr	Forgings	SA–182	F6a	S41000	2
12	13Cr	Castings	SA–217	CA15	J91150	...
13	13Cr	Cast pipe	SA–426	CPCA15	J91150	...
14	13Cr	Bar	SA/EN 10088–3	X12Cr13	...	QT650
15	13Cr	Bolting	SA–193	B6	S41000	...
16	13Cr–4Ni	Castings	SA–487	CA6NM	J91540	A
17	13Cr–4Ni	Forgings	SA–182	F6NM	S41500	...
18	13Cr–4Ni	Bar	SA–479	...	S41500	...
19	13Cr–8Ni–2Mo	Bar	SA–564	XM–13	S13800	H1150M
20	13Cr–8Ni–2Mo	Forgings	SA–705	XM–13	S13800	H1150M
21	13Cr–8Ni–2Mo	Bar	SA–564	XM–13	S13800	H1150
22	13Cr–8Ni–2Mo	Forgings	SA–705	XM–13	S13800	H1150
23	13Cr–8Ni–2Mo	Bar	SA–564	XM–13	S13800	H1100
24	13Cr–8Ni–2Mo	Forgings	SA–705	XM–13	S13800	H1100
25	13Cr–8Ni–2Mo	Bar	SA–564	XM–13	S13800	H1050
26	13Cr–8Ni–2Mo	Forgings	SA–705	XM–13	S13800	H1050
27	13Cr–8Ni–2Mo	Bar	SA–564	XM–13	S13800	H1025
28	13Cr–8Ni–2Mo	Forgings	SA–705	XM–13	S13800	H1025
29	13Cr–8Ni–2Mo	Bar	SA–564	XM–13	S13800	H1000
30	13Cr–8Ni–2Mo	Forgings	SA–705	XM–13	S13800	H1000
31	13Cr–8Ni–2Mo	Bar	SA–564	XM–13	S13800	H950
32	13Cr–8Ni–2Mo	Forgings	SA–705	XM–13	S13800	H950
33	15Cr	Smls. & wld. tube	SA–268	TP429	S42900	...
34	15Cr	Plate	SA–240	429	S42900	...
35	15Cr–5Ni–3Cu	Bar	SA–564	XM–12	S15500	H1150M
36	15Cr–5Ni–3Cu	Forgings	SA–705	XM–12	S15500	H1150M
37	15Cr–5Ni–3Cu	Bar	SA–564	XM–12	S15500	H1150
38	15Cr–5Ni–3Cu	Forgings	SA–705	XM–12	S15500	H1150
39	15Cr–5Ni–3Cu	Bar	SA–564	XM–12	S15500	H1100
40	15Cr–5Ni–3Cu	Forgings	SA–705	XM–12	S15500	H1100
41	15Cr–5Ni–3Cu	Bar	SA–564	XM–12	S15500	H1075
42	15Cr–5Ni–3Cu	Forgings	SA–705	XM–12	S15500	H1075
43	15Cr–5Ni–3Cu	Bar	SA–564	XM–12	S15500	H1025
44	15Cr–5Ni–3Cu	Forgings	SA–705	XM–12	S15500	H1025
45	15Cr–5Ni–3Cu	Bar	SA–564	XM–12	S15500	H925

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	1620	1520	...
2	≥13	1620	1520	...
3	...	380	205	...
4	...	415	205	...
5	...	415	205	...
6	...	450	205	...
7	...	485	275	...
8	...	485	275	...
9	...	485	275	...
10	...	485	275	...
11	...	585	380	...
12	...	620	450	...
13	...	620	450	...
14	$t \le 160$	650	450	...
15	≤100	760	585	...
16	...	760	550	...
17	...	795	620	...
18	...	795	620	...
19	...	860	585	...
20	...	860	585	...
21	...	930	620	...
22	...	930	620	...
23	...	1035	930	...
24	...	1035	930	...
25	...	1205	1140	...
26	...	1205	1140	...
27	...	1275	1205	...
28	...	1275	1205	...
29	...	1415	1310	...
30	...	1415	1310	...
31	...	1515	1415	...
32	...	1515	1415	...
33	...	415	240	...
34	...	450	205	...
35	...	795	515	...
36	...	795	515	...
37	...	930	725	...
38	...	930	725	...
39	...	965	795	...
40	...	965	795	...
41	...	1000	860	...
42	...	1000	860	...
43	...	1070	1000	...
44	...	1070	1000	...
45	...	1170	1070	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	1517	...	...	...	...	...	...	...	...	...
2	1517	...	...	...	...	...	...	...	...	...
3	207	196	189	186	183	182	181	180	178	177
4	207	196	189	186	183	182	181	180	178	177
5	207	196	189	186	183	182	181	180	178	177
6	207	196	189	186	183	182	181	180	178	177
7	276	261	252	248	245	243	241	239	238	236
8	276	261	252	248	245	243	241	239	238	236
9	276	261	252	248	245	243	241	239	238	236
10	276	261	252	248	245	243	241	239	238	236
11	379	359	347	341	336	333	331	329	327	325
12	448	424	410	403	398	394	391	389	387	384
13	448	424	410	403	398	394	391	389	387	384
14	450	428	414	406	400	396	392	390	387	385
15	586	555	535	524	517	511	508	505	503	500
16	552	531	517	508	502	497	492	489	486	483
17	621	605	595	589	583	578	572	566	560	553
18	621	605	595	589	583	578	572	566	560	553
19	586	...	...	...	...	...	...	...	...	...
20	586	...	...	...	...	...	...	...	...	...
21	621	...	...	...	...	...	...	...	...	...
22	621	...	...	...	...	...	...	...	...	...
23	931	...	...	...	...	...	...	...	...	...
24	931	...	...	...	...	...	...	...	...	...
25	1140	...	...	...	...	...	...	...	...	...
26	1140	...	...	...	...	...	...	...	...	...
27	1210	...	...	...	...	...	...	...	...	...
28	1210	...	...	...	...	...	...	...	...	...
29	1310	...	...	...	...	...	...	...	...	...
30	1310	...	...	...	...	...	...	...	...	...
31	1410	...	...	...	...	...	...	...	...	...
32	1410	...	...	...	...	...	...	...	...	...
33	241	228	221	217	214	212	211	209	208	207
34	207	196	189	186	183	182	181	180	178	177
35	517	...	...	...	...	...	...	...	...	...
36	517	...	...	...	...	...	...	...	...	...
37	724	...	...	...	...	...	...	...	...	...
38	724	...	...	...	...	...	...	...	...	...
39	793	764	734	721	711	702	694	687	679	672
40	793	764	734	721	711	702	694	687	679	672
41	862	822	798	785	774	764	755	746	738	730
42	862	822	798	785	774	764	755	746	738	730
43	1000	953	926	910	897	886	875	866	856	847
44	1000	953	926	910	897	886	875	866	856	847
45	1069	1019	990	973	959	947	936	926	915	905

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...
3	176	173	170	167	162	157	150	142	134	124
4	176	173	170	167	162	157	150	142	134	124
5	176	173	170	167	162	157	150	142	134	124
6	176	173	170	167	162	157	150	142	134	124
7	234	231	227	223	216	209	200	190	179	166
8	234	231	227	223	216	209	200	190	179	166
9	234	231	227	223	...	...	...	...	...	...
10	234	231	227	223	...	...	...	...	...	...
11	322	318	312	306	297	288	275	262	246	227
12	380	375	369	361	351	339	325	309	290	269
13	380	375	369	361	...	...	...	...	...	...
14	382	378	372	364	354	342	327	310	291	271
15	497	492	486	477	465	451	433	412	387	359
16	479	475	468	461	450	438	426	...	...	...
17	546	538	530	520	...	...	...	...	...	...
18	546	538	530	520	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...
33	205	202	199	194	189	182	175	166	156	145
34	176	173	170	167	162	157	150	142	134	124
35	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...
39	663	...	...	...	...	...	...	...	...	...
40	663	...	...	...	...	...	...	...	...	...
41	721	711	697	687	...	...	...	...	...	...
42	721	711	697	687	...	...	...	...	...	...
43	836	825	808	797	...	...	...	...	...	...
44	836	825	808	797	...	...	...	...	...	...
45	894	881	864	852	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
		Ferrous Materials (Cont'd)					
	1	15Cr–5Ni–3Cu	Forgings	SA–705	XM–12	S15500	H925
	2	15Cr–5Ni–3Cu	Bar	SA–564	XM–12	S15500	H900
	3	15Cr–5Ni–3Cu	Forgings	SA–705	XM–12	S15500	H900
	4	15Cr–6Ni–Cu–Mo	Bar	SA–564	XM–25	S45000	H1150
	5	15Cr–6Ni–Cu–Mo	Forgings	SA–705	XM–25	S45000	H1150
	6	15Cr–6Ni–Cu–Mo	Bar	SA–564	XM–25	S45000	H1100
	7	15Cr–6Ni–Cu–Mo	Forgings	SA–705	XM–25	S45000	H1100
	8	15Cr–6Ni–Cu–Mo	Bar	SA–564	XM–25	S45000	H1050
	9	15Cr–6Ni–Cu–Mo	Forgings	SA–705	XM–25	S45000	H1050
	10	15Cr–6Ni–Cu–Mo	Bar	SA–564	XM–25	S45000	H1025
	11	15Cr–6Ni–Cu–Mo	Forgings	SA–705	XM–25	S45000	H1025
	12	15Cr–6Ni–Cu–Mo	Bar	SA–564	XM–25	S45000	H1000
	13	15Cr–6Ni–Cu–Mo	Forgings	SA–705	XM–25	S45000	H1000
	14	15Cr–6Ni–Cu–Mo	Bar	SA–564	XM–25	S45000	H950
	15	15Cr–6Ni–Cu–Mo	Forgings	SA–705	XM–25	S45000	H950
	16	15Cr–6Ni–Cu–Mo	Bar	SA–564	XM–25	S45000	H900
	17	15Cr–6Ni–Cu–Mo	Forgings	SA–705	XM–25	S45000	H900
	18	17Cr	Smls. & wld. tube	SA–268	TP430	S43000	...
	19	17Cr	Plate	SA–240	430	S43000	...
	20	17Cr	Bar	SA–479	430	S43000	...
(**23**)	21	17Cr–4Ni–4Cu	Bar	SA–564	630	S17400	H1150M
(**23**)	22	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H1150M
	23	17Cr–4Ni–4Cu	Bar	SA–564	630	S17400	H1150
	24	17Cr–4Ni–4Cu	Plate	SA–693	630	S17400	H1150
	25	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H1150
	26	17Cr–4Ni–4Cu	Bar	SA–564	630	S17400	H1100
	27	17Cr–4Ni–4Cu	Plate	SA–693	630	S17400	H1100
	28	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H1100
	29	17Cr–4Ni–4Cu	Bar	SA–564	630	S17400	H1075
	30	17Cr–4Ni–4Cu	Plate	SA–693	630	S17400	H1075
	31	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H1075
	32	17Cr–4Ni–4Cu	Bar	SA–564	630	S17400	H1025
	33	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H1025
	34	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H925
	35	17Cr–4Ni–4Cu	Forgings	SA–705	630	S17400	H900
	36	17Cr–7Ni–1Al	Forgings	SA–705	631	S17700	TH1050
	37	17Cr–7Ni–1Al	Forgings	SA–705	631	S17700	RH950
	38	18Cr–2Mo	Plate	SA–240	...	S44400	...
	39	18Cr–2Mo	Smls. & wld. tube	SA–268	...	S44400	...
(**23**)	40	18Cr–Ti	Plate	SA–240	...	S43932	...
	41	18Cr–Ti	Smls. & wld. tube	SA–268	TP439	S43035	...
	42	18Cr–Ti	Wld. tube	SA–803	TP439	S43035	...
	43	18Cr–Ti	Smls. & wld. pipe	SA–731	TP439	S43035	...
	44	18Cr–Ti	Smls. & wld. tube	SA–268	TP430 Ti	S43036	...
	45	18Cr–Ti	Bar	SA–479	439	S43035	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	1170	1070	...
2	...	1310	1170	...
3	...	1310	1170	...
4	≥13	860	515	...
5	≥13	860	515	...
6	≥13	895	725	...
7	≥13	895	725	...
8	≥13	1000	930	...
9	≥13	1000	930	...
10	≥13	1035	965	...
11	≥13	1035	965	...
12	≥13	1105	1035	...
13	≥13	1105	1035	...
14	≥13	1170	1105	...
15	≥13	1170	1105	...
16	≥13	1240	1170	...
17	≥13	1240	1170	...
18	...	415	240	...
19	...	450	205	...
20	...	485	275	...
21	...	795	515	...
22	...	795	515	...
23	...	930	725	...
24	...	930	725	...
25	...	930	725	...
26	...	965	795	...
27	...	965	795	...
28	...	965	795	...
29	...	1000	860	...
30	...	1000	860	...
31	...	1000	860	...
32	...	1070	1000	...
33	...	1070	1000	...
34	...	1170	1070	...
35	...	1310	1170	...
36	...	1170	965	...
37	...	1275	1035	...
38	...	415	275	...
39	...	415	275	...
40	...	415	205	...
41	...	415	205	...
42	...	415	205	...
43	...	415	205	...
44	...	415	240	...
45	...	485	275	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	1069	1019	990	973	959	947	936	926	915	905
2	1172	1117	1086	1067	1052	1039	1026	1015	1004	993
3	1172	1117	1086	1067	1052	1039	1026	1015	1004	993
4	517	...	...	...	...	...	...	...	...	...
5	517	...	...	...	...	...	...	...	...	...
6	724	...	...	...	...	...	...	...	...	...
7	724	...	...	...	...	...	...	...	...	...
8	931	...	...	...	...	...	...	...	...	...
9	931	...	...	...	...	...	...	...	...	...
10	965	...	...	...	...	...	...	...	...	...
11	965	...	...	...	...	...	...	...	...	...
12	1030	...	...	...	...	...	...	...	...	...
13	1030	...	...	...	...	...	...	...	...	...
14	1100	...	...	...	...	...	...	...	...	...
15	1100	...	...	...	...	...	...	...	...	...
16	1170	...	...	...	...	...	...	...	...	...
17	1170	...	...	...	...	...	...	...	...	...
18	241	228	221	217	214	212	211	209	208	207
19	207	196	189	186	183	182	181	180	178	177
20	276	261	252	248	245	243	241	239	238	236
21	517	...	476	...	457	...	443	...	430	...
22	517	...	476	...	457	...	443	...	430	...
23	724	688	666	652	641	630	620	611	603	595
24	724	688	666	652	641	630	620	611	603	595
25	724	688	666	652	641	630	620	611	603	595
26	793	754	729	714	701	690	680	669	660	651
27	793	754	729	714	701	690	680	669	660	651
28	793	754	729	714	701	690	680	669	660	651
29	862	819	793	777	763	750	738	727	717	708
30	862	819	793	777	763	750	738	727	717	708
31	862	819	793	777	763	750	738	727	717	708
32	1000	960	918	899	885	870	857	844	832	822
33	1000	950	919	901	885	870	856	844	832	822
34	1069	1018	983	963	946	930	915	902	890	878
35	1172	1114	1078	1056	1037	1020	1004	989	976	963
36	965	...	...	...	...	...	...	...	...	...
37	1030	...	...	...	...	...	...	...	...	...
38	276	252	238	230	223	218	213	209	204	200
39	276	252	238	230	223	218	213	209	204	200
40	207	189	176	168	162	156	152	148	145	143
41	207	189	176	168	162	156	152	148	145	143
42	207	189	176	168	162	156	152	148	145	143
43	207	189	176	168	162	156	152	148	145	143
44	241	221	206	197	189	182	177	172	169	167
45	276	252	236	225	215	208	202	197	193	191

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	894	881	864	852	...	...	...	...	...	...
2	980	967	947	934	...	...	...	...	...	...
3	980	967	947	934	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...
18	205	202	199	194	189	182	175	166	156	145
19	176	173	170	167	162	157	150	142	134	124
20	234	231	227	223	216	209	200	190	179	166
21	420	...	...	...	...	...	...	...	...	...
22	420	...	...	...	...	...	...	...	...	...
23	588	581	575	568	559	548	533	512	483	441
24	588	581	575	568	559	548	533	512	483	441
25	588	581	575	568	559	548	533	512	483	441
26	644	636	629	621	612	600	584	561	530	483
27	644	636	629	621	612	600	584	561	530	483
28	644	636	629	621	612	600	584	561	530	483
29	700	692	684	676	666	653	635	610	575	524
30	700	692	684	676	666	653	635	610	575	524
31	700	692	684	676	666	653	635	610	575	524
32	811	...	...	...	...	...	...	...	...	...
33	812	803	793	784	...	...	...	...	...	...
34	868	858	848	838	...	...	...	...	...	...
35	952	941	930	919	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...
38	196	191	187	183	178	173	168	162	155	147
39	196	191	187	183	178	173	168	162	155	147
40	142	141	140	139	139	137	134	131	126	119
41	142	141	140	139	139	137	134	131	126	119
42	142	141	140	139	139	137	134	131	126	119
43	142	141	140	139	139	137	134	131	126	119
44	165	164	163	162	161	159	157	...	153	147
45	189	188	187	185	184	182	179	174	167	158

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Ferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	26Cr–3Ni–3Mo	Plate	SA–240	26–3–3	S44660	...
2	26Cr–3Ni–3Mo	Smls. & wld. tube	SA–268	26–3–3	S44660	...
3	26Cr–3Ni–3Mo	Wld. tube	SA–803	26–3–3	S44660	...
4	27Cr	Smls. tube	SA–268	TP446–1	S44600	...
5	27Cr–1Mo	Forgings	SA–182	FXM–27Cb	S44627	...
6	27Cr–1Mo	Plate	SA–240	XM–27	S44627	...
7	27Cr–1Mo	Smls. & wld. tube	SA–268	TPXM–27	S44627	...
8	27Cr–1Mo	Bar	SA–479	XM–27	S44627	...
9	27Cr–1Mo	Smls. & wld. pipe	SA–731	TPXM–27	S44627	...
10	27Cr–1Mo–Ti	Smls. & wld. pipe	SA–731	TPXM–33	S44626	...
11	27Cr–1Mo–Ti	Plate	SA–240	XM–33	S44626	...
12	27Cr–1Mo–Ti	Smls. & wld. tube	SA–268	TPXM–33	S44626	...
13	29Cr–4Mo	Bar	SA–479	...	S44700	...
14	29Cr–4Mo	Plate	SA–240	...	S44700	...
15	29Cr–4Mo	Smls. & wld. tube	SA–268	29–4	S44700	...
16	29Cr–4Mo–2Ni	Bar	SA–479	...	S44800	...
17	29Cr–4Mo–2Ni	Plate	SA–240	...	S44800	...
18	29Cr–4Mo–2Ni	Smls. & wld. tube	SA–268	29–4–2	S44800	...
19	29Cr–4Mo–Ti	Smls. & wld. tube	SA–268	...	S44735	...
20	Mn–¼Mo	Forgings	SA–372	D	K14508	...
21	Mn–¼Mo–V	Castings	SA–487	2	J13005	A
22	Mn–¼Mo–V	Castings	SA–487	2	J13005	B
23	Mn–½Mo	Plate	SA–302	A	K12021	...
24	Mn–½Mo	Wld. pipe	SA–672	H75	K12021	...
25	Mn–½Mo	Plate	SA–302	B	K12022	...
26	Mn–½Mo	Plate	SA–533	A	K12521	1
27	Mn–½Mo	Plate	SA–533	A	K12521	2
28	Mn–½Mo	Plate	SA–533	A	K12521	3
29	Mn–½Mo–¼Ni	Plate	SA–533	D	K12529	1
30	Mn–½Mo–¼Ni	Plate	SA–533	D	K12529	2
31	Mn–½Mo–¼Ni	Plate	SA–533	D	K12529	3
32	Mn–½Mo–½Ni	Plate	SA–302	C	K12039	...
33	Mn–½Mo–½Ni	Plate	SA–533	B	K12539	1
34	Mn–½Mo–½Ni	Wld. pipe	SA–672	H80	K12039	...
35	Mn–½Mo–½Ni	Wld. pipe	SA–672	J80	K12539	...
36	Mn–½Mo–½Ni	Plate	SA–533	B	K12539	2
37	Mn–½Mo–½Ni	Wld. pipe	SA–672	J90	K12539	...
38	Mn–½Mo–½Ni	Plate	SA–533	B	K12539	3
39	Mn–½Mo–½Ni	Wld. pipe	SA–672	J100	K12539	...
40	Mn–½Mo–¾Ni	Plate	SA–302	D	K12054	...
41	Mn–½Mo–¾Ni	Plate	SA–533	C	K12554	1
42	Mn–½Mo–¾Ni	Plate	SA–533	E	K12554	1
43	Mn–½Mo–¾Ni	Plate	SA–533	C	K12554	2
44	Mn–½Mo–¾Ni	Plate	SA–533	E	K12554	2
45	Mn–½Mo–¾Ni	Plate	SA–533	C	K12554	3

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	≤5	585	450	...
2	≤5	585	450	...
3	≤5	585	450	...
4	...	485	275	...
5	...	415	240	...
6	...	450	275	...
7	...	450	275	...
8	...	450	275	...
9	...	450	275	...
10	...	450	275	...
11	...	470	310	...
12	...	470	310	...
13	...	485	380	...
14	...	550	415	...
15	...	550	415	...
16	...	485	380	...
17	...	550	415	...
18	...	550	415	...
19	...	515	415	...
20	...	725	450	...
21	...	585	365	...
22	...	620	450	...
23	...	515	310	...
24	...	515	310	...
25	...	550	345	...
26	...	550	345	...
27	...	620	485	...
28	...	690	570	...
29	...	550	345	...
30	...	620	485	...
31	...	690	570	...
32	...	550	345	...
33	...	550	345	...
34	...	550	345	...
35	...	550	345	...
36	...	620	485	...
37	...	620	485	...
38	...	690	570	...
39	...	690	570	...
40	...	550	345	...
41	...	550	345	...
42	...	550	345	...
43	...	620	485	...
44	...	620	485	...
45	...	690	570	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	448	418	399	387	377	368	362	356	351	347
2	448	418	399	387	377	368	362	356	351	347
3	448	418	399	387	377	368	362	356	351	347
4	276	252	236	225	215	208	202	197	193	191
5	241	222	206	197	190	183	178	174	172	170
6	276	253	235	225	215	208	203	199	196	194
7	276	253	235	225	215	208	203	199	196	194
8	276	253	235	225	215	208	203	199	196	194
9	276	253	235	225	215	208	203	199	196	194
10	276	255	239	229	220	211	204	198	193	189
11	310	287	269	257	247	238	230	222	216	212
12	310	287	269	257	247	238	230	222	216	212
13	379	351	330	318	308	300	295	290	288	286
14	414	382	360	347	336	327	321	316	314	312
15	414	382	360	347	336	327	321	316	314	312
16	379	338	311	294	280	267	256	247	239	233
17	414	369	339	321	305	291	279	269	261	254
18	414	369	339	321	305	291	279	269	261	254
19	414	369	339	321	305	291	279	269	261	254
20	448	433	422	416	411	407	404	403	402	400
21	365	353	346	340	332	323	313	304	295	289
22	448	433	424	416	407	396	384	372	362	354
23	310	299	290	286	282	278	275	272	269	266
24	310	299	290	286	282	278	275	272	269	266
25	345	332	323	318	314	309	305	302	299	296
26	345	332	323	318	314	309	305	302	299	296
27	483	464	452	445	439	433	428	423	418	414
28	572	551	536	528	520	513	507	501	496	490
29	345	332	323	318	314	309	305	302	299	296
30	483	464	452	445	439	433	428	423	418	414
31	572	551	536	528	520	513	507	501	496	490
32	345	332	323	318	314	309	305	302	299	296
33	345	332	323	318	314	309	305	302	299	296
34	345	332	323	318	314	309	305	302	299	296
35	345	332	323	318	314	309	305	302	299	296
36	483	464	452	445	439	433	428	423	418	414
37	483	464	452	445	439	433	428	423	418	414
38	572	551	536	528	520	513	507	501	496	490
39	572	551	536	528	520	513	507	501	496	490
40	345	332	323	318	314	309	305	302	299	296
41	345	332	323	318	314	309	305	302	299	296
42	345	332	323	318	314	309	305	302	299	296
43	483	464	452	445	439	433	428	423	418	414
44	483	464	452	445	439	433	428	423	418	414
45	572	551	536	528	520	513	507	501	496	490

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	344	342	341	340	...	...	...	...	...	...
2	344	342	341	340	...	...	...	...	...	...
3	344	342	341	340	...	...	...	...	...	...
4	189	188	187	185	184	182	179	174	167	158
5	170	170	170	...	...	...	...	...	...	...
6	193	193	193	193	193	193	193	193	193	193
7	193	193	193	193	193	193	193	193	193	193
8	193	193	193	193	193	193	193	193	193	193
9	193	193	193	193	193	193	193	193	193	193
10	186	183	182	182	...	...	...	...	...	...
11	208	206	205	204	...	...	...	...	...	...
12	208	206	205	204	...	...	...	...	...	...
13	285	284	283	279	273	...	...	...	...	...
14	311	310	308	305	298	...	...	...	...	...
15	311	310	308	305	298	...	...	...	...	...
16	229	226	224	223	221	...	...	...	...	...
17	249	247	245	243	241	...	...	...	...	...
18	249	247	245	243	241	...	...	...	...	...
19	249	247	245	243	241	...	...	...	...	...
20	399	396	392	385	377	366	353	339	323	306
21	284	281	278	274	...	...	...	...	...	...
22	348	345	341	336	...	...	...	...	...	...
23	263	260	256	252	247	240	231	220	206	187
24	263	260	256	252	247	240	231	220	206	187
25	292	289	285	280	274	267	257	245	229	208
26	292	289	285	280	274	267	257	245	229	208
27	409	404	398	392	384	374	361	343	321	291
28	485	479	473	465	455	443	427	407	380	345
29	292	289	285	280	274	267	257	245	229	208
30	409	404	398	392	384	374	361	343	321	291
31	485	479	473	465	455	443	427	407	380	345
32	292	289	285	280	274	267	257	245	229	208
33	292	289	285	280	274	267	257	245	229	208
34	292	289	285	280	274	267	257	245	229	208
35	292	289	285	280	274	267	257	245	229	208
36	409	404	398	392	384	374	361	343	321	291
37	409	404	398	392	384	374	361	343	321	291
38	485	479	473	465	455	443	427	407	380	345
39	485	479	473	465	455	443	427	407	380	345
40	292	289	285	280	274	267	257	245	229	208
41	292	289	285	280	274	267	257	245	229	208
42	292	289	285	280	274	267	257	245	229	208
43	409	404	398	392	384	374	361	343	321	291
44	409	404	398	392	384	374	361	343	321	291
45	485	479	473	465	455	443	427	407	380	345

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	Mn–½Ni–V	Plate	SA–225	C	K12524	...
2	Mn–V	Castings	SA–487	1	J13002	A
3	Mn–V	Castings	SA–487	1	J13002	B
4	1½Si–½Mo	Smls. pipe	SA–335	P15	K11578	...
5	½Ni–½Cr–¼Mo–V	Castings	SA–487	4	J13047	A
6	½Ni–½Cr–¼Mo–V	Castings	SA–487	4	J13047	B
7	½Ni–½Cr–¼Mo–V	Castings	SA–487	4	J13047	E
8	½Ni–½Mo–V	Forgings	SA–541	3	K12045	1
9	½Ni–½Mo–V	Forgings	SA–541	3	K12045	2
10	¾Ni–½Cr–½Mo–V	Forgings	SA–592	F	K11576	...
11	¾Ni–½Cr–½Mo–V	Plate	SA–517	F	K11576	...
12	¾Ni–½Cr–½Mo–V	Forgings	SA–592	F	K11576	...
13	¾Ni–½Cu–Mo	Smls. & wld. tube	SA–423	2	K11540	...
14	¾Ni–½Mo–⅓Cr–V	Forgings	SA–508	2	K12766	1
15	¾Ni–½Mo–⅓Cr–V	Forgings	SA–541	2	K12765	1
16	¾Ni–½Mo–⅓Cr–V	Forgings	SA–508	2	K12766	2
17	¾Ni–½Mo–⅓Cr–V	Forgings	SA–541	2	K12765	2
18	¾Ni–½Mo–Cr–V	Forgings	SA–508	3	K12042	1
19	¾Ni–½Mo–Cr–V	Forgings	SA–508	3	K12042	2
(**23**) 20	...	...	...	...	...	...
(**23**) 21	...	...	...	...	...	...
(**23**) 22	...	...	...	...	...	...
23	¾Ni–1Cu–¾Cr	Plate	SA–736	A	K12042	3
24	¾Ni–1Cu–¾Cr	Plate	SA–736	A	K12042	3
(**23**) 25	...	...	...	...	...	...
26	¾Ni–1Mo–¾Cr	Castings	SA–217	WC5	J22000	...
27	1Ni–½Cr–½Mo	Castings	SA–217	WC4	J12082	...
28	1¼Ni–1Cr–½Mo	Plate	SA–517	P	K21650	...
29	1¼Ni–1Cr–½Mo	Plate	SA–517	P	K21650	...
30	1½Ni	Forgings	SA–350	LF5	K13050	1
31	1½Ni	Forgings	SA–350	LF5	K13050	2
32	1¾Ni–¾Cr–¼Mo	Bolting	SA–320	L43	G43400	...
33	1¾Ni–¾Cr–¼Mo	Forgings	SA–372	L	K24055	...
34	1¾Ni–¾Cr–¼Mo	Bolting	SA–574	4340	G43400	...
35	1¾Ni–¾Cr–¼Mo	Bolting	SA–574	4340	G43400	...
36	2Ni–¾Cr–¼Mo	Bolting	SA–540	B23	H43400	5
37	2Ni–¾Cr–¼Mo	Bolting	SA–540	B23	H43400	5
38	2Ni–¾Cr–¼Mo	Bolting	SA–540	B23	H43400	4
39	2Ni–¾Cr–¼Mo	Bolting	SA–540	B23	H43400	3
40	2Ni–¾Cr–¼Mo	Bolting	SA–540	B23	H43400	2
41	2Ni–¾Cr–¼Mo	Bolting	SA–540	B23	H43400	1
42	2Ni–¾Cr–⅓Mo	Bolting	SA–540	B24	K24064	5
43	2Ni–¾Cr–⅓Mo	Bolting	SA–540	B24	K24064	5
44	2Ni–¾Cr–⅓Mo	Bolting	SA–540	B24	K24064	4
45	2Ni–¾Cr–⅓Mo	Bolting	SA–540	B24	K24064	3

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	725	485	...
2	...	585	380	...
3	...	620	450	...
4	...	415	205	...
5	...	620	415	...
6	...	725	585	...
7	...	795	655	...
8	...	550	345	...
9	...	620	450	...
10	$65 < t \leq 100$	725	620	...
11	≤65	795	690	...
12	≤65	795	690	...
13	...	415	255	...
14	...	550	345	...
15	...	550	345	...
16	...	620	450	...
17	...	620	450	...
18	...	550	345	...
19	...	620	450	...
20	...	...	...	...
21	...	...	...	...
22	...	...	...	...
23	$50 < t \leq 100$	515	450	...
24	≤50	585	515	...
25	...	...	...	...
26	...	485	275	...
27	...	485	275	...
28	$65 < t \leq 100$	725	620	...
29	≤65	795	690	...
30	...	415	205	...
31	...	485	260	...
32	≤100	860	725	...
33	...	1070	930	...
34	≥16	1170	930	...
35	≤13	1240	965	...
36	$150 < t \leq 240$	795	690	...
37	≤150	825	725	...
38	≤240	930	825	...
39	≤240	1000	895	...
40	≤240	1070	965	...
41	≤200	1140	1035	...
42	$150 < t \leq 240$	795	690	...
43	≤150	825	725	...
44	≤240	930	825	...
45	≤240	1000	895	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	483	448	438	434	430	423	414	403	391	379
2	379	...	...	...	...	...	...	...	...	...
3	448	...	...	...	...	...	...	...	...	...
4	207	199	194	191	188	186	183	181	179	177
5	414	405	390	381	375	371	368	365	360	353
6	586	573	553	540	531	525	521	517	511	501
7	655	641	618	604	594	587	583	578	571	559
8	345	332	323	318	314	309	305	302	299	296
9	448	435	425	419	415	411	407	404	401	398
10	621	604	591	581	573	566	559	553	546	540
11	689	670	656	646	637	629	621	614	607	600
12	689	670	656	646	637	629	621	614	607	600
13	255	...	...	...	...	...	...	...	...	...
14	345	332	323	318	314	309	305	302	299	296
15	345	332	323	318	314	309	305	302	299	296
16	448	431	420	413	407	402	397	393	388	384
17	448	431	420	413	407	402	397	393	388	384
18	345	332	323	318	314	309	305	302	299	296
19	448	431	420	413	407	402	397	393	388	384
20	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...
23	448	433	420	413	406	399	392	385	380	375
24	517	499	485	476	468	460	452	444	438	433
25	...	...	...	...	...	...	...	...	...	...
26	276	265	258	255	251	248	245	242	239	236
27	276	265	258	255	251	248	245	242	239	236
28	621	604	591	581	573	566	559	553	546	540
29	689	670	656	646	637	629	621	614	607	600
30	207	...	...	...	...	...	...	...	...	...
31	259	...	...	...	...	...	...	...	...	...
32	724	702	679	669	659	647	635	624	615	603
33	931	911	891	879	869	862	856	851	846	840
34	931	911	890	879	870	863	857	851	846	840
35	965	945	923	912	903	895	888	883	877	871
36	689	675	659	651	644	639	634	630	626	622
37	724	709	692	684	677	671	666	662	658	654
38	827	810	791	781	773	767	761	757	752	747
39	896	878	857	846	838	831	825	820	814	809
40	965	945	923	912	903	895	888	883	877	871
41	1030	1010	989	977	967	959	952	946	940	934
42	689	675	659	651	644	639	634	630	626	622
43	724	709	692	684	677	671	666	662	658	654
44	827	810	791	781	773	767	761	757	752	747
45	896	878	857	846	838	831	825	820	814	809

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	368	358	350	343	335	323	310	...	...	...
2	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...
4	175	173	171	168	165	160	154	147	138	125
5	343	330	318	307	...	...	...	...	...	...
6	486	468	449	435	...	...	...	...	...	...
7	543	523	503	486	...	...	...	...	...	...
8	292	289	285	280	274	267	257	245	229	208
9	395	393	389	385	381	375	369	362	352	341
10	534	528	521	514	505	494	481	466	447	423
11	594	587	579	571	561	549	534	517	496	470
12	594	587	579	571	561	549	534	517	496	470
13	...	...	...	...	...	...	...	...	...	...
14	292	289	285	280	274	267	257	245	229	208
15	292	289	285	280	274	267	257	245	229	208
16	380	375	370	364	357	347	335	319	298	270
17	380	375	370	364	357	347	335	319	298	270
18	292	289	285	280	274	267	257	245	229	208
19	380	375	370	364	357	347	335	319	298	270
20	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...
23	371	365	357	...	...	...	...	...	...	...
24	428	422	412	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...
26	234	231	228	224	219	213	206	196	183	166
27	234	231	228	224	219	213	206	196	183	166
28	534	528	521	514	505	494	481	466	447	423
29	594	587	579	571	561	549	534	517	496	470
30	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...
32	590	576	562	543	...	...	...	...	...	...
33	833	824	812	798	781	760	738	714	690	667
34	833	824	812	798	781	761	738	714	689	667
35	864	855	842	828	810	789	766	740	715	692
36	617	610	602	591	579	564	546	528	511	494
37	648	641	632	621	607	591	574	555	536	519
38	740	732	722	709	694	676	656	634	613	593
39	802	793	782	769	752	732	711	687	664	642
40	864	855	842	828	810	789	766	740	715	692
41	926	915	902	887	868	845	820	793	766	741
42	617	610	602	591	579	564	546	528	511	494
43	648	641	632	621	607	591	574	555	536	519
44	740	732	722	709	694	676	656	634	613	593
45	802	793	782	769	752	732	711	687	664	642

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Ferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	2Ni–¾Cr–⅓Mo	Bolting	SA–540	B24	K24064	2
2	2Ni–¾Cr–⅓Mo	Bolting	SA–540	B24	K24064	1
3	2Ni–1Cu	Forgings	SA–182	FR	K22035	...
4	2Ni–1Cu	Fittings	SA–234	WPR	K22035	...
5	2Ni–1Cu	Smls. & wld. pipe	SA–333	9	K22035	...
6	2Ni–1Cu	Tube	SA–334	9	K22035	...
7	2Ni–1Cu	Forgings	SA–350	LF9	K22036	...
8	2Ni–1Cu	Smls. & wld. fittings	SA–420	WPL9	K22035	...
9	2Ni–1½Cr–¼Mo–V	Forgings	SA–723	1	K23550	1
10	2Ni–1½Cr–¼Mo–V	Forgings	SA–723	1	K23550	2
11	2Ni–1½Cr–¼Mo–V	Forgings	SA–723	1	K23550	2a
12	2Ni–1½Cr–¼Mo–V	Forgings	SA–723	1	K23550	3
13	2Ni–1½Cr–¼Mo–V	Forgings	SA–723	1	K23550	4
14	2Ni–1½Cr–¼Mo–V	Forgings	SA–723	1	K23550	5
15	2½Ni	Pipe	SA–333	7	K21903	...
16	2½Ni	Tube	SA–334	7	K21903	...
17	2½Ni	Plate	SA–203	A	K21703	...
18	2½Ni	Plate	SA–203	B	K22103	...
19	2½Ni	Castings	SA–352	LC2	J22500	...
20	2¾Ni–1½Cr–½Mo	Plate	SA–543	C	...	3
21	2¾Ni–1½Cr–½Mo	Plate	SA–543	C	...	1
22	2¾Ni–1½Cr–½Mo	Plate	SA–543	C	...	2
23	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	1
24	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	2
25	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	2a
26	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	3
27	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	4
28	2¾Ni–1½Cr–½Mo–V	Forgings	SA–723	2	K34035	5
29	3Ni–1¾Cr–½Mo	Plate	SA–543	B	K42339	3
30	3Ni–1¾Cr–½Mo	Forgings	SA–372	M	K42365	85
31	3Ni–1¾Cr–½Mo	Plate	SA–543	B	K42339	1
32	3Ni–1¾Cr–½Mo	Forgings	SA–508	5	K42365	2
33	3Ni–1¾Cr–½Mo	Plate	SA–543	B	K42339	2
34	3Ni–1¾Cr–½Mo	Forgings	SA–372	M	K42365	100
35	3½Ni	Pipe	SA–333	3	K31918	...
36	3½Ni	Tube	SA–334	3	K31918	...
37	3½Ni	Fittings	SA–420	WPL3	...	...
38	3½Ni	Plate	SA–203	D	K31718	...
39	3½Ni	Forgings	SA–350	LF3	K32025	...
40	3½Ni	Forgings	SA–765	III	K32026	...
41	3½Ni	Plate	SA–203	E	K32018	...
42	3½Ni	Castings	SA–352	LC3	J31550	...
43	3½Ni	Plate	SA–203	F	...	...
44	3½Ni	Plate	SA–203	F	...	...
45	3½Ni–1¾Cr–½Mo–V	Forgings	SA–508	4N	K22375	3

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	≤240	1070	965	...
2	≤200	1140	1035	...
3	...	435	315	...
4	...	435	315	...
5	...	435	315	...
6	...	435	315	...
7	...	435	315	...
8	...	435	315	...
9	...	795	690	...
10	...	930	825	...
11	...	1000	895	...
12	...	1070	965	...
13	...	1205	1105	...
14	...	1310	1240	...
15	...	450	240	...
16	...	450	240	...
17	...	450	255	...
18	...	485	275	...
19	...	485	275	...
20	...	620	485	...
21	...	725	585	...
22	...	795	690	...
23	...	795	690	...
24	...	930	825	...
25	...	1000	895	...
26	...	1070	965	...
27	...	1205	1105	...
28	...	1310	1240	...
29	...	620	485	...
30	...	725	585	...
31	...	725	585	...
32	...	795	690	...
33	...	795	690	...
34	...	825	690	...
35	...	450	240	...
36	...	450	240	...
37	...	450	240	...
38	...	450	255	...
39	...	485	260	...
40	...	485	260	...
41	...	485	275	...
42	...	485	275	...
43	>50	515	345	...
44	≤50	550	380	...
45	...	620	485	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	965	945	923	912	903	895	888	883	877	871
2	1030	1010	989	977	967	959	952	946	940	934
3	317	...	...	...	...	...	...	...	...	...
4	317	...	...	...	...	...	...	...	...	...
5	317	...	...	...	...	...	...	...	...	...
6	317	...	...	...	...	...	...	...	...	...
7	317	...	...	...	...	...	...	...	...	...
8	317	...	...	...	...	...	...	...	...	...
9	689	673	660	651	644	639	634	630	626	622
10	827	807	792	782	773	767	761	757	752	747
11	896	874	857	847	838	831	825	820	815	809
12	965	942	923	912	903	895	888	883	877	871
13	1100	1080	1060	1040	1030	1020	1020	1010	1000	995
14	1240	1210	1190	1170	1160	1150	1140	1140	1130	1120
15	241	227	220	216	213	210	207	203	198	192
16	241	227	220	216	213	210	207	203	198	192
17	255	240	233	228	225	222	219	214	209	203
18	276	259	251	247	244	241	237	232	227	220
19	276	259	251	247	244	241	237	232	227	220
20	483	464	453	446	440	436	432	428	425	421
21	586	564	550	541	534	528	523	519	515	511
22	689	664	647	636	628	622	616	611	607	602
23	689	673	660	651	644	639	634	630	626	622
24	827	807	792	782	773	767	761	757	752	747
25	896	874	857	847	838	831	825	820	815	809
26	965	942	923	912	903	895	888	883	877	871
27	1100	1080	1060	1040	1030	1020	1020	1010	1000	995
28	1240	1210	1190	1170	1160	1150	1140	1140	1130	1120
29	483	464	453	446	440	436	432	428	425	421
30	586	564	549	541	534	529	524	519	515	511
31	586	564	550	541	534	528	523	519	515	511
32	690	663	646	637	629	622	616	611	606	602
33	689	664	647	636	628	622	616	611	607	602
34	690	663	646	637	629	622	616	611	606	602
35	241	227	220	216	213	210	207	203	198	192
36	241	227	220	216	213	210	207	203	198	192
37	241	227	220	216	213	210	207	203	198	192
38	255	240	233	228	225	222	219	214	209	203
39	259	244	235	232	229	225	221	217	212	206
40	259	244	235	232	229	225	221	217	212	206
41	276	259	251	247	244	241	237	232	227	220
42	276	259	251	247	244	241	237	232	227	220
43	345	324	314	309	305	300	295	290	283	275
44	379	357	346	340	335	330	325	319	311	302
45	483	464	453	446	440	436	432	428	425	421

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	864	855	842	828	810	789	766	740	715	692
2	926	915	902	887	868	845	820	793	766	741
3	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...
9	617	610	601	591	578	563	559	551	540	530
10	740	733	722	709	694	676	670	660	648	637
11	802	793	782	768	752	732	...	...	...	...
12	864	855	842	828	810	788	782	771	756	743
13	987	976	963	946	925	901	894	881	864	849
14	1110	1100	1080	1060	1040	1010	1010	990	972	955
15	186	178	170	161	152	142	133	123	114	105
16	186	178	170	161	152	142	133	123	114	105
17	196	189	180	170	161	150	140	130	120	111
18	212	204	195	185	174	163	152	140	130	120
19	212	204	195	185	174	163	152	140	130	120
20	418	413	409	404	397	388	378	366	352	336
21	507	502	497	490	482	472	459	445	428	407
22	596	591	584	576	566	554	541	523	503	479
23	617	610	601	591	578	563	559	551	540	530
24	740	733	722	709	694	676	670	660	648	637
25	802	793	782	768	752	732	...	...	...	...
26	864	855	842	828	810	788	782	771	756	743
27	987	976	963	946	925	901	894	881	864	849
28	1110	1100	1080	1060	1040	1010	1010	990	972	955
29	418	413	409	404	397	388	378	366	352	336
30	507	502	497	490	482	472	460	445	428	408
31	507	502	497	490	482	472	459	445	428	407
32	597	591	584	576	567	555	541	524	503	480
33	596	591	584	576	566	554	541	523	503	479
34	597	591	584	576	567	555	541	524	503	480
35	186	178	170	161	152	142	133	123	114	105
36	186	178	170	161	152	142	133	123	114	105
37	186	178	170	161	152	142	133	123	114	105
38	196	189	180	170	161	150	140	130	120	111
39	199	191	182	173	163	152	142	132	122	112
40	199	191	182	173	163	152	142	132	122	112
41	212	204	195	185	174	163	152	140	130	120
42	212	204	195	185	174	163	152	140	130	120
43	265	254	243	230	217	204	189	176	162	150
44	292	280	267	254	239	224	208	193	179	165
45	418	413	409	404	397	388	378	366	352	336

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	3½Ni–1¾Cr–½Mo–V	Forgings	SA–541	4N	K42343	3
2	3½Ni–1¾Cr–½Mo–V	Forgings	SA–508	4N	K22375	1
3	3½Ni–1¾Cr–½Mo–V	Forgings	SA–541	5	K42348	1
4	3½Ni–1¾Cr–½Mo–V	Forgings	SA–508	4N	K22375	2
5	3½Ni–1¾Cr–½Mo–V	Forgings	SA–541	4N	K42343	2
6	3½Ni–1¾Cr–½Mo–V	Forgings	SA–541	5	K42348	2
7	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	1
8	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	2
9	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	2a
10	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	3
11	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	4
12	4Ni–1½Cr–½Mo–V	Forgings	SA–723	3	K44045	5
13	5Ni–¼Mo	Plate	SA–645	A	K41583	...
14	7Ni	Plate	SA–553	III	K61365	...
15	8Ni	Forgings	SA–522	II	K71340	...
16	8Ni	Plate	SA–553	II	K71340	...
17	9Ni	Plate	SA/EN 10028–4	X8Ni9	...	NNT640
18	9Ni	Plate	SA/EN 10028–4	X8Ni9	...	QT640
19	9Ni	Plate	SA/EN 10028–4	X7Ni9	...	QT
20	9Ni	Plate	SA/EN 10028–4	X8Ni9	...	QT680
21	9Ni	Smls. & wld. pipe	SA–333	8	K81340	...
22	9Ni	Smls. & wld. tube	SA–334	8	K81340	...
23	9Ni	Plate	SA–353	...	K81340	...
24	9Ni	Smls. & wld. fittings	SA–420	WPL8	K81340	...
25	9Ni	Forgings	SA–522	I	K81340	...
26	9Ni	Plate	SA–553	I	K81340	...
27	25Ni–15Cr–2Ti	Bolting	SA–453	660	S66286	A
28	25Ni–15Cr–2Ti	Bolting	SA–453	660	S66286	B
29	25Ni–15Cr–2Ti	Forgings, bar	SA–638	660	S66286	1
30	25Ni–15Cr–2Ti	Forgings, bar	SA–638	660	S66286	2
31	27Ni–22Cr–7Mo–Mn–Cu–N	Forgings	SA–182	...	S31277	...
32	27Ni–22Cr–7Mo–Mn–Cu–N	Smls. tube	SA–213	...	S31277	...
33	27Ni–22Cr–7Mo–Mn–Cu–N	Plate	SA–240	...	S31277	...
34	27Ni–22Cr–7Mo–Mn–Cu–N	Wld. tube	SA–249	...	S31277	...
35	29Ni–20Cr–3Cu–2Mo	Castings	SA–351	CN7M	J95150	...
36	14Cr–16Ni–6Si–Cu–Mo	Smls. tube	SA–213	...	S38815	...
37	14Cr–16Ni–6Si–Cu–Mo	Plate	SA–240	...	S38815	...
38	14Cr–16Ni–6Si–Cu–Mo	Wld. tube	SA–249	...	S38815	...
39	14Cr–16Ni–6Si–Cu–Mo	Wld. pipe	SA–312	...	S38815	...
40	14Cr–16Ni–6Si–Cu–Mo	Smls. & wld. fittings	SA–403	...	S38815	...
41	14Cr–16Ni–6Si–Cu–Mo	Bar	SA–479	...	S38815	...
42	16Cr–4Ni–6Mn	Plate	SA–240	201LN	S20153	...
43	16Cr–9Mn–2Ni–N	Plate	SA–240	204	S20400	...
44	16Cr–12Ni–2Mo	Forgings	SA–182	F316L	S31603	...
45	16Cr–12Ni–2Mo	Forgings	SA–965	F316L	S31603	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	620	485	...
2	...	725	585	...
3	...	725	585	...
4	...	795	690	...
5	...	795	690	...
6	...	795	690	...
7	...	795	690	...
8	...	930	825	...
9	...	1000	895	...
10	...	1070	965	...
11	...	1205	1105	...
12	...	1310	1240	...
13	...	655	450	...
14	≤50	690	585	...
15	...	690	515	...
16	...	690	585	...
17	≤50	640	480	...
18	≤50	640	480	...
19	≤50	680	575	...
20	≤50	680	575	...
21	...	690	515	...
22	...	690	515	...
23	...	690	515	...
24	...	690	515	...
25	...	690	515	...
26	...	690	585	...
27	...	895	585	...
28	...	895	585	...
29	...	895	585	...
30	...	895	585	...
31	...	772	359	...
32	...	772	359	...
33	...	772	359	...
34	...	772	359	...
35	...	425	170	...
36	...	540	255	...
37	...	540	255	...
38	...	540	255	...
39	...	540	255	...
40	...	540	255	...
41	...	540	255	...
42	...	655	310	...
43	...	655	330	...
44	>130	450	170	...
45	...	450	170	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	483	464	453	446	440	436	432	428	425	421
2	586	564	550	541	534	528	523	519	515	511
3	586	564	550	541	534	528	523	519	515	511
4	689	664	647	636	628	622	616	611	607	602
5	689	664	647	636	628	622	616	611	607	602
6	689	664	647	636	628	622	616	611	607	602
7	689	673	660	651	644	639	634	630	626	622
8	827	807	792	782	773	767	761	757	752	747
9	896	874	857	847	838	831	825	820	815	809
10	965	942	923	912	903	895	888	883	877	871
11	1100	1080	1060	1040	1030	1020	1020	1010	1000	995
12	1240	1210	1190	1170	1160	1150	1140	1140	1130	1120
13	448	...	...	...	...	...	...	...	...	...
14	586	559	...	...	...	...	...	...	...	...
15	517	502	495	483	461	...	...	...	...	...
16	586	569	561	548	522	...	...	...	...	...
17	480	466	459	449	427	...	...	...	...	...
18	480	466	459	449	427	...	...	...	...	...
19	575	558	550	538	512	...	...	...	...	...
20	575	558	550	538	512	...	...	...	...	...
21	517	502	495	483	461	...	...	...	...	...
22	517	502	495	483	461	...	...	...	...	...
23	517	502	495	483	461	...	...	...	...	...
24	517	502	495	483	461	...	...	...	...	...
25	517	502	495	483	461	...	...	...	...	...
26	586	569	561	548	522	...	...	...	...	...
27	586	580	573	569	565	562	558	553	549	544
28	586	580	573	569	565	562	558	553	549	544
29	586	580	573	569	565	561	557	553	549	545
30	586	580	573	569	565	561	557	553	549	545
31	359	348	328	...	314	...	274	...	265	...
32	359	348	328	...	314	...	274	...	265	...
33	359	348	328	...	314	...	274	...	265	...
34	359	348	328	...	314	...	274	...	265	...
35	172	160	147	140	133	128	122	117	113	109
36	255	230	212	201	191	183	177	173	170	167
37	255	230	212	201	191	183	177	173	170	167
38	255	230	212	201	191	183	177	173	170	167
39	255	230	212	201	191	183	177	173	170	167
40	255	230	212	201	191	183	177	173	170	167
41	255	230	212	201	191	183	177	173	170	167
42	310	269	246	235	226	220	215	211	208	205
43	331	279	246	225	210	197	186	179	173	169
44	172	157	145	137	131	125	121	118	114	111
45	172	157	145	137	131	125	121	118	114	111

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	418	413	409	404	...	...	...	...	...	...
2	507	502	497	490	482	472	459	445	428	407
3	507	502	497	490	...	...	...	...	...	...
4	596	591	584	576	566	554	541	523	503	479
5	596	591	584	576	...	...	...	...	...	...
6	596	591	584	576	...	...	...	...	...	...
7	617	610	601	591	578	563	559	551	540	530
8	740	733	722	709	694	676	670	660	648	637
9	802	793	782	768	752	732	...	...	...	...
10	864	855	842	828	810	788	782	771	756	743
11	987	976	963	946	925	901	894	881	864	849
12	1110	1100	1080	1060	1040	1010	1010	990	972	955
13	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...
27	540	536	531	526	522	517	511	506	501	495
28	540	536	531	526	522	517	511	506	501	495
29	540	535	531	526	522	517	511	506	501	495
30	540	535	531	526	522	517	511	506	501	495
31	263	263	262	261	260	258	257	...	...	...
32	263	263	262	261	260	258	257	...	...	...
33	263	263	262	261	260	258	257	...	...	...
34	263	263	262	261	260	258	257	...	...	...
35	106	102	99.2	96.0	...	...	...	...	...	...
36	166	166	166	166	166	166	166	...	...	...
37	166	166	166	166	166	166	166	...	...	...
38	166	166	166	166	166	166	166	...	...	...
39	166	166	166	166	166	166	166	...	...	...
40	166	166	166	166	166	166	166	...	...	...
41	166	166	166	166	166	166	166	...	...	...
42	201	196	191	185	179	173	168	164	162	162
43	166	163	162	160	159	157	154	150	144	136
44	109	107	105	103	101	99.4	97.5	95.7	93.8	92.0
45	109	107	105	103	101	99.4	97.5	95.7	93.8	92.0

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	89.7	88.9	87.9	86.7	85.3	...	...	...	...	...	...	...	...	...	...
45	89.7	88.9	87.9	86.7	85.3	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	16Cr–12Ni–2Mo	Bar	SA/JIS G4303	SUS316L	...	...
2	16Cr–12Ni–2Mo	Forgings	SA–182	F316L	S31603	...
3	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316L	S31603	...
4	16Cr–12Ni–2Mo	Plate	SA–240	316L	S31603	...
5	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316L	S31603	...
6	16Cr–12Ni–2Mo	Smls. & wld. pipe	SA–312	TP316L	S31603	...
7	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316L	S31603	1
8	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316L	S31603	3
9	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316L	S31603	4
10	16Cr–12Ni–2Mo	Smls. & wld. fittings	SA–403	316L	S31603	...
11	16Cr–12Ni–2Mo	Wld. pipe	SA–409	TP316L	S31603	...
12	16Cr–12Ni–2Mo	Bar	SA–479	316L	S31603	Annealed
13	16Cr–12Ni–2Mo	Wld. tube	SA–688	TP316L	S31603	...
14	16Cr–12Ni–2Mo	Wld. pipe	SA–813	TP316L	S31603	...
15	16Cr–12Ni–2Mo	Wld. pipe	SA–814	TP316L	S31603	...
16	16Cr–12Ni–2Mo	Forgings	SA–182	F316	S31600	...
17	16Cr–12Ni–2Mo	Forgings	SA–965	F316	S31600	...
18	16Cr–12Ni–2Mo	Forgings	SA–182	F316H	S31609	...
19	16Cr–12Ni–2Mo	Forgings	SA–965	F316H	S31609	...
20	16Cr–12Ni–2Mo	Forgings	SA–182	F316	S31600	...
21	16Cr–12Ni–2Mo	Bolting	SA–193	B8M	S31600	1
22	16Cr–12Ni–2Mo	Bolting	SA–193	B8MA	S31600	1A
23	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316	S31600	...
24	16Cr–12Ni–2Mo	Plate	SA–240	316	S31600	...
25	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316	S31600	...
26	16Cr–12Ni–2Mo	Smls. & wld. pipe	SA–312	TP316	S31600	...
27	16Cr–12Ni–2Mo	Bolting	SA–320	B8M	S31600	1
28	16Cr–12Ni–2Mo	Bolting	SA–320	B8MA	S31600	1A
29	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316	S31600	1
30	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316	S31600	3
31	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316	S31600	4
32	16Cr–12Ni–2Mo	Smls. pipe	SA–376	TP316	S31600	...
33	16Cr–12Ni–2Mo	Smls. & wld. fittings	SA–403	316	S31600	...
34	16Cr–12Ni–2Mo	Wld. pipe	SA–409	TP316	S31600	...
35	16Cr–12Ni–2Mo	Bar	SA–479	316	S31600	Annealed
36	16Cr–12Ni–2Mo	Wld. tube	SA–688	TP316	S31600	...
37	16Cr–12Ni–2Mo	Wld. pipe	SA–813	TP316	S31600	...
38	16Cr–12Ni–2Mo	Wld. pipe	SA–814	TP316	S31600	...
39	16Cr–12Ni–2Mo	Bar	SA/JIS G4303	SUS316	...	...
40	16Cr–12Ni–2Mo	Forgings	SA–182	F316H	S31609	...
41	16Cr–12Ni–2Mo	Smls. tube	SA–213	TP316H	S31609	...
42	16Cr–12Ni–2Mo	Plate	SA–240	316H	S31609	...
43	16Cr–12Ni–2Mo	Wld. tube	SA–249	TP316H	S31609	...
44	16Cr–12Ni–2Mo	Smls. & wld. pipe	SA–312	TP316H	S31609	...
45	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316H	S31609	1

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	480	175	...
2	≤130	485	170	...
3	...	485	170	...
4	...	485	170	...
5	...	485	170	...
6	...	485	170	...
7	...	485	170	...
8	...	485	170	...
9	...	485	170	...
10	...	485	170	...
11	...	485	170	...
12	...	485	170	...
13	...	485	170	...
14	...	485	170	...
15	...	485	170	...
16	>130	485	205	...
17	...	485	205	...
18	>130	485	205	...
19	...	485	205	...
20	≤130	515	205	...
21	...	515	205	...
22	...	515	205	...
23	...	515	205	...
24	...	515	205	...
25	...	515	205	...
26	...	515	205	...
27	...	515	205	...
28	...	515	205	...
29	...	515	205	...
30	...	515	205	...
31	...	515	205	...
32	...	515	205	...
33	...	515	205	...
34	...	515	205	...
35	...	515	205	...
36	...	515	205	...
37	...	515	205	...
38	...	515	205	...
39	...	520	205	...
40	≤130	515	205	...
41	...	515	205	...
42	...	515	205	...
43	...	515	205	...
44	...	515	205	...
45	...	515	205	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	172	157	145	137	131	125	121	118	114	111
2	172	157	145	137	131	125	121	118	114	111
3	172	157	145	137	131	125	121	118	114	111
4	172	157	145	137	131	125	121	118	114	111
5	172	157	145	137	131	125	121	118	114	111
6	172	157	145	137	131	125	121	118	114	111
7	172	157	145	137	131	125	121	118	114	111
8	172	157	145	137	131	125	121	118	114	111
9	172	157	145	137	131	125	121	118	114	111
10	172	157	145	137	131	125	121	118	114	111
11	172	157	145	137	131	125	121	118	114	111
12	172	157	145	137	131	125	121	118	114	111
13	172	157	145	137	131	125	121	118	114	111
14	172	157	145	137	131	125	121	118	114	111
15	172	157	145	137	131	125	121	118	114	111
16	207	189	176	168	161	154	148	144	139	136
17	207	189	176	168	161	154	148	144	139	136
18	207	189	176	168	161	154	148	144	139	136
19	207	189	176	168	161	154	148	144	139	136
20	207	189	176	168	161	154	148	144	139	136
21	207	192	176	168	161	155	149	144	139	136
22	207	192	176	168	161	155	149	144	139	136
23	207	189	176	168	161	154	148	144	139	136
24	207	189	176	168	161	154	148	144	139	136
25	207	189	176	168	161	154	148	144	139	136
26	207	189	176	168	161	154	148	144	139	136
27	207	192	176	168	161	155	149	144	139	136
28	207	192	176	168	161	155	149	144	139	136
29	207	189	176	168	161	154	148	144	139	136
30	207	189	176	168	161	154	148	144	139	136
31	207	189	176	168	161	154	148	144	139	136
32	207	189	176	168	161	154	148	144	139	136
33	207	189	176	168	161	154	148	144	139	136
34	207	189	176	168	161	154	148	144	139	136
35	207	189	176	168	161	154	148	144	139	136
36	207	189	176	168	161	154	148	144	139	136
37	207	189	176	168	161	154	148	144	139	136
38	207	189	176	168	161	154	148	144	139	136
39	207	189	176	168	161	154	148	144	139	136
40	207	189	176	168	161	154	148	144	139	136
41	207	189	176	168	161	154	148	144	139	136
42	207	189	176	168	161	154	148	144	139	136
43	207	189	176	168	161	154	148	144	139	136
44	207	189	176	168	161	154	148	144	139	136
45	207	189	176	168	161	154	148	144	139	136

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	109	107	105	103	101	99.4	97.5	95.7	93.8	92.0
2	109	107	105	103	101	99.4	97.5	95.7	93.8	92.0
3	109	107	105	103	101	99.4	97.5	95.7	93.8	92.0
4	109	107	105	103	101	99.4	97.5	95.7	93.8	92.0
5	109	107	105	103	101	99.4	97.5	95.7	93.8	92.0
6	109	107	105	103	101	99.4	97.5	95.7	93.8	92.0
7	109	107	105	103	101	99.4	97.5	95.7	93.8	92.0
8	109	107	105	103	101	99.4	97.5	95.7	93.8	92.0
9	109	107	105	103	101	99.4	97.5	95.7	93.8	92.0
10	109	107	105	103	101	99.4	97.5	95.7	93.8	92.0
11	109	107	105	103	101	99.4	97.5	95.7	93.8	92.0
12	109	107	105	103	101	99.4	97.5	95.7	93.8	92.0
13	109	107	105	103	101	99.4	97.5	95.7	93.8	92.0
14	109	107	105	103	101	99.4	97.5	95.7	93.8	92.0
15	109	107	105	103	101	99.4	97.5	95.7	93.8	92.0
16	132	129	127	125	123	122	121	120	118	117
17	132	129	127	125	123	122	121	120	118	117
18	132	129	127	125	123	122	121	120	118	117
19	132	129	127	125	123	122	121	120	118	117
20	132	129	127	125	123	122	121	120	118	117
21	132	129	127	125	123	122	121	120	118	117
22	132	129	127	125	123	122	121	120	118	117
23	132	129	127	125	123	122	121	120	118	117
24	132	129	127	125	123	122	121	120	118	117
25	132	129	127	125	123	122	121	120	118	117
26	132	129	127	125	123	122	121	120	118	117
27	132	129	127	125	123	122	121	120	118	117
28	132	129	127	125	123	122	121	120	118	117
29	132	129	127	125	123	122	121	120	118	117
30	132	129	127	125	123	122	121	120	118	117
31	132	129	127	125	123	122	121	120	118	117
32	132	129	127	125	123	122	121	120	118	117
33	132	129	127	125	123	122	121	120	118	117
34	132	129	127	125	123	122	121	120	118	117
35	132	129	127	125	123	122	121	120	118	117
36	132	129	127	125	123	122	121	120	118	117
37	132	129	127	125	123	122	121	120	118	117
38	132	129	127	125	123	122	121	120	118	117
39	132	129	127	125	123	122	121	120	118	117
40	132	129	127	125	123	122	121	120	118	117
41	132	129	127	125	123	122	121	120	118	117
42	132	129	127	125	123	122	121	120	118	117
43	132	129	127	125	123	122	121	120	118	117
44	132	129	127	125	123	122	121	120	118	117
45	132	129	127	125	123	122	121	120	118	117

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	89.7	88.9	87.9	86.7	85.3	...	...	...	...	...	...	...	...	...	...
3	89.7	88.9	87.9	86.7	85.3	...	...	...	...	...	...	...	...	...	...
4	89.7	88.9	87.9	86.7	85.3	...	...	...	...	...	...	...	...	...	...
5	89.7	88.9	87.9	86.7	85.3	...	...	...	...	...	...	...	...	...	...
6	89.7	88.9	87.9	86.7	85.3	...	...	...	...	...	...	...	...	...	...
7	89.7	88.9	87.9	86.7	85.3	...	...	...	...	...	...	...	...	...	...
8	89.7	88.9	87.9	86.7	85.3	...	...	...	...	...	...	...	...	...	...
9	89.7	88.9	87.9	86.7	85.3	...	...	...	...	...	...	...	...	...	...
10	89.7	88.9	87.9	86.7	85.3	...	...	...	...	...	...	...	...	...	...
11	89.7	88.9	87.9	86.7	85.3	...	...	...	...	...	...	...	...	...	...
12	89.7	88.9	87.9	86.7	85.3	...	...	...	...	...	...	...	...	...	...
13	89.7	88.9	87.9	86.7	85.3	...	...	...	...	...	...	...	...	...	...
14	89.7	88.9	87.9	86.7	85.3	...	...	...	...	...	...	...	...	...	...
15	89.7	88.9	87.9	86.7	85.3	...	...	...	...	...	...	...	...	...	...
16	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
17	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
21	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
22	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
23	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
24	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
25	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
26	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
27	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
28	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
29	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
30	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
31	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
32	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
33	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
34	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
35	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
36	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
37	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
38	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
		Ferrous Materials (Cont'd)					
	1	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316H	S31609	3
	2	16Cr–12Ni–2Mo	Wld. pipe	SA–358	316H	S31609	4
	3	16Cr–12Ni–2Mo	Smls. pipe	SA–376	TP316H	S31609	...
	4	16Cr–12Ni–2Mo	Smls. & wld. fittings	SA–403	316H	S31609	...
	5	16Cr–12Ni–2Mo	Bar	SA–479	316H	S31609	...
	6	16Cr–12Ni–2Mo	Wld. pipe	SA–813	TP316H	S31609	...
	7	16Cr–12Ni–2Mo	Wld. pipe	SA–814	TP316H	S31609	...
	8	16Cr–12Ni–2Mo	Plate	SA/EN 10028–7	X2CrNiMo17–12–2	...	...
	9	16Cr–12Ni–2Mo	Plate	SA/EN 10028–7	X5CrNiMo17–12–2	...	...
(**23**)	10	16Cr–12Ni–2Mo	Bolting	SA–193	B8M2	S31600	2B
	11	16Cr–12Ni–2Mo	Bar	SA–276	316	S31600	S
	12	16Cr–12Ni–2Mo	Bolting	SA–193	B8M	S31600	2
	13	16Cr–12Ni–2Mo	Bolting	SA–320	B8M	S31600	2
(**23**)	14	16Cr–12Ni–2Mo	Bolting	SA–193	B8M2	S31600	2B
	15	16Cr–12Ni–2Mo	Bar	SA–276	316	S31600	S
	16	16Cr–12Ni–2Mo	Bar	SA–276	316	S31600	B
	17	16Cr–12Ni–2Mo	Bolting	SA–193	B8M	S31600	2
	18	16Cr–12Ni–2Mo	Bolting	SA–320	B8M	S31600	2
(**23**)	19	16Cr–12Ni–2Mo	Bolting	SA–193	B8M2	S31600	2B
	20	16Cr–12Ni–2Mo	Bar	SA–276	316	S31600	S
	21	16Cr–12Ni–2Mo	Bar	SA–276	316	S31600	B
	22	16Cr–12Ni–2Mo	Bolting	SA–193	B8M	S31600	2
	23	16Cr–12Ni–2Mo	Bolting	SA–320	B8M	S31600	2
	24	16Cr–12Ni–2Mo	Bar	SA–276	316	S31600	B
	25	16Cr–12Ni–2Mo	Bolting	SA–193	B8M	S31600	2
	26	16Cr–12Ni–2Mo	Bolting	SA–320	B8M	S31600	2
	27	16Cr–12Ni–2Mo	Bar	SA–276	316	S31600	B
	28	16Cr–12Ni–2Mo	Bar	SA–276	316	S31600	B
	29	16Cr–12Ni–2Mo–Cb	Plate	SA–240	316Cb	S31640	...
	30	16Cr–12Ni–2Mo–N	Forgings	SA–182	F316LN	S31653	...
	31	16Cr–12Ni–2Mo–N	Forgings	SA–965	F316LN	S31653	...
	32	16Cr–12Ni–2Mo–N	Forgings	SA–182	F316LN	S31653	...
	33	16Cr–12Ni–2Mo–N	Bolting	SA–193	B8MNA	S31651	1A
	34	16Cr–12Ni–2Mo–N	Smls. tube	SA–213	TP316LN	S31653	...
	35	16Cr–12Ni–2Mo–N	Plate	SA–240	316LN	S31653	...
	36	16Cr–12Ni–2Mo–N	Wld. tube	SA–249	TP316LN	S31653	...
	37	16Cr–12Ni–2Mo–N	Smls. & wld. pipe	SA–312	TP316LN	S31653	...
	38	16Cr–12Ni–2Mo–N	Wld. pipe	SA–358	316LN	S31653	1
	39	16Cr–12Ni–2Mo–N	Wld. pipe	SA–358	316LN	S31653	3
	40	16Cr–12Ni–2Mo–N	Wld. pipe	SA–358	316LN	S31653	4
	41	16Cr–12Ni–2Mo–N	Smls. pipe	SA–376	TP316LN	S31653	...
	42	16Cr–12Ni–2Mo–N	Fittings	SA–403	316LN	S31653	...
	43	16Cr–12Ni–2Mo–N	Bar	SA–479	316LN	S31653	...
	44	16Cr–12Ni–2Mo–N	Wld. tube	SA–688	TP316LN	S31653	...
	45	16Cr–12Ni–2Mo–N	Forgings	SA–182	F316N	S31651	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	515	205	...
2	...	515	205	...
3	...	515	205	...
4	...	515	205	...
5	...	515	205	...
6	...	515	205	...
7	...	515	205	...
8	≤75	520	220	...
9	≤75	520	220	...
10	64 < t ≤ 72	550	380	...
11	64 < t ≤ 75	550	380	...
12	30 < t ≤ 36	620	345	...
13	32 < t ≤ 40	620	345	...
14	48 < t ≤ 64	620	450	...
15	50 < t ≤ 64	620	450	...
16	38 < t ≤ 44	655	310	...
17	24 < t ≤ 30	655	450	...
18	25 < t ≤ 32	655	450	...
19	≤48	655	515	...
20	≤50	655	515	...
21	32 < t ≤ 38	690	345	...
22	20 < t ≤ 24	690	550	...
23	20 < t ≤ 25	690	550	...
24	25 < t ≤ 32	725	450	...
25	≤20	760	655	...
26	≤20	760	655	...
27	19 < t ≤ 25	795	550	...
28	≤19	860	690	...
29	...	515	205	...
30	>130	485	205	...
31	...	485	205	...
32	≤130	515	205	...
33	...	515	205	...
34	...	515	205	...
35	...	515	205	...
36	...	515	205	...
37	...	515	205	...
38	...	515	205	...
39	...	515	205	...
40	...	515	205	...
41	...	515	205	...
42	...	515	205	...
43	...	515	205	...
44	...	515	205	...
45	...	550	240	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	207	189	176	168	161	154	148	144	139	136
2	207	189	176	168	161	154	148	144	139	136
3	207	189	176	168	161	154	148	144	139	136
4	207	189	176	168	161	154	148	144	139	136
5	207	189	176	168	161	154	148	144	139	136
6	207	189	176	168	161	154	148	144	139	136
7	207	189	176	168	161	154	148	144	139	136
8	220	199	185	176	168	161	155	150	145	142
9	220	201	187	179	171	164	158	153	148	144
10	379	368	354	345	336	329	322	317	313	311
11	379	368	354	345	336	328	322	317	313	311
12	345	334	322	313	306	299	293	288	285	283
13	345	334	322	313	306	299	293	288	285	283
14	448	435	418	408	397	388	380	374	370	367
15	448	435	418	408	397	388	380	374	370	367
16	310	301	290	282	275	268	263	259	256	254
17	448	435	418	408	397	388	380	374	370	367
18	448	435	418	408	397	388	380	374	370	367
19	517	502	483	470	458	447	438	432	427	423
20	517	502	483	470	458	447	438	432	427	423
21	345	334	322	313	306	299	293	288	285	283
22	552	509	472	460	451	434	414	397	383	374
23	552	509	472	460	451	434	414	397	383	374
24	448	435	418	408	397	388	380	374	370	367
25	655	597	537	509	489	471	454	440	428	418
26	655	597	537	509	489	471	454	440	428	418
27	552	535	515	501	489	477	468	460	455	451
28	689	669	643	627	611	596	584	576	570	564
29	207	193	180	172	164	156	149	143	138	134
30	207	187	174	165	158	151	146	141	136	132
31	207	187	174	165	158	151	146	141	136	132
32	207	187	174	165	158	151	146	141	136	132
33	207	192	182	175	168	162	157	152	148	144
34	207	187	174	165	158	151	146	141	136	132
35	207	187	174	165	158	151	146	141	136	132
36	207	187	174	165	158	151	146	141	136	132
37	207	187	174	165	158	151	146	141	136	132
38	207	187	174	165	158	151	146	141	136	132
39	207	187	174	165	158	151	146	141	136	132
40	207	187	174	165	158	151	146	141	136	132
41	207	187	174	165	158	151	146	141	136	132
42	207	187	174	165	158	151	146	141	136	132
43	207	187	174	165	158	151	146	141	136	132
44	207	187	174	165	158	151	146	141	136	132
45	241	224	212	204	196	189	183	177	172	168

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	132	129	127	125	123	122	121	120	118	117
2	132	129	127	125	123	122	121	120	118	117
3	132	129	127	125	123	122	121	120	118	117
4	132	129	127	125	123	122	121	120	118	117
5	132	129	127	125	123	122	121	120	118	117
6	132	129	127	125	123	122	121	120	118	117
7	132	129	127	125	123	122	121	120	118	117
8	139	136	134	132	129	127	125	122	120	117
9	141	138	135	133	131	130	128	127	126	125
10	308	305	301	297	294	290	287	283	279	276
11	308	305	...	...	...	...	...	...	...	...
12	280	277	274	270	267	264	261	257	254	251
13	280	277	274	270	267	264	261	257	254	251
14	364	360	356	351	347	343	339	335	330	325
15	364	360	...	...	...	...	...	...	...	...
16	252	249	...	...	...	...	...	...	...	...
17	364	360	356	351	347	343	339	335	330	325
18	364	360	356	351	347	343	339	335	330	325
19	419	416	411	405	400	396	391	386	381	376
20	419	416	...	...	...	...	...	...	...	...
21	280	277	...	...	...	...	...	...	...	...
22	364	350	338	333	329	325	322	319	316	314
23	364	350	338	333	329	325	322	319	316	314
24	364	360	...	...	...	...	...	...	...	...
25	408	399	391	383	375	369	362	356	349	342
26	408	399	391	383	375	369	362	356	349	342
27	448	444	...	...	...	...	...	...	...	...
28	559	555	...	...	...	...	...	...	...	...
29	131	128	126	124	123	121	121	120	120	119
30	128	125	122	119	116	114	111	109	108	106
31	128	125	122	119	116	114	111	109	108	106
32	128	125	122	119	116	114	111	109	108	106
33	141	137	134	131	129	126	124	122	120	118
34	128	125	122	119	116	114	111	109	108	106
35	128	125	122	119	116	114	111	109	108	106
36	128	125	122	119	116	114	111	109	108	106
37	128	125	122	119	116	114	111	109	108	106
38	128	125	122	119	116	114	111	109	108	106
39	128	125	122	119	116	114	111	109	108	106
40	128	125	122	119	116	114	111	109	108	106
41	128	125	122	119	116	114	111	109	108	106
42	128	125	122	119	116	114	111	109	108	106
43	128	125	122	119	116	114	111	109	108	106
44	128	125	122	119	116	114	111	109	108	106
45	164	160	156	153	150	147	145	142	140	137

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Ferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	16Cr–12Ni–2Mo–N	Smls. tube	SA–213	TP316N	S31651	...
2	16Cr–12Ni–2Mo–N	Plate	SA–240	316N	S31651	...
3	16Cr–12Ni–2Mo–N	Wld. tube	SA–249	TP316N	S31651	...
4	16Cr–12Ni–2Mo–N	Smls. & wld. pipe	SA–312	TP316N	S31651	...
5	16Cr–12Ni–2Mo–N	Wld. pipe	SA–358	316N	S31651	1
6	16Cr–12Ni–2Mo–N	Wld. pipe	SA–358	316N	S31651	3
7	16Cr–12Ni–2Mo–N	Wld. pipe	SA–358	316N	S31651	4
8	16Cr–12Ni–2Mo–N	Smls. pipe	SA–376	TP316N	S31651	...
9	16Cr–12Ni–2Mo–N	Smls. & wld. fittings	SA–403	316N	S31651	...
10	16Cr–12Ni–2Mo–N	Bar	SA–479	316N	S31651	...
11	16Cr–12Ni–2Mo–N	Wld. tube	SA–688	TP316N	S31651	...
12	16Cr–12Ni–2Mo–N	Wld. pipe	SA–813	TP316N	S31651	...
13	16Cr–12Ni–2Mo–N	Wld. pipe	SA–814	TP316N	S31651	...
14	16Cr–12Ni–2Mo–N	Forgings	SA–965	F316N	S31651	...
15	16Cr–12Ni–2Mo–N	Plate	SA/EN 10028–7	X2CrNiMoN17–11–2	...	...
16	16Cr–12Ni–2Mo–N	Plate	SA/EN 10028–7	X2CrNiMoN17–13–3	...	...
(**23**) 17	16Cr–12Ni–2Mo–Ti	Smls. tube	SA–213	TP316Ti	S31635	...
18	16Cr–12Ni–2Mo–Ti	Plate	SA–240	316Ti	S31635	...
(**23**) 19	16Cr–12Ni–2Mo–Ti	Smls. & wld. pipe	SA–312	TP316Ti	S31635	...
20	17Cr–4Ni–6Mn	Plate	SA–240	201–1	S20100	...
21	17Cr–4Ni–6Mn	Plate	SA–666	201–1	S20100	...
22	17Cr–4Ni–6Mn	Plate	SA–240	201–2	S20100	...
23	17Cr–4Ni–6Mn	Plate	SA–666	201–2	S20100	...
24	17Cr–7Ni	Plate, sheet, strip	SA–240	301	S30100	...
(**23**) 25	17.5Cr–17.5Ni–5.3Si	Plate	SA–240	...	S30601	...
26	18Cr–3Ni–12Mn	Plate	SA–240	XM–29	S24000	...
27	18Cr–3Ni–12Mn	Wld. tube	SA–249	XM–29	S24000	...
28	18Cr–3Ni–12Mn	Wld. pipe	SA–312	XM–29	S24000	...
29	18Cr–3Ni–12Mn	Bar	SA–479	XM–29	S24000	...
30	18Cr–3Ni–12Mn	Wld. tube	SA–688	TPXM–29	S24000	...
31	18Cr–5Ni–3Mo	Smls. & wld. tube	SA–789	...	S31500	...
32	18Cr–5Ni–3Mo	Smls. & wld. pipe	SA–790	...	S31500	...
33	18Cr–8Ni	Forgings	SA–182	F304L	S30403	...
34	18Cr–8Ni	Forgings	SA–965	F304L	S30403	...
35	18Cr–8Ni	Bar	SA/JIS G4303	SUS304L	...	...
36	18Cr–8Ni	Forgings	SA–182	F304L	S30403	...
37	18Cr–8Ni	Smls. tube	SA–213	TP304L	S30403	...
38	18Cr–8Ni	Plate	SA–240	304L	S30403	...
39	18Cr–8Ni	Wld. tube	SA–249	TP304L	S30403	...
40	18Cr–8Ni	Smls. & wld. pipe	SA–312	TP304L	S30403	...
41	18Cr–8Ni	Wld. pipe	SA–358	304L	S30403	1
42	18Cr–8Ni	Wld. pipe	SA–358	304L	S30403	3
43	18Cr–8Ni	Wld. pipe	SA–358	304L	S30403	4
44	18Cr–8Ni	Smls. & wld. fittings	SA–403	304L	S30403	...
45	18Cr–8Ni	Wld. pipe	SA–409	TP304L	S30403	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	550	240	...
2	...	550	240	...
3	...	550	240	...
4	...	550	240	...
5	...	550	240	...
6	...	550	240	...
7	...	550	240	...
8	...	550	240	...
9	...	550	240	...
10	...	550	240	...
11	...	550	240	...
12	...	550	240	...
13	...	550	240	...
14	...	550	240	...
15	≤75	580	280	...
16	≤75	580	280	...
17	...	515	205	...
18	...	515	205	...
19	...	515	205	...
20	...	515	260	...
21	...	515	260	...
22	...	655	310	...
23	...	655	310	...
24	...	515	205	...
25	...	540	255	...
26	...	690	380	...
27	...	690	380	...
28	...	690	380	...
29	...	690	380	...
30	...	690	380	...
31	...	635	440	...
32	...	635	440	...
33	>130	450	170	...
34	...	450	170	...
35	...	480	175	...
36	≤130	485	170	...
37	...	485	170	...
38	...	485	170	...
39	...	485	170	...
40	...	485	170	...
41	...	485	170	...
42	...	485	170	...
43	...	485	170	...
44	...	485	170	...
45	...	485	170	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	241	224	212	204	196	189	183	177	172	168
2	241	224	212	204	196	189	183	177	172	168
3	241	224	212	204	196	189	183	177	172	168
4	241	224	212	204	196	189	183	177	172	168
5	241	224	212	204	196	189	183	177	172	168
6	241	224	212	204	196	189	183	177	172	168
7	241	224	212	204	196	189	183	177	172	168
8	241	224	212	204	196	189	183	177	172	168
9	241	224	212	204	196	189	183	177	172	168
10	241	224	212	204	196	189	183	177	172	168
11	241	224	212	204	196	189	183	177	172	168
12	241	224	212	204	196	189	183	177	172	168
13	241	224	212	204	196	189	183	177	172	168
14	241	224	212	204	196	189	183	177	172	168
15	280	253	235	224	214	205	197	190	184	179
16	280	253	235	224	214	205	197	190	184	179
17	207	193	180	172	164	156	149	143	138	134
18	207	193	180	172	164	156	149	143	138	134
19	207	193	180	172	164	156	149	143	138	134
20	262	220	195	182	172	165	158	151	...	...
21	262	220	195	182	172	165	158	151	...	...
22	310	261	231	215	204	195	187	179	...	...
23	310	261	231	215	204	195	187	179	...	...
24	207	179	164	155	149	144	140	137	135	133
25	255	230	206	195	186	179	172	165	159	153
26	379	334	299	277	258	242	229	219	211	205
27	379	334	299	277	258	242	229	219	211	205
28	379	334	299	277	258	242	229	219	211	205
29	379	334	299	277	258	242	229	219	211	205
30	379	334	299	277	258	242	229	219	211	205
31	441	384	357	345	338	333	329	326	323	319
32	441	384	357	345	338	333	329	326	323	319
33	172	157	146	138	132	126	121	117	114	111
34	172	157	146	138	132	126	121	117	114	111
35	172	157	146	138	132	126	121	117	114	111
36	172	157	146	138	132	126	121	117	114	111
37	172	157	146	138	132	126	121	117	114	111
38	172	157	146	138	132	126	121	117	114	111
39	172	157	146	138	132	126	121	117	114	111
40	172	157	146	138	132	126	121	117	114	111
41	172	157	146	138	132	126	121	117	114	111
42	172	157	146	138	132	126	121	117	114	111
43	172	157	146	138	132	126	121	117	114	111
44	172	157	146	138	132	126	121	117	114	111
45	172	157	146	138	132	126	121	117	114	111

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	164	160	156	153	150	147	145	142	140	137
2	164	160	156	153	150	147	145	142	140	137
3	164	160	156	153	150	147	145	142	140	137
4	164	160	156	153	150	147	145	142	140	137
5	164	160	156	153	150	147	145	142	140	137
6	164	160	156	153	150	147	145	142	140	137
7	164	160	156	153	150	147	145	142	140	137
8	164	160	156	153	150	147	145	142	140	137
9	164	160	156	153	150	147	145	142	140	137
10	164	160	156	153	150	147	145	142	140	137
11	164	160	156	153	150	147	145	142	140	137
12	164	160	156	153	150	147	145	142	140	137
13	164	160	156	153	150	147	145	142	140	137
14	164	160	156	153	150	147	145	142	140	137
15	174	169	165	161	158	154	151	...	...	...
16	174	169	165	161	158	154	151	...	...	...
17	131	128	126	124	123	121	121	120	120	119
18	131	128	126	124	123	121	121	120	120	119
19	131	128	126	124	123	121	121	120	120	119
20	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...
24	131	128	126	123	119	115	112	109	108	...
25	...	...	...	...	...	...	...	...	...	...
26	200	197	194	191	188	184	179	175	169	164
27	200	197	194	191	188	184	179	175	169	164
28	200	197	194	191	188	184	179	175	169	164
29	200	197	194	191	188	184	179	175	169	164
30	200	197	194	191	188	184	179	175	169	164
31	315	310	305	300	295	292	289	...	...	...
32	315	310	305	300	295	292	289	...	...	...
33	108	106	104	103	101	100	98.9	97.1	95.2	93.0
34	108	106	104	103	101	100	98.9	97.1	95.2	93.0
35	108	106	104	103	101	100	98.9	97.1	95.2	93.0
36	108	106	104	103	101	100	98.9	97.1	95.2	93.0
37	108	106	104	103	101	100	98.9	97.1	95.2	93.0
38	108	106	104	103	101	100	98.9	97.1	95.2	93.0
39	108	106	104	103	101	100	98.9	97.1	95.2	93.0
40	108	106	104	103	101	100	98.9	97.1	95.2	93.0
41	108	106	104	103	101	100	98.9	97.1	95.2	93.0
42	108	106	104	103	101	100	98.9	97.1	95.2	93.0
43	108	106	104	103	101	100	98.9	97.1	95.2	93.0
44	108	106	104	103	101	100	98.9	97.1	95.2	93.0
45	108	106	104	103	101	100	98.9	97.1	95.2	93.0

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Ferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	118	116	115	114	113	112	110	109	107	105	103	101	...	...	...	(**23**)
18	118	116	115	114	113	112	110	109	107	105	103	101	...	...	...	
19	118	116	115	114	113	112	110	109	107	105	103	101	...	...	...	(**23**)
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	90.7	89.4	88.0	86.4	84.6	...	...	...	...	...	...	...	...	...	...	
34	90.7	89.4	88.0	86.4	84.6	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	90.7	89.4	88.0	86.4	84.6	...	...	...	...	...	...	...	...	...	...	
37	90.7	89.4	88.0	86.4	84.6	...	...	...	...	...	...	...	...	...	...	
38	90.7	89.4	88.0	86.4	84.6	...	...	...	...	...	...	...	...	...	...	
39	90.7	89.4	88.0	86.4	84.6	...	...	...	...	...	...	...	...	...	...	
40	90.7	89.4	88.0	86.4	84.6	...	...	...	...	...	...	...	...	...	...	
41	90.7	89.4	88.0	86.4	84.6	...	...	...	...	...	...	...	...	...	...	
42	90.7	89.4	88.0	86.4	84.6	...	...	...	...	...	...	...	...	...	...	
43	90.7	89.4	88.0	86.4	84.6	...	...	...	...	...	...	...	...	...	...	
44	90.7	89.4	88.0	86.4	84.6	...	...	...	...	...	...	...	...	...	...	
45	90.7	89.4	88.0	86.4	84.6	...	...	...	...	...	...	...	...	...	...	

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
		Ferrous Materials (Cont'd)					
	1	18Cr–8Ni	Bar	SA–479	304L	S30403	Annealed
	2	18Cr–8Ni	Wld. tube	SA–688	TP304L	S30403	...
	3	18Cr–8Ni	Wld. pipe	SA–813	TP304L	S30403	...
	4	18Cr–8Ni	Wld. pipe	SA–814	TP304L	S30403	...
	5	18Cr–8Ni	Forgings	SA–182	F304	S30400	...
	6	18Cr–8Ni	Forgings	SA–182	F304H	S30409	...
	7	18Cr–8Ni	Castings	SA–351	CF3	J92500	...
	8	18Cr–8Ni	Castings	SA–351	CF8	J92600	...
(**23**)	9	18Cr–8Ni	Smls. pipe	SA–376	TP304	S30400	...
	10	18Cr–8Ni	Cast pipe	SA–451	CPF3	J92500	...
	11	18Cr–8Ni	Cast pipe	SA–451	CPF8	J92600	...
	12	18Cr–8Ni	Forgings	SA–965	F304	S30400	...
	13	18Cr–8Ni	Forgings	SA–965	F304H	S30409	...
	14	18Cr–8Ni	Plate	SA/EN 10028–7	X2CrNi18–9	...	...
	15	18Cr–8Ni	Forgings	SA–182	F304	S30400	...
	16	18Cr–8Ni	Forgings	SA–182	F304H	S30409	...
	17	18Cr–8Ni	Bolting	SA–193	B8	S30400	1
	18	18Cr–8Ni	Bolting	SA–193	B8A	S30400	1A
	19	18Cr–8Ni	Smls. tube	SA–213	TP304	S30400	...
	20	18Cr–8Ni	Smls. tube	SA–213	TP304H	S30409	...
	21	18Cr–8Ni	Plate	SA–240	302	S30200	...
	22	18Cr–8Ni	Plate	SA–240	304	S30400	...
	23	18Cr–8Ni	Plate	SA–240	304H	S30409	...
	24	18Cr–8Ni	Wld. tube	SA–249	TP304	S30400	...
	25	18Cr–8Ni	Wld. tube	SA–249	TP304H	S30409	...
	26	18Cr–8Ni	Smls. & wld. pipe	SA–312	TP304	S30400	...
	27	18Cr–8Ni	Smls. & wld. pipe	SA–312	TP304H	S30409	...
	28	18Cr–8Ni	Bolting	SA–320	B8	S30400	1
	29	18Cr–8Ni	Bolting	SA–320	B8A	S30400	1A
	30	18Cr–8Ni	Wld. pipe	SA–358	304	S30400	1
	31	18Cr–8Ni	Wld. pipe	SA–358	304	S30400	3
	32	18Cr–8Ni	Wld. pipe	SA–358	304	S30400	4
	33	18Cr–8Ni	Wld. pipe	SA–358	304H	S30409	1
	34	18Cr–8Ni	Wld. pipe	SA–358	304H	S30409	3
	35	18Cr–8Ni	Wld. pipe	SA–358	304H	S30409	4
	36	18Cr–8Ni	Wld. pipe	SA–358	304LN	S30453	1
	37	18Cr–8Ni	Wld. pipe	SA–358	304LN	S30453	3
	38	18Cr–8Ni	Wld. pipe	SA–358	304LN	S30453	4
(**23**)	39	18Cr–8Ni	Smls. pipe	SA–376	TP304	S30400	...
	40	18Cr–8Ni	Smls. pipe	SA–376	TP304H	S30409	...
	41	18Cr–8Ni	Smls. & wld. fittings	SA–403	304	S30400	...
	42	18Cr–8Ni	Smls. & wld. fittings	SA–403	304H	S30409	...
	43	18Cr–8Ni	Wld. pipe	SA–409	TP304	S30400	...
	44	18Cr–8Ni	Bar	SA–479	302	S30200	...
	45	18Cr–8Ni	Bar	SA–479	304	S30400	Annealed

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	485	170	...
2	...	485	170	...
3	...	485	170	...
4	...	485	170	...
5	>130	485	205	...
6	>130	485	205	...
7	...	485	205	...
8	...	485	205	...
9	≥200	485	205	...
10	...	485	205	...
11	...	485	205	...
12	...	485	205	...
13	...	485	205	...
14	≤75	500	200	...
15	≤130	515	205	...
16	≤130	515	205	...
17	...	515	205	...
18	...	515	205	...
19	...	515	205	...
20	...	515	205	...
21	...	515	205	...
22	...	515	205	...
23	...	515	205	...
24	...	515	205	...
25	...	515	205	...
26	...	515	205	...
27	...	515	205	...
28	...	515	205	...
29	...	515	205	...
30	...	515	205	...
31	...	515	205	...
32	...	515	205	...
33	...	515	205	...
34	...	515	205	...
35	...	515	205	...
36	...	515	205	...
37	...	515	205	...
38	...	515	205	...
39	<200	515	205	...
40	...	515	205	...
41	...	515	205	...
42	...	515	205	...
43	...	515	205	...
44	...	515	205	...
45	...	515	205	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	172	157	146	138	132	126	121	117	114	111
2	172	157	146	138	132	126	121	117	114	111
3	172	157	146	138	132	126	121	117	114	111
4	172	157	146	138	132	126	121	117	114	111
5	207	184	170	161	154	148	144	139	135	132
6	207	184	170	161	154	148	144	139	135	132
7	207	184	170	161	154	148	144	139	135	132
8	207	184	170	161	154	148	144	139	135	132
9	207	184	170	161	154	148	144	139	135	132
10	207	184	170	161	154	148	144	139	135	132
11	207	184	170	161	154	148	144	139	135	132
12	207	184	170	161	154	148	144	139	135	132
13	207	184	170	161	154	148	144	139	135	132
14	200	182	169	161	153	147	141	136	132	129
15	207	184	170	161	154	148	144	139	135	132
16	207	184	170	161	154	148	144	139	135	132
17	207	188	169	161	154	149	144	139	135	132
18	207	188	169	161	154	149	144	139	135	132
19	207	184	170	161	154	148	144	139	135	132
20	207	184	170	161	154	148	144	139	135	132
21	207	184	170	161	154	148	144	139	135	132
22	207	184	170	161	154	148	144	139	135	132
23	207	184	170	161	154	148	144	139	135	132
24	207	184	170	161	154	148	144	139	135	132
25	207	184	170	161	154	148	144	139	135	132
26	207	184	170	161	154	148	144	139	135	132
27	207	184	170	161	154	148	144	139	135	132
28	207	188	169	161	154	149	144	139	135	132
29	207	188	169	161	154	149	144	139	135	132
30	207	184	170	161	154	148	144	139	135	132
31	207	184	170	161	154	148	144	139	135	132
32	207	184	170	161	154	148	144	139	135	132
33	207	184	170	161	154	148	144	139	135	132
34	207	184	170	161	154	148	144	139	135	132
35	207	184	170	161	154	148	144	139	135	132
36	207	184	170	161	154	148	144	139	135	132
37	207	184	170	161	154	148	144	139	135	132
38	207	184	170	161	154	148	144	139	135	132
39	207	184	170	161	154	148	144	139	135	132
40	207	184	170	161	154	148	144	139	135	132
41	207	184	170	161	154	148	144	139	135	132
42	207	184	170	161	154	148	144	139	135	132
43	207	184	170	161	154	148	144	139	135	132
44	207	184	170	161	154	148	144	139	135	132
45	207	184	170	161	154	148	144	139	135	132

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	108	106	104	103	101	100	98.9	97.1	95.2	93.0
2	108	106	104	103	101	100	98.9	97.1	95.2	93.0
3	108	106	104	103	101	100	98.9	97.1	95.2	93.0
4	108	106	104	103	101	100	98.9	97.1	95.2	93.0
5	129	126	123	121	118	117	114	112	110	108
6	129	126	123	121	118	117	114	112	110	108
7	129	126	123	121	118	117	114	112	110	108
8	129	126	123	121	118	117	114	112	110	108
9	129	126	123	121	118	117	114	112	110	108
10	129	126	123	121	118	117	114	112	110	108
11	129	126	123	121	118	117	114	112	110	108
12	129	126	123	121	118	117	114	112	110	108
13	129	126	123	121	118	117	114	112	110	108
14	126	123	121	119	118	116	115	113	111	108
15	129	126	123	121	118	117	114	112	110	108
16	129	126	123	121	118	117	114	112	110	108
17	129	126	123	121	118	117	114	112	110	108
18	129	126	123	121	118	117	114	112	110	108
19	129	126	123	121	118	117	114	112	110	108
20	129	126	123	121	118	117	114	112	110	108
21	129	126	123	121	118	117	114	112	110	108
22	129	126	123	121	118	117	114	112	110	108
23	129	126	123	121	118	117	114	112	110	108
24	129	126	123	121	118	117	114	112	110	108
25	129	126	123	121	118	117	114	112	110	108
26	129	126	123	121	118	117	114	112	110	108
27	129	126	123	121	118	117	114	112	110	108
28	129	126	123	121	118	117	114	112	110	108
29	129	126	123	121	118	117	114	112	110	108
30	129	126	123	121	118	117	114	112	110	108
31	129	126	123	121	118	117	114	112	110	108
32	129	126	123	121	118	117	114	112	110	108
33	129	126	123	121	118	117	114	112	110	108
34	129	126	123	121	118	117	114	112	110	108
35	129	126	123	121	118	117	114	112	110	108
36	129	126	123	121	118	117	114	112	110	108
37	129	126	123	121	118	117	114	112	110	108
38	129	126	123	121	118	117	114	112	110	108
39	129	126	123	121	118	117	114	112	110	108
40	129	126	123	121	118	117	114	112	110	108
41	129	126	123	121	118	117	114	112	110	108
42	129	126	123	121	118	117	114	112	110	108
43	129	126	123	121	118	117	114	112	110	108
44	129	126	123	121	118	117	114	112	110	108
45	129	126	123	121	118	117	114	112	110	108

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Ferrous Materials (Cont'd)															
1	90.7	89.4	88.0	86.4	84.6	...	...	...	...	...	...	...	...	...	...	
2	90.7	89.4	88.0	86.4	84.6	...	...	...	...	...	...	...	...	...	...	
3	90.7	89.4	88.0	86.4	84.6	...	...	...	...	...	...	...	...	...	...	
4	90.7	89.4	88.0	86.4	84.6	...	...	...	...	...	...	...	...	...	...	
5	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...	(**23**)
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...	
18	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...	
19	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...	
29	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...	
30	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...	
31	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...	
32	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...	(**23**)
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...	

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	18Cr–8Ni	Bar	SA–479	304H	S30409	...
2	18Cr–8Ni	Wld. tube	SA–688	TP304	S30400	...
3	18Cr–8Ni	Wld. pipe	SA–813	TP304	S30400	...
4	18Cr–8Ni	Wld. pipe	SA–813	TP304H	S30409	...
5	18Cr–8Ni	Wld. pipe	SA–814	TP304	S30400	...
6	18Cr–8Ni	Wld. pipe	SA–814	TP304H	S30409	...
7	18Cr–8Ni	Bar	SA/JIS G4303	SUS302	...	...
8	18Cr–8Ni	Bar	SA/JIS G4303	SUS304	...	...
9	18Cr–8Ni	Plate	SA/EN 10028–7	X5CrNi18–10	...	...
10	18Cr–8Ni	Castings	SA–351	CF3A	J92500	...
11	18Cr–8Ni	Castings	SA–351	CF8A	J92600	...
12	18Cr–8Ni	Cast pipe	SA–451	CPF3A	J92500	...
13	18Cr–8Ni	Cast pipe	SA–451	CPF8A	J92600	...
14	18Cr–8Ni	Bolting	SA–193	B8	S30400	2
15	18Cr–8Ni	Bolting	SA–320	B8	S30400	2
16	18Cr–8Ni	Bolting	SA–193	B8	S30400	2
17	18Cr–8Ni	Bolting	SA–320	B8	S30400	2
18	18Cr–8Ni	Bolting	SA–193	B8	S30400	2
19	18Cr–8Ni	Bolting	SA–320	B8	S30400	2
20	18Cr–8Ni	Bolting	SA–193	B8	S30400	2
21	18Cr–8Ni	Bolting	SA–320	B8	S30400	2
22	18Cr–8Ni–N	Forgings	SA–182	F304LN	S30453	...
23	18Cr–8Ni–N	Forgings	SA–965	F304LN	S30453	...
24	18Cr–8Ni–N	Forgings	SA–182	F304LN	S30453	...
25	18Cr–8Ni–N	Bolting	SA–193	B8NA	S30451	1A
26	18Cr–8Ni–N	Smls. tube	SA–213	TP304LN	S30453	...
27	18Cr–8Ni–N	Plate	SA–240	304LN	S30453	...
28	18Cr–8Ni–N	Wld. tube	SA–249	TP304LN	S30453	...
29	18Cr–8Ni–N	Smls. & wld. pipe	SA–312	TP304LN	S30453	...
30	18Cr–8Ni–N	Smls. pipe	SA–376	TP304LN	S30453	...
31	18Cr–8Ni–N	Smls. & wld. fittings	SA–403	304LN	S30453	WP
32	18Cr–8Ni–N	Bar	SA–479	304LN	S30453	...
33	18Cr–8Ni–N	Wld. tube	SA–688	TP304LN	S30453	...
34	18Cr–8Ni–N	Wld. pipe	SA–813	TP304LN	S30453	...
35	18Cr–8Ni–N	Wld. pipe	SA–814	TP304LN	S30453	...
36	18Cr–8Ni–N	Forgings	SA–182	F304N	S30451	...
37	18Cr–8Ni–N	Smls. tube	SA–213	TP304N	S30451	...
38	18Cr–8Ni–N	Plate	SA–240	304N	S30451	...
39	18Cr–8Ni–N	Wld. tube	SA–249	TP304N	S30451	...
40	18Cr–8Ni–N	Smls. & wld. pipe	SA–312	TP304N	S30451	...
41	18Cr–8Ni–N	Wld. pipe	SA–358	304N	S30451	1
42	18Cr–8Ni–N	Wld. pipe	SA–358	304N	S30451	3
43	18Cr–8Ni–N	Wld. pipe	SA–358	304N	S30451	4
44	18Cr–8Ni–N	Smls. pipe	SA–376	TP304N	S30451	...
45	18Cr–8Ni–N	Smls. & wld. fittings	SA–403	304N	S30451	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	515	205	...
2	...	515	205	...
3	...	515	205	...
4	...	515	205	...
5	...	515	205	...
6	...	515	205	...
7	...	520	205	...
8	...	520	205	...
9	≤75	520	210	...
10	...	530	240	...
11	...	530	240	...
12	...	530	240	...
13	...	530	240	...
14	$30 < t \leq 36$	690	345	...
15	$32 < t \leq 40$	690	345	...
16	$24 < t \leq 30$	725	450	...
17	$25 < t \leq 32$	725	450	...
18	$20 < t \leq 24$	795	550	...
19	$20 < t \leq 25$	795	550	...
20	≤20	860	690	...
21	≤20	860	690	...
22	>130	485	205	...
23	...	485	205	...
24	≤130	515	205	...
25	...	515	205	...
26	...	515	205	...
27	...	515	205	...
28	...	515	205	...
29	...	515	205	...
30	...	515	205	...
31	...	515	205	...
32	...	515	205	...
33	...	515	205	...
34	...	515	205	...
35	...	515	205	...
36	...	550	240	...
37	...	550	240	...
38	...	550	240	...
39	...	550	240	...
40	...	550	240	...
41	...	550	240	...
42	...	550	240	...
43	...	550	240	...
44	...	550	240	...
45	...	550	240	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	207	184	170	161	154	148	144	139	135	132
2	207	184	170	161	154	148	144	139	135	132
3	207	184	170	161	154	148	144	139	135	132
4	207	184	170	161	154	148	144	139	135	132
5	207	184	170	161	154	148	144	139	135	132
6	207	184	170	161	154	148	144	139	135	132
7	207	184	170	161	154	148	144	139	135	132
8	207	184	170	161	154	148	144	139	135	132
9	210	187	172	164	157	151	146	141	137	134
10	241	216	198	188	180	173	167	162	157	154
11	241	216	198	188	180	173	167	162	157	154
12	241	216	198	188	180	173	167	162	157	154
13	241	216	198	188	180	173	167	162	157	154
14	345	307	283	268	257	247	240	232	225	220
15	345	307	283	268	257	247	240	232	225	220
16	448	398	368	348	333	320	312	301	292	286
17	448	398	368	348	333	320	312	301	292	286
18	552	491	453	429	411	395	384	371	360	352
19	552	491	453	429	411	395	384	371	360	352
20	689	612	566	536	513	493	479	463	449	439
21	689	612	566	536	513	493	479	463	449	439
22	207	184	170	161	154	148	144	139	135	132
23	207	184	170	161	154	148	144	139	135	132
24	207	184	170	161	154	148	144	139	135	132
25	207	188	169	161	154	149	144	139	135	132
26	207	184	170	161	154	148	144	139	135	132
27	207	184	170	161	154	148	144	139	135	132
28	207	184	170	161	154	148	144	139	135	132
29	207	184	170	161	154	148	144	139	135	132
30	207	184	170	161	154	148	144	139	135	132
31	207	184	170	161	154	148	144	139	135	132
32	207	184	170	161	154	148	144	139	135	132
33	207	184	170	161	154	148	144	139	135	132
34	207	184	170	161	154	148	144	139	135	132
35	207	184	170	161	154	148	144	139	135	132
36	241	213	194	182	172	164	157	151	146	142
37	241	213	194	182	172	164	157	151	146	142
38	241	213	194	182	172	164	157	151	146	142
39	241	213	194	182	172	164	157	151	146	142
40	241	213	194	182	172	164	157	151	146	142
41	241	213	194	182	172	164	157	151	146	142
42	241	213	194	182	172	164	157	151	146	142
43	241	213	194	182	172	164	157	151	146	142
44	241	213	194	182	172	164	157	151	146	142
45	241	213	194	182	172	164	157	151	146	142

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	129	126	123	121	118	117	114	112	110	108
2	129	126	123	121	118	117	114	112	110	108
3	129	126	123	121	118	117	114	112	110	108
4	129	126	123	121	118	117	114	112	110	108
5	129	126	123	121	118	117	114	112	110	108
6	129	126	123	121	118	117	114	112	110	108
7	129	126	123	121	118	117	114	112	110	108
8	129	126	123	121	118	117	114	112	110	108
9	131	128	125	123	121	118	116	114	112	110
10	150	147	144	141	138	136	134	131	129	126
11	150	147	144	141	138	136	134	131	129	126
12	150	147	144	141	138	136	134	131	129	126
13	150	147	144	141	138	136	134	131	129	126
14	215	210	205	202	197	195	190	187	183	180
15	215	210	205	202	197	195	190	187	183	180
16	279	273	266	262	255	253	247	242	238	234
17	279	273	266	262	255	253	247	242	238	234
18	344	336	328	323	315	312	304	299	293	288
19	344	336	328	323	315	312	304	299	293	288
20	429	419	409	403	393	389	379	373	366	359
21	429	419	409	403	393	389	379	373	366	359
22	129	126	123	121	118	117	114	112	110	108
23	129	126	123	121	118	117	114	112	110	108
24	129	126	123	121	118	117	114	112	110	108
25	129	126	123	121	118	117	114	112	110	108
26	129	126	123	121	118	117	114	112	110	108
27	129	126	123	121	118	117	114	112	110	108
28	129	126	123	121	118	117	114	112	110	108
29	129	126	123	121	118	117	114	112	110	108
30	129	126	123	121	118	117	114	112	110	108
31	129	126	123	121	118	117	114	112	110	108
32	129	126	123	121	118	117	114	112	110	108
33	129	126	123	121	118	117	114	112	110	108
34	129	126	123	121	118	117	114	112	110	108
35	129	126	123	121	118	117	114	112	110	108
36	139	136	134	131	130	128	125	123	120	118
37	139	136	134	131	130	128	125	123	120	118
38	139	136	134	131	130	128	125	123	120	118
39	139	136	134	131	130	128	125	123	120	118
40	139	136	134	131	130	128	125	123	120	118
41	139	136	134	131	130	128	125	123	120	118
42	139	136	134	131	130	128	125	123	120	118
43	139	136	134	131	130	128	125	123	120	118
44	139	136	134	131	130	128	125	123	120	118
45	139	136	134	131	130	128	125	123	120	118

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...
3	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	105	103	101	98.6	95.8	92.6	89.1	85.2	80.8	75.8	70.2	64.0	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	18Cr–8Ni–N	Bar	SA–479	304N	S30451	...
2	18Cr–8Ni–N	Wld. tube	SA–688	TP304N	S30451	...
3	18Cr–8Ni–N	Wld. pipe	SA–813	TP304N	S30451	...
4	18Cr–8Ni–N	Wld. pipe	SA–814	TP304N	S30451	...
5	18Cr–8Ni–N	Forgings	SA–965	F304N	S30451	...
6	18Cr–8Ni–N	Plate	SA/EN 10028–7	X2CrNiN18–10	...	...
7	18Cr–8Ni–N	Plate	SA/EN 10028–7	X5CrNiN19–9	...	...
8	18Cr–8Ni–Se	Bolting	SA–320	B8F	S30323	1
9	18Cr–8Ni–Se	Bolting	SA–320	B8FA	S30323	1A
10	18Cr–8Ni–4Si–N	Bolting	SA–193	B8S	S21800	...
11	18Cr–8Ni–4Si–N	Bolting	SA–193	B8SA	S21800	...
12	18Cr–8Ni–4Si–N	Bar	SA–479	...	S21800	...
13	18Cr–9Ni–3Cu–Cb–N	Smls. tube	SA–213	...	S30432	...
14	18Cr–10Ni–Cb	Forgings	SA–965	F348H	S34809	...
15	18Cr–10Ni–Cb	Castings	SA–351	CF8C	J92710	...
16	18Cr–10Ni–Cb	Cast pipe	SA–451	CPF8C	J92710	...
17	18Cr–10Ni–Cb	Forgings	SA–182	F347	S34700	...
18	18Cr–10Ni–Cb	Forgings	SA–965	F347	S34700	...
19	18Cr–10Ni–Cb	Forgings	SA–182	F347H	S34709	...
20	18Cr–10Ni–Cb	Forgings	SA–965	F347H	S34709	...
21	18Cr–10Ni–Cb	Forgings	SA–182	F348	S34800	...
22	18Cr–10Ni–Cb	Forgings	SA–965	F348	S34800	...
23	18Cr–10Ni–Cb	Forgings	SA–182	F348H	S34809	...
24	18Cr–10Ni–Cb	Forgings	SA–182	F347	S34700	...
25	18Cr–10Ni–Cb	Bolting	SA–193	B8C	S34700	1
26	18Cr–10Ni–Cb	Smls. tube	SA–213	TP347	S34700	...
27	18Cr–10Ni–Cb	Plate	SA–240	347	S34700	...
28	18Cr–10Ni–Cb	Wld. tube	SA–249	TP347	S34700	...
29	18Cr–10Ni–Cb	Smls. & wld. pipe	SA–312	TP347	S34700	...
30	18Cr–10Ni–Cb	Bolting	SA–320	B8C	S34700	1
31	18Cr–10Ni–Cb	Bolting	SA–320	B8CA	S34700	1A
32	18Cr–10Ni–Cb	Wld. pipe	SA–358	347	S34700	1
33	18Cr–10Ni–Cb	Wld. pipe	SA–358	347	S34700	3
34	18Cr–10Ni–Cb	Wld. pipe	SA–358	347	S34700	4
35	18Cr–10Ni–Cb	Smls. pipe	SA–376	TP347	S34700	...
36	18Cr–10Ni–Cb	Smls. & wld. fittings	SA–403	347	S34700	...
37	18Cr–10Ni–Cb	Wld. pipe	SA–409	TP347	S34700	...
38	18Cr–10Ni–Cb	Bar	SA–479	347	S34700	...
39	18Cr–10Ni–Cb	Wld. pipe	SA–813	TP347	S34700	...
40	18Cr–10Ni–Cb	Forgings	SA–182	F347H	S34709	...
41	18Cr–10Ni–Cb	Smls. tube	SA–213	TP347H	S34709	...
42	18Cr–10Ni–Cb	Plate	SA–240	347H	S34709	...
43	18Cr–10Ni–Cb	Wld. tube	SA–249	TP347H	S34709	...
44	18Cr–10Ni–Cb	Smls. & wld. pipe	SA–312	TP347H	S34709	...
45	18Cr–10Ni–Cb	Smls. pipe	SA–376	TP347H	S34709	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	550	240	...
2	...	550	240	...
3	...	550	240	...
4	...	550	240	...
5	...	550	240	...
6	≤75	550	270	...
7	≤75	550	270	...
8	...	515	205	...
9	...	515	205	...
10	...	655	345	...
11	...	655	345	...
12	...	655	345	...
13	...	590	235	...
14	...	450	170	...
15	...	485	205	...
16	...	485	205	...
17	>130	485	205	...
18	...	485	205	...
19	>130	485	205	...
20	...	485	205	...
21	>130	485	205	...
22	...	485	205	...
23	>130	485	205	...
24	≤130	515	205	...
25	...	515	205	...
26	...	515	205	...
27	...	515	205	...
28	...	515	205	...
29	...	515	205	...
30	...	515	205	...
31	...	515	205	...
32	...	515	205	...
33	...	515	205	...
34	...	515	205	...
35	...	515	205	...
36	...	515	205	...
37	...	515	205	...
38	...	515	205	...
39	...	515	205	...
40	≤130	515	205	...
41	...	515	205	...
42	...	515	205	...
43	...	515	205	...
44	...	515	205	...
45	...	515	205	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	241	213	194	182	172	164	157	151	146	142
2	241	213	194	182	172	164	157	151	146	142
3	241	213	194	182	172	164	157	151	146	142
4	241	213	194	182	172	164	157	151	146	142
5	241	213	194	182	172	164	157	151	146	142
6	270	240	222	211	202	194	187	181	176	172
7	270	238	217	204	193	183	175	169	164	159
8	207	188	169	161	154	149	144	139	135	132
9	207	188	169	161	154	149	144	139	135	132
10	345	294	262	243	228	216	206	198	192	188
11	345	294	262	243	228	216	206	198	192	188
12	345	294	262	243	228	216	206	198	192	188
13	235	215	203	196	189	183	178	174	170	167
14	172	164	157	152	147	143	139	135	131	128
15	207	197	189	182	177	172	166	162	157	154
16	207	197	189	182	177	172	166	162	157	154
17	207	197	189	182	177	172	166	162	157	154
18	207	197	189	182	177	172	166	162	157	154
19	207	197	189	182	177	172	166	162	157	154
20	207	197	189	182	177	172	166	162	157	154
21	207	197	189	182	177	172	166	162	157	154
22	207	197	189	182	177	172	166	162	157	154
23	207	197	189	182	177	172	166	162	157	154
24	207	197	189	182	177	172	166	162	157	154
25	207	198	189	182	177	172	166	161	157	153
26	207	197	189	182	177	172	166	162	157	154
27	207	197	189	182	177	172	166	162	157	154
28	207	197	189	182	177	172	166	162	157	154
29	207	197	189	182	177	172	166	162	157	154
30	207	198	189	182	177	172	166	161	157	153
31	207	198	189	182	177	172	166	161	157	153
32	207	197	189	182	177	172	166	162	157	154
33	207	197	189	182	177	172	166	162	157	154
34	207	197	189	182	177	172	166	162	157	154
35	207	197	189	182	177	172	166	162	157	154
36	207	197	189	182	177	172	166	162	157	154
37	207	197	189	182	177	172	166	162	157	154
38	207	197	189	182	177	172	166	162	157	154
39	207	197	189	182	177	172	166	162	157	154
40	207	197	189	182	177	172	166	162	157	154
41	207	197	189	182	177	172	166	162	157	154
42	207	197	189	182	177	172	166	162	157	154
43	207	197	189	182	177	172	166	162	157	154
44	207	197	189	182	177	172	166	162	157	154
45	207	197	189	182	177	172	166	162	157	154

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	139	136	134	131	130	128	125	123	120	118
2	139	136	134	131	130	128	125	123	120	118
3	139	136	134	131	130	128	125	123	120	118
4	139	136	134	131	130	128	125	123	120	118
5	139	136	134	131	130	128	125	123	120	118
6	168	164	161	158	155	152	149	...	...	...
7	156	152	150	147	145	143	140	137	135	132
8	129	126	123	121	118	117	114	...	...	...
9	129	126	123	121	118	117	114	...	...	...
10	184	181	178	176	175	174	173	172	172	172
11	184	181	178	176	175	174	173	172	172	172
12	184	181	178	176	175	174	173	172	172	172
13	164	161	158	156	154	152	150	148	146	144
14	125	123	121	119	118	117	117	116	116	116
15	150	147	145	142	141	140	139	139	139	139
16	150	147	145	142	141	140	139	139	139	139
17	150	147	145	142	141	140	139	139	139	139
18	150	147	145	142	141	140	139	139	139	139
19	150	147	145	142	141	140	139	139	139	139
20	150	147	145	142	141	140	139	139	139	139
21	150	147	145	142	141	140	139	139	139	139
22	150	147	145	142	141	140	139	139	139	139
23	150	147	145	142	141	140	139	139	139	139
24	150	147	145	142	141	140	139	139	139	139
25	150	147	145	142	141	141	140	139	139	139
26	150	147	145	142	141	140	139	139	139	139
27	150	147	145	142	141	140	139	139	139	139
28	150	147	145	142	141	140	139	139	139	139
29	150	147	145	142	141	140	139	139	139	139
30	150	147	145	142	141	141	140	139	139	139
31	150	147	145	142	141	141	140	139	139	139
32	150	147	145	142	141	140	139	139	139	139
33	150	147	145	142	141	140	139	139	139	139
34	150	147	145	142	141	140	139	139	139	139
35	150	147	145	142	141	140	139	139	139	139
36	150	147	145	142	141	140	139	139	139	139
37	150	147	145	142	141	140	139	139	139	139
38	150	147	145	142	141	140	139	139	139	139
39	150	147	145	142	141	140	139	139	139	139
40	150	147	145	142	141	140	139	139	139	139
41	150	147	145	142	141	140	139	139	139	139
42	150	147	145	142	141	140	139	139	139	139
43	150	147	145	142	141	140	139	139	139	139
44	150	147	145	142	141	140	139	139	139	139
45	150	147	145	142	141	140	139	139	139	139

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
18	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
22	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
25	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
26	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
27	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
28	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
29	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
30	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
31	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
32	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
33	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
34	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
35	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
36	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
37	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
38	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
39	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	18Cr–10Ni–Cb	Smls. & wld. fittings	SA–403	347H	S34709	...
2	18Cr–10Ni–Cb	Bar	SA–479	347H	S34709	...
3	18Cr–10Ni–Cb	Wld. pipe	SA–813	TP347H	S34709	...
4	18Cr–10Ni–Cb	Wld. pipe	SA–814	TP347H	S34709	...
5	18Cr–10Ni–Cb	Smls. tube	SA–213	TP347LN	S34751	...
6	18Cr–10Ni–Cb	Smls. pipe	SA–312	TP347LN	S34751	...
7	18Cr–10Ni–Cb	Forgings	SA–182	F348	S34800	...
8	18Cr–10Ni–Cb	Smls. tube	SA–213	TP348	S34800	...
9	18Cr–10Ni–Cb	Plate	SA–240	348	S34800	...
10	18Cr–10Ni–Cb	Wld. tube	SA–249	TP348	S34800	...
11	18Cr–10Ni–Cb	Smls. & wld. pipe	SA–312	TP348	S34800	...
12	18Cr–10Ni–Cb	Wld. pipe	SA–358	348	S34800	1
13	18Cr–10Ni–Cb	Wld. pipe	SA–358	348	S34800	3
14	18Cr–10Ni–Cb	Wld. pipe	SA–358	348	S34800	4
15	18Cr–10Ni–Cb	Smls. pipe	SA–376	TP348	S34800	...
16	18Cr–10Ni–Cb	Smls. & wld. fittings	SA–403	348	S34800	...
17	18Cr–10Ni–Cb	Wld. pipe	SA–409	TP348	S34800	...
18	18Cr–10Ni–Cb	Bar	SA–479	348	S34800	...
19	18Cr–10Ni–Cb	Wld. pipe	SA–813	TP348	S34800	...
20	18Cr–10Ni–Cb	Wld. pipe	SA–814	TP348	S34800	...
21	18Cr–10Ni–Cb	Forgings	SA–182	F348H	S34809	...
22	18Cr–10Ni–Cb	Smls. tube	SA–213	TP348H	S34809	...
23	18Cr–10Ni–Cb	Plate	SA–240	348H	S34809	...
24	18Cr–10Ni–Cb	Wld. tube	SA–249	TP348H	S34809	...
25	18Cr–10Ni–Cb	Smls. & wld. pipe	SA–312	TP348H	S34809	...
26	18Cr–10Ni–Cb	Smls. & wld. fittings	SA–403	348H	S34809	...
27	18Cr–10Ni–Cb	Bar	SA–479	348H	S34809	...
28	18Cr–10Ni–Cb	Wld. pipe	SA–813	TP348H	S34809	...
29	18Cr–10Ni–Cb	Wld. pipe	SA–814	TP348H	S34809	...
30	18Cr–10Ni–Cb	Bar	SA/JIS G4303	SUS347	...	...
31	18Cr–10Ni–Cb	Smls. tube	SA–213	TP347HFG	S34710	...
32	18Cr–10Ni–Cb	Bolting	SA–193	B8C	S34700	2
33	18Cr–10Ni–Cb	Bolting	SA–320	B8C	S34700	2
34	18Cr–10Ni–Cb	Bolting	SA–193	B8C	S34700	2
35	18Cr–10Ni–Cb	Bolting	SA–320	B8C	S34700	2
36	18Cr–10Ni–Cb	Bolting	SA–193	B8C	S34700	2
37	18Cr–10Ni–Cb	Bolting	SA–320	B8C	S34700	2
38	18Cr–10Ni–Cb	Bolting	SA–193	B8C	S34700	2
39	18Cr–10Ni–Cb	Bolting	SA–320	B8C	S34700	2
40	18Cr–10Ni–Ti	Smls. & wld. pipe	SA–312	TP321	S32100	...
41	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321	S32100	...
42	18Cr–10Ni–Ti	Smls. & wld. pipe	SA–312	TP321H	S32109	...
43	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321H	S32109	...
44	18Cr–10Ni–Ti	Forgings	SA–182	F321	S32100	...
45	18Cr–10Ni–Ti	Forgings	SA–965	F321	S32100	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	515	205	...
2	...	515	205	...
3	...	515	205	...
4	...	515	205	...
5	...	515	205	...
6	...	515	205	...
7	≤130	515	205	...
8	...	515	205	...
9	...	515	205	...
10	...	515	205	...
11	...	515	205	...
12	...	515	205	...
13	...	515	205	...
14	...	515	205	...
15	...	515	205	...
16	...	515	205	...
17	...	515	205	...
18	...	515	205	...
19	...	515	205	...
20	...	515	205	...
21	≤130	515	205	...
22	...	515	205	...
23	...	515	205	...
24	...	515	205	...
25	...	515	205	...
26	...	515	205	...
27	...	515	205	...
28	...	515	205	...
29	...	515	205	...
30	...	520	205	...
31	...	550	205	...
32	$30 < t \leq 36$	690	345	...
33	$32 < t \leq 40$	690	345	...
34	$24 < t \leq 30$	725	450	...
35	$25 < t \leq 32$	725	450	...
36	$20 < t \leq 24$	795	550	...
37	$20 < t \leq 25$	795	550	...
38	≤20	860	690	...
39	≤20	860	690	...
40	>9.5	485	170	...
41	>9.5	485	170	...
42	>9.5	485	170	...
43	>9.5	485	170	...
44	>130	485	205	...
45	...	485	205	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	207	197	189	182	177	172	166	162	157	154
2	207	197	189	182	177	172	166	162	157	154
3	207	197	189	182	177	172	166	162	157	154
4	207	197	189	182	177	172	166	162	157	154
5	207	192	180	172	165	158	152	147	142	138
6	207	192	180	172	165	158	152	147	142	138
7	207	197	189	182	177	172	166	162	157	154
8	207	197	189	182	177	172	166	162	157	154
9	207	197	189	182	177	172	166	162	157	154
10	207	197	189	182	177	172	166	162	157	154
11	207	197	189	182	177	172	166	162	157	154
12	207	197	189	182	177	172	166	162	157	154
13	207	197	189	182	177	172	166	162	157	154
14	207	197	189	182	177	172	166	162	157	154
15	207	197	189	182	177	172	166	162	157	154
16	207	197	189	182	177	172	166	162	157	154
17	207	197	189	182	177	172	166	162	157	154
18	207	197	189	182	177	172	166	162	157	154
19	207	197	189	182	177	172	166	162	157	154
20	207	197	189	182	177	172	166	162	157	154
21	207	197	189	182	177	172	166	162	157	154
22	207	197	189	182	177	172	166	162	157	154
23	207	197	189	182	177	172	166	162	157	154
24	207	197	189	182	177	172	166	162	157	154
25	207	197	189	182	177	172	166	162	157	154
26	207	197	189	182	177	172	166	162	157	154
27	207	197	189	182	177	172	166	162	157	154
28	207	197	189	182	177	172	166	162	157	154
29	207	197	189	182	177	172	166	162	157	154
30	207	197	189	182	177	172	166	162	157	154
31	207	194	185	179	174	170	165	162	158	155
32	345	328	315	303	295	287	277	270	262	257
33	345	328	315	303	295	287	277	270	262	257
34	450	428	411	396	385	374	361	352	341	335
35	448	428	411	396	385	374	361	352	341	335
36	550	523	502	484	470	457	441	430	417	409
37	552	523	502	484	470	457	441	430	417	409
38	690	657	630	607	590	573	553	540	523	513
39	689	657	630	607	590	573	553	540	523	513
40	172	162	154	147	143	138	133	129	125	121
41	172	162	154	147	143	138	133	129	125	121
42	172	162	154	147	143	138	133	129	125	121
43	172	162	154	147	143	138	133	129	125	121
44	207	194	184	177	171	165	160	154	150	146
45	207	194	184	177	171	165	160	154	150	146

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	150	147	145	142	141	140	139	139	139	139
2	150	147	145	142	141	140	139	139	139	139
3	150	147	145	142	141	140	139	139	139	139
4	150	147	145	142	141	140	139	139	139	139
5	135	133	131	130	129	129	129	129	128	128
6	135	133	131	130	129	129	129	129	128	128
7	150	147	145	142	141	140	139	139	139	139
8	150	147	145	142	141	140	139	139	139	139
9	150	147	145	142	141	140	139	139	139	139
10	150	147	145	142	141	140	139	139	139	139
11	150	147	145	142	141	140	139	139	139	139
12	150	147	145	142	141	140	139	139	139	139
13	150	147	145	142	141	140	139	139	139	139
14	150	147	145	142	141	140	139	139	139	139
15	150	147	145	142	141	140	139	139	139	139
16	150	147	145	142	141	140	139	139	139	139
17	150	147	145	142	141	140	139	139	139	139
18	150	147	145	142	141	140	139	139	139	139
19	150	147	145	142	141	140	139	139	139	139
20	150	147	145	142	141	140	139	139	139	139
21	150	147	145	142	141	140	139	139	139	139
22	150	147	145	142	141	140	139	139	139	139
23	150	147	145	142	141	140	139	139	139	139
24	150	147	145	142	141	140	139	139	139	139
25	150	147	145	142	141	140	139	139	139	139
26	150	147	145	142	141	140	139	139	139	139
27	150	147	145	142	141	140	139	139	139	139
28	150	147	145	142	141	140	139	139	139	139
29	150	147	145	142	141	140	139	139	139	139
30	150	147	145	142	141	140	139	139	139	139
31	152	150	148	146	144	142	141	139	138	137
32	250	245	242	237	235	233	232	232	232	232
33	250	245	242	237	235	233	232	232	232	232
34	326	320	315	309	307	304	302	302	302	302
35	326	320	315	309	307	304	302	302	302	302
36	399	391	385	377	375	372	369	369	369	369
37	399	391	385	377	375	372	369	369	369	369
38	500	490	483	473	470	467	463	463	463	463
39	500	490	483	473	470	467	463	463	463	463
40	118	116	113	111	110	108	107	106	105	104
41	118	116	113	111	110	108	107	106	105	104
42	118	116	113	111	110	108	107	106	105	104
43	118	116	113	111	110	108	107	106	105	104
44	142	139	136	133	132	130	128	127	126	125
45	142	139	136	133	132	130	128	127	126	125

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
8	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
9	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
10	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
11	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
12	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
13	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
14	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
15	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
16	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
17	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
18	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
19	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
20	135	134	132	129	126	122	117	111	104	95.7	86.2	75.5	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	102	100	98.5	96.6	94.4	91.9	89.1	86.0	82.4	78.4	73.9	68.9	...	...	...
41	102	100	98.5	96.6	94.4	91.9	89.1	86.0	82.4	78.4	73.9	68.9	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	123	121	119	116	114	111	107	104	99.4	94.6	89.2	83.1	...	...	...
45	123	121	119	116	114	111	107	104	99.4	94.6	89.2	83.1	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	18Cr–10Ni–Ti	Forgings	SA–182	F321H	S32109	...
2	18Cr–10Ni–Ti	Forgings	SA–965	F321H	S32109	...
3	18Cr–10Ni–Ti	Plate	SA/EN 10028–7	X6CrNiTi18–10	...	...
4	18Cr–10Ni–Ti	Forgings	SA–182	F321	S32100	...
5	18Cr–10Ni–Ti	Bolting	SA–193	B8T	S32100	1
6	18Cr–10Ni–Ti	Smls. tube	SA–213	TP321	S32100	...
7	18Cr–10Ni–Ti	Plate	SA–240	321	S32100	...
8	18Cr–10Ni–Ti	Wld. tube	SA–249	TP321	S32100	...
9	18Cr–10Ni–Ti	Smls. & wld. pipe	SA–312	TP321	S32100	...
10	18Cr–10Ni–Ti	Bolting	SA–320	B8T	S32100	1
11	18Cr–10Ni–Ti	Bolting	SA–320	B8TA	S32100	1A
12	18Cr–10Ni–Ti	Wld. pipe	SA–358	321	S32100	1
13	18Cr–10Ni–Ti	Wld. pipe	SA–358	321	S32100	3
14	18Cr–10Ni–Ti	Wld. pipe	SA–358	321	S32100	4
15	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321	S32100	...
16	18Cr–10Ni–Ti	Smls. & wld. fittings	SA–403	321	S32100	...
17	18Cr–10Ni–Ti	Wld. pipe	SA–409	TP321	S32100	...
18	18Cr–10Ni–Ti	Bar	SA–479	321	S32100	...
19	18Cr–10Ni–Ti	Wld. pipe	SA–813	TP321	S32100	...
20	18Cr–10Ni–Ti	Wld. pipe	SA–814	TP321	S32100	...
21	18Cr–10Ni–Ti	Forgings	SA–182	F321H	S32109	...
22	18Cr–10Ni–Ti	Smls. tube	SA–213	TP321H	S32109	...
23	18Cr–10Ni–Ti	Plate	SA–240	321H	S32109	...
24	18Cr–10Ni–Ti	Wld. tube	SA–249	TP321H	S32109	...
25	18Cr–10Ni–Ti	Smls. & wld. pipe	SA–312	TP321H	S32109	...
26	18Cr–10Ni–Ti	Smls. pipe	SA–376	TP321H	S32109	...
27	18Cr–10Ni–Ti	Smls. & wld. fittings	SA–403	321H	S32109	...
28	18Cr–10Ni–Ti	Bar	SA–479	321H	S32109	...
29	18Cr–10Ni–Ti	Wld. pipe	SA–813	TP321H	S32109	...
30	18Cr–10Ni–Ti	Wld. pipe	SA–814	TP321H	S32109	...
31	18Cr–10Ni–Ti	Bar	SA/JIS G4303	SUS321	...	...
32	18Cr–10Ni–Ti	Bolting	SA–193	B8T	S32100	2
33	18Cr–10Ni–Ti	Bolting	SA–320	B8T	S32100	2
34	18Cr–10Ni–Ti	Bolting	SA–193	B8T	S32100	2
35	18Cr–10Ni–Ti	Bolting	SA–320	B8T	S32100	2
36	18Cr–10Ni–Ti	Bolting	SA–193	B8T	S32100	2
37	18Cr–10Ni–Ti	Bolting	SA–320	B8T	S32100	2
38	18Cr–10Ni–Ti	Bolting	SA–193	B8T	S32100	2
39	18Cr–10Ni–Ti	Bolting	SA–320	B8T	S32100	2
40	18Cr–11Ni	Bolting	SA–193	B8P	S30500	1
41	18Cr–11Ni	Plate	SA–240	305	S30500	...
42	18Cr–11Ni	Bolting	SA–193	B8P	S30500	2
43	18Cr–11Ni	Bolting	SA–193	B8P	S30500	2
44	18Cr–11Ni	Bolting	SA–193	B8P	S30500	2
45	18Cr–11Ni	Bolting	SA–193	B8P	S30500	2

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	>130	485	205	...
2	...	485	205	...
3	≤75	500	200	...
4	≤130	515	205	...
5	...	515	205	...
6	...	515	205	...
7	...	515	205	...
8	...	515	205	...
9	≤9.5	515	205	...
10	...	515	205	...
11	...	515	205	...
12	...	515	205	...
13	...	515	205	...
14	...	515	205	...
15	≤9.5	515	205	...
16	...	515	205	...
17	...	515	205	...
18	...	515	205	...
19	...	515	205	...
20	...	515	205	...
21	≤130	515	205	...
22	...	515	205	...
23	...	515	205	...
24	...	515	205	...
25	≤9.5	515	205	...
26	≤9.5	515	205	...
27	...	515	205	...
28	...	515	205	...
29	...	515	205	...
30	...	515	205	...
31	...	520	205	...
32	$30 < t \leq 36$	690	345	...
33	$32 < t \leq 40$	690	345	...
34	$24 < t \leq 30$	725	450	...
35	$25 < t \leq 32$	725	450	...
36	$20 < t \leq 24$	795	550	...
37	$20 < t \leq 25$	795	550	...
38	≤20	860	690	...
39	≤20	860	690	...
40	...	515	205	...
41	...	515	205	...
42	$30 < t \leq 36$	690	345	...
43	$24 < t \leq 30$	725	450	...
44	$20 < t \leq 24$	795	550	...
45	≤20	860	690	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	207	194	184	177	171	165	160	154	150	146
2	207	194	184	177	171	165	160	154	150	146
3	200	187	178	171	165	160	154	149	145	141
4	207	194	184	177	171	165	160	154	150	146
5	207	196	184	177	171	165	159	154	150	146
6	207	194	184	177	171	165	160	154	150	146
7	207	194	184	177	171	165	160	154	150	146
8	207	194	184	177	171	165	160	154	150	146
9	207	194	184	177	171	165	160	154	150	146
10	207	196	184	177	171	165	159	154	150	146
11	207	196	184	177	171	165	159	154	150	146
12	207	194	184	177	171	165	160	154	150	146
13	207	194	184	177	171	165	160	154	150	146
14	207	194	184	177	171	165	160	154	150	146
15	207	194	184	177	171	165	160	154	150	146
16	207	194	184	177	171	165	160	154	150	146
17	207	194	184	177	171	165	160	154	150	146
18	207	194	184	177	171	165	160	154	150	146
19	207	194	184	177	171	165	160	154	150	146
20	207	194	184	177	171	165	160	154	150	146
21	207	194	184	177	171	165	160	154	150	146
22	207	194	184	177	171	165	160	154	150	146
23	207	194	184	177	171	165	160	154	150	146
24	207	194	184	177	171	165	160	154	150	146
25	207	194	184	177	171	165	160	154	150	146
26	207	194	184	177	171	165	160	154	150	146
27	207	194	184	177	171	165	160	154	150	146
28	207	194	184	177	171	165	160	154	150	146
29	207	194	184	177	171	165	160	154	150	146
30	207	194	184	177	171	165	160	154	150	146
31	207	194	184	177	171	165	160	154	150	146
32	345	327	307	295	285	275	265	257	250	243
33	345	327	307	295	285	275	265	257	250	243
34	448	424	398	383	370	357	344	333	325	316
35	448	424	398	383	370	357	344	333	325	316
36	552	523	491	472	456	440	424	411	400	389
37	552	523	491	472	456	440	424	411	400	389
38	689	652	612	589	569	549	529	513	499	486
39	689	652	612	589	569	549	529	513	499	486
40	207	184	170	161	154	148	144	139	135	132
41	207	184	170	161	154	148	144	139	135	132
42	345	307	283	268	257	247	240	232	225	220
43	450	400	370	350	335	322	313	302	293	287
44	550	489	452	428	409	393	383	369	359	351
45	690	613	567	537	513	493	480	463	450	440

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	142	139	136	133	132	130	128	127	126	125
2	142	139	136	133	132	130	128	127	126	125
3	137	134	131	129	127	126	124	123	122	121
4	142	139	136	133	132	130	128	127	126	125
5	142	139	136	133	132	130	128	127	126	125
6	142	139	136	133	132	130	128	127	126	125
7	142	139	136	133	132	130	128	127	126	125
8	142	139	136	133	132	130	128	127	126	125
9	142	139	136	133	132	130	128	127	126	125
10	142	139	136	133	132	130	128	127	126	125
11	142	139	136	133	132	130	128	127	126	125
12	142	139	136	133	132	130	128	127	126	125
13	142	139	136	133	132	130	128	127	126	125
14	142	139	136	133	132	130	128	127	126	125
15	142	139	136	133	132	130	128	127	126	125
16	142	139	136	133	132	130	128	127	126	125
17	142	139	136	133	132	130	128	127	126	125
18	142	139	136	133	132	130	128	127	126	125
19	142	139	136	133	132	130	128	127	126	125
20	142	139	136	133	132	130	128	127	126	125
21	142	139	136	133	132	130	128	127	126	125
22	142	139	136	133	132	130	128	127	126	125
23	142	139	136	133	132	130	128	127	126	125
24	142	139	136	133	132	130	128	127	126	125
25	142	139	136	133	132	130	128	127	126	125
26	142	139	136	133	132	130	128	127	126	125
27	142	139	136	133	132	130	128	127	126	125
28	142	139	136	133	132	130	128	127	126	125
29	142	139	136	133	132	130	128	127	126	125
30	142	139	136	133	132	130	128	127	126	125
31	142	139	136	133	132	130	128	127	126	125
32	237	232	227	222	220	217	213	212	210	208
33	237	232	227	222	220	217	213	212	210	208
34	307	301	294	288	286	281	277	275	273	271
35	307	301	294	288	286	281	277	275	273	271
36	379	371	363	355	352	347	341	339	336	333
37	379	371	363	355	352	347	341	339	336	333
38	473	463	453	443	439	433	426	423	419	416
39	473	463	453	443	439	433	426	423	419	416
40	129	126	123	121	118	117	114	112	110	108
41	129	126	123	121	118	117	114	112	110	108
42	215	210	205	202	197	195	190	187	183	180
43	280	274	267	263	257	254	248	243	239	235
44	343	335	327	321	314	311	303	298	292	287
45	430	420	410	403	393	390	380	373	367	360

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	123	121	119	116	114	111	107	104	99.4	94.6	89.2	83.1	...	...	...
5	123	121	119	116	114	111	107	104	99.4	94.6	89.2	83.1	...	...	...
6	123	121	119	116	114	111	107	104	99.4	94.6	89.2	83.1	...	...	...
7	123	121	119	116	114	111	107	104	99.4	94.6	89.2	83.1	...	...	...
8	123	121	119	116	114	111	107	104	99.4	94.6	89.2	83.1	...	...	...
9	123	121	119	116	114	111	107	104	99.4	94.6	89.2	83.1	...	...	...
10	123	121	119	116	114	111	107	104	99.4	94.6	89.2	83.1	...	...	...
11	123	121	119	116	114	111	107	104	99.4	94.6	89.2	83.1	...	...	...
12	123	121	119	116	114	111	107	104	99.4	94.6	89.2	83.1	...	...	...
13	123	121	119	116	114	111	107	104	99.4	94.6	89.2	83.1	...	...	...
14	123	121	119	116	114	111	107	104	99.4	94.6	89.2	83.1	...	...	...
15	123	121	119	116	114	111	107	104	99.4	94.6	89.2	83.1	...	...	...
16	123	121	119	116	114	111	107	104	99.4	94.6	89.2	83.1	...	...	...
17	123	121	119	116	114	111	107	104	99.4	94.6	89.2	83.1	...	...	...
18	123	121	119	116	114	111	107	104	99.4	94.6	89.2	83.1	...	...	...
19	123	121	119	116	114	111	107	104	99.4	94.6	89.2	83.1	...	...	...
20	123	121	119	116	114	111	107	104	99.4	94.6	89.2	83.1	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
		Ferrous Materials (Cont'd)					
(**23**)	1	18Cr–12Ni–2Mo	Castings	SA–351	CF3M	J92800	...
(**23**)	2	18Cr–12Ni–2Mo	Cast pipe	SA–451	CPF3M	J92800	...
(**23**)	3	18Cr–12Ni–2Mo	Castings	SA–351	CF8M	J92900	...
(**23**)	4	18Cr–12Ni–2Mo	Cast pipe	SA–451	CPF8M	J92900	...
	5	18Cr–13Ni–3Mo	Forgings	SA–182	F317L	S31703	...
	6	18Cr–13Ni–3Mo	Forgings	SA–182	F317L	S31703	...
	7	18Cr–13Ni–3Mo	Forgings	SA–182	F317	S31700	...
	8	18Cr–13Ni–3Mo	Plate	SA–240	317	S31700	...
	9	18Cr–13Ni–3Mo	Plate	SA–240	317L	S31703	...
	10	18Cr–13Ni–3Mo	Wld. tube	SA–249	TP317	S31700	...
	11	18Cr–13Ni–3Mo	Wld. tube	SA–249	TP317L	S31703	...
	12	18Cr–13Ni–3Mo	Smls. & wld. pipe	SA–312	TP317	S31700	...
	13	18Cr–13Ni–3Mo	Smls. & wld. pipe	SA–312	TP317L	S31703	...
	14	18Cr–13Ni–3Mo	Smls. & wld. fittings	SA–403	317	S31700	...
	15	18Cr–13Ni–3Mo	Fittings	SA–403	317L	S31703	...
(**23**)	16	18Cr–15Ni–4Si	Forgings	SA–182	...	S30600	Solution ann.
(**23**)	17	18Cr–15Ni–4Si	Plate	SA–240	...	S30600	Solution ann.
(**23**)	18	18Cr–15Ni–4Si	Smls. & wld. pipe	SA–312	...	S30600	Solution ann.
(**23**)	19	18Cr–15Ni–4Si	Bar	SA–479	...	S30600	Solution ann.
	20	18Cr–18Ni–2Si	Smls. tube	SA–213	XM–15	S38100	...
	21	18Cr–18Ni–2Si	Plate	SA–240	XM–15	S38100	...
	22	18Cr–18Ni–2Si	Wld. tube	SA–249	TPXM–15	S38100	...
	23	18Cr–18Ni–2Si	Wld. pipe	SA–312	TPXM–15	S38100	...
(**23**)	24	18Cr–20Ni–5.5Si	Smls. tube	SA–213	...	S32615	Solution ann.
(**23**)	25	18Cr–20Ni–5.5Si	Plate	SA–240	...	S32615	Solution ann.
(**23**)	26	18Cr–20Ni–5.5Si	Smls. & wld. pipe	SA–312	...	S32615	Solution ann.
(**23**)	27	18Cr–20Ni–5.5Si	Bar	SA–479	...	S32615	Solution ann.
	28	19Cr–9Ni–½Mo	Castings	SA–351	CF10	J92590	...
	29	19Cr–9Ni–Mo–W	Bolting	SA–453	651	S63198	B
	30	19Cr–9Ni–Mo–W	Bolting	SA–453	651	S63198	B
	31	19Cr–9Ni–Mo–W	Bolting	SA–453	651	S63198	A
	32	19Cr–9Ni–Mo–W	Bolting	SA–453	651	S63198	A
	33	19Cr–9Ni–2Mo	Castings	SA–351	CF10M	...	...
	34	19Cr–10Ni–3Mo	Castings	SA–351	CG8M	J93000	...
	35	19Cr–15Ni–4Mo	Smls. tube	SA–213	...	S31725	...
	36	19Cr–15Ni–4Mo	Plate	SA–240	...	S31725	...
	37	19Cr–15Ni–4Mo	Wld. tube	SA–249	...	S31725	...
	38	19Cr–15Ni–4Mo	Smls. & wld. pipe	SA–312	...	S31725	...
	39	19Cr–15Ni–4Mo	Wld. pipe	SA–358	...	S31725	...
	40	19Cr–15Ni–4Mo	Smls. pipe	SA–376	...	S31725	...
	41	19Cr–15Ni–4Mo	Wld. pipe	SA–409	...	S31725	...
	42	19Cr–15Ni–4Mo	Bar	SA–479	...	S31725	...
	43	20Cr–3Ni–1.5Mo–N	Plate	SA–240	...	S32003	...
	44	20Cr–3Ni–1.5Mo–N	Wld. pipe	SA–790	...	S32003	...
	45	20Cr–3Ni–1.5Mo–N	Sheet	SA–240	...	S32003	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	485	205	...
2	...	485	205	...
3	...	485	205	...
4	...	485	205	...
5	>130	450	170	...
6	≤130	485	170	...
7	≤130	515	205	...
8	...	515	205	...
9	...	515	205	...
10	...	515	205	...
11	...	515	205	...
12	...	515	205	...
13	...	515	205	...
14	...	515	205	...
15	...	515	205	...
16	...	540	240	...
17	≤50	540	240	...
18	...	540	240	...
19	≤100	540	240	...
20	...	515	205	...
21	...	515	205	...
22	...	515	205	...
23	...	515	205	...
24	...	550	220	...
25	...	550	220	...
26	...	550	220	...
27	...	550	220	...
28	...	485	205	...
29	>76	655	345	...
30	≤76	655	415	...
31	≤76	690	415	...
32	>76	690	485	...
33	...	485	205	...
34	...	515	240	...
35	...	515	205	...
36	...	515	205	...
37	...	515	205	...
38	...	515	205	...
39	...	515	205	...
40	...	515	205	...
41	...	515	205	...
42	...	515	205	...
43	>5	655	450	...
44	...	655	450	...
45	≤5	690	485	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	207	189	176	168	160	154	148	143	139	135
2	207	189	176	168	160	154	148	143	139	135
3	207	189	176	168	160	154	148	143	139	135
4	207	189	176	168	160	154	148	143	139	135
5	172	157	145	137	131	125	121	118	114	111
6	172	157	145	137	131	125	121	118	114	111
7	207	189	176	168	161	154	148	144	139	136
8	207	189	176	168	161	154	148	144	139	136
9	207	189	173	165	157	151	146	141	137	134
10	207	189	176	168	161	154	148	144	139	136
11	207	189	173	165	157	151	146	141	137	134
12	207	189	176	168	161	154	148	144	139	136
13	207	189	173	165	157	151	146	141	137	134
14	207	189	176	168	161	154	148	144	139	136
15	207	189	173	165	157	151	146	141	137	134
16	241	209	182	173	166	...	...	...	...	...
17	241	209	182	173	166	...	...	...	...	...
18	241	209	182	173	166	...	...	...	...	...
19	241	209	182	173	166	...	...	...	...	...
20	207	184	170	161	154	148	144	139	135	132
21	207	184	170	161	154	148	144	139	135	132
22	207	184	170	161	154	148	144	139	135	132
23	207	184	170	161	154	148	144	139	135	132
24	221	198	180	175	171	166	160	155	...	...
25	221	198	180	175	171	166	160	155	...	...
26	221	198	180	175	171	166	160	155	...	...
27	221	198	180	175	171	166	160	155	...	...
28	207	184	170	161	154	148	143	138	134	131
29	345	332	318	311	305	299	294	289	285	281
30	414	398	381	373	366	359	353	348	343	338
31	414	398	381	373	366	359	353	348	343	338
32	483	464	445	435	427	419	412	405	399	394
33	207	191	178	170	162	155	149	143	139	135
34	241	211	191	179	169	160	153	148	143	139
35	207	186	172	164	157	151	146	141	137	134
36	207	186	172	164	157	151	146	141	137	134
37	207	186	172	164	157	151	146	141	137	134
38	207	186	172	164	157	151	146	141	137	134
39	207	186	172	164	157	151	146	141	137	134
40	207	186	172	164	157	151	146	141	137	134
41	207	186	172	164	157	151	146	141	137	134
42	207	186	172	164	157	151	146	141	137	134
43	448	409	380	363	348	338	330	324	319	315
44	448	409	380	363	348	338	330	324	319	315
45	483	440	409	390	375	364	355	348	343	339

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	131	129	126	124	123	121	120	119	118	117
2	131	129	126	124	123	121	120	119	118	117
3	131	129	126	124	123	121	120	119	118	117
4	131	129	126	124	123	121	120	119	118	117
5	109	107	105	103	101	99.4	97.5	95.7	93.8	92.0
6	109	107	105	103	101	99.4	97.5	95.7	93.8	92.0
7	132	129	127	125	123	122	121	120	118	117
8	132	129	127	125	123	122	121	120	118	117
9	131	128	126	124	121	119	117	115	112	110
10	132	129	127	125	123	122	121	120	118	117
11	131	128	126	124	121	119	117	115	112	110
12	132	129	127	125	123	122	121	120	118	117
13	131	128	126	124	121	119	117	115	112	110
14	132	129	127	125	123	122	121	120	118	117
15	131	128	126	124	121	119	117	115	112	110
16	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...
20	129	126	123	121	118	117	114	112	110	108
21	129	126	123	121	118	117	114	112	110	108
22	129	126	123	121	118	117	114	112	110	108
23	129	126	123	121	118	117	114	112	110	108
24	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...
28	129	126	123	121	118	117	115	113	111	108
29	277	274	271	268	264	261	258	254	250	246
30	333	329	325	321	317	313	309	305	300	295
31	333	329	325	321	317	313	309	305	300	295
32	389	383	379	374	370	365	361	355	350	345
33	131	129	127	125	123	121	120	119	118	117
34	136	133	130	129	127	126	124	123	121	119
35	131	128	126	124	121	119	117	115	113	111
36	131	128	126	124	121	119	117	115	113	111
37	131	128	126	124	121	119	117	115	113	111
38	131	128	126	124	121	119	117	115	113	111
39	131	128	126	124	121	119	117	115	113	111
40	131	128	126	124	121	119	117	115	113	111
41	131	128	126	124	121	119	117	115	113	111
42	131	128	126	124	121	119	117	115	113	111
43	310	305	299	293	286	282	282	...	...	...
44	310	305	299	293	286	282	282	...	...	...
45	334	329	322	315	308	304	304	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Ferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
5	89.7	88.9	87.9	86.7	85.3	...	...	...	...	...	...	...	...	...	...	
6	89.7	88.9	87.9	86.7	85.3	...	...	...	...	...	...	...	...	...	...	
7	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...	
8	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...	
9	108	107	106	105	103	...	...	...	...	...	...	...	...	...	...	
10	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...	
11	108	107	106	105	103	...	...	...	...	...	...	...	...	...	...	
12	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...	
13	108	107	106	105	103	...	...	...	...	...	...	...	...	...	...	
14	114	112	111	110	109	108	106	105	103	101	99.0	96.5	...	...	...	
15	108	107	106	105	103	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	20Cr–3Ni–1.5Mo–N	Smls. & wld. tube	SA–789	...	S32003	...
2	20Cr–10Ni	Bar	SA–479	ER308	S30880	...
3	20Cr–18Ni–6Mo	Castings	SA–351	CK3MCuN	J93254	...
4	20Cr–18Ni–6Mo	Forgings	SA–182	F44	S31254	...
5	20Cr–18Ni–6Mo	Smls. tube	SA–213	...	S31254	...
6	20Cr–18Ni–6Mo	Wld. tube	SA–249	...	S31254	...
7	20Cr–18Ni–6Mo	Smls. & wld. pipe	SA–312	...	S31254	...
8	20Cr–18Ni–6Mo	Wld. pipe	SA–358	...	S31254	...
9	20Cr–18Ni–6Mo	Smls. tube	SA–213	...	S31254	...
10	20Cr–18Ni–6Mo	Wld. tube	SA–249	...	S31254	...
11	20Cr–18Ni–6Mo	Smls. & wld. pipe	SA–312	...	S31254	...
12	20Cr–18Ni–6Mo	Plate	SA–240	...	S31254	...
13	20Cr–18Ni–6Mo	Wld. pipe	SA–358	...	S31254	...
(**23**) 14	20.5Cr–8.8Ni–Mo–N	Plate	SA–240	...	S31655	...
15	21Cr–5Mn–1.5Ni–Cu–N	Plate	SA–240	...	S32101	...
16	21Cr–5Mn–1.5Ni–Cu–N	Bar	SA–479	...	S32101	...
17	21Cr–5Mn–1.5Ni–Cu–N	Smls. & wld. tube	SA–789	...	S32101	...
18	21Cr–5Mn–1.5Ni–Cu–N	Smls. & wld. pipe	SA–790	...	S32101	...
19	21Cr–5Mn–1.5Ni–Cu–N	Fittings	SA–815	...	S32101	...
20	21Cr–5Mn–1.5Ni–Cu–N	Sheet, strip	SA–240	...	S32101	...
21	21Cr–5Mn–1.5Ni–Cu–N	Smls. & wld. tube	SA–789	...	S32101	...
22	21Cr–5Mn–1.5Ni–Cu–N	Smls. & wld. pipe	SA–790	...	S32101	...
23	21Cr–6Ni–9Mn	Forgings	SA–182	FXM–11	S21904	...
24	21Cr–6Ni–9Mn	Smls. & wld. pipe	SA–312	TPXM–11	S21904	...
25	21Cr–6Ni–9Mn	Plate	SA–666	XM–11	S21904	...
26	21Cr–6Ni–9Mn	Forgings	SA–965	FXM–11	S21904	...
27	21Cr–11Ni–N	Forgings	SA–182	F45	S30815	...
28	21Cr–11Ni–N	Smls. tube	SA–213	...	S30815	...
29	21Cr–11Ni–N	Plate	SA–240	...	S30815	...
30	21Cr–11Ni–N	Wld. tube	SA–249	...	S30815	...
31	21Cr–11Ni–N	Smls. & wld. pipe	SA–312	...	S30815	...
32	21Cr–11Ni–N	Bar	SA–479	...	S30815	...
33	22Cr–2Ni–Mo–N	Forgings	SA–182	F66	S32202	...
34	22Cr–2Ni–Mo–N	Plate	SA–240	...	S32202	...
35	22Cr–2Ni–Mo–N	Bar	SA–479	...	S32202	...
36	22Cr–2Ni–Mo–N	Smls. & wld. tube	SA–789	...	S32202	...
37	22Cr–2Ni–Mo–N	Smls. & wld. pipe	SA–790	...	S32202	...
38	22Cr–2Ni–Mo–N	Smls. & wld. fittings	SA–815	...	S32202	...
39	22Cr–5Ni–3Mo–N	Castings	SA–995	4A	J92205	...
40	22Cr–5Ni–3Mo–N	Forgings	SA–182	F51	S31803	...
41	22Cr–5Ni–3Mo–N	Plate	SA–240	...	S31803	...
42	22Cr–5Ni–3Mo–N	Bar	SA–479	...	S31803	...
43	22Cr–5Ni–3Mo–N	Smls. & wld. tube	SA–789	...	S31803	...
44	22Cr–5Ni–3Mo–N	Smls. & wld. pipe	SA–790	...	S31803	...
45	22Cr–5Ni–3Mo–N	Smls. & wld. fittings	SA–815	...	S31803	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	690	485	...
2	...	515	205	...
3	...	550	260	...
4	...	650	300	...
5	$t > 5$	655	310	...
6	$t > 5$	655	310	...
7	$t > 5$	655	310	...
8	$t \geq 5$	655	310	...
9	$t \leq 5$	675	310	...
10	$t \leq 5$	675	310	...
11	$t \leq 5$	675	310	...
12	...	690	310	...
13	$t < 5$	690	310	...
14	...	635	310	...
15	>5	650	450	...
16	...	650	450	...
17	>5	650	450	...
18	>5	650	450	...
19	...	650	450	...
20	≤5	700	530	...
21	≤5	700	530	...
22	≤5	700	530	...
23	...	620	345	...
24	...	620	345	...
25	...	620	345	...
26	...	620	345	...
27	...	600	310	...
28	...	600	310	...
29	...	600	310	...
30	...	600	310	...
31	...	600	310	...
32	...	600	310	...
33	...	648	448	...
34	...	648	448	...
35	...	648	448	...
36	...	648	448	...
37	...	648	448	...
38	...	648	448	...
39	...	620	415	...
40	...	620	450	...
41	...	620	450	...
42	...	620	450	...
43	...	620	450	...
44	...	620	450	...
45	...	620	450	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	483	440	409	390	375	364	355	348	343	339
2	207	184	170	161	154	148	144	139	135	132
3	262	230	211	200	191	184	178	172	168	165
4	303	266	244	231	221	213	206	200	195	190
5	310	272	249	236	226	218	211	204	199	194
6	310	272	249	236	226	218	211	204	199	194
7	310	272	249	236	226	218	211	204	199	194
8	310	272	249	236	226	218	211	204	199	194
9	310	272	249	236	226	218	211	204	199	194
10	310	272	249	236	226	218	211	204	199	194
11	310	272	249	236	226	218	211	204	199	194
12	310	272	250	237	226	218	211	205	199	195
13	310	272	249	236	226	218	211	204	199	194
14	310	268	243	229	218	209	201	195	190	186
15	450	427	402	...	355	...	342	...	337	...
16	450	427	402	...	355	...	342	...	337	...
17	450	427	402	...	355	...	342	...	337	...
18	450	427	402	...	355	...	342	...	337	...
19	450	427	402	...	355	...	342	...	337	...
20	530	503	473	...	419	...	403	...	397	...
21	530	503	473	...	419	...	403	...	397	...
22	530	503	473	...	419	...	403	...	397	...
23	345	294	261	242	227	215	204	196	189	184
24	345	294	261	242	227	215	204	196	189	184
25	345	294	261	242	227	215	204	196	189	184
26	345	294	261	242	227	215	204	196	189	184
27	310	278	255	240	227	216	208	200	194	189
28	310	278	255	240	227	216	208	200	194	189
29	310	278	255	240	227	216	208	200	194	189
30	310	278	255	240	227	216	208	200	194	189
31	310	278	255	240	227	216	208	200	194	189
32	310	278	255	240	227	216	208	200	194	189
33	448	411	377	355	339	328	321	317	315	312
34	448	411	377	355	339	328	321	317	315	312
35	448	411	377	355	339	328	321	317	315	312
36	448	411	377	355	339	328	321	317	315	312
37	448	411	377	355	339	328	321	317	315	312
38	448	411	377	355	339	328	321	317	315	312
39	414	395	366	346	330	318	308	301	294	288
40	448	418	395	381	370	361	354	349	344	339
41	448	418	395	381	370	361	354	349	344	339
42	448	418	395	381	370	361	354	349	344	339
43	448	418	395	381	370	361	354	349	344	339
44	448	418	395	381	370	361	354	349	344	339
45	448	418	395	381	370	361	354	349	344	339

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	334	329	322	315	308	304	304	...	...	...
2	129	126	123	121	118	117	114	112	110	108
3	162	159	157	156	154	154	153	151	...	...
4	187	184	182	180	179	178	177	175	...	...
5	191	188	186	184	183	182	181	179	...	...
6	191	188	186	184	183	182	181	179	...	...
7	191	188	186	184	183	182	181	179	...	...
8	191	188	186	184	183	182	181	179	...	...
9	191	188	186	184	183	182	181	179	...	...
10	191	188	186	184	183	182	181	179	...	...
11	191	188	186	184	183	182	181	179	...	...
12	191	188	186	185	183	182	181	180	...	...
13	191	188	186	184	183	182	181	179	...	...
14	182	179	176	173	170	167	163	160	...	...
15	324	316	316	...	...	...	...	...	...	...
16	324	316	316	...	...	...	...	...	...	...
17	324	316	316	...	...	...	...	...	...	...
18	324	316	316	...	...	...	...	...	...	...
19	324	316	316	...	...	...	...	...	...	...
20	381	373	372	...	...	...	...	...	...	...
21	381	373	372	...	...	...	...	...	...	...
22	381	373	372	...	...	...	...	...	...	...
23	179	176	174	172	171	170	168	167	164	159
24	179	176	174	172	171	170	168	167	164	159
25	179	176	174	172	171	170	168	167	164	159
26	179	176	174	172	171	170	168	167	164	159
27	185	182	179	178	176	174	173	171	169	166
28	185	182	179	178	176	174	173	171	169	166
29	185	182	179	178	176	174	173	171	169	166
30	185	182	179	178	176	174	173	171	169	166
31	185	182	179	178	176	174	173	171	169	166
32	185	182	179	178	176	174	173	171	169	166
33	307	299	290	281	276	...	...	...	...	...
34	307	299	290	281	276	...	...	...	...	...
35	307	299	290	281	276	...	...	...	...	...
36	307	299	290	281	276	...	...	...	...	...
37	307	299	290	281	276	...	...	...	...	...
38	307	299	290	281	276	...	...	...	...	...
39	284	...	...	...	...	...	...	...	...	...
40	334	328	322	...	...	...	...	...	...	...
41	334	328	322	...	...	...	...	...	...	...
42	334	328	322	...	...	...	...	...	...	...
43	334	328	322	...	...	...	...	...	...	...
44	334	328	322	...	...	...	...	...	...	...
45	334	328	322	...	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	22Cr–5Ni–3Mo–N	Plate	SA–240	...	S32205	...
2	22Cr–5Ni–3Mo–N	Bar	SA–479	...	S32205	...
3	22Cr–5Ni–3Mo–N	Smls. & wld. pipe	SA–790	...	S32205	...
4	22Cr–5Ni–3Mo–N	Smls. & wld. fittings	SA–815	...	S32205	...
5	22Cr–5Ni–3Mo–N	Forgings	SA–182	F60	S32205	...
6	22Cr–5Ni–3Mo–N	Smls. & wld. tube	SA–789	...	S32205	...
7	22Cr–13Ni–5Mn	Castings	SA–351	CG6MMN	J93790	...
8	22Cr–13Ni–5Mn	Forgings	SA–182	FXM–19	S20910	...
9	22Cr–13Ni–5Mn	Bolting	SA–193	B8R	S20910	Annealed
10	22Cr–13Ni–5Mn	Bolting	SA–193	B8RA	S20910	Annealed
11	22Cr–13Ni–5Mn	Smls. tube	SA–213	XM–19	S20910	...
12	22Cr–13Ni–5Mn	Plate	SA–240	XM–19	S20910	...
13	22Cr–13Ni–5Mn	Wld. tube	SA–249	TPXM–19	S20910	...
14	22Cr–13Ni–5Mn	Smls. & wld. pipe	SA–312	TPXM–19	S20910	...
15	22Cr–13Ni–5Mn	Wld. pipe	SA–358	XM–19	S20910	1
16	22Cr–13Ni–5Mn	Wld. pipe	SA–358	XM–19	S20910	3
17	22Cr–13Ni–5Mn	Wld. pipe	SA–358	XM–19	S20910	4
18	22Cr–13Ni–5Mn	Smls. & wld. fittings	SA–403	XM–19	S20910	...
19	22Cr–13Ni–5Mn	Bar	SA–479	XM–19	S20910	Annealed
20	22Cr–13Ni–5Mn	Wld. pipe	SA–813	TPXM–19	S20910	...
21	22Cr–13Ni–5Mn	Wld. pipe	SA–814	TPXM–19	S20910	...
22	22Cr–13Ni–5Mn	Forgings	SA–965	FXM–19	S20910	...
23	22Cr–13Ni–5Mn	Bar	SA–479	XM–19	S20910	Hot rolled
24	22Cr–13Ni–5Mn	Bar	SA–479	XM–19	S20910	Hot rolled
25	22Cr–13Ni–5Mn	Bar	SA–479	XM–19	S20910	Hot rolled
26	23Cr–4Ni–Mo–Cu–N	Plate	SA–240	...	S32304	...
27	23Cr–4Ni–Mo–Cu–N	Smls. & wld. tube	SA–789	...	S32304	...
28	23Cr–4Ni–Mo–Cu–N	Smls. & wld. pipe	SA–790	...	S32304	...
29	23Cr–4Ni–Mo–Cu–N	Smls. & wld. tube	SA–789	...	S32304	...
30	23Cr–12Ni	Smls. & wld. fittings	SA–403	309	S30900	...
31	23Cr–12Ni	Smls. tube	SA–213	TP309S	S30908	...
32	23Cr–12Ni	Plate	SA–240	309S	S30908	...
33	23Cr–12Ni	Wld. tube	SA–249	TP309S	S30908	...
34	23Cr–12Ni	Smls. & wld. pipe	SA–312	TP309S	S30908	...
35	23Cr–12Ni	Wld. pipe	SA–358	309S	S30908	1
36	23Cr–12Ni	Wld. pipe	SA–358	309S	S30908	3
37	23Cr–12Ni	Wld. pipe	SA–358	309S	S30908	4
38	23Cr–12Ni	Bar	SA–479	309S	S30908	...
39	23Cr–12Ni	Wld. pipe	SA–813	TP309S	S30908	...
40	23Cr–12Ni	Wld. pipe	SA–814	TP309S	S30908	...
41	23Cr–12Ni	Smls. tube	SA–213	TP309H	S30909	...
42	23Cr–12Ni	Plate	SA–240	309H	S30909	...
43	23Cr–12Ni	Wld. tube	SA–249	TP309H	S30909	...
44	23Cr–12Ni	Smls. & wld. pipe	SA–312	TP309H	S30909	...
45	23Cr–12Ni	Bar	SA–479	309H	S30909	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	655	450	...
2	...	655	450	...
3	...	655	450	...
4	...	655	450	...
5	...	655	480	...
6	...	655	480	...
7	...	585	295	...
8	...	690	380	...
9	...	690	380	...
10	...	690	380	...
11	...	690	380	...
12	...	690	380	...
13	...	690	380	...
14	...	690	380	...
15	...	690	380	...
16	...	690	380	...
17	...	690	380	...
18	...	690	380	...
19	...	690	380	...
20	...	690	380	...
21	...	690	380	...
22	...	690	380	...
23	76.2 < t ≤ 203.2	690	415	...
24	50.8 < t ≤ 76.2	795	515	...
25	≤50.8	930	725	...
26	...	600	400	...
27	>25	600	400	...
28	...	600	400	...
29	≤25	690	450	...
30	...	515	205	...
31	...	515	205	...
32	...	515	205	...
33	...	515	205	...
34	...	515	205	...
35	...	515	205	...
36	...	515	205	...
37	...	515	205	...
38	...	515	205	...
39	...	515	205	...
40	...	515	205	...
41	...	515	205	...
42	...	515	205	...
43	...	515	205	...
44	...	515	205	...
45	...	515	205	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	448	418	395	381	370	361	354	349	344	339
2	448	418	395	381	370	361	354	349	344	339
3	448	418	395	381	370	361	354	349	344	339
4	448	418	395	381	370	361	354	349	344	339
5	483	449	425	410	399	389	382	376	370	365
6	483	449	425	410	399	389	382	376	370	365
7	293	265	248	238	230	223	218	213	209	205
8	379	344	321	308	298	289	282	275	270	265
9	379	344	321	308	298	289	282	275	270	265
10	379	344	321	308	298	289	282	275	270	265
11	379	344	321	308	298	289	282	275	270	265
12	379	344	321	308	298	289	282	275	270	265
13	379	344	321	308	298	289	282	275	270	265
14	379	344	321	308	298	289	282	275	270	265
15	379	344	321	308	298	289	282	275	270	265
16	379	344	321	308	298	289	282	275	270	265
17	379	344	321	308	298	289	282	275	270	265
18	379	344	321	308	298	289	282	275	270	265
19	379	344	321	308	298	289	282	275	270	265
20	379	344	321	308	298	289	282	275	270	265
21	379	344	321	308	298	289	282	275	270	265
22	379	344	321	308	298	289	282	275	270	265
23	414	382	349	335	325	316	307	300	295	289
24	517	477	436	419	406	395	384	376	368	361
25	724	668	611	586	569	553	539	526	516	506
26	400	363	340	328	319	312	308	304	301	297
27	400	363	340	328	319	312	308	304	301	297
28	400	363	340	328	319	312	308	304	301	297
29	448	407	382	368	357	349	343	339	336	333
30	207	191	179	172	167	162	157	153	150	147
31	207	191	179	172	167	162	157	153	150	147
32	207	191	179	172	167	162	157	153	150	147
33	207	191	179	172	167	162	157	153	150	147
34	207	191	179	172	167	162	157	153	150	147
35	207	191	179	172	167	162	157	153	150	147
36	207	191	179	172	167	162	157	153	150	147
37	207	191	179	172	167	162	157	153	150	147
38	207	191	179	172	167	162	157	153	150	147
39	207	191	179	172	167	162	157	153	150	147
40	207	191	179	172	167	162	157	153	150	147
41	207	191	179	172	167	162	157	153	150	147
42	207	191	179	172	167	162	157	153	150	147
43	207	191	179	172	167	162	157	153	150	147
44	207	191	179	172	167	162	157	153	150	147
45	207	191	179	172	167	162	157	153	150	147

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	334	328	322	...	...	...	...	...	...	...
2	334	328	322	...	...	...	...	...	...	...
3	334	328	322	...	...	...	...	...	...	...
4	334	328	322	...	...	...	...	...	...	...
5	360	353	347	...	...	...	...	...	...	...
6	360	353	347	...	...	...	...	...	...	...
7	201	198	195	193	190	188	186	185	183	181
8	260	256	253	250	247	244	241	239	236	234
9	260	256	253	250	247	244	241	239	236	234
10	260	256	253	250	247	244	241	239	236	234
11	260	256	253	250	247	244	241	239	236	234
12	260	256	253	250	247	244	241	239	236	234
13	260	256	253	250	247	244	241	239	236	234
14	260	256	253	250	247	244	241	239	236	234
15	260	256	253	250	247	244	241	239	236	234
16	260	256	253	250	247	244	241	239	236	234
17	260	256	253	250	247	244	241	239	236	234
18	260	256	253	250	247	244	241	239	236	234
19	260	256	253	250	247	244	241	239	236	234
20	260	256	253	250	247	244	241	239	236	234
21	260	256	253	250	247	244	241	239	236	234
22	260	256	253	250	247	244	241	239	236	234
23	284	280	275	272	269	266	263	261	258	255
24	355	350	345	340	336	333	329	326	323	319
25	497	490	483	476	471	466	461	456	452	446
26	293	288	283	278	271	266	262	...	...	...
27	293	288	283	278	271	266	262	...	...	...
28	293	288	283	278	271	266	262	...	...	...
29	329	323	318	311	...	...	...	...	...	...
30	145	143	141	139	138	136	134	132	130	128
31	145	143	141	139	138	136	134	132	130	128
32	145	143	141	139	138	136	134	132	130	128
33	145	143	141	139	138	136	134	132	130	128
34	145	143	141	139	138	136	134	132	130	128
35	145	143	141	139	138	136	134	132	130	128
36	145	143	141	139	138	136	134	132	130	128
37	145	143	141	139	138	136	134	132	130	128
38	145	143	141	139	138	136	134	132	130	128
39	145	143	141	139	138	136	134	132	130	128
40	145	143	141	139	138	136	134	132	130	128
41	145	143	141	139	138	136	134	132	130	128
42	145	143	141	139	138	136	134	132	130	128
43	145	143	141	139	138	136	134	132	130	128
44	145	143	141	139	138	136	134	132	130	128
45	145	143	141	139	138	136	134	132	130	128

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	229	226	223	218	213	...	...	...	...	...	...	...	...	...	...
9	229	226	223	218	213	...	...	...	...	...	...	...	...	...	...
10	229	226	223	218	213	...	...	...	...	...	...	...	...	...	...
11	229	226	223	218	213	...	...	...	...	...	...	...	...	...	...
12	229	226	223	218	213	...	...	...	...	...	...	...	...	...	...
13	229	226	223	218	213	...	...	...	...	...	...	...	...	...	...
14	229	226	223	218	213	...	...	...	...	...	...	...	...	...	...
15	229	226	223	218	213	...	...	...	...	...	...	...	...	...	...
16	229	226	223	218	213	...	...	...	...	...	...	...	...	...	...
17	229	226	223	218	213	...	...	...	...	...	...	...	...	...	...
18	229	226	223	218	213	...	...	...	...	...	...	...	...	...	...
19	229	226	223	218	213	...	...	...	...	...	...	...	...	...	...
20	229	226	223	218	213	...	...	...	...	...	...	...	...	...	...
21	229	226	223	218	213	...	...	...	...	...	...	...	...	...	...
22	229	226	223	218	213	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	122	119	117	114	111	107	103	98.8	94.0	88.7	82.7	76.2	...	...	...
32	122	119	117	114	111	107	103	98.8	94.0	88.7	82.7	76.2	...	...	...
33	122	119	117	114	111	107	103	98.8	94.0	88.7	82.7	76.2	...	...	...
34	122	119	117	114	111	107	103	98.8	94.0	88.7	82.7	76.2	...	...	...
35	122	119	117	114	111	107	103	98.8	94.0	88.7	82.7	76.2	...	...	...
36	122	119	117	114	111	107	103	98.8	94.0	88.7	82.7	76.2	...	...	...
37	122	119	117	114	111	107	103	98.8	94.0	88.7	82.7	76.2	...	...	...
38	122	119	117	114	111	107	103	98.8	94.0	88.7	82.7	76.2	...	...	...
39	122	119	117	114	111	107	103	98.8	94.0	88.7	82.7	76.2	...	...	...
40	122	119	117	114	111	107	103	98.8	94.0	88.7	82.7	76.2	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	23Cr–12Ni	Bar	SA/JIS G4303	SUS309S	...	...
2	23Cr–12Ni–Cb	Smls. tube	SA–213	TP309Cb	S30940	...
3	23Cr–12Ni–Cb	Plate	SA–240	309Cb	S30940	...
4	23Cr–12Ni–Cb	Wld. tube	SA–249	TP309Cb	S30940	...
5	23Cr–12Ni–Cb	Smls. & wld. pipe	SA–312	TP309Cb	S30940	...
6	23Cr–12Ni–Cb	Bar	SA–479	309Cb	S30940	...
7	23Cr–12Ni–Cb	Wld. pipe	SA–813	TP309Cb	S30940	...
8	23Cr–12Ni–Cb	Wld. pipe	SA–814	TP309Cb	S30940	...
9	23Cr–25Ni–5.5Mo–N	Forgings	SA–182	...	S32053	...
10	23Cr–25Ni–5.5Mo–N	Bolting	SA–193	...	S32053	...
11	23Cr–25Ni–5.5Mo–N	Plate	SA–240	...	S32053	...
12	23Cr–25Ni–5.5Mo–N	Wld. tube	SA–249	...	S32053	...
13	23Cr–25Ni–5.5Mo–N	Smls. & wld. pipe	SA–312	...	S32053	...
14	23Cr–25Ni–5.5Mo–N	Wld. pipe	SA–358	...	S32053	...
15	23Cr–25Ni–5.5Mo–N	Fittings	SA–403	...	S32053	...
16	23Cr–25Ni–5.5Mo–N	Wld. pipe	SA–409	...	S32053	...
17	23Cr–25Ni–5.5Mo–N	Bar	SA–479	...	S32053	...
18	23Cr–25Ni–5.5Mo–N	Wld. pipe	SA–813	...	S32053	...
19	23Cr–25Ni–5.5Mo–N	Wld. pipe	SA–814	...	S32053	...
20	24Cr–10Ni–4Mo–N	Castings	SA–995	2A	J93345	...
21	24Cr–22Ni–6Mo–2W–Cu–N	Forgings	SA–182	F58	S31266	...
22	24Cr–22Ni–6Mo–2W–Cu–N	Smls. tube	SA–213	...	S31266	...
23	24Cr–22Ni–6Mo–2W–Cu–N	Plate	SA–240	...	S31266	...
24	24Cr–22Ni–6Mo–2W–Cu–N	Wld. tube	SA–249	...	S31266	...
25	24Cr–22Ni–6Mo–2W–Cu–N	Smls. & wld. pipe	SA–312	...	S31266	...
26	24Cr–22Ni–6Mo–2W–Cu–N	Wld. pipe	SA–358	...	S31266	...
27	24Cr–22Ni–6Mo–2W–Cu–N	Smls. & wld. fittings	SA–403	...	S31266	...
28	24Cr–22Ni–6Mo–2W–Cu–N	Bar, shapes	SA–479	...	S31266	...
29	24Cr–22Ni–6Mo–2W–Cu–N	Wld. pipe	SA–813	...	S31266	...
30	25Cr–4Ni–4Mo–Ti	Plate	SA–240	...	S44635	...
31	25Cr–4Ni–4Mo–Ti	Wld. tube	SA–268	...	S44635	...
32	25Cr–5Ni–3Mo–2Cu	Castings	SA–995	1B	J93372	...
33	25Cr–5Ni–3Mo–2Cu	Plate	SA–240	...	S32550	...
34	25Cr–5Ni–3Mo–2Cu	Bar	SA–479	...	S32550	...
35	25Cr–5Ni–3Mo–2Cu	Smls. & wld. tube	SA–789	...	S32550	...
36	25Cr–5Ni–3Mo–2Cu	Smls. & wld. pipe	SA–790	...	S32550	...
37	25Cr–6Ni–Mo–N	Forgings	SA–182	...	S32506	...
38	25Cr–6Ni–Mo–N	Plate, sheet	SA–240	...	S32506	...
39	25Cr–6Ni–Mo–N	Bar	SA–479	...	S32506	...
40	25Cr–6Ni–Mo–N	Smls. tube	SA–789	...	S32506	...
41	25Cr–6Ni–Mo–N	Wld. tube	SA–789	...	S32506	...
42	25Cr–6Ni–Mo–N	Smls. pipe	SA–790	...	S32506	...
43	25Cr–6Ni–Mo–N	Wld. pipe	SA–790	...	S32506	...
44	25Cr–6Ni–Mo–N	Plate	SA–240	...	S31200	...
45	25Cr–6.5Ni–3Mo–N	Smls. & wld. tube	SA–789	...	S31260	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	520	205	...
2	...	515	205	...
3	...	515	205	...
4	...	515	205	...
5	...	515	205	...
6	...	515	205	...
7	...	515	205	...
8	...	515	205	...
9	...	640	295	...
10	...	640	295	...
11	...	640	295	...
12	...	640	295	...
13	...	640	295	...
14	...	640	295	...
15	...	640	295	...
16	...	640	295	...
17	...	640	295	...
18	...	640	295	...
19	...	640	295	...
20	...	655	450	...
21	...	750	420	...
22	...	750	420	...
23	...	750	420	...
24	...	750	420	...
25	...	750	420	...
26	...	750	420	...
27	...	750	420	...
28	...	750	420	...
29	...	750	420	...
30	...	620	515	...
31	...	620	515	...
32	...	690	485	...
33	...	760	550	...
34	...	760	550	...
35	...	760	550	...
36	...	760	550	...
37	...	620	450	...
38	...	620	450	...
39	...	620	450	...
40	...	620	450	...
41	...	620	450	...
42	...	620	450	...
43	...	620	450	...
44	...	690	450	...
45	...	690	450	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	207	191	179	172	167	162	157	153	150	147
2	207	191	179	172	167	162	157	153	150	147
3	207	191	179	172	167	162	157	153	150	147
4	207	191	179	172	167	162	157	153	150	147
5	207	191	179	172	167	162	157	153	150	147
6	207	191	179	172	167	162	157	153	150	147
7	207	191	179	172	167	162	157	153	150	147
8	207	191	179	172	167	162	157	153	150	147
9	295	266	247	...	226	...	211	...	201	...
10	295	266	247	...	226	...	211	...	201	...
11	295	266	247	...	226	...	211	...	201	...
12	295	266	247	...	226	...	211	...	201	...
13	295	266	247	...	226	...	211	...	201	...
14	295	266	247	...	226	...	211	...	201	...
15	295	266	247	...	226	...	211	...	201	...
16	295	266	247	...	226	...	211	...	201	...
17	295	266	247	...	226	...	211	...	201	...
18	295	266	247	...	226	...	211	...	201	...
19	295	266	247	...	226	...	211	...	201	...
20	448	391	356	337	322	312	304	298	294	291
21	421	388	367	355	344	336	329	324	319	316
22	421	388	367	355	344	336	329	324	319	316
23	421	388	367	355	344	336	329	324	319	316
24	421	388	367	355	344	336	329	324	319	316
25	421	388	367	355	344	336	329	324	319	316
26	421	388	367	355	344	336	329	324	319	316
27	421	388	367	355	344	336	329	324	319	316
28	421	388	367	355	344	336	329	324	319	316
29	421	388	367	355	344	336	329	324	319	316
30	517	457	422	402	384	368	354	342	331	323
31	517	457	422	402	384	368	354	342	331	323
32	483	...	...	...	...	...	...	...	...	...
33	552	510	479	459	443	429	419	411	406	404
34	552	510	479	459	443	429	419	411	406	404
35	552	510	479	459	443	429	419	411	406	404
36	552	510	479	459	443	429	419	411	406	404
37	450	416	391	376	363	354	347	342	339	337
38	450	416	391	376	363	354	347	342	339	337
39	450	416	391	376	363	354	347	342	339	337
40	450	416	391	376	363	354	347	342	339	337
41	450	416	391	376	363	354	347	342	339	337
42	450	416	391	376	363	354	347	342	339	337
43	450	416	391	376	363	354	347	342	339	337
44	448	405	377	360	347	337	329	322	316	311
45	448	411	386	372	360	350	343	336	332	328

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	145	143	141	139	138	136	134	132	130	128
2	145	143	141	139	138	136	134	132	130	128
3	145	143	141	139	138	136	134	132	130	128
4	145	143	141	139	138	136	134	132	130	128
5	145	143	141	139	138	136	134	132	130	128
6	145	143	141	139	138	136	134	132	130	128
7	145	143	141	139	138	136	134	132	130	128
8	145	143	141	139	138	136	134	132	130	128
9	194	190	187	...	...	...	...	...	...	...
10	194	190	187	...	...	...	...	...	...	...
11	194	190	187	...	...	...	...	...	...	...
12	194	190	187	...	...	...	...	...	...	...
13	194	190	187	...	...	...	...	...	...	...
14	194	190	187	...	...	...	...	...	...	...
15	194	190	187	...	...	...	...	...	...	...
16	194	190	187	...	...	...	...	...	...	...
17	194	190	187	...	...	...	...	...	...	...
18	194	190	187	...	...	...	...	...	...	...
19	194	190	187	...	...	...	...	...	...	...
20	288	284	278	270	...	...	...	...	...	...
21	314	312	311	310	308	307	306	...	...	...
22	314	312	311	310	308	307	306	...	...	...
23	314	312	311	310	308	307	306	...	...	...
24	314	312	311	310	308	307	306	...	...	...
25	314	312	311	310	308	307	306	...	...	...
26	314	312	311	310	308	307	306	...	...	...
27	314	312	311	310	308	307	306	...	...	...
28	314	312	311	310	308	307	306	...	...	...
29	314	312	311	310	308	307	306	...	...	...
30	315	307	297	...	...	...	...	...	...	...
31	315	307	297	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...
33	403	402	400	395	381	357	332	...	...	...
34	403	402	400	395	381	357	332	...	...	...
35	403	402	400	395	381	357	332	...	...	...
36	403	402	400	395	381	357	332	...	...	...
37	335	333	...	...	...	...	...	...	...	...
38	335	333	...	...	...	...	...	...	...	...
39	335	333	...	...	...	...	...	...	...	...
40	335	333	...	...	...	...	...	...	...	...
41	335	333	...	...	...	...	...	...	...	...
42	335	333	...	...	...	...	...	...	...	...
43	335	333	...	...	...	...	...	...	...	...
44	305	298	289	...	...	...	...	...	...	...
45	325	321	318	315	311	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	25Cr–6.5Ni–3Mo–N	Smls. & wld. pipe	SA–790	...	S31260	...
2	25Cr–6.5Ni–3Mo–N	Plate	SA–240	...	S31260	...
3	25Cr–7Ni–3Mo–W–Cu–N	Forgings	SA–182	F54	S39274	...
4	25Cr–7Ni–3Mo–W–Cu–N	Smls. & wld. tube	SA–789	...	S39274	...
5	25Cr–7Ni–3Mo–W–Cu–N	Smls. & wld. pipe	SA–790	...	S39274	...
6	25Cr–7Ni–4Mo–N	Forgings	SA–182	F53	S32750	...
7	25Cr–7Ni–4Mo–N	Plate	SA–240	...	S32750	...
8	25Cr–7Ni–4Mo–N	Smls. & wld. tube	SA–789	...	S32750	...
9	25Cr–7Ni–4Mo–N	Smls. & wld. pipe	SA–790	...	S32750	...
10	25Cr–7.5Ni–3.5Mo–N–Cu–W	Castings	SA–995	CD3MWCuN	J93380	...
11	25Cr–7.5Ni–3.5Mo–N–Cu–W	Forgings	SA–182	F55	S32760	...
12	25Cr–7.5Ni–3.5Mo–N–Cu–W	Plate	SA–240	...	S32760	...
13	25Cr–7.5Ni–3.5Mo–N–Cu–W	Bar	SA–479	...	S32760	Annealed
14	25Cr–7.5Ni–3.5Mo–N–Cu–W	Smls. & wld. tube	SA–789	...	S32760	...
15	25Cr–7.5Ni–3.5Mo–N–Cu–W	Smls. & wld. pipe	SA–790	...	S32760	...
16	25Cr–7.5Ni–3.5Mo–N–Cu–W	Smls. & wld. fittings	SA–815	...	S32760	...
17	25Cr–12Ni	Castings	SA–351	CH8	J93400	...
18	25Cr–12Ni	Cast pipe	SA–451	CPH8	J93400	...
19	25Cr–12Ni	Castings	SA–351	CH20	J93402	...
20	25Cr–12Ni	Cast pipe	SA–451	CPH20	J93402	...
21	25Cr–20Ni	Castings	SA–351	CK20	J94202	...
22	25Cr–20Ni	Cast pipe	SA–451	CPK20	J94202	...
23	25Cr–20Ni	Forgings	SA–182	F310	S31000	...
24	25Cr–20Ni	Forgings	SA–965	F310	S31000	...
(**23**) 25	25Cr–20Ni	Smls. tube	SA–213	...	S31002	...
(**23**) 26	25Cr–20Ni	Smls. pipe	SA–312	...	S31002	...
27	25Cr–20Ni	Smls. tube	SA–213	TP310S	S31008	...
28	25Cr–20Ni	Plate	SA–240	310S	S31008	...
29	25Cr–20Ni	Wld. tube	SA–249	TP310S	S31008	...
30	25Cr–20Ni	Smls. & wld. pipe	SA–312	TP310S	S31008	...
31	25Cr–20Ni	Wld. pipe	SA–358	310S	S31008	1
32	25Cr–20Ni	Wld. pipe	SA–358	310S	S31008	3
33	25Cr–20Ni	Wld. pipe	SA–358	310S	S31008	4
34	25Cr–20Ni	Smls. & wld. fittings	SA–403	310S	S31008	...
35	25Cr–20Ni	Bar	SA–479	310S	S31008	...
36	25Cr–20Ni	Wld. pipe	SA–813	TP310S	S31008	...
37	25Cr–20Ni	Wld. pipe	SA–814	TP310S	S31008	...
38	25Cr–20Ni	Smls. tube	SA–213	TP310H	S31009	...
39	25Cr–20Ni	Plate	SA–240	310H	S31009	...
40	25Cr–20Ni	Wld. tube	SA–249	TP310H	S31009	...
41	25Cr–20Ni	Smls. & wld. pipe	SA–312	TP310H	S31009	...
42	25Cr–20Ni	Bar	SA–479	310H	S31009	...
43	25Cr–20Ni	Bar	SA/JIS G4303	SUS310S	...	...
44	25Cr–20Ni–Cb	Smls. tube	SA–213	TP310Cb	S31040	...
45	25Cr–20Ni–Cb	Plate	SA–240	310Cb	S31040	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	690	450	...
2	...	690	485	...
3	...	800	550	...
4	...	800	550	...
5	...	800	550	...
6	...	800	550	...
7	...	800	550	...
8	...	800	550	...
9	...	800	550	...
10	...	690	450	...
11	...	750	550	...
12	...	750	550	...
13	...	750	550	...
14	...	750	550	...
15	...	750	550	...
16	...	750	550	...
17	...	450	195	...
18	...	450	195	...
19	...	485	205	...
20	...	485	205	...
21	...	450	195	...
22	...	450	195	...
23	≤130	515	205	...
24	...	515	205	...
25	...	500	205	...
26	...	500	205	...
27	...	515	205	...
28	...	515	205	...
29	...	515	205	...
30	...	515	205	...
31	...	515	205	...
32	...	515	205	...
33	...	515	205	...
34	...	515	205	...
35	...	515	205	...
36	...	515	205	...
37	...	515	205	...
38	...	515	205	...
39	...	515	205	...
40	...	515	205	...
41	...	515	205	...
42	...	515	205	...
43	...	520	205	...
44	...	515	205	...
45	...	515	205	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	448	411	386	372	360	350	343	336	332	328
2	483	443	416	400	388	377	369	362	357	353
3	552	487	456	440	427	418	410	405	402	401
4	552	487	456	440	427	418	410	405	402	401
5	552	487	456	440	427	418	410	405	402	401
6	552	511	481	462	445	432	420	411	404	399
7	552	511	481	462	445	432	420	411	404	399
8	552	511	481	462	445	432	420	411	404	399
9	552	511	481	462	445	432	420	411	404	399
10	448	396	369	355	346	340	335	332	330	327
11	550	489	455	437	424	415	409	405	404	403
12	550	489	455	437	424	415	409	405	404	403
13	550	489	455	437	424	415	409	405	404	403
14	550	489	455	437	424	415	409	405	404	403
15	550	489	455	437	424	415	409	405	404	403
16	550	489	455	437	424	415	409	405	404	403
17	193	169	156	149	145	142	140	138	136	134
18	193	169	156	149	145	142	140	138	136	134
19	207	180	167	160	156	152	150	148	146	144
20	207	180	167	160	156	152	150	148	146	144
21	193	169	156	149	145	142	140	138	136	134
22	193	169	156	149	145	142	140	138	136	134
23	207	193	181	173	167	161	157	152	149	146
24	207	193	181	173	167	161	157	152	149	146
25	207	193	183	178	172	168	163	159	155	152
26	207	193	183	178	172	168	163	159	155	152
27	207	193	181	173	167	161	157	152	149	146
28	207	193	181	173	167	161	157	152	149	146
29	207	193	181	173	167	161	157	152	149	146
30	207	193	181	173	167	161	157	152	149	146
31	207	193	181	173	167	161	157	152	149	146
32	207	193	181	173	167	161	157	152	149	146
33	207	193	181	173	167	161	157	152	149	146
34	207	193	181	173	167	161	157	152	149	146
35	207	193	181	173	167	161	157	152	149	146
36	207	193	181	173	167	161	157	152	149	146
37	207	193	181	173	167	161	157	152	149	146
38	207	193	181	173	167	161	157	152	149	146
39	207	193	181	173	167	161	157	152	149	146
40	207	193	181	173	167	161	157	152	149	146
41	207	193	181	173	167	161	157	152	149	146
42	207	193	181	173	167	161	157	152	149	146
43	207	193	181	173	167	161	157	152	149	146
44	207	193	181	173	167	161	157	152	149	146
45	207	193	181	173	167	161	157	152	149	146

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	325	321	318	315	311	...	...	...	...	...
2	349	346	343	340	336	...	...	...	...	...
3	401	401	401	401	393	...	...	...	...	...
4	401	401	401	401	393	...	...	...	...	...
5	401	401	401	401	393	...	...	...	...	...
6	396	394	393	393	393	...	...	...	...	...
7	396	394	393	393	393	...	...	...	...	...
8	396	394	393	393	393	...	...	...	...	...
9	396	394	393	393	393	...	...	...	...	...
10	325	323	...	...	...	...	...	...	...	...
11	402	401	...	...	...	...	...	...	...	...
12	402	401	...	...	...	...	...	...	...	...
13	402	401	...	...	...	...	...	...	...	...
14	402	401	...	...	...	...	...	...	...	...
15	402	401	...	...	...	...	...	...	...	...
16	402	401	...	...	...	...	...	...	...	...
17	132	130	127	124	121	118	115	111	108	104
18	132	130	127	124	121	118	115	111	108	104
19	141	139	136	133	130	126	123	119	115	112
20	141	139	136	133	130	126	123	119	115	112
21	132	130	127	124	121	118	115	111	108	104
22	132	130	127	124	121	118	115	111	108	104
23	144	141	139	137	135	134	132	130	128	126
24	144	141	139	137	135	134	132	130	128	126
25	148	144	140	137	133	130	128	127	127	...
26	148	144	140	137	133	130	128	127	127	...
27	144	141	139	137	135	134	132	130	128	126
28	144	141	139	137	135	134	132	130	128	126
29	144	141	139	137	135	134	132	130	128	126
30	144	141	139	137	135	134	132	130	128	126
31	144	141	139	137	135	134	132	130	128	126
32	144	141	139	137	135	134	132	130	128	126
33	144	141	139	137	135	134	132	130	128	126
34	144	141	139	137	135	134	132	130	128	126
35	144	141	139	137	135	134	132	130	128	126
36	144	141	139	137	135	134	132	130	128	126
37	144	141	139	137	135	134	132	130	128	126
38	144	141	139	137	135	134	132	130	128	126
39	144	141	139	137	135	134	132	130	128	126
40	144	141	139	137	135	134	132	130	128	126
41	144	141	139	137	135	134	132	130	128	126
42	144	141	139	137	135	134	132	130	128	126
43	144	141	139	137	135	134	132	130	128	126
44	144	141	139	137	135	134	132	130	128	126
45	144	141	139	137	135	134	132	130	128	126

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Ferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
27	122	119	115	111	105	99.2	92.4	84.8	76.4	67.3	57.3	46.6	...	...	...	
28	122	119	115	111	105	99.2	92.4	84.8	76.4	67.3	57.3	46.6	...	...	...	
29	122	119	115	111	105	99.2	92.4	84.8	76.4	67.3	57.3	46.6	...	...	...	
30	122	119	115	111	105	99.2	92.4	84.8	76.4	67.3	57.3	46.6	...	...	...	
31	122	119	115	111	105	99.2	92.4	84.8	76.4	67.3	57.3	46.6	...	...	...	
32	122	119	115	111	105	99.2	92.4	84.8	76.4	67.3	57.3	46.6	...	...	...	
33	122	119	115	111	105	99.2	92.4	84.8	76.4	67.3	57.3	46.6	...	...	...	
34	122	119	115	111	105	99.2	92.4	84.8	76.4	67.3	57.3	46.6	...	...	...	
35	122	119	115	111	105	99.2	92.4	84.8	76.4	67.3	57.3	46.6	...	...	...	
36	122	119	115	111	105	99.2	92.4	84.8	76.4	67.3	57.3	46.6	...	...	...	
37	122	119	115	111	105	99.2	92.4	84.8	76.4	67.3	57.3	46.6	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Ferrous Materials (Cont'd)					
1	25Cr–20Ni–Cb	Wld. tube	SA–249	TP310Cb	S31040	...
2	25Cr–20Ni–Cb	Smls. & wld. pipe	SA–312	TP310Cb	S31040	...
3	25Cr–20Ni–Cb	Bar	SA–479	310Cb	S31040	...
4	25Cr–20Ni–Cb	Wld. pipe	SA–813	TP310Cb	S31040	...
5	25Cr–20Ni–Cb	Wld. pipe	SA–814	TP310Cb	S31040	...
6	25Cr–20Ni–Cb–N	Smls. tube	SA–213	TP310HCbN	S31042	...
7	25Cr–22Ni–2Mo–N	Forgings	SA–182	F310MoLN	S31050	...
8	25Cr–22Ni–2Mo–N	Smls. tube	SA–213	TP310MoLN	S31050	...
9	25Cr–22Ni–2Mo–N	Plate	SA–240	310MoLN	S31050	...
10	25Cr–22Ni–2Mo–N	Wld. tube	SA–249	TP310MoLN	S31050	...
11	25Cr–22Ni–2Mo–N	Wld. pipe	SA–312	TP310MoLN	S31050	...
12	25Cr–22Ni–2Mo–N	Smls. tube	SA–213	TP310MoLN	S31050	...
13	25Cr–22Ni–2Mo–N	Plate	SA–240	310MoLN	S31050	...
14	25Cr–22Ni–2Mo–N	Wld. tube	SA–249	TP310MoLN	S31050	...
15	25Cr–22Ni–2Mo–N	Wld. pipe	SA–312	TP310MoLN	S31050	...
16	26Cr–4Ni–Mo	Plate	SA–240	329	S32900	...
17	26Cr–4Ni–Mo	Smls. & wld. tube	SA–789	...	S32900	...
18	26Cr–4Ni–Mo	Smls. & wld. pipe	SA–790	...	S32900	...
19	26Cr–4Ni–Mo–N	Plate	SA–240	...	S32950	...
20	26Cr–4Ni–Mo–N	Smls. & wld. tube	SA–789	...	S32950	...
21	26Cr–4Ni–Mo–N	Smls. & wld. pipe	SA–790	...	S32950	...
(**23**) 22	27Cr–7.5Ni–4.5Mo–Co–N	Smls. tube	SA–789	...	S32707	...
(**23**) 23	27Cr–7.5Ni–4.5Mo–Co–N	Smls. pipe	SA–790	...	S32707	...
24	29Cr–6.5Ni–2Mo–N	Plate, sheet, strip	SA–240	...	S32906	...
25	29Cr–6.5Ni–2Mo–N	Bar	SA–479	...	S32906	...
26	29Cr–6.5Ni–2Mo–N	Smls. tube	SA–789	...	S32906	...
27	29Cr–6.5Ni–2Mo–N	Smls. pipe	SA–790	...	S32906	...
28	29Cr–6.5Ni–2Mo–N	Plate, sheet, strip	SA–240	...	S32906	...
29	29Cr–6.5Ni–2Mo–N	Smls. tube	SA–789	...	S32906	...
30	29Cr–6.5Ni–2Mo–N	Smls. pipe	SA–790	...	S32906	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Ferrous Materials (Cont'd)
1	...	515	205	...
2	...	515	205	...
3	...	515	205	...
4	...	515	205	...
5	...	515	205	...
6	...	655	295	...
7	...	540	255	...
8	$6 < t \le 32$	540	255	...
9	$t > 6$	540	255	...
10	$6 < t \le 32$	540	255	...
11	$6 < t \le 32$	540	255	...
12	≤6	580	270	...
13	$t \le 6$	580	270	...
14	≤6	580	270	...
15	≤6	580	270	...
16	...	620	485	...
17	...	620	485	...
18	...	620	485	...
19	...	690	485	...
20	...	690	485	...
21	...	690	485	...
22	...	920	700	...
23	...	920	700	...
24	≥10	750	550	...
25	...	750	550	...
26	≥10	750	550	...
27	≥10	750	550	...
28	<10	800	650	...
29	<10	800	650	...
30	<10	800	650	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Ferrous Materials (Cont'd)									
1	207	193	181	173	167	161	157	152	149	146
2	207	193	181	173	167	161	157	152	149	146
3	207	193	181	173	167	161	157	152	149	146
4	207	193	181	173	167	161	157	152	149	146
5	207	193	181	173	167	161	157	152	149	146
6	296	265	245	233	224	216	209	204	200	196
7	255	231	215	205	197	190	185	180	175	171
8	255	231	215	205	197	190	185	180	175	171
9	255	231	215	205	197	190	185	180	175	171
10	255	231	215	205	197	190	185	180	175	171
11	255	231	215	205	197	190	185	180	175	171
12	269	243	226	216	208	201	195	189	185	180
13	269	243	226	216	208	201	195	189	185	180
14	269	243	226	216	208	201	195	189	185	180
15	269	243	226	216	208	201	195	189	185	180
16	483	451	426	410	397	384	373	364	356	350
17	483	451	426	410	397	384	373	364	356	350
18	483	451	426	410	397	384	373	364	356	350
19	483	448	423	408	395	383	373	364	356	350
20	483	448	423	408	395	383	373	364	356	350
21	483	448	423	408	395	383	373	364	356	350
22	696	647	592	565	552	546	541	533	519	510
23	696	647	592	565	552	546	541	533	519	510
24	552	501	470	451	435	...	411	...	396	...
25	552	501	470	451	435	...	411	...	396	...
26	552	501	470	451	435	...	411	...	396	...
27	552	501	470	451	435	...	411	...	396	...
28	648	588	552	530	511	...	483	...	465	...
29	648	588	552	530	511	...	483	...	465	...
30	648	588	552	530	511	...	483	...	465	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Ferrous Materials (Cont'd)
1	144	141	139	137	135	134	132	130	128	126
2	144	141	139	137	135	134	132	130	128	126
3	144	141	139	137	135	134	132	130	128	126
4	144	141	139	137	135	134	132	130	128	126
5	144	141	139	137	135	134	132	130	128	126
6	193	191	189	186	184	182	180	178	175	173
7	167	163	160	156	152	149	145	143	140	138
8	167	163	160	156	152	149	145	143	140	138
9	167	163	160	156	152	149	145	143	140	138
10	167	163	160	156	152	149	145	143	140	138
11	167	163	160	156	152	149	145	143	140	138
12	176	172	168	164	160	157	154	150	148	146
13	176	172	168	164	160	157	154	150	148	146
14	176	172	168	164	160	157	154	150	148	146
15	176	172	168	164	160	157	154	150	148	146
16	345	341	338	336	...	...	...	...	...	...
17	345	341	338	336	...	...	...	...	...	...
18	345	341	338	336	...	...	...	...	...	...
19	345	341	338	335	...	...	...	...	...	...
20	345	341	338	335	...	...	...	...	...	...
21	345	341	338	335	...	...	...	...	...	...
22	510	...	...	...	...	...	...	...	...	...
23	510	...	...	...	...	...	...	...	...	...
24	387	385	...	...	...	...	...	...	...	...
25	387	385	...	...	...	...	...	...	...	...
26	387	385	...	...	...	...	...	...	...	...
27	387	385	...	...	...	...	...	...	...	...
28	455	452	...	...	...	...	...	...	...	...
29	455	452	...	...	...	...	...	...	...	...
30	455	452	...	...	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Ferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Nonferrous Materials					
1	...	Plate, sheet	SB–209	...	Alclad 3003	O
2	...	Plate, sheet	SB–209	...	Alclad 3003	O
3	...	Plate, sheet	SB–209	...	Alclad 3003	H112
4	...	Plate, sheet	SB–209	...	Alclad 3003	H112
5	...	Plate, sheet	SB–209	...	Alclad 3003	H112
6	...	Plate, sheet	SB–209	...	Alclad 3003	H12
7	...	Plate, sheet	SB–209	...	Alclad 3003	H12
8	...	Plate, sheet	SB–209	...	Alclad 3003	H14
9	...	Plate, sheet	SB–209	...	Alclad 3003	H14
10	...	Drawn smls. tube	SB–210	...	Alclad 3003	O
11	...	Drawn smls. tube	SB–210	...	Alclad 3003	H113
12	...	Drawn smls. tube	SB–210	...	Alclad 3003	H14
13	...	Drawn smls. tube	SB–210	...	Alclad 3003	H18
14	...	Cond. & heat exch. tubes	SB–234	...	Alclad 3003	H14
15	...	Cond. & heat exch. tubes	SB–234	...	Alclad 3003	H25
16	...	Smls. extr. tube	SB–241	...	Alclad 3003	O
17	...	Smls. extr. tube	SB–241	...	Alclad 3003	H112
18	...	Plate, sheet	SB–209	...	Alclad 3004	O
19	...	Plate, sheet	SB–209	...	Alclad 3004	O
20	...	Plate, sheet	SB–209	...	Alclad 3004	H112
21	...	Plate, sheet	SB–209	...	Alclad 3004	H112
22	...	Plate, sheet	SB–209	...	Alclad 3004	H32
23	...	Plate, sheet	SB–209	...	Alclad 3004	H32
24	...	Plate, sheet	SB–209	...	Alclad 3004	H34
25	...	Plate, sheet	SB–209	...	Alclad 3004	H34
26	...	Plate, sheet	SB–209	...	Alclad 6061	T4
27	...	Plate, sheet	SB–209	...	Alclad 6061	T451
28	...	Plate, sheet	SB–209	...	Alclad 6061	T451
29	...	Plate, sheet	SB–209	...	Alclad 6061	T6
30	...	Plate, sheet	SB–209	...	Alclad 6061	T651
31	...	Plate, sheet	SB–209	...	Alclad 6061	T651
32	...	Plate, sheet	SB–209	...	Alclad 6061	T651
33	...	Castings	SB/EN 1706	...	AC–42000–S	T6
34	...	Plate, sheet	SB–209	...	A91060	O
35	...	Plate, sheet	SB–209	...	A91060	H112
36	...	Plate, sheet	SB–209	...	A91060	H112
37	...	Plate, sheet	SB–209	...	A91060	H112
38	...	Plate, sheet	SB–209	...	A91060	H12
39	...	Plate, sheet	SB–209	...	A91060	H14
40	...	Drawn smls. tube	SB–210	...	A91060	O
41	...	Drawn smls. tube	SB–210	...	A91060	H14
42	...	Drawn smls. tube	SB–210	...	A91060	H113
43	...	Bar, rod, shapes	SB–221	...	A91060	O
44	...	Bar, rod, shapes	SB–221	...	A91060	H112
45	...	Cond. & heat exch. tubes	SB–234	...	A91060	H14

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials
1	0.15–12.67	90	30	...
2	12.70–76.20	95	35	...
3	6.35–12.67	110	60	...
4	12.70–50.80	105	40	...
5	50.83–76.20	100	40	...
6	0.43–12.67	110	75	...
7	12.70–50.80	115	85	...
8	0.23–12.67	130	110	...
9	12.70–25.40	140	115	...
10	0.25–12.70	90	30	...
11	1.27–12.70	90	30	...
12	0.25–12.70	130	110	...
13	0.25–12.70	180	160	...
14	0.25–5.08	130	110	...
15	0.25–5.08	145	125	...
16	...	90	30	...
17	...	90	30	...
18	0.15–12.67	145	55	...
19	12.70–76.20	150	60	...
20	6.35–12.67	150	60	...
21	12.70–76.20	160	60	...
22	0.43–12.67	185	140	...
23	12.70–50.80	195	145	...
24	0.23–12.67	215	165	...
25	12.70–25.40	220	170	...
26	0.25–6.34	185	95	...
27	6.35–12.69	185	95	...
28	12.70–76.20	205	110	...
29	0.25–6.34	260	220	...
30	6.35–12.69	260	220	...
31	12.70–101.60	290	240	...
32	101.61–127.00	275	240	...
33	...	220	180	...
34	0.15–76.2	55	15	...
35	6.35–12.7	75	50	...
36	12.7–25.4	70	35	...
37	25.4–76.2	60	30	...
38	0.43–50.8	75	60	...
39	0.23–25.4	85	70	...
40	0.46–12.7	60	15	...
41	0.46–12.7	85	70	...
42	0.46–12.7	60	15	...
43	...	60	15	...
44	...	60	15	...
45	0.25–5.08	85	70	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials									
1	31.0	29.8	28.9	27.7	26.0	24.3	22.6	21.1	...	...
2	34.5	33.1	32.2	30.7	28.9	27.0	25.2	23.5	...	...
3	62.1	59.8	57.2	54.6	51.5	48.2	45.0	42.0	...	...
4	41.4	39.9	38.4	36.7	34.7	32.7	30.4	28.4	...	...
5	41.4	39.9	38.4	36.7	34.7	32.7	30.4	28.4	...	...
6	75.8	74.5	67.1	58.3	49.0	39.9	28.6	20.5	...	...
7	82.7	81.3	73.2	63.6	53.4	43.5	31.2	22.3	...	...
8	110	106	97.8	88.6	77.2	64.5	51.5	41.2	...	...
9	117	113	104	94.1	82.1	68.5	54.7	43.7	...	...
10	31.0	29.9	28.9	27.6	25.7	23.8	21.8	20.0	...	...
11	31.0	29.9	28.9	27.6	25.7	23.8	21.8	20.0	...	...
12	110	106	97.8	88.6	77.2	64.5	51.5	41.2	...	...
13	159	141	120	104	87.3	68.0	49.3	35.8	...	...
14	110	106	97.8	88.6	77.2	64.5	51.5	41.2	...	...
15	124	117	105	93.4	80.0	64.6	49.0	37.2	...	...
16	31.0	29.9	28.9	27.6	25.7	23.8	21.8	20.0	...	...
17	31.0	29.9	28.9	27.6	25.7	23.8	21.8	20.0	...	...
18	55.2	55.2	55.2	55.2	55.2	55.2	53.4	51.6	...	...
19	58.6	58.6	58.6	58.6	58.6	58.6	56.7	54.8	...	...
20	58.6	58.6	58.6	58.6	58.6	58.6	56.7	54.8	...	...
21	62.1	61.8	61.8	61.8	61.8	61.4	59.3	57.3	...	...
22	138	137	137	134	127	112	89.0	70.8	...	...
23	145	144	144	141	133	118	93.5	74.3	...	...
24	165	164	163	155	136	103	67.0	43.8	...	...
25	172	171	169	162	141	107	69.8	45.6	...	...
26	96.5	95.8	95.8	95.8	95.8	95.8	95.8	95.8	...	...
27	96.5	95.8	95.8	95.8	95.8	95.8	95.8	95.8	...	...
28	110	109	109	109	109	109	109	109	...	...
29	221	217	215	203	175	131	92.8	65.5	...	...
30	221	217	215	203	175	131	92.8	65.5	...	...
31	241	238	235	222	191	144	101	71.7	...	...
32	241	238	235	222	191	144	101	71.7	...	...
33	181	178	168	168	149	...	...	...	...	...
34	17.2	17	15.9	14.1	12.3	11	9.5	8.2	...	...
35	48.3	48.3	47	43	39.4	38.2	38	37.9	...	...
36	34.5	33.6	30.5	25.9	20.5	15.4	10.1	6.5	...	...
37	27.6	27.6	26.1	23.6	20.9	19.1	17.5	16.1	...	...
38	62.1	57.2	52	47.5	42.9	38.1	32	26.8	...	...
39	68.9	65.4	62	56.4	48.6	39.2	28.1	20.1	...	...
40	17.2	17	15.9	14.1	12.3	11	9.5	8.2	...	...
41	68.9	65.4	62	56.4	48.6	39.2	28.1	20.1	...	...
42	17.2	17	15.9	14.1	12.3	11	9.5	8.2	...	...
43	17.2	17	15.9	14.1	12.3	11	9.5	8.2	...	...
44	17.2	17	15.9	14.1	12.3	11	9.5	8.2	...	...
45	68.9	65.4	62	56.4	48.6	39.2	28.1	20.1	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials
1	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Nonferrous Materials (Cont'd)					
1	...	Smls. extr. tube	SB–241	...	A91060	O
2	...	Smls. extr. tube	SB–241	...	A91060	H112
3	...	Plate, sheet	SB–209	...	A91100	O
4	...	Plate, sheet	SB–209	...	A91100	H112
5	...	Plate, sheet	SB–209	...	A91100	H112
6	...	Plate, sheet	SB–209	...	A91100	H112
7	...	Plate, sheet	SB–209	...	A91100	H12
8	...	Plate, sheet	SB–209	...	A91100	H14
9	...	Bar, rod, shapes	SB–221	...	A91100	O
10	...	Bar, rod, shapes	SB–221	...	A91100	H112
11	...	Smls. extr. tube	SB–241	...	A91100	O
12	...	Smls. extr. tube	SB–241	...	A91100	H112
13	...	Plate, sheet	SB–209	...	A93003	O
14	...	Plate, sheet	SB–209	...	A93003	H112
15	...	Plate, sheet	SB–209	...	A93003	H112
16	...	Plate, sheet	SB–209	...	A93003	H112
17	...	Plate, sheet	SB–209	...	A93003	H12
18	...	Plate, sheet	SB–209	...	A93003	H14
19	...	Drawn smls. tube	SB–210	...	A93003	O
20	...	Drawn smls. tube	SB–210	...	A93003	H113
21	...	Drawn smls. tube	SB–210	...	A93003	H12
22	...	Drawn smls. tube	SB–210	...	A93003	H14
23	...	Drawn smls. tube	SB–210	...	A93003	H18
24	...	Bar, rod, shapes	SB–221	...	A93003	O
25	...	Bar, rod, shapes	SB–221	...	A93003	H112
26	...	Cond. & heat exch. tubes	SB–234	...	A93003	H14
27	...	Cond. & heat exch. tubes	SB–234	...	A93003	H25
28	...	Smls. extr. tube	SB–241	...	A93003	O
29	...	Smls. extr. tube	SB–241	...	A93003	H112
30	...	Smls. pipe	SB–241	...	A93003	H112
31	...	Smls. pipe	SB–241	...	A93003	H18
32	...	Die forgings	SB–247	...	A93003	H112
33	...	Plate, sheet	SB–209	...	A93004	O
34	...	Plate, sheet	SB–209	...	A93004	H112
35	...	Plate, sheet	SB–209	...	A93004	H32
36	...	Plate, sheet	SB–209	...	A93004	H34
37	...	Plate, sheet	SB–209	...	A95052	O
38	...	Plate, sheet	SB–209	...	A95052	H112
39	...	Plate, sheet	SB–209	...	A95052	H112
40	...	Plate, sheet	SB–209	...	A95052	H32
41	...	Plate, sheet	SB–209	...	A95052	H34
42	...	Drawn smls. tube	SB–210	...	A95052	O
43	...	Drawn smls. tube	SB–210	...	A95052	H32
44	...	Drawn smls. tube	SB–210	...	A95052	H34
45	...	Cond. & heat exch. tubes	SB–234	...	A95052	H32

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	...	60	15	...
2	...	60	15	...
3	0.15–76.2	75	25	...
4	6.35–12.7	90	50	...
5	12.7–50.8	85	35	...
6	50.8–76.2	80	30	...
7	0.43–50.8	95	75	...
8	0.23–25.4	110	95	...
9	...	75	20	...
10	...	75	20	...
11	...	75	20	...
12	...	75	20	...
13	0.15–76.20	95	35	...
14	6.35–12.67	115	70	...
15	12.70–50.80	105	40	...
16	50.83–76.20	100	40	...
17	0.43–50.80	115	85	...
18	0.23–25.40	140	115	...
19	0.25–12.70	95	35	...
20	0.25–12.70	95	35	...
21	0.25–12.70	115	85	...
22	0.25–12.70	140	115	...
23	0.25–12.70	185	165	...
24	...	95	35	...
25	...	95	35	...
26	0.25–5.08	140	115	...
27	0.25–5.08	150	130	...
28	...	95	35	...
29	...	95	35	...
30	≥25.40	95	35	...
31	<25.40	185	165	...
32	≤101.60	95	35	...
33	0.15–76.20	150	60	...
34	6.35–76.20	160	60	...
35	0.43–50.80	195	145	...
36	0.23–25.40	220	170	...
37	0.15–76.20	170	65	...
38	6.35–12.69	195	110	...
39	12.70–76.20	170	65	...
40	0.43–50.80	215	160	...
41	0.23–25.40	235	180	...
42	0.25–11.43	170	70	...
43	0.25–11.43	215	160	...
44	0.25–11.43	235	180	...
45	0.25–5.08	215	160	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	17.2	17	15.9	14.1	12.3	11	9.5	8.2	...	...
2	17.2	17	15.9	14.1	12.3	11	9.5	8.2	...	...
3	24.1	24.1	24	23.3	21.8	19.3	16.6	14.3	...	...
4	48.3	48.3	47.9	46.6	44	39.8	34.9	30.7	...	...
5	34.5	34.5	33.9	33	30.9	27.3	23.2	19.6	...	...
6	27.6	27.6	27	26.1	24.3	21.2	17.2	14	...	...
7	75.8	73.8	69.2	63.4	55.9	47.4	38.5	31.3	...	...
8	96.5	93.4	85.9	78.1	68.3	57.3	45.9	36.8	...	...
9	20.7	20.6	20.5	19.8	18.5	16.7	14.8	13.1	...	...
10	20.7	20.6	20.5	19.8	18.5	16.7	14.8	13.1	...	...
11	20.7	20.6	20.5	19.8	18.5	16.7	14.8	13.1	...	...
12	20.7	20.6	20.5	19.8	18.5	16.7	14.8	13.1	...	...
13	34.5	33.2	32.2	30.6	28.6	26.4	24.2	22.2	...	...
14	68.9	66.4	63.5	60.6	57.2	53.6	50.0	46.7	...	...
15	41.4	39.9	38.4	36.7	34.7	32.7	30.4	28.4	...	...
16	41.4	39.9	38.4	36.7	34.7	32.7	30.4	28.4	...	...
17	82.7	81.3	73.2	63.6	53.4	43.5	31.2	22.3	...	...
18	117	113	104	94.1	82.1	68.5	54.7	43.7	...	...
19	34.5	33.2	32.2	30.6	28.6	26.4	24.2	22.2	...	...
20	34.5	33.2	32.2	30.6	28.6	26.4	24.2	22.2	...	...
21	82.7	81.3	73.2	63.6	53.4	43.5	31.2	22.3	...	...
22	117	113	104	94.1	82.1	68.5	54.7	43.7	...	...
23	165	147	125	109	91.0	71.0	51.5	37.3	...	...
24	34.5	33.2	32.2	30.6	28.6	26.4	24.2	22.2	...	...
25	34.5	33.2	32.2	30.6	28.6	26.4	24.2	22.2	...	...
26	117	113	104	94.1	82.1	68.5	54.7	43.7	...	...
27	131	123	110	98.6	84.4	68.1	51.7	39.2	...	...
28	34.5	33.2	32.2	30.6	28.6	26.4	24.2	22.2	...	...
29	34.5	33.2	32.2	30.6	28.6	26.4	24.2	22.2	...	...
30	34.5	33.2	32.2	30.6	28.6	26.4	24.2	22.2	...	...
31	165	147	125	109	91.0	71.0	51.5	37.3	...	...
32	34.5	33.2	32.2	30.6	28.6	26.4	24.2	22.2	...	...
33	58.6	58.6	58.6	58.6	58.6	58.6	56.7	54.8	...	...
34	62.1	61.8	61.8	61.8	61.8	61.4	59.3	57.3	...	...
35	145	144	144	141	133	118	93.5	74.3	...	...
36	172	171	169	162	141	107	69.8	45.6	...	...
37	65.5	65.5	65.4	65.2	65.1	64.2	59.7	55.5	...	...
38	110	110	110	109	109	108	101	94.2	...	...
39	65.5	65.5	65.4	65.2	65.1	64.2	59.7	55.5	...	...
40	159	158	156	150	136	114	86.5	65.5	...	...
41	179	179	177	172	155	124	88.5	63.3	...	...
42	68.9	68.9	68.9	68.7	68.5	67.6	62.9	58.5	...	...
43	159	158	156	150	136	114	86.5	65.5	...	...
44	179	179	177	172	155	124	88.5	63.3	...	...
45	159	158	156	150	136	114	86.5	65.5	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials (Cont'd)
1	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
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11	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Nonferrous Materials (Cont'd)					
1	...	Cond. & heat exch. tubes	SB–234	...	A95052	H34
2	...	Smls. extr. tube	SB–241	...	A95052	O
3	...	Plate, sheet	SB–209	...	A95083	O
4	...	Plate, sheet	SB–209	...	A95083	O
5	...	Plate, sheet	SB–209	...	A95083	O
6	...	Plate, sheet	SB–209	...	A95083	O
7	...	Plate, sheet	SB–209	...	A95083	O
8	...	Plate, sheet	SB–209	...	A95083	H112
9	...	Plate, sheet	SB–209	...	A95083	H112
10	...	Plate, sheet	SB–209	...	A95083	H32
11	...	Plate, sheet	SB–209	...	A95083	H32
12	...	Bar, rod, shapes	SB–221	...	A95083	O
13	...	Bar, rod, shapes	SB–221	...	A95083	H111
14	...	Bar, rod, shapes	SB–221	...	A95083	H112
15	...	Smls. extr. tube	SB–241	...	A95083	O
16	...	Smls. extr. tube	SB–241	...	A95083	H111
17	...	Smls. extr. tube	SB–241	...	A95083	H112
18	...	Die & hand forgings	SB–247	...	A95083	H111
19	...	Die & hand forgings	SB–247	...	A95083	H112
20	...	Plate, sheet	SB–928	...	A95083	H321
21	...	Plate, sheet	SB–928	...	A95083	H321
22	...	Plate, sheet	SB–209	...	A95086	O
23	...	Plate, sheet	SB–209	...	A95086	H112
24	...	Plate, sheet	SB–209	...	A95086	H112
25	...	Plate, sheet	SB–209	...	A95086	H112
26	...	Plate, sheet	SB–209	...	A95086	H112
27	...	Plate, sheet	SB–209	...	A95086	H32
28	...	Plate, sheet	SB–209	...	A95086	H34
29	...	Bar, rod, shapes	SB–221	...	A95086	H112
30	...	Smls. extr. tube	SB–241	...	A95086	O
31	...	Smls. extr. tube	SB–241	...	A95086	H111
32	...	Smls. extr. tube	SB–241	...	A95086	H112
33	...	Plate, sheet	SB–928	...	A95086	H116
34	...	Plate, sheet	SB–209	...	A95154	O
35	...	Plate, sheet	SB–209	...	A95154	H112
36	...	Plate, sheet	SB–209	...	A95154	H112
37	...	Plate, sheet	SB–209	...	A95154	H32
38	...	Plate, sheet	SB–209	...	A95154	H34
39	...	Drawn smls. tube	SB–210	...	A95154	O
40	...	Drawn smls. tube	SB–210	...	A95154	H34
41	...	Bar, rod, shapes	SB–221	...	A95154	O
42	...	Bar, rod, shapes	SB–221	...	A95154	H112
43	...	Plate, sheet	SB–209	...	A95254	O
44	...	Plate, sheet	SB–209	...	A95254	H112
45	...	Plate, sheet	SB–209	...	A95254	H112

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	0.25–5.08	235	180	...
2	...	170	70	...
3	1.30–38.10	275	125	...
4	38.11–76.20	270	115	...
5	76.21–127.00	260	110	...
6	127.01–177.80	255	105	...
7	177.81–203.20	250	95	...
8	6.35–38.10	275	125	...
9	38.11–76.20	270	115	...
10	$3.20 < t \leq 40.00$	305	215	...
11	$40.00 < t \leq 80.00$	285	200	...
12	≤127.00	270	110	...
13	≤127.00	275	165	...
14	≤127.00	270	110	...
15	...	270	110	...
16	...	275	165	...
17	...	270	110	...
18	≤101.60	270	140	...
19	≤101.60	270	110	...
20	$3.20 < t \leq 40.00$	305	215	...
21	$40.00 < t \leq 80.00$	285	200	...
22	0.51–50.80	240	95	...
23	4.78–12.69	250	125	...
24	12.70–25.40	240	110	...
25	25.41–50.80	240	95	...
26	50.81–76.20	235	95	...
27	0.51–50.80	275	195	...
28	0.23–25.40	305	235	...
29	≤127.00	240	95	...
30	...	240	95	...
31	...	250	145	...
32	...	240	95	...
33	$1.60 < t \leq 50.00$	275	195	...
34	0.51–76.2	205	75	...
35	6.35–12.7	220	125	...
36	12.7–76.2	205	75	...
37	0.51–50.8	250	180	...
38	0.23–25.4	270	200	...
39	0.25–11.4	205	75	...
40	0.25–11.4	270	200	...
41	...	205	75	...
42	...	205	75	...
43	1.30–76.2	205	75	...
44	6.35–12.7	220	125	...
45	12.7–76.2	205	75	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	179	179	177	172	155	124	88.5	63.3	...	...
2	68.9	68.9	68.9	68.7	68.5	67.6	62.9	58.5	...	...
3	124	124	...	...	...	...	...	...	...	...
4	117	117	...	...	...	...	...	...	...	...
5	110	110	...	...	...	...	...	...	...	...
6	103	103	...	...	...	...	...	...	...	...
7	96.5	96.5	...	...	...	...	...	...	...	...
8	124	124	...	...	...	...	...	...	...	...
9	117	117	...	...	...	...	...	...	...	...
10	214	214	...	...	...	...	...	...	...	...
11	200	200	...	...	...	...	...	...	...	...
12	110	110	...	...	...	...	...	...	...	...
13	165	165	...	...	...	...	...	...	...	...
14	110	110	...	...	...	...	...	...	...	...
15	110	110	...	...	...	...	...	...	...	...
16	165	165	...	...	...	...	...	...	...	...
17	110	110	...	...	...	...	...	...	...	...
18	138	138	...	...	...	...	...	...	...	...
19	110	110	...	...	...	...	...	...	...	...
20	214	214	...	...	...	...	...	...	...	...
21	200	200	...	...	...	...	...	...	...	...
22	96.5	96.5	...	...	...	...	...	...	...	...
23	124	124	...	...	...	...	...	...	...	...
24	110	110	...	...	...	...	...	...	...	...
25	96.5	96.5	...	...	...	...	...	...	...	...
26	96.5	96.5	...	...	...	...	...	...	...	...
27	193	193	...	...	...	...	...	...	...	...
28	234	234	...	...	...	...	...	...	...	...
29	96.5	96.5	...	...	...	...	...	...	...	...
30	96.5	96.5	...	...	...	...	...	...	...	...
31	145	145	...	...	...	...	...	...	...	...
32	96.5	96.5	...	...	...	...	...	...	...	...
33	193	193	...	...	...	...	...	...	...	...
34	75.8	75.8	...	...	...	...	...	...	...	...
35	124	124	...	...	...	...	...	...	...	...
36	75.8	75.8	...	...	...	...	...	...	...	...
37	179	179	...	...	...	...	...	...	...	...
38	200	200	...	...	...	...	...	...	...	...
39	75.8	75.8	...	...	...	...	...	...	...	...
40	200	200	...	...	...	...	...	...	...	...
41	75.8	75.8	...	...	...	...	...	...	...	...
42	75.8	75.8	...	...	...	...	...	...	...	...
43	75.8	75.8	...	...	...	...	...	...	...	...
44	124	124	...	...	...	...	...	...	...	...
45	75.8	75.8	...	...	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials (Cont'd)
1	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Nonferrous Materials (Cont'd)					
1	...	Plate, sheet	SB–209	...	A95254	H32
2	...	Plate, sheet	SB–209	...	A95254	H34
3	...	Plate, sheet	SB–209	...	A95454	O
4	...	Plate, sheet	SB–209	...	A95454	H112
5	...	Plate, sheet	SB–209	...	A95454	H112
6	...	Plate, sheet	SB–209	...	A95454	H32
7	...	Plate, sheet	SB–209	...	A95454	H34
8	...	Bar, rod, shapes	SB–221	...	A95454	O
9	...	Bar, rod, shapes	SB–221	...	A95454	H111
10	...	Bar, rod, shapes	SB–221	...	A95454	H112
11	...	Cond. & heat exch. tubes	SB–234	...	A95454	H32
12	...	Cond. & heat exch. tubes	SB–234	...	A95454	H34
13	...	Smls. extr. tube	SB–241	...	A95454	O
14	...	Smls. extr. tube	SB–241	...	A95454	H111
15	...	Smls. extr. tube	SB–241	...	A95454	H112
16	...	Plate, sheet	SB–209	...	A95456	O
17	...	Plate, sheet	SB–209	...	A95456	O
18	...	Plate, sheet	SB–209	...	A95456	O
19	...	Plate, sheet	SB–209	...	A95456	O
20	...	Plate, sheet	SB–209	...	A95456	O
21	...	Plate, sheet	SB–209	...	A95456	H112
22	...	Plate, sheet	SB–209	...	A95456	H112
23	...	Plate, sheet	SB–209	...	A95456	H32
24	...	Plate, sheet	SB–209	...	A95456	H32
25	...	Plate, sheet	SB–209	...	A95456	H32
26	...	Bar, rod, shapes	SB–221	...	A95456	O
27	...	Bar, rod, shapes	SB–221	...	A95456	H111
28	...	Bar, rod, shapes	SB–221	...	A95456	H112
29	...	Smls. extr. tube	SB–241	...	A95456	O
30	...	Smls. extr. tube	SB–241	...	A95456	H111
31	...	Smls. extr. tube	SB–241	...	A95456	H112
32	...	Plate, sheet	SB–928	...	A95456	H321
33	...	Plate, sheet	SB–928	...	A95456	H321
34	...	Plate, sheet	SB–928	...	A95456	H321
35	...	Plate, sheet	SB–209	...	A96061	T4
36	...	Plate, sheet	SB–209	...	A96061	T451
37	...	Plate, sheet	SB–209	...	A96061	T6
38	...	Plate, sheet	SB–209	...	A96061	T651
39	...	Plate, sheet	SB–209	...	A96061	T651
40	...	Drawn smls. tube	SB–210	...	A96061	T4
41	...	Drawn smls. tube	SB–210	...	A96061	T6
42	...	Bar, rod, wire	SB–211	...	A96061	T6
43	...	Bar, rod, wire	SB–211	...	A96061	T651
44	...	Bar, rod, shapes	SB–221	...	A96061	T4
45	...	Bar, rod, shapes	SB–221	...	A96061	T6

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	1.30–50.8	250	180	...
2	1.30–25.4	270	200	...
3	0.51–76.2	215	85	...
4	6.35–12.7	220	125	...
5	12.7–76.2	215	85	...
6	0.51–50.8	250	180	...
7	0.51–25.4	270	200	...
8	≤127	215	85	...
9	≤127	230	130	...
10	≤127	215	85	...
11	0.25–5.08	250	180	...
12	0.25–5.08	270	200	...
13	...	215	85	...
14	...	230	130	...
15	...	215	85	...
16	1.30–38.10	290	130	...
17	38.13–76.20	285	125	...
18	76.23–127.00	275	115	...
19	127.03–177.80	270	110	...
20	177.83–203.20	260	105	...
21	6.35–38.10	290	130	...
22	38.13–76.20	285	125	...
23	4.78–12.69	315	230	...
24	12.70–38.10	305	215	...
25	38.11–76.20	285	200	...
26	≤127.00	285	130	...
27	≤127.00	290	180	...
28	≤127.00	285	130	...
29	...	285	130	...
30	...	290	180	...
31	...	285	130	...
32	4.00–12.50	315	230	...
33	12.51–40.00	305	215	...
34	40.01–80.00	285	200	...
35	0.15–6.34	205	110	...
36	6.35–76.20	205	110	...
37	0.15–6.34	290	240	...
38	6.35–101.60	290	240	...
39	101.61–152.40	275	240	...
40	0.64–12.70	205	110	...
41	0.64–12.70	290	240	...
42	3.18–203.20	290	240	...
43	3.18–203.20	290	240	...
44	...	180	110	...
45	...	260	240	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	179	179	...	...	...	...	...	...	...	...
2	200	200	...	...	...	...	...	...	...	...
3	82.7	82.7	82.7	82.7	82.3	80.1	75.2	70.7	...	...
4	124	124	124	124	123	119	112	105	...	...
5	82.7	82.7	82.7	82.7	82.3	80.1	75.2	70.7	...	...
6	179	179	177	172	163	149	129	112	...	...
7	200	197	187	177	164	148	128	111	...	...
8	82.7	82.7	82.7	82.7	82.3	80.1	75.2	70.7	...	...
9	131	131	131	131	129	126	118	110	...	...
10	82.7	82.7	82.7	82.7	82.3	80.1	75.2	70.7	...	...
11	179	179	177	172	163	149	129	112	...	...
12	200	197	187	177	164	148	128	111	...	...
13	82.7	82.7	82.7	82.7	82.3	80.1	75.2	70.7	...	...
14	131	131	131	131	129	126	118	110	...	...
15	82.7	82.7	82.7	82.7	82.3	80.1	75.2	70.7	...	...
16	131	131	...	...	...	...	...	...	...	...
17	124	124	...	...	...	...	...	...	...	...
18	117	117	...	...	...	...	...	...	...	...
19	110	110	...	...	...	...	...	...	...	...
20	103	103	...	...	...	...	...	...	...	...
21	131	131	...	...	...	...	...	...	...	...
22	124	124	...	...	...	...	...	...	...	...
23	227	227	...	...	...	...	...	...	...	...
24	213	213	...	...	...	...	...	...	...	...
25	200	200	...	...	...	...	...	...	...	...
26	131	131	...	...	...	...	...	...	...	...
27	179	179	...	...	...	...	...	...	...	...
28	131	131	...	...	...	...	...	...	...	...
29	131	131	...	...	...	...	...	...	...	...
30	179	179	...	...	...	...	...	...	...	...
31	131	131	...	...	...	...	...	...	...	...
32	228	228	...	...	...	...	...	...	...	...
33	214	214	...	...	...	...	...	...	...	...
34	200	200	...	...	...	...	...	...	...	...
35	110	109	109	109	109	109	109	109	...	...
36	110	109	109	109	109	109	109	109	...	...
37	241	238	235	222	191	144	102	72.0	...	...
38	241	238	235	222	191	144	102	72.0	...	...
39	241	238	235	222	191	144	102	72.0	...	...
40	110	109	109	109	109	109	109	109	...	...
41	241	238	235	222	191	144	102	71.7	...	...
42	241	238	235	222	191	144	102	71.7	...	...
43	241	238	235	222	191	144	102	71.7	...	...
44	110	109	109	109	109	109	109	109	...	...
45	241	238	235	222	191	144	102	71.7	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials (Cont'd)
1	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Nonferrous Materials (Cont'd)					
1	...	Cond. & heat exch. tubes	SB–234	...	A96061	T4
2	...	Cond. & heat exch. tubes	SB–234	...	A96061	T6
3	...	Smls. extr. tube	SB–241	...	A96061	T4
4	...	Smls. extr. tube	SB–241	...	A96061	T6
5	...	Smls. pipe	SB–241	...	A96061	T6 drawn
6	...	Smls. pipe	SB–241	...	A96061	T6
7	...	Die forgings	SB–247	...	A96061	T6
8	...	Hand forgings	SB–247	...	A96061	T6
9	...	Hand forgings	SB–247	...	A96061	T6
10	...	Shapes	SB–308	...	A96061	T6
11	...	Drawn smls. tube	SB–210	...	A96063	T6
12	...	Drawn smls. tube	SB–210	...	A96063	T6 wld.
13	...	Bar, rod, shapes	SB–221	...	A96063	T1
14	...	Bar, rod, shapes	SB–221	...	A96063	T1
15	...	Bar, rod, shapes	SB–221	...	A96063	T5
16	...	Bar, rod, shapes	SB–221	...	A96063	T5
17	...	Bar, rod, shapes	SB–221	...	A96063	T6
18	...	Smls. extr. tube	SB–241	...	A96063	O
19	...	Smls. extr. tube	SB–241	...	A96063	T1
20	...	Smls. extr. tube	SB–241	...	A96063	T1
21	...	Smls. extr. tube	SB–241	...	A96063	T5
22	...	Smls. extr. tube	SB–241	...	A96063	T5
23	...	Smls. extr. tube/pipe	SB–241	...	A96063	T6
24	...	Smls. pipe	SB–241	...	A96063	O
25	...	Smls. pipe	SB–241	...	A96063	T6
(**23**) 26	...	Castings	SB/EN 1706	AlSi7Mg	AC–42000	...
(**23**) 27	...	Castings	SB/EN 1706	...	AC–44300	F
(**23**) 28	...	Bar, rod	SB–187	...	C10200	O60
29	...	Smls. pipe	SB–42	...	C10200	O61
30	...	Smls. tube	SB–75	...	C10200	O60
31	...	Plate, sheet, strip	SB–152	...	C10200	H00
32	...	Plate, sheet, strip	SB–152	...	C10200	H01
33	...	Plate, sheet, strip	SB–152	...	C10200	H02
34	...	Plate, sheet, strip	SB–152	...	C10200	H03
35	...	Plate, sheet, strip	SB–152	...	C10200	H04
36	...	Plate, sheet, strip	SB–152	...	C10200	M20, O25
37	...	Smls. pipe	SB–42	...	C10200	H55
38	...	Smls. tube	SB–75	...	C10200	H55
39	...	Smls. cond. tube	SB–111	...	C10200	H55
40	...	Smls. U–bend tube	SB–395	...	C10200	H55
41	...	Smls. pipe	SB–42	...	C10200	H80
42	...	Smls. tube	SB–75	...	C10200	H80
43	...	Smls. cond. tube	SB–111	...	C10200	H80
44	...	Plate, sheet, strip	SB–152	...	C10400	H00
45	...	Plate, sheet, strip	SB–152	...	C10400	H01

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	0.64–5.08	205	110	...
2	0.64–5.08	290	240	...
3	...	180	110	...
4	...	260	240	...
5	<25.40	290	240	...
6	≥25.40	260	240	...
7	≤101.60	260	240	...
8	≤101.60	255	230	...
9	101.61–203.20	240	220	...
10	...	260	240	...
11	0.64–12.70	230	190	...
12	0.64–12.70	115	...	...
13	≤12.70	115	60	...
14	12.71–25.40	110	55	...
15	≤12.70	150	110	...
16	12.71–25.40	145	105	...
17	≤25.40	205	170	...
18	...	110	35	...
19	≤12.70	115	60	...
20	12.71–25.40	110	55	...
21	≤12.70	150	110	...
22	12.71–25.40	145	105	...
23	≤25.40	205	170	...
24	...	110	35	...
25	≤25.40	205	170	...
26	...	140	80	...
27	...	240	130	...
28	All	195	55	...
29	All	205	60	...
30	All	205	62	...
31	...	205	70	...
32	...	205	70	...
33	...	205	70	...
34	...	205	70	...
35	...	205	70	...
36	...	205	70	...
37	50 < DN ≤ 300	250	205	...
38	All	250	205	...
39	...	250	205	...
40	...	250	205	...
41	6 < DN ≤ 50	310	275	...
42	<102	310	275	...
43	...	310	275	...
44	...	205	70	...
45	...	205	70	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	110	109	109	109	109	109	109	109	...	...
2	241	238	235	222	191	144	102	71.7	...	...
3	110	109	109	109	109	109	109	109	...	...
4	241	238	235	222	191	144	102	71.7	...	...
5	241	238	235	222	191	144	102	71.7	...	...
6	241	238	235	222	191	144	102	71.7	...	...
7	241	238	235	222	191	144	102	71.7	...	...
8	228	223	218	203	168	116	64.0	35.5	...	...
9	221	219	219	219	219	219	219	219	...	...
10	241	238	235	222	191	144	102	71.7	...	...
11	193	188	187	173	139	92.1	66.9	48.5	...	...
12	117	115	113	110	110	106	68.4	44.1	...	...
13	62.1	60.8	60	58.3	58.2	56.2	36.2	23.3	...	...
14	55.2	53.7	51.8	48.6	46.1	41.1	20.9	10.6	...	...
15	110	107	103	99.8	85	55.3	24.6	10.9	...	...
16	103	101	99.1	97.6	87.3	65.1	39.6	24	...	...
17	172	165	161	145	111	63.1	34.0	18.3	...	...
18	34.5	33.6	32.4	30.4	28.8	25.7	13.0	...	...	...
19	62.1	60.8	60	58.3	58.2	56.2	54.2	52.2	...	...
20	55,2	53,7	51,8	48,6	46,1	41,1	36,7	32,7	...	...
21	110	107	103	99.8	85	55.3	24.6	10.9	...	...
22	103	101	99.1	97.6	87.3	65.1	39.6	24	...	...
23	172	165	161	145	111	63.3	34.1	18.3	...	...
24	34.5	33.6	32.4	30.4	28.8	25.7	13.0	...	...	...
25	172	165	161	145	111	63.3	34.1	18.3	...	...
26	80.0	80.0	80.0	80.0	80.0	...	...	...	...	...
27	130	107	88.4	86.9	86.9	...	...	...	...	...
28	55.2	48.5	48.5	48.5	48.3	46.9	44.9	42.8	41.2	...
29	62.1	54.6	54.6	54.6	54.3	52.8	50.5	48.1	46.4	...
30	62.1	54.6	54.6	54.6	54.3	52.8	50.5	48.1	46.4	...
31	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
32	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
33	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
34	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
35	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
36	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
37	207	205	199	193	186	178	170	161	152	...
38	207	205	199	193	186	178	170	161	152	...
39	207	205	199	193	186	178	170	161	152	...
40	207	205	199	193	186	178	170	161	152	...
41	276	264	258	254	246	233	215	185	154	...
42	276	264	258	254	246	233	215	185	154	...
43	276	264	258	254	246	233	215	185	154	...
44	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
45	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials (Cont'd)
1	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Nonferrous Materials (Cont'd)					
1	...	Plate, sheet, strip	SB–152	...	C10400	H02
2	...	Plate, sheet, strip	SB–152	...	C10400	H03
3	...	Plate, sheet, strip	SB–152	...	C10400	H04
4	...	Plate, sheet, strip	SB–152	...	C10400	M20, O25
5	...	Plate, sheet, strip	SB–152	...	C10500	H00
6	...	Plate, sheet, strip	SB–152	...	C10500	H01
7	...	Plate, sheet, strip	SB–152	...	C10500	H02
8	...	Plate, sheet, strip	SB–152	...	C10500	H03
9	...	Plate, sheet, strip	SB–152	...	C10500	H04
10	...	Plate, sheet, strip	SB–152	...	C10500	M20, O25
11	...	Plate, sheet, strip	SB–152	...	C10700	H00
12	...	Plate, sheet, strip	SB–152	...	C10700	H01
13	...	Plate, sheet, strip	SB–152	...	C10700	H02
14	...	Plate, sheet, strip	SB–152	...	C10700	H03
15	...	Plate, sheet, strip	SB–152	...	C10700	H04
16	...	Plate, sheet, strip	SB–152	...	C10700	M20, O25
(**23**) 17	...	Bar	SB–187	...	C11000	H04
18	...	Bar, rod	SB–187	...	C11000	O60
19	...	Plate, sheet, strip, bar	SB–152	...	C11000	M20, O25
20	...	Smls. pipe	SB–42	...	C12000	O61
21	...	Smls. tube	SB–75	...	C12000	O50
22	...	Smls. tube	SB–75	...	C12000	O60
23	...	Smls. pipe	SB–42	...	C12000	H55
24	...	Smls. tube	SB–75	...	C12000	H55
25	...	Smls. cond. tube	SB–111	...	C12000	H55
26	...	Smls. U–bend tube	SB–395	...	C12000	H55
27	...	Smls. pipe	SB–42	...	C12000	H80
28	...	Smls. tube	SB–75	...	C12000	H80
29	...	Smls. cond. tube	SB–111	...	C12000	H80
30	...	Finned tube	SB–359	...	C12200	O62
31	...	Smls. pipe	SB–42	...	C12200	O61
32	...	Smls. tube	SB–75	...	C12200	O50
33	...	Smls. tube	SB–75	...	C12200	O60
34	...	Finned tube	SB–359	...	C12200	O61
35	...	Wld. cond. tube	SB–543	...	C12200	WO61
36	...	Plate, sheet, strip	SB–152	...	C12200	H00
37	...	Plate, sheet, strip	SB–152	...	C12200	H01
38	...	Plate, sheet, strip	SB–152	...	C12200	H02
39	...	Plate, sheet, strip	SB–152	...	C12200	H03
40	...	Plate, sheet, strip	SB–152	...	C12200	H04
41	...	Plate, sheet, strip	SB–152	...	C12200	M20, O25
42	...	Wld. cond. tube	SB–543	...	C12200	WC55
43	...	Smls. pipe	SB–42	...	C12200	H55
44	...	Smls. tube	SB–75	...	C12200	H55
45	...	Smls. cond. tube	SB–111	...	C12200	H55

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	...	205	70	...
2	...	205	70	...
3	...	205	70	...
4	...	205	70	...
5	...	205	70	...
6	...	205	70	...
7	...	205	70	...
8	...	205	70	...
9	...	205	70	...
10	...	205	70	...
11	...	205	70	...
12	...	205	70	...
13	...	205	70	...
14	...	205	70	...
15	...	205	70	...
16	...	205	70	...
17	All	195	55	...
18	All	195	55	...
19	...	205	70	...
20	All	205	60	...
21	All	205	62	...
22	All	205	62	...
23	50 < DN ≤ 300	250	205	...
24	All	250	205	...
25	...	250	205	...
26	...	250	205	...
27	6 < DN ≤ 50	310	275	...
28	<102	310	275	...
29	...	310	275	...
30	...	205	45	...
31	All	205	60	...
32	All	205	62	...
33	All	205	62	...
34	...	205	62	...
35	...	205	60	...
36	...	205	70	...
37	...	205	70	...
38	...	205	70	...
39	...	205	70	...
40	...	205	70	...
41	...	205	70	...
42	...	220	105	...
43	50 < DN ≤ 300	250	205	...
44	All	250	205	...
45	...	250	205	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
2	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
3	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
4	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
5	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
6	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
7	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
8	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
9	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
10	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
11	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
12	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
13	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
14	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
15	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
16	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
17	55.2	48.5	48.5	48.5	48.3	46.9	44.9	42.8	41.2	...
18	55.2	48.5	48.5	48.5	48.3	46.9	44.9	42.8	41.2	...
19	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
20	62.1	54.6	54.6	54.6	54.3	52.8	50.5	48.1	46.4	...
21	62.1	54.6	54.6	54.6	54.3	52.8	50.5	48.1	46.4	...
22	62.1	54.6	54.6	54.6	54.3	52.8	50.5	48.1	46.4	...
23	207	205	199	193	186	178	170	161	152	...
24	207	205	199	193	186	178	170	161	152	...
25	207	205	199	193	186	178	170	161	152	...
26	207	205	199	193	186	178	170	161	152	...
27	276	264	258	254	246	233	215	185	154	...
28	276	264	258	254	246	233	215	185	154	...
29	276	264	258	254	246	233	215	185	154	...
30	44.8	39.6	39.6	39.6	39.4	38.3	36.7	34.9	33.7	...
31	62.1	54.6	54.6	54.6	54.3	52.8	50.5	48.1	46.4	...
32	62.1	54.6	54.6	54.6	54.3	52.8	50.5	48.1	46.4	...
33	62.1	54.6	54.6	54.6	54.3	52.8	50.5	48.1	46.4	...
34	62.1	54.6	54.6	54.6	54.3	52.8	50.5	48.1	46.4	...
35	62.1	54.6	54.6	54.6	54.3	52.8	50.5	48.1	46.4	...
36	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
37	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
38	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
39	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
40	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
41	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
42	103	102	99.4	96.7	92.9	89.2	84.9	80.5	76.2	...
43	207	205	199	193	186	178	170	161	152	...
44	207	205	199	193	186	178	170	161	152	...
45	207	205	199	193	186	178	170	161	152	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials (Cont'd)
1	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Nonferrous Materials (Cont'd)					
1	...	Finned tube	SB–359	...	C12200	H55
2	...	Smls. U–bend tube	SB–395	...	C12200	H55
3	...	Smls. pipe	SB–42	...	C12200	H80
4	...	Smls. cond. tube	SB–75	...	C12200	H80
5	...	Smls. tube	SB–111	...	C12200	H80
6	...	Plate, sheet, strip, bar	SB–152	...	C12300	H00
7	...	Plate, sheet, strip, bar	SB–152	...	C12300	H01
8	...	Plate, sheet, strip, bar	SB–152	...	C12300	H02
9	...	Plate, sheet, strip, bar	SB–152	...	C12300	H03
10	...	Plate, sheet, strip, bar	SB–152	...	C12300	H04
11	...	Plate, sheet, strip, bar	SB–152	...	C12300	M20, O25
12	...	Plate, sheet, strip	SB–152	...	C14200	M20, O25
13	...	Smls. cond. tube	SB–111	...	C14200	H55
14	...	Smls. U–bend tube	SB–395	...	C14200	H55
15	...	Smls. cond. tube	SB–111	...	C14200	H80
16	...	Smls. cond. tube	SB–111	...	C19200	O61
17	...	Smls. U–bend tube	SB–395	...	C19200	O61
18	...	Wld. cond. tube	SB–543	...	C19400	WO61
19	...	Wld. cond. tube	SB–543	...	C19400	WC55
20	...	Smls. pipe	SB–43	...	C23000	O61 and H58
21	...	Smls. cond. tube	SB–111	...	C23000	O61
22	...	Smls. tube	SB–135	...	C23000	O50 and O60
23	...	Smls. U–bend tube	SB–395	...	C23000	O61
24	...	Smls. cond. tube	SB–543	...	C23000	WO61 and WC55
25	...	Smls. tube	SB–111	...	C28000	O25
26	...	Plate	SB–171	...	C36500	O25 and M20
27	...	Plate	SB–171	...	C36500	O25 and M20
28	...	Plate	SB–171	...	C36500	O25 and M20
(**23**) 29	...	Forgings, brass	SB–283	...	C37700	M10
(**23**) 30	...	Forgings, brass	SB–283	...	C37700	M11
(**23**) 31	...	Forgings, brass	SB–283	...	C37700	O20
(**23**) 32	...	Forgings, brass	SB–283	...	C37700	M10
(**23**) 33	...	Forgings, brass	SB–283	...	C37700	M11
(**23**) 34	...	Forgings, brass	SB–283	...	C37700	O20
35	...	Plate	SB–171	...	C44300	M10, M20
36	...	Plate	SB–171	...	C44300	O20, O25
37	...	Smls. cond. tube	SB–111	...	C44300	O61
38	...	Finned tube	SB–359	...	C44300	O61
39	...	Smls. U–bend tube	SB–395	...	C44300	O61
40	...	Wld. cond. tube	SB–543	...	C44300	WO61
41	...	Plate	SB–171	...	C44400	M10, M20
42	...	Plate	SB–171	...	C44400	O20, O25
43	...	Smls. cond. tube	SB–111	...	C44400	O61
44	...	Finned tube	SB–359	...	C44400	O61
45	...	Smls. U–bend tube	SB–395	...	C44400	O61

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	...	250	205	...
2	...	250	205	...
3	6 < DN ≤ 50	310	275	...
4	<102	310	275	...
5	...	310	275	...
6	...	205	70	...
7	...	205	70	...
8	...	205	70	...
9	...	205	70	...
10	...	205	70	...
11	...	205	70	...
12	...	205	70	...
13	...	250	205	...
14	...	250	205	...
15	...	310	275	...
16	...	260	85	...
17	...	260	85	...
18	...	310	105	...
19	...	310	150	...
20	...	275	85	...
21	...	275	85	...
22	...	275	85	...
23	...	275	85	...
24	...	275	85	...
25	...	345	140	...
26	100 < t ≤ 140	275	85	...
27	50 < t ≤ 100	310	105	...
28	≤50	345	140	...
29	>38	315	100	...
30	>38	315	100	...
31	>38	315	100	...
32	≤38	345	125	...
33	≤38	345	125	...
34	≤38	345	125	...
35	≤100	310	105	...
36	≤100	310	105	...
37	...	310	105	...
38	...	310	105	...
39	...	310	105	...
40	...	310	105	...
41	≤100	310	105	...
42	≤100	310	105	...
43	...	310	105	...
44	...	310	105	...
45	...	310	105	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	207	205	199	193	186	178	170	161	152	...
2	207	205	199	193	186	178	170	161	152	...
3	276	264	258	254	246	233	215	185	154	...
4	276	264	258	254	246	233	215	185	154	...
5	276	264	258	254	246	233	215	185	154	...
6	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
7	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
8	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
9	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
10	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
11	68.9	60.7	60.7	60.7	60.4	58.7	56.1	53.4	51.5	...
12	68.9	58.7	55.5	55.0	53.7	52.5	50.7	48.8	46.9	...
13	207	205	199	193	186	178	170	161	152	...
14	207	205	199	193	186	178	170	161	152	...
15	276	264	258	254	246	233	215	185	154	...
16	82.7	73.9	68.8	65.8	64.0	62.2	60.9	59.2	57.3	...
17	82.7	73.9	68.8	65.8	64.0	62.2	60.9	59.2	57.3	...
18	103	102	100	98.2	95.0	92.6	88.9	85.6	82.6	...
19	152	150	147	144	140	135	131	126	121	...
20	82.7	82.7	82.7	82.7	82.7	82.7	82.3	80.5	77.3	...
21	82.7	82.7	82.7	82.7	82.7	82.7	82.3	80.5	77.3	...
22	82.7	82.7	82.7	82.7	82.7	82.7	82.3	80.5	77.3	...
23	82.7	82.7	82.7	82.7	82.7	82.7	82.3	80.5	77.3	...
24	82.7	82.7	82.7	82.7	82.7	82.7	82.3	80.5	77.3	...
25	138	138	138	138	138	138	138	138	133	...
26	82.7	82.7	82.7	82.7	82.7	82.7	82.7	82.7	79.8	...
27	103	103	103	103	103	103	103	103	100	...
28	138	138	138	138	138	138	138	138	133	...
29	103	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1
30	103	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1
31	103	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1
32	124	103	103	103	103	103	103	103	103	103
33	124	103	103	103	103	103	103	103	103	103
34	124	103	103	103	103	103	103	103	103	103
35	103	103	103	103	103	103	103	102	101	98.9
36	103	103	103	103	103	103	103	102	101	98.9
37	103	103	103	103	103	103	103	102	101	98.9
38	103	103	103	103	103	103	103	102	101	98.9
39	103	103	103	103	103	103	103	102	101	98.9
40	103	103	103	103	103	103	103	102	101	98.9
41	103	103	103	103	103	103	103	102	101	98.9
42	103	103	103	103	103	103	103	102	101	98.9
43	103	103	103	103	103	103	103	102	101	98.9
44	103	103	103	103	103	103	103	102	101	98.9
45	103	103	103	103	103	103	103	102	101	98.9

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials (Cont'd)
1	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Nonferrous Materials (Cont'd)					
1	...	Wld. cond. tube	SB–543	...	C44400	WO61
2	...	Plate	SB–171	...	C44500	M10, M20
3	...	Plate	SB–171	...	C44500	O20, O25
4	...	Smls. cond. tube	SB–111	...	C44500	O61
5	...	Finned tube	SB–359	...	C44500	O61
6	...	Smls. U–bend tube	SB–395	...	C44500	O61
7	...	Wld. cond. tube	SB–543	...	C44500	WO61
8	...	Plate	SB–171	...	C46400	M10, M20
9	...	Plate	SB–171	...	C46400	O20, O25
10	...	Plate	SB–171	...	C46500	M10, M20
11	...	Plate	SB–171	...	C46500	O20, O25
12	...	Smls. cond. tube	SB–111	...	C60800	O61
13	...	Smls. U–bend tube	SB–395	...	C60800	O61
14	...	Plate, sheet	SB–169	...	C61400	O25 or O60
15	...	Plate	SB–171	...	C61400	M10, M20, O20, O25
16	...	Bar	SB–150	...	C61400	HR50
17	...	Plate, sheet	SB–169	...	C61400	O25 or O60
18	...	Plate	SB–171	...	C61400	M10, M20, O20, O25
19	...	Bar	SB–150	...	C61400	HR50
20	...	Plate, sheet	SB–169	...	C61400	O25 or O60
21	...	Bar	SB–150	...	C61400	HR50
22	...	Bar	SB–150	...	C61400	HR50
23	...	Plate	SB–171	...	C63000	M10, M20, O20, O25
24	...	Plate	SB–171	...	C63000	M10, M20, O20, O25
25	...	Bar, rod	SB–150	...	C63000	M20, M30
26	...	Bar, rod	SB–150	...	C63000	O20, O25, O30
27	...	Bar, rod	SB–150	...	C63000	HR50
28	...	Bar, rod	SB–150	...	C63000	HR50
29	...	Bar, rod	SB–150	...	C63000	M20, M30
30	...	Bar, rod	SB–150	...	C63000	O20, O25, O30
31	...	Plate	SB–171	...	C63000	M10, M20, O20, O25
32	...	Bar, rod	SB–150	...	C63000	HR50
33	...	Bar, rod	SB–150	...	C63000	HR50
(**23**) 34	...	Forgings	SB–283	...	C64200	M10
(**23**) 35	...	Forgings	SB–283	...	C64200	M10
(**23**) 36	...	Bar, rod	SB–150	...	C64200	M10, M20, M30
37	...	Bar, rod	SB–150	...	C64200	M30
(**23**) 38	...	Bar, rod	SB–150	...	C64200	M10, M20, M30
(**23**) 39	...	Bar, rod	SB–150	...	C64200	HR50
(**23**) 40	...	Bar, rod	SB–150	...	C64200	HR50
(**23**) 41	...	Bar, rod	SB–150	...	C64200	HR50
(**23**) 42	...	Bar, rod	SB–150	...	C64200	HR50
43	...	Bar, rod	SB–98	...	C65100	O60
44	...	Bar, rod	SB–98	...	C65100	H02
45	...	Rod	SB–98	...	C65100	H06

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	...	310	105	...
2	≤100	310	105	...
3	≤100	310	105	...
4	...	310	105	...
5	...	310	105	...
6	...	310	105	...
7	...	310	105	...
8	80 < t ≤ 140	345	125	...
9	≤80	345	140	...
10	80 < t ≤ 140	345	125	...
11	≤80	345	140	...
12	...	345	130	...
13	...	345	130	...
14	50 < t ≤ 140	450	195	...
15	50 < t ≤ 140	450	195	...
16	50 < t ≤ 80	485	205	...
17	12 < t ≤ 50	485	205	...
18	≤50	485	205	...
19	25 < t ≤ 50	485	220	...
20	≤12	495	220	...
21	12 < t ≤ 25	515	240	...
22	≤12	550	275	...
23	100 < t ≤ 140	550	205	...
24	50 < t ≤ 100	585	230	...
25	>100	550	275	...
26	>100	550	275	...
27	>100	550	275	...
28	50 < t ≤ 100	585	295	...
29	50 < t ≤ 100	585	295	...
30	50 < t ≤ 100	585	295	...
31	≤50	620	250	...
32	25 < t ≤ 50	620	310	...
33	12 < t ≤ 25	690	345	...
34	>38	470	160	...
35	≤38	485	170	...
36	>100	485	170	...
37	>100	485	170	...
38	80 < t ≤ 100	485	205	...
39	50 < t ≤ 80	515	240	...
40	25 < t ≤ 50	550	290	...
41	12 < t ≤ 25	585	310	...
42	≤12	620	310	...
43	All	275	85	...
44	≤50	380	140	...
45	25 < t ≤ 38	515	275	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	103	103	103	103	103	103	103	102	101	98.9
2	103	103	103	103	103	103	103	102	101	98.9
3	103	103	103	103	103	103	103	102	101	98.9
4	103	103	103	103	103	103	103	102	101	98.9
5	103	103	103	103	103	103	103	102	101	98.9
6	103	103	103	103	103	103	103	102	101	98.9
7	103	103	103	103	103	103	103	102	101	98.9
8	124	124	124	124	124	124	123	120	116	...
9	138	138	138	138	138	138	136	133	129	...
10	124	124	124	124	124	124	123	120	116	...
11	138	138	138	138	138	138	136	133	129	...
12	131	126	126	126	124	121	118	115	112	108
13	131	126	126	126	124	121	118	115	112	108
14	193	192	191	189	189	188	186	184	182	180
15	193	192	191	189	189	188	186	184	182	180
16	207	206	204	203	202	201	199	197	195	193
17	207	206	204	203	202	201	199	197	195	193
18	207	206	204	203	202	201	199	197	195	193
19	221	220	218	216	216	215	213	210	208	206
20	221	220	218	216	216	215	213	210	208	206
21	240	239	237	235	235	233	231	228	226	224
22	275	274	271	269	269	268	265	261	259	256
23	207	207	207	207	207	207	207	206	205	202
24	228	228	228	228	228	228	228	227	225	222
25	276	276	276	276	276	276	276	275	273	269
26	276	276	276	276	276	276	276	275	273	269
27	276	276	276	276	276	276	276	275	273	269
28	293	293	293	293	293	293	293	292	290	286
29	293	293	293	293	293	293	293	292	290	286
30	293	293	293	293	293	293	293	292	290	286
31	248	248	248	248	248	248	248	247	245	242
32	310	310	310	310	310	310	310	309	307	303
33	345	345	345	345	345	345	345	343	341	337
34	158	149	146	146	146	146	146	146	146	146
35	172	162	159	159	159	159	159	159	159	159
36	172	162	159	159	159	159	159	159	159	159
37	172	...	...	...	...	...	...	...	...	...
38	207	194	191	190	190	190	190	190	190	190
39	241	227	222	222	222	222	222	222	222	222
40	289	272	267	267	267	267	267	267	267	267
41	310	291	286	286	286	286	286	286	286	286
42	310	291	286	286	286	286	286	286	286	286
43	82.7	82.1	81.5	81.0	80.4	79.6	78.7	77.4	75.7	...
44	138	138	136	133	129	125	119	114	108	...
45	276	271	263	257	250	242	233	222	209	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials (Cont'd)
1	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...
23	197	189	176	156	...	...	...	...	...	...
24	217	208	193	171	...	...	...	...	...	...
25	263	252	234	207	...	...	...	...	...	...
26	263	252	234	207	...	...	...	...	...	...
27	263	252	234	207	...	...	...	...	...	...
28	279	268	249	220	...	...	...	...	...	...
29	279	268	249	220	...	...	...	...	...	...
30	279	268	249	220	...	...	...	...	...	...
31	237	227	211	187	...	...	...	...	...	...
32	296	283	263	233	...	...	...	...	...	...
33	329	315	293	259	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
		Nonferrous Materials (Cont'd)					
	1	...	Rod	SB–98	...	C65100	H06
	2	...	Rod	SB–98	...	C65100	H06
(**23**)	3	...	Smls. pipe & tube	SB–315	...	C65500	O61
	4	...	Plate, sheet	SB–96	...	C65500	O61
	5	...	Bar, rod	SB–98	...	C65500	O60
	6	...	Rod	SB–98	...	C65500	H01
	7	...	Bar, rod	SB–98	...	C65500	H02
	8	...	Rod	SB–98	...	C66100	O60
	9	...	Rod	SB–98	...	C66100	H01
	10	...	Rod	SB–98	...	C66100	H02
(**23**)	11	...	Smls. cond. tube	SB–111	...	C68700	O61
(**23**)	12	...	Smls. U–bend tube	SB–395	...	C68700	O61
(**23**)	13	...	Wld. cond. tube	SB–543	...	C68700	WO61
(**23**)	14	...	Smls. cond. tube	SB–111	...	C70400	O61
(**23**)	15	...	Wld. tube	SB–543	...	C70400	WO61
(**23**)	16	...	Smls. cond. tube	SB–111	...	C70400	H55
	17	...	Smls. pipe & tube	SB–466	...	C70600	O60
	18	...	Wld. pipe	SB–467	...	C70600	WO61
	19	...	Bar, rod	SB–151	...	C70600	O60
	20	...	Plate, sheet	SB–171	...	C70600	M10, M20
	21	...	Plate, sheet	SB–171	...	C70600	O20, O25
	22	...	Smls. cond. tube	SB–111	...	C70600	O61
	23	...	Finned tube	SB–359	...	C70600	O61
	24	...	Smls. U–bend tube	SB–395	...	C70600	O61
	25	...	Wld. pipe	SB–467	...	C70600	WO61
	26	...	Wld. tube	SB–543	...	C70600	WO61
	27	...	Finned wld. tube	SB–956	...	C70600	WO61
	28	...	Wld. pipe	SB–467	...	C70600	WM50
	29	...	Smls. tube	SB–111	...	C70600	H55
	30	...	Smls. pipe & tube	SB–466	...	C70600	H55
	31	...	Wld. tube	SB–543	...	C70600	WC55
	32	...	Finned wld. tube	SB–956	...	C70600	WC55
	33	...	Wld. pipe	SB–467	...	C70600	Wld. fr. cold rld. strip
	34	...	Smls. pipe & tube	SB–466	...	C70620	O60
	35	...	Wld. pipe	SB–467	...	C70620	WO61
	36	...	Bar, rod	SB–151	...	C70620	O60
	37	...	Forgings	SB–283	...	C70620	M10
	38	...	Plate, sheet	SB–171	...	C70620	M10, M20
	39	...	Forgings	SB–283	...	C70620	O20
	40	...	Plate, sheet	SB–171	...	C70620	O20, O25
	41	...	Smls. cond. tube	SB–111	...	C70620	O61
	42	...	Finned tube	SB–359	...	C70620	O61
	43	...	Smls. U–bend tube	SB–395	...	C70620	O61
	44	...	Wld. pipe	SB–467	...	C70620	WO61
	45	...	Wld. tube	SB–543	...	C70620	WO61

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	12 < t ≤ 25	515	310	...
2	t ≤ 12	585	380	...
3	...	345	103	...
4	≤50	345	125	...
5	All	360	105	...
6	All	380	165	...
7	≤50	485	260	...
8	All	360	105	...
9	All	380	165	...
10	≤50	485	260	...
11	...	345	125	...
12	...	345	125	...
13	...	345	125	...
14	...	260	85	...
15	...	260	85	...
16	...	275	205	...
17	...	260	90	...
18	>114	260	90	...
19	All	260	105	...
20	≤140	275	105	...
21	≤140	275	105	...
22	...	275	105	...
23	...	275	105	...
24	...	275	105	...
25	≤114	275	105	...
26	...	275	105	...
27	...	275	105	...
28	≤114	310	205	...
29	...	310	240	...
30	...	310	240	...
31	...	310	240	...
32	...	310	240	...
33	≤114	370	310	...
34	...	260	90	...
35	>114	260	90	...
36	All	260	105	...
37	>152	276	103	...
38	≤140	275	105	...
39	...	276	103	...
40	≤140	275	105	...
41	...	275	105	...
42	...	275	105	...
43	...	275	105	...
44	≤114	275	105	...
45	...	275	105	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	310	305	296	289	281	272	262	250	235	...
2	379	372	362	354	344	333	320	305	287	...
3	103	103	103	103	102	102	101	100	98.6	...
4	124	124	123	123	122	122	121	120	118	...
5	103	103	103	103	102	102	101	100	98.6	...
6	165	162	158	155	151	148	145	143	140	...
7	262	259	255	252	246	239	227	212	191	...
8	103	103	103	103	102	102	101	100	98.6	...
9	165	162	158	155	151	148	145	143	140	...
10	262	259	255	252	246	239	227	212	191	...
11	124	123	122	121	120	119	118	117	115	112
12	124	123	122	121	120	119	118	117	115	112
13	124	123	122	121	120	119	118	117	115	112
14	82.7	79.8	77.6	76.5	75.7	75.2	74.9	74.9	74.9	74.9
15	82.7	79.8	77.6	76.5	75.7	75.2	74.9	74.9	74.9	74.9
16	207	199	194	191	189	188	187	187	187	187
17	89.6	86.9	84.3	82.4	80.6	79.4	78.1	76.9	75.6	74.7
18	89.6	86.9	84.3	82.4	80.6	79.4	78.1	76.9	75.6	74.7
19	103	101	97.4	95.6	93.7	91.8	89.9	88.6	87.3	86.4
20	103	101	97.4	95.6	93.7	91.8	89.9	88.6	87.3	86.4
21	103	101	97.4	95.6	93.7	91.8	89.9	88.6	87.3	86.4
22	103	101	97.4	95.6	93.7	91.8	89.9	88.6	87.3	86.4
23	103	101	97.4	95.6	93.7	91.8	89.9	88.6	87.3	86.4
24	103	101	97.4	95.6	93.7	91.8	89.9	88.6	87.3	86.4
25	103	101	97.4	95.6	93.7	91.8	89.9	88.6	87.3	86.4
26	103	101	97.4	95.6	93.7	91.8	89.9	88.6	87.3	86.4
27	103	101	97.4	95.6	93.7	91.8	89.9	88.6	87.3	86.4
28	207	201	195	191	187	183	180	177	175	173
29	241	235	228	223	218	213	210	206	204	202
30	241	235	228	223	218	213	210	206	204	202
31	241	235	228	223	218	213	210	206	204	202
32	241	235	228	223	218	213	210	206	204	202
33	310	301	293	286	280	275	270	266	262	260
34	89.6	86.9	84.3	82.4	80.6	79.4	78.1	76.9	75.6	74.7
35	89.6	86.9	84.3	82.4	80.6	79.4	78.1	76.9	75.6	74.7
36	103	101	97.4	95.6	93.7	91.8	89.9	88.6	87.3	86.4
37	103	101	97.4	95.6	93.7	91.8	89.9	88.6	87.3	86.4
38	103	101	97.4	95.6	93.7	91.8	89.9	88.6	87.3	86.4
39	103	101	97.4	95.6	93.7	91.8	89.9	88.6	87.3	86.4
40	103	101	97.4	95.6	93.7	91.8	89.9	88.6	87.3	86.4
41	103	101	97.4	95.6	93.7	91.8	89.9	88.6	87.3	86.4
42	103	101	97.4	95.6	93.7	91.8	89.9	88.6	87.3	86.4
43	103	101	97.4	95.6	93.7	91.8	89.9	88.6	87.3	86.4
44	103	101	97.4	95.6	93.7	91.8	89.9	88.6	87.3	86.4
45	103	101	97.4	95.6	93.7	91.8	89.9	88.6	87.3	86.4

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials (Cont'd)
1	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...
11	110	...	...	...	...	...	...	...	...	...
12	110	...	...	...	...	...	...	...	...	...
13	110	...	...	...	...	...	...	...	...	...
14	74.9	...	...	...	...	...	...	...	...	...
15	74.9	...	...	...	...	...	...	...	...	...
16	187	...	...	...	...	...	...	...	...	...
17	74.5	74.5	...	...	...	...	...	...	...	...
18	74.5	74.5	...	...	...	...	...	...	...	...
19	85.9	85.3	...	...	...	...	...	...	...	...
20	85.9	85.3	...	...	...	...	...	...	...	...
21	85.9	85.3	...	...	...	...	...	...	...	...
22	85.9	85.3	...	...	...	...	...	...	...	...
23	85.9	85.3	...	...	...	...	...	...	...	...
24	85.9	85.3	...	...	...	...	...	...	...	...
25	85.9	85.3	...	...	...	...	...	...	...	...
26	85.9	85.3	...	...	...	...	...	...	...	...
27	85.9	85.3	...	...	...	...	...	...	...	...
28	172	171	...	...	...	...	...	...	...	...
29	201	199	...	...	...	...	...	...	...	...
30	201	199	...	...	...	...	...	...	...	...
31	201	199	...	...	...	...	...	...	...	...
32	201	199	...	...	...	...	...	...	...	...
33	258	257	...	...	...	...	...	...	...	...
34	74.5	74.5	...	...	...	...	...	...	...	...
35	74.5	74.5	...	...	...	...	...	...	...	...
36	85.9	85.3	...	...	...	...	...	...	...	...
37	85.9	85.3	...	...	...	...	...	...	...	...
38	85.9	85.3	...	...	...	...	...	...	...	...
39	85.9	85.3	...	...	...	...	...	...	...	...
40	85.9	85.3	...	...	...	...	...	...	...	...
41	85.9	85.3	...	...	...	...	...	...	...	...
42	85.9	85.3	...	...	...	...	...	...	...	...
43	85.9	85.3	...	...	...	...	...	...	...	...
44	85.9	85.3	...	...	...	...	...	...	...	...
45	85.9	85.3	...	...	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

INTENTIONALLY LEFT BLANK

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
		Nonferrous Materials (Cont'd)					
	1	...	Finned wld. tube	SB–956	...	C70620	WO61
	2	...	Forgings	SB–283	...	C70620	M10
	3	...	Wld. pipe	SB–467	...	C70620	WM50
	4	...	Smls. tube	SB–111	...	C70620	H55
	5	...	Smls. pipe & tube	SB–466	...	C70620	H55
	6	...	Wld. tube	SB–543	...	C70620	WC55
	7	...	Finned wld. tube	SB–956	...	C70620	WC55
	8	...	Wld. pipe	SB–467	...	C70620	Wld. fr. cold rld. strip
(**23**)	9	...	Smls. tube	SB–466	...	C71000	O60
(**23**)	10	...	Smls. cond. tube	SB–111	...	C71000	O61
(**23**)	11	...	Finned tube	SB–359	...	C71000	O61
(**23**)	12	...	Smls. tube	SB–395	...	C71000	O61
	13	...	Wld. pipe	SB–467	...	C71500	WO61
	14	...	Plate, sheet	SB–171	...	C71500	M10, M20, O20, O25
	15	...	Plate, sheet	SB–171	...	C71500	M10, M20, O20, O25
	16	...	Wld. pipe	SB–467	...	C71500	WO61
	17	...	Smls. pipe & tube	SB–466	...	C71500	O60
	18	...	Smls. cond. tube	SB–111	...	C71500	O61
	19	...	Finned tube	SB–359	...	C71500	O61
	20	...	Smls. U–bend tube	SB–395	...	C71500	O61
	21	...	Wld. tube	SB–543	...	C71500	WO61
	22	...	Finned wld. tube	SB–956	...	C71500	WO61
(**23**)	23	...	Smls. cond. tube	SB–111	...	C71500	HR50
(**23**)	24	...	Smls. U–bend tube	SB–395	...	C71500	HR50
	25	...	Wld. pipe	SB–467	...	C71520	WO61
	26	...	Forgings	SB–283	...	C71520	M10
	27	...	Forgings	SB–283	...	C71520	O20
	28	...	Plate, sheet	SB–171	...	C71520	O25
	29	...	Forgings	SB–283	...	C71520	M10
	30	...	Plate, sheet	SB–171	...	C71520	O25
	31	...	Wld. pipe	SB–467	...	C71520	WO61
	32	...	Smls. pipe & tube	SB–466	...	C71520	O60
	33	...	Smls. cond. tube	SB–111	...	C71520	O61
	34	...	Finned tube	SB–359	...	C71520	O61
	35	...	Smls. U–bend tube	SB–395	...	C71520	O61
	36	...	Wld. tube	SB–543	...	C71520	WO61
	37	...	Finned wld. tube	SB–956	...	C71520	WO61
(**23**)	38	...	Smls. cond. tube	SB–111	...	C71520	HR50
(**23**)	39	...	Smls. U–bend tube	SB–395	...	C71520	HR50
(**23**)	40	...	Smls. cond. tube	SB–111	...	C72200	O61
	41	...	Castings	SB–62	...	C83600	...
	42	...	Castings	SB–61	...	C92200	M01
	43	...	Castings	SB–584	...	C92200	M01
	44	...	Castings	SB–584	...	C93700	M01
	45	...	Castings	SB–148	...	C95200	M01

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	...	275	105	...
2	≤152	310	124	...
3	≤114	310	205	...
4	...	310	240	...
5	...	310	240	...
6	...	310	240	...
7	...	310	240	...
8	≤114	370	310	...
9	...	310	110	...
10	...	310	110	...
11	...	310	110	...
12	...	310	110	...
13	>114	310	105	...
14	$60 < t \leq 140$	310	125	...
15	≤60	345	140	...
16	≤114	345	140	...
17	...	360	125	...
18	...	360	125	...
19	...	360	125	...
20	...	360	125	...
21	...	360	125	...
22	...	360	125	...
23	...	495	345	...
24	...	495	345	...
25	>114	310	105	...
26	>152	310	124	...
27	...	310	124	...
28	$60 < t \leq 140$	310	125	...
29	≤152	345	138	...
30	≤60	345	140	...
31	≤114	345	140	...
32	...	360	125	...
33	...	360	125	...
34	...	360	125	...
35	...	360	125	...
36	...	360	125	...
37	...	360	125	...
38	...	495	345	...
39	...	495	345	...
40	...	310	110	...
41	...	205	95	...
42	...	235	110	...
43	...	234	110	...
44	...	207	83	...
45	...	450	170	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	103	101	97.4	95.6	93.7	91.8	89.9	88.6	87.3	86.4
2	124	122	117	115	113	111	108	107	105	104
3	207	201	195	191	187	183	180	177	175	173
4	241	235	228	223	218	213	210	206	204	202
5	241	235	228	223	218	213	210	206	204	202
6	241	235	228	223	218	213	210	206	204	202
7	241	235	228	223	218	213	210	206	204	202
8	310	301	293	286	280	275	270	266	262	260
9	110	108	105	103	100	97.6	95.2	92.9	90.7	88.7
10	110	107	105	102	99.9	97.4	95.0	92.7	90.5	88.5
11	110	107	105	102	99.9	97.4	95.0	92.7	90.5	88.5
12	110	107	105	102	99.9	97.4	95.0	92.7	90.5	88.5
13	103	99.8	97.0	95.0	93.0	91.1	89.3	87.6	86.1	84.7
14	124	120	117	114	112	109	107	105	103	102
15	138	133	129	126	124	122	119	117	115	113
16	138	133	129	126	124	122	119	117	115	113
17	124	120	117	114	112	109	107	105	103	102
18	124	120	117	114	112	109	107	105	103	102
19	124	120	117	114	112	109	107	105	103	102
20	124	120	117	114	112	109	107	105	103	102
21	124	120	117	114	112	109	107	105	103	102
22	124	120	117	114	112	109	107	105	103	102
23	345	333	326	322	318	315	311	307	304	301
24	345	333	326	322	318	315	311	307	304	301
25	103	99.8	97.0	95.0	93.0	91.1	89.3	87.6	86.1	84.7
26	124	120	117	114	112	109	107	105	103	102
27	124	120	117	114	112	109	107	105	103	102
28	124	120	117	114	112	109	107	105	103	102
29	138	133	129	126	124	122	119	117	115	113
30	138	133	129	126	124	122	119	117	115	113
31	138	133	129	126	124	122	119	117	115	113
32	124	120	117	114	112	109	107	105	103	102
33	124	120	117	114	112	109	107	105	103	102
34	124	120	117	114	112	109	107	105	103	102
35	124	120	117	114	112	109	107	105	103	102
36	124	120	117	114	112	109	107	105	103	102
37	124	120	117	114	112	109	107	105	103	102
38	345	333	326	322	318	315	311	307	304	301
39	345	333	326	322	318	315	311	307	304	301
40	110	108	104	102	99.6	97.8	96.1	94.6	93.3	...
41	96.5	90.2	86.0	83.3	80.8	78.4	75.9	73.3	70.6	67.6
42	110	104	97.8	94.8	92.9	91.9	91.2	90.6	89.8	88.7
43	110	104	97.8	94.8	92.9	91.9	91.2	90.6	89.8	88.7
44	82.7	76.4	73.3	71.7	70.6	69.8	69.2	68.5	67.8	67.4
45	172	162	156	153	150	148	147	146	146	146

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials (Cont'd)
1	85.9	85.3	...	...	...	...	...	...	...	...
2	103	103	...	...	...	...	...	...	...	...
3	172	171	...	...	...	...	...	...	...	...
4	201	199	...	...	...	...	...	...	...	...
5	201	199	...	...	...	...	...	...	...	...
6	201	199	...	...	...	...	...	...	...	...
7	201	199	...	...	...	...	...	...	...	...
8	258	257	...	...	...	...	...	...	...	...
9	86.9	85.3	83.8	82.4	81.0	79.6	78.1	76.3	74.1	...
10	86.7	85.1	83.6	82.2	80.9	79.5	77.9	76.1	74.0	...
11	86.7	85.1	83.6	82.2	80.9	79.5	77.9	76.1	74.0	...
12	86.7	85.1	83.6	82.2	80.9	79.5	77.9	76.1	74.0	...
13	83.4	82.4	81.5	80.9	...	...	...	...	...	...
14	100	98.8	97.7	97.1	...	...	...	...	...	...
15	112	110	109	108	...	...	...	...	...	...
16	112	110	109	108	...	...	...	...	...	...
17	100	98.8	97.7	97.1	...	...	...	...	...	...
18	100	98.8	97.7	97.1	...	...	...	...	...	...
19	100	98.8	97.7	97.1	...	...	...	...	...	...
20	100	98.8	97.7	97.1	...	...	...	...	...	...
21	100	98.8	97.7	97.1	...	...	...	...	...	...
22	100	98.8	97.7	97.1	...	...	...	...	...	...
23	299	297	295	293	...	...	...	...	...	...
24	299	297	295	293	...	...	...	...	...	...
25	83.4	82.4	81.5	80.9	...	...	...	...	...	...
26	100	98.8	97.7	97.1	...	...	...	...	...	...
27	100	98.8	97.7	97.1	...	...	...	...	...	...
28	100	98.8	97.7	97.1	...	...	...	...	...	...
29	112	110	109	108	...	...	...	...	...	...
30	112	110	109	108	...	...	...	...	...	...
31	112	110	109	108	...	...	...	...	...	...
32	100	98.8	97.7	97.1	...	...	...	...	...	...
33	100	98.8	97.7	97.1	...	...	...	...	...	...
34	100	98.8	97.7	97.1	...	...	...	...	...	...
35	100	98.8	97.7	97.1	...	...	...	...	...	...
36	100	98.8	97.7	97.1	...	...	...	...	...	...
37	100	98.8	97.7	97.1	...	...	...	...	...	...
38	299	297	295	293	...	...	...	...	...	...
39	299	297	295	293	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...
41	64.2	60.3	55.9	...	...	...	...	...	...	...
42	87.9	87.9	87.9	...	...	...	...	...	...	...
43	87.9	87.9	87.9	...	...	...	...	...	...	...
44	67.4	...	...	...	...	...	...	...	...	...
45	146	146	...	...	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Nonferrous Materials (Cont'd)					
1	...	Castings	SB–271	...	C95200	M02
2	...	Castings	SB–505	...	C95200	M07
3	...	Castings	SB–148	...	C95400	M01
4	...	Castings	SB–271	...	C95400	M02
5	...	Castings	SB–148	...	C95800	M01
6	...	Castings	SB–148	...	C95820	M01
7	...	Castings	SB–369	...	C96200	M01
(**23**) 8	...	Castings	SB–584	...	C97600	M01
9	99Ni	Bolting	SB–160	...	N02200	Annealed
10	99Ni	Plate, sheet, strip	SB–162	...	N02200	As rolled
11	99Ni	Bolting	SB–160	...	N02200	Hot fin./ann.
12	99Ni	Bolting	SB–160	...	N02200	Cold drawn
13	99Ni	Smls. pipe & tube	SB–161	...	N02200	Stress rel.
14	99Ni	Smls. tube	SB–163	...	N02200	Stress rel.
15	99Ni–Low C	Smls. pipe & tube	SB–161	...	N02201	Annealed
16	99Ni–Low C	Smls. & wld. fittings	SB–366	...	N02201	Annealed
17	99Ni–Low C	Bar, rod	SB–160	...	N02201	Hot rolled/ann.
18	99Ni–Low C	Smls. pipe & tube	SB–161	...	N02201	Annealed
19	99Ni–Low C	Smls. tube	SB–163	...	N02201	Annealed
20	99Ni–Low C	Plate, sheet, strip	SB–162	...	N02201	Hot rolled/ann.
21	67Ni–30Cu	Bar	SB–164	...	N04400	Annealed
22	67Ni–30Cu	Smls. pipe & tube	SB–165	...	N04400	Annealed
23	67Ni–30Cu	Forgings	SB–564	...	N04400	Annealed
24	67Ni–30Cu	Plate	SB–127	...	N04400	Annealed
25	67Ni–30Cu	Smls. tube	SB–163	...	N04400	Annealed
26	67Ni–30Cu	Smls. pipe & tube	SB–165	...	N04400	Annealed
27	67Ni–30Cu	Smls. & wld. fittings	SB–366	...	N04400	Annealed
28	67Ni–30Cu	Plate	SB–127	...	N04400	As rolled
29	67Ni–30Cu	Rounds	SB–164	...	N04400	Hot worked
30	67Ni–30Cu	Rounds	SB–164	...	N04400	Hot worked
31	67Ni–30Cu	Rounds	SB–164	...	N04400	CW & SR
32	67Ni–30Cu	Rounds	SB–164	...	N04400	CW & SR
33	67Ni–30Cu	Smls. tube	SB–163	...	N04400	Stress rel.
34	67Ni–30Cu	Smls. pipe & tube	SB–165	...	N04400	Stress rel.
35	67Ni–30Cu	Rounds	SB–164	...	N04400	CW & SR
36	67Ni–30Cu	Rounds	SB–164	...	N04400	Cold worked
37	67Ni–30Cu–S	Bar	SB–164	...	N04405	Annealed
38	67Ni–30Cu–S	Bar	SB–164	...	N04405	Hot worked
39	67Ni–28Cu–3Al	Bolting	SF–468	...	N05500	Ann./aged
40	67Ni–28Cu–3Al	Bolting	SF–468	...	N05500	Ann./aged
41	47Ni–22Cr–9Mo–18Fe	Plate	SB–435	...	N06002	Annealed
42	47Ni–22Cr–9Mo–18Fe	Sheet	SB–435	...	N06002	Solution ann.
43	47Ni–22Cr–9Mo–18Fe	Rod	SB–572	...	N06002	Annealed
44	47Ni–22Cr–9Mo–18Fe	Smls. & wld. fittings	SB–366	...	N06002	Annealed
45	47Ni–22Cr–9Mo–18Fe	Sheet	SB–435	...	N06002	Annealed

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	...	450	170	...
2	...	470	180	...
3	...	515	205	...
4	...	515	205	...
5	...	585	240	...
6	...	650	270	...
7	...	310	170	...
8	...	276	117	...
9	...	380	100	...
10	...	380	140	...
11	...	415	100	...
12	...	450	275	...
13	...	450	275	...
14	...	450	275	...
15	>125 O.D.	345	69	...
16	...	345	69	...
17	...	345	69	...
18	≤125 O.D.	345	83	...
19	...	345	83	...
20	...	345	83	...
21	...	485	170	...
22	>125 O.D.	485	170	...
23	...	485	170	...
24	...	485	195	...
25	≤75	485	195	...
26	≤125 O.D.	485	195	...
27	...	485	195	...
28	...	515	275	...
29	$300 < t \leq 350$	515	275	...
30	≤300	550	275	...
31	<13	580	345	...
32	$89 < t \leq 100$	580	380	...
33	...	585	380	...
34	...	585	380	...
35	$13 < t \leq 89$	600	415	...
36	<13	760	585	...
37	...	485	170	...
38	...	515	240	...
39	25–38	895	585	...
40	6–22	895	620	...
41	>5	655	240	...
42	≤5	655	240	...
43	...	655	240	...
44	...	690	275	...
45	$1.5 < t \leq 5$	690	275	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	172	162	156	153	150	148	147	146	146	146
2	179	169	162	158	156	154	152	152	152	152
3	207	203	201	200	199	199	199	199	199	199
4	207	203	201	200	199	199	199	199	199	199
5	241	238	236	235	235	234	233	232	...	...
6	269	265	263	262	261	261	260	259	257	...
7	172	168	162	158	155	153	150	148	146	144
8	117	105	97.5	93.3	90.4	88.4	87.0	86.0	85.2	84.6
9	100	100	100	100	100	100	100	98.6	95.7	92.0
10	138	138	138	138	138	138	138	136	132	127
11	100	100	100	100	100	100	100	98.6	95.7	92.0
12	276	267	265	264	264	264	264	262	260	257
13	276	267	265	264	264	264	264	262	260	257
14	276	267	265	264	264	264	264	262	260	257
15	68.9	66.9	66.1	65.4	64.8	64.8	64.8	64.8	64.8	64.8
16	68.9	66.9	66.1	65.4	64.8	64.8	64.8	64.8	64.8	64.8
17	68.9	66.9	66.1	65.4	64.8	64.8	64.8	64.8	64.8	64.8
18	82.7	80.7	79.1	78.5	77.9	77.2	77.2	77.2	77.2	77.2
19	82.7	80.7	79.1	78.5	77.9	77.2	77.2	77.2	77.2	77.2
20	82.7	80.7	79.1	78.5	77.9	77.2	77.2	77.2	77.2	77.2
21	172	159	149	144	141	138	136	136	136	136
22	172	159	149	144	141	138	136	136	136	136
23	172	159	149	144	141	138	136	136	136	136
24	193	178	167	162	157	155	153	152	152	152
25	193	178	167	162	157	155	153	152	152	152
26	193	178	167	162	157	155	153	152	152	152
27	193	178	167	162	157	155	153	152	152	152
28	276	272	266	260	256	251	248	245	243	242
29	276	258	240	233	227	223	219	219	219	219
30	276	258	240	233	227	223	219	219	219	219
31	345	334	324	319	316	312	310	310	310	310
32	379	368	356	351	347	343	341	341	341	341
33	379	365	356	351	347	345	343	342	340	337
34	379	365	356	351	347	345	343	342	340	337
35	414	401	388	383	378	375	372	372	372	372
36	586	568	550	542	536	531	528	527	527	527
37	172	159	149	144	141	138	136	136	136	136
38	241	239	233	228	224	220	217	214	213	212
39	586	569	558	552	547	543	540	537	535	534
40	621	602	591	584	579	575	571	569	567	565
41	241	227	215	206	198	191	185	179	173	168
42	241	227	215	206	198	191	185	179	173	168
43	241	227	215	206	198	191	185	179	173	168
44	276	259	245	236	227	218	211	204	198	192
45	276	259	245	236	227	218	211	204	198	192

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials (Cont'd)
1	146	146	...	...	...	...	...	...	...	...
2	152	152	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...
7	143	143	143	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...
9	88.4	84.1	...	...	...	...	...	...	...	...
10	122	116	...	...	...	...	...	...	...	...
11	88.4	84.1	...	...	...	...	...	...	...	...
12	253	249	245	...	...	...	...	...	...	...
13	253	249	245	...	...	...	...	...	...	...
14	253	249	245	...	...	...	...	...	...	...
15	64.8	64.6	64.1	64.1	63.4	62.1	60.9	59.8	57.6	55.3
16	64.8	64.6	64.1	64.1	63.4	62.1	60.9	59.8	57.6	55.3
17	64.8	64.6	64.1	64.1	63.4	62.1	60.9	59.8	57.6	55.3
18	77.2	77.2	77.1	76.4	75.8	74.5	73.3	71.6	69.3	66.4
19	77.2	77.2	77.1	76.4	75.8	74.5	73.3	71.6	69.3	66.4
20	77.2	77.2	77.1	76.4	75.8	74.5	73.3	71.6	69.3	66.4
21	136	136	136	135	134	132	130	130	129	...
22	136	136	136	135	134	132	130	130	129	...
23	136	136	136	135	134	132	130	130	129	...
24	152	152	152	151	150	148	146	146	145	...
25	152	152	152	151	150	148	146	146	145	...
26	152	152	152	151	150	148	146	146	145	...
27	152	152	152	151	150	148	146	146	145	...
28	240	239	237	234	231	227	223	219	215	...
29	219	219	219	219	215	211	208	...	...	...
30	219	219	219	219	215	211	208	...	...	...
31	308	300	290	290	288	279	270	...	...	...
32	339	329	319	319	316	307	297	...	...	...
33	334	330	325	318	312	306	301	...	...	...
34	334	330	325	318	312	306	301	...	...	...
35	369	359	348	348	345	335	325	...	...	...
36	523	508	493	493	489	475	460	...	...	...
37	136	136	136	135	134	132	130	130	129	...
38	210	208	207	205	202	199	195	192	189	...
39	532	531	530	529	...	...	...	...	...	...
40	564	562	561	560	...	...	...	...	...	...
41	164	161	158	155	154	152	151	150	149	149
42	164	161	158	155	154	152	151	150	149	149
43	164	161	158	155	154	152	151	150	149	149
44	188	184	180	178	176	174	173	172	171	170
45	188	184	180	178	176	174	173	172	171	170

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	... (**23**)
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	54.1	52.3	50.5	48.6	46.7	...	...	...	...	...	...	...	...	...	...
16	54.1	52.3	50.5	48.6	46.7	...	...	...	...	...	...	...	...	...	...
17	54.1	52.3	50.5	48.6	46.7	...	...	...	...	...	...	...	...	...	...
18	65.0	62.9	60.7	58.4	56.1	...	...	...	...	...	...	...	...	...	...
19	65.0	62.9	60.7	58.4	56.1	...	...	...	...	...	...	...	...	...	...
20	65.0	62.9	60.7	58.4	56.1	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	148	147	146	144	143	141	139	136	132	129	124	119	113	106	98.0
42	148	147	146	144	143	141	139	136	132	129	124	119	113	106	98.0
43	148	147	146	144	143	141	139	136	132	129	124	119	113	106	98.0
44	169	168	167	165	164	161	159	156	152	147	142	136	129	121	113
45	169	168	167	165	164	161	159	156	152	147	142	136	129	121	113

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Nonferrous Materials (Cont'd)					
1	47Ni–22Cr–9Mo–18Fe	Wld. pipe	SB–619	...	N06002	Solution ann.
2	47Ni–22Cr–9Mo–18Fe	Smls. pipe & tube	SB–622	...	N06002	Solution ann.
3	47Ni–22Cr–9Mo–18Fe	Wld. tube	SB–626	...	N06002	Solution ann.
4	47Ni–22Cr–19Fe–6Mo	Rod	SB–581	...	N06007	Solution ann.
5	47Ni–22Cr–19Fe–6Mo	Plate, sheet, strip	SB–582	...	N06007	Solution ann.
6	47Ni–22Cr–19Fe–6Mo	Smls. & wld. fittings	SB–366	...	N06007	Annealed
7	47Ni–22Cr–19Fe–6Mo	Rod	SB–581	...	N06007	Solution ann.
8	47Ni–22Cr–19Fe–6Mo	Plate, sheet, strip	SB–582	...	N06007	Solution ann.
9	47Ni–22Cr–19Fe–6Mo	Wld. pipe	SB–619	...	N06007	Solution ann.
10	47Ni–22Cr–19Fe–6Mo	Smls. pipe & tube	SB–622	...	N06007	Solution ann.
11	47Ni–22Cr–19Fe–6Mo	Wld. tube	SB–626	...	N06007	Solution ann.
12	55Ni–21Cr–13.5Mo	Smls. & wld. fittings	SB–366	...	N06022	Solution ann.
13	55Ni–21Cr–13.5Mo	Forgings	SB–462	...	N06022	Solution ann.
14	55Ni–21Cr–13.5Mo	Forgings	SB–564	...	N06022	Solution ann.
15	55Ni–21Cr–13.5Mo	Rod	SB–574	...	N06022	Solution ann.
16	55Ni–21Cr–13.5Mo	Plate, sheet, strip	SB–575	...	N06022	Solution ann.
17	55Ni–21Cr–13.5Mo	Wld. pipe	SB–619	...	N06022	Solution ann.
18	55Ni–21Cr–13.5Mo	Smls. pipe & tube	SB–622	...	N06022	Solution ann.
19	55Ni–21Cr–13.5Mo	Wld. tube	SB–626	...	N06022	Solution ann.
20	60Ni–25Cr–9.5Fe–2.1Al	Smls. tube	SB–163	...	N06025	Annealed
21	60Ni–25Cr–9.5Fe–2.1Al	Plate, sheet, strip	SB–168	...	N06025	Annealed
22	60Ni–25Cr–9.5Fe–2.1Al	Wrought fittings	SB–366	...	N06025	Annealed
23	60Ni–25Cr–9.5Fe–2.1Al	Forgings	SB–462	...	N06025	Annealed
24	60Ni–25Cr–9.5Fe–2.1Al	Wld. tube	SB–516	...	N06025	Annealed
25	60Ni–25Cr–9.5Fe–2.1Al	Wld. pipe	SB–517	...	N06025	Annealed
26	60Ni–25Cr–9.5Fe–2.1Al	Forgings	SB–564	...	N06025	Annealed
27	60Ni–25Cr–9.5Fe–2.1Al	Bar	SB–166	...	N06025	HW or CW ann.
28	60Ni–25Cr–9.5Fe–2.1Al	Smls. pipe & tube	SB–167	...	N06025	HW or CW ann.
29	40Ni–29Cr–15Fe–5Mo	Smls. & wld. fittings	SB–366	...	N06030	Solution ann.
30	40Ni–29Cr–15Fe–5Mo	Forgings	SB–462	...	N06030	Solution ann.
31	40Ni–29Cr–15Fe–5Mo	Rod	SB–581	...	N06030	Solution ann.
32	40Ni–29Cr–15Fe–5Mo	Plate, sheet, strip	SB–582	...	N06030	Solution ann.
33	40Ni–29Cr–15Fe–5Mo	Wld. pipe	SB–619	...	N06030	Solution ann.
34	40Ni–29Cr–15Fe–5Mo	Smls. pipe & tube	SB–622	...	N06030	Solution ann.
35	40Ni–29Cr–15Fe–5Mo	Wld. tube	SB–626	...	N06030	Solution ann.
36	58Ni–33Cr–8Mo	Smls. & wld. fittings	SB–366	...	N06035	Solution ann.
37	58Ni–33Cr–8Mo	Forgings	SB–462	...	N06035	Solution ann.
38	58Ni–33Cr–8Mo	Forgings	SB–564	...	N06035	Solution ann.
39	58Ni–33Cr–8Mo	Rod	SB–574	...	N06035	Solution ann.
40	58Ni–33Cr–8Mo	Plate, sheet, strip	SB–575	...	N06035	Solution ann.
41	58Ni–33Cr–8Mo	Wld. pipe	SB–619	...	N06035	Solution ann.
42	58Ni–33Cr–8Mo	Smls. pipe & tube	SB–622	...	N06035	Solution ann.
43	58Ni–33Cr–8Mo	Wld. tube	SB–626	...	N06035	Solution ann.
44	46Ni–27Cr–23Fe–2.75Si	Rod	SB–166	...	N06045	Solution ann.
45	46Ni–27Cr–23Fe–2.75Si	Smls. pipe & tube	SB–167	...	N06045	Solution ann.

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	...	690	275	...
2	...	690	275	...
3	...	690	275	...
4	>19	585	205	...
5	>19	585	205	...
6	...	620	240	...
7	≤19	620	240	...
8	≤19	620	240	...
9	...	620	240	...
10	...	620	240	...
11	...	620	240	...
12	...	690	310	...
13	...	690	310	...
14	...	690	310	...
15	...	690	310	...
16	...	690	310	...
17	...	690	310	...
18	...	690	310	...
19	...	690	310	...
20	...	676	269	...
21	...	676	269	...
22	...	676	269	...
23	$t \le 102$	676	269	...
24	...	676	269	...
25	...	676	269	...
26	$t \le 102$	676	269	...
27	$t \le 102$	676	269	...
28	...	676	269	...
29	...	585	240	...
30	...	585	240	...
31	...	585	240	...
32	...	585	240	...
33	...	585	240	...
34	...	585	240	...
35	...	585	240	...
36	...	586	241	...
37	...	586	241	...
38	...	586	241	...
39	...	586	241	...
40	...	586	241	...
41	...	586	241	...
42	...	586	241	...
43	...	586	241	...
44	...	620	240	...
45	...	620	240	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	276	259	245	236	227	218	211	204	198	192
2	276	259	245	236	227	218	211	204	198	192
3	276	259	245	236	227	218	211	204	198	192
4	207	194	184	178	172	167	163	159	156	153
5	207	194	184	178	172	167	163	159	156	153
6	241	226	214	207	201	195	190	185	181	178
7	241	226	214	207	201	195	190	185	181	178
8	241	226	214	207	201	195	190	185	181	178
9	241	226	214	207	201	195	190	185	181	178
10	241	226	214	207	201	195	190	185	181	178
11	241	226	214	207	201	195	190	185	181	178
12	310	290	274	263	254	245	238	231	224	219
13	310	290	274	263	254	245	238	231	224	219
14	310	290	274	263	254	245	238	231	224	219
15	310	290	274	263	254	245	238	231	224	219
16	310	290	274	263	254	245	238	231	224	219
17	310	290	274	263	254	245	238	231	224	219
18	310	290	274	263	254	245	238	231	224	219
19	310	290	274	263	254	245	238	231	224	219
20	269	269	266	262	257	251	246	240	235	230
21	269	269	266	262	257	251	246	240	235	230
22	269	269	266	262	257	251	246	240	235	230
23	269	269	266	262	257	251	246	240	235	230
24	269	269	266	262	257	251	246	240	235	230
25	269	269	266	262	257	251	246	240	235	230
26	269	269	266	262	257	251	246	240	235	230
27	269	269	266	262	257	251	246	240	235	230
28	269	269	266	262	257	251	246	240	235	230
29	241	219	205	196	189	184	179	174	171	168
30	241	219	205	196	189	184	179	174	171	168
31	241	219	205	196	189	184	179	174	171	168
32	241	219	205	196	189	184	179	174	171	168
33	241	219	205	196	189	184	179	174	171	168
34	241	219	205	196	189	184	179	174	171	168
35	241	219	205	196	189	184	179	174	171	168
36	241	224	208	198	188	179	172	165	160	156
37	241	224	208	198	188	179	172	165	160	156
38	241	224	208	198	188	179	172	165	160	156
39	241	224	208	198	188	179	172	165	160	156
40	241	224	208	198	188	179	172	165	160	156
41	241	224	208	198	188	179	172	165	160	156
42	241	224	208	198	188	179	172	165	160	156
43	241	224	208	198	188	179	172	165	160	156
44	241	228	214	206	199	193	188	184	180	178
45	241	228	214	206	199	193	188	184	180	178

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials (Cont'd)
1	188	184	180	178	176	174	173	172	171	170
2	188	184	180	178	176	174	173	172	171	170
3	188	184	180	178	176	174	173	172	171	170
4	150	148	146	145	144	143	143	142	142	141
5	150	148	146	145	144	143	143	142	142	141
6	175	173	171	169	168	167	166	166	165	164
7	175	173	171	169	168	167	166	166	165	164
8	175	173	171	169	168	167	166	166	165	164
9	175	173	171	169	168	167	166	166	165	164
10	175	173	171	169	168	167	166	166	165	164
11	175	173	171	169	168	167	166	166	165	164
12	214	209	206	202	200	197	195	193	191	190
13	214	209	206	202	200	197	195	193	191	190
14	214	209	206	202	200	197	195	193	191	190
15	214	209	206	202	200	197	195	193	191	190
16	214	209	206	202	200	197	195	193	191	190
17	214	209	206	202	200	197	195	193	191	190
18	214	209	206	202	200	197	195	193	191	190
19	214	209	206	202	200	197	195	193	191	190
20	225	221	217	214	211	209	208	206	205	204
21	225	221	217	214	211	209	208	206	205	204
22	225	221	217	214	211	209	208	206	205	204
23	225	221	217	214	211	209	208	206	205	204
24	225	221	217	214	211	209	208	206	205	204
25	225	221	217	214	211	209	208	206	205	204
26	225	221	217	214	211	209	208	206	205	204
27	225	221	217	214	211	209	208	206	205	204
28	225	221	217	214	211	209	208	206	205	204
29	165	162	159	157	154	151	149	146	145	143
30	165	162	159	157	154	151	149	146	145	143
31	165	162	159	157	154	151	149	146	145	143
32	165	162	159	157	154	151	149	146	145	143
33	165	162	159	157	154	151	149	146	145	143
34	165	162	159	157	154	151	149	146	145	143
35	165	162	159	157	154	151	149	146	145	143
36	153	150	148	147	145	144	142	140	137	135
37	153	150	148	147	145	144	142	140	137	135
38	153	150	148	147	145	144	142	140	137	135
39	153	150	148	147	145	144	142	140	137	135
40	153	150	148	147	145	144	142	140	137	135
41	153	150	148	147	145	144	142	140	137	135
42	153	150	148	147	145	144	142	140	137	135
43	153	150	148	147	145	144	142	140	137	135
44	176	175	174	173	172	172	171	169	168	166
45	176	175	174	173	172	172	171	169	168	166

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	169	168	167	165	164	161	159	156	152	147	142	136	129	121	113
2	169	168	167	165	164	161	159	156	152	147	142	136	129	121	113
3	169	168	167	165	164	161	159	156	152	147	142	136	129	121	113
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	187	186	184	183	182	181	179	...	...	...	...	...	...	...	...
13	187	186	184	183	182	181	179	...	...	...	...	...	...	...	...
14	187	186	184	183	182	181	179	...	...	...	...	...	...	...	...
15	187	186	184	183	182	181	179	...	...	...	...	...	...	...	...
16	187	186	184	183	182	181	179	...	...	...	...	...	...	...	...
17	187	186	184	183	182	181	179	...	...	...	...	...	...	...	...
18	187	186	184	183	182	181	179	...	...	...	...	...	...	...	...
19	187	186	184	183	182	181	179	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Nonferrous Materials (Cont'd)					
1	46Ni–27Cr–23Fe–2.75Si	Plate, sheet, strip	SB–168	...	N06045	Solution ann.
2	46Ni–27Cr–23Fe–2.75Si	Smls. & wld. fittings	SB–366	...	N06045	Solution ann.
3	46Ni–27Cr–23Fe–2.75Si	Wld. tube	SB–516	...	N06045	Solution ann.
4	46Ni–27Cr–23Fe–2.75Si	Wld. pipe	SB–517	...	N06045	Solution ann.
5	46Ni–27Cr–23Fe–2.75Si	Forgings	SB–564	...	N06045	Solution ann.
6	59Ni–23Cr–16Mo	Fittings	SB–366	CR5923	N06059	Annealed
7	59Ni–23Cr–16Mo	Fittings	SB–366	WP5923	N06059	Annealed
8	59Ni–23Cr–16Mo	Wld. fittings	SB–366	WP5923W	N06059	Annealed
9	59Ni–23Cr–16Mo	Fittings	SB–366	WP5923WX	N06059	Annealed
10	59Ni–23Cr–16Mo	Forged fittings	SB–462	...	N06059	Solution ann.
11	59Ni–23Cr–16Mo	Forgings	SB–564	...	N06059	Solution ann.
12	59Ni–23Cr–16Mo	Rod	SB–574	...	N06059	Solution ann.
13	59Ni–23Cr–16Mo	Plate, sheet, strip	SB–575	...	N06059	Solution ann.
14	59Ni–23Cr–16Mo	Wld. pipe	SB–619	...	N06059	Solution ann.
15	59Ni–23Cr–16Mo	Smls. pipe & tube	SB–622	...	N06059	Solution ann.
16	59Ni–23Cr–16Mo	Wld. tube	SB–626	...	N06059	Solution ann.
17	59Ni–23Cr–16Mo–1.6Cu	Fittings	SB–366	...	N06200	Solution ann.
18	59Ni–23Cr–16Mo–1.6Cu	Forgings	SB–462	...	N06200	Solution ann.
19	59Ni–23Cr–16Mo–1.6Cu	Forgings	SB–564	...	N06200	Solution ann.
20	59Ni–23Cr–16Mo–1.6Cu	Rod	SB–574	...	N06200	Solution ann.
21	59Ni–23Cr–16Mo–1.6Cu	Plate, sheet, strip	SB–575	...	N06200	Solution ann.
22	59Ni–23Cr–16Mo–1.6Cu	Wld. pipe	SB–619	...	N06200	Solution ann.
23	59Ni–23Cr–16Mo–1.6Cu	Smls. pipe & tube	SB–622	...	N06200	Solution ann.
24	59Ni–23Cr–16Mo–1.6Cu	Wld. tube	SB–626	...	N06200	Solution ann.
25	60Ni–19Cr–19Mo–1.8Ta	Smls. & wld. fittings	SB–366	...	N06210	Solution ann.
26	60Ni–19Cr–19Mo–1.8Ta	Forgings	SB–564	...	N06210	Solution ann.
27	60Ni–19Cr–19Mo–1.8Ta	Rod	SB–574	...	N06210	Solution ann.
28	60Ni–19Cr–19Mo–1.8Ta	Plate, sheet, strip	SB–575	...	N06210	Solution ann.
29	60Ni–19Cr–19Mo–1.8Ta	Wld. pipe	SB–619	...	N06210	Solution ann.
30	60Ni–19Cr–19Mo–1.8Ta	Smls. pipe & tube	SB–622	...	N06210	Solution ann.
31	60Ni–19Cr–19Mo–1.8Ta	Wld. tube	SB–626	...	N06210	Solution ann.
32	57Ni–22Cr–14W–2Mo–La	Plate, sheet, strip	SB–435	...	N06230	Solution ann.
33	57Ni–22Cr–14W–2Mo–La	Forgings	SB–564	...	N06230	Solution ann.
34	57Ni–22Cr–14W–2Mo–La	Bar	SB–572	...	N06230	Solution ann.
35	57Ni–22Cr–14W–2Mo–La	Wld. pipe	SB–619	...	N06230	Solution ann.
36	57Ni–22Cr–14W–2Mo–La	Smls. pipe & tube	SB–622	...	N06230	Solution ann.
37	57Ni–22Cr–14W–2Mo–La	Wld. tube	SB–626	...	N06230	Solution ann.
38	61Ni–16Mo–16Cr	Smls. & wld. fittings	SB–366	...	N06455	Annealed
39	61Ni–16Mo–16Cr	Rod	SB–574	...	N06455	Solution ann.
40	61Ni–16Mo–16Cr	Plate, sheet, strip	SB–575	...	N06455	Solution ann.
41	61Ni–16Mo–16Cr	Wld. pipe	SB–619	...	N06455	Solution ann.
42	61Ni–16Mo–16Cr	Smls. pipe & tube	SB–622	...	N06455	Solution ann.
43	61Ni–16Mo–16Cr	Wld. tube	SB–626	...	N06455	Solution ann.
44	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Hot fin./ann.
(**23**) 45	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Hot fin./ann.

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	...	620	240	...
2	...	620	240	...
3	...	620	240	...
4	...	620	240	...
5	...	620	240	...
6	...	690	310	...
7	...	690	310	...
8	...	690	310	...
9	...	690	310	...
10	...	690	310	...
11	...	690	310	...
12	...	690	310	...
13	...	690	310	...
14	...	690	310	...
15	...	690	310	...
16	...	690	310	...
17	...	690	310	...
18	...	690	310	...
19	...	690	310	...
20	...	690	310	...
21	...	690	310	...
22	...	690	310	...
23	...	690	310	...
24	...	690	310	...
25	...	690	310	...
26	...	690	310	...
27	...	690	310	...
28	...	690	310	...
29	...	690	310	...
30	...	690	310	...
31	...	690	310	...
32	...	760	310	...
33	...	760	310	...
34	...	760	310	...
35	...	760	310	...
36	...	760	310	...
37	...	760	310	...
38	...	690	275	...
39	...	690	275	...
40	...	690	275	...
41	...	690	275	...
42	...	690	275	...
43	...	690	275	...
44	>125	515	170	...
45	>125	550	205	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	241	228	214	206	199	193	188	184	180	178
2	241	228	214	206	199	193	188	184	180	178
3	241	228	214	206	199	193	188	184	180	178
4	241	228	214	206	199	193	188	184	180	178
5	241	228	214	206	199	193	188	184	180	178
6	310	295	276	268	260	255	248	242	236	230
7	310	295	276	268	260	255	248	242	236	230
8	310	295	276	268	260	255	248	242	236	230
9	310	295	276	268	260	255	248	242	236	230
10	310	295	276	268	260	255	248	242	236	230
11	310	295	276	268	260	255	248	242	236	230
12	310	295	276	268	260	255	248	242	236	230
13	310	295	276	268	260	255	248	242	236	230
14	310	295	276	268	260	255	248	242	236	230
15	310	295	276	268	260	255	248	242	236	230
16	310	295	276	268	260	255	248	242	236	230
17	310	...	276	...	256	...	238	...	222	...
18	310	...	276	...	256	...	238	...	222	...
19	310	...	276	...	256	...	238	...	222	...
20	310	...	276	...	256	...	238	...	222	...
21	310	...	276	...	256	...	238	...	222	...
22	310	...	276	...	256	...	238	...	222	...
23	310	...	276	...	256	...	238	...	222	...
24	310	...	276	...	256	...	238	...	222	...
25	310	287	273	263	253	...	236	...	220	...
26	310	287	273	263	253	...	236	...	220	...
27	310	287	273	263	253	...	236	...	220	...
28	310	287	273	263	253	...	236	...	220	...
29	310	287	273	263	253	...	236	...	220	...
30	310	287	273	263	253	...	236	...	220	...
31	310	287	273	263	253	...	236	...	220	...
32	310	301	289	281	273	264	256	249	242	235
33	310	301	289	281	273	264	256	249	242	235
34	310	301	289	281	273	264	256	249	242	235
35	310	301	289	281	273	264	256	249	242	235
36	310	301	289	281	273	264	256	249	242	235
37	310	301	289	281	273	264	256	249	242	235
38	276	264	252	244	238	231	226	221	217	213
39	276	264	252	244	238	231	226	221	217	213
40	276	264	252	244	238	231	226	221	217	213
41	276	264	252	244	238	231	226	221	217	213
42	276	264	252	244	238	231	226	221	217	213
43	276	264	252	244	238	231	226	221	217	213
44	172	168	163	160	157	154	151	148	146	143
45	207	201	196	192	189	185	181	178	175	172

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials (Cont'd)
1	176	175	174	173	172	172	171	169	168	166
2	176	175	174	173	172	172	171	169	168	166
3	176	175	174	173	172	172	171	169	168	166
4	176	175	174	173	172	172	171	169	168	166
5	176	175	174	173	172	172	171	169	168	166
6	225	219	214	208	202	198	193	188	183	179
7	225	219	214	208	202	198	193	188	183	179
8	225	219	214	208	202	198	193	188	183	179
9	225	219	214	208	202	198	193	188	183	179
10	225	219	214	208	202	198	193	188	183	179
11	225	219	214	208	202	198	193	188	183	179
12	225	219	214	208	202	198	193	188	183	179
13	225	219	214	208	202	198	193	188	183	179
14	225	219	214	208	202	198	193	188	183	179
15	225	219	214	208	202	198	193	188	183	179
16	225	219	214	208	202	198	193	188	183	179
17	209	204	200	197	195	193	192	191	189	185
18	209	204	200	197	195	193	192	191	189	185
19	209	204	200	197	195	193	192	191	189	185
20	209	204	200	197	195	193	192	191	189	185
21	209	204	200	197	195	193	192	191	189	185
22	209	204	200	197	195	193	192	191	189	185
23	209	204	200	197	195	193	192	191	189	185
24	209	204	200	197	195	193	192	191	189	185
25	206	200	194	189	185	181	177	175	173	171
26	206	200	194	189	185	181	177	175	173	171
27	206	200	194	189	185	181	177	175	173	171
28	206	200	194	189	185	181	177	175	173	171
29	206	200	194	189	185	181	177	175	173	171
30	206	200	194	189	185	181	177	175	173	171
31	206	200	194	189	185	181	177	175	173	171
32	230	225	222	220	218	217	216	216	216	216
33	230	225	222	220	218	217	216	216	216	216
34	230	225	222	220	218	217	216	216	216	216
35	230	225	222	220	218	217	216	216	216	216
36	230	225	222	220	218	217	216	216	216	216
37	230	225	222	220	218	217	216	216	216	216
38	210	207	205	202	200	198	196	193	191	189
39	210	207	205	202	200	198	196	193	191	189
40	210	207	205	202	200	198	196	193	191	189
41	210	207	205	202	200	198	196	193	191	189
42	210	207	205	202	200	198	196	193	191	189
43	210	207	205	202	200	198	196	193	191	189
44	141	139	137	135	133	132	130	129	127	125
45	169	167	164	162	160	158	156	154	152	151

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	123	121	119	117	114	...	...	...	...	...	...	...	...	...	...
45	149	146	144	141	137	...	...	...	...	...	...	...	...	...	... (**23**)

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Nonferrous Materials (Cont'd)					
1	72Ni–15Cr–8Fe	Smls. & wld. fittings	SB–366	...	N06600	Annealed
2	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Cold drawn/ann.
3	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Hot fin./ann.
4	72Ni–15Cr–8Fe	Smls. tube	SB–163	...	N06600	Annealed
5	72Ni–15Cr–8Fe	Bar	SB–166	...	N06600	Annealed
6	72Ni–15Cr–8Fe	Plate	SB–168	...	N06600	Annealed
7	72Ni–15Cr–8Fe	Wld. tube	SB–516	...	N06600	Annealed
8	72Ni–15Cr–8Fe	Forgings	SB–564	...	N06600	...
9	72Ni–15Cr–8Fe	Smls. pipe & tube	SB–167	...	N06600	Cold drawn/ann.
10	72Ni–15Cr–8Fe	Wld. pipe	SB–517	...	N06600	Cold drawn/ann.
11	72Ni–15Cr–8Fe	Smls. tube	SB–163	...	N06600	...
12	72Ni–15Cr–8Fe	Bar, rod	SB–166	...	N06600	Hot worked
13	72Ni–15Cr–8Fe	Plate, sheet, strip	SB–168	...	N06600	Hot rolled
14	72Ni–15Cr–8Fe	Rounds	SB–166	...	N06600	Hot worked
15	72Ni–15Cr–8Fe	Rounds	SB–166	...	N06600	Hot worked
16	60Ni–23Cr–Fe	Smls. tube	SB–163	...	N06601	Annealed
17	60Ni–23Cr–Fe	Bar	SB–166	...	N06601	Annealed
18	60Ni–23Cr–Fe	Smls. pipe & tube	SB–167	...	N06601	Annealed
19	60Ni–23Cr–Fe	Plate, sheet, strip	SB–168	...	N06601	Annealed
20	52Ni–22Cr–13Co–9Mo	Bar, rod	SB–166	...	N06617	Annealed
21	52Ni–22Cr–13Co–9Mo	Smls. pipe & tube	SB–167	...	N06617	Annealed
22	52Ni–22Cr–13Co–9Mo	Plate, sheet, strip	SB–168	...	N06617	Annealed
23	52Ni–22Cr–13Co–9Mo	Forgings	SB–564	...	N06617	Annealed
(**23**) 24	52Ni–22Cr–13Co–9Mo	Wld. tube	SB–626	...	N06617	Solution ann.
(**23**) 25	60Ni–22Cr–9Mo–3.5Cb	Plate, sheet, strip	SB–443	2	N06625	Solution ann.
(**23**) 26	60Ni–22Cr–9Mo–3.5Cb	Plate, sheet	SB–443	2	N06625	Hot rolled/sol. ann.
27	60Ni–22Cr–9Mo–3.5Cb	Smls. pipe & tube	SB–444	2	N06625	Solution ann.
28	60Ni–22Cr–9Mo–3.5Cb	Bar	SB–446	2	N06625	Solution ann.
29	60Ni–22Cr–9Mo–3.5Cb	Smls. & wld. fittings	SB–366	...	N06625	Annealed
30	60Ni–22Cr–9Mo–3.5Cb	Bar	SB–446	1	N06625	Annealed
31	60Ni–22Cr–9Mo–3.5Cb	Forgings	SB–564	...	N06625	Annealed
32	60Ni–22Cr–9Mo–3.5Cb	Plate	SB–443	1	N06625	Cold rolled/annealed
(**23**) 33	60Ni–22Cr–9Mo–3.5Cb	Plate, sheet, strip	SB–443	1	N06625	Hot rolled/ann.
34	60Ni–22Cr–9Mo–3.5Cb	Sheet, strip	SB–443	1	N06625	Cold rolled/annealed
35	60Ni–22Cr–9Mo–3.5Cb	Smls. pipe	SB–444	1	N06625	Annealed
36	60Ni–22Cr–9Mo–3.5Cb	Bar	SB–446	1	N06625	Annealed
37	60Ni–22Cr–9Mo–3.5Cb	Forgings	SB–564	...	N06625	Annealed
38	60Ni–22Cr–9Mo–3.5Cb	Wld. tube	SB–704	...	N06625	Annealed
39	60Ni–22Cr–9Mo–3.5Cb	Wld. pipe	SB–705	...	N06625	Annealed
40	Ni–Cr–Mo–W	Forgings	SB–564	...	N06686	Solution ann.
41	Ni–Cr–Mo–W	Rod	SB–574	...	N06686	Solution ann.
42	Ni–Cr–Mo–W	Plate, sheet, strip	SB–575	...	N06686	Solution ann.
43	Ni–Cr–Mo–W	Wld. pipe	SB–619	...	N06686	Solution ann.
44	Ni–Cr–Mo–W	Smls. pipe & tube	SB–622	...	N06686	Solution ann.
45	Ni–Cr–Mo–W	Wld. tube	SB–626	...	N06686	Solution ann.

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	...	550	205	...
2	>125	550	205	...
3	≤125	550	205	...
4	≤75	550	240	...
5	...	550	240	...
6	...	550	240	...
7	...	550	240	...
8	...	550	240	...
9	≤125	550	240	...
10	...	550	240	...
11	...	550	275	...
12	>75	585	240	...
13	...	585	240	...
14	$13 < t \leq 75$	620	275	...
15	$6 < t \leq 13$	655	310	...
16	≤75 O.D.	552	207	...
17	...	552	207	...
18	...	552	207	...
19	...	552	207	...
20	...	655	240	...
21	...	655	240	...
22	...	655	240	...
23	...	655	240	...
24	...	655	240	...
25	...	690	275	...
26	...	690	276	...
27	...	690	275	...
28	...	690	275	...
29	...	760	345	...
30	$100 < t \leq 250$	760	345	...
31	$100 < t \leq 250$	760	345	...
32	≤9.5	758	379	...
33	≤70	758	379	...
34	...	827	414	...
35	...	825	415	...
36	≤100	825	415	...
37	≤100	825	415	...
38	...	825	415	...
39	...	825	415	...
40	...	689	310	...
41	...	689	310	...
42	...	689	310	...
43	≤203.2	689	310	...
44	...	689	310	...
45	≤88.9	689	310	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	207	201	196	192	189	185	181	178	175	172
2	207	201	196	192	189	185	181	178	175	172
3	207	201	196	192	189	185	181	178	175	172
4	241	226	220	217	215	213	212	211	209	208
5	241	226	220	217	215	213	212	211	209	208
6	241	226	220	217	215	213	212	211	209	208
7	241	226	220	217	215	213	212	211	209	208
8	241	226	220	217	215	213	212	211	209	208
9	241	226	220	217	215	213	212	211	209	208
10	241	226	220	217	215	213	212	211	209	208
11	276	263	251	247	245	244	242	241	240	238
12	241	233	228	225	223	221	220	220	220	220
13	241	233	228	225	223	221	220	220	220	220
14	276	268	261	258	255	253	251	251	251	251
15	310	302	294	290	287	285	283	282	282	282
16	207	192	183	177	171	166	161	157	154	151
17	207	192	183	177	171	166	161	157	154	151
18	207	192	183	177	171	166	161	157	154	151
19	207	192	183	177	171	166	161	157	154	151
20	241	227	212	205	199	193	188	183	180	177
21	241	227	212	205	199	193	188	183	180	177
22	241	227	212	205	199	193	188	183	180	177
23	241	227	212	205	199	193	188	183	180	177
24	241	227	212	205	199	193	188	183	180	177
25	276	259	248	241	235	229	224	219	215	211
26	276	262	253	247	242	237	233	229	225	222
27	276	259	248	241	235	229	224	219	215	211
28	276	259	248	241	235	229	224	219	215	211
29	345	315	295	283	273	265	258	253	248	245
30	345	315	295	283	273	265	258	253	248	245
31	345	315	295	283	273	265	258	253	248	245
32	379	347	325	312	301	292	284	278	274	270
33	379	371	364	359	354	350	345	340	336	332
34	414	379	355	341	329	319	311	304	299	295
35	414	379	355	341	329	319	311	304	299	295
36	414	379	355	341	329	319	311	304	299	295
37	414	379	355	341	329	319	311	304	299	295
38	414	379	355	341	329	319	311	304	299	295
39	414	379	355	341	329	319	311	304	299	295
40	310	272	255	...	241	...	233	...	225	...
41	310	272	255	...	241	...	233	...	225	...
42	310	272	255	...	241	...	233	...	225	...
43	310	272	255	...	241	...	233	...	225	...
44	310	272	255	...	241	...	233	...	225	...
45	310	272	255	...	241	...	233	...	225	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials (Cont'd)
1	169	167	164	162	160	158	156	154	152	151
2	169	167	164	162	160	158	156	154	152	151
3	169	167	164	162	160	158	156	154	152	151
4	207	206	204	202	201	198	195	190	185	176
5	207	206	204	202	201	198	195	190	185	176
6	207	206	204	202	201	198	195	190	185	176
7	207	206	204	202	201	198	195	190	185	176
8	207	206	204	202	201	198	195	190	185	176
9	207	206	204	202	201	198	195	190	185	176
10	207	206	204	202	201	198	195	190	185	176
11	237	235	233	231	229	226	224	...	...	...
12	220	219	218	217	215	212	208	204	201	197
13	220	219	218	217	215	212	208	204	201	197
14	251	250	249	247	244	240	236	...	...	...
15	282	281	280	278	274	270	266	...	...	...
16	148	146	145	144	143	143	142	142	142	142
17	148	146	145	144	143	143	142	142	142	142
18	148	146	145	144	143	143	142	142	142	142
19	148	146	145	144	143	143	142	142	142	142
20	174	171	169	167	166	164	164	162	162	161
21	174	171	169	167	166	164	164	162	162	161
22	174	171	169	167	166	164	164	162	162	161
23	174	171	169	167	166	164	164	162	162	161
24	174	171	169	167	166	164	164	162	162	161
25	208	206	204	202	201	200	199	199	198	198
26	219	217	214	212	210	208	207	205	204	203
27	208	206	204	202	201	200	199	199	198	198
28	208	206	204	202	201	200	199	199	198	198
29	243	242	242	242	242	242	242	242	242	242
30	243	242	242	242	242	242	242	242	242	242
31	243	242	242	242	242	242	242	242	242	242
32	268	267	266	266	266	266	266	266	266	266
33	328	324	320	317	314	312	309	307	306	304
34	293	291	291	291	291	291	291	291	291	291
35	293	291	291	291	291	291	291	291	291	291
36	293	291	291	291	291	291	291	291	291	291
37	293	291	291	291	291	291	291	291	291	291
38	293	291	291	291	291	291	291	291	291	291
39	293	291	291	291	291	291	291	291	291	291
40	217	214	210	208	206	205	205	205	205	205
41	217	214	210	208	206	205	205	205	205	205
42	217	214	210	208	206	205	205	205	205	205
43	217	214	210	208	206	205	205	205	205	205
44	217	214	210	208	206	205	205	205	205	205
45	217	214	210	208	206	205	205	205	205	205

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	149	146	144	141	137	...	...	...	...	...	...	...	...	...	...	
2	149	146	144	141	137	...	...	...	...	...	...	...	...	...	...	
3	149	146	144	141	137	...	...	...	...	...	...	...	...	...	...	
4	170	164	157	149	140	...	...	...	...	...	...	...	...	...	...	
5	170	164	157	149	140	...	...	...	...	...	...	...	...	...	...	
6	170	164	157	149	140	...	...	...	...	...	...	...	...	...	...	
7	170	164	157	149	140	...	...	...	...	...	...	...	...	...	...	
8	170	164	157	149	140	...	...	...	...	...	...	...	...	...	...	
9	170	164	157	149	140	...	...	...	...	...	...	...	...	...	...	
10	170	164	157	149	140	...	...	...	...	...	...	...	...	...	...	
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
12	191	186	181	175	167	...	...	...	...	...	...	...	...	...	...	
13	191	186	181	175	167	...	...	...	...	...	...	...	...	...	...	
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
25	198	198	197	197	196	195	194	192	189	186	182	178	172	166	...	(**23**)
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
27	198	198	197	197	196	195	194	192	189	186	182	178	172	166	...	
28	198	198	197	197	196	195	194	192	189	186	182	178	172	166	...	
29	242	242	242	242	242	242	242	242	240	235	227	218	208	196	...	
30	242	242	242	242	242	242	242	242	240	235	227	218	208	196	...	
31	242	242	242	242	242	242	242	242	240	235	227	218	208	196	...	
32	266	266	266	266	266	266	266	266	265	258	250	241	229	215	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
34	291	291	291	291	291	291	291	291	289	282	273	263	250	235	...	
35	291	291	291	291	291	291	291	291	289	282	273	263	250	235	...	
36	291	291	291	291	291	291	291	291	289	282	273	263	250	235	...	
37	291	291	291	291	291	291	291	291	289	282	273	263	250	235	...	
38	291	291	291	291	291	291	291	291	289	282	273	263	250	235	...	
39	291	291	291	291	291	291	291	291	289	282	273	263	250	235	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Nonferrous Materials (Cont'd)					
1	58Ni–29Cr–9Fe	Smls. pipe & tube	SB–167	...	N06690	Hot worked/ann.
2	58Ni–29Cr–9Fe	Smls. tube	SB–163	...	N06690	Annealed
3	58Ni–29Cr–9Fe	Bar, rod	SB–166	...	N06690	Annealed
4	58Ni–29Cr–9Fe	Plate, sheet, strip	SB–168	...	N06690	Annealed
5	58Ni–29Cr–9Fe	Forgings	SB–564	...	N06690	Annealed
6	58Ni–29Cr–9Fe	Smls. tube	SB–163	...	N06690	Annealed
7	58Ni–29Cr–9Fe	Smls. pipe & tube	SB–167	...	N06690	Cold worked/ann.
8	58Ni–29Cr–9Fe	Smls. pipe & tube	SB–167	...	N06690	Hot worked/ann.
9	58Ni–29Cr–9Fe	Smls. pipe & tube	SB–167	...	N06690	Cold worked/ann.
10	49Ni–25Cr–18Fe–6Mo	Bolting	SB–581	...	N06975	Solution ann.
11	49Ni–25Cr–18Fe–6Mo	Plate, sheet, strip	SB–582	...	N06975	Solution ann.
12	49Ni–25Cr–18Fe–6Mo	Wld. pipe	SB–619	...	N06975	Solution ann.
13	49Ni–25Cr–18Fe–6Mo	Smls. pipe & tube	SB–622	...	N06975	Solution ann.
14	49Ni–25Cr–18Fe–6Mo	Wld. tube	SB–626	...	N06975	Solution ann.
15	47Ni–22Cr–20Fe–7Mo	Rod	SB–581	...	N06985	Annealed
16	47Ni–22Cr–20Fe–7Mo	Plate, sheet, strip	SB–582	...	N06985	Annealed
17	47Ni–22Cr–20Fe–7Mo	Smls. & wld. fittings	SB–366	...	N06985	Annealed
18	47Ni–22Cr–20Fe–7Mo	Rod	SB–581	...	N06985	Annealed
19	47Ni–22Cr–20Fe–7Mo	Plate, sheet, strip	SB–582	...	N06985	Annealed
20	47Ni–22Cr–20Fe–7Mo	Wld. pipe	SB–619	...	N06985	Annealed
21	47Ni–22Cr–20Fe–7Mo	Smls. pipe & tube	SB–622	...	N06985	Annealed
22	47Ni–22Cr–20Fe–7Mo	Wld. tube	SB–626	...	N06985	Annealed
23	35Ni–35Fe–20Cr–Cb	Forgings	SB–462	...	N08020	Annealed
24	35Ni–35Fe–20Cr–Cb	Plate	SB–463	...	N08020	Annealed
25	35Ni–35Fe–20Cr–Cb	Bar	SB–473	...	N08020	Annealed
26	35Ni–35Fe–20Cr–Cb	Smls. pipe & tube	SB–729	...	N08020	Annealed
27	35Ni–35Fe–20Cr–Cb	Wld. pipe	SB–464	...	N08020	Wld. ann.
28	35Ni–35Fe–20Cr–Cb	Wld. tube	SB–468	...	N08020	Wld. ann.
29	35Ni–35Fe–20Cr–Cb	Smls. & wld. fittings	SB–366	...	N08020	Annealed
30	37Ni–33Fe–23Cr–4Mo–Cu	Wld. pipe	SB–464	...	N08024	Wld. ann.
31	37Ni–33Fe–23Cr–4Mo–Cu	Wld. tube	SB–468	...	N08024	Wld. ann.
32	35Ni–30Fe–24Cr–6Mo–Cu	Wld. pipe	SB–464	...	N08026	Wld. ann.
33	35Ni–30Fe–24Cr–6Mo–Cu	Wld. tube	SB–468	...	N08026	Wld. ann.
34	31Ni–31Fe–29Cr–Mo	Smls. tube	SB–668	...	N08028	Annealed
35	31Ni–31Fe–29Cr–Mo	Plate, sheet, strip	SB–709	...	N08028	Annealed
36	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Smls. & wld. fittings	SB–366	...	N08031	Solution ann.
37	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Forgings	SB–564	...	N08031	Solution ann.
38	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Rod	SB–581	...	N08031	Solution ann.
39	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Wld. pipe	SB–619	...	N08031	Solution ann.
40	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Smls. pipe & tube	SB–622	...	N08031	Solution ann.
41	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Plate, sheet, strip	SB–625	...	N08031	Solution ann.
42	31Ni–33Fe–27Cr–6.5Mo–Cu–N	Wld. tube	SB–626	...	N08031	Solution ann.
43	37Ni–33Fe–25Cr	Condenser tubes	SB–163	...	N08120	Solution ann.
44	37Ni–33Fe–25Cr	Smls. & wld. fittings	SB–366	...	N08120	Solution ann.
45	37Ni–33Fe–25Cr	Smls. pipe & tube	SB–407	...	N08120	Solution ann.

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	>127 O.D.	515	170	...
2	...	585	240	...
3	...	585	240	...
4	...	585	240	...
5	...	585	240	...
6	...	585	275	...
7	>127 O.D.	586	205	...
8	≤127 O.D.	586	205	...
9	≤127 O.D.	586	240	...
10	...	585	220	...
11	...	585	220	...
12	...	585	220	...
13	...	585	220	...
14	...	585	220	...
15	>19	585	205	...
16	>19	585	205	...
17	...	620	240	...
18	≤19	620	240	...
19	≤19	620	240	...
20	...	620	240	...
21	...	620	240	...
22	...	620	240	...
23	...	550	240	...
24	...	550	240	...
25	...	550	240	...
26	...	550	240	...
27	...	550	240	...
28	...	550	240	...
29	...	585	275	...
30	...	550	240	...
31	...	550	240	...
32	...	550	240	...
33	...	550	240	...
34	...	505	215	...
35	...	505	215	...
36	...	650	275	...
37	...	650	275	...
38	...	650	275	...
39	...	650	275	...
40	...	650	275	...
41	...	650	275	...
42	...	650	275	...
43	...	621	276	...
44	...	621	276	...
45	...	621	276	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	172	163	155	151	147	144	141	139	138	137
2	241	227	217	211	205	201	198	195	193	192
3	241	227	217	211	205	201	198	195	193	192
4	241	227	217	211	205	201	198	195	193	192
5	241	227	217	211	205	201	198	195	193	192
6	276	262	247	240	235	230	226	223	221	219
7	207	195	187	181	176	172	169	167	165	164
8	207	195	187	181	176	172	169	167	165	164
9	241	228	218	211	206	201	197	195	193	191
10	221	208	201	196	191	186	182	177	173	168
11	221	208	201	196	191	186	182	177	173	168
12	221	208	201	196	191	186	182	177	173	168
13	221	208	201	196	191	186	182	177	173	168
14	221	208	201	196	191	186	182	177	173	168
15	207	193	182	175	167	161	155	150	145	141
16	207	193	182	175	167	161	155	150	145	141
17	241	226	213	203	195	188	181	175	169	165
18	241	226	213	203	195	188	181	175	169	165
19	241	226	213	203	195	188	181	175	169	165
20	241	226	213	203	195	188	181	175	169	165
21	241	226	213	203	195	188	181	175	169	165
22	241	226	213	203	195	188	181	175	169	165
23	241	221	212	208	204	200	196	193	189	186
24	241	221	212	208	204	200	196	193	189	186
25	241	221	212	208	204	200	196	193	189	186
26	241	221	212	208	204	200	196	193	189	186
27	241	221	212	208	204	200	196	193	189	186
28	241	221	212	208	204	200	196	193	189	186
29	276	253	243	237	233	228	225	221	217	213
30	241	222	211	204	198	193	188	183	178	173
31	241	222	211	204	198	193	188	183	178	173
32	241	225	212	203	195	189	182	176	170	166
33	241	225	212	203	195	189	182	176	170	166
34	214	203	194	188	182	177	172	166	162	157
35	214	203	194	188	182	177	172	166	162	157
36	276	250	224	212	204	197	190	184	180	176
37	276	250	224	212	204	197	190	184	180	176
38	276	250	224	212	204	197	190	184	180	176
39	276	250	224	212	204	197	190	184	180	176
40	276	250	224	212	204	197	190	184	180	176
41	276	250	224	212	204	197	190	184	180	176
42	276	250	224	212	204	197	190	184	180	176
43	276	258	242	232	223	215	207	200	195	189
44	276	258	242	232	223	215	207	200	195	189
45	276	258	242	232	223	215	207	200	195	189

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials (Cont'd)
1	136	136	136	136	136	136	135	135	135	134
2	191	190	190	190	190	190	190	190	189	188
3	191	190	190	190	190	190	190	190	189	188
4	191	190	190	190	190	190	190	190	189	188
5	191	190	190	190	190	190	190	190	189	188
6	218	217	217	217	217	217	217	...	...	...
7	163	163	163	163	163	163	163	162	162	161
8	163	163	163	163	163	163	163	162	162	161
9	190	190	190	190	190	190	190	189	189	188
10	164	160	157	155	153	152	151	151	151	151
11	164	160	157	155	153	152	151	151	151	151
12	164	160	157	155	153	152	151	151	151	151
13	164	160	157	155	153	152	151	151	151	151
14	164	160	157	155	153	152	151	151	151	151
15	138	135	132	129	127	124	122	120	118	116
16	138	135	132	129	127	124	122	120	118	116
17	161	157	154	151	147	145	142	140	137	135
18	161	157	154	151	147	145	142	140	137	135
19	161	157	154	151	147	145	142	140	137	135
20	161	157	154	151	147	145	142	140	137	135
21	161	157	154	151	147	145	142	140	137	135
22	161	157	154	151	147	145	142	140	137	135
23	184	182	180	179	178	174	170	...	...	...
24	184	182	180	179	178	174	170	...	...	...
25	184	182	180	179	178	174	170	...	...	...
26	184	182	180	179	178	174	170	...	...	...
27	184	182	180	179	178	174	170	...	...	...
28	184	182	180	179	178	174	170	...	...	...
29	210	208	207	205	203	199	195	...	...	...
30	169	164	160	156	153	150	149	147	146	144
31	169	164	160	156	153	150	149	147	146	144
32	161	157	153	150	147	144	142	140	139	138
33	161	157	153	150	147	144	142	140	139	138
34	152	148	144	139	136	132	129	126	123	120
35	152	148	144	139	136	132	129	126	123	120
36	173	169	165	162	160	157	155	153	152	...
37	173	169	165	162	160	157	155	153	152	...
38	173	169	165	162	160	157	155	153	152	...
39	173	169	165	162	160	157	155	153	152	...
40	173	169	165	162	160	157	155	153	152	...
41	173	169	165	162	160	157	155	153	152	...
42	173	169	165	162	160	157	155	153	152	...
43	185	181	178	176	174	172	171	170	170	169
44	185	181	178	176	174	172	171	170	170	169
45	185	181	178	176	174	172	171	170	170	169

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Nonferrous Materials (Cont'd)					
1	37Ni–33Fe–25Cr	Bar, rod	SB–408	...	N08120	Solution ann.
2	37Ni–33Fe–25Cr	Plate, sheet, strip	SB–409	...	N08120	Solution ann.
3	37Ni–33Fe–25Cr	Wld. pipe	SB–514	...	N08120	Solution ann.
4	37Ni–33Fe–25Cr	Wld. tube	SB–515	...	N08120	Solution ann.
5	37Ni–33Fe–25Cr	Forgings	SB–564	...	N08120	Solution ann.
6	26Ni–43Fe–22Cr–5Mo	Wld. pipe	SB–619	...	N08320	Solution ann.
7	26Ni–43Fe–22Cr–5Mo	Plate, sheet, strip	SB–620	...	N08320	Solution ann.
8	26Ni–43Fe–22Cr–5Mo	Rod	SB–621	...	N08320	Solution ann.
9	26Ni–43Fe–22Cr–5Mo	Smls. pipe & tube	SB–622	...	N08320	Solution ann.
10	26Ni–43Fe–22Cr–5Mo	Wld. tube	SB–626	...	N08320	Solution ann.
11	35Ni–19Cr–1 1/4Si	Bar	SB–511	...	N08330	...
12	35Ni–19Cr–1 1/4Si	Pipe	SB–535	...	N08330	...
13	35Ni–19Cr–1 1/4Si	Plate	SB–536	...	N08330	...
14	35Ni–19Cr–1 1/4Si	Smls. & wld. fittings	SB–366	...	N08330	Annealed
15	35Ni–19Cr–1 1/4Si	Smls. & wld. pipe	SB–535	...	N08330	Annealed
16	35Ni–19Cr–1 1/4Si	Plate, sheet, strip	SB–536	...	N08330	Annealed
17	35Ni–19Cr–1 1/4Si	Wld. pipe	SB–710	...	N08330	Annealed
18	35Ni–23Cr–7.5Mo–N	Plate, sheet, strip	SB–625	...	N08354	Solution ann.
19	35Ni–23Cr–7.5Mo–N	Bar, wire	SB–649	...	N08354	Solution ann.
20	35Ni–23Cr–7.5Mo–N	Wld. pipe	SB–673	...	N08354	Solution ann.
21	35Ni–23Cr–7.5Mo–N	Wld. tube	SB–674	...	N08354	Solution ann.
22	35Ni–23Cr–7.5Mo–N	Smls. pipe & tube	SB–677	...	N08354	Solution ann.
23	46Fe–24Ni–21Cr–6Mo–N	Forgings	SB–462	...	N08367	Solution ann.
24	46Fe–24Ni–21Cr–6Mo–N	Forgings	SB–564	...	N08367	Solution ann.
25	46Fe–24Ni–21Cr–6Mo–N	Wld. pipe	SB–675	...	N08367	Solution ann.
26	46Fe–24Ni–21Cr–6Mo–N	Wld. tube	SB–676	...	N08367	Solution ann.
27	46Fe–24Ni–21Cr–6Mo–N	Plate, sheet, strip	SB–688	...	N08367	Solution ann.
28	46Fe–24Ni–21Cr–6Mo–N	Smls. pipe & tube	SB–690	...	N08367	Solution ann.
29	46Fe–24Ni–21Cr–6Mo–N	Bar, rod, wire	SB–691	...	N08367	Solution ann.
30	46Fe–24Ni–21Cr–6Mo–N	Wld. pipe	SB–804	...	N08367	Solution ann.
31	46Fe–24Ni–21Cr–6Mo–N	Wld. pipe	SB–675	...	N08367	Solution ann.
32	46Fe–24Ni–21Cr–6Mo–N	Wld. tube	SB–676	...	N08367	Solution ann.
33	46Fe–24Ni–21Cr–6Mo–N	Plate, sheet, strip	SB–688	...	N08367	Solution ann.
34	46Fe–24Ni–21Cr–6Mo–N	Smls. pipe & tube	SB–690	...	N08367	Solution ann.
35	46Fe–24Ni–21Cr–6Mo–N	Wld. pipe	SB–804	...	N08367	Solution ann.
36	46Fe–24Ni–21Cr–6Mo–N	Castings	SA–351	CN3MN	J94651	Solution ann.
37	25Ni–47Fe–21Cr–5Mo	Plate, sheet, strip	SB–599	...	N08700	Solution ann.
38	25Ni–47Fe–21Cr–5Mo	Bar, wire	SB–672	...	N08700	Solution ann.
39	32Ni–45Fe–20Cr–Cb	Castings	SA–351	CT15C	...	As cast
40	33Ni–42Fe–21Cr	Smls. tube	SB–163	...	N08800	Annealed
41	33Ni–42Fe–21Cr	Smls. & wld. fittings	SB–366	...	N08800	Annealed
42	33Ni–42Fe–21Cr	Smls. pipe & tube	SB–407	...	N08800	Annealed
43	33Ni–42Fe–21Cr	Bar	SB–408	...	N08800	Annealed
44	33Ni–42Fe–21Cr	Plate	SB–409	...	N08800	Annealed
45	33Ni–42Fe–21Cr	Wld. pipe	SB–514	...	N08800	Annealed

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	...	621	276	...
2	...	621	276	...
3	...	621	276	...
4	...	621	276	...
5	...	621	276	...
6	...	515	195	...
7	...	515	195	...
8	...	515	195	...
9	...	515	195	...
10	...	515	195	...
11	...	485	205	...
12	...	485	205	...
13	...	485	205	...
14	...	485	205	...
15	...	485	205	...
16	...	485	205	...
17	...	485	205	...
18	...	640	295	...
19	...	640	295	...
20	...	640	295	...
21	...	640	295	...
22	...	640	295	...
23	...	655	310	...
24	...	655	310	...
25	>5	655	310	...
26	>5	655	310	...
27	>5	655	310	...
28	>5	655	310	...
29	...	655	310	...
30	>5	655	310	...
31	≤5	690	310	...
32	≤5	690	310	...
33	≤5	690	310	...
34	≤5	690	310	...
35	≤5	690	310	...
36	...	550	260	...
37	...	550	240	...
38	...	550	240	...
39	...	435	170	...
40	...	515	205	...
41	...	515	205	...
42	...	515	205	...
43	...	515	205	...
44	...	515	205	...
45	...	515	205	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	276	258	242	232	223	215	207	200	195	189
2	276	258	242	232	223	215	207	200	195	189
3	276	258	242	232	223	215	207	200	195	189
4	276	258	242	232	223	215	207	200	195	189
5	276	258	242	232	223	215	207	200	195	189
6	193	184	177	173	169	164	160	156	152	148
7	193	184	177	173	169	164	160	156	152	148
8	193	184	177	173	169	164	160	156	152	148
9	193	184	177	173	169	164	160	156	152	148
10	193	184	177	173	169	164	160	156	152	148
11	207	191	181	175	170	165	161	157	153	150
12	207	191	181	175	170	165	161	157	153	150
13	207	191	181	175	170	165	161	157	153	150
14	207	191	181	175	170	165	161	157	153	150
15	207	191	181	175	170	165	161	157	153	150
16	207	191	181	175	170	165	161	157	153	150
17	207	191	181	175	170	165	161	157	153	150
18	295	267	249	237	228	...	213	...	204	...
19	295	267	249	237	228	...	213	...	204	...
20	295	267	249	237	228	...	213	...	204	...
21	295	267	249	237	228	...	213	...	204	...
22	295	267	249	237	228	...	213	...	204	...
23	310	285	268	256	246	236	228	221	215	209
24	310	285	268	256	246	236	228	221	215	209
25	310	285	268	256	246	236	228	221	215	209
26	310	285	268	256	246	236	228	221	215	209
27	310	285	268	256	246	236	228	221	215	209
28	310	285	268	256	246	236	228	221	215	209
29	310	285	268	256	246	236	228	221	215	209
30	310	285	268	256	246	236	228	221	215	209
31	310	285	268	256	246	236	228	221	215	209
32	310	285	268	256	246	236	228	221	215	209
33	310	285	268	256	246	236	228	221	215	209
34	310	285	268	256	246	236	228	221	215	209
35	310	285	268	256	246	236	228	221	215	209
36	262	237	217	205	194	184	176	169	164	160
37	241	228	215	205	196	189	184	181	178	176
38	241	228	215	205	196	189	184	181	178	176
39	172	166	162	160	158	157	155	153	151	149
40	207	197	190	186	183	181	178	176	174	172
41	207	197	190	186	183	181	178	176	174	172
42	207	197	190	186	183	181	178	176	174	172
43	207	197	190	186	183	181	178	176	174	172
44	207	197	190	186	183	181	178	176	174	172
45	207	197	190	186	183	181	178	176	174	172

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials (Cont'd)
1	185	181	178	176	174	172	171	170	170	169
2	185	181	178	176	174	172	171	170	170	169
3	185	181	178	176	174	172	171	170	170	169
4	185	181	178	176	174	172	171	170	170	169
5	185	181	178	176	174	172	171	170	170	169
6	145	142	139	136	134	132	130	...	...	...
7	145	142	139	136	134	132	130	...	...	...
8	145	142	139	136	134	132	130	...	...	...
9	145	142	139	136	134	132	130	...	...	...
10	145	142	139	136	134	132	130	...	...	...
11	147	144	141	138	136	133	131	128	126	124
12	147	144	141	138	136	133	131	128	126	124
13	147	144	141	138	136	133	131	128	126	124
14	147	144	141	138	136	133	131	128	126	124
15	147	144	141	138	136	133	131	128	126	124
16	147	144	141	138	136	133	131	128	126	124
17	147	144	141	138	136	133	131	128	126	124
18	197	194	192	189	186	183	181	179	179	179
19	197	194	192	189	186	183	181	179	179	179
20	197	194	192	189	186	183	181	179	179	179
21	197	194	192	189	186	183	181	179	179	179
22	197	194	192	189	186	183	181	179	179	179
23	204	199	196	192	189	186	184	181	179	...
24	204	199	196	192	189	186	184	181	179	...
25	204	199	196	192	189	186	184	181	179	...
26	204	199	196	192	189	186	184	181	179	...
27	204	199	196	192	189	186	184	181	179	...
28	204	199	196	192	189	186	184	181	179	...
29	204	199	196	192	189	186	184	181	179	...
30	204	199	196	192	189	186	184	181	179	...
31	204	199	196	192	189	186	184	181	179	...
32	204	199	196	192	189	186	184	181	179	...
33	204	199	196	192	189	186	184	181	179	...
34	204	199	196	192	189	186	184	181	179	...
35	204	199	196	192	189	186	184	181	179	...
36	156	153	151	150	148	148	146	146	145	145
37	173	168	163	...	...	...	...	...	...	...
38	173	168	163	...	...	...	...	...	...	...
39	147	145	144	142	140	137	135	134	132	130
40	170	168	166	164	162	160	158	157	155	153
41	170	168	166	164	162	160	158	157	155	153
42	170	168	166	164	162	160	158	157	155	153
43	170	168	166	164	162	160	158	157	155	153
44	170	168	166	164	162	160	158	157	155	153
45	170	168	166	164	162	160	158	157	155	153

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	122	120	117	115	112	109	106	102	98.6	94.4	89.8	84.7	79.2	73.1	66.5
12	122	120	117	115	112	109	106	102	98.6	94.4	89.8	84.7	79.2	73.1	66.5
13	122	120	117	115	112	109	106	102	98.6	94.4	89.8	84.7	79.2	73.1	66.5
14	122	120	117	115	112	109	106	102	98.6	94.4	89.8	84.7	79.2	73.1	66.5
15	122	120	117	115	112	109	106	102	98.6	94.4	89.8	84.7	79.2	73.1	66.5
16	122	120	117	115	112	109	106	102	98.6	94.4	89.8	84.7	79.2	73.1	66.5
17	122	120	117	115	112	109	106	102	98.6	94.4	89.8	84.7	79.2	73.1	66.5
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	151	147	143	139	134	128	121	113	104	94.2	83.3	71.1	...	...	...
41	151	147	143	139	134	128	121	113	104	94.2	83.3	71.1	...	...	...
42	151	147	143	139	134	128	121	113	104	94.2	83.3	71.1	...	...	...
43	151	147	143	139	134	128	121	113	104	94.2	83.3	71.1	...	...	...
44	151	147	143	139	134	128	121	113	104	94.2	83.3	71.1	...	...	...
45	151	147	143	139	134	128	121	113	104	94.2	83.3	71.1	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

	Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
		Nonferrous Materials (Cont'd)					
	1	33Ni–42Fe–21Cr	Wld. tube	SB–515	...	N08800	Annealed
	2	33Ni–42Fe–21Cr	Forgings	SB–564	...	N08800	Annealed
	3	33Ni–42Fe–21Cr	Smls. tube	SB–163	...	N08800	Annealed
	4	33Ni–42Fe–21Cr	Smls. tube	SB–163	...	N08800	Cold worked
	5	32Ni–44Fe–21Cr	Smls. tube	SB–163	...	N08801	Ann./stabilized
	6	32Ni–44Fe–21Cr	Smls. pipe & tube	SB–407	...	N08801	Ann./stabilized
	7	33Ni–42Fe–21Cr	Smls. tube	SB–163	...	N08810	Annealed
	8	33Ni–42Fe–21Cr	Smls. pipe & tube	SB–407	...	N08810	Annealed
	9	33Ni–42Fe–21Cr	Bar	SB–408	...	N08810	Annealed
	10	33Ni–42Fe–21Cr	Plate	SB–409	...	N08810	Annealed
	11	33Ni–42Fe–21Cr	Wld. pipe	SB–514	...	N08810	Annealed
	12	33Ni–42Fe–21Cr	Wld. tube	SB–515	...	N08810	Annealed
	13	33Ni–42Fe–21Cr	Forgings	SB–564	...	N08810	Annealed
	14	33Ni–42Fe–21Cr	Smls. tube	SB–163	...	N08811	Annealed
(**23**)	15	...	...	...	...	...	...
	16	33Ni–42Fe–21Cr	Smls. pipe & tube	SB–407	...	N08811	Annealed
(**23**)	17	...	...	...	...	...	...
	18	33Ni–42Fe–21Cr	Bar	SB–408	...	N08811	Annealed
(**23**)	19	...	...	...	...	...	...
	20	33Ni–42Fe–21Cr	Plate	SB–409	...	N08811	Annealed
(**23**)	21	...	...	...	...	...	...
	22	33Ni–42Fe–21Cr	Wld. tube	SB–515	...	N08811	Annealed
(**23**)	23	...	...	...	...	...	...
	24	33Ni–42Fe–21Cr	Forgings	SB–564	...	N08811	Annealed
(**23**)	25	...	...	...	...	...	...
	26	42Ni–21.5Cr–3Mo–2.3Cu	Smls. tube	SB–163	...	N08825	Annealed
	27	42Ni–21.5Cr–3Mo–2.3Cu	Smls. & wld. fittings	SB–366	...	N08825	Annealed
	28	42Ni–21.5Cr–3Mo–2.3Cu	Smls. pipe & tube	SB–423	...	N08825	Cold worked/ann.
	29	42Ni–21.5Cr–3Mo–2.3Cu	Plate	SB–424	...	N08825	Annealed
	30	42Ni–21.5Cr–3Mo–2.3Cu	Bar, rod	SB–425	...	N08825	Annealed
	31	42Ni–21.5Cr–3Mo–2.3Cu	Forgings	SB–564	...	N08825	Annealed
	32	42Ni–21.5Cr–3Mo–2.3Cu	Wld. tube	SB–704	...	N08825	Annealed
	33	42Ni–21.5Cr–3Mo–2.3Cu	Wld. pipe	SB–705	...	N08825	Annealed
	34	44Fe–25Ni–21Cr–Mo	Forgings	SA–182	...	N08904	Annealed
(**23**)	35	44Fe–25Ni–21Cr–Mo	Smls. tube	SA–213	...	N08904	Annealed
	36	44Fe–25Ni–21Cr–Mo	Plate, sheet, strip	SA–240	...	N08904	Annealed
	37	44Fe–25Ni–21Cr–Mo	Wld. tube	SA–249	...	N08904	Annealed
	38	44Fe–25Ni–21Cr–Mo	Smls. & wld. pipe	SA–312	...	N08904	Annealed
	39	44Fe–25Ni–21Cr–Mo	Fittings	SA–403	...	N08904	Annealed
(**23**)	40	44Fe–25Ni–21Cr–Mo	Bar	SA–479	...	N08904	Annealed
	41	25Ni–20Cr–6Mo–Cu–N	Plate, sheet, strip	SB–625	...	N08925	Annealed
	42	25Ni–20Cr–6Mo–Cu–N	Bar, wire	SB–649	...	N08925	Annealed
	43	25Ni–20Cr–6Mo–Cu–N	Wld. pipe	SB–673	...	N08925	Annealed
	44	25Ni–20Cr–6Mo–Cu–N	Wld. tube	SB–674	...	N08925	Annealed
	45	25Ni–20Cr–6Mo–Cu–N	Smls. pipe & tube	SB–677	...	N08925	Annealed

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	...	515	205	...
2	...	515	205	...
3	...	515	275	...
4	...	570	325	...
5	...	450	170	...
6	...	450	170	...
7	...	450	170	...
8	...	450	170	...
9	...	450	170	...
10	...	450	170	...
11	...	450	170	...
12	...	450	170	...
13	...	450	170	...
14	...	450	170	...
15	...	...	...	...
16	...	450	170	...
17	...	...	...	...
18	...	450	170	...
19	...	...	...	...
20	...	450	170	...
21	...	...	...	...
22	...	450	170	...
23	...	...	...	...
24	...	450	170	...
25	...	...	...	...
26	...	585	240	...
27	...	585	240	...
28	...	585	240	...
29	...	585	240	...
30	...	585	240	...
31	...	585	240	...
32	...	585	240	...
33	...	585	240	...
34	...	490	215	...
35	...	490	215	...
36	...	490	215	...
37	...	490	215	...
38	...	490	215	...
39	...	490	215	...
40	...	490	215	...
41	...	600	295	...
42	...	600	295	...
43	...	600	295	...
44	...	600	295	...
45	...	600	295	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	207	197	190	186	183	181	178	176	174	172
2	207	197	190	186	183	181	178	176	174	172
3	276	265	253	248	245	241	238	235	232	229
4	324	311	297	292	287	283	279	276	273	270
5	172	164	157	153	149	145	141	138	134	131
6	172	164	157	153	149	145	141	138	134	131
7	172	164	157	153	149	145	141	138	134	131
8	172	164	157	153	149	145	141	138	134	131
9	172	164	157	153	149	145	141	138	134	131
10	172	164	157	153	149	145	141	138	134	131
11	172	164	157	153	149	145	141	138	134	131
12	172	164	157	153	149	145	141	138	134	131
13	172	164	157	153	149	145	141	138	134	131
14	172	164	157	153	149	145	141	138	134	131
15	...	...	...	...	...	...	...	...	...	...
16	172	164	157	153	149	145	141	138	134	131
17	...	...	...	...	...	...	...	...	...	...
18	172	164	157	153	149	145	141	138	134	131
19	...	...	...	...	...	...	...	...	...	...
20	172	164	157	153	149	145	141	138	134	131
21	...	...	...	...	...	...	...	...	...	...
22	172	164	157	153	149	145	141	138	134	131
23	...	...	...	...	...	...	...	...	...	...
24	172	164	157	153	149	145	141	138	134	131
25	...	...	...	...	...	...	...	...	...	...
26	241	228	220	214	210	205	201	197	193	189
27	241	228	220	214	210	205	201	197	193	189
28	241	228	220	214	210	205	201	197	193	189
29	241	228	220	214	210	205	201	197	193	189
30	241	228	220	214	210	205	201	197	193	189
31	240	227	218	...	209	...	200	...	192	...
32	241	228	220	214	210	205	201	197	193	189
33	241	228	220	214	210	205	201	197	193	189
34	214	185	171	163	156	150	144	139	133	129
35	214	185	171	163	156	150	144	139	133	129
36	214	185	171	163	156	150	144	139	133	129
37	214	185	171	163	156	150	144	139	133	129
38	214	185	171	163	156	150	144	139	133	129
39	214	185	171	163	156	150	144	139	133	129
40	214	185	171	163	156	150	144	139	133	129
41	296	256	237	227	220	213	205	198	192	186
42	296	256	237	227	220	213	205	198	192	186
43	296	256	237	227	220	213	205	198	192	186
44	296	256	237	227	220	213	205	198	192	186
45	296	256	237	227	220	213	205	198	192	186

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials (Cont'd)
1	170	168	166	164	162	160	158	157	155	153
2	170	168	166	164	162	160	158	157	155	153
3	226	224	221	219	216	214	211	...	...	...
4	268	267	267	...	...	...	...	...	...	...
5	128	125	123	120	118	115	113	112	110	108
6	128	125	123	120	118	115	113	112	110	108
7	128	125	123	120	118	115	113	112	110	108
8	128	125	123	120	118	115	113	112	110	108
9	128	125	123	120	118	115	113	112	110	108
10	128	125	123	120	118	115	113	112	110	108
11	128	125	123	120	118	115	113	112	110	108
12	128	125	123	120	118	115	113	112	110	108
13	128	125	123	120	118	115	113	112	110	108
14	128	125	123	120	118	115	113	112	110	108
15	...	...	...	...	...	...	...	...	...	...
16	128	125	123	120	118	115	113	112	110	108
17	...	...	...	...	...	...	...	...	...	...
18	128	125	123	120	118	115	113	112	110	108
19	...	...	...	...	...	...	...	...	...	...
20	128	125	123	120	118	115	113	112	110	108
21	...	...	...	...	...	...	...	...	...	...
22	128	125	123	120	118	115	113	112	110	108
23	...	...	...	...	...	...	...	...	...	...
24	128	125	123	120	118	115	113	112	110	108
25	...	...	...	...	...	...	...	...	...	...
26	186	183	181	179	177	177	175	175	174	172
27	186	183	181	179	177	177	175	175	174	172
28	186	183	181	179	177	177	175	175	174	172
29	186	183	181	179	177	177	175	175	174	172
30	186	183	181	179	177	177	175	175	174	172
31	185	...	180	178	176	175	175	174	173	171
32	186	183	181	179	177	177	175	175	174	172
33	186	183	181	179	177	177	175	175	174	172
34	125	122	119	118	...	...	...	...	...	...
35	125	122	119	118	...	...	...	...	...	...
36	125	122	119	118	...	...	...	...	...	...
37	125	122	119	118	...	...	...	...	...	...
38	125	122	119	118	...	...	...	...	...	...
39	125	122	119	118	...	...	...	...	...	...
40	125	122	119	118	...	...	...	...	...	...
41	181	177	175	174	174	174	174	...	...	...
42	181	177	175	174	174	174	174	...	...	...
43	181	177	175	174	174	174	174	...	...	...
44	181	177	175	174	174	174	174	...	...	...
45	181	177	175	174	174	174	174	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	151	147	143	139	134	128	121	113	104	94.2	83.3	71.1	...	...	...	
2	151	147	143	139	134	128	121	113	104	94.2	83.3	71.1	...	...	...	
3	202	198	192	186	179	171	162	151	140	126	112	95.4	...	...	...	
4	239	234	227	220	212	202	191	179	165	149	132	113	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	103	101	98.8	96.7	94.4	92.0	89.3	86.5	83.4	80.0	76.4	72.4	68.1	63.4	58.4	
8	103	101	98.8	96.7	94.4	92.0	89.3	86.5	83.4	80.0	76.4	72.4	68.1	63.4	58.4	
9	103	101	98.8	96.7	94.4	92.0	89.3	86.5	83.4	80.0	76.4	72.4	68.1	63.4	58.4	
10	103	101	98.8	96.7	94.4	92.0	89.3	86.5	83.4	80.0	76.4	72.4	68.1	63.4	58.4	
11	103	101	98.8	96.7	94.4	92.0	89.3	86.5	83.4	80.0	76.4	72.4	68.1	63.4	58.4	
12	103	101	98.8	96.7	94.4	92.0	89.3	86.5	83.4	80.0	76.4	72.4	68.1	63.4	58.4	
13	103	101	98.8	96.7	94.4	92.0	89.3	86.5	83.4	80.0	76.4	72.4	68.1	63.4	58.4	
14	103	101	98.8	96.7	94.4	92.0	89.3	86.5	83.4	80.0	76.4	72.4	68.1	63.4	58.4	
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
16	103	101	98.8	96.7	94.4	92.0	89.3	86.5	83.4	80.0	76.4	72.4	68.1	63.4	58.4	
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
18	103	101	98.8	96.7	94.4	92.0	89.3	86.5	83.4	80.0	76.4	72.4	68.1	63.4	58.4	
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
20	103	101	98.8	96.7	94.4	92.0	89.3	86.5	83.4	80.0	76.4	72.4	68.1	63.4	58.4	
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
22	103	101	98.8	96.7	94.4	92.0	89.3	86.5	83.4	80.0	76.4	72.4	68.1	63.4	58.4	
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
24	103	101	98.8	96.7	94.4	92.0	89.3	86.5	83.4	80.0	76.4	72.4	68.1	63.4	58.4	
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Nonferrous Materials (Cont'd)					
1	62Ni–28Mo–5Fe	Plate	SB–333	...	N10001	Annealed
2	62Ni–28Mo–5Fe	Smls. & wld. fittings	SB–366	...	N10001	Annealed
3	62Ni–28Mo–5Fe	Wld. pipe	SB–619	...	N10001	Solution ann.
4	62Ni–28Mo–5Fe	Smls. pipe & tube	SB–622	...	N10001	Solution ann.
5	62Ni–28Mo–5Fe	Wld. tube	SB–626	...	N10001	Solution ann.
6	62Ni–28Mo–5Fe	Rod	SB–335	...	N10001	Annealed
7	62Ni–28Mo–5Fe	Rod	SB–335	...	N10001	Annealed
8	62Ni–28Mo–5Fe	Sheet, strip	SB–333	...	N10001	Annealed
9	70Ni–16Mo–7Cr–5Fe	Smls. & wld. fittings	SB–366	...	N10003	Annealed
10	70Ni–16Mo–7Cr–5Fe	Plate, sheet, strip	SB–434	...	N10003	Annealed
11	70Ni–16Mo–7Cr–5Fe	Rod	SB–573	...	N10003	Annealed
12	62Ni–25Mo–8Cr–2Fe	Smls. & wld. fittings	SB–366	...	N10242	Annealed
13	62Ni–25Mo–8Cr–2Fe	Plate, sheet, strip	SB–434	...	N10242	Annealed
14	62Ni–25Mo–8Cr–2Fe	Forgings	SB–564	...	N10242	Annealed
15	62Ni–25Mo–8Cr–2Fe	Rod	SB–573	...	N10242	Annealed
16	62Ni–25Mo–8Cr–2Fe	Wld. pipe	SB–619	...	N10242	Solution ann.
17	62Ni–25Mo–8Cr–2Fe	Smls. pipe & tube	SB–622	...	N10242	Solution ann.
18	62Ni–25Mo–8Cr–2Fe	Wld. tube	SB–626	...	N10242	Solution ann.
19	54Ni–16Mo–15Cr	Smls. & wld. fittings	SB–366	...	N10276	Solution ann.
20	54Ni–16Mo–15Cr	Forgings	SB–462	...	N10276	Solution ann.
21	54Ni–16Mo–15Cr	Forgings	SB–564	...	N10276	Solution ann.
22	54Ni–16Mo–15Cr	Rod	SB–574	...	N10276	Solution ann.
23	54Ni–16Mo–15Cr	Plate, sheet, strip	SB–575	...	N10276	Solution ann.
24	54Ni–16Mo–15Cr	Wld. pipe	SB–619	...	N10276	Solution ann.
25	54Ni–16Mo–15Cr	Smls. pipe & tube	SB–622	...	N10276	Solution ann.
26	54Ni–16Mo–15Cr	Wld. tube	SB–626	...	N10276	Solution ann.
27	62Ni–22Mo–15Cr	Smls. & wld. fittings	SB–366	...	N10362	Solution ann.
28	62Ni–22Mo–15Cr	Forgings	SB–462	...	N10362	Solution ann.
29	62Ni–22Mo–15Cr	Forgings	SB–564	...	N10362	Solution ann.
30	62Ni–22Mo–15Cr	Rod	SB–574	...	N10362	Solution ann.
31	62Ni–22Mo–15Cr	Plate, sheet, strip	SB–575	...	N10362	Solution ann.
32	62Ni–22Mo–15Cr	Wld. pipe	SB–619	...	N10362	Solution ann.
33	62Ni–22Mo–15Cr	Smls. pipe & tube	SB–622	...	N10362	Solution ann.
34	62Ni–22Mo–15Cr	Wld. tube	SB–626	...	N10362	Solution ann.
35	Ni–28Mo–3Fe–1.3Cr–0.25Al	Plate, sheet, strip	SB–333	...	N10629	Solution ann.
36	Ni–28Mo–3Fe–1.3Cr–0.25Al	Rod	SB–335	...	N10629	Solution ann.
37	Ni–28Mo–3Fe–1.3Cr–0.25Al	Smls. & wld. fittings	SB–366	...	N10629	Solution ann.
38	Ni–28Mo–3Fe–1.3Cr–0.25Al	Forgings	SB–564	...	N10629	Solution ann.
39	Ni–28Mo–3Fe–1.3Cr–0.25Al	Wld. pipe	SB–619	...	N10629	Solution ann.
40	Ni–28Mo–3Fe–1.3Cr–0.25Al	Smls. pipe & tube	SB–622	...	N10629	Solution ann.
41	Ni–28Mo–3Fe–1.3Cr–0.25Al	Wld. tube	SB–626	...	N10629	Solution ann.
42	65Ni–28Mo–2Fe	Smls. & wld. fittings	SB–366	...	N10665	Annealed
43	65Ni–28Mo–2Fe	Wld. pipe	SB–619	...	N10665	Annealed
44	65Ni–28Mo–2Fe	Wld. tube	SB–626	...	N10665	Annealed
45	65Ni–28Mo–2Fe	Plate, sheet, strip	SB–333	...	N10665	Solution ann.

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	...	690	310	...
2	...	690	310	...
3	...	690	310	...
4	...	690	310	...
5	...	690	310	...
6	>38.1	690	315	...
7	7.94 < t ≤ 38.1	795	315	...
8	...	795	345	...
9	...	690	275	...
10	...	690	275	...
11	...	690	275	...
12	...	725	310	...
13	...	725	310	...
14	...	725	310	...
15	...	725	310	...
16	...	725	310	...
17	...	725	310	...
18	...	725	310	...
19	...	690	285	...
20	...	690	285	...
21	...	690	285	...
22	...	690	285	...
23	...	690	285	...
24	...	690	285	...
25	...	690	285	...
26	...	690	285	...
27	...	725	310	...
28	...	725	310	...
29	...	725	310	...
30	...	725	310	...
31	...	725	310	...
32	...	725	310	...
33	...	725	310	...
34	...	725	310	...
35	...	760	350	...
36	...	760	350	...
37	...	760	350	...
38	...	760	350	...
39	...	760	350	...
40	...	760	350	...
41	...	760	350	...
42	...	760	350	...
43	...	760	350	...
44	...	760	350	...
45	...	760	350	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	310	291	279	272	266	260	255	251	247	243
2	310	291	279	272	266	260	255	251	247	243
3	310	291	279	272	266	260	255	251	247	243
4	310	291	279	272	266	260	255	251	247	243
5	310	291	279	272	266	260	255	251	247	243
6	317	297	286	278	271	266	261	256	252	249
7	317	297	286	278	271	266	261	256	252	249
8	345	324	310	302	295	289	284	278	275	270
9	276	260	247	239	231	225	219	214	209	205
10	276	260	247	239	231	225	219	214	209	205
11	276	260	247	239	231	225	219	214	209	205
12	310	302	289	279	270	262	256	251	248	246
13	310	302	289	279	270	262	256	251	248	246
14	310	302	289	279	270	262	256	251	248	246
15	310	302	289	279	270	262	256	251	248	246
16	310	302	289	279	270	262	256	251	248	246
17	310	302	289	279	270	262	256	251	248	246
18	310	302	289	279	270	262	256	251	248	246
19	283	268	255	246	237	229	222	215	208	202
20	283	268	255	246	237	229	222	215	208	202
21	283	268	255	246	237	229	222	215	208	202
22	283	268	255	246	237	229	222	215	208	202
23	283	268	255	246	237	229	222	215	208	202
24	283	268	255	246	237	229	222	215	208	202
25	283	268	255	246	237	229	222	215	208	202
26	283	268	255	246	237	229	222	215	208	202
27	310	289	273	263	253	244	236	229	224	219
28	310	289	273	263	253	244	236	229	224	219
29	310	289	273	263	253	244	236	229	224	219
30	310	289	273	263	253	244	236	229	224	219
31	310	289	273	263	253	244	236	229	224	219
32	310	289	273	263	253	244	236	229	224	219
33	310	289	273	263	253	244	236	229	224	219
34	310	289	273	263	253	244	236	229	224	219
35	352	338	322	313	306	299	292	286	281	277
36	352	338	322	313	306	299	292	286	281	277
37	352	338	322	313	306	299	292	286	281	277
38	352	338	322	313	306	299	292	286	281	277
39	352	338	322	313	306	299	292	286	281	277
40	352	338	322	313	306	299	292	286	281	277
41	352	338	322	313	306	299	292	286	281	277
42	352	339	328	320	313	306	300	295	291	287
43	352	339	328	320	313	306	300	295	291	287
44	352	339	328	320	313	306	300	295	291	287
45	352	339	328	320	313	306	300	295	291	287

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials (Cont'd)
1	240	237	235	233	230	229	228	...	...	...
2	240	237	235	233	230	229	228	...	...	...
3	240	237	235	233	230	229	228	...	...	...
4	240	237	235	233	230	229	228	...	...	...
5	240	237	235	233	230	229	228	...	...	...
6	245	242	240	238	236	234	232	...	...	...
7	245	242	240	238	236	234	232	...	...	...
8	267	264	261	258	256	255	253	...	...	...
9	202	199	196	194	192	191	189	188	188	187
10	202	199	196	194	192	191	189	188	188	187
11	202	199	196	194	192	191	189	188	188	187
12	245	245	244	242	240	237	233	229	225	223
13	245	245	244	242	240	237	233	229	225	223
14	245	245	244	242	240	237	233	229	225	223
15	245	245	244	242	240	237	233	229	225	223
16	245	245	244	242	240	237	233	229	225	223
17	245	245	244	242	240	237	233	229	225	223
18	245	245	244	242	240	237	233	229	225	223
19	196	191	187	183	180	177	175	173	172	171
20	196	191	187	183	180	177	175	173	172	171
21	196	191	187	183	180	177	175	173	172	171
22	196	191	187	183	180	177	175	173	172	171
23	196	191	187	183	180	177	175	173	172	171
24	196	191	187	183	180	177	175	173	172	171
25	196	191	187	183	180	177	175	173	172	171
26	196	191	187	183	180	177	175	173	172	171
27	215	211	209	206	205	203	200	...	...	...
28	215	211	209	206	205	203	200	...	...	...
29	215	211	209	206	205	203	200	...	...	...
30	215	211	209	206	205	203	200	...	...	...
31	215	211	209	206	205	203	200	...	...	...
32	215	211	209	206	205	203	200	...	...	...
33	215	211	209	206	205	203	200	...	...	...
34	215	211	209	206	205	203	200	...	...	...
35	273	269	266	264	261	260	258	257	256	255
36	273	269	266	264	261	260	258	257	256	255
37	273	269	266	264	261	260	258	257	256	255
38	273	269	266	264	261	260	258	257	256	255
39	273	269	266	264	261	260	258	257	256	255
40	273	269	266	264	261	260	258	257	256	255
41	273	269	266	264	261	260	258	257	256	255
42	283	280	277	274	271	267	263	258	254	249
43	283	280	277	274	271	267	263	258	254	249
44	283	280	277	274	271	267	263	258	254	249
45	283	280	277	274	271	267	263	258	254	249

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	186	185	185	184	183	182	181	179	178	175	173	170	166	...	...
10	186	185	185	184	183	182	181	179	178	175	173	170	166	...	...
11	186	185	185	184	183	182	181	179	178	175	173	170	166	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	171	171	171	170	170	169	169	...	...	...	...	...	...	...	...
20	171	171	171	170	170	169	169	...	...	...	...	...	...	...	...
21	171	171	171	170	170	169	169	...	...	...	...	...	...	...	...
22	171	171	171	170	170	169	169	...	...	...	...	...	...	...	...
23	171	171	171	170	170	169	169	...	...	...	...	...	...	...	...
24	171	171	171	170	170	169	169	...	...	...	...	...	...	...	...
25	171	171	171	170	170	169	169	...	...	...	...	...	...	...	...
26	171	171	171	170	170	169	169	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Nonferrous Materials (Cont'd)					
1	65Ni–28Mo–2Fe	Rod	SB–335	...	N10665	Solution ann.
2	65Ni–28Mo–2Fe	Forgings	SB–462	...	N10665	Solution ann.
3	65Ni–28Mo–2Fe	Forgings	SB–564	...	N10665	Solution ann.
4	65Ni–28Mo–2Fe	Wld. pipe	SB–619	...	N10665	Solution ann.
5	65Ni–28Mo–2Fe	Smls. pipe & tube	SB–622	...	N10665	Solution ann.
6	65Ni–28Mo–2Fe	Wld. tube	SB–626	...	N10665	Solution ann.
7	65Ni–29.5Mo–2Fe–2Cr	Plate, sheet, strip	SB–333	...	N10675	Solution ann.
8	65Ni–29.5Mo–2Fe–2Cr	Rod	SB–335	...	N10675	Solution ann.
9	65Ni–29.5Mo–2Fe–2Cr	Smls. & wld. fittings	SB–366	...	N10675	Solution ann.
10	65Ni–29.5Mo–2Fe–2Cr	Forgings	SB–462	...	N10675	Solution ann.
11	65Ni–29.5Mo–2Fe–2Cr	Forgings	SB–564	...	N10675	Solution ann.
12	65Ni–29.5Mo–2Fe–2Cr	Wld. pipe	SB–619	...	N10675	Solution ann.
13	65Ni–29.5Mo–2Fe–2Cr	Smls. pipe & tube	SB–622	...	N10675	Solution ann.
14	65Ni–29.5Mo–2Fe–2Cr	Wld. tube	SB–626	...	N10675	Solution ann.
15	37Ni–30Co–28Cr–2.7Si	Plate, sheet, strip	SB–435	...	N12160	Solution ann.
16	37Ni–30Co–28Cr–2.7Si	Forgings	SB–564	...	N12160	Solution ann.
17	37Ni–30Co–28Cr–2.7Si	Bar	SB–572	...	N12160	Solution ann.
18	37Ni–30Co–28Cr–2.7Si	Wld. pipe	SB–619	...	N12160	Solution ann.
19	37Ni–30Co–28Cr–2.7Si	Smls. pipe & tube	SB–622	...	N12160	Solution ann.
20	37Ni–30Co–28Cr–2.7Si	Wld. tube	SB–626	...	N12160	Solution ann.
21	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Smls. & wld. fittings	SB–366	...	R20033	Solution ann.
22	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Forgings	SB–564	...	R20033	Solution ann.
23	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Wld. pipe	SB–619	...	R20033	Solution ann.
24	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Smls. pipe & tube	SB–622	...	R20033	Solution ann.
25	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Plate, sheet, strip	SB–625	...	R20033	Solution ann.
26	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Wld. tube	SB–626	...	R20033	Solution ann.
27	33Cr–31Ni–32Fe–1.5Mo–0.6Cu–N	Rod	SB–649	...	R20033	Solution ann.
28	21Ni–30Fe–22Cr–18Co–3Mo–3W	Plate, sheet, strip	SB–435	...	R30556	Annealed
29	21Ni–30Fe–22Cr–18Co–3Mo–3W	Rod	SB–572	...	R30556	Annealed
30	21Ni–30Fe–22Cr–18Co–3Mo–3W	Wld. pipe	SB–619	...	R30556	Annealed
31	21Ni–30Fe–22Cr–18Co–3Mo–3W	Smls. pipe & tube	SB–622	...	R30556	Annealed
32	21Ni–30Fe–22Cr–18Co–3Mo–3W	Wld. tube	SB–626	...	R30556	Annealed
33	Co–26Cr–9Ni–5Mo–3Fe–2W	Rod	SB–815	...	R31233	Solution ann.
34	Co–26Cr–9Ni–5Mo–3Fe–2W	Plate, sheet, strip	SB–818	...	R31233	Solution ann.
35	Ti	Plate, sheet, strip	SB–265	1	R50250	Annealed
36	Ti	Smls. & wld. tube	SB–338	1	R50250	Annealed
37	Ti	Bar, billet	SB–348	1	R50250	Annealed
38	Ti	Forgings	SB–381	F–1	R50250	Annealed
39	Ti	Smls. pipe	SB–861	1	R50250	Annealed
40	Ti	Wld. pipe	SB–862	1	R50250	Annealed
41	Ti	Castings	SB–367	C–2	R50400	...
42	Ti	Plate, sheet, strip	SB–265	2	R50400	Annealed
43	Ti	Smls. & wld. tube	SB–338	2	R50400	Annealed
44	Ti	Bar, billet	SB–348	2	R50400	Annealed
45	Ti	Forgings	SB–381	F–2	R50400	Annealed

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	...	760	350	...
2	...	760	350	...
3	...	760	350	...
4	...	760	350	...
5	...	760	350	...
6	...	760	350	...
7	...	760	350	...
8	...	760	350	...
9	...	760	350	...
10	...	760	350	...
11	...	760	350	...
12	...	760	350	...
13	...	760	350	...
14	...	760	350	...
15	...	620	240	...
16	...	620	240	...
17	...	620	240	...
18	...	620	240	...
19	...	620	240	...
20	...	620	240	...
21	...	750	380	...
22	...	750	380	...
23	...	750	380	...
24	...	750	380	...
25	...	750	380	...
26	...	750	380	...
27	...	750	380	...
28	...	690	310	...
29	...	690	310	...
30	...	690	310	...
31	...	690	310	...
32	...	690	310	...
33	...	896	379	...
34	...	896	379	...
35	...	240	138	...
36	...	240	138	...
37	...	240	138	...
38	...	240	138	...
39	...	240	138	...
40	...	240	138	...
41	...	345	275	...
42	...	345	275	...
43	...	345	275	...
44	...	345	275	...
45	...	345	275	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	352	339	328	320	313	306	300	295	291	287
2	352	339	328	320	313	306	300	295	291	287
3	352	339	328	320	313	306	300	295	291	287
4	352	339	328	320	313	306	300	295	291	287
5	352	339	328	320	313	306	300	295	291	287
6	352	339	328	320	313	306	300	295	291	287
7	352	340	327	320	313	306	299	292	286	280
8	352	340	327	320	313	306	299	292	286	280
9	352	340	327	320	313	306	299	292	286	280
10	352	340	327	320	313	306	300	292	286	280
11	352	340	327	320	313	306	299	292	286	280
12	352	340	327	320	313	306	299	292	286	280
13	352	340	327	320	313	306	299	292	286	280
14	352	340	327	320	313	306	299	292	286	280
15	241	227	209	199	189	180	172	164	157	152
16	241	227	209	199	189	180	172	164	157	152
17	241	227	209	199	189	180	172	164	157	152
18	241	227	209	199	189	180	172	164	157	152
19	241	227	209	199	189	180	172	164	157	152
20	241	227	209	199	189	180	172	164	157	152
21	379	347	314	300	290	280	272	264	258	253
22	379	347	314	300	290	280	272	264	258	253
23	379	347	314	300	290	280	272	264	258	253
24	379	347	314	300	290	280	272	264	258	253
25	379	347	314	300	290	280	272	264	258	253
26	379	347	314	300	290	280	272	264	258	253
27	379	347	314	300	290	280	272	264	258	253
28	310	282	261	249	239	229	222	215	210	206
29	310	282	261	249	239	229	222	215	210	206
30	310	282	261	249	239	229	222	215	210	206
31	310	282	261	249	239	229	222	215	210	206
32	310	282	261	249	239	229	222	215	210	206
33	379	352	328	...	294	...	266	...	245	...
34	379	352	328	...	294	...	266	...	245	...
35	138	111	93.6	83.2	74.1	65.1	57.5	50.8	45.4	41.0
36	138	111	93.6	83.2	74.1	65.1	57.5	50.8	45.4	41.0
37	138	111	93.6	83.2	74.1	65.1	57.5	50.8	45.4	41.0
38	138	111	93.6	83.2	74.1	65.1	57.5	50.8	45.4	41.0
39	138	111	93.6	83.2	74.1	65.1	57.5	50.8	45.4	41.0
40	138	111	93.6	83.2	74.1	65.1	57.5	50.8	45.4	41.0
41	276	238	213	194	176	157	138	121	108	93.3
42	276	238	213	194	176	157	138	121	108	93.3
43	276	238	213	194	176	157	138	121	108	93.3
44	276	238	213	194	176	157	138	121	108	93.3
45	276	238	213	194	176	157	138	121	108	93.3

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials (Cont'd)
1	283	280	277	274	271	267	263	258	254	249
2	283	280	277	274	271	267	263	258	254	249
3	283	280	277	274	271	267	263	258	254	249
4	283	280	277	274	271	267	263	258	254	249
5	283	280	277	274	271	267	263	258	254	249
6	283	280	277	274	271	267	263	258	254	249
7	275	270	266	262	259	257	255	254	253	251
8	275	270	266	262	259	257	255	254	253	251
9	275	270	266	262	259	257	255	254	253	251
10	275	270	266	262	259	257	255	254	253	251
11	275	270	266	262	259	257	255	254	253	251
12	275	270	266	262	259	257	255	254	253	251
13	275	270	266	262	259	257	255	254	253	251
14	275	270	266	262	259	257	255	254	253	251
15	148	144	142	140	140	140	140	140	140	140
16	148	144	142	140	140	140	140	140	140	140
17	148	144	142	140	140	140	140	140	140	140
18	148	144	142	140	140	140	140	140	140	140
19	148	144	142	140	140	140	140	140	140	140
20	148	144	142	140	140	140	140	140	140	140
21	248	245	242	239	236	234	232	230	227	...
22	248	245	242	239	236	234	232	230	227	...
23	248	245	242	239	236	234	232	230	227	...
24	248	245	242	239	236	234	232	230	227	...
25	248	245	242	239	236	234	232	230	227	...
26	248	245	242	239	236	234	232	230	227	...
27	248	245	242	239	236	234	232	230	227	...
28	201	198	195	193	190	188	187	185	183	182
29	201	198	195	193	190	188	187	185	183	182
30	201	198	195	193	190	188	187	185	183	182
31	201	198	195	193	190	188	187	185	183	182
32	201	198	195	193	190	188	187	185	183	182
33	231	226	222	219	216	213	209	204	198	190
34	231	226	222	219	216	213	209	204	198	190
35	37.8	35.5	...	...	...	...	...	...	...	...
36	37.8	35.5	...	...	...	...	...	...	...	...
37	37.8	35.5	...	...	...	...	...	...	...	...
38	37.8	35.5	...	...	...	...	...	...	...	...
39	37.8	35.5	...	...	...	...	...	...	...	...
40	37.8	35.5	...	...	...	...	...	...	...	...
41	82.6	76.0	...	...	...	...	...	...	...	...
42	82.6	76.0	...	...	...	...	...	...	...	...
43	82.6	76.0	...	...	...	...	...	...	...	...
44	82.6	76.0	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Nonferrous Materials (Cont'd)					
1	Ti	Smls. pipe	SB–861	2	R50400	Annealed
2	Ti	Wld. pipe	SB–862	2	R50400	Annealed
3	Ti	Plate, sheet, strip	SB–265	2H	R50400	Annealed
4	Ti	Smls. & wld. tube	SB–338	2H	R50400	Annealed
5	Ti	Bar, billet	SB–348	2H	R50400	Annealed
6	Ti	Smls. fittings	SB–363	WPT2H	R50400	Annealed
7	Ti	Wld. fittings	SB–363	WPT2HW	R50400	Annealed
8	Ti	Forgings	SB–381	F–2H	R50400	Annealed
9	Ti	Smls. pipe	SB–861	2H	R50400	Annealed
10	Ti	Wld. pipe	SB–862	2H	R50400	Annealed
11	Ti	Plate, sheet, strip	SB–265	3	R50550	Annealed
12	Ti	Smls. & wld. tube	SB–338	3	R50550	Annealed
13	Ti	Bar, billet	SB–348	3	R50550	Annealed
14	Ti	Castings	SB–367	C–3	R50550	Annealed
15	Ti	Forgings	SB–381	F–3	R50550	Annealed
16	Ti	Smls. pipe	SB–861	3	R50550	Annealed
17	Ti	Wld. pipe	SB–862	3	R50550	Annealed
18	Ti–Pd	Plate, sheet, strip	SB–265	11	R52250	Annealed
19	Ti–Pd	Plate, sheet, strip	SB–265	17	R52252	Annealed
20	Ti–Ru	Plate, sheet, strip	SB–265	27	R52254	Annealed
21	Ti–Pd	Plate, sheet, strip	SB–265	7	R52400	Annealed
22	Ti–Pd	Smls. & wld. tube	SB–338	7	R52400	Annealed
23	Ti–Pd	Bar, billet	SB–348	7	R52400	Annealed
24	Ti–Pd	Forgings	SB–381	F–7	R52400	Annealed
25	Ti–Pd	Smls. pipe	SB–861	7	R52400	Annealed
26	Ti–Pd	Wld. pipe	SB–862	7	R52400	Annealed
27	Ti–0.15Pd	Plate, sheet, strip	SB–265	7H	R52400	Annealed
28	Ti–0.15Pd	Smls. & wld. tube	SB–338	7H	R52400	Annealed
29	Ti–0.15Pd	Bar, billet	SB–348	7H	R52400	Annealed
30	Ti–0.15Pd	Smls. fittings	SB–363	WPT7H	R52400	Annealed
31	Ti–0.15Pd	Wld. fittings	SB–363	WPT7HW	R52400	Annealed
32	Ti–0.15Pd	Forgings	SB–381	F–7H	R52400	Annealed
33	Ti–0.15Pd	Smls. pipe	SB–861	7H	R52400	Annealed
34	Ti–0.15Pd	Wld. pipe	SB–862	7H	R52400	Annealed
35	Ti–0.05Pd	Plate, sheet, strip	SB–265	16H	R52402	Annealed
36	Ti–0.05Pd	Smls. & wld. tube	SB–338	16H	R52402	Annealed
37	Ti–0.05Pd	Bar, billet	SB–348	16H	R52402	Annealed
38	Ti–0.05Pd	Smls. fittings	SB–363	WPT16H	R52402	Annealed
39	Ti–0.05Pd	Wld. fittings	SB–363	WPT16HW	R52402	Annealed
40	Ti–0.05Pd	Forgings	SB–381	F–16H	R52402	Annealed
41	Ti–0.05Pd	Smls. pipe	SB–861	16H	R52402	Annealed
42	Ti–0.05Pd	Wld. pipe	SB–862	16H	R52402	Annealed
43	Ti–Ru	Plate, sheet, strip	SB–265	26	R52404	Annealed
44	Ti–Ru	Smls. & wld. tube	SB–338	26	R52404	Annealed
45	Ti–Ru	Bar, billet	SB–348	26	R52404	Annealed

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	...	345	275	...
2	...	345	275	...
3	...	400	275	...
4	...	400	275	...
5	...	400	275	...
6	...	400	275	...
7	...	400	275	...
8	...	400	275	...
9	...	400	275	...
10	...	400	275	...
11	...	450	380	...
12	...	450	380	...
13	...	450	380	...
14	...	450	380	...
15	...	450	380	...
16	...	450	380	...
17	...	450	380	...
18	...	240	138	...
19	...	240	138	...
20	...	240	138	...
21	...	345	275	...
22	...	345	275	...
23	...	345	275	...
24	...	345	275	...
25	...	345	275	...
26	...	345	275	...
27	...	400	275	...
28	...	400	275	...
29	...	400	275	...
30	...	400	275	...
31	...	400	275	...
32	...	400	275	...
33	...	400	275	...
34	...	400	275	...
35	...	400	275	...
36	...	400	275	...
37	...	400	275	...
38	...	400	275	...
39	...	400	275	...
40	...	400	275	...
41	...	400	275	...
42	...	400	275	...
43	...	345	275	...
44	...	345	275	...
45	...	345	275	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	276	238	213	194	176	157	138	121	108	93.3
2	276	238	213	194	176	157	138	121	108	93.3
3	276	238	212	194	176	157	139	122	107	95.1
4	276	238	212	194	176	157	139	122	107	95.1
5	276	238	212	194	176	157	139	122	107	95.1
6	276	238	212	194	176	157	139	122	107	95.1
7	276	238	212	194	176	157	139	122	107	95.1
8	276	238	212	194	176	157	139	122	107	95.1
9	276	238	212	194	176	157	139	122	107	95.1
10	276	238	212	194	176	157	139	122	107	95.1
11	379	334	297	270	245	222	201	181	162	145
12	379	334	297	270	245	222	201	181	162	145
13	379	334	297	270	245	222	201	181	162	145
14	379	334	297	270	245	222	201	181	162	145
15	379	334	297	270	245	222	201	181	162	145
16	379	334	297	270	245	222	201	181	162	145
17	379	334	297	270	245	222	201	181	162	145
18	138	111	93.6	83.2	74.1	65.1	57.5	50.8	45.4	41.0
19	138	111	93.6	83.2	74.1	65.1	57.5	50.8	45.4	41.0
20	138	111	93.6	83.2	74.1	65.1	57.5	50.8	45.4	41.0
21	276	238	213	194	176	157	138	121	108	93.3
22	276	238	213	194	176	157	138	121	108	93.3
23	276	238	213	194	176	157	138	121	108	93.3
24	276	238	213	194	176	157	138	121	108	93.3
25	276	238	213	194	176	157	138	121	108	93.3
26	276	238	213	194	176	157	138	121	108	93.3
27	276	238	212	194	176	157	139	122	107	95.1
28	276	238	212	194	176	157	139	122	107	95.1
29	276	238	212	194	176	157	139	122	107	95.1
30	276	238	212	194	176	157	139	122	107	95.1
31	276	238	212	194	176	157	139	122	107	95.1
32	276	238	212	194	176	157	139	122	107	95.1
33	276	238	212	194	176	157	139	122	107	95.1
34	276	238	212	194	176	157	139	122	107	95.1
35	276	238	212	194	176	157	139	122	107	95.1
36	276	238	212	194	176	157	139	122	107	95.1
37	276	238	212	194	176	157	139	122	107	95.1
38	276	238	212	194	176	157	139	122	107	95.1
39	276	238	212	194	176	157	139	122	107	95.1
40	276	238	212	194	176	157	139	122	107	95.1
41	276	238	212	194	176	157	139	122	107	95.1
42	276	238	212	194	176	157	139	122	107	95.1
43	276	238	213	194	176	157	138	121	108	93.3
44	276	238	213	194	176	157	138	121	108	93.3
45	276	238	213	194	176	157	138	121	108	93.3

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials (Cont'd)
1	82.6	76.0	...	...	...	...	...	...	...	...
2	82.6	76.0	...	...	...	...	...	...	...	...
3	86.6	80.8	...	...	...	...	...	...	...	...
4	86.6	80.8	...	...	...	...	...	...	...	...
5	86.6	80.8	...	...	...	...	...	...	...	...
6	86.6	80.8	...	...	...	...	...	...	...	...
7	86.6	80.8	...	...	...	...	...	...	...	...
8	86.6	80.8	...	...	...	...	...	...	...	...
9	86.6	80.8	...	...	...	...	...	...	...	...
10	86.6	80.8	...	...	...	...	...	...	...	...
11	128	112	...	...	...	...	...	...	...	...
12	128	112	...	...	...	...	...	...	...	...
13	128	112	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...
15	128	112	...	...	...	...	...	...	...	...
16	128	112	...	...	...	...	...	...	...	...
17	128	112	...	...	...	...	...	...	...	...
18	37.8	35.5	...	...	...	...	...	...	...	...
19	37.8	35.5	...	...	...	...	...	...	...	...
20	37.8	35.5	...	...	...	...	...	...	...	...
21	82.6	76.0	...	...	...	...	...	...	...	...
22	82.6	76.0	...	...	...	...	...	...	...	...
23	82.6	76.0	...	...	...	...	...	...	...	...
24	82.6	76.0	...	...	...	...	...	...	...	...
25	82.6	76.0	...	...	...	...	...	...	...	...
26	82.6	76.0	...	...	...	...	...	...	...	...
27	86.6	80.8	...	...	...	...	...	...	...	...
28	86.6	80.8	...	...	...	...	...	...	...	...
29	86.6	80.8	...	...	...	...	...	...	...	...
30	86.6	80.8	...	...	...	...	...	...	...	...
31	86.6	80.8	...	...	...	...	...	...	...	...
32	86.6	80.8	...	...	...	...	...	...	...	...
33	86.6	80.8	...	...	...	...	...	...	...	...
34	86.6	80.8	...	...	...	...	...	...	...	...
35	86.6	80.8	...	...	...	...	...	...	...	...
36	86.6	80.8	...	...	...	...	...	...	...	...
37	86.6	80.8	...	...	...	...	...	...	...	...
38	86.6	80.8	...	...	...	...	...	...	...	...
39	86.6	80.8	...	...	...	...	...	...	...	...
40	86.6	80.8	...	...	...	...	...	...	...	...
41	86.6	80.8	...	...	...	...	...	...	...	...
42	86.6	80.8	...	...	...	...	...	...	...	...
43	82.6	76.0	...	...	...	...	...	...	...	...
44	82.6	76.0	...	...	...	...	...	...	...	...
45	82.6	76.0	...	...	...	...	...	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Nonferrous Materials (Cont'd)					
1	Ti–Ru	Smls. fittings	SB–363	WPT26	R52404	Annealed
2	Ti–Ru	Wld. fittings	SB–363	WPT26W	R52404	Annealed
3	Ti–Ru	Forgings	SB–381	F–26	R52404	Annealed
4	Ti–Ru	Smls. pipe	SB–861	26	R52404	Annealed
5	Ti–Ru	Wld. pipe	SB–862	26	R52404	Annealed
6	Ti–0.10Ru	Plate, sheet, strip	SB–265	26H	R52404	Annealed
7	Ti–0.10Ru	Smls. & wld. tube	SB–338	26H	R52404	Annealed
8	Ti–0.10Ru	Bar, billet	SB–348	26H	R52404	Annealed
9	Ti–0.10Ru	Smls. fittings	SB–363	WPT26H	R52404	Annealed
10	Ti–0.10Ru	Wld. fittings	SB–363	WPT26HW	R52404	Annealed
11	Ti–0.10Ru	Forgings	SB–381	F–26H	R52404	Annealed
12	Ti–0.10Ru	Smls. pipe	SB–861	26H	R52404	Annealed
13	Ti–0.10Ru	Wld. pipe	SB–862	26H	R52404	Annealed
14	Ti–0.3Mo–0.8Ni	Plate, sheet, strip	SB–265	12	R53400	Annealed
15	Ti–0.3Mo–0.8Ni	Smls. & wld. tube	SB–338	12	R53400	Annealed
16	Ti–0.3Mo–0.8Ni	Bar, billet	SB–348	12	R53400	Annealed
17	Ti–0.3Mo–0.8Ni	Forgings	SB–381	F–12	R53400	Annealed
18	Ti–0.3Mo–0.8Ni	Smls. pipe	SB–861	12	R53400	Annealed
19	Ti–0.3Mo–0.8Ni	Wld. pipe	SB–862	12	R53400	Annealed
20	Ti–4Al–2.5V–1.5Fe	Plate, sheet, strip	SB–265	38	R54250	Annealed
21	Ti–4Al–2.5V–1.5Fe	Smls. tube	SB–338	38	R54250	Annealed
22	Ti–4Al–2.5V–1.5Fe	Wld. tube	SB–338	38	R54250	Annealed
23	Ti–4Al–2.5V–1.5Fe	Bar, billet	SB–348	38	R54250	Annealed
24	Ti–4Al–2.5V–1.5Fe	Smls. fittings	SB–363	WPT38	R54250	Annealed
25	Ti–4Al–2.5V–1.5Fe	Wld. fittings	SB–363	WPT38W	R54250	Annealed
26	Ti–4Al–2.5V–1.5Fe	Forgings	SB–381	F–38	R54250	Annealed
27	Ti–4Al–2.5V–1.5Fe	Smls. pipe	SB–861	38	R54250	Annealed
28	Ti–4Al–2.5V–1.5Fe	Wld. pipe	SB–862	38	R54250	Annealed
29	Ti–3Al–2.5V	Plate, sheet, strip	SB–265	9	R56320	Annealed
30	Ti–3Al–2.5V	Smls. & wld. tube	SB–338	9	R56320	Annealed
31	Ti–3Al–2.5V	Bar, billet	SB–348	9	R56320	Annealed
32	Ti–3Al–2.5V	Smls. fittings	SB–363	WPT9	R56320	Annealed
33	Ti–3Al–2.5V	Wld. fittings	SB–363	WPT9W	R56320	Annealed
34	Ti–3Al–2.5V	Forgings	SB–381	F–9	R56320	Annealed
35	Ti–3Al–2.5V	Smls. pipe	SB–861	9	R56320	Annealed
36	Ti–3Al–2.5V	Wld. pipe	SB–862	9	R56320	Annealed
37	Ti–3Al–2.5V–0.1Ru	Plate, sheet, strip	SB–265	28	R56323	Annealed
38	Ti–3Al–2.5V–0.1Ru	Smls. & wld. tube	SB–338	28	R56323	Annealed
39	Ti–3Al–2.5V–0.1Ru	Bar, billet	SB–348	28	R56323	Annealed
40	Ti–3Al–2.5V–0.1Ru	Smls. fittings	SB–363	WPT28	R56323	Annealed
41	Ti–3Al–2.5V–0.1Ru	Wld. fittings	SB–363	WPT28W	R56323	Annealed
42	Ti–3Al–2.5V–0.1Ru	Forgings	SB–381	F–28	R56323	Annealed
43	Ti–3Al–2.5V–0.1Ru	Smls. pipe	SB–861	28	R56323	Annealed
44	Ti–3Al–2.5V–0.1Ru	Wld. pipe	SB–862	28	R56323	Annealed
45	99.2Zr	Forgings	SB–493	...	R60702	Annealed

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	...	345	275	...
2	...	345	275	...
3	...	345	275	...
4	...	345	275	...
5	...	345	275	...
6	...	400	275	...
7	...	400	275	...
8	...	400	275	...
9	...	400	275	...
10	...	400	275	...
11	...	400	275	...
12	...	400	275	...
13	...	400	275	...
14	...	485	345	...
15	...	485	345	...
16	...	485	345	...
17	...	485	345	...
18	...	485	345	...
19	...	485	345	...
20	...	895	794	...
21	...	895	794	...
22	...	895	794	...
23	...	895	794	...
24	...	895	794	...
25	...	895	794	...
26	...	895	794	...
27	...	895	794	...
28	...	895	794	...
29	...	620	485	...
30	...	620	485	...
31	...	620	485	...
32	...	620	485	...
33	...	620	485	...
34	...	620	485	...
35	...	620	485	...
36	...	620	485	...
37	...	620	485	...
38	...	620	485	...
39	...	620	485	...
40	...	620	485	...
41	...	620	485	...
42	...	620	485	...
43	...	620	485	...
44	...	620	485	...
45	...	380	205	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	276	238	213	194	176	157	138	121	108	93.3
2	276	238	213	194	176	157	138	121	108	93.3
3	276	238	213	194	176	157	138	121	108	93.3
4	276	238	213	194	176	157	138	121	108	93.3
5	276	238	213	194	176	157	138	121	108	93.3
6	276	238	212	194	176	157	139	122	107	95.1
7	276	238	212	194	176	157	139	122	107	95.1
8	276	238	212	194	176	157	139	122	107	95.1
9	276	238	212	194	176	157	139	122	107	95.1
10	276	238	212	194	176	157	139	122	107	95.1
11	276	238	212	194	176	157	139	122	107	95.1
12	276	238	212	194	176	157	139	122	107	95.1
13	276	238	212	194	176	157	139	122	107	95.1
14	345	311	281	259	241	223	205	194	183	174
15	345	311	281	259	241	223	205	194	183	174
16	345	311	281	259	241	223	205	194	183	174
17	345	311	281	259	241	223	205	194	183	174
18	345	311	281	259	241	223	205	194	183	174
19	345	311	281	259	241	223	205	194	183	174
20	793	735	686	652	621	592	566	542	522	504
21	793	735	686	652	621	592	566	542	522	504
22	793	735	686	652	621	592	566	542	522	504
23	793	735	686	652	621	592	566	542	522	504
24	793	735	686	652	621	592	566	542	522	504
25	793	735	686	652	621	592	566	542	522	504
26	793	735	686	652	621	592	566	542	522	504
27	793	735	686	652	621	592	566	542	522	504
28	793	735	686	652	621	592	566	542	522	504
29	483	449	416	398	381	363	346	328	313	304
30	483	449	416	398	381	363	346	328	313	304
31	483	449	416	398	381	363	346	328	313	304
32	483	449	416	398	381	363	346	328	313	304
33	483	449	416	398	381	363	346	328	313	304
34	483	449	416	398	381	363	346	328	313	304
35	483	449	416	398	381	363	346	328	313	304
36	483	449	416	398	381	363	346	328	313	304
37	483	449	416	398	381	363	346	328	313	304
38	483	449	416	398	381	363	346	328	313	304
39	483	449	416	398	381	363	346	328	313	304
40	483	449	416	398	381	363	346	328	313	304
41	483	449	416	398	381	363	346	328	313	304
42	483	449	416	398	381	363	346	328	313	304
43	483	449	416	398	381	363	346	328	313	304
44	483	449	416	398	381	363	346	328	313	304
45	207	178	155	138	123	110	98.5	88.2	79.1	71.5

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
										Nonferrous Materials (Cont'd)
1	82.6	76.0	...	...	...	...	...	...	...	...
2	82.6	76.0	...	...	...	...	...	...	...	...
3	82.6	76.0	...	...	...	...	...	...	...	...
4	82.6	76.0	...	...	...	...	...	...	...	...
5	82.6	76.0	...	...	...	...	...	...	...	...
6	86.6	80.8	...	...	...	...	...	...	...	...
7	86.6	80.8	...	...	...	...	...	...	...	...
8	86.6	80.8	...	...	...	...	...	...	...	...
9	86.6	80.8	...	...	...	...	...	...	...	...
10	86.6	80.8	...	...	...	...	...	...	...	...
11	86.6	80.8	...	...	...	...	...	...	...	...
12	86.6	80.8	...	...	...	...	...	...	...	...
13	86.6	80.8	...	...	...	...	...	...	...	...
14	168	164	...	...	...	...	...	...	...	...
15	168	164	...	...	...	...	...	...	...	...
16	168	164	...	...	...	...	...	...	...	...
17	168	164	...	...	...	...	...	...	...	...
18	168	164	...	...	...	...	...	...	...	...
19	168	164	...	...	...	...	...	...	...	...
20	488	474	460	...	...	...	...	...	...	...
21	488	474	460	...	...	...	...	...	...	...
22	488	474	460	...	...	...	...	...	...	...
23	488	474	460	...	...	...	...	...	...	...
24	488	474	460	...	...	...	...	...	...	...
25	488	474	460	...	...	...	...	...	...	...
26	488	474	460	...	...	...	...	...	...	...
27	488	474	460	...	...	...	...	...	...	...
28	488	474	460	...	...	...	...	...	...	...
29	293	280	...	...	...	...	...	...	...	...
30	293	280	...	...	...	...	...	...	...	...
31	293	280	...	...	...	...	...	...	...	...
32	293	280	...	...	...	...	...	...	...	...
33	293	280	...	...	...	...	...	...	...	...
34	293	280	...	...	...	...	...	...	...	...
35	293	280	...	...	...	...	...	...	...	...
36	293	280	...	...	...	...	...	...	...	...
37	293	280	...	...	...	...	...	...	...	...
38	293	280	...	...	...	...	...	...	...	...
39	293	280	...	...	...	...	...	...	...	...
40	293	280	...	...	...	...	...	...	...	...
41	293	280	...	...	...	...	...	...	...	...
42	293	280	...	...	...	...	...	...	...	...
43	293	280	...	...	...	...	...	...	...	...
44	293	280	...	...	...	...	...	...	...	...
45	65.3	60.5	57.0	54.1	52.4	51.7	51.1	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding														
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	Alloy Desig./UNS No.	Class/Condition/ Temper
	Nonferrous Materials (Cont'd)					
1	99.2Zr	Smls. & wld. tube	SB–523	...	R60702	Annealed
2	99.2Zr	Bar, wire	SB–550	...	R60702	Annealed
3	99.2Zr	Plate, sheet, strip	SB–551	...	R60702	Annealed
4	99.2Zr	Smls. fittings	SB–653	PZ–2	R60702	Annealed
5	99.2Zr	Wld. fittings	SB–653	PZ–2W	R60702	Annealed
6	99.2Zr	Smls. & wld. pipe	SB–658	...	R60702	Annealed
(**23**) 7	95.5Zr + 2.5Nb	Forgings	SB–493	...	R60705	Annealed
(**23**) 8	95.5Zr + 2.5Nb	Smls. & wld. tube	SB–523	...	R60705	Annealed
(**23**) 9	95.5Zr + 2.5Nb	Bar, wire	SB–550	...	R60705	Annealed
(**23**) 10	95.5Zr + 2.5Nb	Plate, sheet, strip	SB–551	...	R60705	Annealed
(**23**) 11	95.5Zr + 2.5Nb	Smls. fittings	SB–653	PZ–5	R60705	Annealed
(**23**) 12	95.5Zr + 2.5Nb	Wld. fittings	SB–653	PZ–5W	R60705	Annealed
(**23**) 13	95.5Zr + 2.5Nb	Smls. & wld. pipe	SB–658	...	R60705	Annealed

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Size/Thickness, mm	Min. Tensile Strength, MPa	Min. Yield Strength, MPa	Notes
				Nonferrous Materials (Cont'd)
1	...	380	205	...
2	...	380	205	...
3	...	380	205	...
4	...	380	205	...
5	...	380	205	...
6	...	380	205	...
7	...	485	380	...
8	...	550	380	...
9	...	550	380	...
10	...	550	380	...
11	...	550	380	...
12	...	550	380	...
13	...	550	380	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	40	65	100	125	150	175	200	225	250	275
	Nonferrous Materials (Cont'd)									
1	207	178	155	138	123	110	98.5	88.2	79.1	71.5
2	207	178	155	138	123	110	98.5	88.2	79.1	71.5
3	207	178	155	138	123	110	98.5	88.2	79.1	71.5
4	207	178	155	138	123	110	98.5	88.2	79.1	71.5
5	207	178	155	138	123	110	98.5	88.2	79.1	71.5
6	207	178	155	138	123	110	98.5	88.2	79.1	71.5
7	379	298	251	225	203	186	171.8	159.9	149.8	141.0
8	379	298	251	225	203	186	171.8	159.9	149.8	141.0
9	379	298	251	225	203	186	171.8	159.9	149.8	141.0
10	379	298	251	225	203	186	171.8	159.9	149.8	141.0
11	379	298	251	225	203	186	171.8	159.9	149.8	141.0
12	379	298	251	225	203	186	171.8	159.9	149.8	141.0
13	379	298	251	225	203	186	171.8	159.9	149.8	141.0

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding									
	300	325	350	375	400	425	450	475	500	525
								Nonferrous Materials (Cont'd)		
1	65.3	60.5	57.0	54.1	52.4	51.7	51.1	...	...	...
2	65.3	60.5	57.0	54.1	52.4	51.7	51.1	...	...	...
3	65.3	60.5	57.0	54.1	52.4	51.7	51.1	...	...	...
4	65.3	60.5	57.0	54.1	52.4	51.7	51.1	...	...	...
5	65.3	60.5	57.0	54.1	52.4	51.7	51.1	...	...	...
6	65.3	60.5	57.0	54.1	52.4	51.7	51.1	...	...	...
7	133.3	126.7	121.2	117.3	115.3	115.3	115.3	...	...	...
8	133.3	126.7	121.2	117.3	115.3	115.3	115.3	...	...	...
9	133.3	126.7	121.2	117.3	115.3	115.3	115.3	...	...	...
10	133.3	126.7	121.2	117.3	115.3	115.3	115.3	...	...	...
11	133.3	126.7	121.2	117.3	115.3	115.3	115.3	...	...	...
12	133.3	126.7	121.2	117.3	115.3	115.3	115.3	...	...	...
13	133.3	126.7	121.2	117.3	115.3	115.3	115.3	...	...	...

Table Y-1 (Cont'd)
Yield Strength Values, S_y, for Ferrous and Nonferrous Materials

Line No.	Yield Strength, MPa (Multiply by 1000 to Obtain kPa), for Metal Temperature, °C, Not Exceeding															
	550	575	600	625	650	675	700	725	750	775	800	825	850	875	900	
	Nonferrous Materials (Cont'd)															
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(**23**)

NOTES TO TABLE Y-1

GENERAL NOTES

(a) The following abbreviations are used: ann., annealed; cond., condenser; CW, cold worked; extr., extruded; fin., finished; fr., from; HW, hot worked; NT, Normalized and tempered; QT, Quenched and tempered; rel., relieved; rld., rolled; Smls., Seamless; Sol., Solution; SR, stress relieved; treat., treated; and Wld., Welded.

(b) The tabulated values of yield strength are those which the Committee believes are suitable for use in design calculations. At temperatures above room temperature, the yield strength values correspond to the yield strength trend curve adjusted to the minimum specified room temperature yield strength. The yield strength values do not correspond exactly to "minimum" or "average" as these terms are applied to a statistical treatment of a homogeneous set of data. Neither the ASME Material Specifications nor the rules of Sections I, III, VIII, or XII require elevated temperature testing for yield strengths of production material for use in Code components. It is not intended that results of such tests, if performed, be compared with these tabulated yield strength values for ASME Code acceptance/rejection purposes for materials. If some elevated temperature test results on production material appear lower than the tabulated values by a large amount (more than the typical variability of material and suggesting the possibility of some error), further investigation by retest or other means should be considered.

(c) Notes limiting applications of these materials appear in Tables 1A, 1B, 2A, 2B, 3, 4, 5A, and 5B.

(d) These values represent yield strength design values that are appropriate for use in any section of the ASME Boiler & Pressure Vessel Code in which the material is permitted and not otherwise restricted by applicability temperature limits, application limits, or notes.

(e) Where specifications, grades, classes, and types are listed in this Table, and where the material specification in Section II, Part A or Part B is a dual–unit specification (e.g., SA–516/SA–516M), the values listed in this Table shall be applicable to either the U.S. customary version of the material specification or the SI units version of the material specification. For example, the values listed for SA–516 Grade 70 shall be used when SA–516M Grade 485 is used in construction.

(f) The values in this Table may be interpolated to determine values for intermediate temperatures. The values at intermediate temperatures shall be rounded to the same number of decimal places as the value at the higher temperature between which values are being interpolated. The rounding rule is: when the next digit beyond the last place to be retained is less than 5, retain unchanged the digit in the last place retained; when the digit next beyond the last place to be retained is 5 or greater, increase by 1 the digit in the last place retained.

(g) Where a size limit appears in the Size/Thickness column, the limit applies to the dimension appropriate to the product form: wall thickness of tubing, pipe, pipe fittings, and hollow forgings; thickness of plate, flat bar and forgings, and polygonal bar; diameter of solid bar and bolting; and thickest cross–section of other pressure parts, e.g., castings and forgings.

NOTES FOR SECTION VIII, DIVISION 3 APPLICATIONS

(1) Strength values for intermediate thickness may be interpolated.

(23)

Table Y-2
Factors for Limiting Permanent Strain in Austenitic Stainless Steels, High-Nickel Alloy Steels, Nickel, Nickel Alloys, Copper, and Copper Alloys

Strain, %	Factors
0.10	0.90
0.09	0.89
0.08	0.88
0.07	0.86
0.06	0.83
0.05	0.80
0.04	0.77
0.03	0.73
0.02	0.69
0.01	0.63

GENERAL NOTE: This Table lists multiplying factors that, when applied to the yield strength values shown in Table Y-1, will give a value that will result in lower levels of permanent strain. If this value is less than the maximum allowable stress value listed in Table 1A, Table 1B, Table 2A, Table 2B, Table 5A, or Table 5B, or the design stress intensity value listed in Table 2A or Table 2B, the lower value shall be used.

SUBPART 2
PHYSICAL PROPERTIES TABLES

INTRODUCTION (23)

Section II, Part D, Subpart 2 provides, to the extent possible, physical properties for most of the alloys used in Code construction. Included in this Subpart are tables of thermal expansion (instantaneous, mean, and linear), thermal conductivity and thermal diffusivity, and modulus of elasticity. These values are all listed as a function of temperature from 20°C to as high as 1 000°C. Subpart 2 also contains tables of density and Poisson's ratio for ferrous and nonferrous alloys.

All of the properties provided in Subpart 2 are considered typical. They are neither average nor minimum. Thermal–physical properties such as thermal expansion, thermal conductivity, and thermal diffusivity are affected more by alloy content than by crystal structure or heat treatment. Due to the permitted range for elements comprising alloys (specification ranges of chemical compositions), the thermal–physical properties described in Tables TE-1 through TE-5 and Table TCD should be considered to have an associated uncertainty of ±10%.

Moduli of elasticity and Poisson's ratio are also typical values, but the values of modulus of elasticity, shown as a function of temperature in Tables TM-1 through TM-5, tend to be closer to average values since their temperature dependency is factored against an "average" room-temperature value.

The physical properties listed in this Subpart are for information only, unless invoked by a Boiler & Pressure Vessel Code (Sections I, III, IV, VIII, X, XI, and XII). When a user of the Code has data supporting the use of values different from those in this Subpart, such other values may be used in lieu of the values in this Subpart.

Values for temperatures between those tabulated may be obtained by linear interpolation.

For those alloys for which physical properties are not yet addressed in Subpart 2, the user of the Code may use other authoritative sources for the needed information. In those instances, or when alternative values are used, the user is encouraged to submit the values and supporting data to the attention of the ASME Boiler and Pressure Vessel Committee II on Materials for its consideration in improving and revising the values in Subpart 2. Information should be directed to:

Secretary
ASME Boiler and Pressure Vessel Committee II on Materials
Two Park Avenue
New York, NY 10016-5990

(23)

Table TE-1
Thermal Expansion for Ferrous Materials

	Coefficients for Carbon and Low Alloy Steels (Group 1) [Note (1)]			Coefficients for Other Alloy Steels (Group 2) [Note (2)]			Coefficients for 5Cr–1Mo and 29Cr–7Ni–2Mo–N Steels		
Temperature, °C	A	B	C	A	B	C	A	B	C
20	11.5	11.5	0	12.6	12.6	0	11.5	11.5	0
50	12.0	11.8	0.35	13.0	12.8	0.38	12.0	11.8	0.35
75	12.3	11.9	0.65	13.3	13.0	0.72	12.3	12.0	0.66
100	12.7	12.1	0.97	13.5	13.1	1.0	12.6	12.1	0.97
125	12.9	12.3	1.3	13.8	13.2	1.4	12.8	12.3	1.3
150	13.2	12.4	1.6	14.0	13.4	1.7	12.9	12.4	1.6
175	13.5	12.6	2.0	14.2	13.5	2.1	13.0	12.5	1.9
200	13.8	12.7	2.3	14.4	13.6	2.4	13.2	12.6	2.3
225	14.0	12.9	2.6	14.6	13.7	2.8	13.3	12.6	2.6
250	14.3	13.0	3.0	14.8	13.8	3.2	13.4	12.7	2.9
275	14.6	13.2	3.4	15.0	13.9	3.6	13.5	12.8	3.3
300	14.9	13.3	3.7	15.1	14.0	3.9	13.6	12.8	3.6
325	15.1	13.4	4.1	15.3	14.1	4.3	13.7	12.9	3.9
350	15.4	13.6	4.5	15.4	14.2	4.7	13.8	13.0	4.3
375	15.7	13.7	4.9	15.5	14.3	5.1	14.0	13.0	4.6
400	15.9	13.8	5.3	15.7	14.4	5.5	14.1	13.1	5.0
425	16.1	14.0	5.7	15.8	14.5	5.9	14.2	13.2	5.3
450	16.4	14.1	6.1	15.9	14.6	6.3	14.4	13.2	5.7
475	16.5	14.2	6.5	16.0	14.6	6.7	14.5	13.3	6.1
500	16.7	14.4	6.9	16.1	14.7	7.1	14.6	13.4	6.4
525	16.8	14.5	7.3	16.2	14.8	7.5	14.7	13.4	6.8
550	16.9	14.6	7.7	16.2	14.8	7.9	14.8	13.5	7.2
575	17.0	14.7	8.2	16.3	14.9	8.3	14.9	13.6	7.5
600	17.0	14.8	8.6	16.4	15.0	8.7	15.0	13.6	7.9
625	17.1	14.9	9.0	16.4	15.0	9.1	15.1	13.7	8.3
650	17.1	15.0	9.4	16.4	15.1	9.5	15.2	13.7	8.7
675	17.1	15.1	9.9	16.4	15.1	9.9	15.3	13.8	9.0
700	17.1	15.1	10.3	16.4	15.2	10.3	15.4	13.9	9.4
725	17.1	15.2	10.7	16.3	15.2	10.7	15.6	13.9	9.8
750	17.2	15.3	11.1	16.3	15.3	11.1	15.9	14.0	10.2
775	17.4	15.3	11.6	16.2	15.3	11.1	16.3	14.0	10.6
800	17.7	15.4	12.0	16.0	15.3	11.5	16.8	14.1	11.0
825	18.1	15.5	12.5	15.8	15.3	11.9	17.4	14.2	11.4

Table TE-1
Thermal Expansion for Ferrous Materials (Cont'd)

	Coefficients for 9Cr–1Mo Steels (Including Grades 9, 91, 911, and 92)			Coefficients for 5Ni–$^1/_4$Mo Steels			Coefficients for 7% Nickel Steel		
Temperature, °C	A	B	C	A	B	C	A	B	C
20	10.5	10.5	0	11.2	11.2	0	10.6	10.6	0
50	10.8	10.6	0.32	11.6	11.4	0.34	11.1	10.8	0.32
75	11.0	10.7	0.59	12.0	11.6	0.64	11.6	11.1	0.61
100	11.2	10.9	0.87	12.3	11.8	0.94	11.9	11.3	0.90
125	11.4	11.0	1.2	12.5	11.9	1.3	12.2	11.5	1.3
150	11.6	11.1	1.4	12.7	12.0	1.6	12.5	11.6	1.6
							12.7	11.8	1.9
175	11.8	11.2	1.7	13.0	12.2	1.9			
200	12.0	11.3	2.0	13.2	12.3	2.2	12.9	11.9	2.2
225	12.2	11.4	2.3	13.4	12.4	2.5	13.1	12.1	2.5
250	12.4	11.5	2.6	13.6	12.5	2.9	13.2	12.2	2.8
275	12.5	11.6	3.0	13.8	12.7	3.2	13.4	12.3	3.1
300	12.7	11.7	3.3	14.0	12.8	3.6	13.5	12.4	3.5
							13.7	12.5	3.8
325	12.8	11.8	3.6	14.3	12.9	3.9			
350	13.0	11.9	3.9	14.5	13.0	4.3	13.9	12.6	4.2
375	13.1	11.9	4.2	14.6	13.1	4.7	14.0	12.7	4.5
400	13.3	12.0	4.6	14.8	13.2	5.0	14.2	12.8	4.9
425	13.4	12.1	4.9	15.0	13.3	5.4	14.4	12.9	5.2
450	13.6	12.2	5.2	15.1	13.4	5.8	14.5	13.0	5.6
							14.5	13.0	5.9
475	13.7	12.3	5.6	15.3	13.5	6.1			
500	13.8	12.3	5.9	15.4	13.6	6.5	14.4	13.1	6.3
525	14.0	12.4	6.3	15.6	13.7	6.9	...	...	...
550	14.2	12.5	6.6	15.8	13.8	7.3	...	...	...
575	14.4	12.6	7.0	16.0	13.9	7.7	...	...	...
600	14.6	12.7	7.3	16.4	14.0	8.1	...	...	...
625	14.9	12.7	7.7	16.9	14.1	8.5	...	...	...
650	15.2	12.8	8.1	17.5	14.2	9.0	...	...	...
675	15.5	12.9	8.5	...	...	...	...	...	...
700	16.0	13.0	8.9	...	...	...	...	...	...
725	16.5	13.1	9.3	...	...	...	...	...	...
750	17.1	13.3	9.7	...	...	...	...	...	...
775	17.9	13.4	10.1	...	...	...	...	...	...
800	18.8	13.6	10.6	...	...	...	...	...	...
825	19.9	13.8	11.1	...	...	...	...	...	...

Table TE-1
Thermal Expansion for Ferrous Materials (Cont'd)

	Coefficients for 8Ni and 9Ni Steels			Coefficients for 12Cr, 12Cr–1Al, 13Cr, and 13Cr–4Ni Steels			Coefficients for 15Cr and 17Cr Steels		
Temperature, °C	A	B	C	A	B	C	A	B	C
20	9.9	9.9	0	10.6	10.6	0	9.6	9.6	0
50	10.5	10.2	0.31	11.1	10.9	0.33	9.9	9.7	0.29
75	11.1	10.5	0.58	11.3	11.0	0.61	10.1	9.9	0.54
100	11.5	10.7	0.86	11.5	11.1	0.89	10.3	10.0	0.80
125	11.9	11.0	1.2	11.7	11.3	1.2	10.5	10.1	1.1
150	12.2	11.2	1.5	11.8	11.4	1.5	10.7	10.2	1.3
175	12.4	11.4	1.8	11.9	11.4	1.8	10.9	10.3	1.6
200	12.6	11.5	2.1	12.0	11.5	2.1	11.1	10.4	1.9
225	12.7	11.7	2.4	12.1	11.6	2.4	11.2	10.5	2.2
250	12.8	11.8	2.7	12.1	11.6	2.7	11.4	10.6	2.4
275	12.9	11.9	3.0	12.2	11.7	3.0	11.5	10.7	2.7
300	12.9	12.0	3.4	12.3	11.7	3.3	11.7	10.8	3.0
325	13.1	12.0	3.7	12.4	11.8	3.6	11.8	10.8	3.3
350	13.2	12.1	4.0	12.5	11.8	3.9	11.9	10.9	3.6
375	13.4	12.2	4.3	12.6	11.9	4.2	12.0	11.0	3.9
400	13.6	12.3	4.7	12.7	11.9	4.5	12.0	11.0	4.2
425	13.7	12.4	5.0	12.8	12.0	4.9	12.1	11.1	4.5
450	13.8	12.5	5.4	12.9	12.0	5.2	12.2	11.2	4.8
475	13.7	12.5	5.7	13.0	12.1	5.5	12.2	11.2	5.1
500	13.4	12.6	6.0	13.1	12.1	5.8	12.2	11.3	5.4
525	12.7	12.6	6.4	13.2	12.2	6.2	12.3	11.3	5.7
550	11.6	12.6	6.7	13.3	12.2	6.5	12.3	11.4	6.0
575	...	...	...	13.3	12.3	6.8	12.4	11.4	6.3
600	...	...	...	13.3	12.3	7.2	12.5	11.5	6.6
625	...	...	...	13.4	12.4	7.5	12.5	11.5	7.0
650	...	...	...	13.4	12.4	7.8	12.7	11.5	7.3
675	...	...	...	13.4	12.5	8.2	12.8	11.6	7.6
700	...	...	...	13.4	12.5	8.5	13.0	11.6	7.9
725	...	...	...	13.4	12.5	8.8	13.3	11.7	8.2
750	...	...	...	13.4	12.5	9.2	13.6	11.7	8.6
775	...	...	...	13.5	12.6	9.5	14.0	11.8	8.9
800	...	...	...	13.6	12.6	9.8	14.5	11.9	9.3
825	...	...	...	13.8	12.6	10.2	15.2	12.0	9.6

Table TE-1
Thermal Expansion for Ferrous Materials (Cont'd)

	Coefficients for 27Cr Steels			Coefficients for Austenitic Stainless Steels (Group 3) [Note (3)]			Coefficients for Other Austenitic Stainless Steels (Group 4) [Note (4)]		
Temperature, °C	A	B	C	A	B	C	A	B	C
20	9.0	9.0	0	15.3	15.3	0	14.7	14.7	0
50	9.3	9.2	0.28	16.0	15.6	0.47	15.2	15.0	0.45
75	9.4	9.2	0.51	16.5	15.9	0.87	15.6	15.2	0.84
100	9.5	9.3	0.74	17.0	16.2	1.3	16.0	15.4	1.2
125	9.6	9.4	0.99	17.4	16.4	1.7	16.3	15.6	1.6
150	9.7	9.4	1.2	17.8	16.6	2.2	16.5	15.7	2.0
175	9.8	9.5	1.5	18.1	16.8	2.6	16.8	15.9	2.5
200	9.9	9.5	1.7	18.4	17.0	3.1	16.9	16.0	2.9
225	10.0	9.6	2.0	18.6	17.2	3.5	17.1	16.1	3.3
250	10.1	9.6	2.2	18.8	17.4	4.0	17.3	16.3	3.7
275	10.2	9.7	2.5	18.9	17.5	4.5	17.4	16.4	4.2
300	10.3	9.7	2.7	19.1	17.7	4.9	17.6	16.5	4.6
325	10.5	9.8	3.0	19.2	17.8	5.4	17.7	16.6	5.0
350	10.6	9.9	3.3	19.3	17.9	5.9	17.8	16.6	5.5
375	10.8	9.9	3.5	19.4	18.0	6.4	18.0	16.7	5.9
400	10.9	10.0	3.8	19.5	18.1	6.9	18.1	16.8	6.4
425	11.1	10.0	4.1	19.6	18.2	7.4	18.3	16.9	6.8
450	11.2	10.1	4.3	19.8	18.3	7.9	18.4	17.0	7.3
475	11.3	10.2	4.6	20.0	18.4	8.3	18.6	17.1	7.8
500	11.4	10.2	4.9	20.2	18.4	8.9	18.8	17.2	8.2
525	11.5	10.3	5.2	20.4	18.5	9.4	19.0	17.2	8.7
550	11.6	10.4	5.5	20.6	18.6	9.9	19.2	17.3	9.2
575	11.6	10.4	5.8	20.9	18.7	10.4	19.4	17.4	9.7
600	11.7	10.5	6.1	21.1	18.8	10.9	19.6	17.5	10.2
625	11.7	10.5	6.4	21.4	18.9	11.4	19.8	17.6	10.6
650	11.8	10.6	6.7	21.6	19.0	12.0	20.0	17.7	11.1
675	11.9	10.6	7.0	21.7	19.1	12.5	20.3	17.8	11.7
700	12.0	10.7	7.2	21.7	19.2	13.1	20.5	17.9	12.2
725	12.2	10.7	7.6	21.5	19.3	13.6	20.7	18.0	12.7
750	12.4	10.8	7.9	21.2	19.4	14.1	20.9	18.1	13.2
775	12.9	10.8	8.2	20.6	19.4	14.7	21.2	18.2	13.7
800	13.4	10.9	8.5	19.7	19.4	15.2	21.4	18.3	14.3
825	14.2	11.0	8.8	18.4	19.4	15.6	21.6	18.4	14.8

Table TE-1
Thermal Expansion for Ferrous Materials (Cont'd)

	Coefficients for Ductile Cast Iron			Coefficients for Precipitation Hardened 17Cr–4Ni–4Cu Stainless Steels, Condition 1075			Coefficients for Precipitation Hardened 17Cr–4Ni–4Cu Stainless Steels, Condition 1150		
Temperature, °C	A	B	C	A	B	C	A	B	C
20	10.3	10.3	0	11.1	11.1	0	11.5	11.5	0
50	10.7	10.5	0.32	11.3	11.2	0.34	11.8	11.6	0.35
75	11.1	10.7	0.59	11.4	11.3	0.62	12.0	11.8	0.65
100	11.6	10.9	0.87	11.6	11.4	0.91	12.3	11.9	0.95
125	12.1	11.1	1.2	11.7	11.4	1.2	12.5	12.0	1.3
150	12.5	11.3	1.5	11.8	11.5	1.5	12.7	12.1	1.6
175	13.0	11.6	1.8	12.0	11.6	1.8	12.9	12.2	1.9
200	13.3	11.8	2.1	12.1	11.6	2.1	13.1	12.3	2.2
225	13.6	12.0	2.5	12.2	11.7	2.4	13.2	12.4	2.6
250	13.9	12.2	2.8	12.3	11.8	2.7	13.4	12.5	2.9
275	14.1	12.4	3.1	12.5	11.8	3.0	13.5	12.6	3.2
300	14.2	12.5	3.5	12.6	11.9	3.3	13.5	12.7	3.6
325	14.2	12.6	3.9	12.7	11.9	3.6	13.6	12.8	3.9
350	14.3	12.8	4.2	12.8	12.0	4.0	13.6	12.8	4.2
375	14.3	12.9	4.6	12.9	12.1	4.3	13.6	12.9	4.6
400	14.4	13.0	4.9	13.0	12.1	4.6	13.6	12.9	4.9
425	14.5	13.1	5.3	13.0	12.2	4.9	13.7	13.0	5.3
450	14.6	13.2	5.7	13.1	12.2	5.3	13.8	13.0	5.6
475	14.9	13.2	6.0	13.1	12.3	5.6	13.9	13.1	5.9
500	15.1	13.3	6.4	...	...	...	14.3	13.1	6.3
525	15.5	13.4	6.8	...	...	...	14.8	13.2	6.7
550	16.0	13.5	7.2	...	...	...	15.6	13.3	7.0
575	...	...	...	...	...	...	...	...	...
600	...	...	...	...	...	...	...	...	...
625	...	...	...	...	...	...	...	...	...
650	...	...	...	...	...	...	...	...	...
675	...	...	...	...	...	...	...	...	...
700	...	...	...	...	...	...	...	...	...
725	...	...	...	...	...	...	...	...	...
750	...	...	...	...	...	...	...	...	...
775	...	...	...	...	...	...	...	...	...
800	...	...	...	...	...	...	...	...	...
825	...	...	...	...	...	...	...	...	...

GENERAL NOTE: Coefficient A is the instantaneous coefficient of thermal expansion × 10^{-6} (mm/mm/°C). Coefficient B is the mean coefficient of thermal expansion × 10^{-6} (mm/mm/°C) in going from 20°C to indicated temperature. Coefficient C is the linear thermal expansion (mm/m) in going from 20°C to indicated temperature.

NOTES:

(1) Group 1 alloys (by nominal composition):

Carbon steel
C–Mn–Cb
C–Mn–Si–Cb
C–Mn–Si–V
C–Mn–Ti
C–Si–Ti
C–1/4Mo
C–1/2Mo
1/2Cr–1/5Mo
1/2Cr–1/5Mo–V
1/2Cr–1/4Mo–Si
1/2Cr–1/2Mo
3/4Cr–1/2Ni–Cu
3/4Cr–3/4Ni–Cu–Al
1Cr–1/5Mo
1Cr–1/5Mo–Si
1Cr–1/2Mo
1Cr–1/2Mo–V
1 1/4Cr–1/2Mo
1 1/4Cr–1/2Mo–Si
1 3/4Cr–1/2Mo–Cu
1 3/4Cr–1/2Mo–Ti
2Cr–1/2Mo
2 1/4Cr–1Mo
3Cr–1Mo
3Cr–1Mo–1/4V–Cb–Ca
3Cr–1Mo–1/4V–Ti–B
Mn–1/4Mo
Mn–1/2Mo
Mn–1/2Mo–1/4Ni
Mn–1/2Mo–1/2Ni
Mn–1/2Mo–3/4Ni
Mn–V
1/2Ni–1/2Cr–1/4Mo
1/2Ni–1/2Cr–1/4Mo–V
1/2Ni–1/2Mo–V
3/4Ni–1/2Cr–1/2Mo–V
3/4Ni–1/2Cu–Mo
3/4Ni–1/2Mo–1/3Cr–V
3/4Ni–1/2Mo–Cr–V
3/4Ni–1Mo–3/4Cr
1Ni–1/2Cr–1/2Mo
1 1/4Ni–1Cr–1/2Mo
1 3/4Ni–3/4Cr–1/4Mo
2Ni–3/4Cr–1/4Mo
2Ni–3/4Cr–1/3Mo
2Ni–1 1/2Cr–1/4Mo–V
2 1/2Ni
2 3/4Ni–1 1/2Cr–1/2Mo–V
3 1/2Ni
3 1/2Ni–1 3/4Cr–1/2Mo–V
4Ni–1 1/2Cr–1/2Mo–V

NOTES (CONT'D):

(2) Group 2 alloys (by nominal composition):

18Cr–5Ni–3Mo–N	23Cr–4Ni–Mo–Cu	27Cr–7.5Ni–4.5Mo–Co–N
22Cr–2Ni–Mo–N	25Cr–7Ni–4Mo–N	
22Cr–5Ni–3Mo–N	25Cr–6Ni–Mo–N	

(3) Group 3 alloys (by nominal composition):

16Cr–12Ni–2Mo	18Cr–10Ni–Cb	18Cr–18Ni–2Si
16Cr–12Ni–2Mo–N	18Cr–10Ni–Ti	19Cr–9Ni–Mo–W
16Cr–12Ni–2Mo–Ti	18Cr–11Ni	21Cr–11Ni–N
18Cr–8Ni	18Cr–13Ni–3Mo	
18Cr–8Ni–N	18Cr–15Ni–4Si	

(4) Group 4 alloys (by nominal composition):

14Cr–16Ni–6Si–Cu–Mo	22Cr–13Ni–5Mn	25Cr–20Ni–2Mo
25Ni–15Cr–2Ti	23Cr–12Ni	31Ni–31Fe–29Cr–Mo
29Ni–20Cr–3Cu–2Mo	24Cr–22Ni–6Mo–2W–Cu–N	44Fe–25Ni–21Cr–Mo
18Cr–20Ni–5.5Si	25Cr–12Ni	47Fe–25Ni–23Cr–5.5Mo–N
20Cr–18Ni–6Mo	25Cr–20Ni	

Table TE-2
Thermal Expansion for Aluminum Alloys

	Coefficients for Aluminum Alloys		
Temperature, °C	A	B	C
20	21.7	21.7	0
50	23.3	22.6	0.68
75	23.9	23.1	1.3
100	24.3	23.4	1.9
125	24.7	23.7	2.5
150	25.2	23.9	3.1
175	25.7	24.2	3.7
200	26.4	24.4	4.4
225	27.0	24.7	5.1
250	27.5	25.0	5.7
275	27.7	25.2	6.4
300	27.6	25.5	7.1
325	27.1	25.6	7.8

GENERAL NOTES:

(a) Aluminum alloys represented by these thermal expansion coefficients include:

A03560	A93003	A95254
A24430	A93004	A95454
A91060	A95052	A95456
A91100	A95083	A95652
A92014	A95086	A96061
A92024	A95154	A96063

(b) Coefficient A is the instantaneous coefficient of thermal expansion × 10^{-6} (mm/mm/°C). Coefficient B is the mean coefficient of thermal expansion × 10^{-6} (mm/mm/°C) in going from 20°C to indicated temperature. Coefficient C is the linear thermal expansion (mm/m) in going from 20°C to indicated temperature.

Table TE-3
Thermal Expansion for Copper Alloys

	Coefficients for Copper Alloys C1XXXX Series			Coefficients for Bronze Alloys [Note (1)]			Coefficients for Brass Alloys [Note (2)]			Coefficients for Copper–Nickel (70Cu–30Ni) [Note (3)]			Coefficients for Copper–Nickel (90Cu–10Ni) [Note (4)]		
Temperature, °C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
20	16.7	16.7	0	17.2	17.2	0	16.7	16.7	0	14.5	14.5	0	...	...	...
50	17.2	17.0	0.51	18.0	17.6	0.53	17.5	17.1	0.51	15.3	14.9	0.45	...	...	...
75	17.4	17.2	0.95	18.3	17.9	0.98	17.9	17.4	0.96	15.6	15.2	0.84	...	...	...
100	17.6	17.3	1.4	18.5	18.0	1.4	18.3	17.6	1.4	15.9	15.3	1.2	...	...	...
125	17.8	17.4	1.8	18.6	18.2	1.9	18.6	17.8	1.9	16.2	15.5	1.6	...	...	...
150	18.0	17.5	2.3	18.7	18.2	2.4	19.0	18.0	2.3	16.5	15.7	2.0	...	...	...
175	18.2	17.6	2.7	18.8	18.3	2.8	19.4	18.2	2.8	16.8	15.8	2.5	...	...	...
200	18.4	17.7	3.2	18.9	18.4	3.3	19.9	18.4	3.3	17.1	16.0	2.9	...	...	...
225	18.5	17.8	3.6	19.1	18.5	3.8	20.3	18.6	3.8	17.4	16.1	3.3	...	...	...
250	18.6	17.8	4.1	19.3	18.5	4.3	20.6	18.8	4.3	17.5	16.3	3.7	...	...	...
275	18.6	17.9	4.6	19.5	18.6	4.7	20.9	19.0	4.8	17.4	16.4	4.2	17.1	17.1	4.4
300	18.6	18.0	5.0	19.7	18.7	5.2	21.0	19.2	5.4	17.2	16.5	4.6	...	...	...
325	18.9	18.0	5.5	19.9	18.8	5.7	21.2	19.3	5.9	17.0	16.5	5.0	...	...	...
350	...	...	...	20.0	18.9	6.2	21.5	19.5	6.4	16.7	16.6	5.5	...	...	...
375	...	...	...	20.0	19.0	6.7	22.1	19.6	7.0	...	...	...	...	...	...
400	...	...	...	20.0	19.0	7.2	23.4	19.8	7.5	...	...	...	...	...	...
425	...	...	...	...	...	...	25.9	20.1	8.2	...	...	...	...	...	...

GENERAL NOTE: Coefficient A is the instantaneous coefficient of thermal expansion × 10^{-6} (mm/mm/°C). Coefficient B is the mean coefficient of thermal expansion × 10^{-6} (mm/mm/°C) in going from 20°C to indicated temperature. Coefficient C is the linear thermal expansion (mm/m) in going from 20°C to indicated temperature.

NOTES:
(1) Includes C6XXXX, C8XXXX, C92XXX, C93XXX, and C95XXX alloys.
(2) Includes C2XXXX, C3XXXX, and C4XXXX alloys.
(3) Includes C71XXX, C72XXX, and C97600 alloys.
(4) Includes C70XXX and C96200 alloys.

Table TE-4
Thermal Expansion for Nickel Alloys

	Coefficients for N02200 and N02201			Coefficients for N04400 and N04405			Coefficients for N06002		
Temperature, °C	A	B	C	A	B	C	A	B	C
20	11.9	11.9	0	13.8	13.8	0	13.1	13.1	0
50	12.8	12.4	0.37	14.4	14.1	0.42	13.5	13.3	0.40
75	13.5	12.7	0.70	14.9	14.4	0.79	13.7	13.4	0.74
100	13.9	13.0	1.0	15.3	14.6	1.2	13.9	13.5	1.1
125	14.3	13.3	1.4	15.6	14.8	1.6	14.0	13.6	1.4
150	14.6	13.5	1.8	15.9	15.0	1.9	14.2	13.7	1.8
175	14.8	13.7	2.1	16.1	15.1	2.3	14.3	13.8	2.1
200	15.0	13.9	2.5	16.3	15.3	2.8	14.5	13.9	2.5
225	15.2	14.0	2.9	16.4	15.4	3.2	14.6	14.0	2.9
250	15.3	14.2	3.3	16.5	15.5	3.6	14.8	14.0	3.2
275	15.5	14.3	3.6	16.6	15.6	4.0	15.0	14.1	3.6
300	15.7	14.4	4.0	16.7	15.7	4.4	15.3	14.2	4.0
325	15.8	14.5	4.4	16.8	15.8	4.8	15.5	14.3	4.4
350	16.0	14.6	4.8	16.8	15.9	5.2	15.8	14.4	4.8
375	16.2	14.7	5.2	16.9	16.0	5.7	16.1	14.5	5.2
400	16.4	14.8	5.6	16.9	16.0	6.1	16.3	14.6	5.6
425	16.6	14.9	6.0	17.0	16.1	6.5	16.6	14.7	6.0
450	16.8	15.0	6.5	17.0	16.1	6.9	16.9	14.9	6.4
475	16.9	15.1	6.9	17.1	16.2	7.4	17.1	15.0	6.8
500	17.0	15.2	7.3	17.1	16.2	7.8	17.4	15.1	7.2
525	17.1	15.3	7.7	17.2	16.3	8.2	17.6	15.2	7.7
550	17.2	15.4	8.2	17.3	16.3	8.6	17.8	15.3	8.1
575	17.3	15.5	8.6	17.4	16.4	9.1	18.0	15.5	8.6
600	17.3	15.6	9.0	17.4	16.4	9.5	18.2	15.6	9.0
625	17.4	15.6	9.5	17.5	16.5	10.0	18.3	15.7	9.5
650	17.5	15.7	9.9	17.6	16.5	10.4	18.5	15.8	9.9
675	17.6	15.8	10.3	17.7	16.5	10.8	18.7	15.9	10.4
700	17.9	15.9	10.8	17.8	16.6	11.3	18.9	16.0	10.9
725	18.3	15.9	11.2	17.9	16.6	11.7	19.1	16.1	11.4
750	18.9	16.0	11.7	18.0	16.7	12.2	19.5	16.2	11.8
775	19.7	16.1	12.2	18.1	16.7	12.6	19.9	16.3	12.3
800	...	...	...	18.1	16.8	13.1	20.5	16.5	12.8
825	...	...	...	18.1	16.8	13.5	21.3	16.6	13.4

Table TE-4
Thermal Expansion for Nickel Alloys (Cont'd)

	Coefficients for N06007			Coefficients for N06022			Coefficients for N06030		
Temperature, °C	A	B	C	A	B	C	A	B	C
20	13.3	13.3	0	12.4	12.4	0	12.0	12.0	0
50	13.5	13.4	0.40	12.4	12.4	0.37	12.7	12.4	0.37
75	13.6	13.5	0.74	12.4	12.4	0.68	13.3	12.7	0.70
100	13.7	13.5	1.1	12.4	12.4	0.99	13.7	12.9	1.0
125	13.8	13.6	1.4	12.4	12.4	1.3	14.2	13.2	1.4
150	13.9	13.6	1.8	12.4	12.4	1.6	14.5	13.4	1.7
175	14.1	13.7	2.1	12.5	12.4	1.9	14.8	13.6	2.1
200	14.3	13.8	2.5	12.6	12.4	2.2	15.1	13.8	2.5
225	14.6	13.9	2.8	12.8	12.5	2.6	15.3	14.0	2.9
250	14.9	14.0	3.2	13.0	12.5	2.9	15.5	14.1	3.2
275	15.2	14.1	3.6	13.2	12.6	3.2	15.6	14.2	3.6
300	15.6	14.2	4.0	13.5	12.6	3.5	15.8	14.4	4.0
325	16.0	14.3	4.4	13.8	12.7	3.9	15.9	14.5	4.4
350	16.4	14.4	4.8	14.2	12.8	4.2	16.1	14.6	4.8
375	16.8	14.6	5.2	14.6	12.9	4.6	16.2	14.7	5.2
400	17.2	14.8	5.6	15.0	13.0	5.0	16.5	14.8	5.6
425	17.6	14.9	6.0	15.4	13.2	5.3	16.7	14.9	6.0
450	17.9	15.1	6.5	15.8	13.3	5.7	16.9	15.0	6.5
475	18.2	15.2	6.9	16.2	13.5	6.1	17.2	15.2	6.9
500	18.4	15.4	7.4	16.6	13.6	6.5	17.5	15.3	7.3
525	18.5	15.6	7.9	17.0	13.8	7.0	17.8	15.4	7.8
550	18.6	15.7	8.3	17.4	13.9	7.4	18.1	15.5	8.2
575	18.7	15.8	8.8	17.7	14.1	7.8	18.3	15.6	8.7
600	18.7	16.0	9.3	18.1	14.3	8.3	18.4	15.7	9.1
625	18.6	16.1	9.7	18.4	14.4	8.7	18.4	15.9	9.6
650	18.6	16.2	10.2	18.7	14.6	9.2	18.1	16.0	10.1
675	18.7	16.3	10.7	18.9	14.8	9.7	17.6	16.0	10.5
700	18.8	16.4	11.1	19.2	14.9	10.1	16.7	16.1	10.9
725	19.1	16.4	11.6	19.5	15.1	10.6	15.4	16.1	11.3
750	19.7	16.5	12.1	19.9	15.2	11.1	13.5	16.0	11.7
775	20.6	16.7	12.6	20.4	15.4	11.6	11.0	15.9	12.0
800	22.0	16.8	13.1	21.0	15.6	12.1	...	...	...
825	24.0	17.0	13.7	21.7	15.7	12.7	...	...	...

Table TE-4
Thermal Expansion for Nickel Alloys (Cont'd)

	Coefficients for N06045			Coefficients for N06059 and N06686			Coefficients for N06230		
Temperature, °C	A	B	C	A	B	C	A	B	C
20	11.0	11.0	0	11.7	11.7	0	12.4	12.4	0
50	12.6	11.8	0.35	11.8	11.7	0.35	12.5	12.5	0.38
75	13.7	12.4	0.68	11.9	11.8	0.65	12.7	12.5	0.69
100	14.5	13.0	1.0	12.1	11.8	0.94	12.8	12.6	1.0
125	15.1	13.4	1.4	12.3	11.9	1.3	12.9	12.7	1.3
150	15.5	13.8	1.8	12.5	12.0	1.6	13.1	12.7	1.7
175	15.8	14.1	2.2	12.7	12.1	1.9	13.3	12.8	2.0
200	15.9	14.3	2.6	12.8	12.2	2.2	13.4	12.9	2.3
225	16.0	14.5	3.0	12.9	12.3	2.5	13.6	13.0	2.7
250	16.0	14.7	3.4	13.0	12.4	2.8	13.8	13.0	3.0
275	16.0	14.8	3.8	13.1	12.4	3.2	14.0	13.1	3.3
300	16.1	14.9	4.2	13.1	12.5	3.5	14.3	13.2	3.7
325	16.1	15.0	4.6	13.1	12.5	3.8	14.5	13.3	4.1
350	16.2	15.1	5.0	13.2	12.6	4.2	14.7	13.4	4.4
375	16.4	15.2	5.4	13.3	12.6	4.5	14.9	13.5	4.8
400	16.6	15.3	5.8	13.4	12.7	4.8	15.2	13.6	5.2
425	16.8	15.4	6.2	13.5	12.7	5.2	15.4	13.7	5.6
450	17.1	15.5	6.6	13.7	12.8	5.5	15.6	13.8	5.9
475	17.4	15.6	7.1	13.8	12.8	5.8	15.7	13.9	6.3
500	17.7	15.7	7.5	13.8	12.9	6.2	15.9	14.0	6.7
525	18.0	15.8	8.0	13.8	12.9	6.5	16.0	14.1	7.1
550	18.4	15.9	8.4	13.5	13.0	6.9	16.2	14.2	7.5
575	18.7	16.0	8.9	13.0	13.0	7.2	16.3	14.3	7.9
600	19.0	16.1	9.3	...	...	...	16.4	14.4	8.3
625	19.2	16.2	9.8	...	...	...	16.5	14.5	8.8
650	19.4	16.4	10.3	...	...	...	16.5	14.5	9.2
675	19.6	16.5	10.8	...	...	...	16.7	14.6	9.6
700	19.7	16.6	11.3	...	...	...	16.8	14.7	10.0
725	19.8	16.7	11.8	...	...	...	17.0	14.8	10.4
750	19.9	16.8	12.3	...	...	...	17.2	14.9	10.8
775	19.9	16.9	12.8	...	...	...	...	...	...
800	19.9	17.0	13.3	...	...	...	...	...	...
825	19.9	17.1	13.8	...	...	...	...	...	...

Table TE-4
Thermal Expansion for Nickel Alloys (Cont'd)

	Coefficients for N06455			Coefficients for N06600			Coefficients for N06625		
Temperature, °C	A	B	C	A	B	C	A	B	C
20	10.4	10.4	0	12.3	12.3	0	12.0	12.0	0
50	11.0	10.7	0.32	12.7	12.5	0.38	12.7	12.4	0.37
75	11.4	10.9	0.60	13.0	12.7	0.70	13.1	12.6	0.69
100	11.8	11.1	0.89	13.4	12.8	1.0	13.3	12.8	1.0
125	12.3	11.4	1.2	13.7	13.0	1.4	13.4	12.9	1.4
150	12.6	11.6	1.5	14.0	13.2	1.7	13.4	13.0	1.7
175	13.0	11.8	1.8	14.2	13.3	2.1	13.5	13.1	2.0
200	13.3	12.0	2.2	14.5	13.5	2.4	13.5	13.2	2.4
225	13.5	12.1	2.5	14.7	13.6	2.8	13.5	13.2	2.7
250	13.7	12.3	2.8	14.9	13.7	3.2	13.5	13.2	3.0
275	13.9	12.4	3.2	15.0	13.8	3.5	13.6	13.3	3.4
300	14.0	12.6	3.5	15.2	14.0	3.9	13.8	13.3	3.7
325	14.1	12.7	3.9	15.4	14.1	4.3	14.0	13.3	4.1
350	14.2	12.8	4.2	15.5	14.2	4.7	14.2	13.4	4.4
375	14.2	12.9	4.6	15.7	14.3	5.1	14.5	13.5	4.8
400	14.2	13.0	4.9	15.9	14.4	5.5	14.8	13.5	5.1
425	14.2	13.1	5.3	16.1	14.5	5.9	15.1	13.6	5.5
450	14.2	13.1	5.6	16.3	14.6	6.3	15.5	13.7	5.9
475	14.2	13.2	6.0	16.5	14.7	6.7	15.9	13.8	6.3
500	14.3	13.2	6.4	16.7	14.8	7.1	16.3	14.0	6.7
525	14.3	13.3	6.7	17.0	14.9	7.5	16.7	14.1	7.1
550	14.4	13.4	7.1	17.2	15.0	7.9	17.0	14.2	7.5
575	14.4	13.4	7.4	17.5	15.1	8.4	17.3	14.3	8.0
600	14.5	13.4	7.8	17.8	15.2	8.8	17.7	14.5	8.4
625	14.6	13.5	8.2	18.1	15.3	9.3	17.9	14.6	8.8
650	14.6	13.5	8.5	18.5	15.4	9.7	18.2	14.8	9.3
675	14.6	13.6	8.9	18.8	15.6	10.2	18.4	14.9	9.8
700	14.6	13.6	9.3	19.1	15.7	10.7	18.6	15.0	10.2
725	14.5	13.6	9.6	19.4	15.8	11.1	18.8	15.1	10.7
750	14.3	13.7	10.0	19.6	15.9	11.6	19.1	15.3	11.2
775	14.0	13.7	10.3	19.8	16.1	12.1	19.5	15.4	11.6
800	13.4	13.7	10.7	19.9	16.2	12.6	20.0	15.6	12.1
825	12.7	13.7	11.0	20.0	16.3	13.1	20.6	15.7	12.6

Table TE-4
Thermal Expansion for Nickel Alloys (Cont'd)

	Coefficients for N06690			Coefficients for N07718			Coefficients for N07750		
Temperature, °C	A	B	C	A	B	C	A	B	C
20	13.9	13.9	0	12.8	12.8	0	12.1	12.1	0
50	14.2	14.0	0.42	12.9	12.9	0.39	12.5	12.3	0.37
75	14.3	14.1	0.78	13.1	12.9	0.71	12.9	12.5	0.69
100	14.3	14.2	1.1	13.3	13.0	1.0	13.3	12.7	1.0
125	14.4	14.2	1.5	13.5	13.1	1.4	13.6	12.8	1.3
150	14.6	14.3	1.9	13.7	13.2	1.7	13.9	13.0	1.7
175	14.8	14.3	2.2	13.9	13.3	2.1	14.0	13.2	2.0
200	15.0	14.4	2.6	14.1	13.4	2.4	14.1	13.3	2.4
225	15.2	14.5	3.0	14.3	13.5	2.8	14.0	13.4	2.7
250	15.5	14.6	3.4	14.4	13.6	3.1	14.0	13.4	3.1
275	15.6	14.7	3.7	14.6	13.7	3.5	13.9	13.5	3.4
300	15.7	14.8	4.1	14.7	13.8	3.9	13.9	13.5	3.8
325	15.7	14.8	4.5	14.8	13.9	4.2	14.0	13.6	4.1
350	15.5	14.9	4.9	15.0	13.9	4.6	14.2	13.6	4.5
375	15.3	14.9	5.3	15.1	14.0	5.0	14.7	13.7	4.8
400	14.9	15.0	5.7	15.3	14.1	5.4	15.6	13.8	5.2
425	...	...	...	15.4	14.2	5.7	...	...	...
450	...	...	...	15.6	14.2	6.1	...	...	...
475	...	...	...	15.8	14.3	6.5	...	...	...
500	...	...	...	16.0	14.4	6.9	...	...	...
525	...	...	...	16.2	14.5	7.3	...	...	...
550	...	...	...	16.5	14.6	7.7	...	...	...
575	...	...	...	...	...	...	...	...	...
600	...	...	...	...	...	...	...	...	...
625	...	...	...	...	...	...	...	...	...
650	...	...	...	...	...	...	...	...	...
675	...	...	...	...	...	...	...	...	...
700	...	...	...	...	...	...	...	...	...
725	...	...	...	...	...	...	...	...	...
750	...	...	...	...	...	...	...	...	...
775	...	...	...	...	...	...	...	...	...
800	...	...	...	...	...	...	...	...	...
825	...	...	...	...	...	...	...	...	...

Table TE-4
Thermal Expansion for Nickel Alloys (Cont'd)

	Coefficients for N08031 and N08367			Coefficients for N08330			Coefficients for N08354		
Temperature, °C	A	B	C	A	B	C	A	B	C
20	13.8	13.8	0	14.6	14.6	0	13.9	13.9	0
50	14.1	14.0	0.42	14.8	14.7	0.44	14.2	14.0	0.42
75	14.4	14.1	0.78	15.2	14.8	0.81	14.4	14.1	0.78
100	14.6	14.2	1.1	15.5	15.0	1.2	14.5	14.2	1.1
125	14.9	14.4	1.5	15.7	15.1	1.6	14.6	14.3	1.5
150	15.1	14.5	1.9	15.9	15.3	2.0	14.8	14.4	1.9
175	15.4	14.6	2.3	16.1	15.4	2.4	14.9	14.5	2.2
200	15.5	14.7	2.7	16.2	15.5	2.8	15.1	14.5	2.6
225	15.7	14.8	3.0	16.3	15.6	3.2	15.2	14.6	3.0
250	15.8	14.9	3.4	16.4	15.7	3.6	15.4	14.7	3.4
275	16.0	15.0	3.8	16.6	15.7	4.0	15.5	14.8	3.8
300	16.1	15.1	4.2	16.9	15.8	4.4	15.7	14.8	4.2
325	16.2	15.2	4.6	17.2	15.9	4.9	15.8	14.9	4.5
350	16.3	15.3	5.0	17.5	16.0	5.3	15.9	15.0	4.9
375	16.4	15.4	5.5	17.8	16.2	5.7	16.1	15.0	5.3
400	16.6	15.4	5.9	17.8	16.3	6.2	16.2	15.1	5.7
425	16.7	15.5	6.3	...	...	...	16.3	15.2	6.2
450	16.8	15.6	6.7	...	...	...	16.5	15.3	6.6
475	16.9	15.6	7.1	...	...	...	...	...	...
500	16.9	15.7	7.5	...	...	...	...	...	...
525	16.8	15.8	8.0	...	...	...	...	...	...
550	16.6	15.8	8.4	...	...	...	...	...	...
575	16.2	15.8	8.8	...	...	...	...	...	...
600	15.6	15.8	9.2	...	...	...	...	...	...
625	...	...	...	...	...	...	...	...	...
650	...	...	...	...	...	...	...	...	...
675	...	...	...	...	...	...	...	...	...
700	...	...	...	...	...	...	...	...	...
725	...	...	...	...	...	...	...	...	...
750	...	...	...	...	...	...	...	...	...
775	...	...	...	...	...	...	...	...	...
800	...	...	...	...	...	...	...	...	...
825	...	...	...	...	...	...	...	...	...

Table TE-4
Thermal Expansion for Nickel Alloys (Cont'd)

	Coefficients for N08800, N08801, N08810, and N08811			Coefficients for N08825			Coefficients for N10001		
Temperature, °C	A	B	C	A	B	C	A	B	C
20	14.2	14.2	0	13.5	13.5	0	10.8	10.8	0
50	14.9	14.6	0.44	13.8	13.6	0.41	11.2	11.0	0.33
75	15.4	14.9	0.82	14.1	13.7	0.75	11.5	11.2	0.62
100	15.8	15.1	1.2	14.4	13.9	1.1	11.6	11.3	0.90
125	16.1	15.3	1.6	14.6	14.0	1.5	11.6	11.4	1.2
150	16.4	15.5	2.0	14.8	14.2	1.8	11.7	11.4	1.5
175	16.6	15.6	2.4	14.8	14.3	2.2	11.7	11.5	1.8
200	16.7	15.8	2.8	14.9	14.4	2.6	11.7	11.5	2.1
225	16.9	15.9	3.3	15.0	14.4	3.0	11.8	11.5	2.4
250	17.0	16.0	3.7	15.2	14.5	3.3	11.9	11.6	2.7
275	17.1	16.1	4.1	15.4	14.6	3.7	12.0	11.6	3.0
300	17.2	16.2	4.5	15.8	14.7	4.1	12.2	11.6	3.3
325	17.3	16.3	5.0	16.2	14.8	4.5	12.4	11.7	3.6
350	17.4	16.4	5.4	16.6	14.9	4.9	12.7	11.8	3.9
375	17.6	16.5	5.8	16.6	15.0	5.3	13.0	11.8	4.2
400	17.7	16.5	6.3	15.9	15.1	5.7	13.3	11.9	4.5
425	17.9	16.6	6.7	...	...	...	13.6	12.0	4.9
450	18.0	16.7	7.2	...	...	...	13.9	12.1	5.2
475	18.2	16.8	7.6	...	...	...	14.2	12.2	5.6
500	18.3	16.8	8.1	...	...	...	14.5	12.3	5.9
525	18.5	16.9	8.5	...	...	...	14.7	12.4	6.3
550	18.6	17.0	9.0	...	...	...	14.9	12.6	6.7
575	18.8	17.1	9.5	...	...	...	15.1	12.7	7.0
600	19.0	17.2	9.9	...	...	...	15.3	12.8	7.4
625	19.2	17.2	10.4	...	...	...	15.5	12.9	7.8
650	19.4	17.3	10.9	...	...	...	15.7	13.0	8.2
675	19.6	17.4	11.4	...	...	...	15.9	13.1	8.6
700	19.9	17.5	11.9	...	...	...	16.2	13.2	9.0
725	20.3	17.6	12.4	...	...	...	16.7	13.3	9.4
750	20.7	17.7	12.9	...	...	...	17.3	13.4	9.8
775	21.2	17.8	13.4	...	...	...	18.2	13.6	10.3
800	21.8	17.9	14.0	...	...	...	19.4	13.8	10.7
825	22.6	18.0	14.5	...	...	...	...	...	...

Table TE-4
Thermal Expansion for Nickel Alloys (Cont'd)

	Coefficients for N10003			Coefficients for N10242			Coefficients for N10276		
Temperature, °C	A	B	C	A	B	C	A	B	C
20	11.1	11.1	0	10.4	10.4	0	10.8	10.8	0
50	11.4	11.3	0.34	10.7	10.5	0.33	11.2	11.0	0.33
75	11.7	11.4	0.63	10.9	10.7	0.59	11.6	11.2	0.62
100	12.0	11.6	0.93	11.2	10.8	0.86	11.9	11.4	0.91
125	12.3	11.7	1.2	11.5	10.9	1.1	12.3	11.6	1.2
150	12.4	11.8	1.5	11.8	11.1	1.4	12.6	11.7	1.5
175	12.5	11.9	1.8	12.1	11.2	1.7	12.9	11.9	1.8
200	12.6	12.0	2.2	12.3	11.3	2.0	13.2	12.0	2.2
225	12.7	12.1	2.5	12.4	11.5	2.4	13.5	12.2	2.5
250	12.8	12.2	2.8	12.5	11.6	2.7	13.7	12.4	2.8
275	12.9	12.2	3.1	12.6	11.7	3.0	13.9	12.5	3.2
300	13.1	12.3	3.4	12.6	11.8	3.3	14.1	12.6	3.5
325	13.4	12.4	3.8	12.6	11.8	3.6	14.3	12.8	3.9
350	13.7	12.5	4.1	12.6	11.9	3.9	14.5	12.9	4.3
375	14.0	12.6	4.5	12.6	11.9	4.2	14.7	13.0	4.6
400	14.1	12.7	4.8	12.5	12.0	4.6	14.8	13.1	5.0
425	...	...	...	12.5	12.0	4.9	15.0	13.2	5.4
450	...	...	...	12.5	12.0	5.2	15.1	13.3	5.7
475	...	...	...	12.6	12.1	5.5	15.3	13.4	6.1
500	...	...	...	12.8	12.1	5.8	15.4	13.5	6.5
525	...	...	...	13.0	12.1	6.1	15.6	13.6	6.9
550	...	...	...	13.4	12.2	6.5	15.7	13.7	7.3
575	...	...	...	13.9	12.3	6.8	15.8	13.8	7.7
600	...	...	...	14.5	12.3	7.2	16.0	13.9	8.1
625	...	...	...	15.3	12.5	7.5	16.1	14.0	8.5
650	...	...	...	16.3	12.6	7.9	16.3	14.1	8.9
675	...	...	...	17.5	12.7	8.4	16.4	14.2	9.3
700	...	...	...	18.9	12.9	8.8	16.5	14.3	9.7
725	...	...	...	20.5	13.2	9.3	16.6	14.3	10.1
750	...	...	...	22.3	13.5	9.8	16.6	14.4	10.5
775	...	...	...	24.5	13.8	10.4	16.7	14.5	10.9
800	...	...	...	26.8	14.2	11.1	16.6	14.6	11.4
825	...	...	...	29.5	14.6	11.8	16.5	14.6	11.8

Table TE-4
Thermal Expansion for Nickel Alloys (Cont'd)

	Coefficients for N10629			Coefficients for N10665			Coefficients for N10675		
Temperature, °C	A	B	C	A	B	C	A	B	C
20	9.8	9.8	0	9.5	9.5	0	10.3	10.3	0
50	10.2	10.0	0.30	10.2	9.9	0.30	10.4	10.3	0.31
75	10.5	10.2	0.56	10.6	10.1	0.56	10.6	10.4	0.57
100	10.7	10.3	0.82	10.9	10.3	0.82	10.8	10.5	0.84
125	10.9	10.4	1.1	11.1	10.5	1.1	11.0	10.6	1.1
150	11.1	10.5	1.4	11.2	10.6	1.4	11.3	10.7	1.4
175	11.2	10.6	1.6	11.4	10.7	1.7	11.5	10.8	1.7
200	11.4	10.7	1.9	11.5	10.8	1.9	11.7	10.9	2.0
225	11.6	10.8	2.2	11.6	10.9	2.2	12.0	11.0	2.3
250	11.7	10.9	2.5	11.7	11.0	2.5	12.1	11.1	2.6
275	11.9	11.0	2.8	11.9	11.1	2.8	12.3	11.3	2.9
300	12.0	11.1	3.1	12.0	11.2	3.1	12.4	11.3	3.2
325	12.1	11.2	3.4	12.2	11.2	3.4	12.5	11.4	3.5
350	12.2	11.2	3.7	12.4	11.3	3.7	12.5	11.5	3.8
375	12.3	11.3	4.0	12.6	11.4	4.0	12.5	11.6	4.1
400	12.4	11.4	4.3	12.8	11.5	4.4	12.4	11.6	4.4
425	12.5	11.4	4.6	12.9	11.6	4.7	12.3	11.7	4.7
450	12.5	11.5	4.9	13.0	11.6	5.0	12.2	11.7	5.0
475	12.5	11.6	5.3	13.1	11.7	5.3	12.1	11.7	5.3
500	12.5	11.6	5.6	13.1	11.8	5.7	12.1	11.8	5.6
525	12.6	11.7	5.9	13.1	11.8	6.0	12.0	11.8	5.9
550	12.6	11.7	6.2	13.0	11.9	6.3	12.1	11.8	6.2
575	12.7	11.7	6.5	12.9	12.0	6.6	12.2	11.8	6.6
600	12.8	11.8	6.8	12.7	12.0	7.0	12.4	11.8	6.9
625	13.1	11.8	7.2	12.6	12.0	7.3	12.9	11.9	7.2
650	...	...	...	12.4	12.0	7.6	13.5	11.9	7.5
675	...	...	...	12.3	12.1	7.9	14.4	12.0	7.9
700	...	...	...	12.3	12.1	8.2	15.6	12.1	8.2
725	...	...	...	12.5	12.1	8.5	17.2	12.2	8.6
750	...	...	...	12.9	12.1	8.8	19.3	12.5	9.1
775	...	...	...	13.6	12.1	9.2	...	...	...
800	...	...	...	14.8	12.2	9.5	...	...	...
825	...	...	...	16.5	12.3	9.9	...	...	...

Table TE-4
Thermal Expansion for Nickel Alloys (Cont'd)

	Coefficients for N12160			Coefficients for R20033		
Temperature, °C	A	B	C	A	B	C
20	12.4	12.4	0	14.1	14.1	0
50	12.9	12.6	0.38	14.5	14.3	0.43
75	13.2	12.8	0.70	14.9	14.4	0.79
100	13.6	13.0	1.0	15.3	14.6	1.2
125	13.9	13.2	1.4	15.6	14.8	1.6
150	14.2	13.4	1.7	15.7	15.0	1.9
175	14.5	13.5	2.1	15.8	15.1	2.3
200	14.8	13.7	2.5	15.7	15.2	2.7
225	15.0	13.8	2.8	15.6	15.3	3.1
250	15.2	14.0	3.2	15.6	15.3	3.5
275	15.3	14.1	3.6	15.6	15.3	3.9
300	15.4	14.2	4.0	15.7	15.3	4.3
325	15.5	14.3	4.4	16.0	15.4	4.7
350	15.6	14.4	4.7	16.4	15.4	5.1
375	15.6	14.5	5.1	16.9	15.5	5.5
400	15.7	14.6	5.5	17.5	15.6	5.9
425	15.8	14.6	5.9	17.9	15.8	6.4
450	16.0	14.7	6.3	17.9	15.9	6.8
475	16.1	14.8	6.7	...	...	...
500	16.4	14.9	7.1	...	...	...
525	16.6	14.9	7.5	...	...	...
550	17.0	15.0	8.0	...	...	...
575	17.3	15.1	8.4	...	...	...
600	17.8	15.2	8.8	...	...	...
625	18.2	15.3	9.3	...	...	...
650	18.7	15.5	9.7	...	...	...
675	19.1	15.6	10.2	...	...	...
700	19.5	15.7	10.7	...	...	...
725	19.9	15.9	11.2	...	...	...
750	20.1	16.0	11.7	...	...	...
775	20.2	16.2	12.2	...	...	...
800	20.0	16.3	12.7	...	...	...
825	19.4	16.4	13.2	...	...	...

GENERAL NOTE: Coefficient A is the instantaneous coefficient of thermal expansion × 10^{-6} (mm/mm/°C). Coefficient B is the mean coefficient of thermal expansion × 10^{-6} (mm/mm/°C) in going from 20°C to indicated temperature. Coefficient C is the linear thermal expansion (mm/m) in going from 20°C to indicated temperature.

Table TE-5
Thermal Expansion for Titanium Alloys

Temperature, °C	Coefficients for Titanium Alloy, Grades 1, 2, 2H, 3, 7, 7H, 11, 12, 16, 16H, 17, 26, 26H, and 27			Coefficients for Titanium Alloy, Grades 9 and 28			Coefficients for Titanium Alloy, Grade 38		
	A	B	C	A	B	C	A	B	C
20	8.3	8.3	0	8.4	8.4	0	8.7	8.7	0
50	8.5	8.4	0.25	8.6	8.6	0.26	8.8	8.7	0.26
75	8.6	8.5	0.47	8.8	8.6	0.47	8.9	8.7	0.48
100	8.7	8.5	0.68	8.9	8.7	0.70	9.0	8.7	0.70
125	8.7	8.6	0.90	9.2	8.8	0.92	9.1	8.8	0.92
150	8.7	8.6	1.1	9.4	8.9	1.2	9.2	8.9	1.2
175	8.8	8.6	1.3	9.5	9.0	1.4	9.2	8.9	1.4
200	8.9	8.7	1.6	9.6	9.0	1.6	9.3	9.0	1.6
225	9.0	8.7	1.8	9.5	9.1	1.9	9.4	9.0	1.8
250	9.1	8.7	2.0	9.5	9.2	2.1	9.5	9.1	2.1
275	9.1	8.8	2.2	9.7	9.2	2.3	9.5	9.1	2.3
300	9.2	8.8	2.5	10.4	9.3	2.6	9.6	9.2	2.6
325	9.3	8.8	2.7	...	...	...	9.7	9.2	2.8
350	9.5	8.9	2.9	...	...	...	9.7	9.2	3.0
375	9.9	8.9	3.2	...	...	...	9.8	9.3	3.3
400	10.6	9.0	3.4	...	...	...	9.8	9.3	3.5
425	11.8	9.2	3.7	...	...	...	9.9	9.3	3.8

GENERAL NOTE: Coefficient A is the instantaneous coefficient of thermal expansion × 10^{-6} (mm/mm/°C). Coefficient B is the mean coefficient of thermal expansion × 10^{-6} (mm/mm/°C) in going from 20°C to indicated temperature. Coefficient C is the linear thermal expansion (mm/m) in going from 20°C to indicated temperature.

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Table TCD
Nominal Coefficients of Thermal Conductivity (TC) and Thermal Diffusivity (TD)

	Carbon and Low Alloy Steels		Carbon and Low Alloy Steels		Carbon and Low Alloy Steels		Carbon and Low Alloy Steels		Carbon and Low Alloy Steels	
	Material Group A [Note (1)] Plain Carbon		Material Group B [Note (2)]		Material Group C [Note (3)]		Material Group D [Note (4)]		Material Group E [Note (5)]	
Temp., °C	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
20	60.4	18.10	47.3	13.66	41.0	11.87	36.3	10.53	27.4	8.02
50	59.8	17.03	47.9	13.23	40.8	11.47	36.5	10.23	28.4	8.05
75	58.9	16.27	48.0	12.85	40.7	11.16	36.7	10.03	29.2	8.07
100	58.0	15.60	47.9	12.47	40.6	10.88	36.9	9.86	29.8	8.07
125	57.0	15.00	47.6	12.10	40.5	10.60	37.0	9.71	30.3	8.05
150	55.9	14.43	47.2	11.74	40.4	10.33	37.1	9.56	30.8	8.01
175	54.7	13.90	46.7	11.39	40.3	10.08	37.2	9.41	31.2	7.95
200	53.6	13.40	46.1	11.05	40.1	9.82	37.2	9.25	31.5	7.87
225	52.5	12.90	45.5	10.73	39.8	9.57	37.2	9.08	31.7	7.76
250	51.4	12.42	44.8	10.42	39.5	9.32	37.1	8.89	31.9	7.63
275	50.3	11.95	44.2	10.11	39.1	9.07	36.9	8.70	32.0	7.49
300	49.2	11.48	43.5	9.81	38.7	8.82	36.7	8.49	32.1	7.34
325	48.1	11.01	42.9	9.50	38.3	8.57	36.5	8.27	32.1	7.17
350	47.0	10.55	42.2	9.20	37.8	8.32	36.2	8.05	32.0	7.00
375	45.9	10.10	41.5	8.89	37.3	8.06	35.8	7.82	32.0	6.82
400	44.9	9.65	40.9	8.57	36.8	7.81	35.4	7.59	31.9	6.64
425	43.8	9.20	40.2	8.25	36.3	7.55	35.0	7.35	31.7	6.46
450	42.7	8.77	39.4	7.93	35.8	7.29	34.6	7.11	31.6	6.27
475	41.6	8.34	38.6	7.60	35.3	7.03	34.2	6.87	31.4	6.09
500	40.5	7.92	37.8	7.27	34.8	6.77	33.7	6.62	31.2	5.90
525	39.3	7.51	36.9	6.96	34.4	6.50	33.3	6.37	30.9	5.70
550	38.2	7.10	36.0	6.65	33.9	6.24	32.8	6.11	30.7	5.50
575	37.0	6.71	35.0	6.36	33.4	5.97	32.4	5.84	30.4	5.29
600	35.8	6.31	34.0	6.10	32.8	5.69	32.0	5.55	30.1	5.06
625	34.7	5.93	33.0	5.88	32.2	5.42	31.5	5.25	29.8	4.82
650	33.5	5.54	31.9	5.69	31.6	5.14	31.1	4.93	29.4	4.55
675	32.3	5.11	30.8	5.56	30.7	4.78	30.6	4.58	29.1	4.26
700	31.2	4.59	29.8	5.50	29.1	4.37	30.1	4.21	28.6	3.94
725	30.1	3.84	28.8	5.52	27.6	3.83	28.7	3.69	28.2	3.59
750	29.1	2.42	27.8	1.71	26.7	2.69	27.4	2.62	27.6	3.36
775	...	3.07	26.9	3.17	...	1.26	26.8	1.64	27.1	3.29
800	...	4.19	26.1	4.37	...	5.06	26.7	4.59	26.9	4.02
825	...	4.82	...	4.59	...	7.74	...	7.51	...	4.36
850	...	...	...	...	...	...	...	...	...	...
875	...	...	...	...	...	...	...	...	...	...
900	...	...	...	...	...	...	...	...	...	...

Table TCD
Nominal Coefficients of Thermal Conductivity (TC) and Thermal Diffusivity (TD) (Cont'd)

	Carbon and Low Alloy Steels (Cont'd)		Ductile Cast Iron		High Chrome Steels		High Chrome Steels		High Alloy Steels		High Alloy Steels	
	Material Group F [Note (6)]				Material Group G [Note (7)]		Material Group H [Note (8)]		Material Group I [Note (9)]		Material Group J [Note (10)]	
Temp., °C	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
20	22.3	6.61	37.50	11.44	24.6	7.12	20.1	5.70	17.3	4.80	14.8	3.90
50	23.1	6.67	38.50	11.59	24.7	6.93	20.2	5.65	17.6	4.84	15.3	3.94
75	23.8	6.71	39.18	11.56	24.7	6.80	20.2	5.59	18.0	4.85	15.8	3.99
100	24.4	6.74	39.73	11.51	24.8	6.69	20.3	5.51	18.4	4.86	16.2	4.04
125	25.0	6.76	40.15	11.44	24.9	6.58	20.4	5.44	18.9	4.87	16.6	4.08
150	25.5	6.76	40.45	11.36	24.9	6.48	20.5	5.37	19.3	4.87	17.0	4.14
175	25.9	6.75	40.64	11.26	25.0	6.37	20.5	5.30	19.8	4.87	17.5	4.19
200	26.3	6.71	40.73	11.13	25.0	6.26	20.6	5.24	20.2	4.88	17.9	4.24
225	26.6	6.66	40.73	10.99	25.1	6.14	20.7	5.18	20.7	4.88	18.3	4.30
250	26.9	6.58	40.64	10.83	25.1	6.02	20.8	5.12	21.1	4.88	18.6	4.35
275	27.2	6.49	40.47	10.65	25.2	5.90	20.9	5.07	21.5	4.87	19.0	4.41
300	27.4	6.39	40.23	10.44	25.2	5.78	21.0	5.02	21.9	4.86	19.4	4.46
325	27.5	6.27	39.93	10.22	25.2	5.65	21.1	4.95	22.2	4.84	19.8	4.52
350	27.7	6.15	...	...	25.3	5.53	21.2	4.89	22.5	4.81	20.1	4.57
375	27.8	6.01	...	...	25.3	5.41	21.3	4.81	22.8	4.77	20.5	4.63
400	27.9	5.87	...	...	25.3	5.29	21.4	4.72	23.0	4.71	20.8	4.69
425	27.9	5.72	...	...	25.4	5.18	21.5	4.62	23.3	4.63	21.2	4.74
450	27.9	5.56	...	...	25.4	5.07	21.6	4.51	23.5	4.54	21.5	4.80
475	27.9	5.40	...	...	25.4	4.95	21.7	4.39	23.6	4.43	21.9	4.85
500	27.9	5.22	...	...	25.4	4.84	21.8	4.26	23.8	4.30	22.2	4.91
525	27.9	5.04	...	...	25.5	4.72	21.9	4.13	23.9	4.15	22.6	4.97
550	27.8	4.85	...	...	25.5	4.59	22.1	4.01	24.1	3.99	22.9	5.02
575	27.7	4.64	...	...	25.5	4.44	22.2	3.90	24.2	3.81	23.3	5.08
600	27.6	4.42	...	...	25.5	4.26	22.4	3.84	24.4	3.64	23.6	5.13
625	27.5	4.18	...	...	25.5	4.06	22.5	3.94	24.5	3.46	24.0	5.19
650	27.3	3.91	...	...	25.6	3.83	22.7	4.12	24.7	3.34	24.3	5.24
675	27.2	3.62	...	...	25.6	3.55	22.9	4.32	24.9	3.52	24.7	5.30
700	27.0	3.30	...	...	25.6	3.23	23.1	4.52	25.1	3.85	25.0	5.35
725	26.8	2.99	...	...	25.6	2.88	23.3	4.68	25.4	4.25	25.4	5.40
750	26.5	3.52	...	...	25.6	4.57	23.5	4.83	25.7	4.62	25.7	5.45
775	...	4.08	...	...	...	4.39	...	4.95	...	4.88	...	...
800	...	4.41	...	...	...	3.57	...	5.06	...	5.02	...	...
825	...	4.54	...	...	...	...	...	5.17	...	5.20	...	...
850	...	...	...	...	...	...	...	...	...	...	...	...
875	...	...	...	...	...	...	...	...	...	...	...	...
900	...	...	...	...	...	...	...	...	...	...	...	...

Table TCD
Nominal Coefficients of Thermal Conductivity (TC) and Thermal Diffusivity (TD) (Cont'd)

	High Alloy Steels (Cont'd)		High Alloy Steels		High Nickel Alloys		High Nickel Alloys		High Nickel Alloys	
	Material Group K [Note (11)]		Material Group L [Note (12)]		Nickel N02200		Low C–Nickel N02201		Ni–Cu N04400	
Temp., °C	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
20	14.1	3.57	11.1	2.95	...	...	70.9	...	21.8	5.76
50	14.6	3.64	11.6	3.02	...	...	73.3	...	22.7	5.95
75	15.0	3.69	12.0	3.08	...	...	73.8	...	23.5	6.10
100	15.4	3.75	12.5	3.14	66.8	...	73.3	...	24.3	6.25
125	15.7	3.80	12.9	3.20	65.6	...	72.1	...	25.2	6.41
150	16.1	3.86	13.3	3.26	64.3	...	70.4	...	26.1	6.57
175	16.5	3.92	13.8	3.33	62.9	...	68.5	...	26.9	6.73
200	16.8	3.98	14.2	3.39	61.7	...	66.5	...	27.7	6.89
225	17.2	4.05	14.6	3.46	60.6	...	64.6	...	28.5	7.04
250	17.6	4.11	15.0	3.53	59.4	...	62.8	...	29.2	7.18
275	17.9	4.16	15.5	3.59	58.2	...	61.3	...	29.9	7.30
300	18.3	4.22	15.9	3.66	57.0	...	59.9	...	30.6	7.40
325	18.7	4.28	16.3	3.73	55.8	...	58.9	...	31.3	7.48
350	19.0	4.33	16.7	3.79	54.9	...	58.1	...	32.0	7.52
375	19.4	4.39	17.1	3.86	54.9	...	57.5	...	32.8	7.55
400	19.7	4.44	17.5	3.93	55.7	...	57.2	...	33.5	7.56
425	20.1	4.50	18.0	4.00	56.3	...	57.1	...	34.3	...
450	20.5	4.55	18.4	4.06	56.7	...	57.3	...	35.1	...
475	20.8	4.61	18.8	4.13	57.1	...	57.6	...	36.0	...
500	21.2	4.66	19.2	4.20	57.6	...	58.0	...	36.8	...
525	21.5	4.72	19.6	4.27	58.2	...	58.6	...	37.7	...
550	21.9	4.78	20.0	4.34	...	...	59.2	...	...	...
575	22.2	4.84	20.4	4.41	...	...	59.9	...	...	...
600	22.6	4.90	20.8	4.47	...	...	60.5	...	...	...
625	22.9	4.95	21.2	4.54	...	...	61.2	...	...	...
650	23.2	5.01	21.6	4.61	...	...	61.8	...	...	...
675	23.6	5.07	22.0	4.67	...	...	62.4	...	...	...
700	23.9	5.12	22.4	4.73	...	...	62.9	...	...	...
725	24.2	5.16	22.8	4.79	...	...	63.4	...	...	...
750	24.6	5.19	23.1	4.84	...	...	63.9	...	...	...
775	...	...	...	...	...	...	...	...	...	...
800	...	...	...	...	...	...	...	...	...	...
825	...	...	...	...	...	...	...	...	...	...
850	...	...	...	...	...	...	...	...	...	...
875	...	...	...	...	...	...	...	...	...	...
900	...	...	...	...	...	...	...	...	...	...

Table TCD
Nominal Coefficients of Thermal Conductivity (TC) and Thermal Diffusivity (TD) (Cont'd)

	High Nickel Alloys (Cont'd)		High Nickel Alloys		High Nickel Alloys		High Nickel Alloys		High Nickel Alloys	
	Ni–Cu N04405		Ni–Cr–Mo–Fe N06002		Ni–Cr–Fe–Mo–Cu N06007		N06022		N06030	
Temp., °C	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
20	21.8	...	9.0	2.25	10.1	3.00	9.7	...	10.2	...
50	22.7	...	9.8	2.44	10.5	2.98	10.2	...	10.9	...
75	23.5	...	10.4	2.59	10.9	2.99	10.6	...	11.5	...
100	24.3	...	11.0	2.74	11.3	3.01	11.1	...	12.1	...
125	25.2	...	11.6	2.88	11.7	3.05	11.7	...	12.7	...
150	26.1	...	12.1	3.01	12.0	3.10	12.2	...	13.2	...
175	26.9	...	12.6	3.14	12.4	3.15	12.8	...	13.8	...
200	27.7	...	13.1	3.26	12.8	3.21	13.3	...	14.4	...
225	28.5	...	13.6	3.37	13.2	3.28	13.9	...	15.0	...
250	29.2	...	14.0	3.48	13.6	3.34	14.4	...	15.5	...
275	29.9	...	14.5	3.58	13.9	3.41	14.9	...	16.1	...
300	30.6	...	15.0	3.68	14.3	3.48	15.5	...	16.7	...
325	31.3	...	15.4	3.77	14.7	3.55	16.0	...	17.2	...
350	32.0	...	15.9	3.86	15.1	3.61	16.5	...	17.7	...
375	32.8	...	16.4	3.95	15.5	3.68	16.9	...	18.3	...
400	33.5	...	16.9	4.03	15.9	3.75	17.4	...	18.8	...
425	34.3	...	17.4	4.11	16.3	3.81	17.9	...	19.2	...
450	35.1	...	17.9	4.19	16.7	3.88	18.4	...	19.7	...
475	36.0	...	18.4	4.26	17.1	3.95	18.9	...	20.0	...
500	36.8	...	18.9	4.33	17.5	4.02	19.5	...	20.4	...
525	37.7	...	19.4	4.39	17.9	4.09	20.0	...	20.7	...
550	...	...	19.9	4.46	...	4.16	20.5	...	21.0	...
575	...	...	20.4	4.51	...	4.22	...	...	...	...
600	...	...	20.9	4.56	...	4.29	...	...	...	...
625	...	...	21.4	4.61	...	...	...	...	...	...
650	...	...	21.9	4.65	...	...	...	...	...	...
675	...	...	22.4	4.68	...	...	...	...	...	...
700	...	...	22.8	4.71	...	...	...	...	...	...
725	...	...	23.3	4.73	...	...	...	...	...	...
750	...	...	23.8	4.74	...	...	...	...	...	...
775	...	...	...	...	...	...	...	...	...	...
800	...	...	...	...	...	...	...	...	...	...
825	...	...	...	...	...	...	...	...	...	...
850	...	...	...	...	...	...	...	...	...	...
875	...	...	...	...	...	...	...	...	...	...
900	...	...	...	...	...	...	...	...	...	...

Table TCD
Nominal Coefficients of Thermal Conductivity (TC) and Thermal Diffusivity (TD) (Cont'd)

	High Nickel Alloys (Cont'd)		High Nickel Alloys		High Nickel Alloys		High Nickel Alloys		High Nickel Alloys	
	N06045		N06059		N06230		Ni–Mo–Cr–Low C N06455 and N06686		Ni–Cr–Fe N06600	
Temp., °C	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
20	12.97	3.22	10.4	2.92	9.0	2.44	10.0	2.85	14.9	3.97
50	...	...	11.1	...	9.5	2.54	10.5	2.92	15.2	3.98
75	...	...	11.6	...	9.9	2.62	10.9	2.98	15.5	4.01
100	...	...	12.1	...	10.4	2.70	11.4	3.05	15.9	4.05
125	...	...	12.5	...	10.9	2.78	11.8	3.13	16.2	4.09
150	...	...	12.9	...	11.4	2.86	12.3	3.20	16.6	4.14
175	...	...	13.3	...	11.9	2.94	12.7	3.28	17.0	4.19
200	...	...	13.7	...	12.4	3.02	13.2	3.35	17.3	4.25
225	...	...	14.1	...	12.9	3.09	13.6	3.43	17.7	4.31
250	...	...	14.5	...	13.4	3.16	14.1	3.51	18.1	4.36
275	...	...	14.9	...	13.9	3.24	14.5	3.58	18.5	4.42
300	...	...	15.3	...	14.5	3.31	14.9	3.66	18.9	4.47
325	...	...	15.7	...	15.0	3.38	15.4	3.74	19.3	4.53
350	...	...	16.1	...	15.5	3.44	15.8	3.82	19.7	4.58
375	...	...	16.6	...	16.0	3.51	16.2	3.90	20.1	4.62
400	...	...	17.0	...	16.5	3.58	16.7	3.98	20.5	4.67
425	...	...	17.4	...	17.0	3.64	17.1	4.06	20.9	4.71
450	...	...	17.8	...	17.5	3.71	17.5	4.15	21.3	4.75
475	...	...	18.2	...	18.0	3.77	18.0	4.23	21.7	4.79
500	...	...	18.6	...	18.5	3.84	18.5	4.32	22.1	4.83
525	...	...	19.0	...	19.0	3.90	19.0	4.41	22.6	4.86
550	...	...	19.4	...	19.4	3.97	19.5	4.50	23.0	4.90
575	...	...	...	...	19.9	4.03	20.0	4.59	23.4	4.94
600	...	...	...	...	20.4	4.09	20.6	4.69	23.9	4.97
625	...	...	...	...	20.9	4.14	...	...	24.3	5.01
650	...	...	...	...	21.4	4.20	...	...	24.8	5.05
675	...	...	...	...	21.9	4.25	...	...	25.3	5.09
700	...	...	...	...	22.4	4.29	...	...	25.7	5.14
725	...	...	...	...	22.9	4.32	...	...	26.2	5.18
750	...	...	...	...	23.3	4.34	...	...	26.6	5.23
775	...	...	...	...	23.8	4.35	...	...	...	...
800	...	...	...	...	24.3	4.34	...	...	...	...
825	...	...	...	...	24.8	4.30	...	...	...	...
850	...	...	...	...	25.2	4.25	...	...	...	...
875	...	...	...	...	25.6	4.17	...	...	...	...
900	...	...	...	...	25.9	4.06	...	...	...	...

Table TCD
Nominal Coefficients of Thermal Conductivity (TC) and Thermal Diffusivity (TD) (Cont'd)

	High Nickel Alloys (Cont'd)		High Nickel Alloys		High Nickel Alloys		High Nickel Alloys		High Nickel Alloys	
	Ni–Cr–Mo–Cb N06625		Ni–Cr–Fe N06690		Ni–Cr–Fe–Mo–Cb N07718		70Ni–16Cr–7Fe–Ti–Al N07750		Cr–Ni–Fe–Mo–Cu–Cb N08020	
Temp., °C	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
20	9.8	2.85	11.8	3.23	11.1	3.05	11.9	3.41	...	3.06
50	10.2	2.95	12.3	3.33	11.6	3.21	12.3	3.41	12.2	3.16
75	10.6	3.02	12.8	3.40	12.0	3.30	12.6	3.42	12.7	3.23
100	10.9	3.08	13.3	3.48	12.4	3.37	12.9	3.43	13.1	3.31
125	11.3	3.14	13.8	3.55	12.9	3.43	13.2	3.45	13.5	3.39
150	11.7	3.19	14.2	3.63	13.3	3.49	13.5	3.48	13.9	3.47
175	12.0	3.24	14.7	3.70	13.7	3.55	13.8	3.52	14.3	3.54
200	12.4	3.29	15.1	3.78	14.1	3.61	14.1	3.56	14.7	3.62
225	12.8	3.33	15.6	3.86	14.6	3.68	14.4	3.61	15.2	3.70
250	13.2	3.38	16.1	3.93	15.0	3.76	14.8	3.67	15.6	3.78
275	13.5	3.43	16.5	4.01	15.4	3.84	15.1	3.73	16.0	3.85
300	13.9	3.47	17.0	4.09	15.8	3.94	15.5	3.79	16.5	3.93
325	14.3	3.52	17.5	4.17	16.3	4.05	15.8	3.85	16.9	4.01
350	14.7	3.57	17.9	4.25	16.7	4.15	16.2	3.91	17.4	4.09
375	15.0	3.62	18.4	4.33	17.1	4.27	16.5	3.96	17.8	4.16
400	15.4	3.66	18.9	4.41	17.5	4.38	16.9	4.02	18.2	4.24
425	15.8	3.71	19.4	4.49	18.0	4.48	17.3	4.07	18.6	4.32
450	16.1	3.76	19.9	4.57	18.4	4.57	17.7	4.12	19.0	4.40
475	16.5	3.81	20.4	4.64	18.8	4.65	18.0	4.17	19.4	...
500	16.9	3.86	20.8	4.71	19.3	4.70	18.4	4.23	19.9	...
525	17.2	3.91	21.3	4.78	19.7	4.74	...	...	...	...
550	17.6	3.95	21.8	4.85	20.1	4.74	...	...	...	...
575	18.0	3.99	22.3	4.91	20.5	4.72	...	...	...	...
600	18.4	4.04	22.8	4.97	20.9	4.67	...	...	...	...
625	18.7	4.08	23.3	5.03	21.4	4.60	...	...	...	...
650	19.1	4.12	23.7	5.08	21.8	4.52	...	...	...	...
675	19.5	4.15	24.2	5.13	22.2	4.42	...	...	...	...
700	19.9	4.19	24.7	5.17	22.6	4.32	...	...	...	...
725	20.3	4.23	25.1	5.22	23.0	4.23	...	...	...	...
750	20.7	4.28	25.6	5.26	23.4	4.15	...	...	...	...
775	...	...	...	...	...	...	...	...	...	...
800	...	...	...	...	...	...	...	...	...	...
825	...	...	...	...	...	...	...	...	...	...
850	...	...	...	...	...	...	...	...	...	...
875	...	...	...	...	...	...	...	...	...	...
900	...	...	...	...	...	...	...	...	...	...

Table TCD
Nominal Coefficients of Thermal Conductivity (TC) and Thermal Diffusivity (TD) (Cont'd)

	High Nickel Alloys (Cont'd)		High Nickel Alloys		High Nickel Alloys		High Nickel Alloys		High Nickel Alloys		High Nickel Alloys	
	N08031 and N08367		Ni–Fe–Cr–Si N08330		N08354		Ni–Fe–Cr N08800, N08801, N08810, N08811		Ni–Fe–Cr–Mo–Cu N08825		Ni–Mo N10001	
Temp., °C	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
20	11.6	3.15	12.4	3.39	11.2	2.97	11.5	3.14	...	...	...	...
50	12.2	...	12.7	3.43	11.9	3.19	12.1	3.27	...	...	10.6	2.96
75	12.6	...	13.0	3.53	12.5	3.20	12.5	3.37	11.9	3.26	10.9	2.97
100	13.1	...	13.4	3.63	13.1	3.30	13.0	3.46	12.4	3.25	11.1	2.98
125	13.6	...	13.8	...	13.7	3.41	13.4	3.54	12.8	3.27	11.3	3.00
150	14.1	...	14.2	...	14.3	3.51	13.9	3.63	13.2	3.30	11.6	3.02
175	14.5	...	14.7	...	14.8	3.61	14.3	3.71	13.6	3.33	11.8	3.05
200	15.0	...	15.1	...	15.4	3.70	14.7	3.78	14.0	3.36	12.1	3.07
225	15.4	...	15.6	...	15.9	3.80	15.1	3.85	14.4	3.39	12.3	3.09
250	15.9	...	16.1	...	16.4	3.89	15.5	3.92	14.8	3.41	12.6	3.12
275	16.3	...	16.6	...	16.9	3.97	16.0	3.99	15.2	3.42	12.9	3.15
300	16.8	...	17.0	...	17.4	4.05	16.4	4.05	15.5	3.44	13.2	3.18
325	17.2	...	17.5	...	17.9	4.13	16.7	4.12	15.9	3.44	13.5	3.21
350	17.6	...	18.0	...	18.3	4.19	17.1	4.18	16.3	3.44	13.9	3.25
375	18.0	...	18.4	...	18.8	4.25	17.5	4.24	16.6	3.44	14.2	3.29
400	18.4	...	18.9	...	19.2	4.30	17.9	4.30	17.0	3.44	14.6	3.34
425	18.9	...	19.4	...	19.6	4.35	18.3	4.36	17.3	3.43	15.0	3.40
450	19.3	...	19.8	...	19.9	4.38	18.7	4.42	17.6	3.42	15.5	3.47
475	19.7	...	20.3	...	...	...	19.1	4.47	18.0	3.41	16.0	3.54
500	20.2	...	20.7	...	...	...	19.4	4.53	18.3	3.38	16.5	3.62
525	20.6	...	21.2	...	...	...	19.8	4.58	18.7	...	17.0	3.71
550	21.0	...	21.7	...	...	...	20.3	4.63	19.0	...	17.6	3.80
575	...	...	22.1	...	...	...	20.7	4.68	19.4	...	18.2	3.89
600	...	...	22.6	...	...	...	21.1	4.73	19.7	...	...	...
625	...	...	23.0	...	...	...	21.5	4.78	20.1	...	...	...
650	...	...	...	...	...	...	22.0	4.82	20.5	...	...	...
675	...	...	...	...	...	...	22.4	4.87	20.9	...	...	...
700	...	...	...	...	...	...	22.9	4.91	21.4	...	...	...
725	...	...	...	...	...	...	23.3	4.96	21.8	...	...	...
750	...	...	...	...	...	...	23.8	5.00	22.3	...	...	...
775	...	...	...	...	...	...	...	...	...	...	...	...
800	...	...	...	...	...	...	...	...	...	...	...	...
825	...	...	...	...	...	...	...	...	...	...	...	...
850	...	...	...	...	...	...	...	...	...	...	...	...
875	...	...	...	...	...	...	...	...	...	...	...	...
900	...	...	...	...	...	...	...	...	...	...	...	...

Table TCD
Nominal Coefficients of Thermal Conductivity (TC) and Thermal Diffusivity (TD) (Cont'd)

	High Nickel Alloys (Cont'd)		High Nickel Alloys		High Nickel Alloys		High Nickel Alloys		High Nickel Alloys	
	Ni–Mo–Cr–Fe N10003		65Ni–25Mo–8Cr–2Fe N10242		Ni–Mo–Cr N10276		N10629		Ni–Mo N10665	
Temp., °C	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
20	...	...	10.9	3.00	...	...	11.0	3.2	...	...
50	...	...	11.3	3.14	10.4	...	11.5	...	...	...
75	10.9	3.00	11.7	3.24	10.8	...	11.9	...	...	...
100	11.3	3.13	12.1	3.33	11.2	...	12.2	...	12.2	3.37
125	11.8	3.21	12.5	3.40	11.7	...	12.5	...	12.4	3.41
150	12.1	3.26	13.0	3.47	12.1	...	12.8	...	12.7	3.45
175	12.5	3.29	13.4	3.53	12.5	...	13.1	...	12.9	3.49
200	12.8	3.32	13.8	3.60	12.9	...	13.4	...	13.2	3.53
225	13.1	3.36	14.2	3.66	13.4	...	13.7	...	13.4	3.58
250	13.5	3.40	14.6	3.72	13.8	...	14.0	...	13.7	3.63
275	13.8	3.46	15.0	3.79	14.3	...	14.4	...	14.0	3.68
300	14.1	3.53	15.4	3.86	14.7	...	14.7	...	14.3	3.74
325	14.5	3.62	15.8	3.94	15.1	...	15.1	...	14.7	3.79
350	14.8	3.71	16.2	4.02	15.6	...	15.5	...	15.0	3.85
375	15.2	3.81	16.6	4.11	16.0	...	15.8	...	15.4	3.92
400	15.6	3.91	17.0	4.20	16.5	...	16.2	...	15.8	3.98
425	16.0	3.99	17.4	4.29	16.9	...	16.5	...	16.2	4.05
450	16.4	4.06	17.8	4.39	17.4	...	16.8	...	16.6	4.13
475	16.9	4.11	18.2	4.48	17.9	...	17.0	...	17.1	4.20
500	17.3	4.14	18.6	4.57	18.3	...	17.3	...	17.6	4.28
525	17.8	4.14	19.0	4.66	18.8	...	17.6	...	18.2	4.37
550	18.3	4.13	19.4	4.74	19.2	...	17.9	...	18.7	4.46
575	18.8	4.09	19.8	4.81	19.7	...	18.3	...	19.3	4.55
600	19.3	4.06	20.2	4.87	20.1	...	18.9	...	19.9	4.65
625	19.8	4.04	20.6	4.91	...	...	...	...	...	...
650	20.4	...	21.0	4.92	...	...	...	...	...	...
675	20.9	...	21.4	4.92	...	...	...	...	...	...
700	21.5	...	21.8	4.89	...	...	...	...	...	...
725	22.1	...	22.2	4.84	...	...	...	...	...	...
750	22.7	...	22.6	4.76	...	...	...	...	...	...
775	...	...	23.0	4.66	...	...	...	...	...	...
800	...	...	23.4	4.53	...	...	...	...	...	...
825	...	...	23.8	4.38	...	...	...	...	...	...
850	...	...	24.2	4.21	...	...	...	...	...	...
875	...	...	24.6	4.02	...	...	...	...	...	...
900	...	...	25.0	3.82	...	...	...	...	...	...

Table TCD
Nominal Coefficients of Thermal Conductivity (TC) and Thermal Diffusivity (TD) (Cont'd)

	High Nickel Alloys (Cont'd)		High Nickel Alloys		High Nickel Alloys		Titanium Alloys		Titanium Alloys	
	N10675		N12160		R20033		Titanium Gr. 1, 2, 2H, 3, 7, 7H, 11, 12, 16, 16H, 17, 26, 26H, and 27		Titanium Grades 9 and 28	
Temp., °C	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
20	11.2	2.98	10.9	2.97	13.3	3.350	22.0	9.27	8.8	3.74
50	11.5	3.05	11.2	3.01	13.8	...	21.4	8.95	9.2	3.83
75	11.8	3.12	11.6	3.04	14.2	...	21.1	8.70	9.6	3.89
100	12.1	3.19	11.9	3.09	14.6	...	20.7	8.47	9.9	3.95
125	12.4	3.26	12.3	3.15	14.9	...	20.5	8.26	10.2	4.01
150	12.7	3.33	12.7	3.21	15.3	...	20.2	8.07	10.5	4.07
175	13.0	3.40	13.1	3.28	15.7	...	20.0	7.90	10.8	4.13
200	13.3	3.46	13.5	3.35	16.0	...	19.9	7.76	11.0	4.20
225	13.7	3.53	14.0	3.43	16.4	...	19.7	7.63	11.3	4.26
250	14.0	3.59	14.5	3.52	16.8	...	19.6	7.52	11.5	4.32
275	14.4	3.66	14.9	3.61	17.1	...	19.5	7.42	11.7	4.37
300	14.8	3.72	15.4	3.70	17.5	...	19.4	7.34	11.9	4.41
325	15.1	3.79	16.0	3.79	17.9	...	19.4	7.27	...	...
350	15.5	3.85	16.5	3.89	18.3	...	19.3	7.22	...	...
375	15.9	3.92	17.0	3.98	18.7	...	19.3	7.17	...	...
400	16.3	3.99	17.6	4.08	19.0	...	19.3	7.13	...	...
425	16.7	4.06	18.1	4.16	19.4	...	19.4	7.10	...	...
450	17.1	4.13	18.7	4.25	...	...	19.4	7.07	...	...
475	17.5	4.21	19.3	4.33	...	...	19.5	7.05	...	...
500	18.0	4.28	19.9	4.40	...	...	19.6	7.02	...	...
525	18.4	4.36	20.4	4.46	...	...	19.7	7.01	...	...
550	18.8	4.44	21.0	4.52	...	...	19.8	6.99	...	...
575	19.2	4.52	21.6	4.57	...	...	...	...	...	...
600	19.6	4.59	22.2	4.61	...	...	...	...	...	...
625	20.1	4.66	22.8	4.64	...	...	...	...	...	...
650	20.5	4.73	23.4	4.67	...	...	...	...	...	...
675	20.9	4.78	23.9	4.69	...	...	...	...	...	...
700	21.4	4.82	24.5	4.71	...	...	...	...	...	...
725	21.8	4.85	24.9	4.73	...	...	...	...	...	...
750	22.3	4.85	25.4	4.75	...	...	...	...	...	...
775	22.8	4.83	25.8	4.78	...	...	...	...	...	...
800	23.3	4.78	26.1	4.83	...	...	...	...	...	...
825	23.9	4.69	26.3	4.89	...	...	...	...	...	...
850	24.5	4.56	26.4	4.98	...	...	...	...	...	...
875	25.1	4.39	26.3	5.10	...	...	...	...	...	...
900	25.8	4.17	26.2	5.27	...	...	...	...	...	...

Table TCD
Nominal Coefficients of Thermal Conductivity (TC) and Thermal Diffusivity (TD) (Cont'd)

	Titanium Alloys (Cont'd)		Aluminum Alloys		Aluminum Alloys		Aluminum Alloys		Aluminum Alloys		Aluminum Alloys	
	Titanium Grade 38		A24430		A03560		A91060		A91100		A92014	
Temp., °C	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
20	7.4	3.16	162.6	68.14	159.1	67.38	234.2	95.16	230.5	94.86	155.5	63.71
50	7.8	3.23	164.6	68.01	161.8	67.26	229.8	92.89	226.7	91.87	158.4	64.03
75	8.1	3.31	167.0	67.88	163.8	67.12	227.0	90.66	224.1	89.64	160.6	64.00
100	8.4	3.38	168.8	67.85	165.5	66.97	224.5	88.71	221.9	87.74	162.5	64.01
125	8.7	3.46	170.1	67.82	167.1	66.87	222.4	86.97	220.0	86.13	164.2	64.04
150	9.0	3.54	171.2	67.66	168.6	66.84	220.6	85.39	218.4	84.71	165.7	63.97
175	9.3	3.62	172.6	67.35	169.9	66.83	219.0	83.94	216.9	83.38	167.1	63.77
200	9.6	3.70	173.7	67.10	171.0	66.66	217.6	82.57	215.7	82.05	168.4	63.69
225	9.9	3.79	...	...	...	...	...	...	...	...	...	...
250	10.2	3.88	...	...	...	...	...	...	...	...	...	...
275	10.5	3.98	...	...	...	...	...	...	...	...	...	...
300	10.9	4.08	...	...	...	...	...	...	...	...	...	...
325	11.2	4.19	...	...	...	...	...	...	...	...	...	...
350	11.6	4.31	...	...	...	...	...	...	...	...	...	...
375	12.0	4.44	...	...	...	...	...	...	...	...	...	...
400	12.5	4.58	...	...	...	...	...	...	...	...	...	...
425	12.9	4.72	...	...	...	...	...	...	...	...	...	...
450	...	...	...	...	...	...	...	...	...	...	...	...
475	...	...	...	...	...	...	...	...	...	...	...	...
500	...	...	...	...	...	...	...	...	...	...	...	...
525	...	...	...	...	...	...	...	...	...	...	...	...
550	...	...	...	...	...	...	...	...	...	...	...	...
575	...	...	...	...	...	...	...	...	...	...	...	...
600	...	...	...	...	...	...	...	...	...	...	...	...
625	...	...	...	...	...	...	...	...	...	...	...	...
650	...	...	...	...	...	...	...	...	...	...	...	...
675	...	...	...	...	...	...	...	...	...	...	...	...
700	...	...	...	...	...	...	...	...	...	...	...	...
725	...	...	...	...	...	...	...	...	...	...	...	...
750	...	...	...	...	...	...	...	...	...	...	...	...
775	...	...	...	...	...	...	...	...	...	...	...	...
800	...	...	...	...	...	...	...	...	...	...	...	...
825	...	...	...	...	...	...	...	...	...	...	...	...
850	...	...	...	...	...	...	...	...	...	...	...	...
875	...	...	...	...	...	...	...	...	...	...	...	...
900	...	...	...	...	...	...	...	...	...	...	...	...

Table TCD
Nominal Coefficients of Thermal Conductivity (TC) and Thermal Diffusivity (TD) (Cont'd)

	Aluminum Alloys (Cont'd)		Aluminum Alloys		Aluminum Alloys		Aluminum Alloys		Aluminum Alloys	
	A92024		A93003		A93004		A95052 and A95652		A95083	
Temp., °C	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
20	148.4	60.88	177.0	72.52	162.1	67.10	137.6	57.29	116.1	48.47
50	151.7	61.30	178.5	72.02	165.2	66.98	141.3	57.78	120.6	49.67
75	154.1	61.52	179.6	71.55	167.0	66.85	144.2	58.27	123.8	50.36
100	156.3	61.65	180.5	71.18	168.6	66.82	146.7	58.63	126.7	50.93
125	158.3	61.77	181.3	70.86	170.1	66.79	149.0	58.88	129.5	51.44
150	160.0	61.89	182.1	70.47	171.4	66.63	151.0	59.11	132.1	51.91
175	161.5	61.96	182.9	69.96	172.5	66.32	152.9	59.34	134.5	52.34
200	163.1	61.76	183.5	69.48	173.6	66.07	154.7	59.40	136.7	52.81
225	...	...	...	...	...	...	...	...	...	...
250	...	...	...	...	...	...	...	...	...	...
275	...	...	...	...	...	...	...	...	...	...
300	...	...	...	...	...	...	...	...	...	...
325	...	...	...	...	...	...	...	...	...	...
350	...	...	...	...	...	...	...	...	...	...
375	...	...	...	...	...	...	...	...	...	...
400	...	...	...	...	...	...	...	...	...	...
425	...	...	...	...	...	...	...	...	...	...
450	...	...	...	...	...	...	...	...	...	...
475	...	...	...	...	...	...	...	...	...	...
500	...	...	...	...	...	...	...	...	...	...
525	...	...	...	...	...	...	...	...	...	...
550	...	...	...	...	...	...	...	...	...	...
575	...	...	...	...	...	...	...	...	...	...
600	...	...	...	...	...	...	...	...	...	...
625	...	...	...	...	...	...	...	...	...	...
650	...	...	...	...	...	...	...	...	...	...
675	...	...	...	...	...	...	...	...	...	...
700	...	...	...	...	...	...	...	...	...	...
725	...	...	...	...	...	...	...	...	...	...
750	...	...	...	...	...	...	...	...	...	...
775	...	...	...	...	...	...	...	...	...	...
800	...	...	...	...	...	...	...	...	...	...
825	...	...	...	...	...	...	...	...	...	...
850	...	...	...	...	...	...	...	...	...	...
875	...	...	...	...	...	...	...	...	...	...
900	...	...	...	...	...	...	...	...	...	...

Table TCD
Nominal Coefficients of Thermal Conductivity (TC) and Thermal Diffusivity (TD) (Cont'd)

	Aluminum Alloys (Cont'd)		Aluminum Alloys		Aluminum Alloys		Aluminum Alloys		Aluminum Alloys		Aluminum Alloys	
	A95086		A95154 and A95254		A95454		A95456		A96061		A96063	
Temp., °C	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
20	126.9	52.83	126.9	52.83	134.0	55.45	116.1	48.75	166.2	68.66	209.1	68.53
50	131.0	53.96	131.0	53.96	137.6	56.25	120.6	49.63	168.6	68.54	207.8	68.42
75	134.1	54.37	134.1	54.37	140.8	56.71	123.7	50.34	170.2	68.41	206.7	68.40
100	136.9	54.81	136.9	54.81	143.6	57.15	126.7	51.03	171.7	68.29	205.7	68.34
125	139.4	55.32	139.4	55.32	145.9	57.56	129.6	51.66	173.0	68.12	204.9	68.11
150	141.8	55.76	141.8	55.76	148.0	57.87	132.2	52.20	174.1	67.87	204.5	67.84
175	143.9	55.99	143.9	55.99	150.0	58.03	134.5	52.60	175.3	67.61	204.2	67.63
200	145.9	56.18	145.9	56.18	151.9	58.07	136.7	52.87	176.2	67.57	203.7	67.60
225	...	...	...	...	...	...	...	...	...	...	...	...
250	...	...	...	...	...	...	...	...	...	...	...	...
275	...	...	...	...	...	...	...	...	...	...	...	...
300	...	...	...	...	...	...	...	...	...	...	...	...
325	...	...	...	...	...	...	...	...	...	...	...	...
350	...	...	...	...	...	...	...	...	...	...	...	...
375	...	...	...	...	...	...	...	...	...	...	...	...
400	...	...	...	...	...	...	...	...	...	...	...	...
425	...	...	...	...	...	...	...	...	...	...	...	...
450	...	...	...	...	...	...	...	...	...	...	...	...
475	...	...	...	...	...	...	...	...	...	...	...	...
500	...	...	...	...	...	...	...	...	...	...	...	...
525	...	...	...	...	...	...	...	...	...	...	...	...
550	...	...	...	...	...	...	...	...	...	...	...	...
575	...	...	...	...	...	...	...	...	...	...	...	...
600	...	...	...	...	...	...	...	...	...	...	...	...
625	...	...	...	...	...	...	...	...	...	...	...	...
650	...	...	...	...	...	...	...	...	...	...	...	...
675	...	...	...	...	...	...	...	...	...	...	...	...
700	...	...	...	...	...	...	...	...	...	...	...	...
725	...	...	...	...	...	...	...	...	...	...	...	...
750	...	...	...	...	...	...	...	...	...	...	...	...
775	...	...	...	...	...	...	...	...	...	...	...	...
800	...	...	...	...	...	...	...	...	...	...	...	...
825	...	...	...	...	...	...	...	...	...	...	...	...
850	...	...	...	...	...	...	...	...	...	...	...	...
875	...	...	...	...	...	...	...	...	...	...	...	...
900	...	...	...	...	...	...	...	...	...	...	...	...

GENERAL NOTES:

(a) TC is the thermal conductivity, W/(m·°C), and TD is the thermal diffusivity, 10^{-6} m^2/sec:

$$TD = \frac{TC\left[W/\left(m\cdot°C\right)\right]}{\text{density}\left(kg/m^3\right) \times \text{specific heat}\left[J/\left(kg\cdot°C\right)\right]}$$

(b) Values of thermal conductivity and thermal diffusivity should be used with the understanding that there is an associated ±10% uncertainty. This uncertainty results from compositional variations and variables associated with original data acquisition and analysis.

NOTES:

(1) Material Group A includes those materials listed as “Carbon steel” in the Nominal Composition column in Tables 1A, 2A, 3, 5A, U, or Y-1.

(2) Material Group B includes those materials listed as “C–Mn–Si–Cb,” “C–Mn–Si–V,” “C–Mn–Si–V–Cb,” “C–Mn–Ti,” or “C–Si–Ti” in the Nominal Composition column in Tables 1A, 2A, 3, 5A, U, or Y–1. Also includes:

3/4Cr–1/2Ni–Cu	3/4Ni–1/2Cu–Mo
1Cr–1/2Mo–Si	2 1/2Ni

(3) Material Group C includes the following carbon–moly steels:

C–1/4Mo	C–1/2Mo

The following low chrome steels:

1/2Cr–1/5Mo–V	1Cr–1/2Mo
1/2Cr–1/4Mo–Si	1 1/4Cr–1/2Mo
1/2Cr–1/2Mo	1 1/4Cr–1/2Mo–Si
1/2Cr–1/2Ni–1/5Mo	1 3/4Cr–1/2Mo–Cu
3/4Cr–3/4Ni–Cu–Al	1 3/4Cr–1/2Mo–Ti
1Cr–1Mn–1/4Mo	2Cr–1/2Mo
1Cr–1/5Mo	

The following manganese steels:

Mn–1/2Mo	Mn–1/2Mo–3/4Ni
Mn–1/2Mo–1/4Ni	Mn–1/2Ni–V
Mn–1/2Mo–1/2Ni	Mn–V

The following nickel steels:

1/2Ni–1/2Cr–1/4Mo–V	3/4Ni–1Mo–3/4Cr
1/2Ni–1/2Mo–V	1Ni–1/2Cr–1/2Mo
3/4Ni–1/2Cr–1/2Mo–V	1 1/4Ni–1Cr–1/2Mo
3/4Ni–1/2Mo–1/3Cr–V	3 1/2Ni–1 3/4Cr–1/2Mo–V
3/4Ni–1/2Mo–Cr–V	4Ni–1 1/2Cr–1/2Mo–V

(4) Material Group D includes the following low chrome steels:

2 1/4Cr–1Mo	3Cr–1Mo–1/4V–Cb–Ca
3Cr–1Mo	3Cr–1Mo–1/4V–Ti–B

The following manganese steel:

Mn–1/4Mo

The following nickel steels:

1 3/4Ni–3/4Cr–1/4Mo	2 3/4Ni–1 1/2Cr–1/2Mo–V
2Ni–3/4Cr–1/4Mo	5Ni–1/4Mo
2Ni–3/4Cr–1/3Mo	7Ni
2Ni–1 1/2Cr–1/4Mo–V	8Ni
2Ni–1Cu	9Ni

(5) Material Group E includes:

5Cr–1/2Mo	5Cr–1/2Mo–Ti
5Cr–1/2Mo–Si	

(6) Material Group F includes:

9Cr–1Mo

(7) Material Group G includes:

12Cr	13Cr–4Ni
12Cr–1Al	15Cr
13Cr	17Cr

(8) Material Group H includes:

27Cr

(9) Material Group I includes:

17Cr–4Ni–4Cu	15Cr–5Ni–3Mo (only to 425°C)

NOTES (CONT'D):

(10) Material Group J includes:

15Cr–6Ni–Cu–Mo (only to 425°C)
17Cr–7Ni–1Al (only to 425°C)
18Cr–8Ni
18Cr–8Ni–S (or Se)
18Cr–11Ni
22Cr–2Ni–Mo–N
23Cr–4Ni–Mo–Cu

These thermal conductivity and diffusivity values are also appropriate for H, L, N, and LN grades of austenitic stainless steels.

(11) Material Group K includes:

13Cr–8Ni–2Mo (only to 425°C)
29Cr–7Ni–2Mo–N
25Ni–15Cr–2Ti
29Ni–20Cr–3Cu–2Mo
16Cr–12Ni–2Mo
18Cr–5Ni–3Mo
18Cr–10Ni–Cb
18Cr–10Ni–Ti
18Cr–13Ni–3Mo
18Cr–15Ni–4Si
19Cr–9Ni–Mo–W
21Cr–11Ni–N
22Cr–5Ni–3Mo–N
23Cr–12Ni
25Cr–6Ni–Mo–N
25Cr–7Ni–4Mo–N
25Cr–20Ni
25Cr–20Ni–2Mo
27Cr–7.5Ni–4.5Mo–Co–N
44Fe–25Ni–21Cr–Mo

These thermal conductivity and diffusivity values are also appropriate for H, L, N, and LN grades of austenitic stainless steels.

(12) Material Group L includes:

14Cr–16Ni–6Si–Cu–Mo
18Cr–18Ni–2Si
18Cr–20Ni–5.5Si
22Cr–13Ni–5Mn
23Cr–25Ni–5.5Mo–N
24Cr–22Ni–7.5Mo
24Cr–22Ni–6Mo–2W–Cu–N
25Cr–12Ni
25Cr–35Ni–N–Ce
31Ni–31Fe–29Cr–Mo

These thermal conductivity and diffusivity values are also appropriate for H, L, N, and LN grades of austenitic stainless steels.

Table TM-1
Moduli of Elasticity *E* of Ferrous Materials for Given Temperatures

Materials	Modulus of Elasticity *E* = Value Given × 10^3 MPa, for Temperature, °C, of																
	−200	−125	−75	25	100	150	200	250	300	350	400	450	500	550	600	650	700
Carbon steels with C ≤ 0.30%	216	212	209	202	198	195	192	189	185	179	171	162	151	137	...	...	...
Carbon steels with C > 0.30%	215	211	207	201	197	194	191	188	183	178	170	161	149	136	121	...	...
Ductile cast iron	...	...	169	161	155	151	147	142	138	134	...	...	...	...	...	...	...
Material Group A [Note (1)]	214	210	207	200	196	193	190	187	183	177	170	160	149	135	121	...	...
Material Group B [Note (2)]	204	200	197	191	187	184	181	178	174	171	167	163	158	153	147	141	133
Material Group C [Note (3)]	218	213	210	204	200	197	193	190	186	183	179	174	169	164	157	150	142
Material Group D [Note (4)]	225	220	217	210	206	202	199	196	192	188	184	180	175	169	162	155	146
Material Group E [Note (5)]	228	223	220	213	208	205	201	198	195	191	187	183	179	174	168	161	153
Material Group F [Note (6)]	215	212	208	201	195	192	189	186	182	178	173	166	157	145	131	...	...
Material Group G [Note (7)]	209	204	201	195	189	186	183	179	176	172	169	165	160	156	151	146	140
Material Group H [Note (8)]	...	...	209	200	194	190	186	183	180	177	174	172	...	...	...	...	...
Material Group I [Note (9)]	192	187	184	178	173	170	167	163	160	157	154	151	148	145	142	139	135
Material Group J [Note (10)]	214	209	205	197	191	187	184	180	176	172	168	164	161	157	...	...	...
S13800 [Note (11)]	217	213	209	202	197	194	190	186	183	179	175	171	...	...	...	...	...
S15500 [Note (12)]	210	206	203	196	191	188	184	181	177	173	169	166	...	...	...	...	...
S45000 [Note (13)]	218	213	210	203	198	194	191	187	183	179	175	171	...	...	...	...	...
S17400 [Note (14)]	210	206	203	196	191	188	184	181	177	173	169	166	...	...	...	...	...
S17700 [Note (15)]	218	213	210	203	198	194	191	187	183	179	175	171	...	...	...	...	...
S66286 [Note (16)]	214	211	208	201	196	192	189	185	181	178	174	169	...	...	...	...	...

NOTES:

(1) Material Group A consists of the following carbon–molybdenum and manganese steels:

C–¼Mo
C–½Mo
Mn–¼Mo
Mn–½Mo
Mn–½Mo–¼Ni
Mn–½Mo–½Ni
Mn–½Ni–V
Mn–V

(2) Material Group B consists of the following Ni steels:

¾Cr–½Ni–Cu
¾Cr–¾Ni–Cu–Al
½Ni–½Cr–¼Mo–V
½Ni–½Mo–V
¾Ni–½Cr–½Mo–V
¾Ni–½Cu–Mo
¾Ni–½Mo–⅓Cr–V
¾Ni–½Mo–Cr–V
¾Ni–1Mo–¾Cr
1Ni–½Cr–½Mo
1¼Ni–1Cr–½Mo
1¾Ni–¾Cr–¼Mo
2Ni–1½Cr–¼Mo–V
2Ni–1Cu

Table TM-1
Moduli of Elasticity *E* of Ferrous Materials for Given Temperatures (Cont'd)

NOTES (CONT'D):

$2\frac{1}{2}$Ni
$2\frac{3}{4}$Ni–$1\frac{1}{2}$Cr–$\frac{1}{2}$Mo–V
$3\frac{1}{2}$Ni
$3\frac{1}{2}$Ni–$1\frac{3}{4}$Cr–$\frac{1}{2}$Mo–V
4Ni–$1\frac{1}{2}$Cr–$\frac{1}{2}$Mo–V
7Ni

(3) Material Group C consists of the following $\frac{1}{2}$–2Cr steels:
$\frac{1}{2}$Cr–$\frac{1}{5}$Mo–V
$\frac{1}{2}$Cr–$\frac{1}{4}$Mo–Si
$\frac{1}{2}$Cr–$\frac{1}{2}$Mo
1Cr–$\frac{1}{5}$Mo
1Cr–$\frac{1}{2}$Mo
1Cr–$\frac{1}{2}$Mo–V
$1\frac{1}{4}$Cr–$\frac{1}{2}$Mo
$1\frac{1}{4}$Cr–$\frac{1}{2}$Mo–Si
$1\frac{3}{4}$Cr–$\frac{1}{2}$Mo–Ti
2Cr–$\frac{1}{2}$Mo

(4) Material Group D consists of the following $2\frac{1}{4}$–3Cr steels:
$2\frac{1}{4}$Cr–1Mo
3Cr–1Mo
3Cr–1Mo–$\frac{1}{4}$V–Cb–Ca
3Cr–1Mo–$\frac{1}{4}$V–Ti–B

(5) Material Group E consists of the following 5–9Cr steels:
5Cr–$\frac{1}{2}$Mo
5Cr–$\frac{1}{2}$Mo–Si
5Cr–$\frac{1}{2}$Mo–Ti
7Cr–$\frac{1}{2}$Mo
9Cr–Mo, including variations thereof

(6) Material Group F consists of the following chromium steels:
11Cr–Ti
12Cr–Al
13Cr
13Cr–4Ni
15Cr
17Cr

(7) Material Group G consists of the following austenitic steels:
16Cr–12Ni–2Mo
16Cr–12Ni–2Mo–N
18Cr–3Ni–13Mn
18Cr–8Ni
18Cr–8Ni–N
18Cr–8Ni–S
18Cr–8Ni–Se
18Cr–10Ni–Cb
18Cr–10Ni–Ti
18Cr–13Ni–3Mo
18Cr–18Ni–2Si
21Cr–6Ni–9Mn
22Cr–13Ni–5Mn
23Cr–12Ni
25Cr–20Ni

(8) Material Group H consists of the following duplex (austenitic–ferritic) stainless steels:
18Cr–5Ni–3Mo
22Cr–2Ni–Mo–N
22Cr–5Ni–3Mo–N
23Cr–4Ni–Mo–Cu–N
24Cr–10Ni–4Mo–N
25Cr–5Ni–3Mo–2Cu
25Cr–6Ni–Mo–N
25Cr–6.5Ni–3Mo–N
25Cr–7Ni–3Mo–W–Cu–N
25Cr–7Ni–4Mo–N
25Cr–7.5Ni–3.5Mo–N–Cu–W
27Cr–7.5Ni–4.5Mo–Co–N
29Cr–6.5Ni–2Mo–N

Table TM-1
Moduli of Elasticity *E* of Ferrous Materials for Given Temperatures (Cont'd)

NOTES (CONT'D):

(9) Material Group I consists of the following high-silicon austenitic steels:

14Cr–16Ni–6Si–Cu–Mo	18Cr–8Ni–4Si–N
17.5Cr–17.5Ni–5.3Si	18Cr–20Ni–5.5Si

(10) Material Group J consists of the following high-molybdenum austenitic stainless steels:

27Ni–22Cr–7Mo–Cu–N	25Ni–47Fe–21Cr–5Mo
20Cr–18Ni–6Mo	25Ni–47Fe–23Cr–5.5Mo–N
24Cr–22Ni–6Mo–2W–Cu–N	44Fe–25Ni–21Cr–Mo
31Ni–31Fe–29Cr–Mo	25Ni–20Cr–6Mo–Cu–N
46Fe–24Ni–21Cr–6Mo–N	

(11) Also known as 13Cr–8Ni–2Mo, XM-13, or PH13-8Mo.
(12) Also known as 15Cr–5Ni–3Mo, XM-12, or 15-5PH.
(13) Also known as 15Cr–6Ni–Cu–Mo, Custom 450, or XM-25. Modulus values are for material aged at 480°C.
(14) Also known as 17Cr–4Ni–4Cu, Grade 630, or 17-4PH.
(15) Also known as 17Cr–7Ni–1Al, Grade 631, or 17-7PH.
(16) Also known as 25Ni–15Cr–2Ti, Grade 660, or A-286 stainless steel.

Table TM-2
Moduli of Elasticity *E* of Aluminum and Aluminum Alloys for Given Temperatures

	Modulus of Elasticity E = Value Given × 10^3 MPa, for Temperature, °C, of						
Material	**−200**	**−125**	**−75**	**25**	**100**	**150**	**200**
A03560	79	76	75	71	68	65	62
A95083	79	76	75	71	68	65	62
A95086	79	76	75	71	68	65	62
A95456	79	76	75	71	68	65	62
A24430	77	74	72	69	66	63	60
A91060	77	74	72	69	66	63	60
A91100	77	74	72	69	66	63	60
A93003	77	74	72	69	66	63	60
A93004	77	74	72	69	66	63	60
A96061	77	74	72	69	66	63	60
A96063	77	74	72	69	66	63	60
A92014	81	78	77	73	70	67	64
A92024	81	78	77	73	70	67	64
A95052	78	76	74	70	67	65	62
A95154	78	76	74	70	67	65	62
A95254	78	76	74	70	67	65	62
A95454	78	76	74	70	67	65	62
A95652	78	76	74	70	67	65	62

(23)

Table TM-3
Moduli of Elasticity *E* of Copper and Copper Alloys for Given Temperatures

	Modulus of Elasticity E = Value Given × 10^3 MPa, for Temperature, °C, of						
Material	**−200**	**−125**	**−75**	**25**	**100**	**150**	**200**
C93700	80	79	78	76	74	73	71
C83600	102	101	99	96	94	93	91
C92200	102	101	99	96	94	93	91
C28000	110	108	106	103	101	99	97
C36500	110	108	106	103	101	99	97
C37700	110	108	106	103	101	99	97
C46400	110	108	106	103	101	99	97
C46500	110	108	106	103	101	99	97
C62300	110	108	106	103	101	99	97
C65500	110	108	106	103	101	99	97
C66100	110	108	106	103	101	99	97
C95200	110	108	106	103	101	99	97
C95400	110	108	106	103	101	99	97
C95800	110	108	106	103	101	99	97
C95820	110	108	106	103	101	99	97
C44300	116	115	113	110	108	106	104
C44400	116	115	113	110	108	106	104
C44500	116	115	113	110	108	106	104
C64200	116	115	113	110	108	106	104
C68700	116	115	113	110	108	106	104
C10200	124	122	121	117	114	112	110
C10400	124	122	121	117	114	112	110
C10500	124	122	121	117	114	112	110
C10700	124	122	121	117	114	112	110
C11000	124	122	121	117	114	112	110
C12000	124	122	121	117	114	112	110
C12200	124	122	121	117	114	112	110
C12300	124	122	121	117	114	112	110
C12500	124	122	121	117	114	112	110
C14200	124	122	121	117	114	112	110
C23000	124	122	121	117	114	112	110
C61000	124	122	121	117	114	112	110
C61400	124	122	121	117	114	112	110
C65100	124	122	121	117	114	112	110
C70400	124	122	121	117	114	112	110
C19200	128	126	124	121	118	116	114
C19400	128	126	124	121	118	116	114
C60800	128	126	124	121	118	116	114
C63000	128	126	124	121	118	116	114
C70600	131	129	127	124	121	119	117
C70620	131	129	127	124	121	119	117
C96200	131	129	127	124	121	119	117
C97600	139	137	135	131	128	126	123
C72200	139	137	135	131	128	126	124
C71000	146	144	142	138	134	132	130
C71500	161	158	156	152	148	145	143
C71520	161	158	156	152	148	145	143

Table TM-4
Moduli of Elasticity *E* of High Nickel Alloys for Given Temperatures

Material	Modulus of Elasticity E = Value Given × 10^3 MPa, for Temperature, °C, of																			
	−200	−125	−75	25	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850
N02200	222	216	213	207	202	199	197	194	191	189	186	183	180	176	172	169	164	160	...	...
N02201	222	216	213	207	202	199	197	194	191	189	186	183	180	176	172	169	164	160	...	...
N04400	192	188	185	179	175	173	171	168	166	163	161	158	155	152	149	146	142	139	...	...
N04405	192	188	185	179	175	173	171	168	166	163	161	158	155	152	149	146	142	139	...	...
N06002	211	206	202	196	192	189	187	184	182	179	176	173	170	167	163	160	156	152	...	...
N06007	205	200	197	191	187	185	182	180	177	175	172	169	166	163	160	156	152	148	...	...
N06022	221	216	212	206	201	199	196	193	191	188	185	182	179	175	172	168	164	160	155	151
N06030	217	212	208	202	197	195	192	189	187	184	181	178	175	172	168	165	161	156	152	148
N06045	207	202	199	193	189	186	184	181	179	176	173	170	167	164	161	157	153	150	...	...
N06059	225	220	216	210	205	203	200	197	194	192	189	185	182	178	175	171	167	162	158	154
N06230	226	221	217	211	206	203	200	198	195	192	189	186	183	179	176	172	168	163	159	154
N06455	220	215	212	205	201	198	195	193	190	187	184	181	178	175	171	167	163	159	...	...
N06600	229	224	220	213	209	206	203	201	198	195	192	189	186	182	178	174	170	165	...	...
N06617	...	...	...	201	196	193	191	189	187	184	181	178	174	171	167	164	160	156	152	146
N06625	222	216	213	207	202	199	197	194	191	189	186	183	180	176	172	169	164	160	...	...
N06686	225	220	216	210	205	203	200	197	194	192	189	185	182	178	175	171	167	162	158	154
N06690	225	219	215	208	204	201	199	196	193	191	188	185	181	178	174	170	166	162	...	...
N07718	214	210	206	199	195	192	190	188	185	183	180	176	173	169	...	...	...	...	...	...
N07750	229	224	220	213	208	206	203	201	198	195	192	189	185	181	178	...	...	...	...	...
N08020	207	202	199	193	189	186	184	181	179	176	173	170	167	164	161	157	153	150	...	...
N08031	212	207	204	198	193	191	188	185	183	180	178	175	172	168	165	161	157	153	149	145
N08330	207	202	199	193	189	186	184	181	179	176	173	170	167	164	161	157	153	150	...	...
N08354	207	204	202	198	194	191	189	186	183	180	177	174	...	...	...	...	...	...	...	...
N08800	211	206	202	196	192	189	187	184	182	179	176	173	170	167	164	160	156	152	...	...
N08801	211	206	202	196	192	189	187	184	182	179	176	173	170	167	164	160	156	152	...	...
N08810	211	206	202	196	192	189	187	184	182	179	176	173	170	167	164	160	156	152	...	...
N08825	207	202	199	193	189	186	184	181	179	176	173	170	167	164	161	157	153	150	...	...
N10001	230	224	221	214	209	206	204	201	198	196	193	189	186	182	178	174	170	166	...	...
N10003	234	229	225	218	213	210	207	205	202	199	196	193	190	186	182	178	173	169	...	...
N10242	245	240	236	229	224	221	217	214	211	208	205	202	198	195	191	186	182	177	172	167
N10276	220	215	212	205	201	198	195	193	190	187	184	181	178	175	171	167	163	159	...	...
N10629	232	227	223	216	211	208	206	203	200	197	194	191	188	184	180	176	172	168	...	...
N10665	232	227	223	216	211	208	206	203	200	197	194	191	188	184	180	176	172	168	...	...
N10675	232	227	223	216	211	208	206	203	200	197	194	191	188	184	180	176	172	168	...	...
N12160	226	221	217	211	206	203	200	198	195	192	189	186	183	179	176	172	168	163	159	154
R20033	210	204	201	195	191	188	186	183	181	178	175	172	169	166	162	159	155	151	147	142

Table TM-5
Moduli of Elasticity *E* of Titanium and Zirconium for Given Temperatures

Material Grade/UNS No.	Modulus of Elasticity E = Value Given × 10^3 MPa, for Temperature, °C, of							
	25	100	150	200	250	300	350	400
Titanium Alloys								
1 (R50250)	107	103	101	97	93	88	84	80
2, 2H (R50400)	107	103	101	97	93	88	84	80
3 (R50550)	107	103	101	97	93	88	84	80
7, 7H (R52400)	107	103	101	97	93	88	84	80
9 (R56320)	110	105	101	96	92	87	...	...
11 (R52250)	107	103	101	97	93	88	84	80
12 (R53400)	107	103	101	97	93	88	84	80
16, 16H (R52402)	107	103	101	97	93	88	84	80
17 (R52252)	107	103	101	97	93	88	84	80
26, 26H (R52404)	107	103	101	97	93	88	84	80
27 (R52254)	107	103	101	97	93	88	84	80
28 (R56323)	110	105	101	96	92	87	...	...
38 (R54250)	105	101	95	89	85	82	79	76
Zirconium Alloys								
702 (R60702)	99	92	87	81	76	71	66	60
705 (R60705)	94	90	87	84	82	79	76	73

GENERAL NOTE: These elastic modulus values are for the longitudinal direction of wrought plate. This represents a practical minimum for design. The modulus in other orientations will be higher. See Nonmandatory Appendix A, A-804.

Table PRD
Poisson's Ratio and Density of Materials

Material	Poisson's Ratio	Density, kg/m^3	Material	Poisson's Ratio	Density, kg/m^3
Ferrous Materials			**Nonferrous Materials**		
Carbon steels	0.30	7 750	**Aluminum Base**		
Cast irons	0.29	7 200	Alclad 3003	0.33	2 730
Low alloy steels			Alclad 3004	0.33	2 720
C–Mo steels	0.30	7 750	Alclad 6061	0.33	2 700
$\frac{1}{2}$Cr to 1$\frac{1}{4}$Cr steels	0.30	7 750	A02040	0.33	2 800
1$\frac{3}{4}$Cr to 3Cr steels	0.30	7 750	A03560	0.33	2 680
5Cr to 9Cr steels	0.30	7 750	A24430	0.33	2 700
Mn, Mn–Mo, and Si steels	0.30	7 750	A91060	0.33	2 705
Ni steels	0.30	7 750	A91100	0.33	2 710
PH stainless: S15500, S17400, S17700	0.31	7 750	A92014	0.33	2 800
			A92024	0.33	2 780
High alloy steels (200 series)	0.31	7 810	A93003	0.33	2 730
High alloy steels (300 series)	0.31	8 030	A93004	0.33	2 720
High-Si stainless: S30600, S30601, S32615, and S38815	0.31	7 600	A95052	0.33	2 680
			A95083	0.33	2 660
5–7% Mo stainless: S32050, S31254, S31266, S31277, and S32654	0.31	8 100	A95086	0.33	2 660
			A95154	0.33	2 660
S32202	0.31	7 770	A95254	0.33	2 660
High alloy steels (400 series)	0.31	7 750	A95454	0.33	2 690
High alloy steels (duplex/ austenitic–ferritic)	0.31	7 800	A95456	0.33	2 660
			A95652	0.33	2 670
PH stainless: S66286	0.31	7 920	A96061	0.33	2 700
Cast high alloy steels	0.30	7 830	A96063	0.33	2 700

Table PRD
Poisson's Ratio and Density of Materials (Cont'd)

Material	Poisson's Ratio	Density, kg/m^3
Nonferrous Materials (Cont'd)		
Chromium Base		
R20033	0.31	7 950
Cobalt Base		
R30556	0.31	8 200
R31233	0.31	8 400
Copper Base		
C10200, C10400, C10500, and C10700	0.33	8 940
C11000	0.33	8 890
C12000, C12200, C12300, and C14200	0.33	8 940
C19200	0.33	8 860
C19400	0.33	8 910
C23000	0.33	8 750
C28000	0.33	8 390
C36500	0.33	8 420
C37700	0.33	8 440
C44300, C44400, and C44500	0.33	8 520
C46400 and C46500	0.33	8 420
C60800	0.33	8 170
C61400	0.33	7 890
C63000	0.33	7 580
C64200	0.33	7 700
C65100	0.33	8 750
C65500 and C66100	0.33	8 520
C68700	0.33	8 330
C70400, C70600, C70620, C71000, C71500, C71520, and C72200	0.33	8 940
C83600	0.33	8 800
C99200	0.33	8 640
C93700	0.33	8 940
C95200	0.31	7 640
C95400	0.32	7 450
C95800	0.32	7 640
C95820	0.32	7 450
C97600	0.33	8 880
Nickel Base		
N02200 and N02201	0.31	8 890
N04400 and N04405	0.31	8 860
N05500	0.31	8 300
N06002	0.31	8 310
N06022	0.31	8 690
N06030	0.31	8 220
Nonferrous Materials (Cont'd)		
Nickel Base (Cont'd)		
N06045	0.31	8 000
N06059	0.31	8 600
N06200	0.31	8 500
N06230	0.31	8 970
N06455	0.31	8 640
N06600	0.31	8 410
N06601	0.31	8 050
N06617	0.31	8 360
N06625	0.31	8 440
N06686	0.31	8 730
N06690	0.31	8 110
N06975	0.31	8 170
N06985	0.31	8 310
N07718	0.31	8 220
N07750	0.31	8 250
N08020	0.31	8 050
N08024	0.31	8 110
N08026	0.31	8 140
N08028	0.31	8 000
N08031	0.31	8 110
N08330	0.31	8 030
N08354	0.31	8 130
N08367 and J94651	0.31	8 060
N08800, N08810, and N08811	0.31	8 030
N08825	0.31	8 140
N08904	0.31	8 060
N08925	0.31	8 150
N08926	0.31	8 060
N10001	0.31	9 150
N10003	0.31	8 860
N10242	0.31	9 050
N10276	0.31	8 870
N10629	0.31	9 190
N10665 and N10675	0.31	9 220
N12160	0.31	8 080
Titanium Base		
R50250, R50400, R50550, R52250, R52252, R52254, R52400, R52402, R52404, and R53400	0.32	4 510
R56320 and R56323	0.32	4 480
R54250	0.32	4 450
Zirconium Base		
R60702, R60704, and R60705	0.35	6 480

SUBPART 3
CHARTS AND TABLES FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE

Figure G
Geometric Chart for Components Under External or Compressive Loadings (for All Materials)

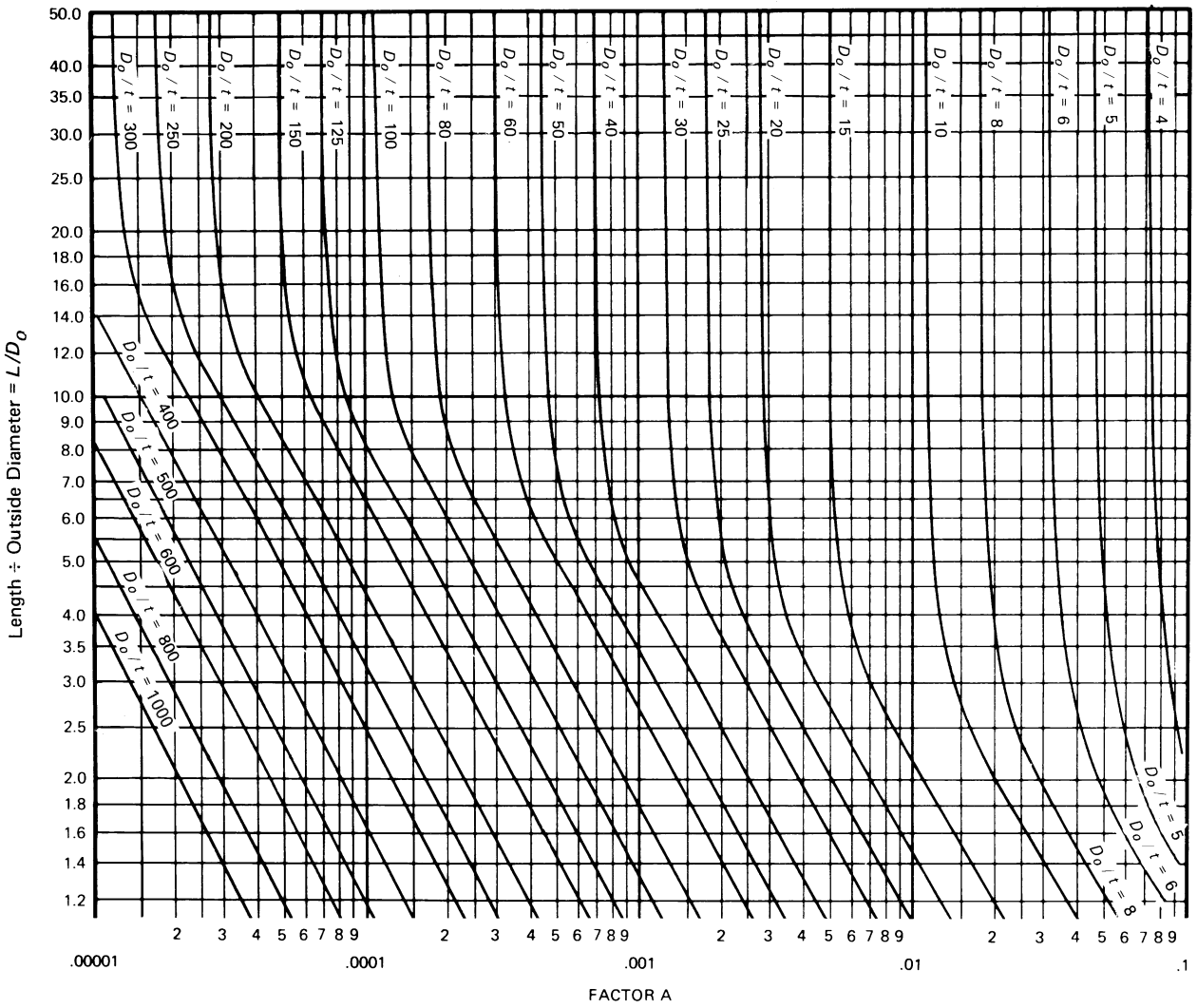
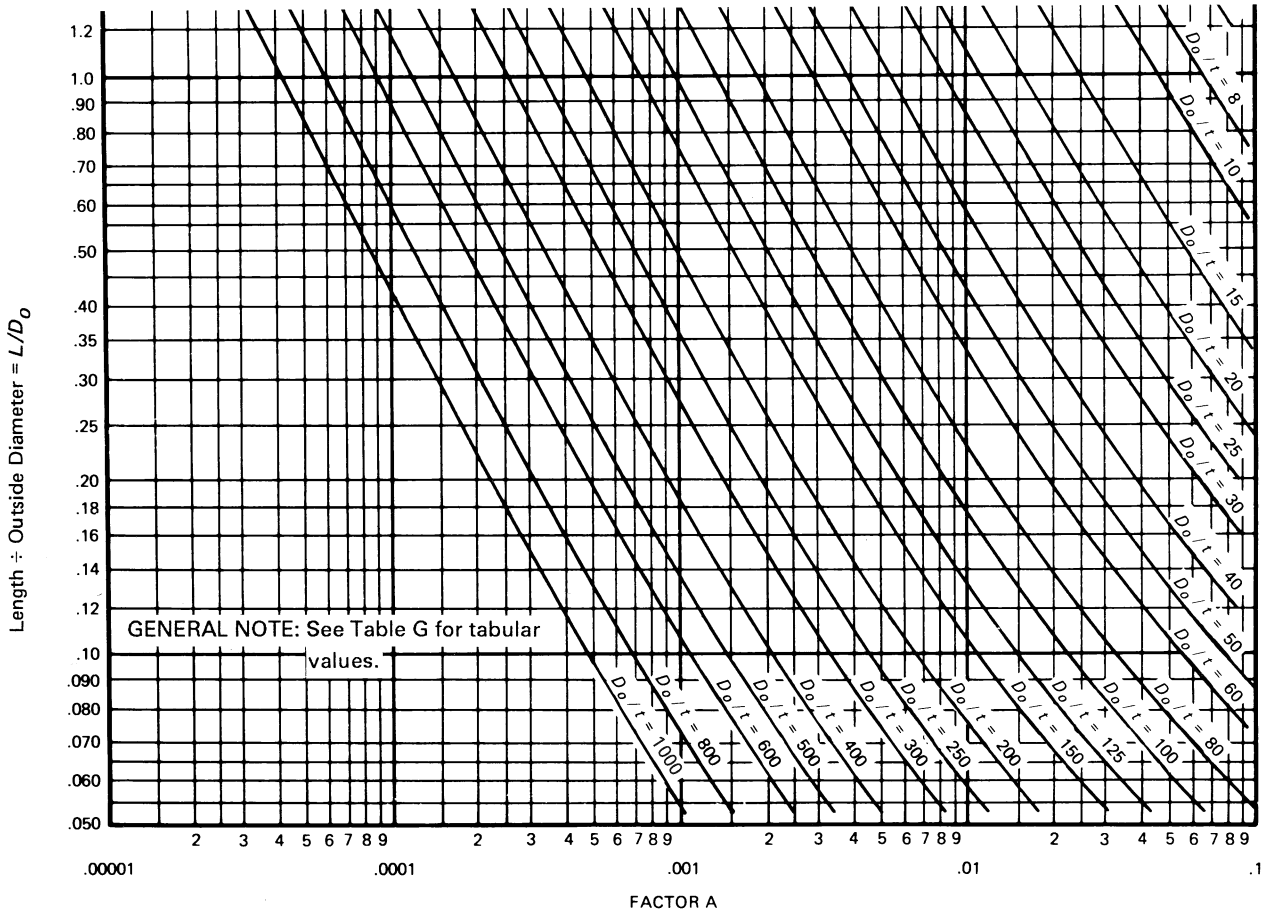
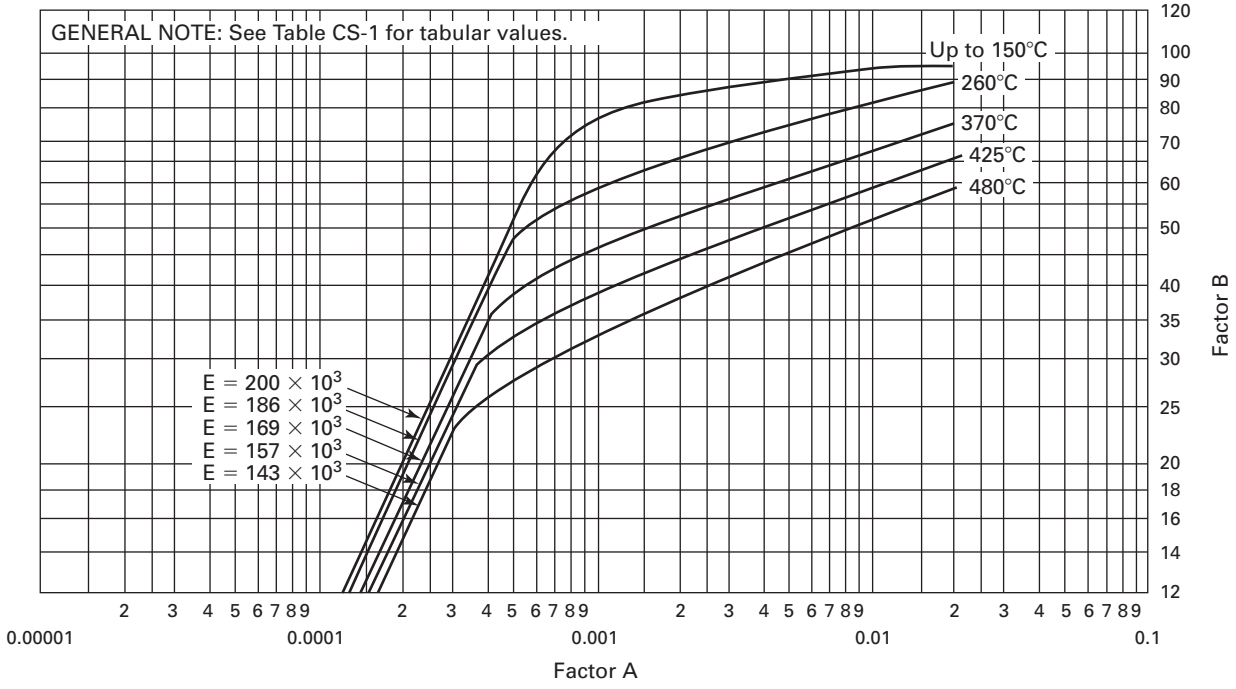


Figure G
Geometric Chart for Components Under External or Compressive Loadings (for All Materials) (Cont'd)



GENERAL NOTE: Extrapolation is not permitted except as explicitly allowed by the Construction Code.

Figure CS-1
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Carbon or Low Alloy Steels With Specified Minimum Yield Strength Less Than 207 MPa

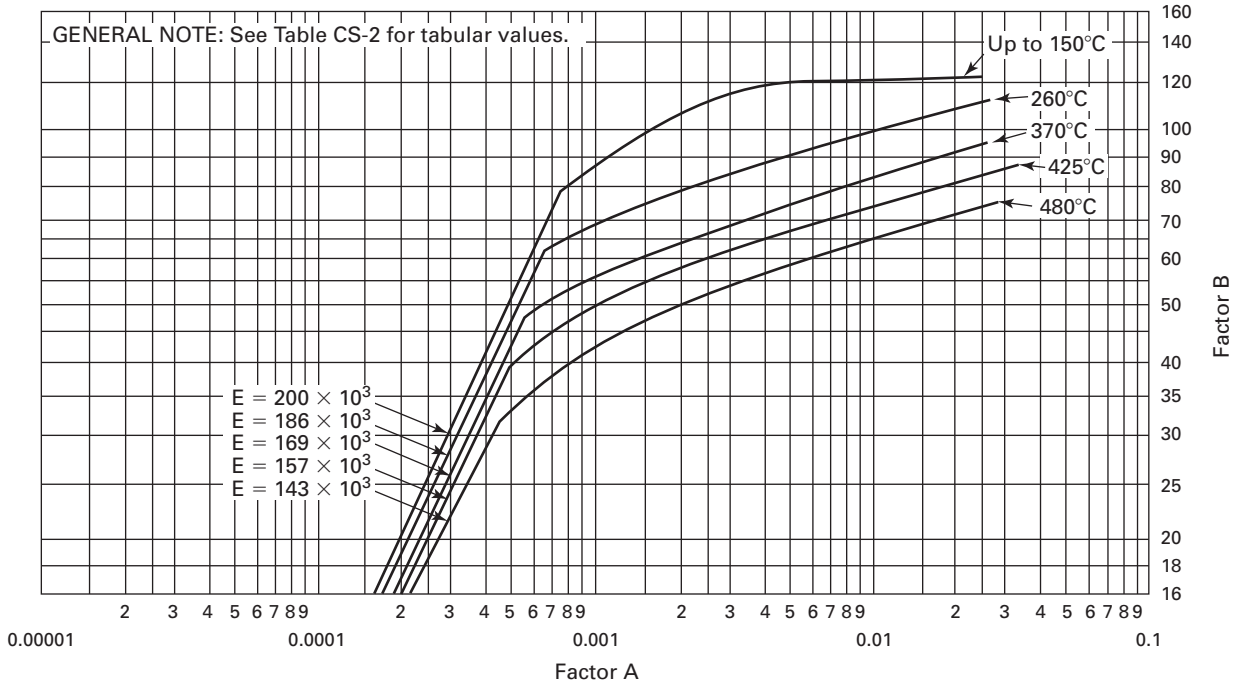


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure CS-2
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Carbon or Low Alloy Steels With Specified Minimum Yield Strength 207 MPa and Higher

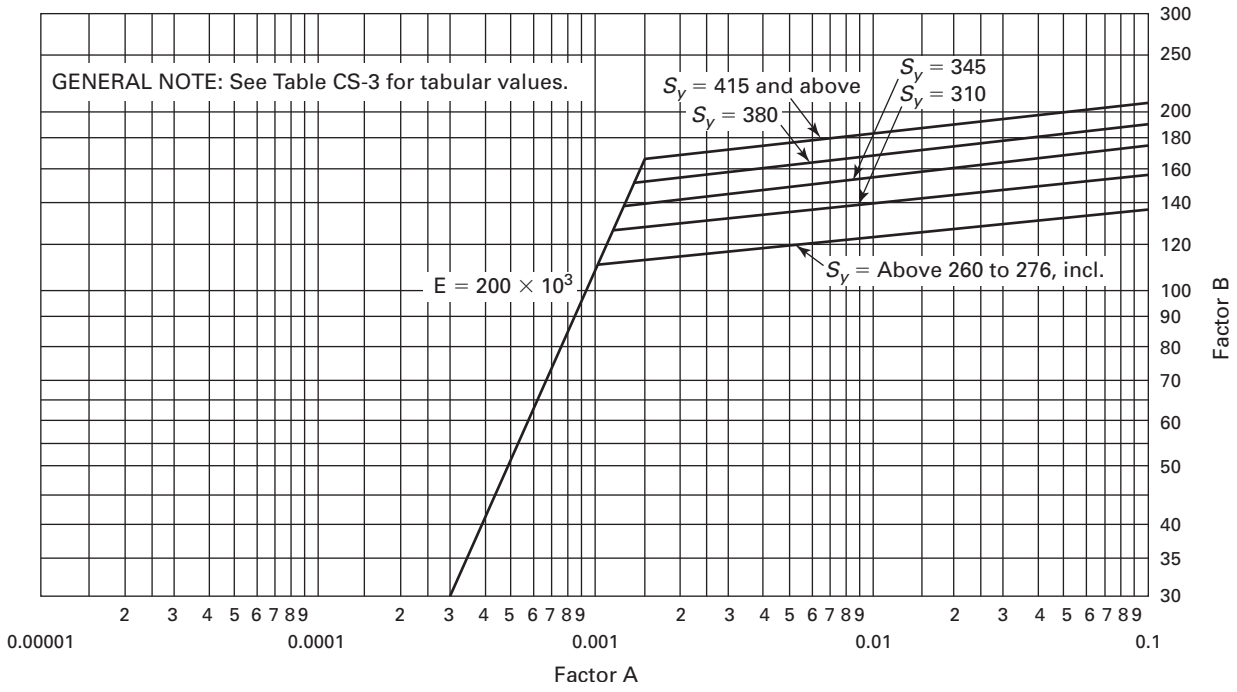


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure CS-3
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Carbon Steel and Low Alloy Steels With Specified Minimum Yield Strength 260 MPa and Higher for Temperatures 150°C and Less



GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

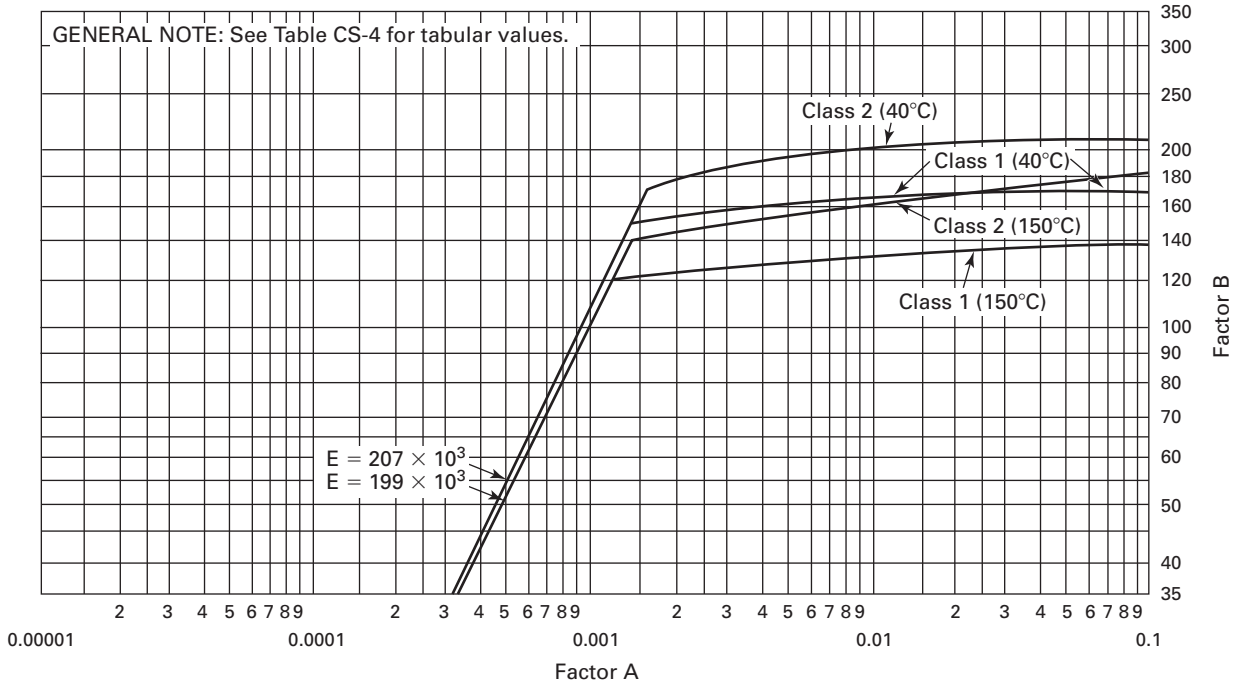
(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

(c) See Table Y-1 for values of yield strength at design temperature.

(d) When Table Y-1 yield strength values at design temperature are less than 260 MPa for the material covered by this chart, Figure CS-2 shall be used.

(e) These curves shall not be used for design temperature above 150°C. Above 150°C, use the appropriate temperature curve shown in Figure CS-2.

Figure CS-4
Chart for Determining Shell Thickness of Components Under External Pressure Developed for SA-537 Thickness 64 mm and Less

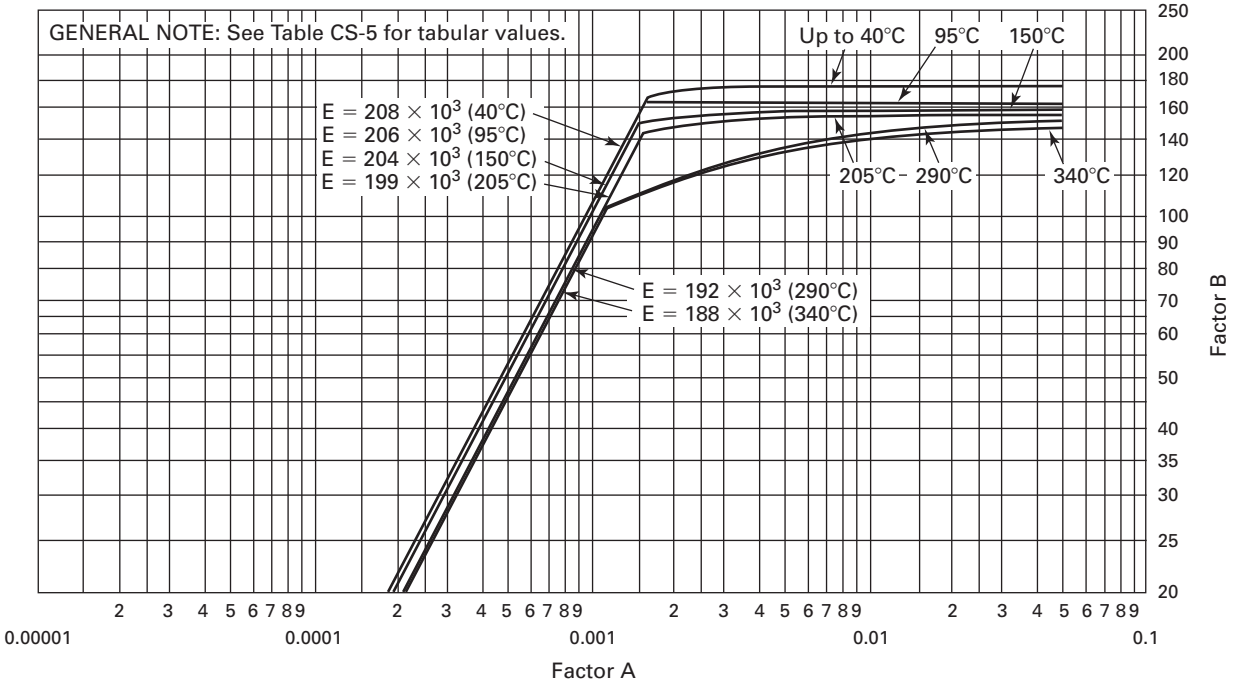


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure CS-5
Chart for Determining Shell Thickness of Components Under External Pressure Developed for SA-508 Class 1, Grades 2 and 3; SA-508 Class 2, Grade 2; SA-533 Class 1, Grades A, B, C, and D; SA-533 Class 2, Grades A, B, C, and D; or SA-541 Grades 2 and 3

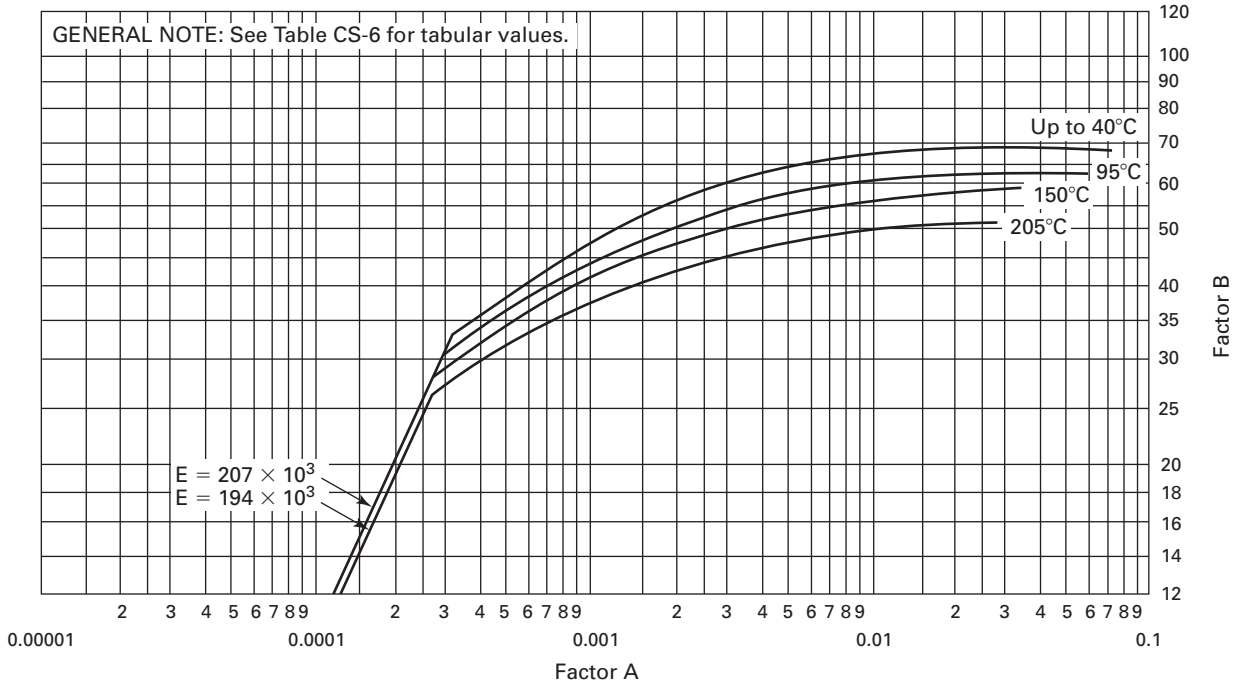


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure CS-6
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Carbon Steel With Specified Minimum Yield Strength of 138 MPa

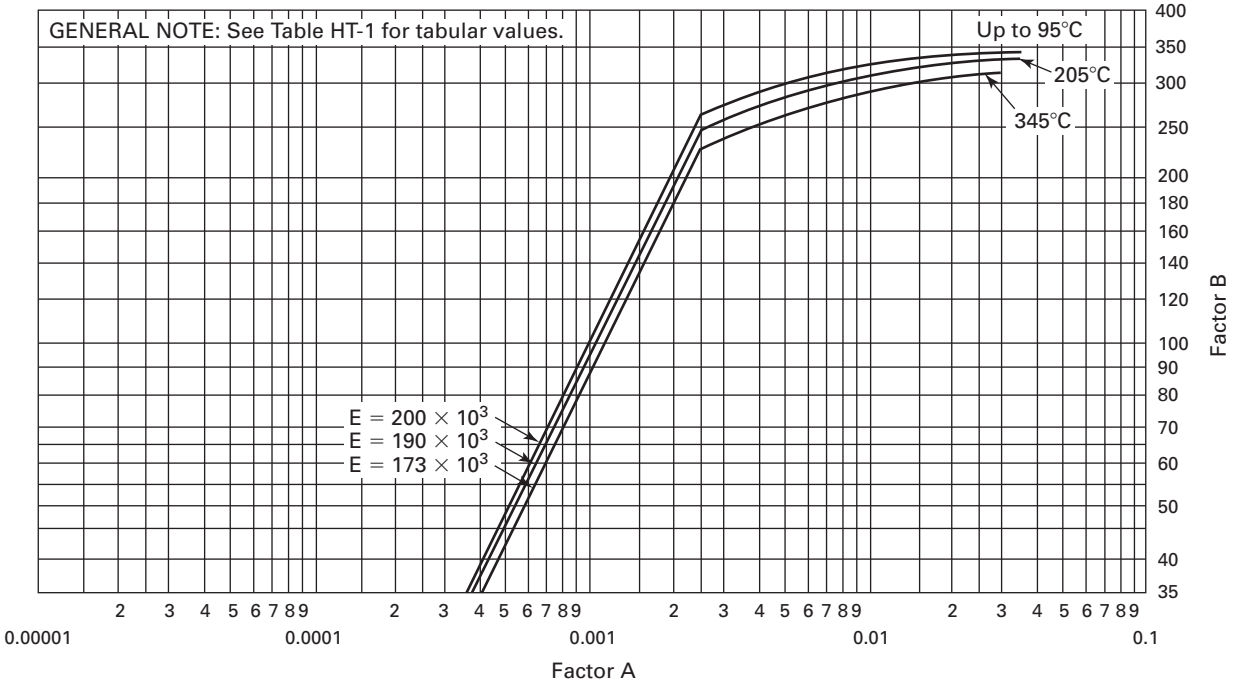


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure HT-1
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Quenched and Tempered Low Alloy Steel With Specified Minimum Yield Strength of 689 MPa and Thickness 64 mm and Less

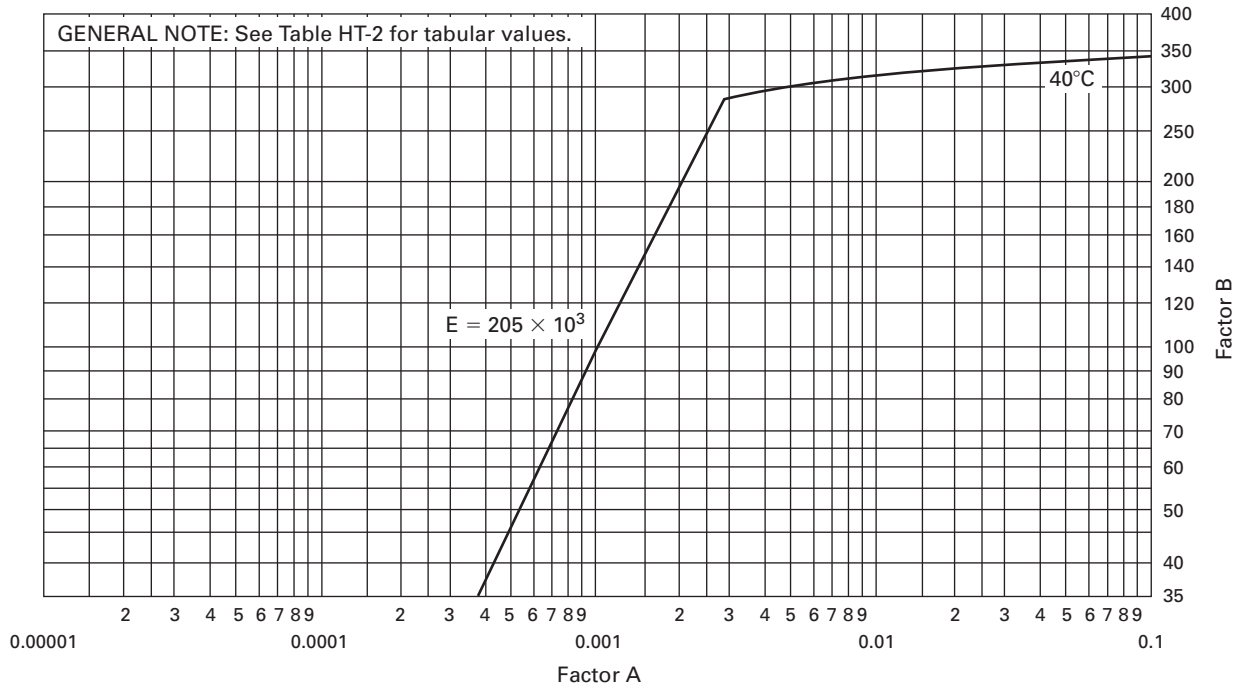


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure HT-2
Chart for Determining Shell Thickness of Components Under External Pressure Developed for SA-508 Grade 4N, Class 2 or SA-543 Types B and C, Class 2 With Specified Minimum Yield Strength of 689 MPa



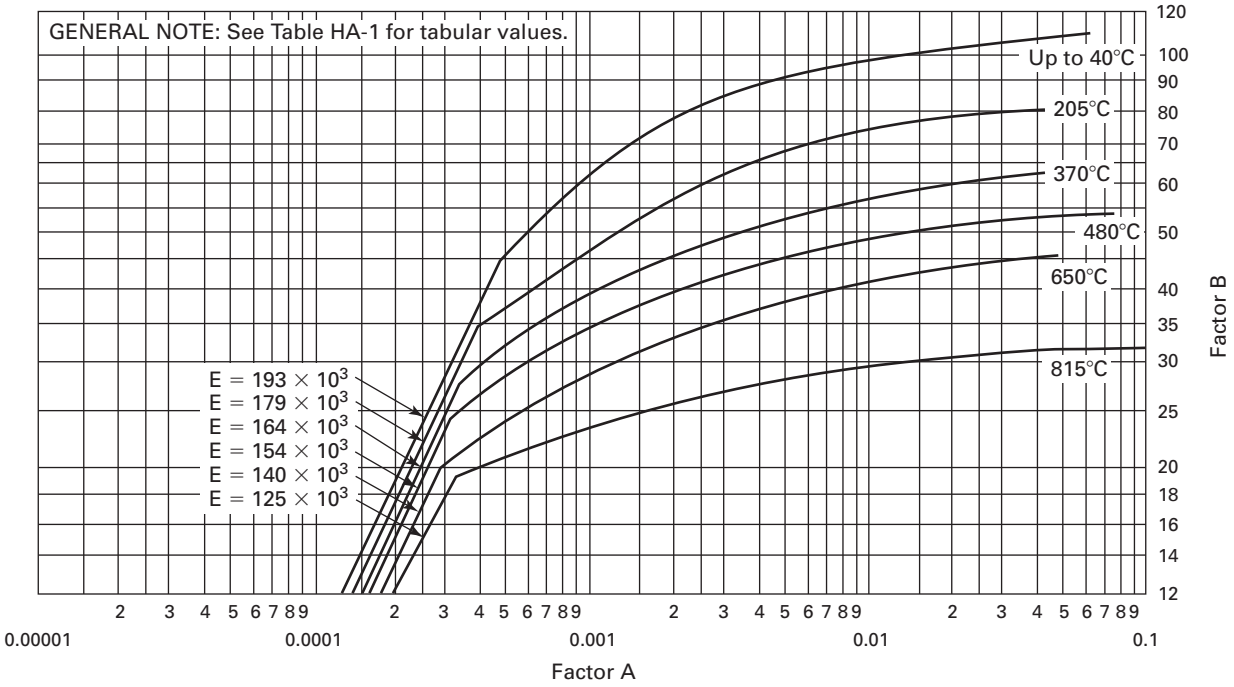
GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

(c) For temperatures over 40°C, use Figure CS-2.

Figure HA-1
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Austenitic Steel 18Cr–8Ni, Type 304

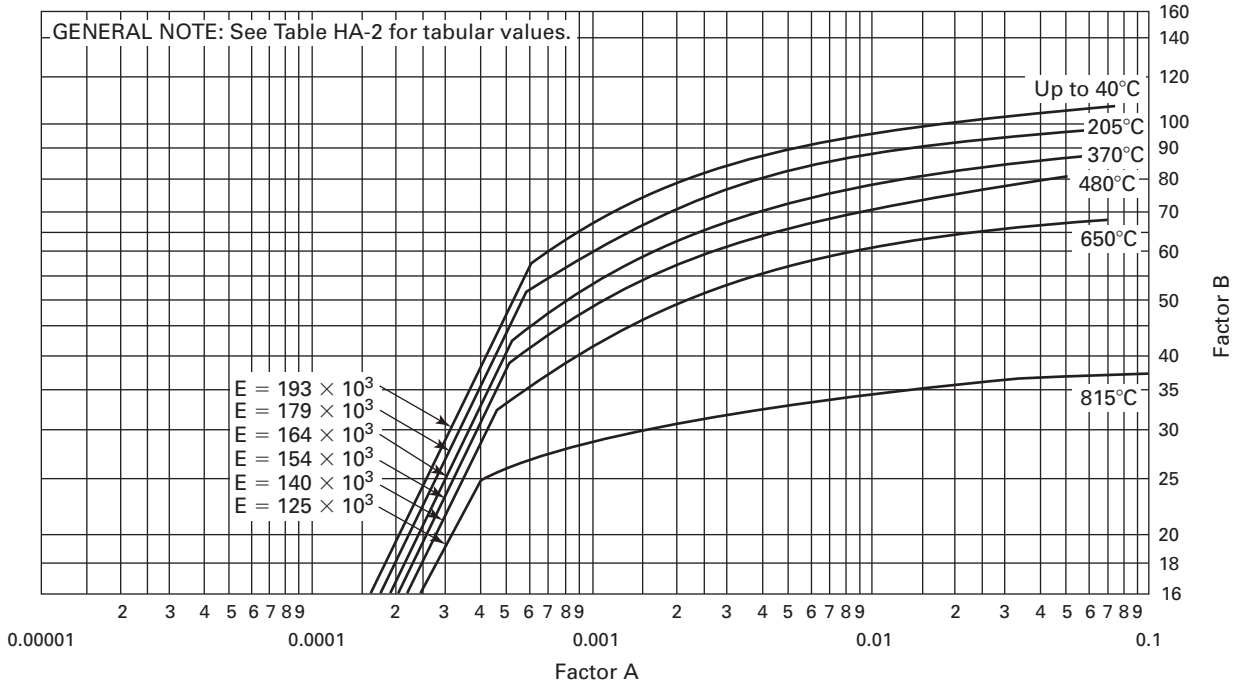


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure HA-2
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Austenitic Steel 16Cr–12Ni–2Mo, Type 316

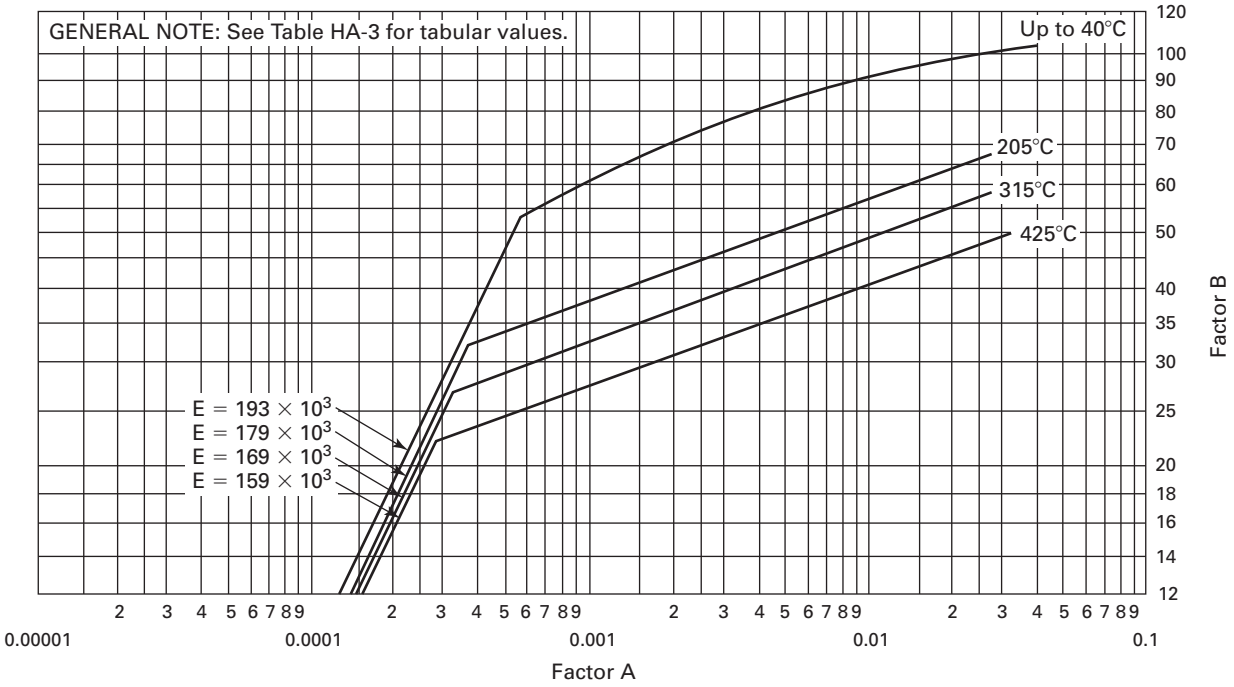


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure HA-3
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Austenitic Steel 18Cr–8Ni–0.035 Maximum Carbon, Type 304L

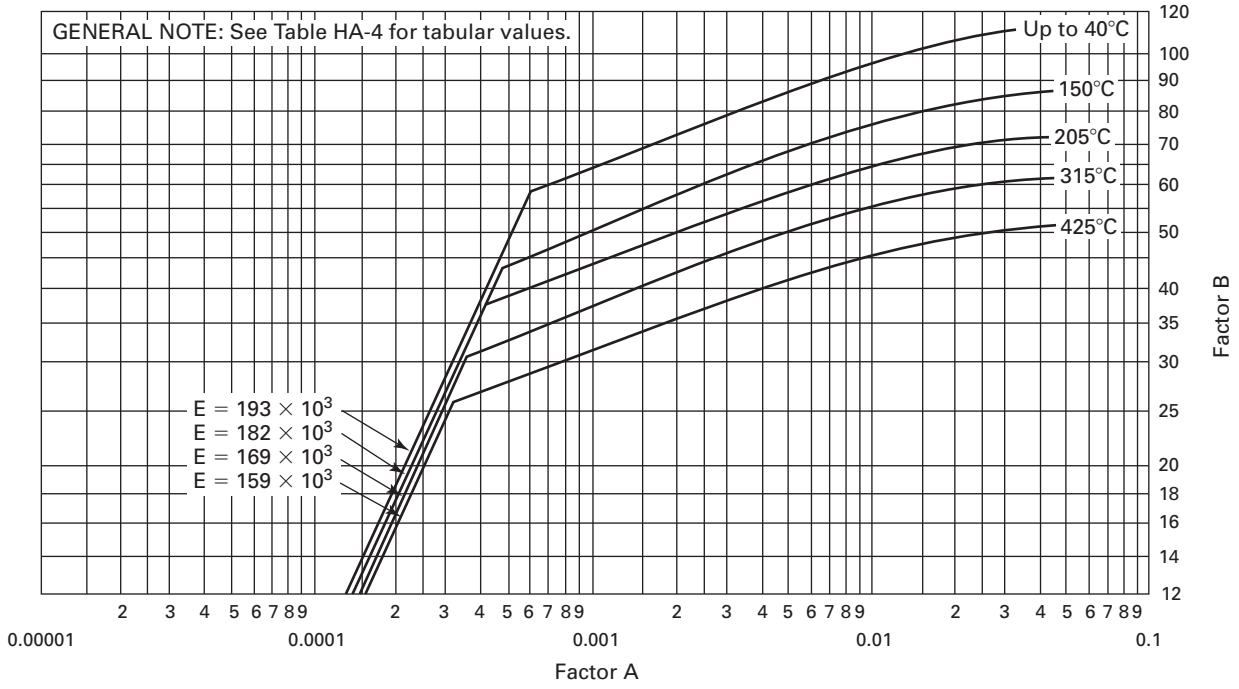


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure HA-4
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Austenitic Steel 18Cr–8Ni–Mo–0.035 Maximum Carbon, Type 316L

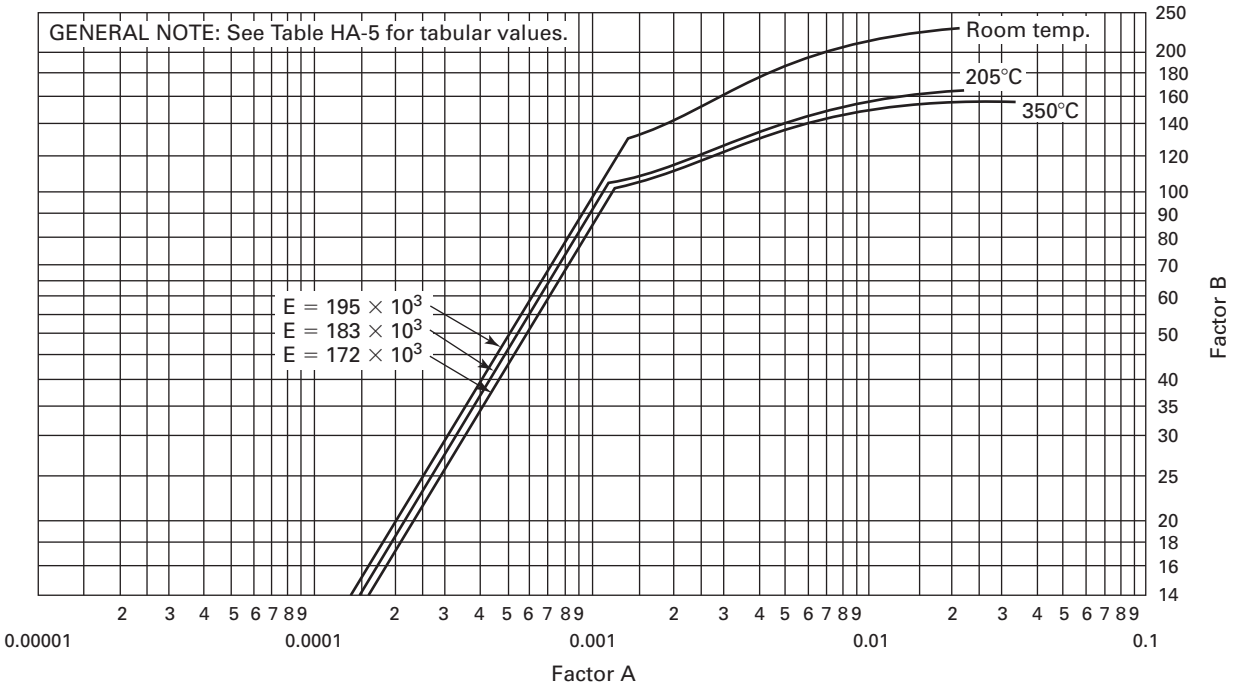


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure HA-5
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Austenitic–Ferritic Steel 18Cr–5Ni–3Mo S31500 and Austenitic–Ferritic Steel 25Cr–6Ni–Mo–N S32053

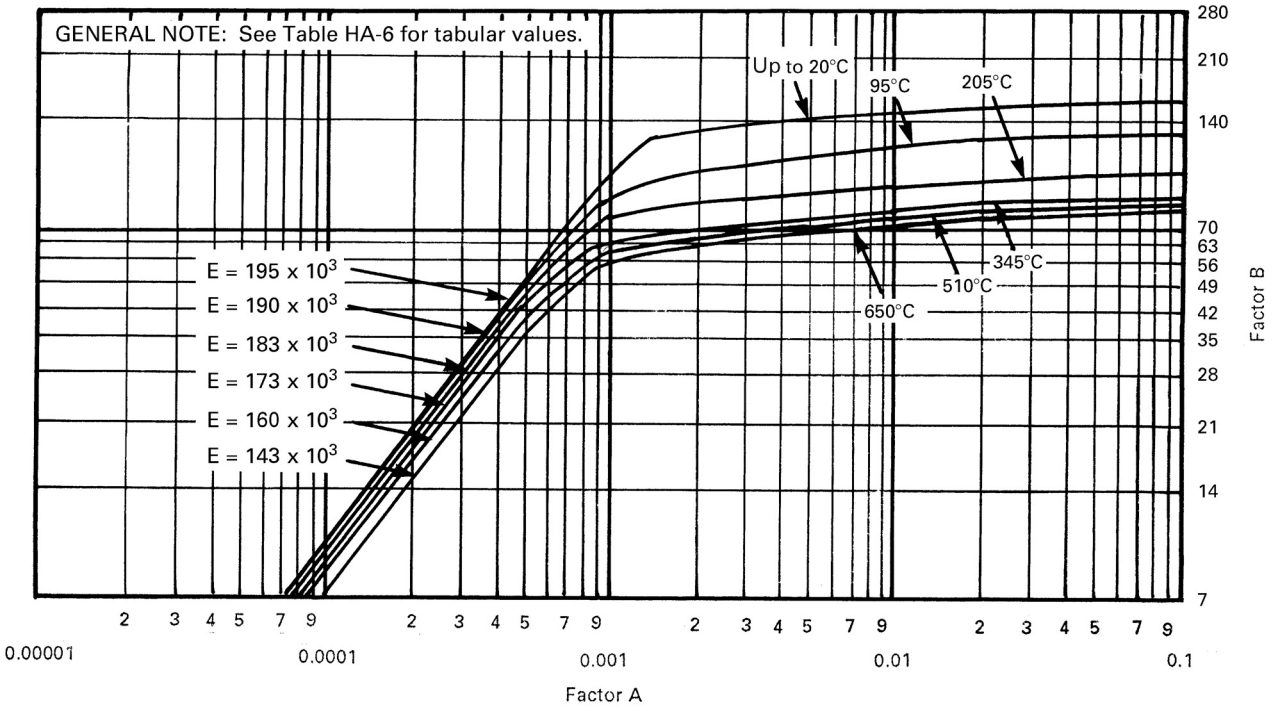


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure HA-6
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Austenitic Steel 21Cr–11Ni–N S30815



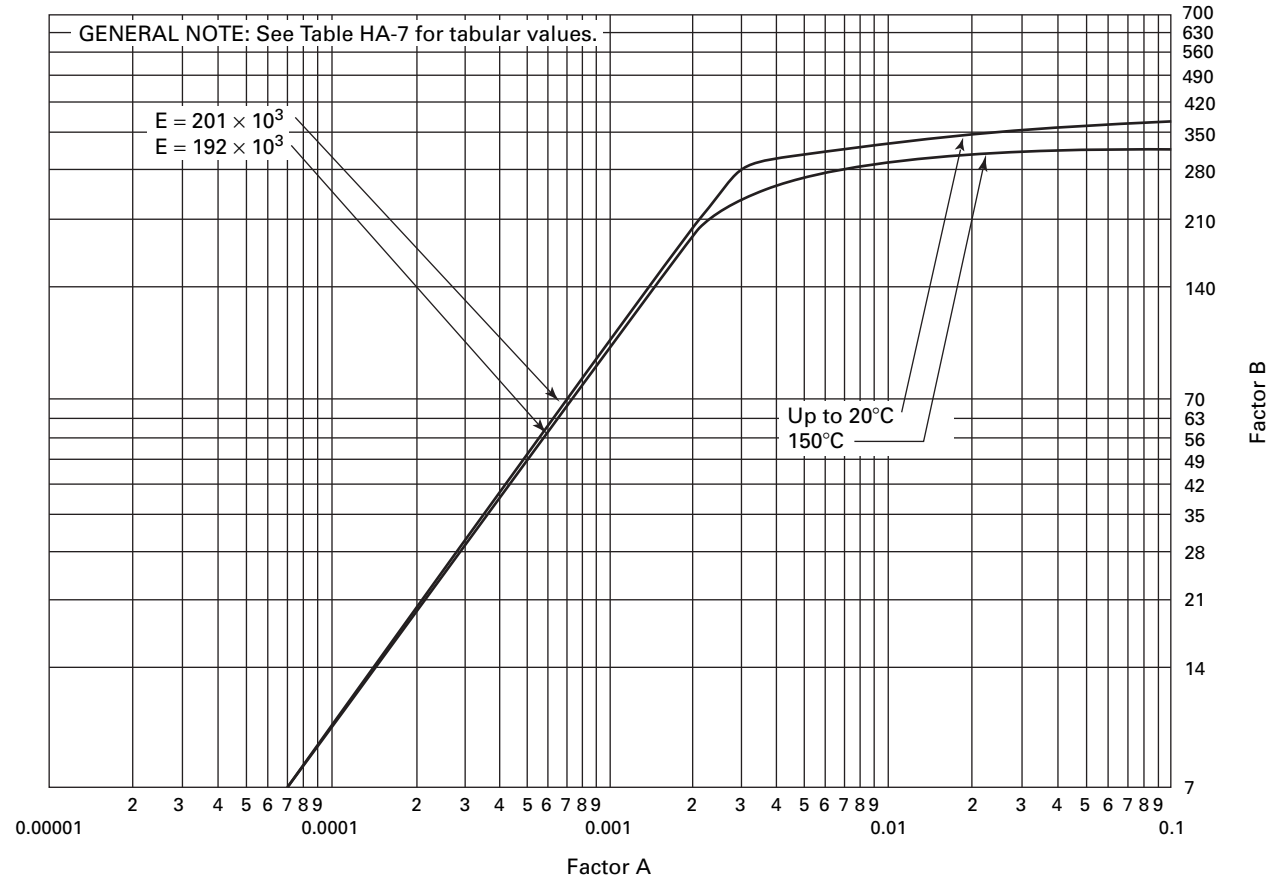
GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

(c) The external pressure chart does not account for reduction of buckling strength due to creep under long-term loads at temperatures above 540°C.

Figure HA-7
Chart for Determining Shell Thickness of Components Under External Pressure Developed for SA-564 Type 630 H1150 (17Cr–4Ni–4Cu S17400)

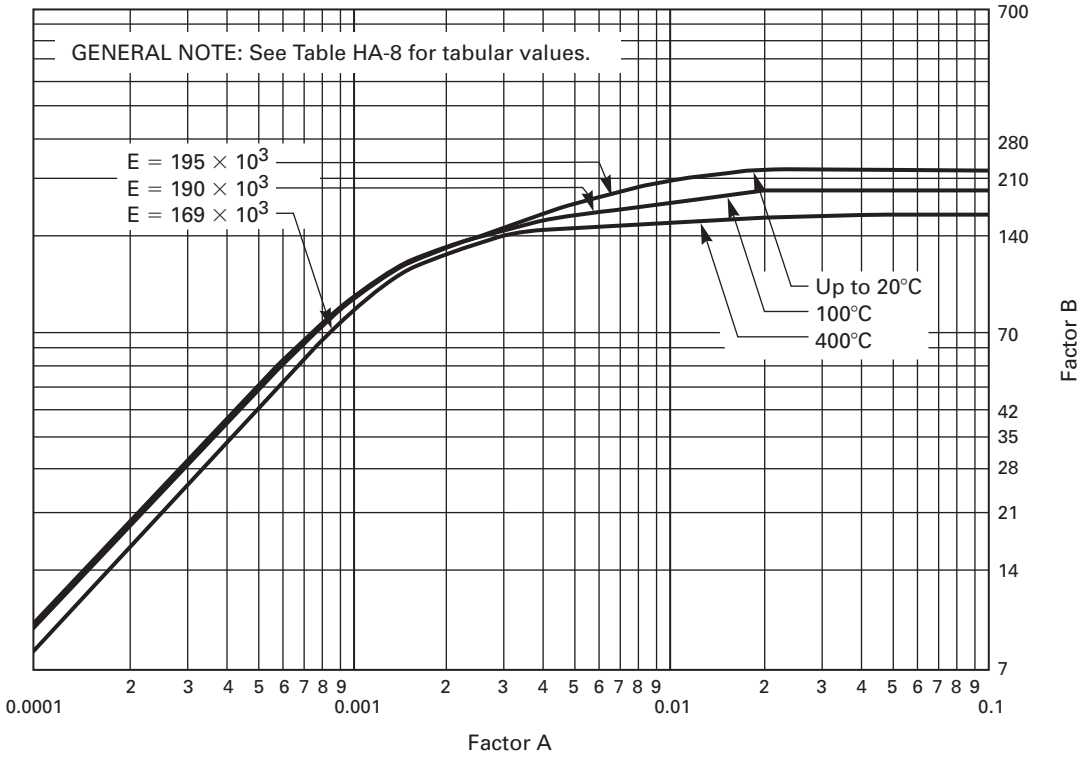


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure HA-8
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Austenitic–Ferritic Steel 25Cr–7Ni–3Mo–2W–0.28N S39274

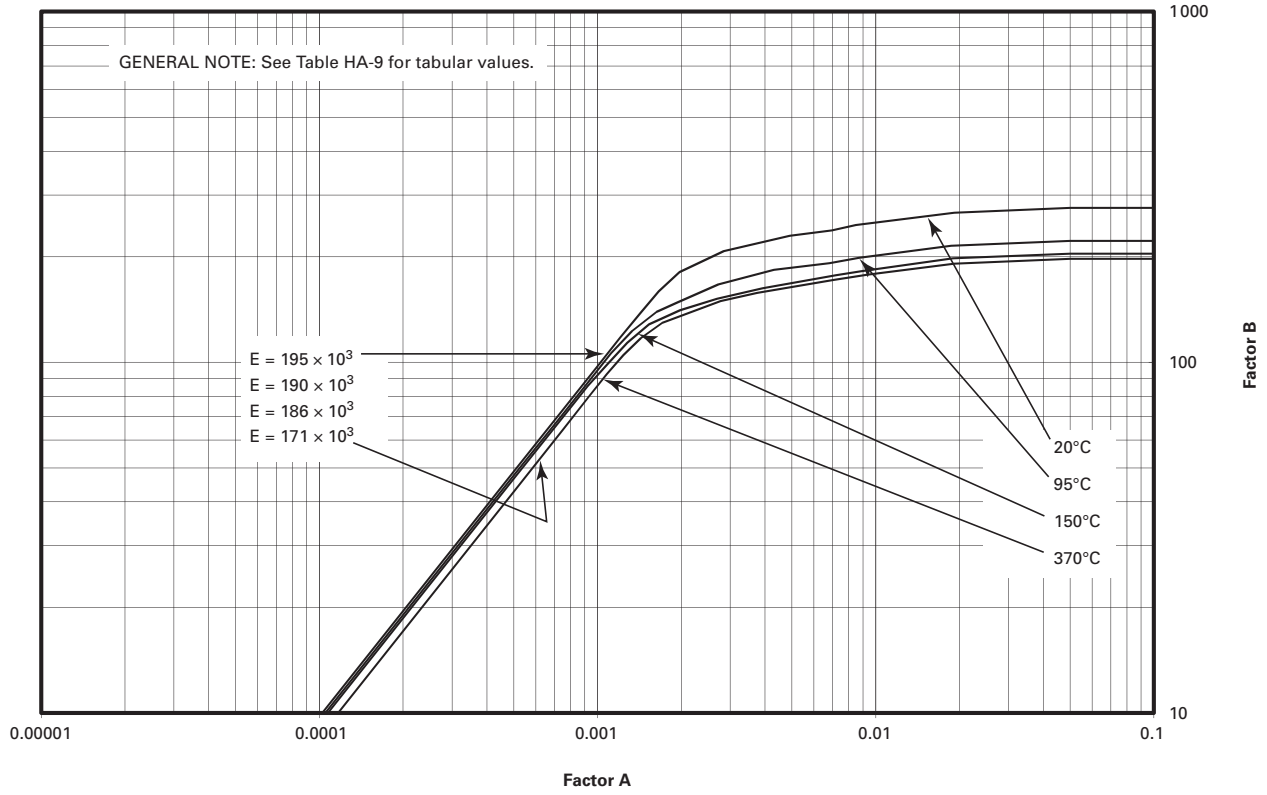


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure HA-9
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Austenitic Steel 25Cr–7.5Ni–3.5Mo–N–Cu–W S32760

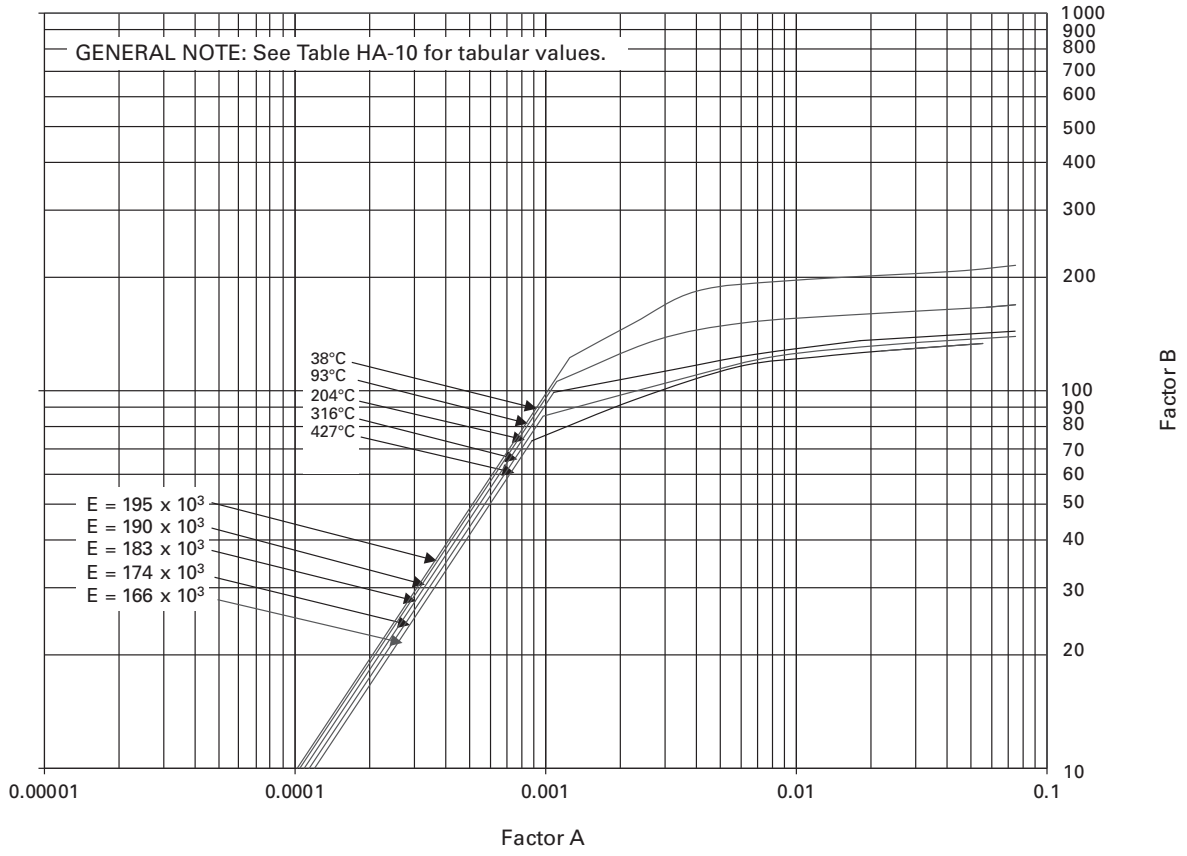


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure HA-10
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Austenitic Stainless Steel 24Cr–17Ni–6Mn–4.5Mo–N S34565

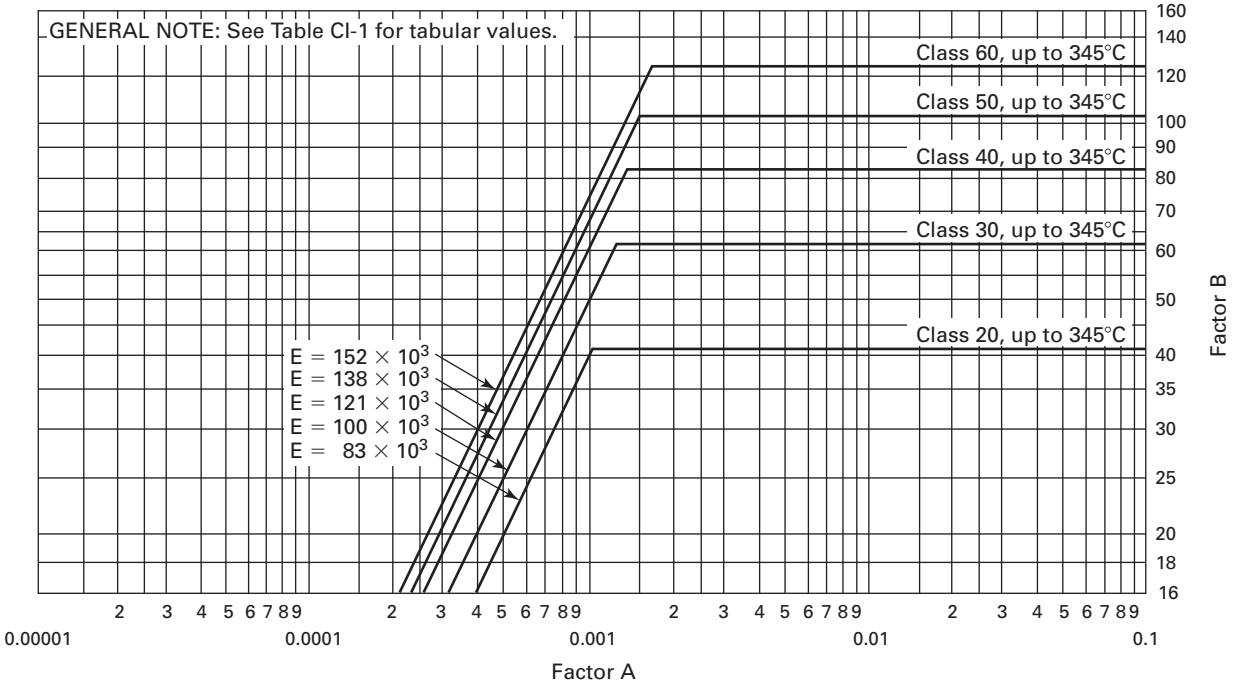


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure CI-1
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Cast Iron

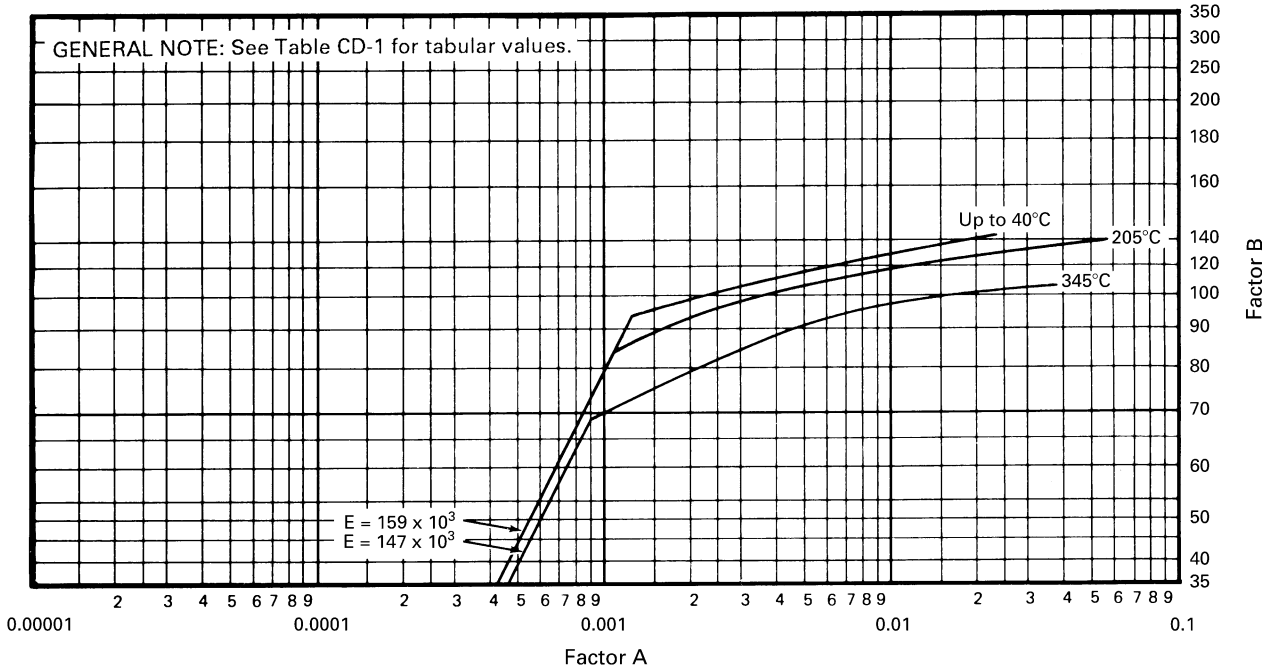


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure CD-1
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Cast Ductile Iron With a Specified Minimum Yield Strength of 275 MPa

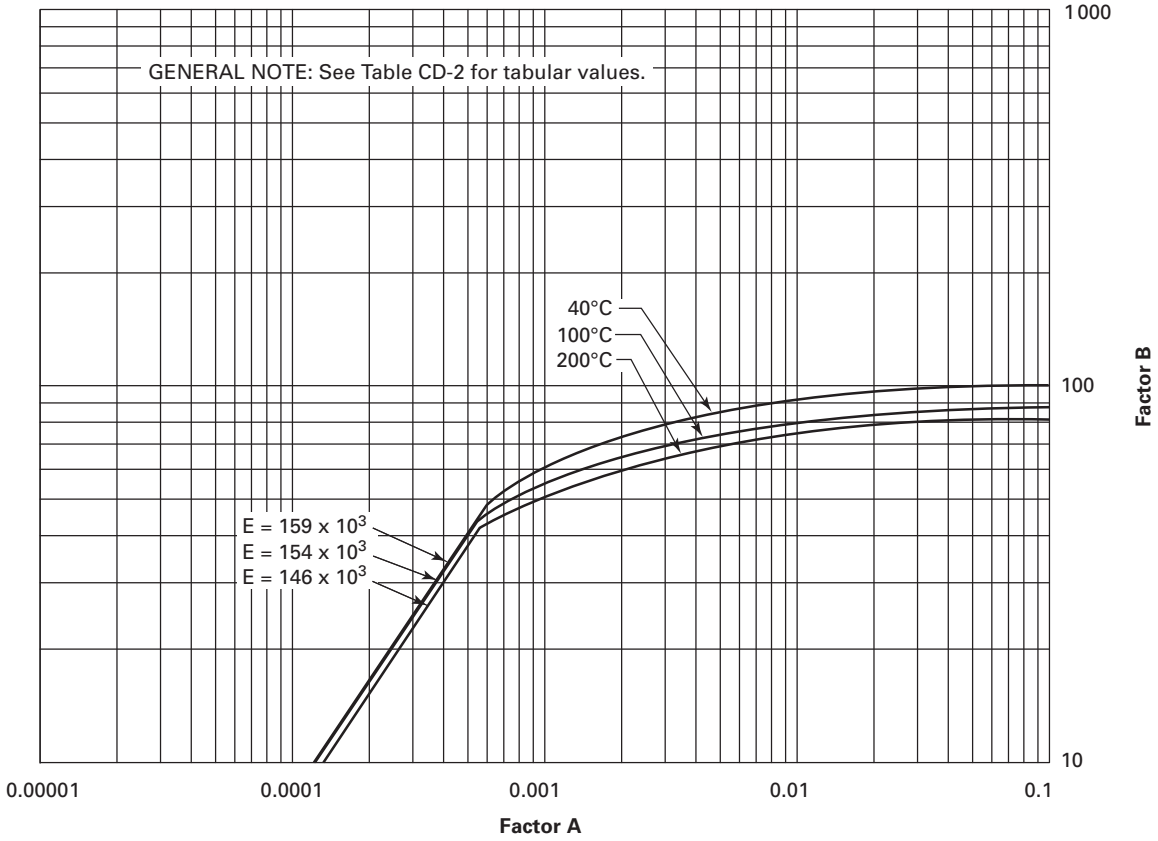


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure CD-2
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Cast Ductile Iron With a Specified Minimum Yield Strength of 200 MPa

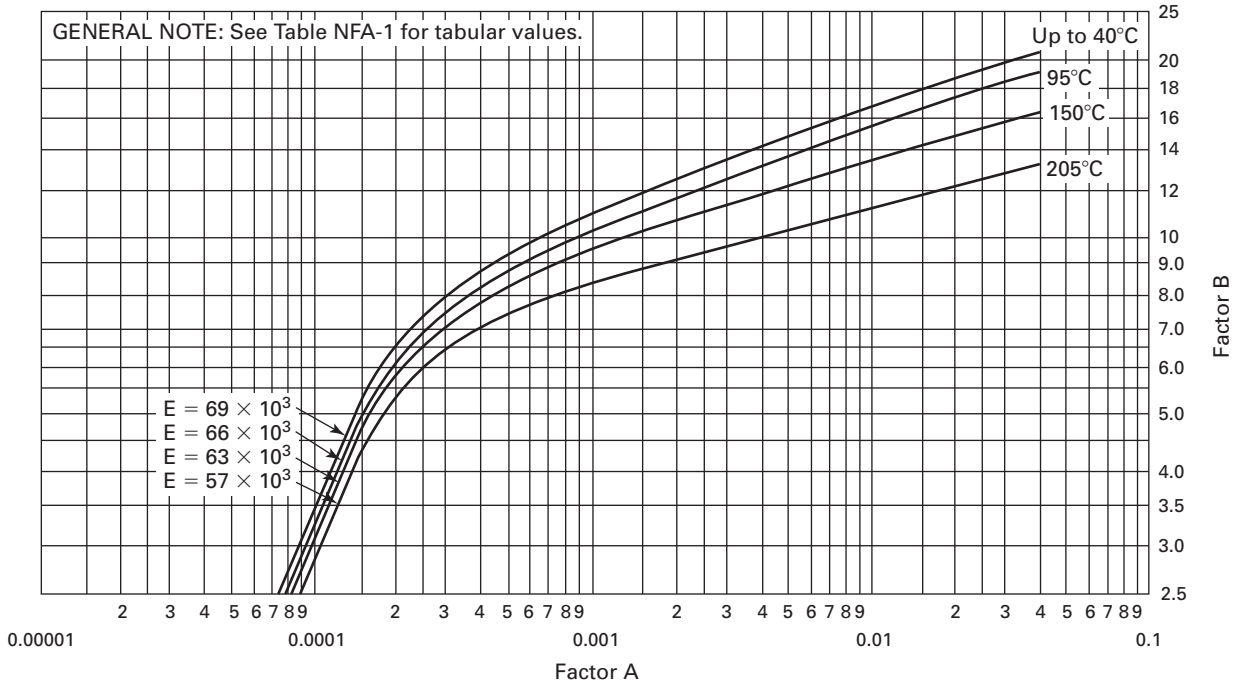


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFA-1
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Aluminum Alloy 3003 in O Temper



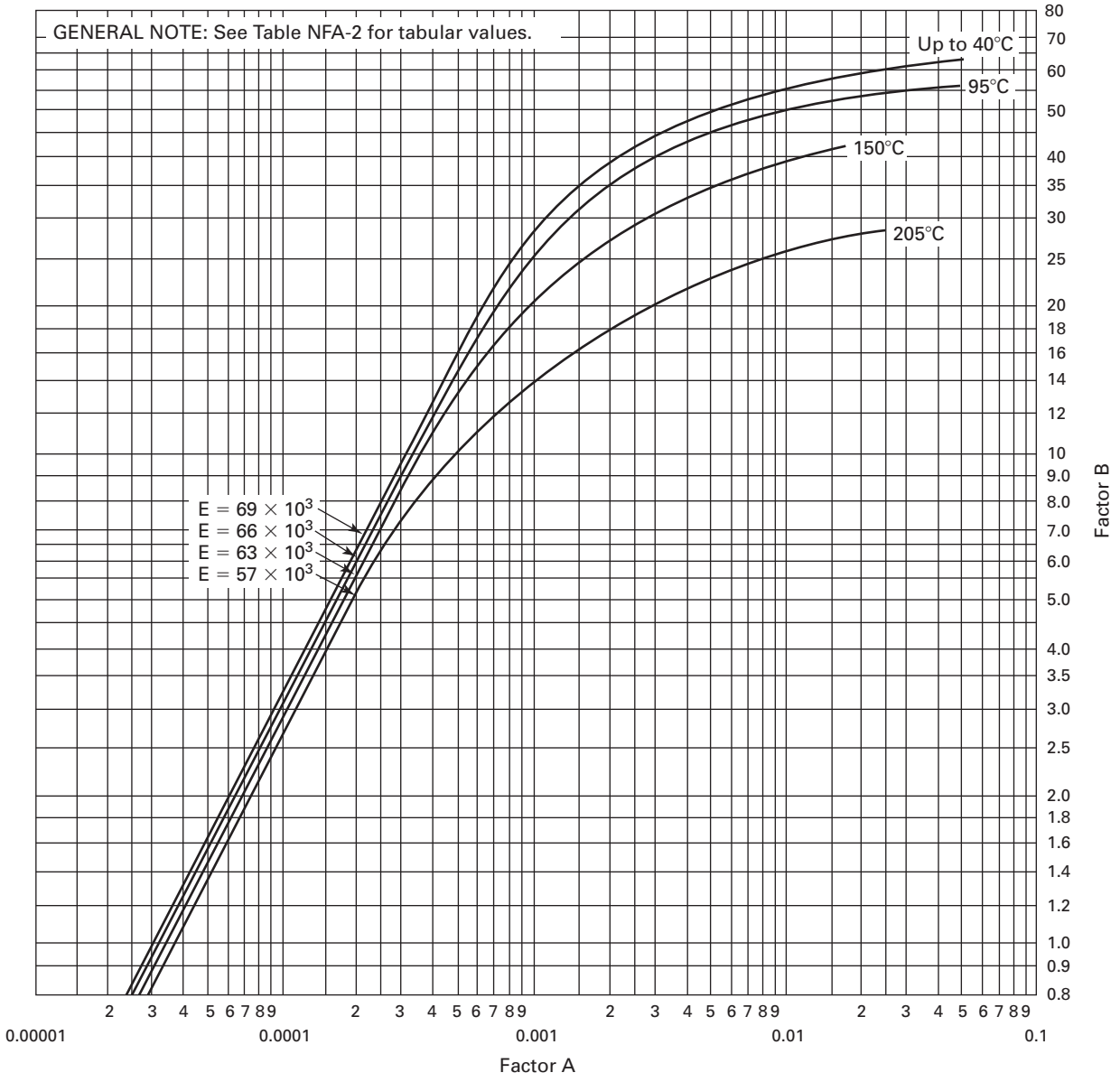
GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

(c) For Section III application, maximum use limit is 120°C, except for SB-209/3003/H112/6–12.7 and 13–75 mm use limits are 150°C and 95°C, respectively. Use 150°C curve for interpolation only.

Figure NFA-2
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Aluminum Alloy 3003 in H14 Temper



GENERAL NOTES:

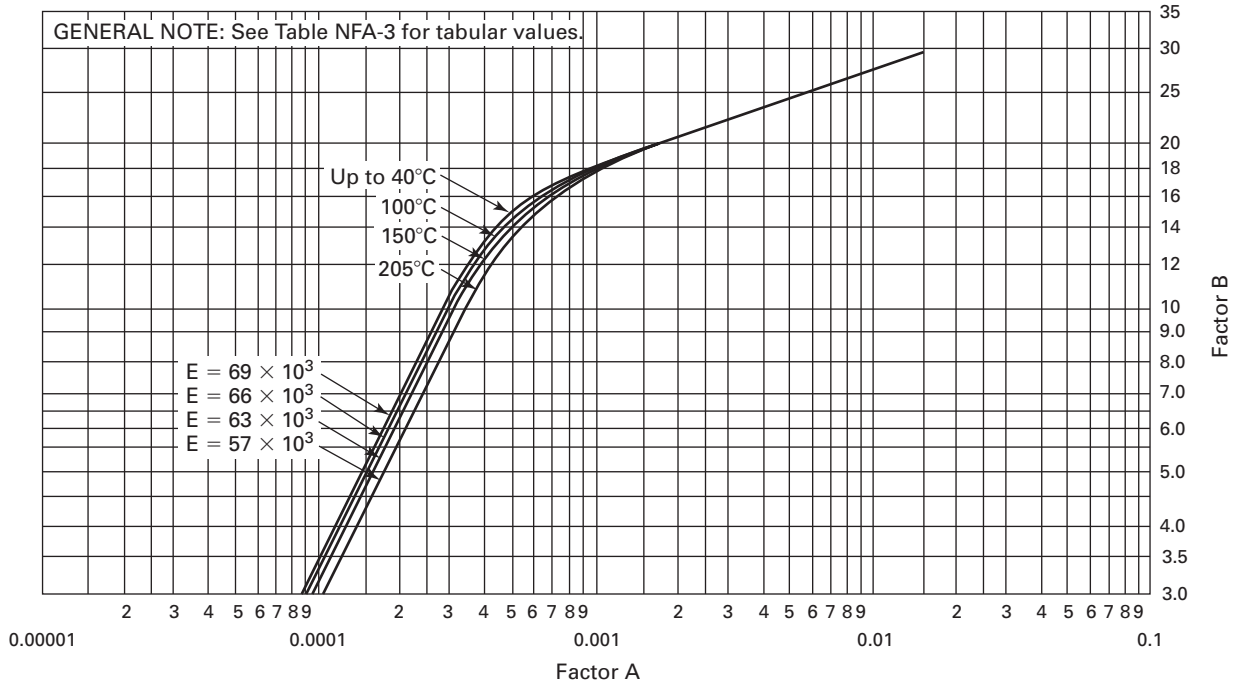
(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

(c) For Section III application, maximum use limit is 120°C, except for SB-209/3003/H112/6–12.7 and 13–75 mm use limits are 150°C and 95°C, respectively. Use 150°C curve for interpolation only.

(d) This chart is not to be used for welded construction.

Figure NFA-3
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Aluminum Alloy 3004 in O Temper

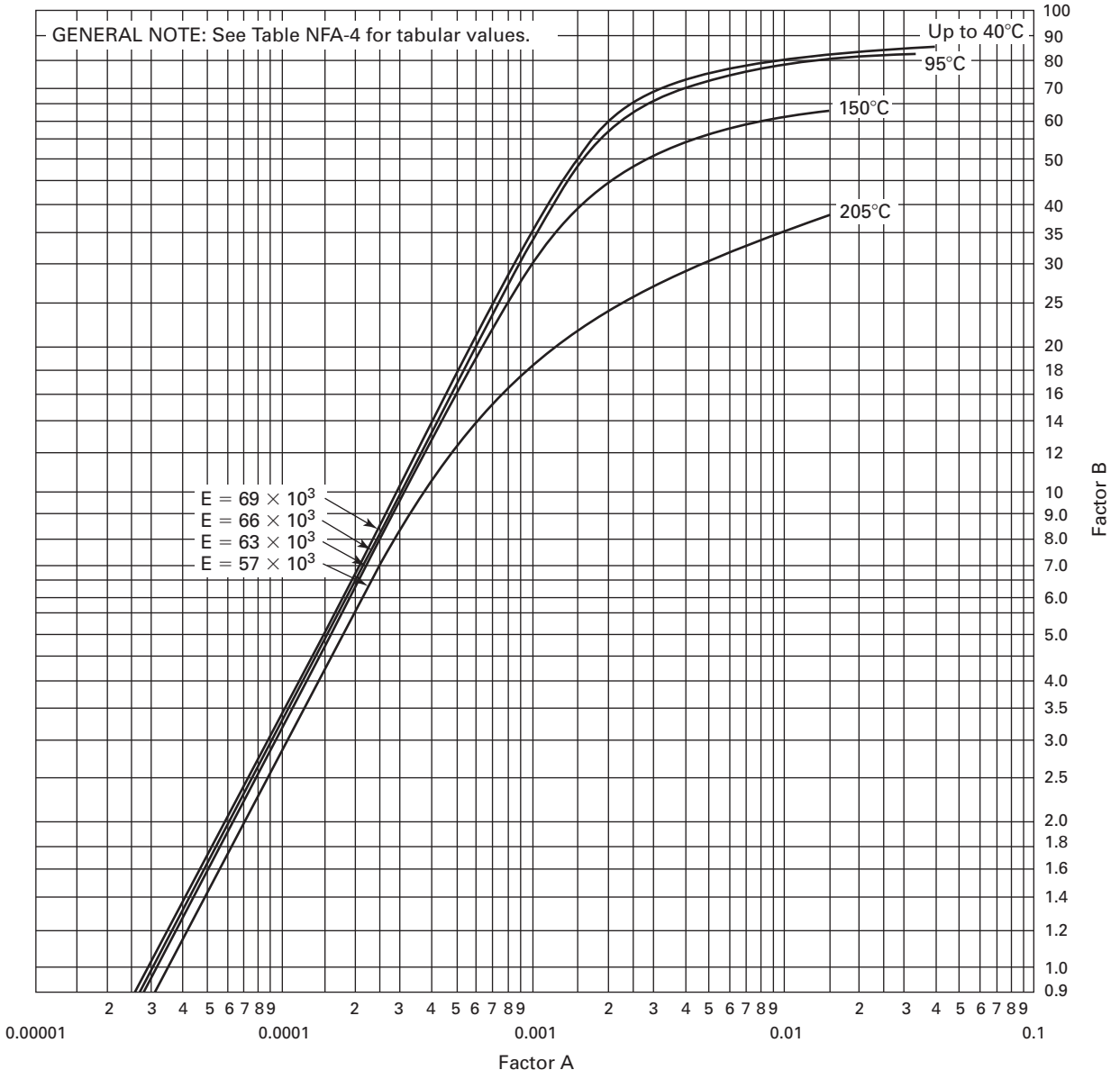


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFA-4
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Aluminum Alloy 3004 in H34 Temper



GENERAL NOTES:

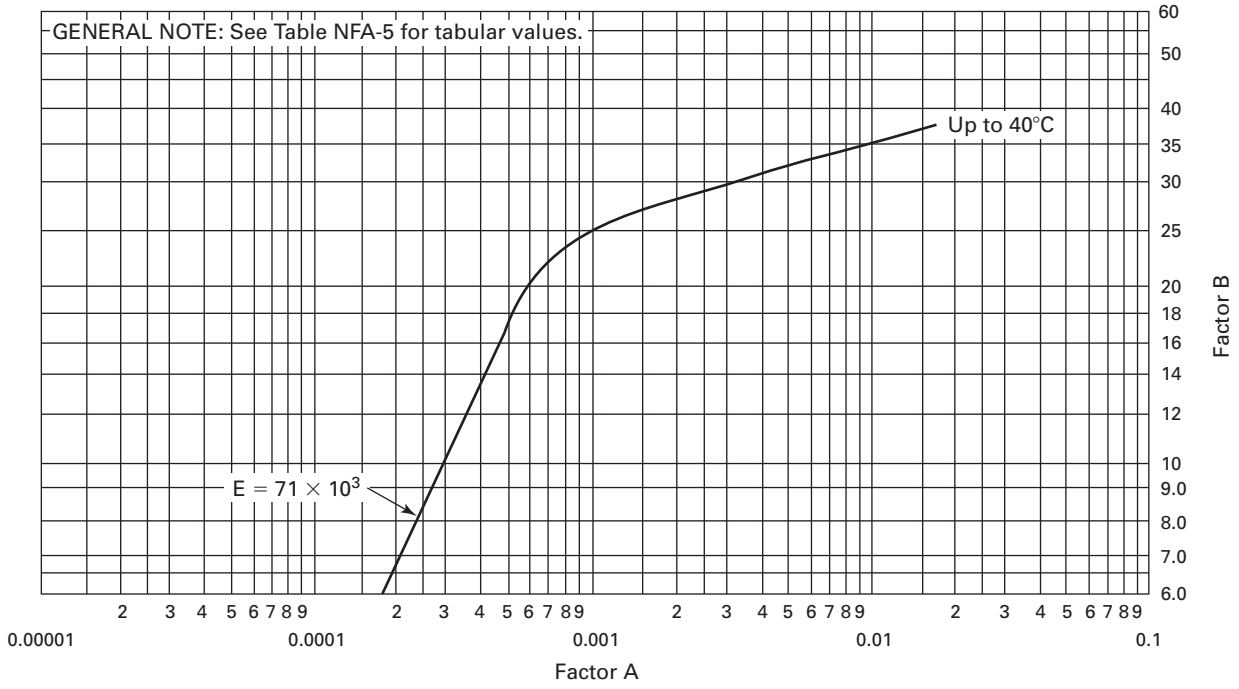
(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

(c) For Section III application, maximum use limit is 120°C, except for SB-209/3003/H112/6–12.7 and 13–75 mm use limits are 150°C and 95°C, respectively. Use 150°C curve for interpolation only.

(d) This chart is not to be used for welded construction.

Figure NFA-5
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Aluminum Alloy 5154 in O Temper

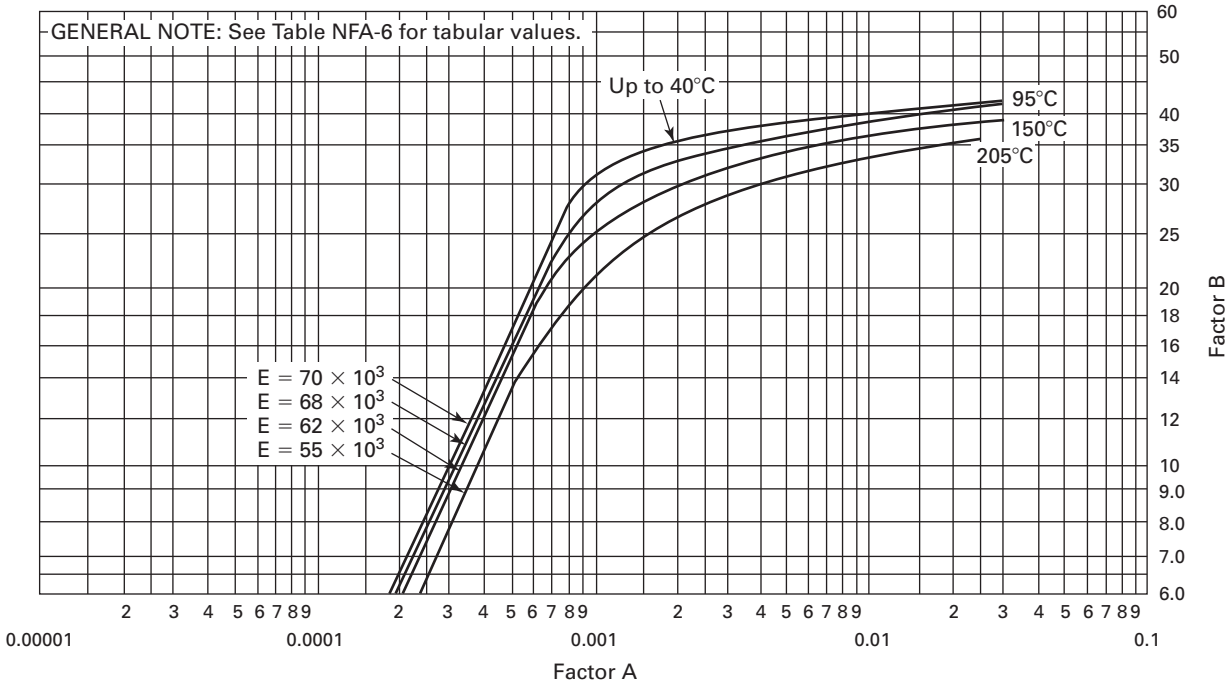


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFA-6
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Aluminum Alloy 5454 in O Temper

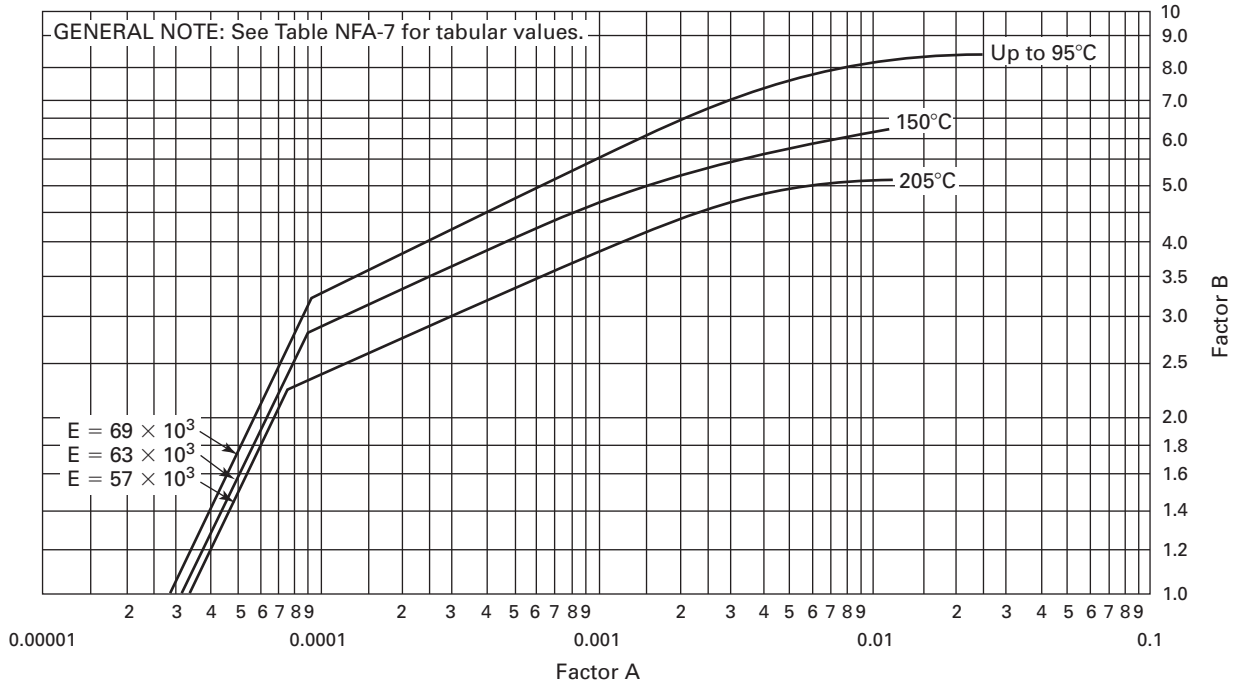


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFA-7
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Aluminum Alloy 1060 in O Temper

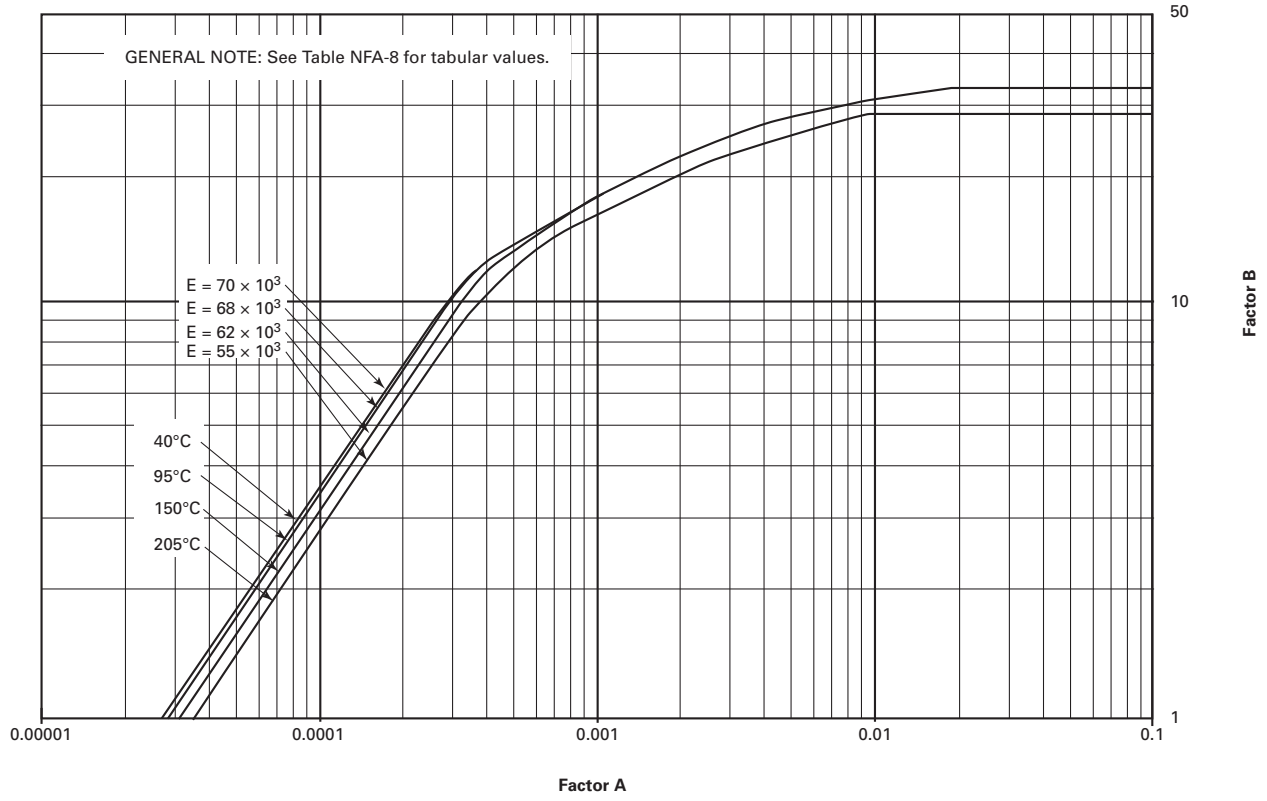


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFA-8
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Aluminum Alloy 5052 in O Temper



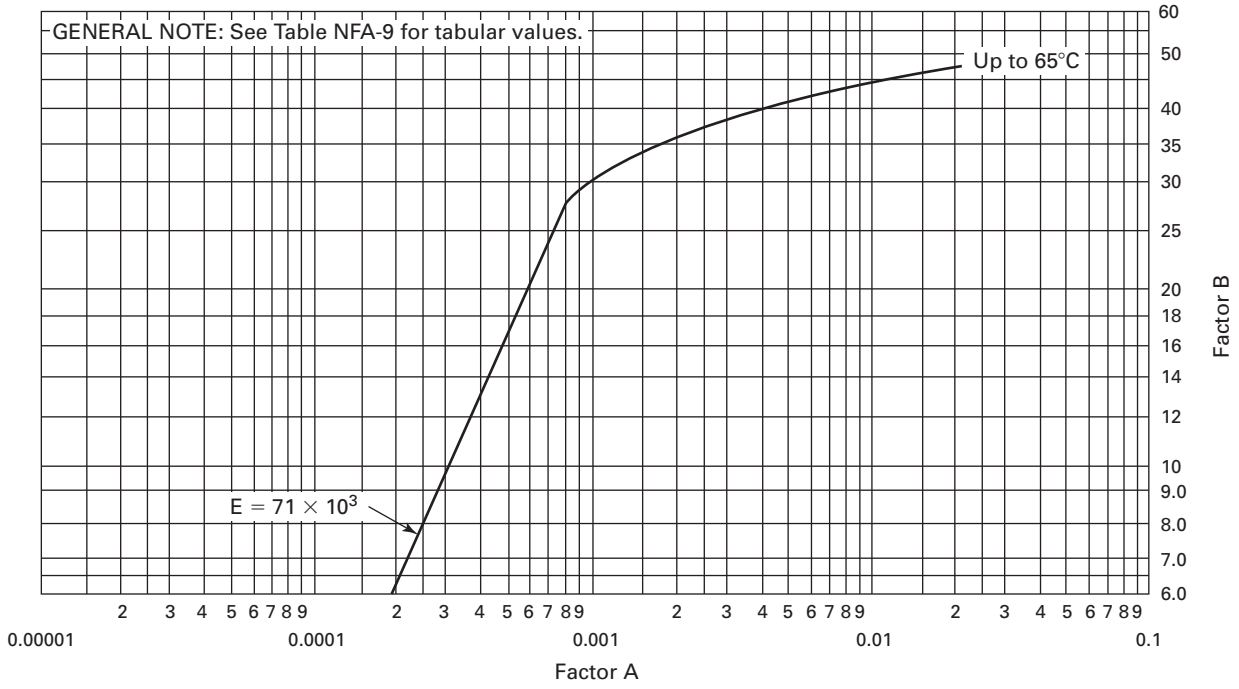
GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

(c) For Section III application, maximum use limit is 120°C, except for SB-210 use limit is 150°C. Use 150°C curve for interpolation only.

Figure NFA-9
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Aluminum Alloy 5086 in O Temper

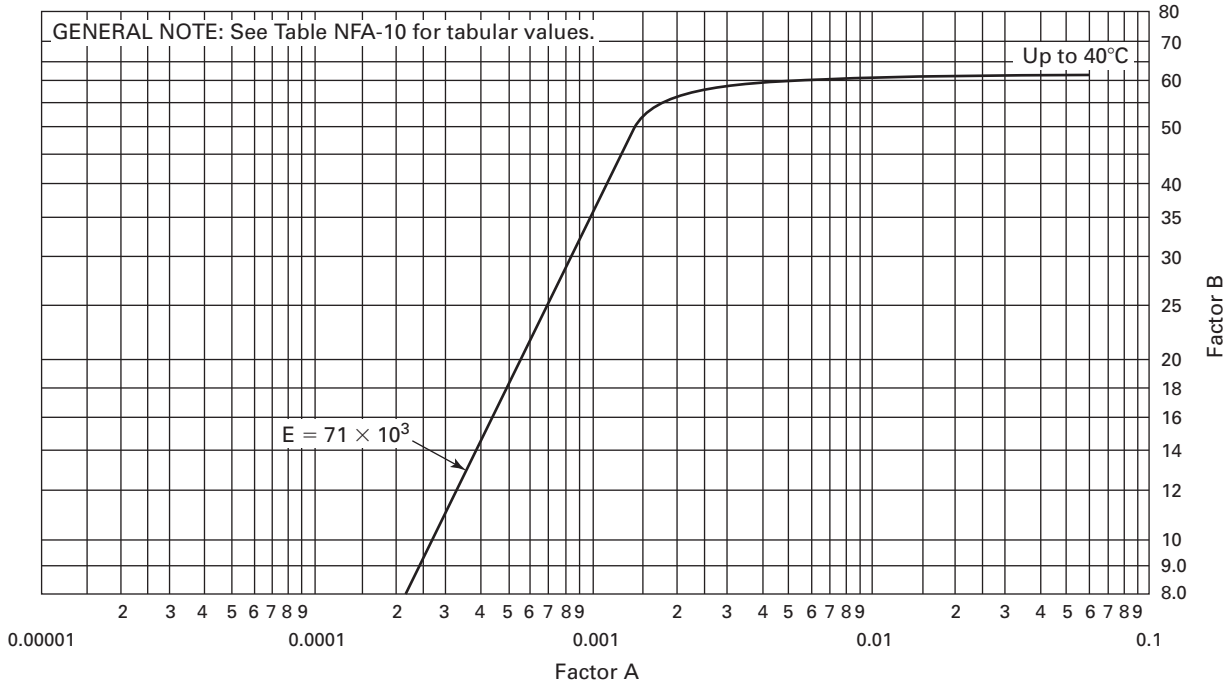


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFA-10
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Aluminum Alloy 5456 in O Temper

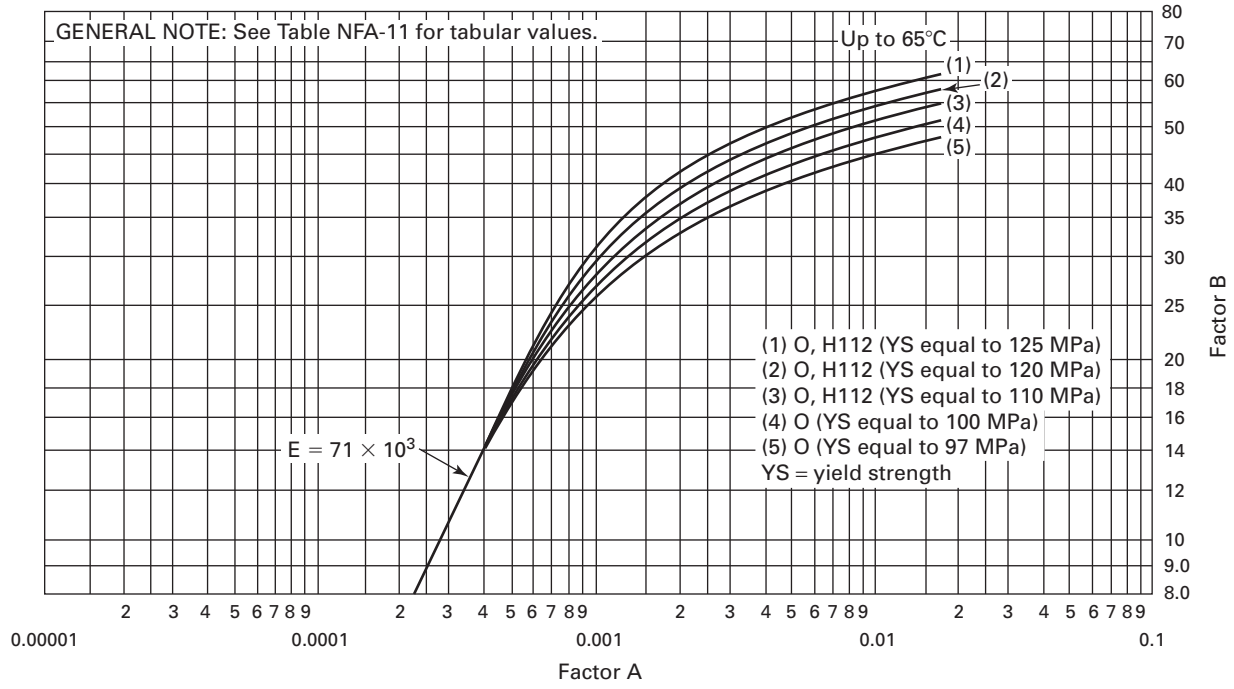


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFA-11
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Aluminum Alloy 5083 in O Temper

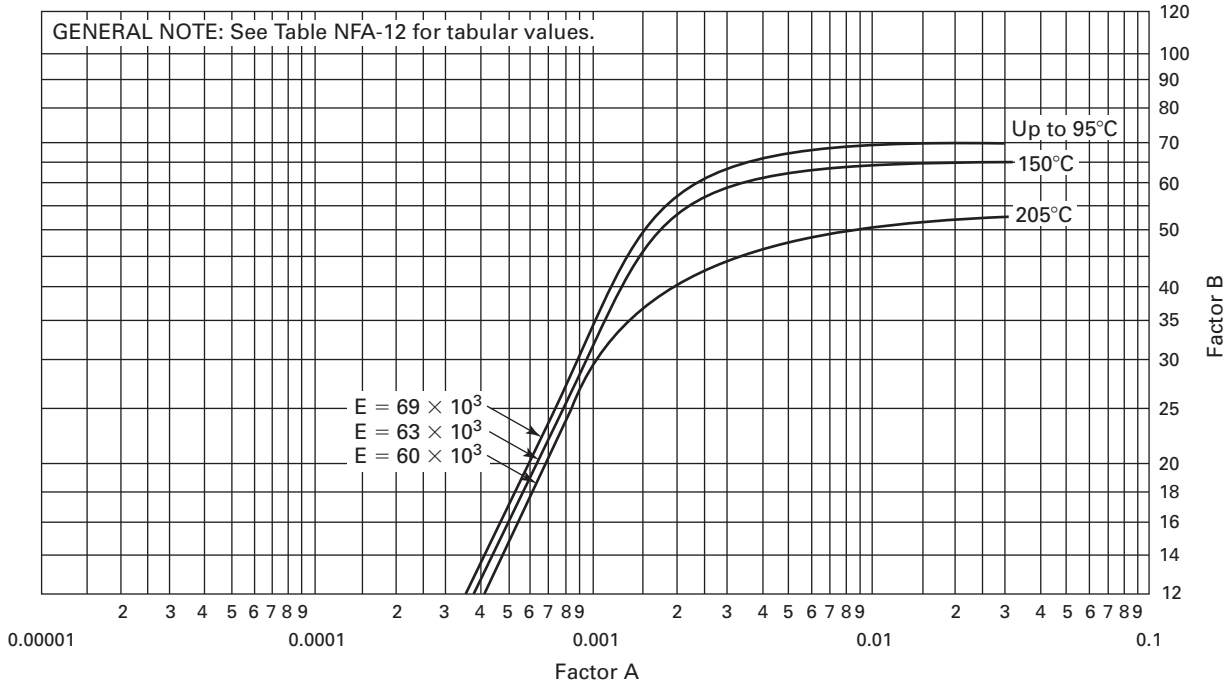


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFA-12
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Welded Aluminum Alloy 6061-T6

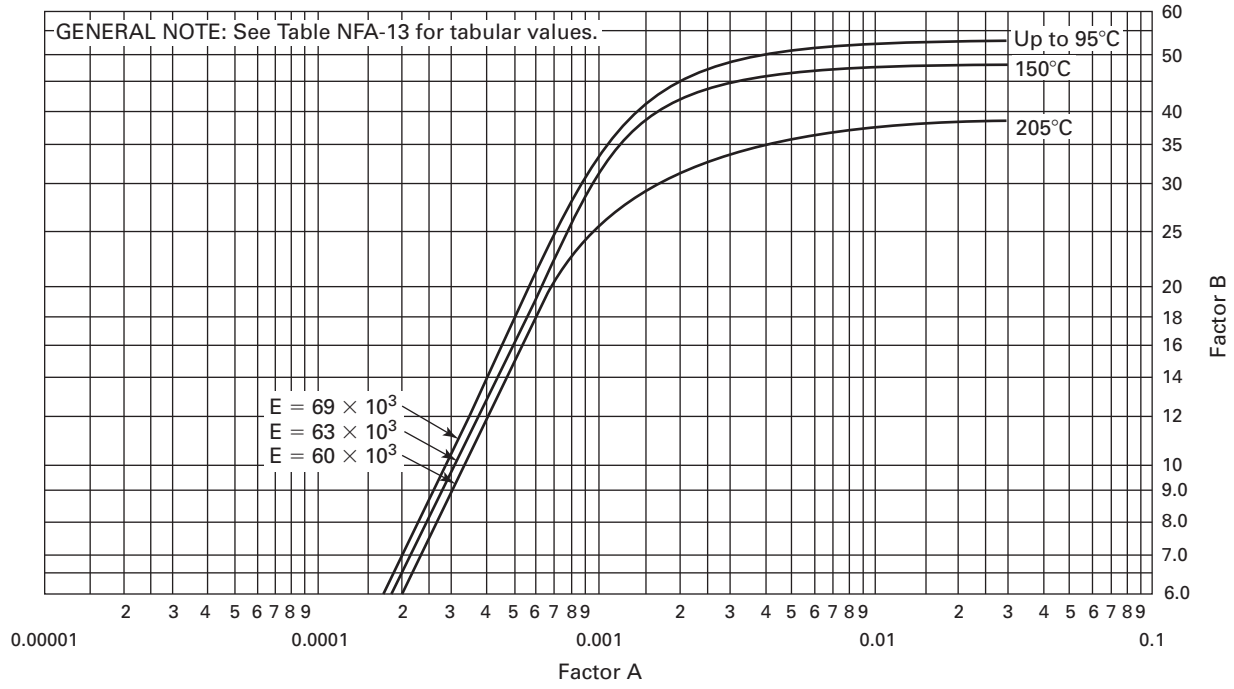


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFA-13
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Welded Aluminum Alloy 6061-T4

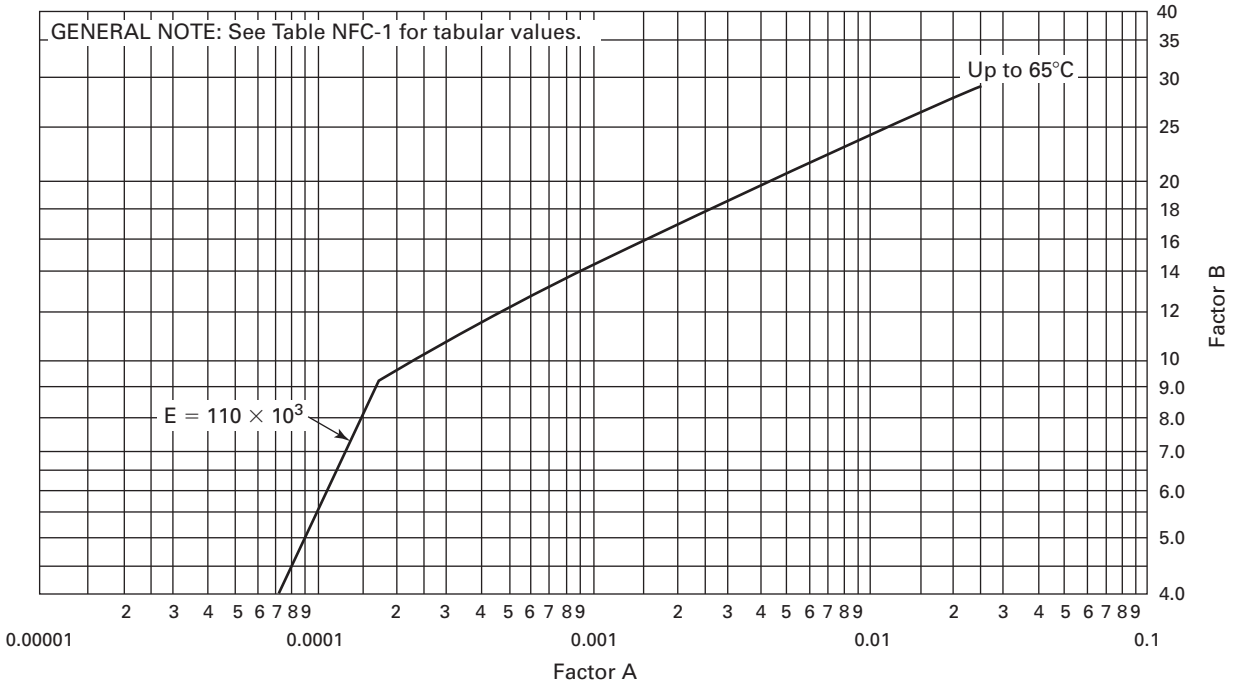


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFC-1
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Annealed Copper, Type DHP

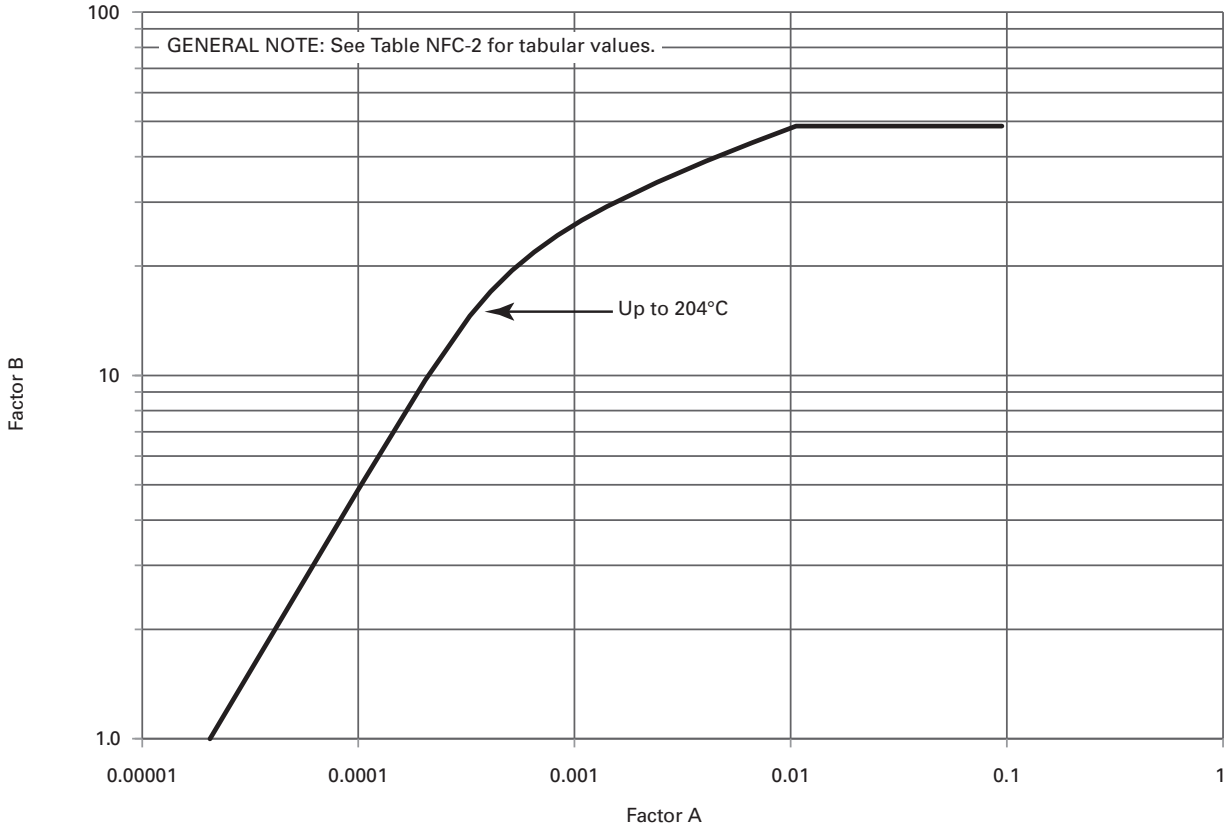


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFC-2
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Copper–Silicon Alloy C65500

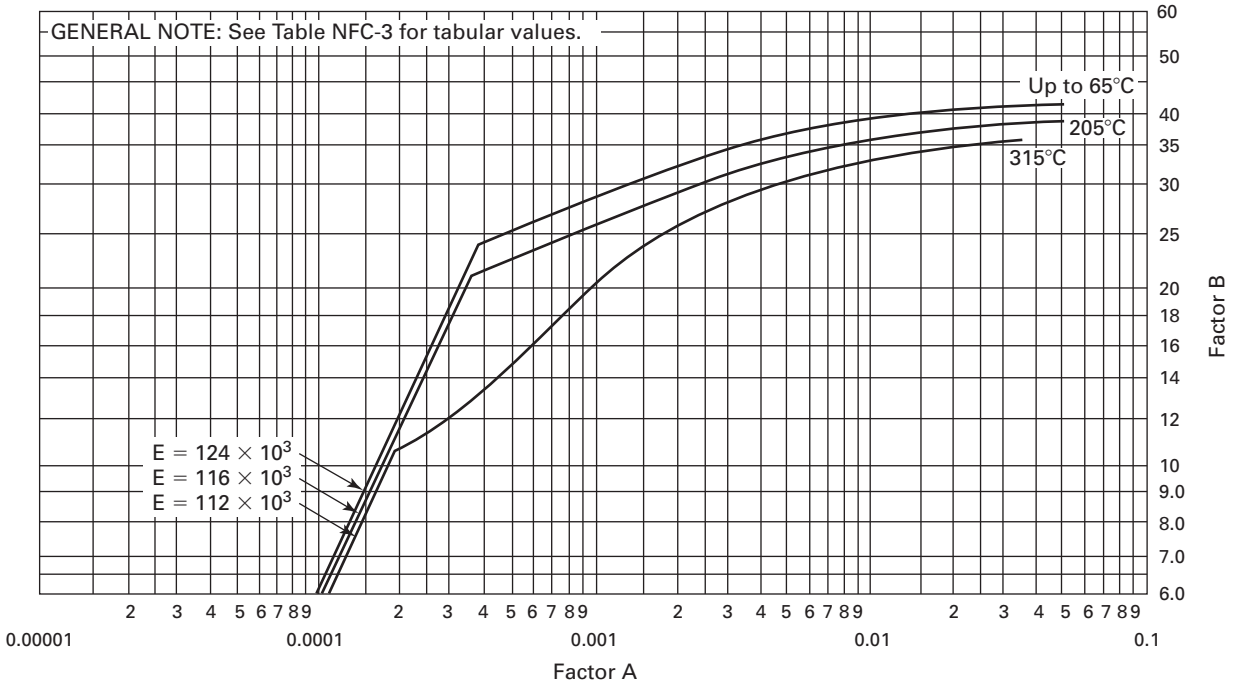


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFC-3
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Annealed 90–10 Copper–Nickel Alloy

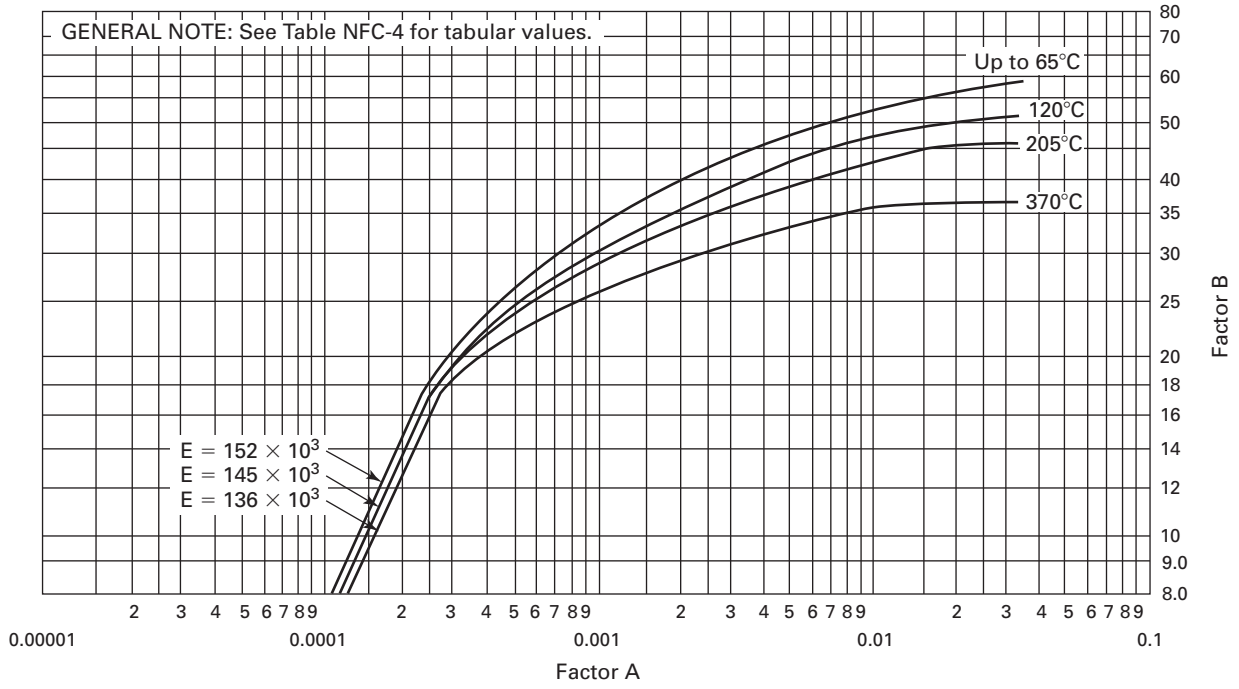


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFC-4
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Annealed 70–30 Copper–Nickel Alloy

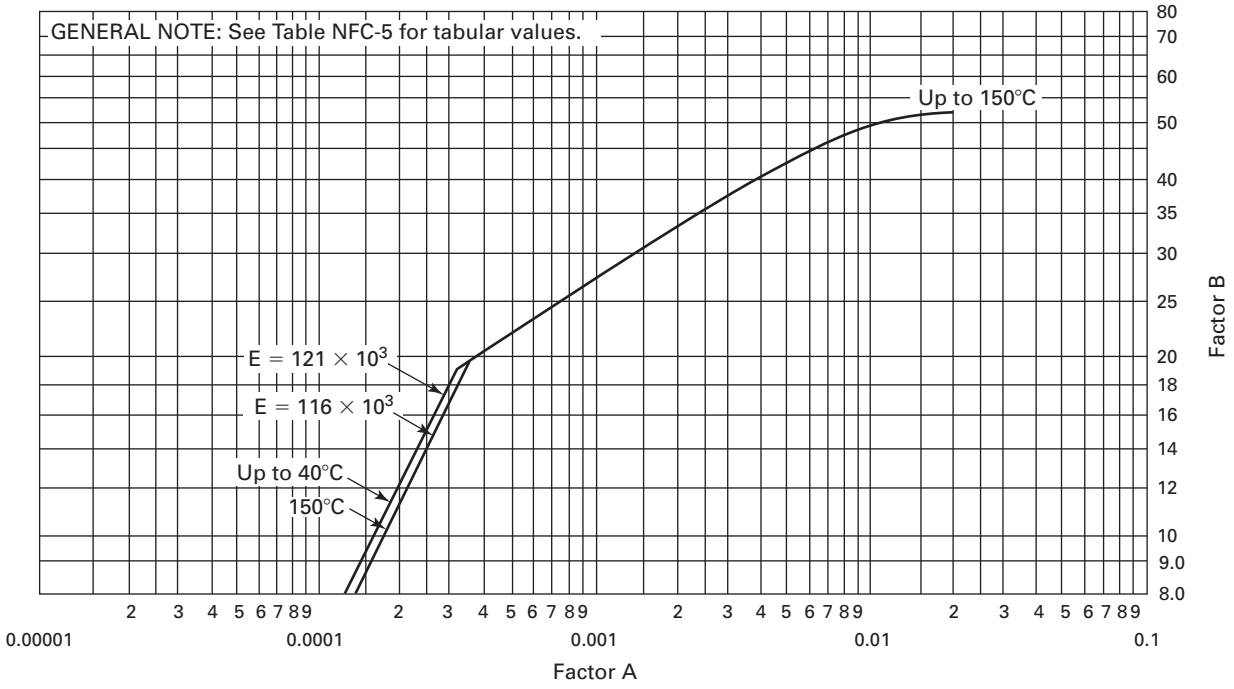


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFC-5
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Welded Copper–Iron Alloy Tube C19400 (SB-543 Welded)

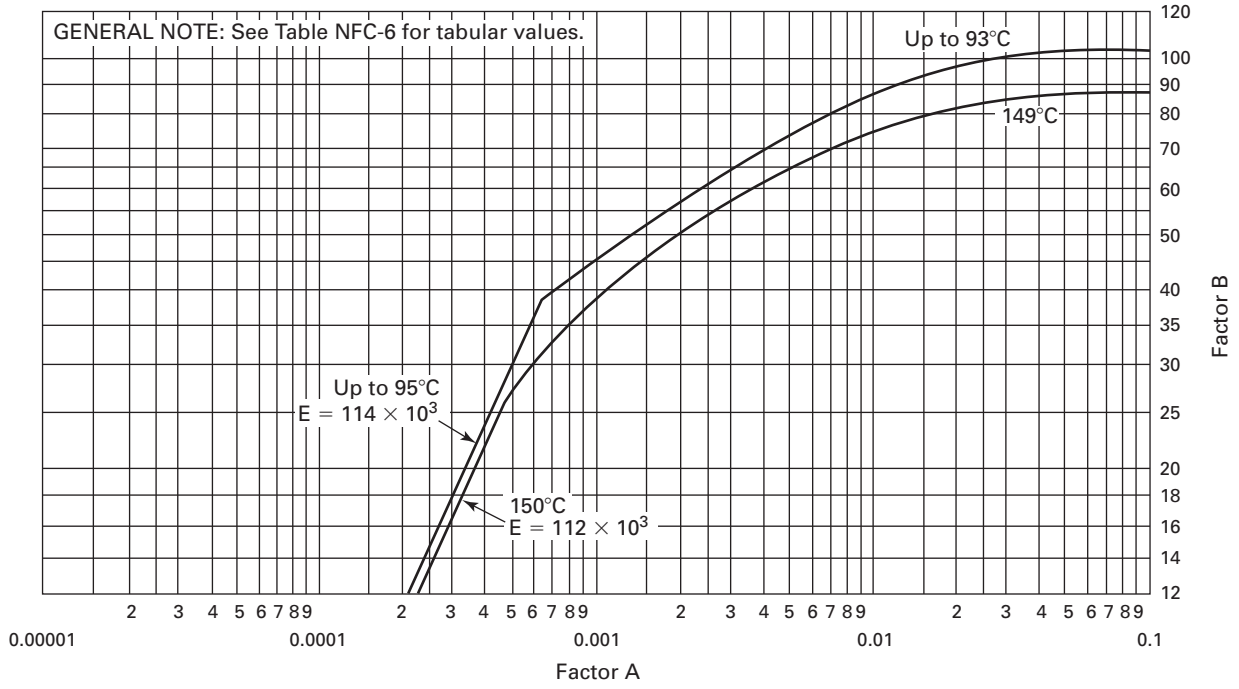


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFC-6
Chart for Determining Shell Thickness of Components Under External Pressure Developed for SB-75 and SB-111 Light Drawn Seamless Copper Tubes, Alloys C10200, C12000, C12200, and C14200

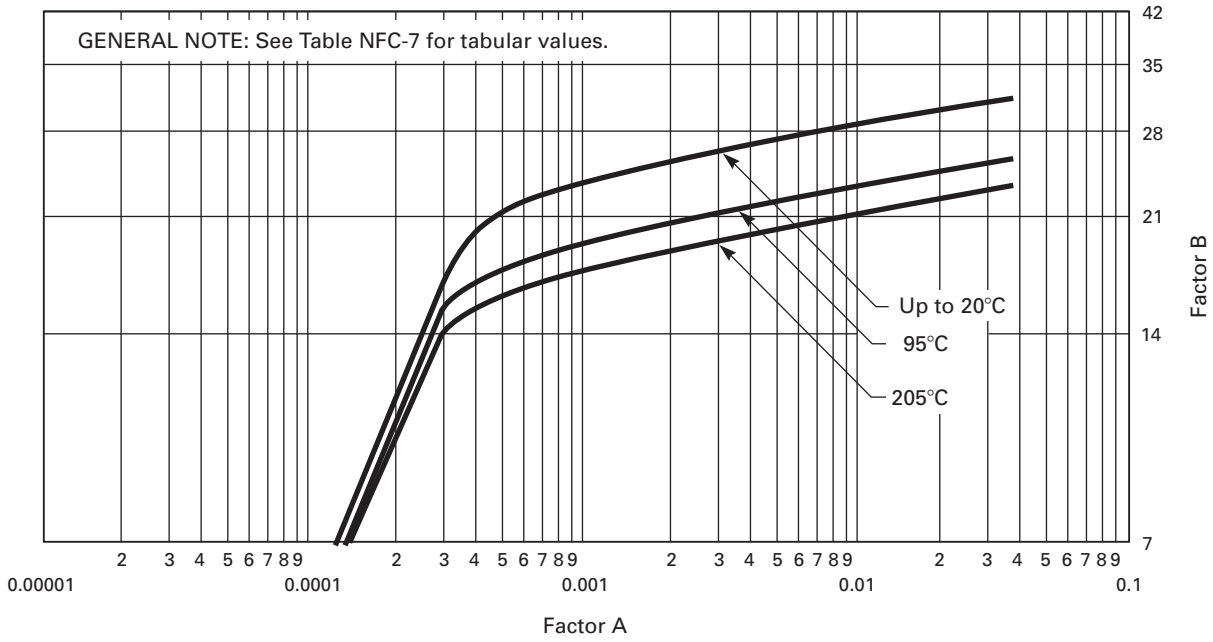


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFC-7
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Annealed Copper, SB-75, UNS C12200, Temper O50



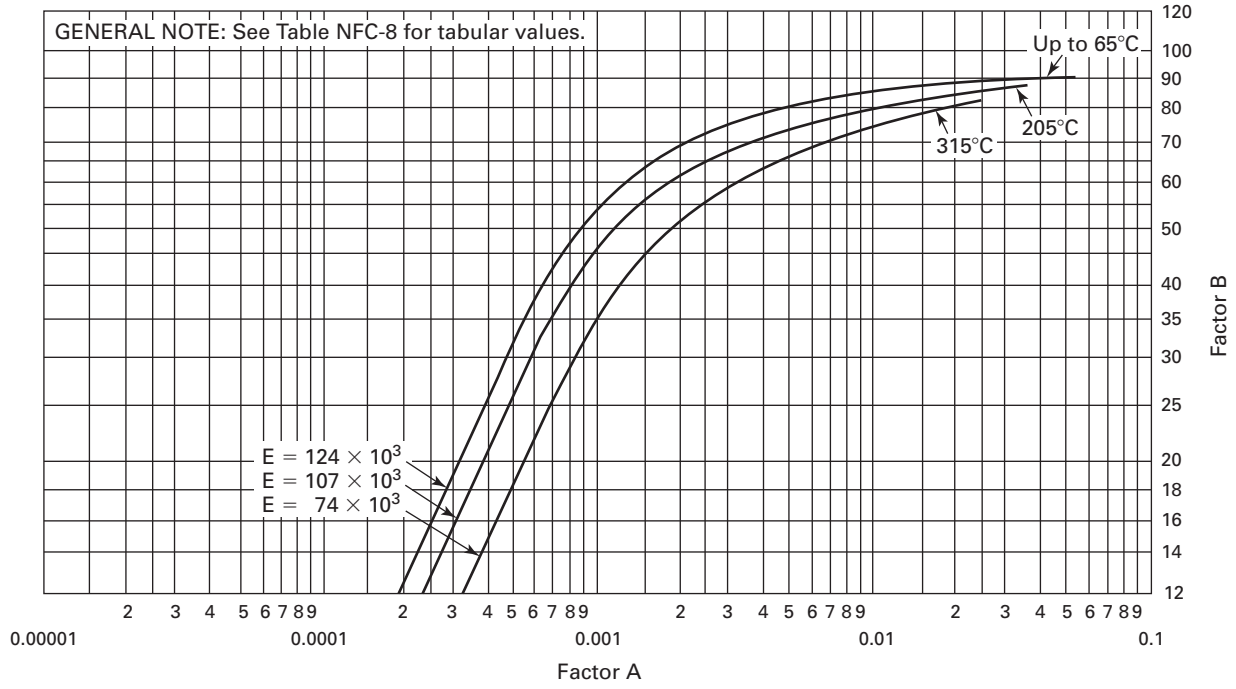
GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

(c) Use tabular data in Table NFC-7 for values of Factor A to the left of each curve.

Figure NFC-8
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Aluminum Bronze Alloy C61400

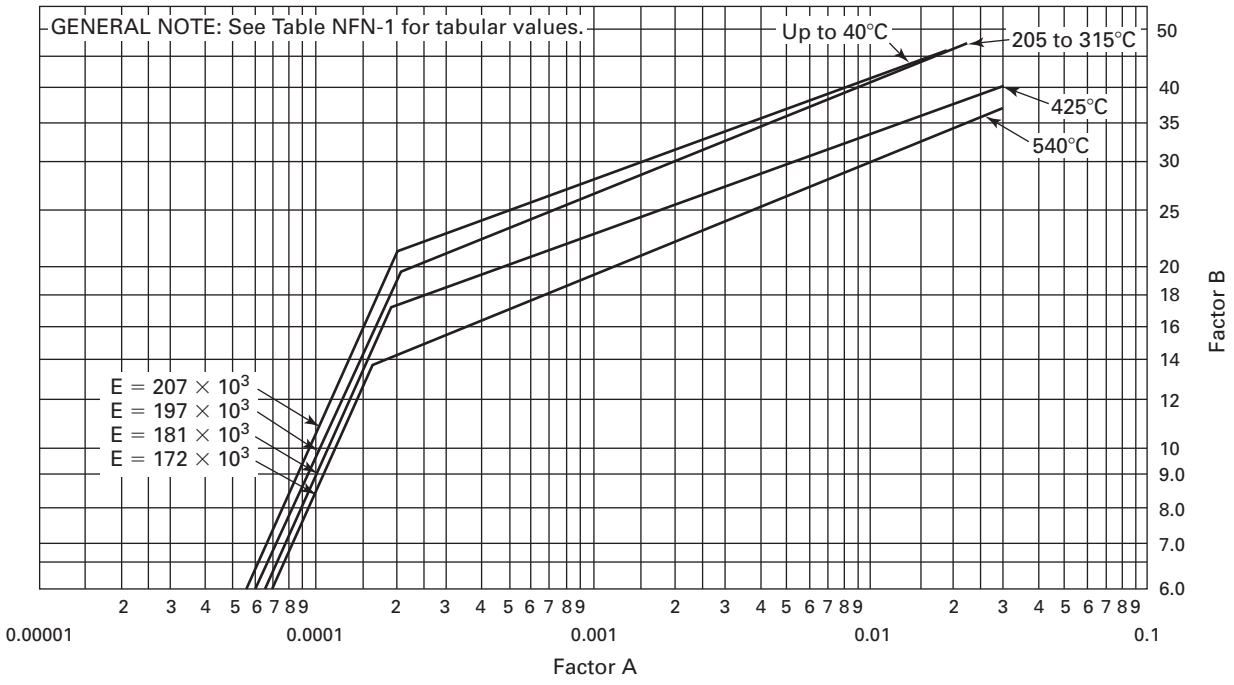


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-1
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Annealed Low Carbon Nickel N02201

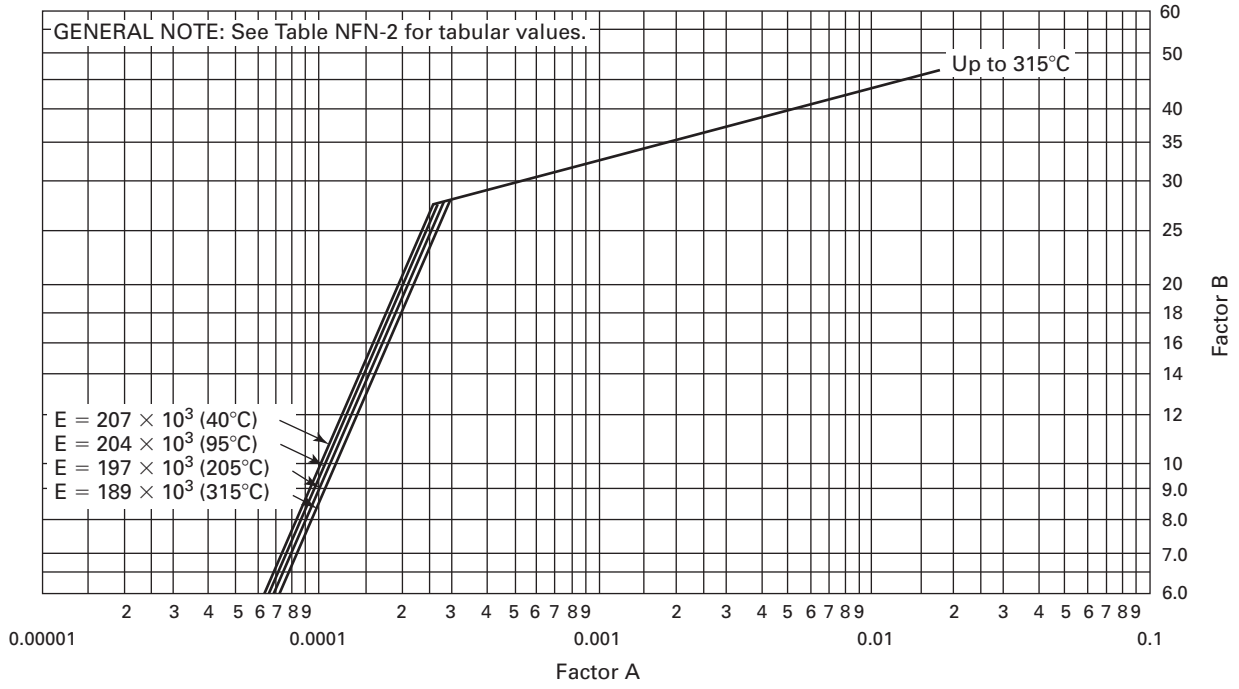


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-2
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Annealed Nickel N02200

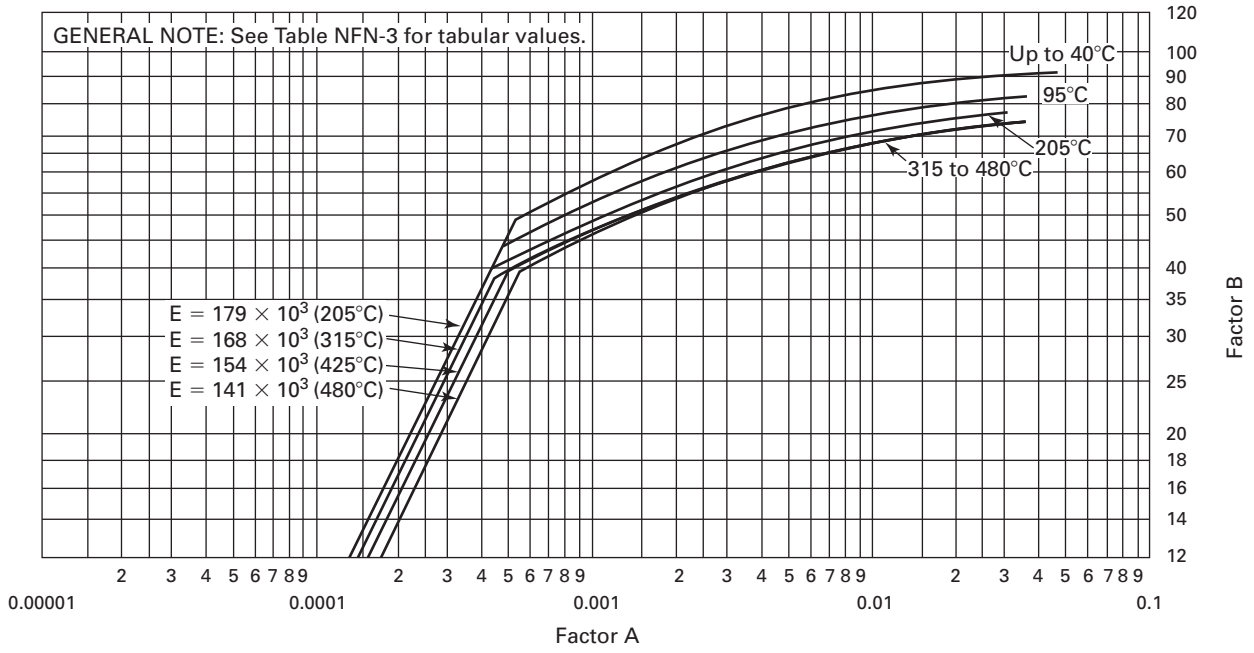


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-3
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Annealed Nickel–Copper Alloy N04400

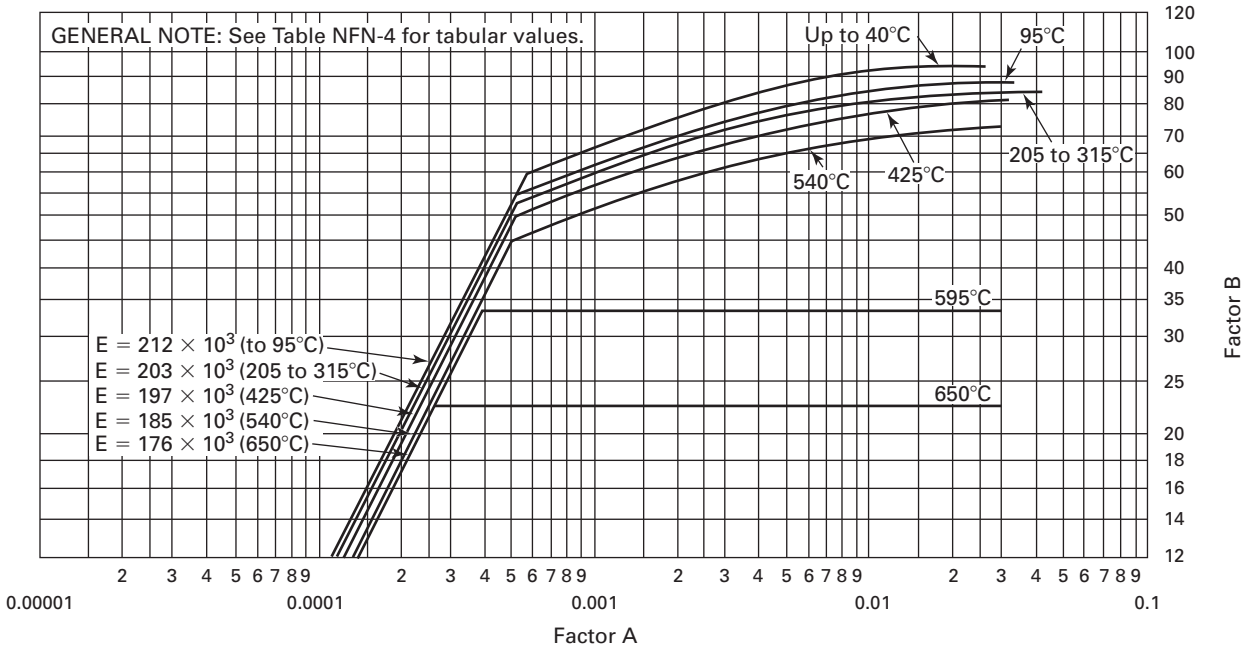


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-4
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Annealed Nickel–Chromium–Iron Alloy N06600

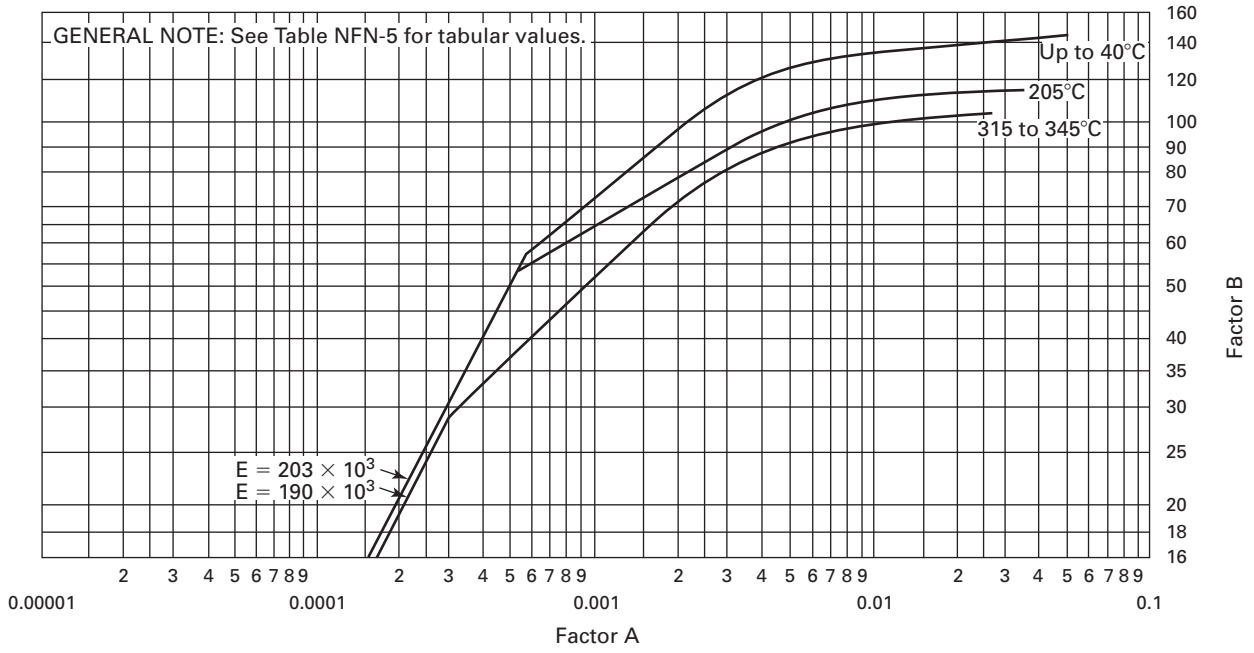


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-5
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Nickel–Molybdenum Alloy N10001

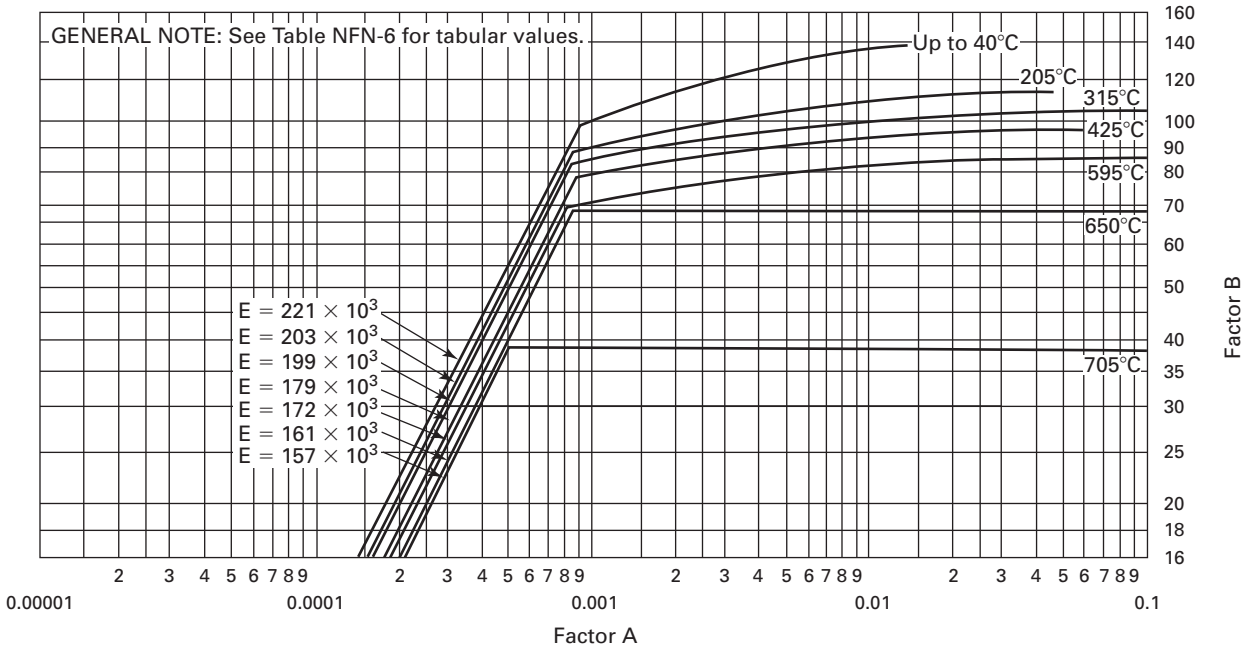


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-6
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Nickel–Molybdenum–Chromium–Iron Alloy N10003

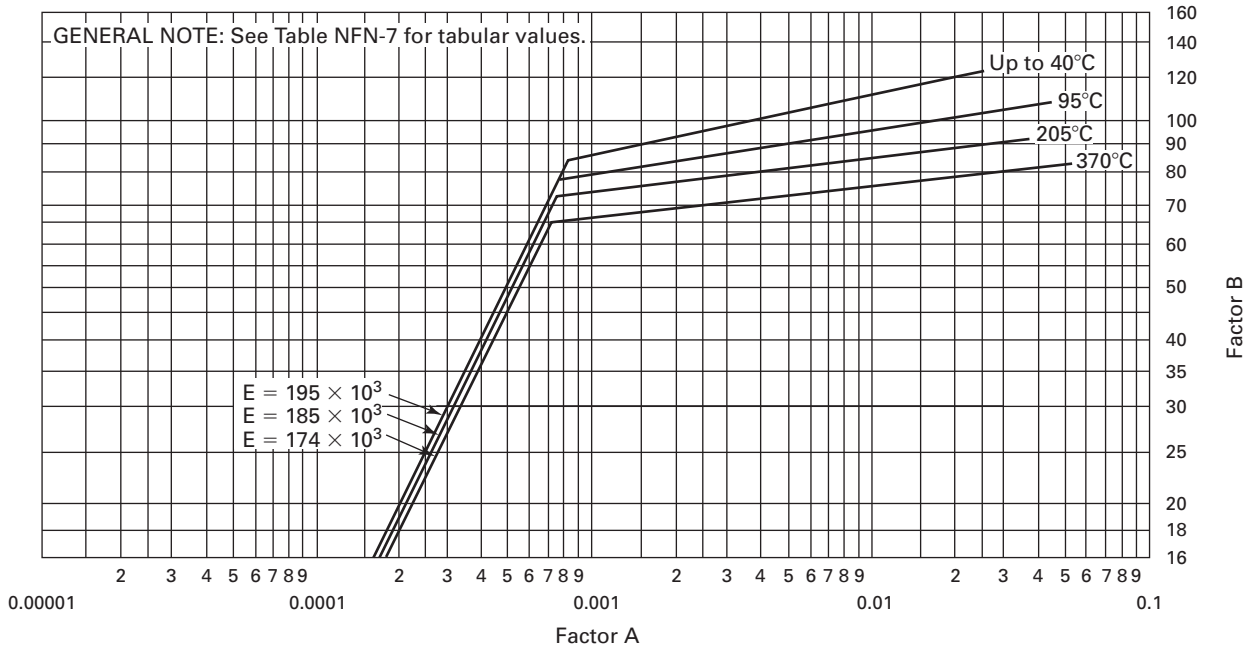


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-7
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Nickel–Iron–Chromium–Molybdenum–Copper Alloy N08825

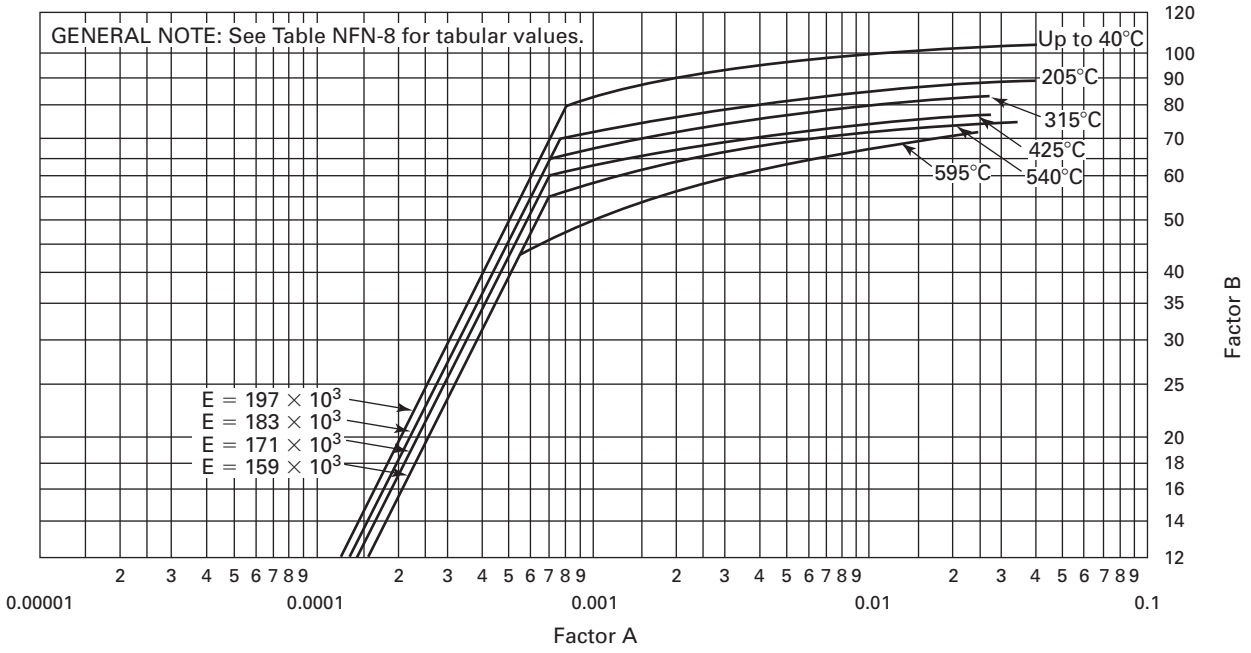


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-8
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Annealed Nickel–Iron–Chromium Alloy N08800

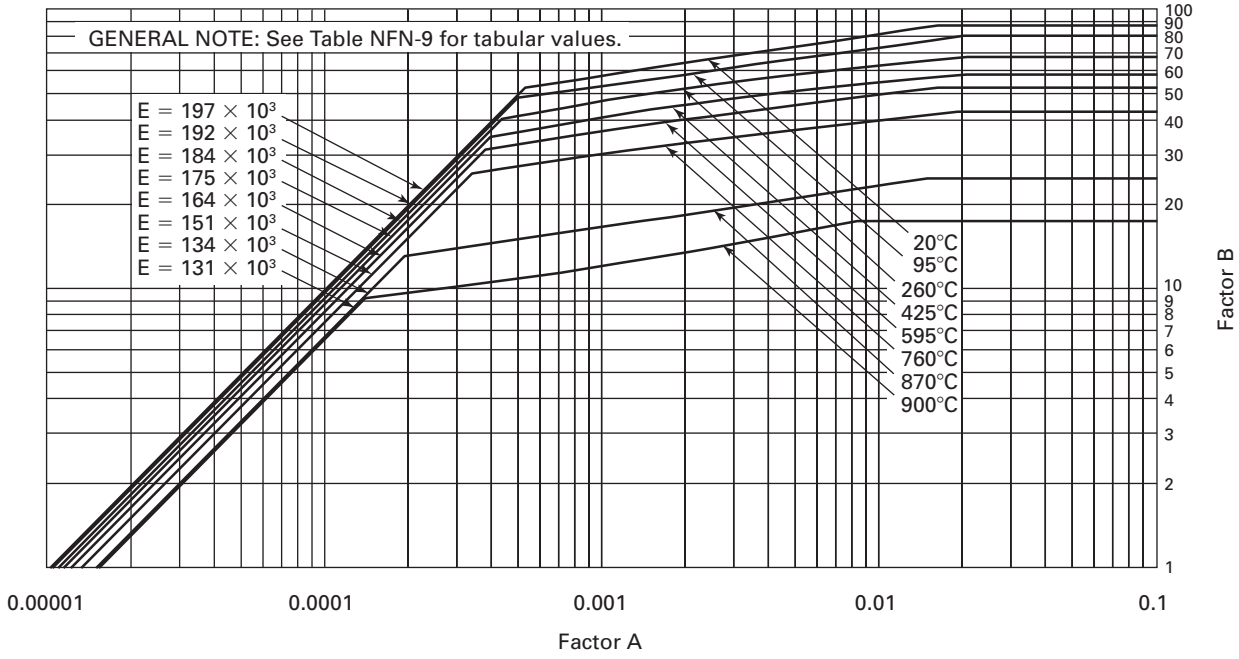


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-9
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Annealed Nickel–Iron–Chromium Alloy N08810

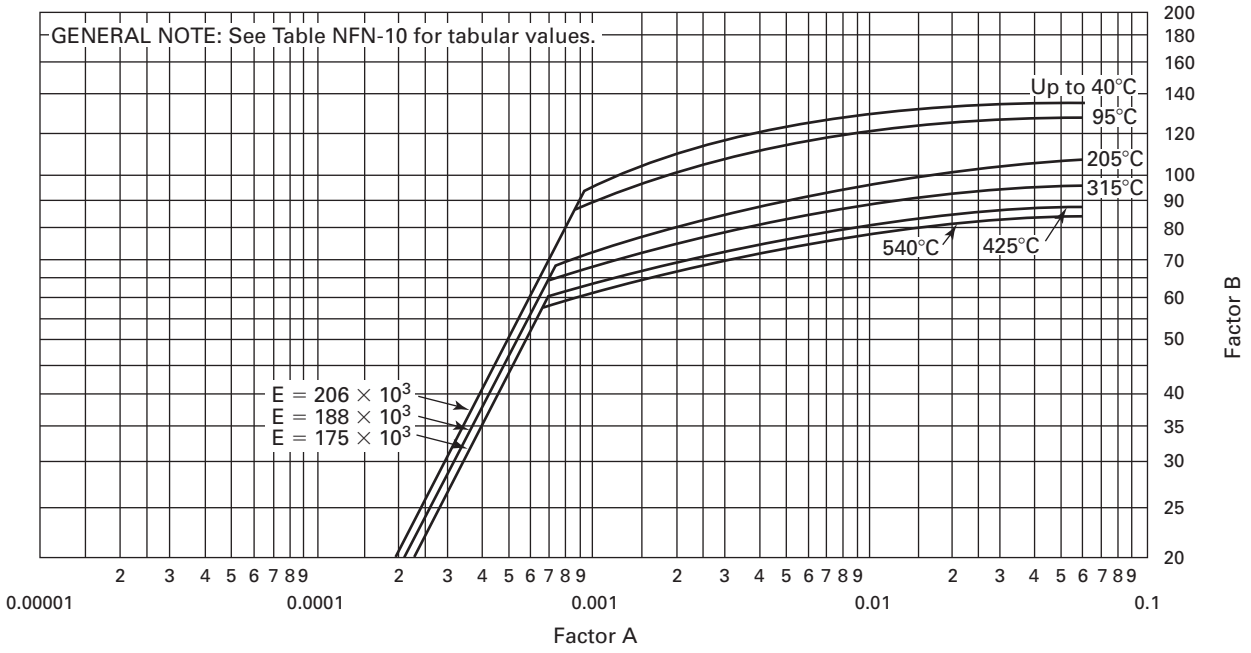


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-10
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Low Carbon Nickel–Molybdenum–Chromium Alloy N10276

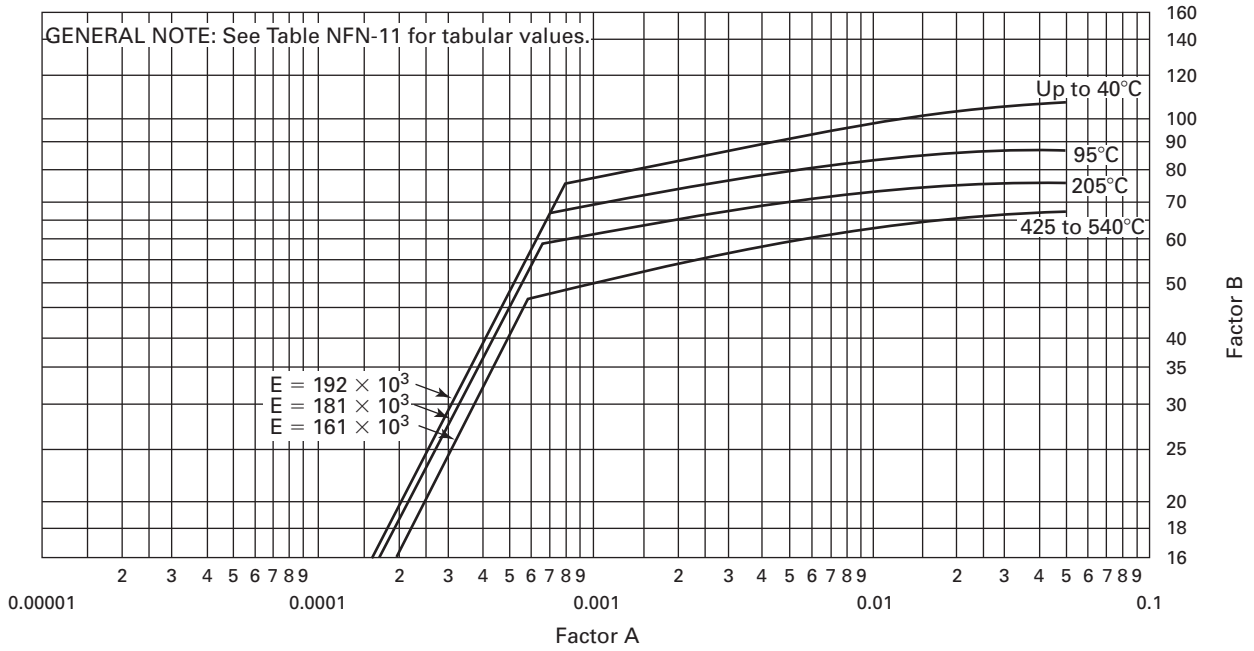


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-11
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Solution Treated Nickel–Chromium–Iron–Molybdenum–Copper Alloy N06007

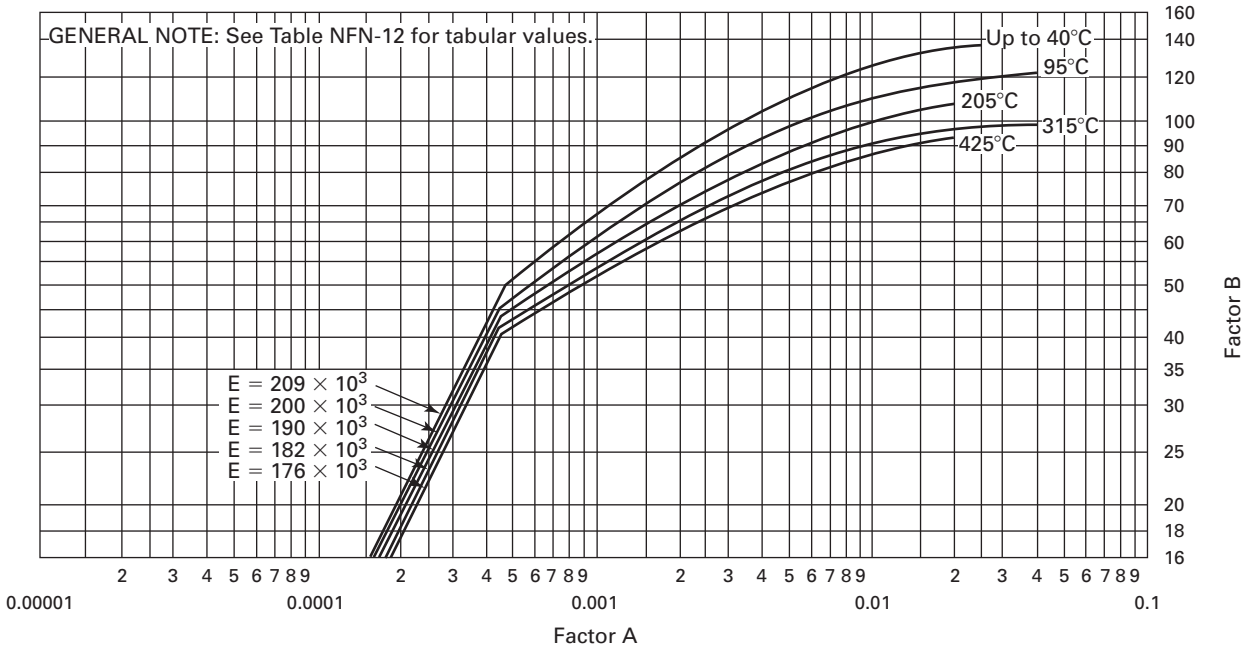


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-12
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Chromium–Nickel–Iron–Molybdenum–Copper–Columbium Alloy N08020

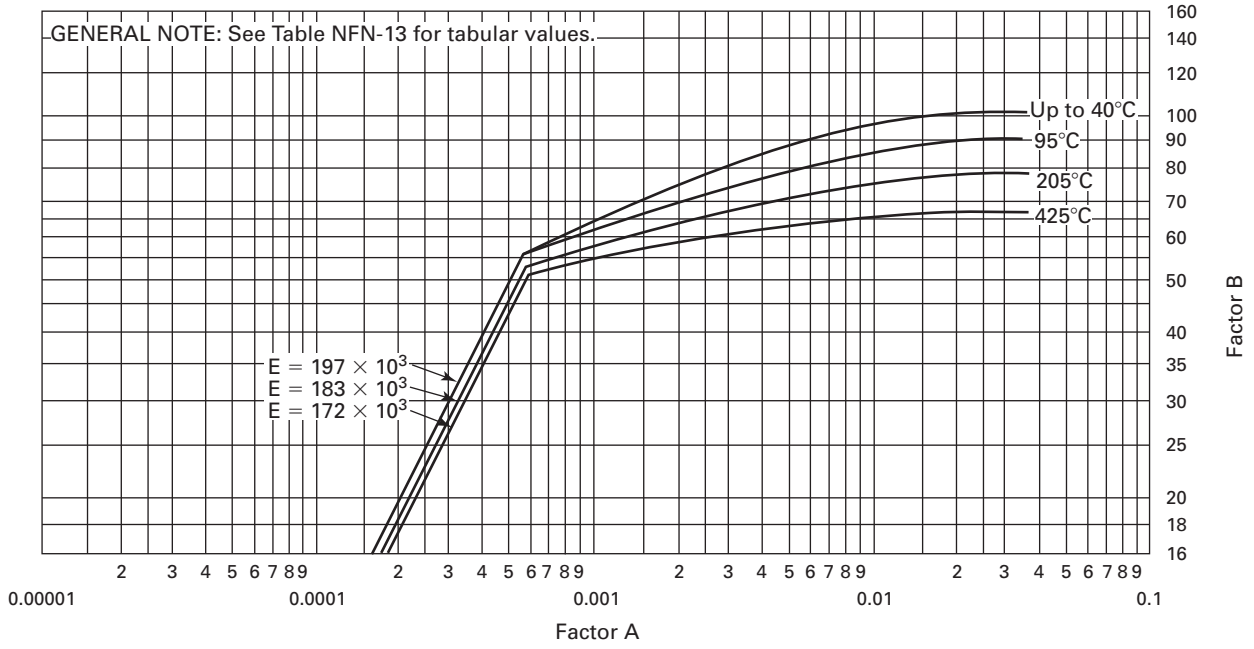


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-13
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Nickel–Iron–Chromium–Silicon Alloy N08330

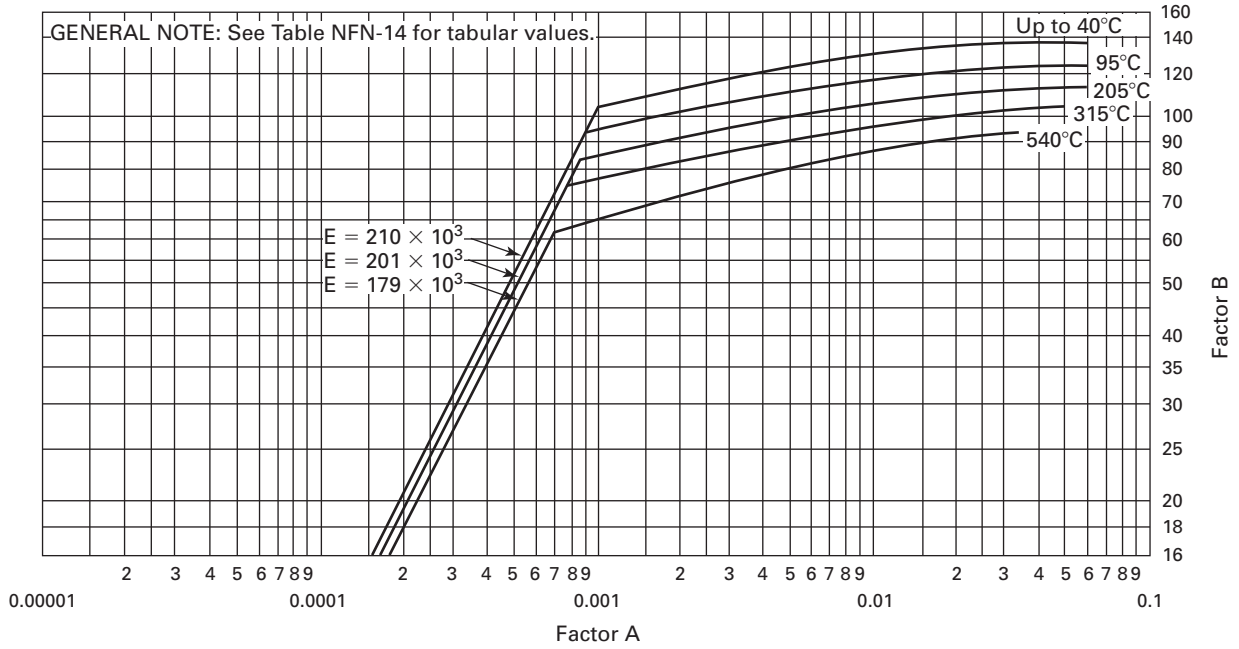


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-14
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Nickel–Chromium–Molybdenum Alloy N06455

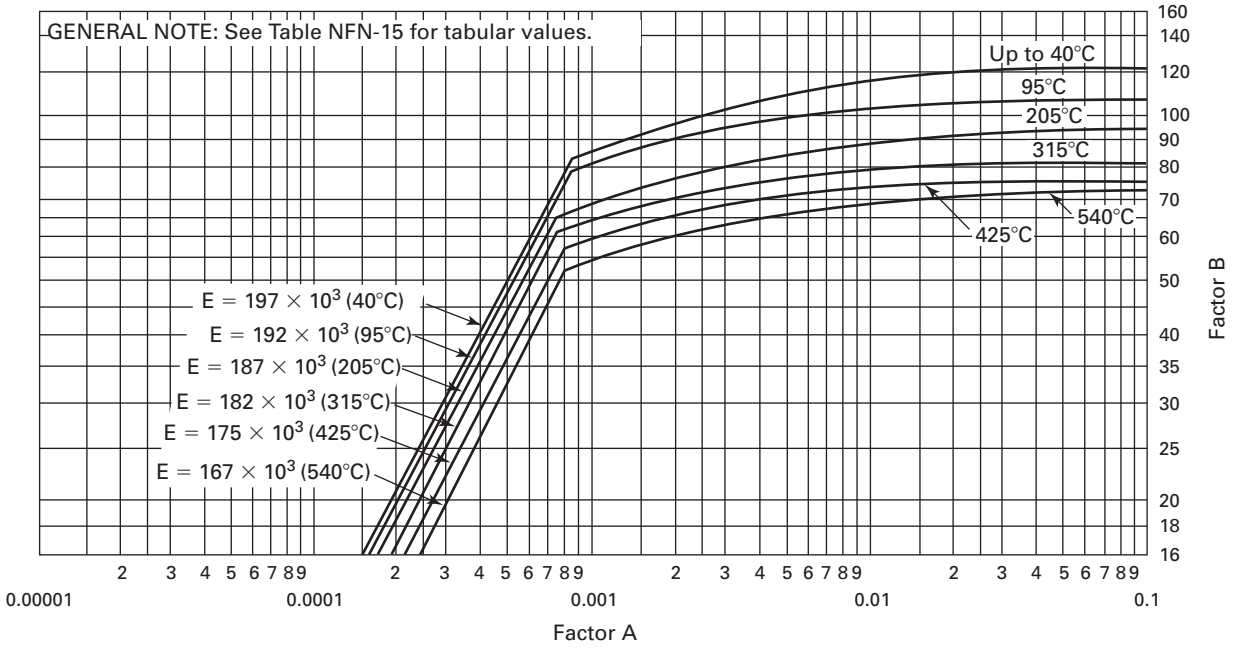


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-15
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Nickel–Molybdenum Alloy N06002

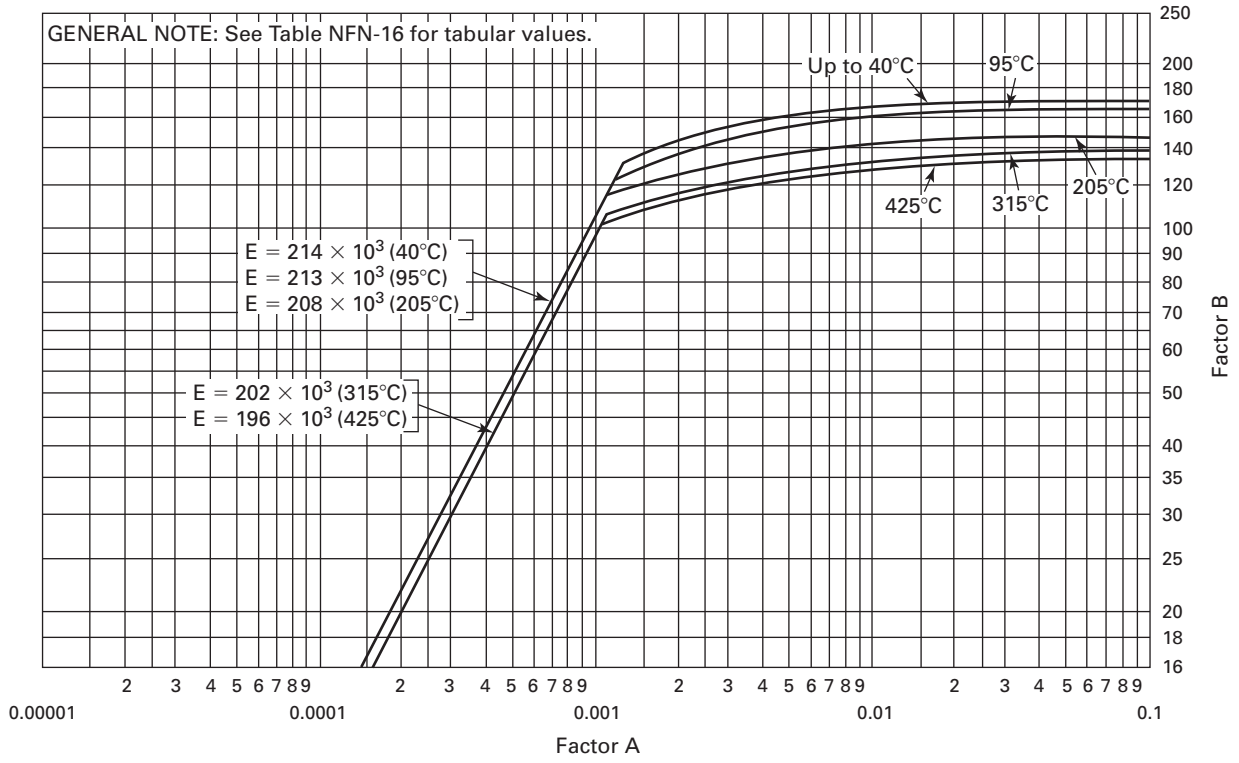


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-16
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Nickel–Molybdenum Alloy N10665

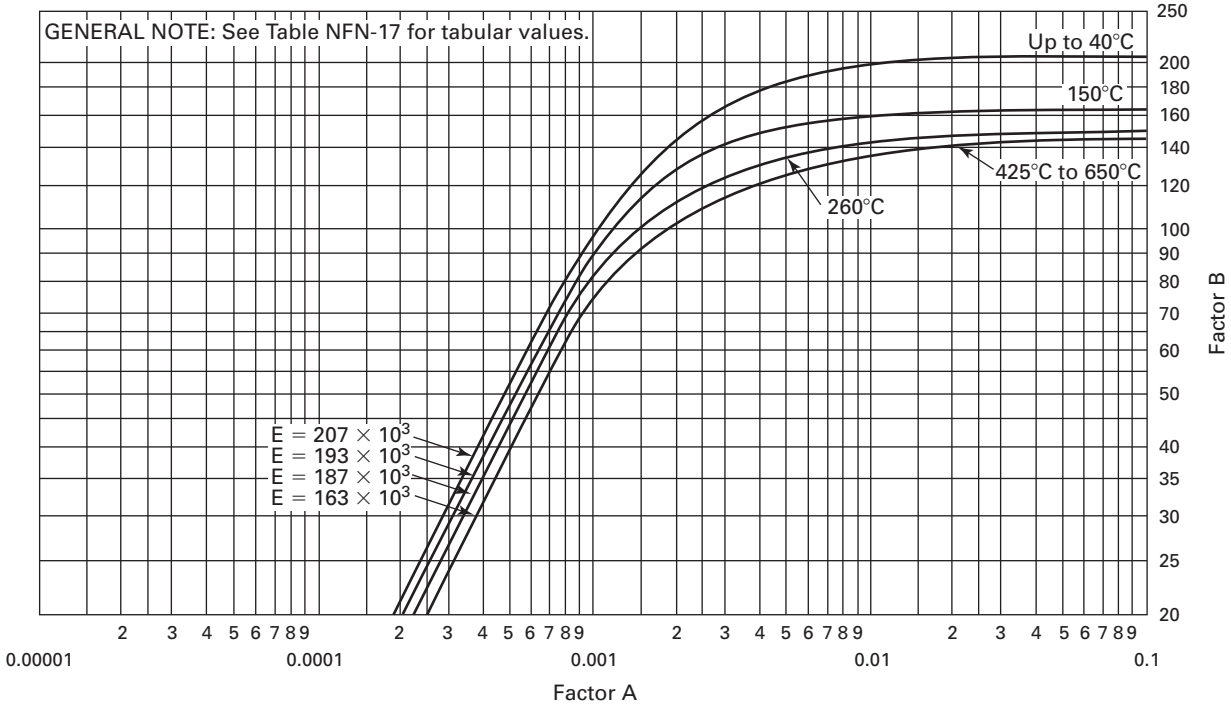


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-17
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Annealed Nickel–Chromium–Molybdenum–Columbium Alloy N06625 (SB-443, SB-444, and SB-446)

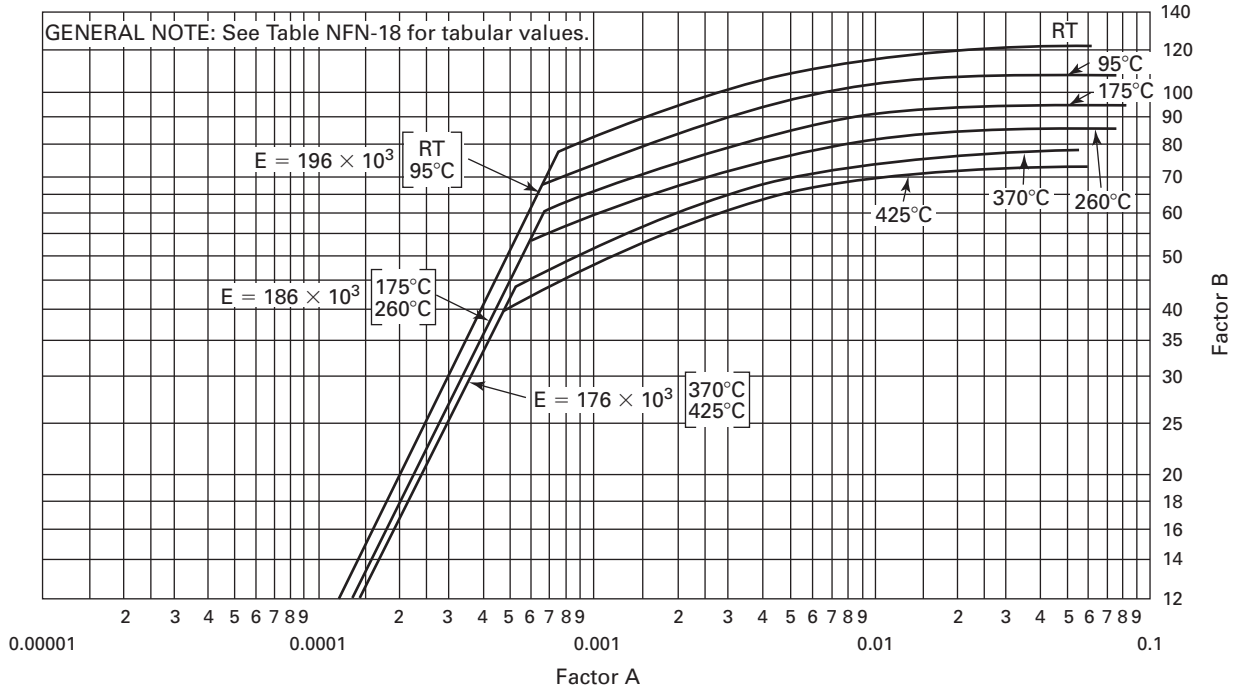


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-18
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Nickel–Molybdenum–Chromium–Iron–Copper Alloy N06985 Having a Minimum Yield Strength of 240 MPa

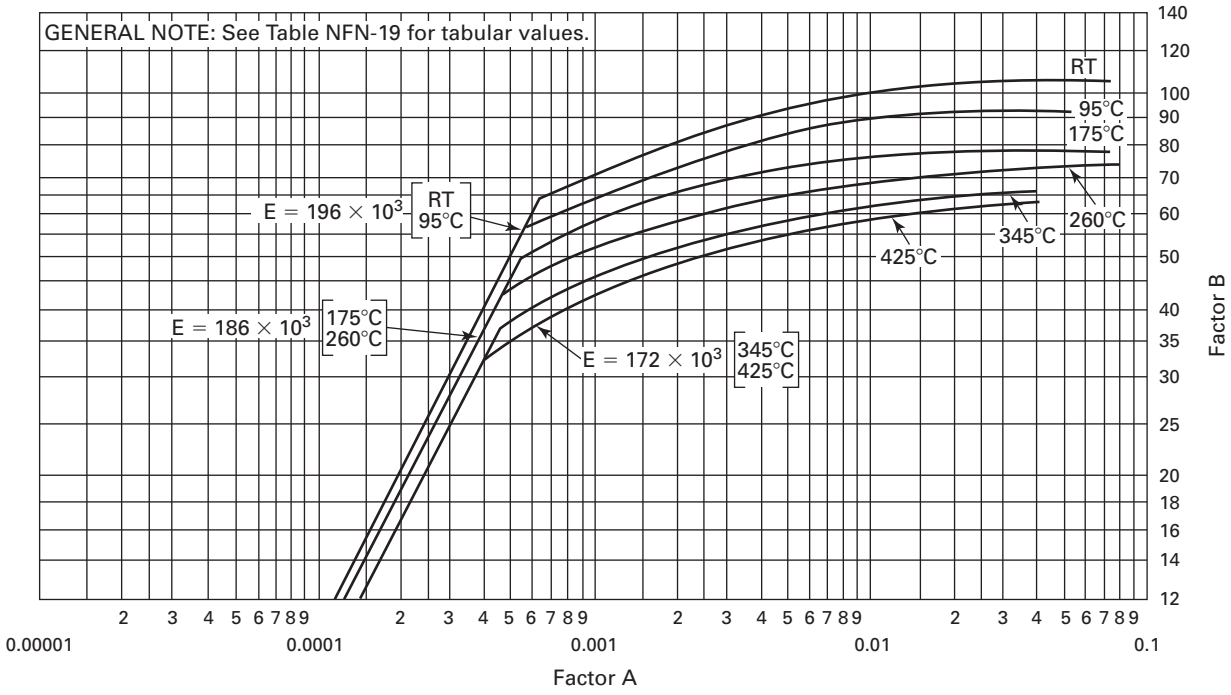


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-19
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Nickel–Molybdenum–Chromium–Iron–Copper Alloy N06985 Having a Minimum Yield Strength of 207 MPa

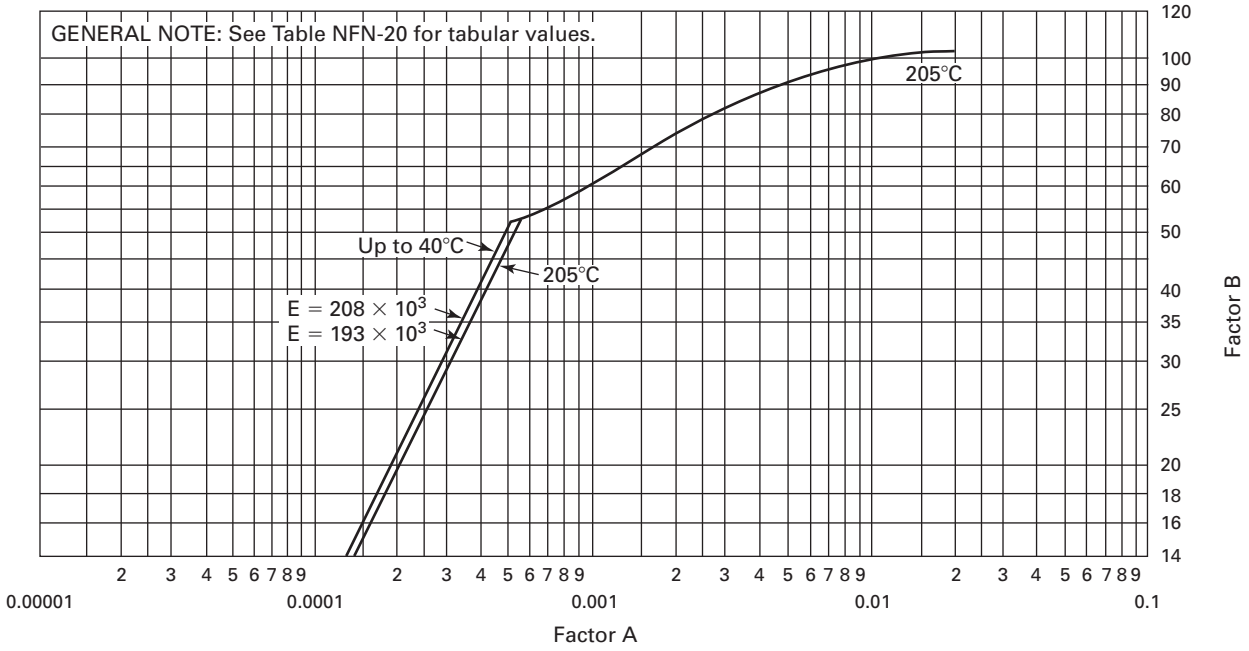


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-20
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Work-Hardened Nickel



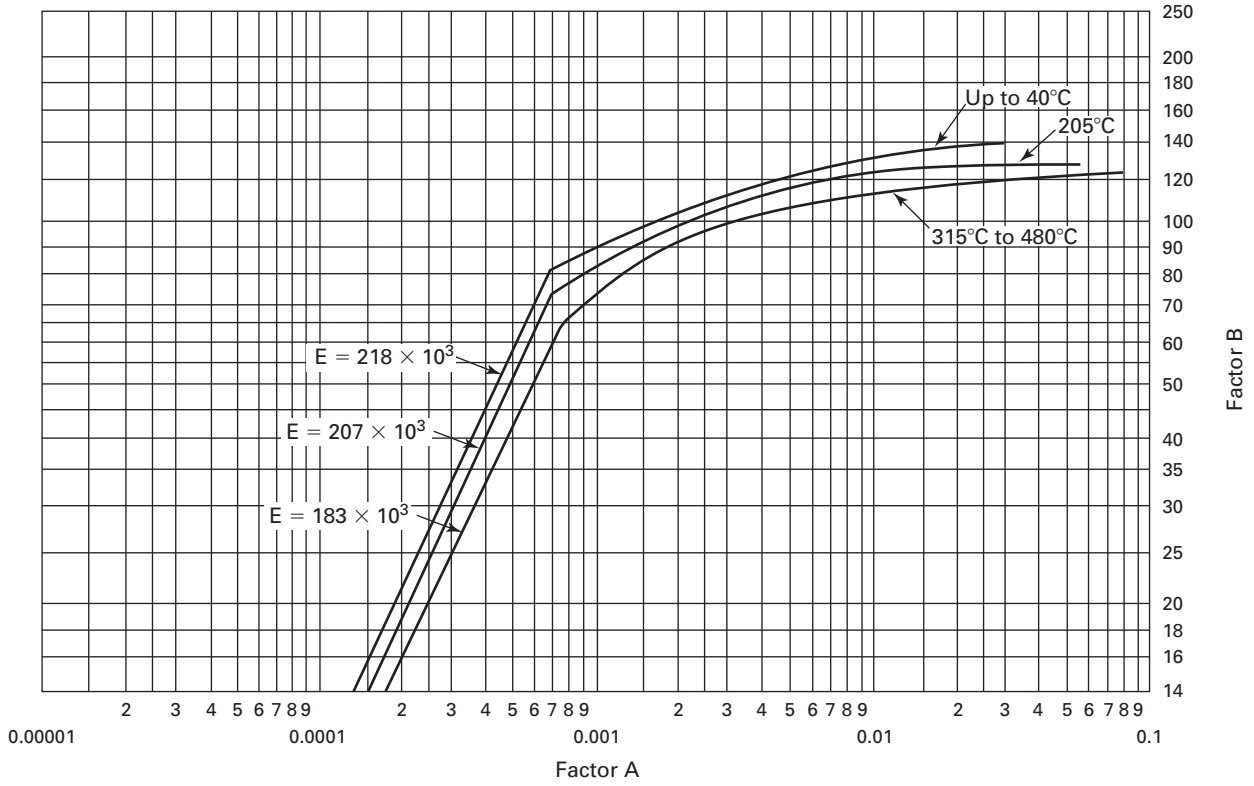
GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

(c) Vessels constructed of material covered by this chart must be subjected to an external hydrostatic test pressure of three times the maximum allowable working pressure. Thicknesses determined by this chart are minimum, and greater thickness may be required to withstand the test pressure if the planishing used does not provide an adequate degree of work-hardening.

Figure NFN-21
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Nickel–Chromium–Iron Alloy N06600 (Specified Minimum Yield Strength 276 MPa)

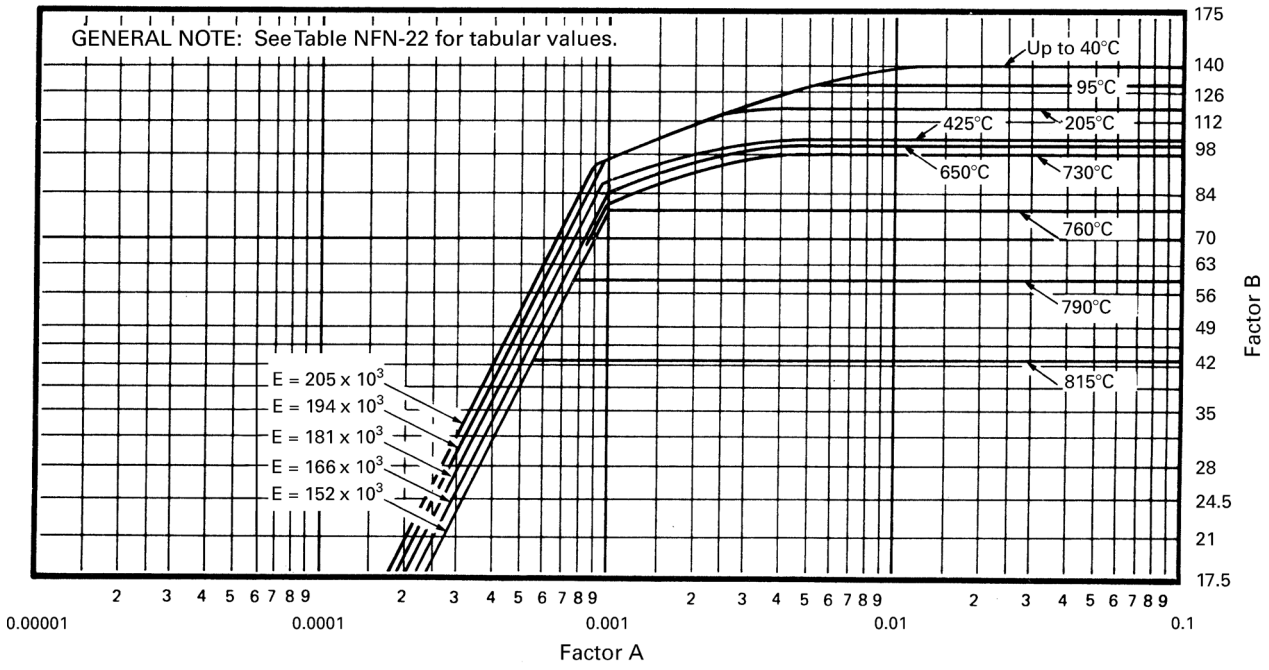


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-22
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Solution Annealed Ni–Cr–Mo–Cb Alloy, Grade 2 N06625



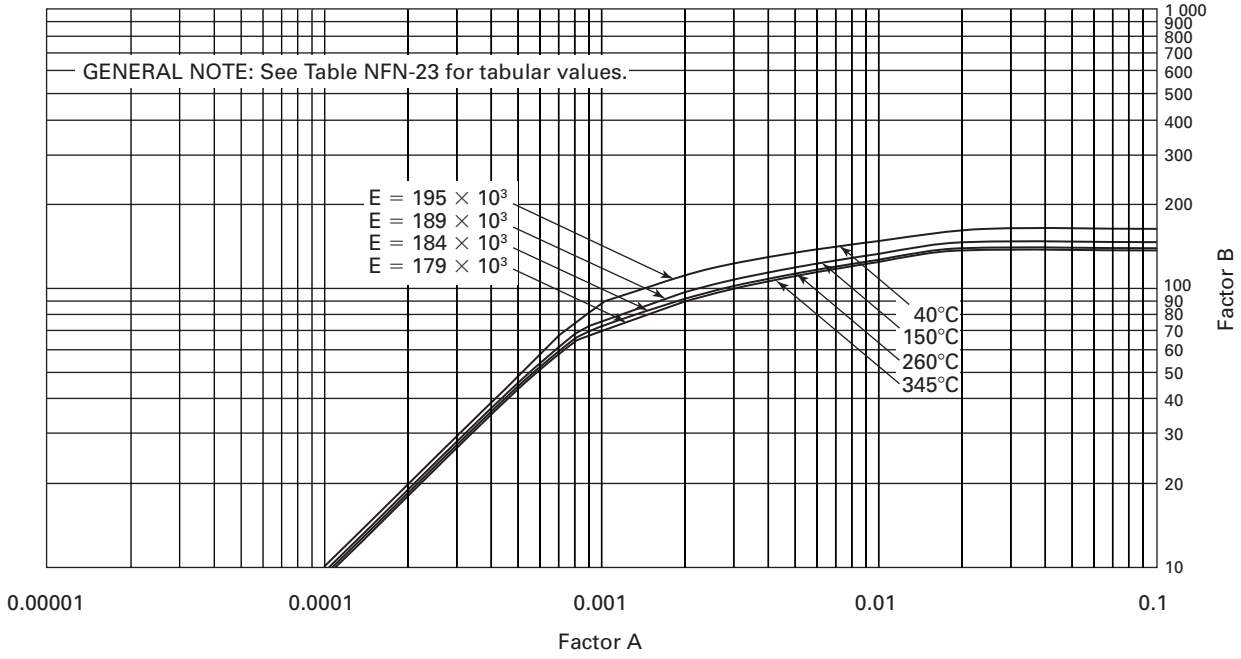
GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

(c) The external pressure chart does not account for reduction of buckling strength due to creep under long-term loads at temperatures above 650°C.

Figure NFN-23
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Cold Worked Nickel–Iron–Chromium Alloy N08800

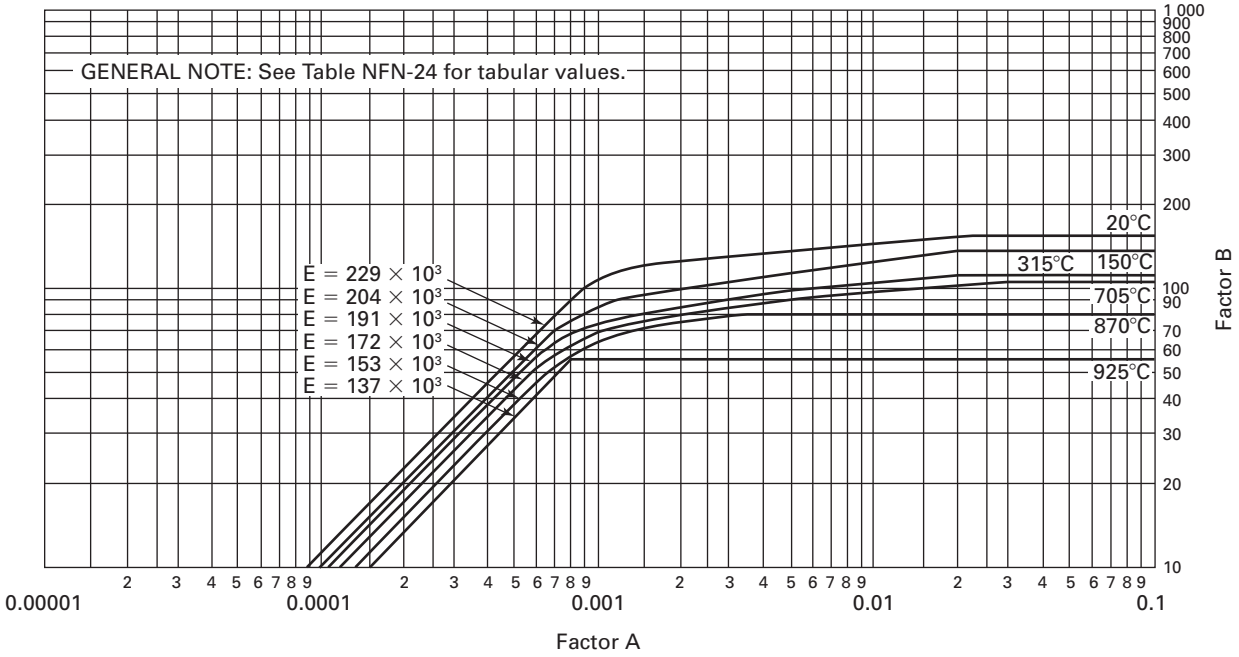


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-24
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Nickel Alloy N06230

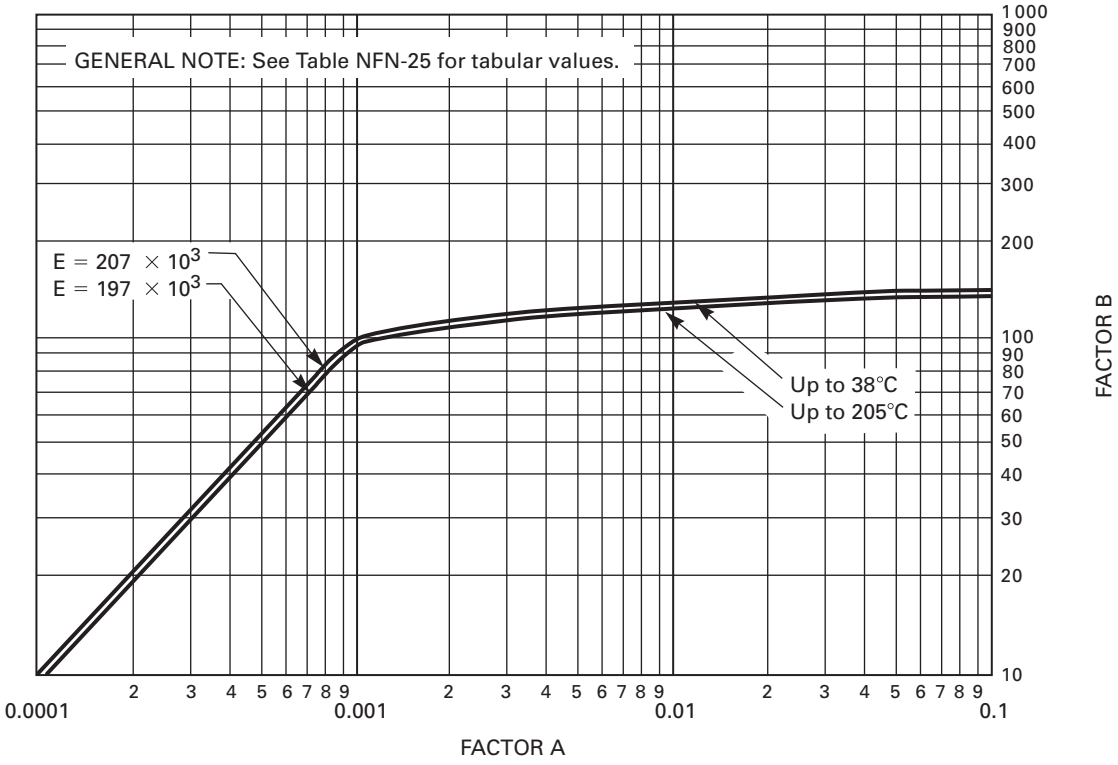


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-25
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Stress Relieved Nickel Alloy N02200

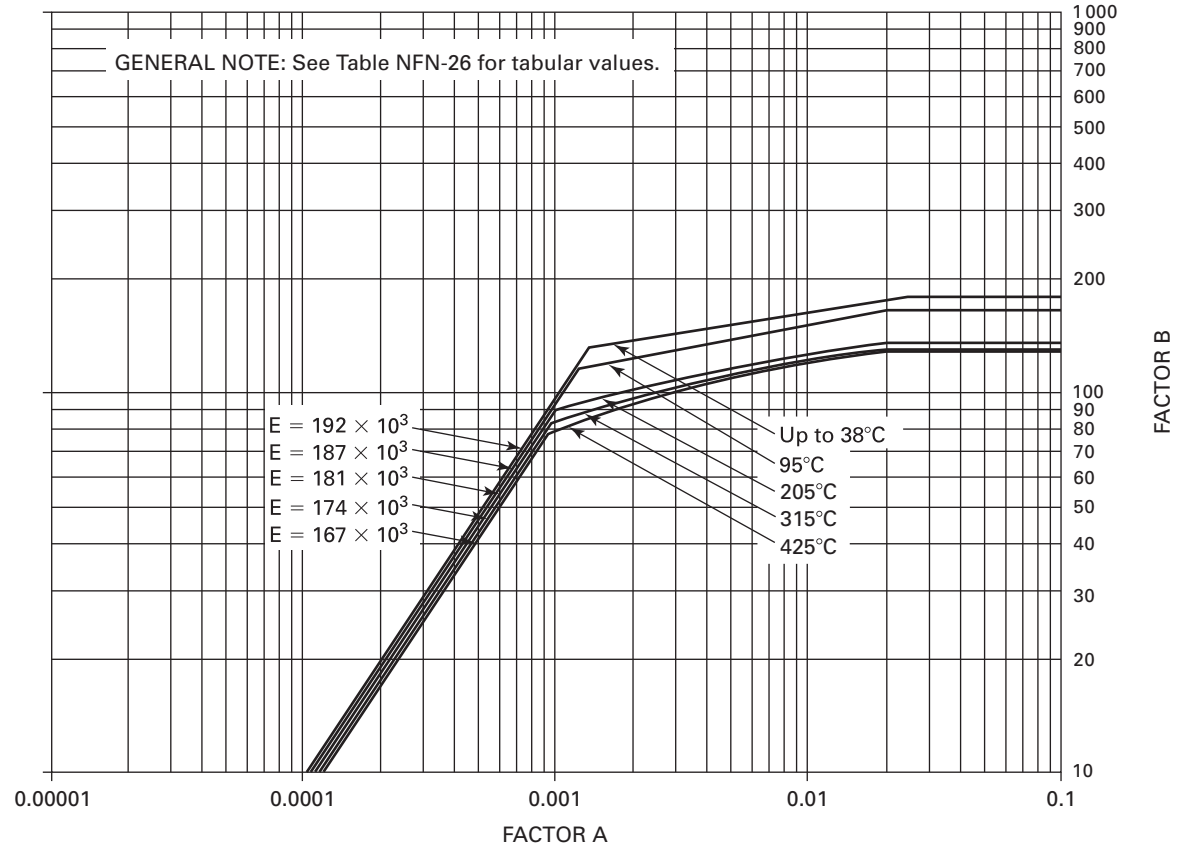


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-26
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Alloy S31277

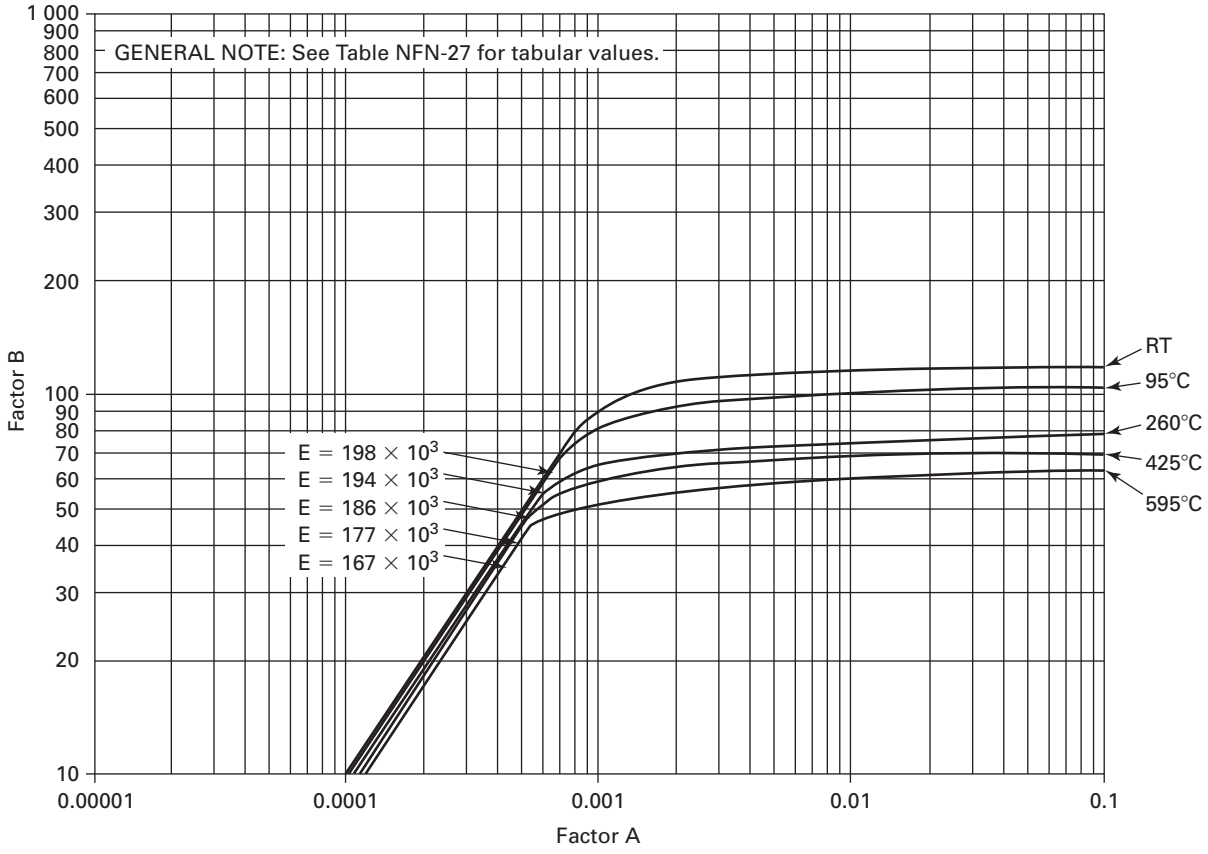


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFN-27
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Alloy N06035

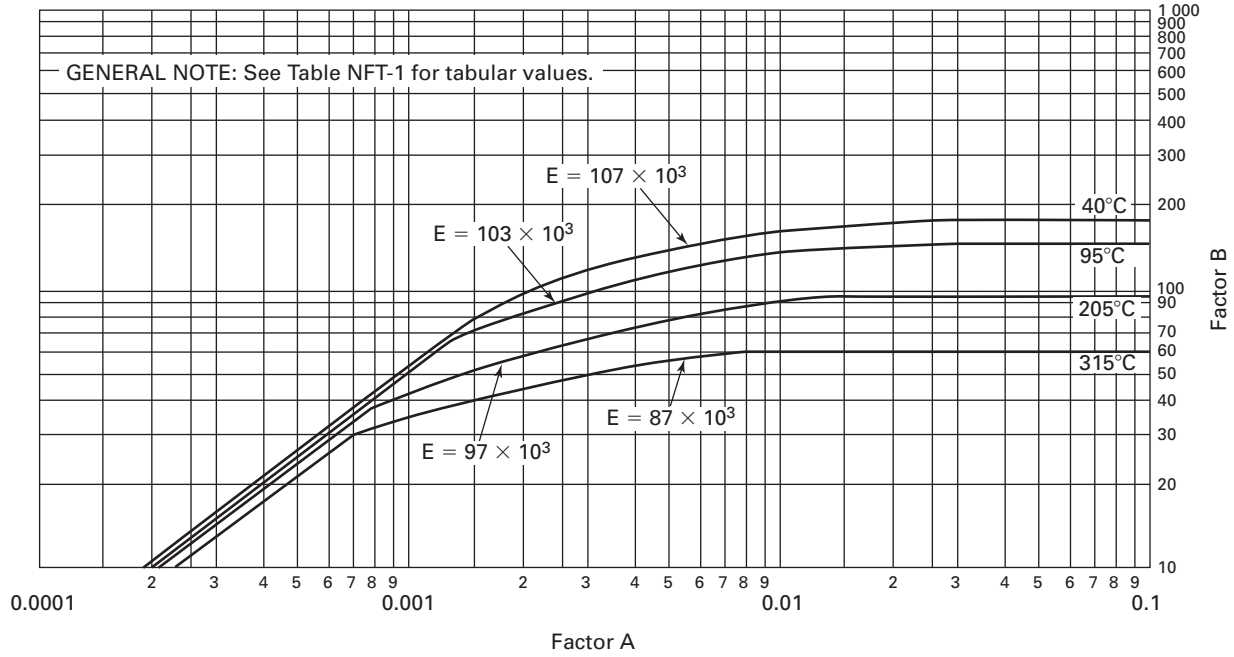


GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

Figure NFT-1
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Unalloyed Titanium Grade 3 (UNS R50550)



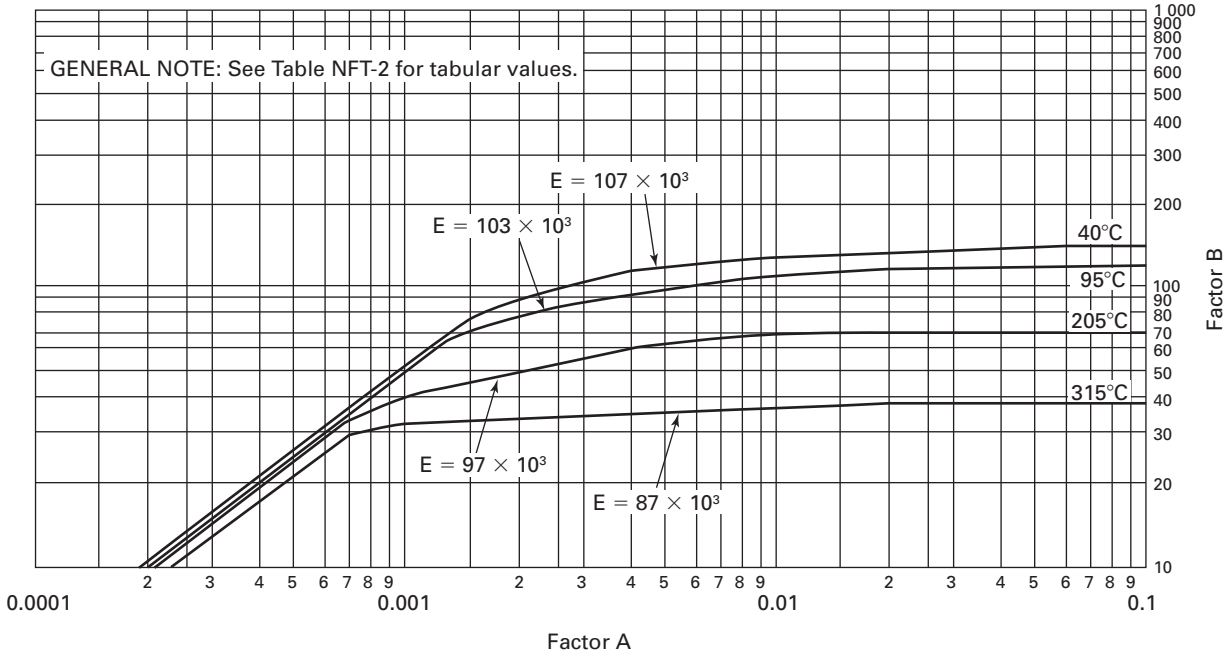
GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

(c) When unidirectionally produced bar product is utilized for stiffening rings, Factor A, elastic or inelastic, shall be multiplied by 1.1 to account for reduced stiffness.

Figure NFT-2
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Unalloyed Titanium Grade 2 (UNS R50400)



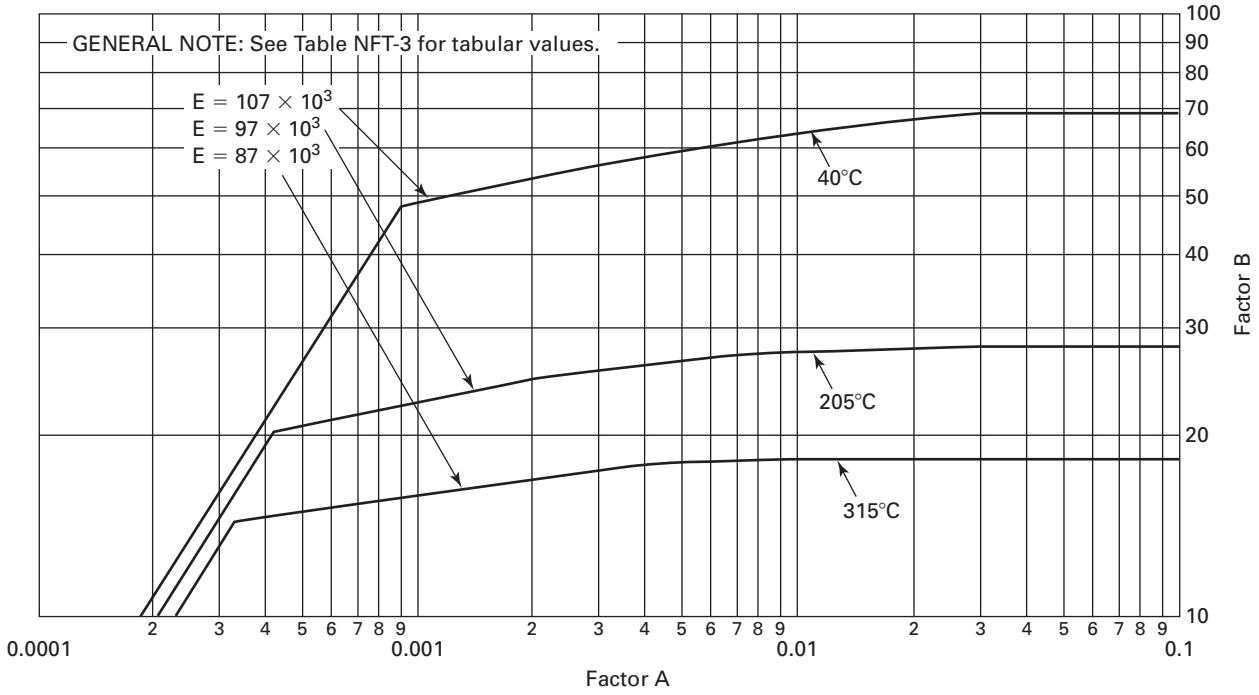
GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

(c) When unidirectionally produced bar product is utilized for stiffening rings, Factor A, elastic or inelastic, shall be multiplied by 1.1 to account for reduced stiffness.

Figure NFT-3
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Titanium Grade 1 (UNS R50250)



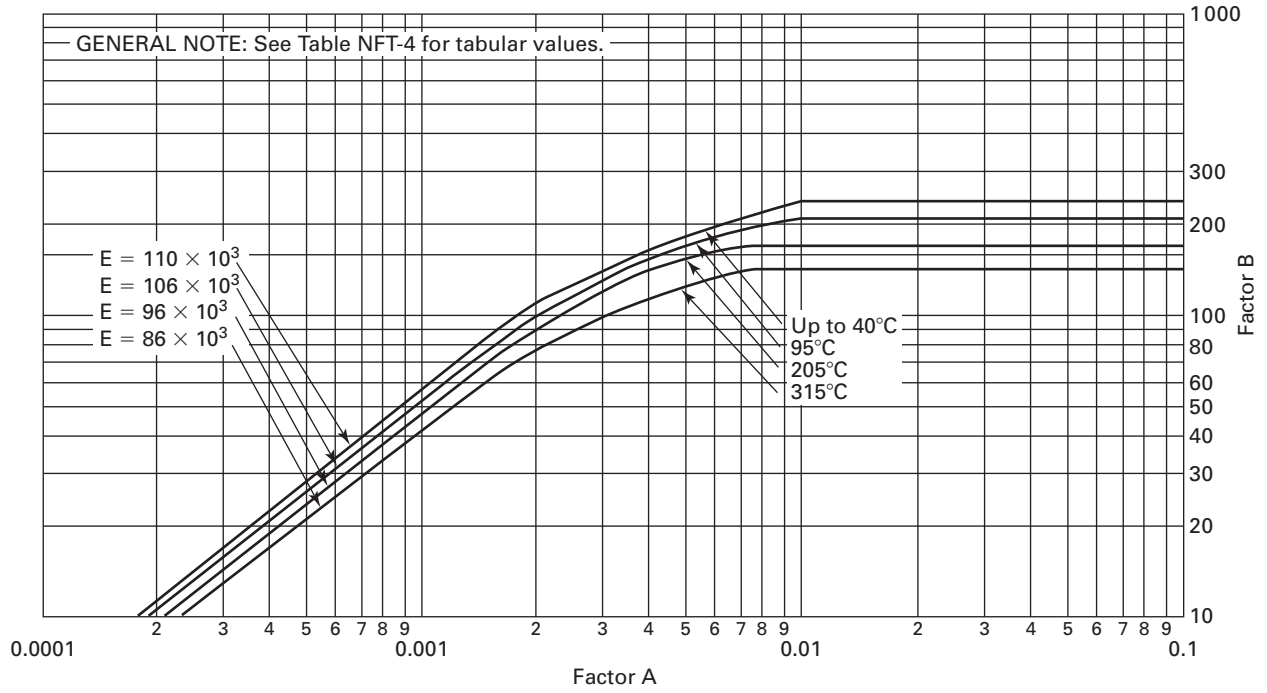
GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

(c) When unidirectionally produced bar product is utilized for stiffening rings, Factor A, elastic or inelastic, shall be multiplied by 1.1 to account for reduced stiffness.

Figure NFT-4
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Titanium Grade 9 Alloy (UNS R56320)



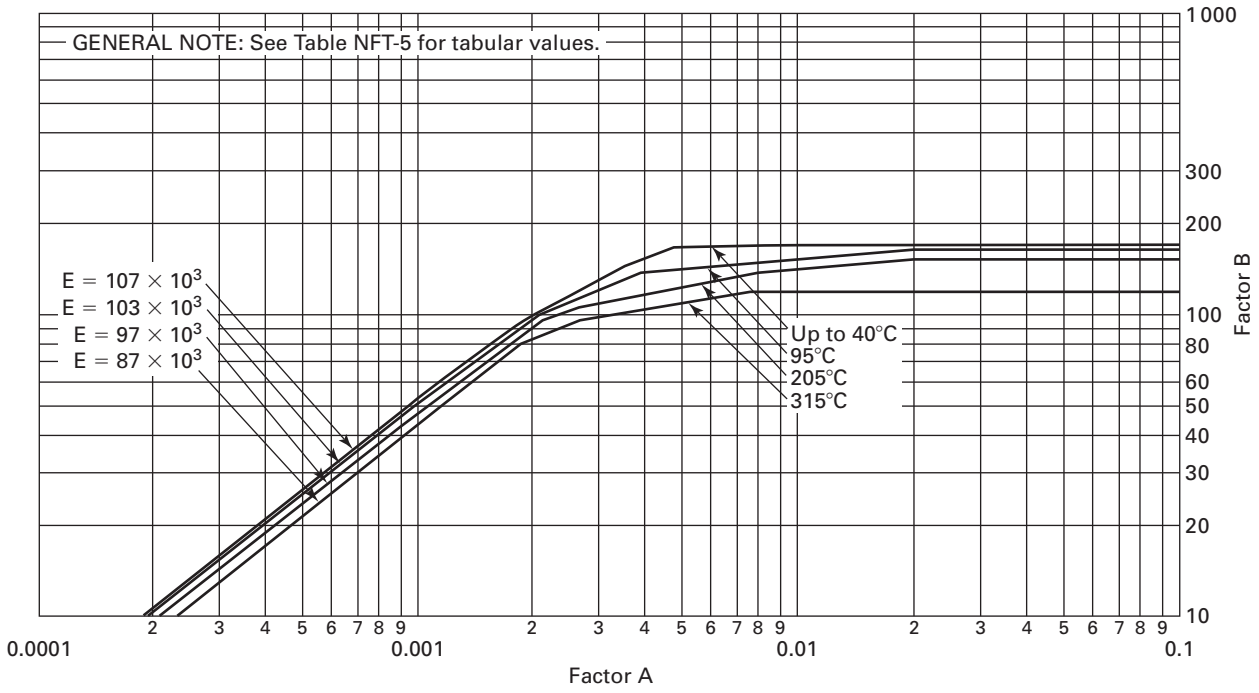
GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

(c) When unidirectionally produced bar product is utilized for stiffening rings, Factor A, elastic or inelastic, shall be multiplied by 1.1 to account for reduced stiffness.

Figure NFT-5
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Titanium Grade 12 Alloy (UNS R53400)



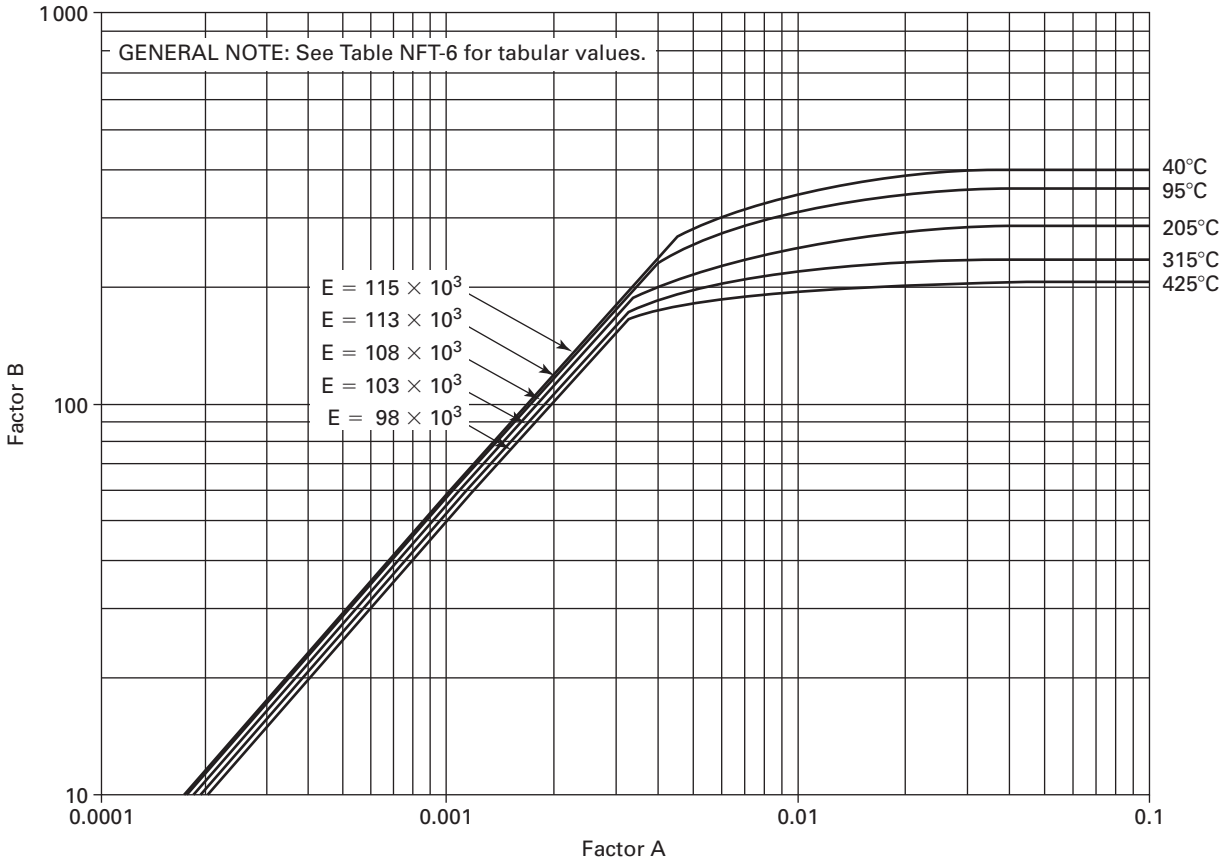
GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

(c) When unidirectionally produced bar product is utilized for stiffening rings, Factor A, elastic or inelastic, shall be multiplied by 1.1 to account for reduced stiffness.

Figure NFT-6
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Titanium Grade 38 (UNS R54250)



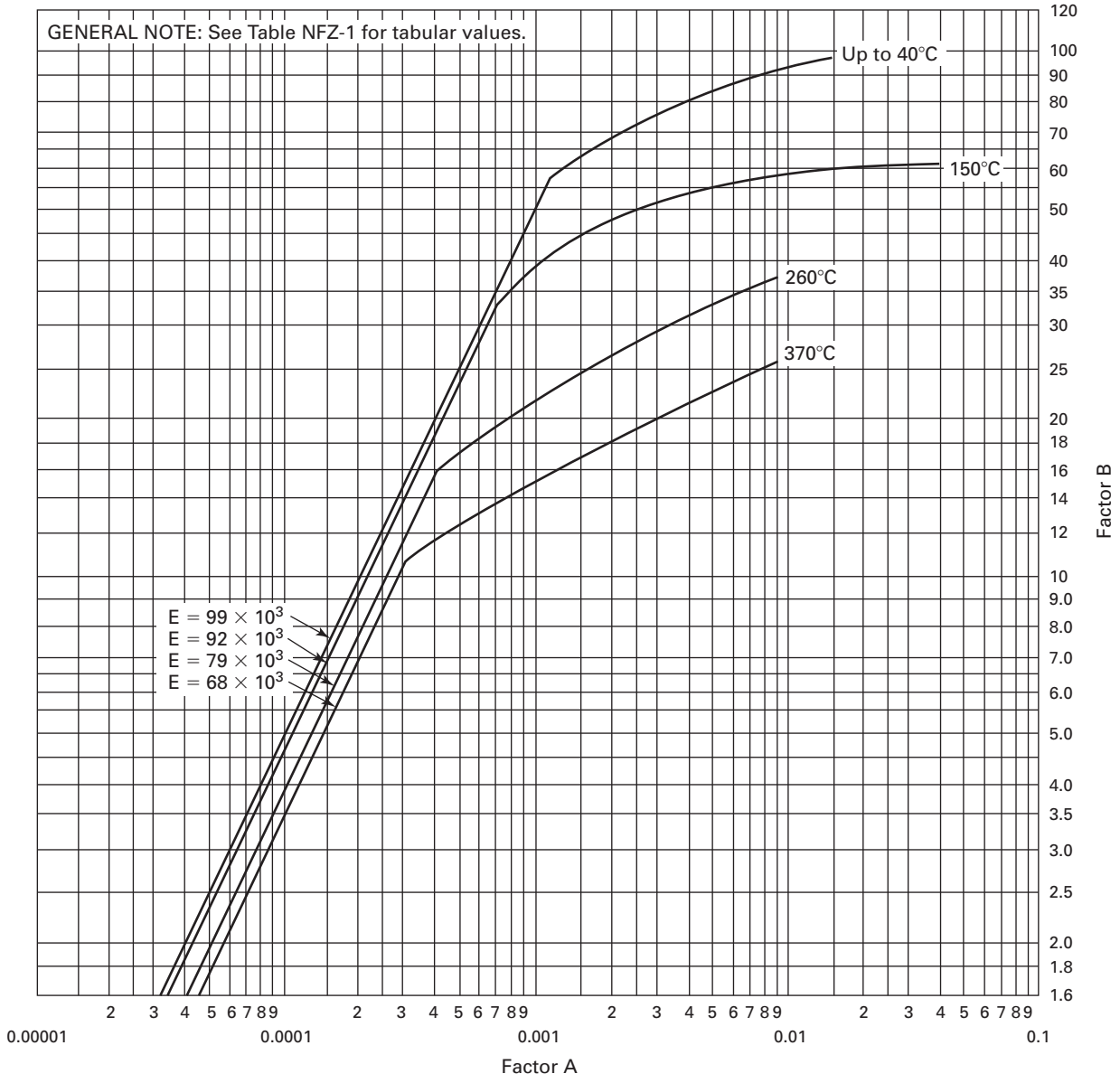
GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

(c) When unidirectionally produced bar product is utilized for stiffening rings, Factor A, elastic or inelastic, shall be multiplied by 1.1 to account for reduced stiffness.

Figure NFZ-1
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Zirconium Alloy (UNS R60702)



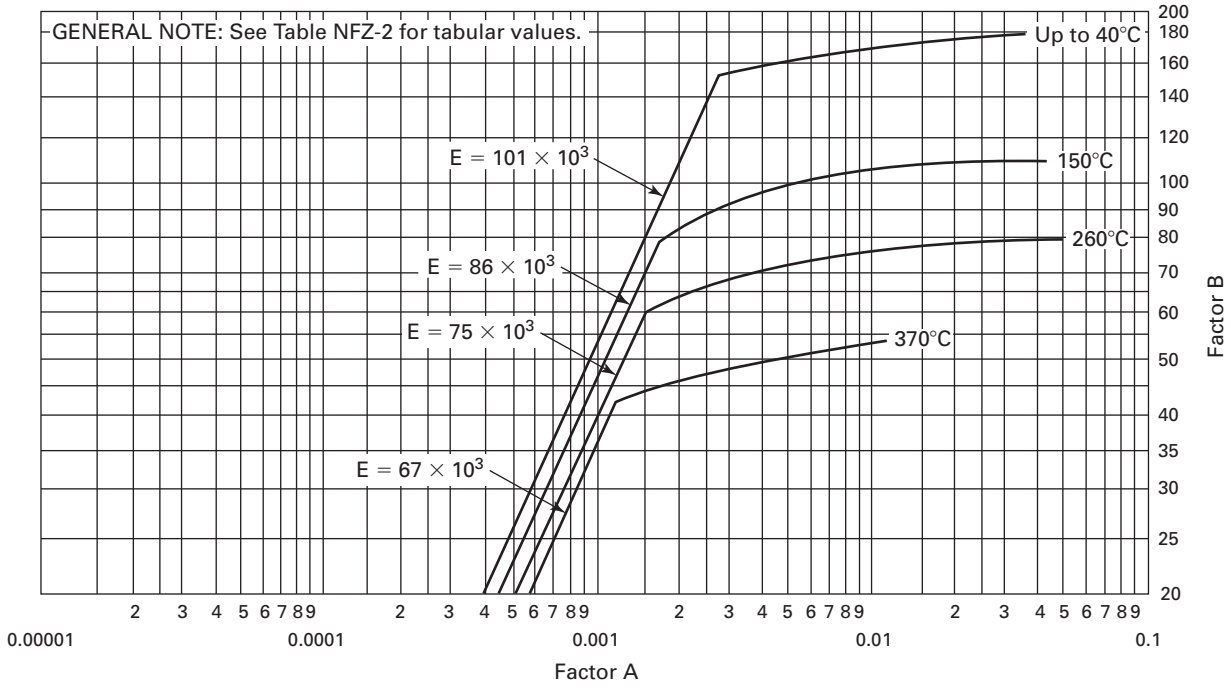
GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

(c) When unidirectionally produced bar product is utilized for stiffening rings, Factor A, elastic or inelastic, shall be multiplied by 1.1 to account for reduced stiffness.

Figure NFZ-2
Chart for Determining Shell Thickness of Components Under External Pressure Developed for Zirconium Alloy (UNS R60705)



GENERAL NOTES:

(a) The external pressure charts do not account for reduction of buckling strength due to creep under long-term loads. The effect of creep on buckling shall be considered at temperatures for which allowable stresses are shown italicized in Tables 1A, 1B, 5A, and 5B, and in boldface in Tables 2A and 2B.

(b) The external pressure chart assigned for a particular material is obtained from Tables 1A, 1B, 2A, 2B, 5A, and 5B under the column for External Pressure Chart No. for that material and is mandatory, with the exception of Tables 5A and 5B.

(c) When unidirectionally produced bar product is utilized for stiffening rings, Factor A, elastic or inelastic, shall be multiplied by 1.1 to account for reduced stiffness.

Table G
Tabular Values for Figure G

D_o/t	L/D_o	A	D_o/t	L/D_o	A	D_o/t	L/D_o	A	D_o/t	L/D_o	A	D_o/t	L/D_o	A	D_o/t	L/D_o	A
4	2.2	0.959 −01	8	5.0	0.184 −01	20	3.0	0.446 −02	30	30.0	0.122 −02	60	0.074	0.954 −01	100	0.20	0.831 −02
	2.6	0.884		7.0	0.179		3.4	0.388		50.0	0.122		0.10	0.556		0.40	0.364
	3.0	0.839		10.0	0.176		4.0	0.342					0.14	0.323		0.5	0.283
	4.0	0.783		20.0	0.174		5.0	0.308	40	0.12	0.864 −01		0.2	0.193		0.8	0.170
	5.0	0.759		50.0	0.174		7.0	0.287		0.2	0.385		0.4	0.812 −02		1.0	0.134
	7.0	0.739					10.0	0.280		0.3	0.222		0.6	0.510		2.0	0.641 −03
	10.0	0.729	10	0.56	0.964 −01		40.0	0.275		0.4	0.155		0.8	0.371		4.0	0.305
	30.0	0.720		0.7	0.720		50.0	0.275		0.6	0.958 −02		1.0	0.291		6.0	0.195
	50.0	0.720		1.0	0.463					0.8	0.691		2.0	0.138		8.0	0.142
				1.2	0.371	25	0.2	0.877 −01		1.0	0.539		3.0	0.886 −03		10.0	0.124
5	1.4	0.929 −01		2.0	0.201		0.3	0.484		1.2	0.441		4.0	0.645		14.0	0.114
	1.6	0.802		2.4	0.165		0.5	0.250		2.0	0.252		6.0	0.409		25.0	0.110
	2.0	0.658		3.0	0.139		0.8	0.143		4.0	0.117		7.0	0.364		50.0	0.110
	2.4	0.586		4.0	0.124		1.0	0.111		5.0	0.912 −03		8.0	0.341			
	3.0	0.532		5.0	0.118		1.2	0.902 −02		6.0	0.804		10.0	0.322	125	0.05	0.480 −01
	4.0	0.494		7.0	0.114		2.0	0.508		7.0	0.756		14.0	0.310		0.06	0.344
	5.0	0.478		10.0	0.112		3.0	0.323		8.0	0.731		40.0	0.306		0.08	0.210
	7.0	0.465		16.0	0.111		3.4	0.278		10.0	0.708		50.0	0.306		0.10	0.148
	10.0	0.459		50.0	0.111		4.0	0.235		16.0	0.692					0.14	0.917 −02
	30.0	0.454					4.4	0.219		40.0	0.688	80	0.054	0.990 −01		0.2	0.578
	50.0	0.453	15	0.34	0.968 −01		5.0	0.204		50.0	0.688		0.07	0.608		0.4	0.257
				0.4	0.770		6.0	0.191					0.09	0.391		0.6	0.165
6	1.2	0.837 −01		0.6	0.453		7.0	0.186	50	0.088	0.930 −01		0.10	0.328		0.8	0.121
	1.6	0.584		1.0	0.244		10.0	0.180		0.1	0.782		0.14	0.196		1.0	0.955 −03
	2.0	0.469		1.2	0.197		30.0	0.176		0.2	0.263		0.20	0.120		2.0	0.459
	2.4	0.411		2.0	0.109		50.0	0.176		0.3	0.154		0.24	0.950 −02		4.0	0.220
	3.0	0.369		2.4	0.890 −02					0.4	0.108		0.4	0.516		6.0	0.141
	4.0	0.341		3.0	0.691	30	0.16	0.904 −01		0.6	0.677 −02		0.6	0.328		9.0	0.904 −04
	5.0	0.329		4.0	0.573		0.2	0.635		0.8	0.490		0.8	0.239		10.0	0.837
	7.0	0.320		5.0	0.534		0.3	0.357		1.0	0.384		1.0	0.188		12.0	0.770
	10.0	0.316		6.0	0.516		0.4	0.246		2.0	0.181		2.0	0.895 −03		14.0	0.740
	30.0	0.312		10.0	0.497		0.6	0.150		4.0	0.842 −03		4.0	0.424		20.0	0.713
	50.0	0.312		40.0	0.490		0.8	0.108		5.0	0.652		6.6	0.241		40.0	0.704
				50.0	0.490		1.0	0.838 −02		6.0	0.548		8.0	0.205		50.0	0.704
8	0.74	0.968 −01					1.2	0.683		7.0	0.502		10.0	0.186			
	0.8	0.875	20	0.24	0.982 −01		2.0	0.388		8.0	0.478		14.0	0.176	150	0.05	0.338 −01
	1.0	0.660		0.4	0.477		3.0	0.246		10.0	0.458		30.0	0.172		0.06	0.244
	1.6	0.372		0.6	0.286		4.0	0.177		12.0	0.449		50.0	0.172		0.08	0.151
	2.0	0.285		0.8	0.203		4.4	0.161		16.0	0.444					0.10	0.108
	2.4	0.242		1.0	0.156		5.0	0.147		40.0	0.440	100	0.05	0.741 −01		0.12	0.833 −02
	3.0	0.212		1.2	0.127		6.0	0.136		50.0	0.440		0.07	0.398		0.16	0.569
	4.0	0.192		2.0	0.713 −02		7.0	0.130					0.10	0.220		0.2	0.431
							10.0	0.125					0.14	0.133		0.4	0.194

Table G
Tabular Values for Figure G (Cont'd)

D_o/t	L/D_o	A	D_o/t	L/D_o	A	D_o/t	L/D_o	A	D_o/t	L/D_o	A	D_o/t	L/D_o	A	D_o/t	L/D_o	A
150	0.6	0.125 −02	200	12.0	0.338 −04	300	0.05	0.923 −02	400	0.4	0.429 −03	500	12.0	0.880 −05	800	0.6	0.980 −04
	1.0	0.726 −03		14.0	0.309		0.06	0.690		0.6	0.280					0.8	0.728
	2.0	0.349		16.0	0.295		0.08	0.452		0.8	0.207	600	0.05	0.270 −02		1.0	0.580
	4.0	0.168		20.0	0.283		0.10	0.334		1.0	0.165		0.06	0.208		2.0	0.286
	6.0	0.108		40.0	0.275		0.12	0.264		2.0	0.808 −04		0.08	0.142		4.0	0.140
	8.0	0.787 −04		50.0	0.275		0.2	0.143		4.0	0.393		0.10	0.108		5.0	0.112
	10.0	0.619					0.4	0.666 −03		6.0	0.257		0.12	0.868 −03		5.6	0.992 −05
	12.0	0.553	250	0.05	0.129 −01		0.6	0.433		8.0	0.189		0.16	0.624			
	16.0	0.510		0.06	0.955 −02		0.8	0.321		10.0	0.148		0.2	0.486	1 000	0.05	0.113 −02
	20.0	0.498		0.08	0.617		1.0	0.254		14.0	0.102		0.4	0.231		0.06	0.891 −03
	40.0	0.489		0.10	0.452		2.0	0.124		16.0	0.882 −05		0.6	0.151		0.07	0.733
	50.0	0.489		0.14	0.293		4.0	0.602 −04					0.8	0.112		0.09	0.541
				0.2	0.191		6.0	0.393	500	0.05	0.370 −02		1.0	0.894 −04		0.12	0.388
200	0.05	0.196 −01		0.4	0.881 −03		8.0	0.287		0.06	0.284		2.0	0.439		0.16	0.282
	0.06	0.143		0.6	0.572		10.0	0.225		0.08	0.192		4.0	0.216		0.2	0.221
	0.08	0.909 −02		0.8	0.422		14.0	0.156		0.10	0.145		6.0	0.141		0.4	0.106
	0.10	0.659		1.0	0.335		16.0	0.142		0.12	0.116		8.0	0.104		0.7	0.596 −04
	0.14	0.421		2.0	0.163		20.0	0.130		0.16	0.830 −03		8.4	0.988 −05		1.0	0.414
	0.2	0.272		4.0	0.789 −04		40.0	0.123		0.2	0.645					2.0	0.204
	0.3	0.171		6.0	0.513		50.0	0.122		0.4	0.305	800	0.05	0.165 −02		4.0	0.101
	0.5	0.976 −03		8.0	0.377					0.6	0.199		0.06	0.129		4.2	0.957 −05
	0.8	0.592		10.0	0.293	400	0.05	0.549 −02		0.8	0.148		0.08	0.892 −03			
	1.0	0.469		12.0	0.238		0.06	0.417		1.0	0.118		0.10	0.682			
	2.0	0.227		14.0	0.210		0.08	0.278		2.0	0.579 −04		0.12	0.551			
	4.0	0.110		16.0	0.196		0.10	0.208		4.0	0.282		0.16	0.398			
	6.0	0.711 −04		20.0	0.184		0.12	0.166		6.0	0.185		0.2	0.312			
	8.0	0.520		40.0	0.176		0.16	0.118		8.0	0.137		0.4	0.149			
	10.0	0.403		50.0	0.176		0.2	0.914 −03		10.0	0.107						

GENERAL NOTE: Extrapolation is not permitted except as explicitly allowed by the Construction Code.

Table CS-1
Tabular Values for Figure CS-1

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
150	1.00 −05	1.00 +00	370	9.00	4.48
	1.20 −04	1.20 +01		1.00 −03	4.59
	6.45 −04	6.48 +01		1.50	5.00
	7.00	6.83		2.00	5.24
	8.00	7.24		2.12 −02	7.58
	9.00	7.52		1.00 −01	7.58
	1.00 −03	7.72			
	1.50	8.23	425	1.00 −05	7.85 −01
	2.00	8.48		1.53 −04	1.20 +01
	9.50	9.51		3.67 −04	2.87 +01
	2.00 −02	9.51		4.00	3.00
	1.00 −01	9.51		5.00	3.21
				6.00	3.34
260	1.00 −05	9.30 −01		7.00	3.52
	1.29 −04	1.20 +01		1.00 −03	3.86
	5.13 −04	4.83 +01		1.50	4.17
	6.00	5.15		2.00	4.41
	8.00	5.58		2.25 −02	6.72
	1.00 −03	5.86		1.00 −01	6.72
	1.50	6.45			
	2.50	6.86	480	1.00 −05	7.15 −01
	1.95 −02	9.03		1.68 −04	1.20 +01
	1.00 −01	9.03		3.31 −04	2.41 +01
				5.00	2.72
370	1.00 −05	8.45 −01		7.00	2.96
	1.42 −04	1.20 +01		1.00 −03	3.25
	4.13 −04	3.54 +01		1.50	3.56
	5.00	3.83		2.50	3.96
	6.00	4.00		2.13 −02	5.86
	7.00	4.21		1.00 −01	5.86
	8.00	4.34			

Table CS-2
Tabular Values for Figure CS-2

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
150	1.00 −05	1.00 +00	370	1.89 −04	1.60 +01
	1.60 −04	1.60 +01		5.64 −04	4.69 +01
	7.83 −04	7.79 +01		1.00 −03	5.52
	8.00	7.86		3.00	6.96
	9.00	8.14		1.00 −02	8.34
	1.00 −03	8.48		2.64	9.51
	2.00	1.03 +02		1.00 −01	9.51
	3.00	1.12			
	4.00	1.16	425	1.00 −05	7.85 −01
	5.00	1.19		2.04 −04	1.60 +01
	2.50 −02	1.21		5.05 −04	3.94 +01
	1.00 −01	1.21		1.00 −03	4.90
				1.50	5.48
260	1.00 −05	9.30 −01		2.00	5.79
	1.72 −04	1.60 +01		3.00	6.14
	6.75 −04	6.21 +01		3.19 −02	8.55
	9.00	6.65		1.00 −01	8.55
	1.00 −03	6.89			
	2.50	8.27	480	1.00 −05	7.15 −01
	3.00	8.55		2.24 −04	1.60 +01
	8.00	9.79		4.28 −04	3.10 +01
	1.00 −02	1.01 +02		1.00 −03	4.14
	1.50	1.07		1.50	4.69
	2.00	1.11		2.00	5.07
	2.80	1.17		3.00	5.45
	1.00 −01	1.17		8.00	6.34
				3.00 −02	7.65
370	1.00 −05	8.45 −01		1.00 −01	7.65

Table CS-3
Tabular Values for Figure CS-3

Yield Strength, MPa	A	B, MPa
414	1.00 −05	1.00 +00
	3.00 −04	3.00 +01
	1.00 −03	1.00 +02
	1.66	1.65
	1.00 −01	2.07
379	1.00 −05	1.00 +00
	3.00 −04	3.00 +01
	1.00 −03	1.00 +02
	1.52	1.52
	1.00 −01	1.86
345	1.00 −05	1.00 +00
	3.00 −04	3.00 +01
	1.00 −03	1.00 +02
	1.38	1.38
	1.00 −01	1.72
310	1.00 −05	1.00 +00
	3.00 −04	3.00 +01
	1.00 −03	1.00 +02
	1.24	1.24
	1.00 −01	1.55
262 to 276	1.00 −05	1.00 +00
	3.00 −04	3.00 +01
	1.00 −03	1.00 +02
	1.10	1.10
	1.00 −01	1.38

Table CS-4
Tabular Values for Figure CS-4

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40 (Cl. 2)	1.00 −05	1.03 +00	150 (Cl. 2)	1.00 −05	9.95 −01
	3.38 −04	3.50 +01		3.52 −04	3.50 +01
	1.56 −03	1.74 +02		1.35 −03	1.41 +02
	3.00	1.85		6.00	1.59
	7.00	1.98		1.00 −02	1.65
	9.00	2.00		4.00	1.77
	3.00 −02	2.10		1.00 −01	1.84
	4.00	2.12			
	1.00 −01	2.12	150 (Cl. 1)	1.00 −05	9.95 −01
				3.52 −04	3.50 +01
40 (Cl. 1)	1.00 −05	1.03 +00		1.18 −03	1.22 +02
	3.38 −04	3.50 +01		3.00	1.29
	1.36 −03	1.49 +02		4.00	1.31
	4.00	1.61		3.00 −02	1.39
	1.00 −02	1.68		7.00	1.41
	3.00	1.74		1.00 −01	1.41
	1.00 −01	1.74			

Table CS-5
Tabular Values for Figure CS-5

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.99 −04	2.07 +01	205	3.00	1.46
	1.60 −03	1.69 +02		7.00	1.52
	2.00	1.70		9.00	1.52
	3.00	1.71		1.00 −02	1.54
	5.00	1.72		5.00	1.54
	6.00	1.72			
	5.00 −02	1.72	290	2.15 −04	2.07 +01
				1.08 −03	1.03 +02
95	2.00 −04	2.07 +01		2.00	1.13
	1.57 −03	1.62 +02		4.00	1.27
	5.00 −02	1.62		1.00 −02	1.38
				2.00	1.43
150	2.03 −04	2.07 +01		5.00	1.47
	1.50 −03	1.52 +02			
	3.00	1.55	345	2.20 −04	2.07 +01
	6.00	1.55		1.21 −03	1.03 +02
	5.00 −02	1.55		2.00	1.13
				4.00	1.23
205	2.10 −04	2.07 +01		1.00 −02	1.34
	1.54 −03	1.43 +02		5.00	1.43

Table CS-6
Tabular Values for Figure CS-6

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.50 −04	1.52 +01	95	2.00 −02	6.21
	2.00	2.07			
	3.00	3.10	150	1.50 −04	1.52 +01
	6.00	4.14		2.00	2.07
	8.00	4.48		5.00	3.45
	2.00 −03	5.52		1.00 −03	4.14
	4.20	6.21		2.50	4.83
	4.00 −02	6.89		9.00	5.52
	7.00	6.89		2.50 −02	5.72
95	1.50 −04	1.52 +01	205	1.80 −04	1.72 +01
	2.00	2.07		3.00	2.76
	4.20	3.45		1.00 −03	3.79
	8.00	4.14		7.00	4.83
	1.50 −03	4.83		2.50 −02	5.17
	4.00	5.52			

Table HT-1
Tabular Values for Figure HT-1

Temp., °C	A	B, MPa
Up to 95	1.00 −05	1.01 +00
	2.45 −03	2.54 +02
	4.00	2.80
	7.00	3.04
	1.00 −02	3.17
	2.00	3.32
	5.00	3.45
205	1.00 −05	9.45 −01
	2.45 −03	2.39 +02
	4.00	2.65
	7.00	2.90
	1.00 −02	3.04
	4.00	3.32
345	1.00 −05	8.55 −01
	2.43 −03	2.17 +02
	4.00	2.46
	7.00	2.75
	1.00 −02	2.88
	3.00	3.20

Table HT-2
Tabular Values for Figure HT-2

Temp., °C	A	B, MPa
40	3.37 −04	3.45 +01
	2.83 −03	2.90 +02
	4.00	2.98
	6.00	3.03
	8.00	3.09
	1.00 −02	3.13
	1.50	3.23
	2.00	3.28
	2.50	3.32
	3.00	3.36
	4.00	3.41
	5.00	3.43
	6.00	3.43
	7.00	3.45
	1.00 −01	3.45

Table HA-1
Tabular Values for Figure HA-1

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.42 −05	1.38 +00	480	1.81 −05	1.38 +00
	4.63 −04	4.48 +01		3.15 −04	2.41 +01
	1.50 −03	7.31		4.00	2.66
	2.00	7.93		5.00	2.87
	3.00	8.62		1.50 −03	3.78
	1.00 −02	9.65		3.00	4.22
	6.31	1.09 +02		1.00 −02	4.87
	1.00 −01	1.09		2.00	5.12
				7.84	5.47
205	1.59 −05	1.38 +00		1.00 −01	5.47
	3.91 −04	3.45 +01			
	2.00 −03	5.65	650	2.00 −05	1.38 +00
	3.00	6.27		2.83 −04	1.96 +01
	4.00	6.68		1.00 −03	2.87
	5.00	6.89		2.00	3.33
	1.00 −02	7.31		5.00	3.82
	5.38	8.00		1.00 −02	4.10
	1.00 −01	8.00		2.00	4.38
				4.88	4.62
370	1.70 −05	1.38 +00		1.00 −01	4.62
	3.38 −04	2.76 +01			
	4.00	2.99	815	1.00 −04	6.2
	5.00	3.25		1.60	10.0
	6.00	3.45		3.12	19.5
	1.00 −03	3.97		4.00	20.7
	2.00	4.60		1.27 −03	24.1
	5.00	5.27		5.06	27.6
	6.00	5.38		4.00 −02	32.1
	1.00 −02	5.58		1.00 −01	32.1
	5.42	6.21			
	1.00 −01	6.21			

Table HA-2
Tabular Values for Figure HA-2

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.84 −05	1.72 +00	370	5.00	8.76
	6.05 −04	5.79 +01		5.92	8.89
	1.50 −03	7.65		1.00 −01	8.89
	2.00	8.07			
	2.50	8.41	480	2.28 −05	1.72 +00
	3.00	8.69		5.10 −04	3.90 +01
	4.00	8.96		6.00	4.21
	5.00	9.17		1.00 −03	4.96
	7.00	9.38		3.00	6.24
	1.00 −02	9.65		4.00	6.48
	2.00	1.01 +02		1.00 −02	7.10
	7.26	1.08		5.22	8.07
	1.00 −01	1.08		1.00 −01	8.07
205	1.99 −05	1.72 +00	650	2.47 −05	1.72 +00
	5.85 −04	5.17 +01		4.60 −04	3.21 +01
	1.00 −03	6.00		1.00 −03	4.14
	1.50	6.69		2.00	4.96
	2.00	7.17		3.00	5.38
	3.00	7.72		4.00	5.65
	4.00	8.07		5.00	5.79
	5.00	8.27		1.00 −02	6.17
	6.00	8.41		7.00	6.89
	1.00 −02	8.76		1.00 −01	6.89
	5.74	9.86			
	1.00 −01	9.86	815	1.00 −04	6.2
				1.60	10.0
370	2.18 −05	1.72 +00		3.95	24.6
	5.33 −04	4.31 +01		1.45 −03	29.3
	7.00	4.83		2.54	31.0
	1.00 −03	5.38		5.62	33.2
	3.00	6.89		3.50 −02	37.6
	4.00	7.24		1.00 −01	37.6
	1.00 −02	7.86			

Table HA-3
Tabular Values for Figure HA-3

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.39 −05	1.38 +00	315	1.65 −05	1.38 +00
	5.35 −04	5.21 +01		3.19 −04	2.68 +01
	2.00 −03	6.96		1.00 −03	3.28
	6.00	8.55		1.00 −02	4.90
	4.00 −02	1.03 +02		2.81	5.83
	1.00 −01	1.03		1.00 −01	5.83
205	1.58 −05	1.38 +00	425	1.74 −05	1.38 +00
	3.61 −04	3.19 +01		2.75 −04	2.19 +01
	1.00 −03	3.79		1.50 −03	2.94
	1.00 −02	5.62		1.00 −02	4.07
	2.83	6.72		3.00	4.96
	1.00 −01	6.72		1.00 −01	4.96

Table HA-4
Tabular Values for Figure HA-4

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.43 −05	1.38 +00	205	7.00 −03	6.17
	6.00 −04	5.79 +01		1.00 −02	6.48
	7.00 −03	9.17		4.29	7.31
	1.00 −02	9.65		1.00 −01	7.31
	2.00	1.05 +02			
	5.00	1.12	315	1.69 −05	1.38 +00
	1.00 −01	1.12		3.63 −04	3.02 +01
				5.00 −03	4.96
150	1.53 −05	1.38 +00		1.00 −02	5.45
	4.75 −04	4.31 +01		4.56	6.21
	5.00 −03	6.86		1.00 −01	6.21
	6.00	7.03			
	1.00 −02	7.58	425	1.76 −05	1.38 +00
	4.58	8.69		3.17 −04	2.50 +01
	1.00 −01	8.69		5.00 −03	4.10
				1.00 −02	4.55
205	1.54 −05	1.38 +00		4.68	5.31
	4.10 −04	3.71 +01		1.00 −01	5.31

Table HA-5
Tabular Values for Figure HA-5

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
20	0.000141	14	205	0.004	134
	0.00134	131 P.L.		0.006	145
	0.0015	133		0.01	155
	0.002	142		0.015	160
	0.0025	155		0.023	165
	0.003	164			
	0.004	179	345	0.00016	14
	0.006	195		0.0012	103 P.L.
	0.01	210		0.0015	107
	0.015	217		0.002	112
	0.021	225		0.0025	117
				0.003	123
205	0.0001509	14		0.004	131
	0.001166	107 P.L.		0.006	140
	0.0015	109		0.01	151
	0.002	114		0.015	155
	0.0025	121		0.034	157
	0.003	126			

Table HA-6
Tabular Values for Figure HA-6

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
20	7.07 −05	6.89 +00	345	7.98 −05	6.89 +00
	5.00 −04	4.88 +01		4.99 −04	4.31 +01
	1.00 −03	9.72		8.85	6.15
	1.44	1.24 +02		1.44 −03	6.65
	1.81	1.30		1.81	6.83
	4.48	1.39		4.66	7.38
	9.42	1.44		9.80	7.72
	1.89 −02	1.49		2.00 −02	8.14
	5.00	1.55		5.00	8.27
	1.00 −01	1.55		1.00 −01	8.27
95	7.25 −05	6.89 +00	510	8.62 −05	6.89 +00
	5.00 −04	4.76 +01		4.99 −04	3.99 +01
	9.71	8.48		9.64	6.10
	1.37 −03	9.45		1.09 −03	6.24
	1.95	1.00 +02		1.27	6.38
	4.81	1.10		4.84	7.10
	9.81	1.17		9.68	7.45
	1.96 −02	1.23		1.99 −02	7.72
	5.00	1.27		5.00	7.93
	1.00 −01	1.27		1.00 −01	7.93
205	7.55 −05	6.89 +00	650	9.64 −05	6.89 +00
	5.00 −04	4.56 +01		4.98 −04	3.56 +01
	9.76	7.45		9.32	5.55
	1.31 −03	7.86		1.38 −03	6.00
	1.97	8.20		1.90	6.25
	4.44	8.76		4.88	6.78
	9.57	9.17		9.94	7.17
	1.99 −02	9.51		1.94 −02	7.45
	5.00	9.93		5.00	7.79
	1.00 −01	9.93		1.00 −01	7.79

Table HA-7
Tabular Values for Figure HA-7

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
20	7.00 −05	6.89 +00	150	7.00 −05	6.89 +00
	5.00 −04	5.03 +01		5.00 −04	4.81 +01
	7.50	7.58		7.50	7.24
	1.00 −03	1.01 +02		1.00 −03	9.58
	1.25	1.26		1.25	1.20 +02
	1.50	1.51		1.50	1.44
	1.74	1.75		1.74	1.67
	1.98	1.99		1.98	1.89
	2.89	2.71		2.71	2.32
	4.07	2.96		4.62	2.62
	6.41	3.13		6.19	2.72
	7.49	3.17		7.63	2.78
	1.57 −02	3.35		1.99 −02	3.01
	5.00	3.59		5.00	3.19
	1.00 −01	3.62		1.00 −01	3.21

Table HA-8
Tabular Values for Figure HA-8

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
20	7.07 −05	6.89 +00	100	3.37	1.52
	4.03 −04	3.92 +01		4.76	1.61
	6.06	5.80		7.42	1.70
	8.36	7.65		9.85	1.77
	1.13 −03	9.58		1.99 −02	1.92
	1.48	1.12 +02		5.00	1.94
	1.64	1.17		1.00 −01	1.94
	1.82	1.23			
	3.46	1.56	400	8.78 −05	6.89 +00
	4.87	1.72		5.00 −04	4.21 +01
	7.30	1.92		7.50	6.32
	9.89	2.06		1.00 −03	8.27
	2.00 −02	2.24		1.25	9.65
	5.00	2.24		1.47	1.07 +02
	1.00 −01	2.24		1.70	1.15
				1.92	1.21
100	7.27 −05	6.89 +00		3.29	1.43
	4.73 −04	4.49 +01		4.99	1.47
	7.07	6.71		7.36	1.50
	9.50	8.62		9.37	1.52
	1.25 −03	1.04 +02		1.97 −02	1.59
	1.46	1.14		5.00	1.64
	1.74	1.23		1.00 −01	1.65
	1.95	1.28			

Table HA-9
Tabular Values for Figure HA-9

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
20	0.100 −04	0.488 +01	150	0.100 −04	0.465 +01
	0.707	0.689		0.741	0.689
	0.103 −03	0.100 +02		0.108 −03	0.100 +02
	0.500	0.488		0.500	0.465
	0.750	0.731		0.750	0.696
	0.992	0.965		0.923	0.855
	0.121 −02	0.118 +03		0.109 −02	0.993
	0.143	0.139		0.128	0.114 +03
	0.166	0.159		0.153	0.128
	0.197	0.181		0.198	0.141
	0.284	0.208		0.269	0.152
	0.491	0.230		0.392	0.163
	0.697	0.238		0.721	0.177
	0.849	0.246		0.893	0.182
	0.192 −01	0.267		0.190 −01	0.198
	0.500	0.276		0.500	0.204
	0.100 +00	0.276		0.100 +00	0.204
95	0.100 −04	0.476 +01	370	0.100 −04	0.427 +01
	0.725	0.689		0.806	0.689
	0.105 −03	0.100 +02		0.117 −03	0.100 +02
	0.500	0.476		0.500	0.427
	0.750	0.710		0.750	0.641
	0.939	0.889		0.933	0.800
	0.112 −02	0.106 +03		0.108 −02	0.924
	0.133	0.123		0.124	0.105 +03
	0.163	0.139		0.143	0.117
	0.194	0.148		0.171	0.130
	0.272	0.167		0.277	0.150
	0.431	0.183		0.375	0.158
	0.683	0.192		0.701	0.172
	0.872	0.199		0.934	0.178
	0.187 −01	0.215		0.192 −01	0.191
	0.500	0.222		0.500	0.197
	0.100 +00	0.222		0.100 +00	0.197

Table HA-10
Tabular Values for Figure HA-10

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
Up to 38	1.00 −05	9.75 −01	204	6.78	1.24
	1.03 −04	1.00 +01		1.80 −02	1.35
	1.25 −03	1.22 +02		7.47	1.43
	2.24	1.51			
	4.01	1.83	316	1.00 −05	8.72 −01
	9.49	1.95		1.15 −04	1.00 +01
	4.29 −02	2.07		9.79	8.54
	7.50	2.14		3.77 −03	1.09 +02
				8.38	1.23
93	1.00 −05	9.51 −01		2.41 −02	1.32
	1.05 −04	1.00 +01		7.50	1.39
	1.11 −03	1.06 +02			
	2.76	1.36	427	1.00 −05	8.30 −01
	6.14	1.51		1.20 −04	1.00 +01
	1.64 −02	1.58		8.84	7.35
	5.72	1.66		2.28 −03	9.46
	7.50	1.69		5.90	1.16 +02
				1.21 −02	1.23
204	1.00 −05	9.51 −01		2.19	1.27
	1.09 −04	1.00 +01		5.55	1.33
	1.08 −03	9.88		7.50	1.36
	3.23	1.13 +02			

Table CI-1
Tabular Values for Figure CI-1

Class/Temp., °C	A	B, MPa	Class/Temp., °C	A	B, MPa
Class 60 up to 345	1.00 −05	7.58 −01	Class 30 up to 345	1.00 −05	4.94 −01
	1.60 −03	1.25 +02		1.22 −03	6.26 +01
	1.00 −01	1.25		1.00 −01	6.26
Class 50 up to 345	1.00 −05	6.87 −01	Class 20 up to 345	1.00 −05	4.10 −01
	1.47 −03	1.03 +02		9.91 −04	4.19 +01
	1.00 −01	1.03		1.00 −01	4.19
Class 40 up to 345	1.00 −05	6.01 −01			
	1.35 −03	8.27 +01			
	1.00 −01	8.27			

Table CD-1
Tabular Values for Figure CD-1

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
Up to 40	1.00 −05	8.41 −01	205	3.00	1.34
	1.24 −03	1.03 +02		6.00	1.40
	2.00	1.09			
	4.00	1.19	345	1.00 −05	7.72 −01
	1.00 −02	1.32		8.92 −04	6.77 +01
	2.50	1.43		2.00 −03	8.20
				4.00	9.51
205	1.00 −05	8.41 −01		6.00	1.01 +02
	1.07 −03	8.96 +01		8.00	1.05
	2.00	1.02 +02		1.00 −02	1.07
	3.00	1.08		2.00	1.12
	4.00	1.13		4.00	1.17
	1.00 −02	1.24			

Table CD-2
Tabular Values for Figure CD-2

Temp., °C	A	B	Temp., °C	A	B
40	1.00 −05	8.00 −01	100	2.50	6.72
	1.26 −04	1.00 +01		7.00	7.72
	6.28	5.00		3.00 −02	8.69
	1.00 −03	6.07		1.00 −01	8.69
	2.00	7.31			
	7.00	8.96	200	1.00 −05	7.31 −01
	3.50 −02	1.00 +02		1.37 −04	1.00 +01
	1.00 −01	1.00		5.57	4.07
				1.00 −03	5.10
100	1.00 −05	7.72 −01		2.50	6.27
	1.30 −04	1.00 +01		7.00	7.17
	5.62	4.34		3.00 −02	8.14
	1.00 −03	5.52		1.00 −01	8.14

Table NFA-1
Tabular Values for Figure NFA-1

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.00 −05	3.46 −01	150	1.10 −05	3.45 −01
	1.48 −04	5.12 +00		1.48 −04	4.69 +00
	2.00	6.56		2.00	5.80
	2.50	7.38		2.50	6.54
	3.00	8.00		3.00	7.03
	1.00 −03	1.08 +01		4.00	7.72
	1.50	1.18		7.00	8.76
	4.00	1.43		2.50 −03	1.08 +01
	1.00 −02	1.70		4.00 −02	1.59
	1.50	1.81		1.00 −01	1.59
	4.00	2.08			
	1.00 −01	2.08	205	1.19 −05	3.45 −01
				9.98	2.95 +00
95	1.03 −05	3.45 −01		1.50 −04	4.30
	1.48 −04	4.89 +00		2.00	5.26
	2.00	6.27		2.50	5.94
	2.50	7.03		3.00	6.39
	3.00	7.58		4.00	6.89
	4.00	8.34		5.00	7.24
	1.00 −03	1.02 +01		1.00 −03	8.34
	3.00	1.26		3.00	9.86
	6.00	1.43		1.00 −02	1.13 +01
	2.00 −02	1.72		4.00	1.32
	4.00	1.92		1.00 −01	1.32
	1.00 −01	1.92			

Table NFA-2
Tabular Values for Figure NFA-2

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.00 −05	3.45 −01	150	1.99 −04	6.21 +00
	4.05 −04	1.38 +01		2.50	7.65
	5.00	1.71		3.00	9.24
	6.00	2.01		4.00	1.16 +01
	7.00	2.28		5.00	1.36
	8.00	2.52		6.00	1.54
	9.00	2.76		7.00	1.68
	1.00 −03	2.94		1.00 −03	2.06
	1.50	3.59		1.50	2.48
	2.00	4.03		2.50	2.93
	2.50	4.29		3.00	3.10
	3.00	4.50		4.00	3.34
	4.00	4.79		5.00	3.50
	5.00	5.01		1.00 −02	3.88
	6.00	5.10		1.50	4.08
	1.00 −02	5.47		1.00 −01	4.08
	2.00	5.82			
	4.00	6.10	205	1.18 −05	3.45 −01
	5.00	6.19		1.47 −04	4.16 +00
	1.00 −01	6.19		2.00	5.48
				2.50	6.57
95	1.02 −05	3.45 −01		3.00	7.45
	3.01 −04	9.86 +00		4.00	8.83
	6.00	1.82 +01		5.00	1.00 +01
	7.00	2.06		1.00 −03	1.38
	1.00 −03	2.63		1.50	1.61
	1.50	3.23		2.00	1.79
	2.00	3.62		2.50	1.92
	2.50	3.90		3.00	2.03
	3.00	4.08		5.00	2.30
	4.00	4.30		6.00	2.36
	5.00	4.45		7.00	2.41
	6.00	4.54		1.00 −02	2.54
	1.00 −02	4.79		1.50	2.65
	5.00	5.52		2.00	2.70
	1.00 −01	5.52		2.50	2.75
				1.00 −01	2.75
150	1.10 −05	3.45 −01			

Table NFA-3
Tabular Values for Figure NFA-3

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.00 −05	3.49 −01	150	3.48 −04	1.10 +01
	3.53 −04	1.23 +01		4.00	1.24
	4.00	1.34		5.00	1.41
	5.00	1.50		6.00	1.52
	6.00	1.60		7.00	1.61
	7.00	1.68		8.00	1.68
	8.00	1.73		1.00 −03	1.77
	1.00 −03	1.82		1.50	1.94
	1.50	1.94		1.50 −02	2.92
	1.50 −02	2.92		1.00 −01	2.92
	1.00 −01	2.92			
			205	1.16 −05	3.45 −01
95	1.04 −05	3.45 −01		3.34 −04	9.72 +00
	3.75 −04	1.23 +01		4.00	1.16 +01
	4.00	1.29		5.00	1.36
	5.00	1.44		6.00	1.49
	6.00	1.55		7.00	1.58
	7.00	1.64		8.00	1.65
	8.00	1.70		9.00	1.71
	1.00 −03	1.80		1.00 −03	1.76
	1.50	1.94		1.50	1.94
	1.50 −02	2.92		1.50 −02	2.92
	1.00 −01	2.92		1.00 −01	2.92
150	1.07 −05	3.45 −01			

Table NFA-4
Tabular Values for Figure NFA-4

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.00 −05	3.50 −01	150	6.98 −04	2.28 +01
	1.26 −03	4.50 +01		1.00 −03	3.10
	1.50	5.14		1.50	3.99
	2.00	6.03		2.00	4.52
	2.50	6.54		2.50	4.90
	3.00	6.88		3.00	5.12
	4.00	7.24		4.00	5.39
	5.00	7.52		5.00	5.60
	6.00	7.72		6.00	5.73
	1.00 −02	8.07		1.00 −02	6.01
	1.50	8.20		1.50	6.21
	2.50	8.41		1.00 −01	6.21
	4.00	8.55			
	1.00 −01	8.55	205	1.17 −05	3.45 −01
				2.48 −04	7.31 +00
95	1.01 −05	3.45 −01		3.00	8.69
	1.31 −03	4.50 +01		4.00	1.10 +01
	1.50	4.96		5.00	1.28
	2.00	5.77		6.00	1.42
	2.50	6.25		7.00	1.54
	3.00	6.60		9.00	1.75
	4.00	6.96		1.00 −03	1.85
	5.00	7.24		1.50	2.17
	6.00	7.45		2.00	2.41
	7.00	7.58		2.50	2.60
	1.00 −02	7.79		3.00	2.72
	2.50	8.14		4.00	2.94
	3.00	8.20		1.00 −02	3.53
	4.00	8.27		1.50	3.79
	1.00 −01	8.27		1.00 −01	3.79
150	1.07 −05	3.45 −01			

Table NFA-5
Tabular Values for Figure NFA-5

Temp., °C	A	B, MPa
40	1.00 −05	3.54 −01
	4.92 −04	1.76 +01
	6.00	2.07
	7.00	2.25
	8.00	2.39
	9.00	2.48
	1.00 −03	2.53
	1.71 −02	3.79
	1.00 −01	3.79

Table NFA-6
Tabular Values for Figure NFA-6

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
Up to 40	1.00 −05	3.61 −01	150	4.99 −04	1.57 +01
	6.87 −04	2.45 +01		6.00	1.82
	8.00	2.80		7.00	2.03
	9.00	3.03		8.00	2.21
	1.00 −03	3.14		1.00 −03	2.45
	1.50	3.43		1.50	2.81
	2.00	3.53		2.00	2.98
	3.00	3.62		3.00	3.17
	1.00 −02	3.93		1.00 −02	3.59
	3.00	4.21		3.00	3.87
95	1.01 −05	3.45 −01	205	1.26 −05	3.45 −01
	4.99 −04	1.68 +01		3.98 −04	1.10 +01
	7.00	2.22		5.00	1.30
	8.00	2.44		7.00	1.65
	9.00	2.63		1.00 −03	2.03
	1.00 −03	2.74		1.50	2.42
	1.50	3.08		2.00	2.62
	2.00	3.25		3.00	2.83
	3.00	3.45		5.00	3.05
	1.00 −02	3.90		1.00 −02	3.26
	3.00	4.21		2.50	3.52
150	1.10 −05	3.45 −01			

Table NFA-7
Tabular Values for Figure NFA-7

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
95	1.01 −05	3.45 −01	150	7.00	4.37
	9.01	3.21 +00		1.50 −03	4.99
	5.00 −04	4.83		3.00	5.50
	7.00	5.18		6.00	5.94
	1.50 −03	6.07		1.00 −02	6.25
	4.00	7.24		1.00 −01	6.25
	7.00	7.93			
	1.00 −02	8.27	205	1.19 −05	3.45 −01
	1.50	8.48		7.46	2.25 +00
	2.00	8.62		1.50 −03	4.16
	1.00 −01	8.62		3.00	4.69
				5.00	4.96
150	1.12 −05	3.45 −01		7.00	5.07
	8.85	2.86 +00		9.00	5.14
	5.00 −04	4.10		1.00 −01	5.14

Table NFA-8
Tabular Values for Figure NFA-8

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.00 −05	3.50 −01	150	1.00 −05	3.10 −01
	2.86	1.00 +00		3.23	1.00 +00
	2.78 −04	9.79		3.38 −04	1.05 +01
	3.00	1.05 +01		4.00	1.21
	4.00	1.27		1.00 −03	1.83
	1.00 −03	1.83		2.50	2.44
	2.50	2.44		5.00	2.86
	5.00	2.86		6.00	2.95
	6.00	2.95		7.00	3.02
	7.00	3.02		8.00	3.06
	8.00	3.06		9.00	3.12
	9.00	3.12		1.00 −02	3.14
	1.00 −02	3.14		1.50	3.28
	1.50	3.28		2.00	3.35
	2.00	3.35		1.00 −01	3.35
	1.00 −01	3.35			
			205	1.00 −05	2.75 −01
95	1.00 −05	3.40 −01		3.64	1.00 +00
	2.94	1.00 +00		2.88 −04	8.00
	2.83 −04	9.72		3.00	8.34
	3.00	1.02 +01		4.00	1.05 +01
	4.00	1.25		6.00	1.36
	1.00 −03	1.83		1.00 −03	1.65
	2.50	2.44		2.50	2.21
	5.00	2.86		3.00	2.32
	6.00	2.95		4.00	2.48
	7.00	3.02		5.00	2.61
	8.00	3.06		6.00	2.68
	9.00	3.12		7.00	2.76
	1.00 −02	3.14		8.00	2.83
	1.50	3.28		9.00	2.88
	2.00	3.35		1.00 −02	2.92
	1.00 −01	3.35		1.00 −01	2.92

Table NFA-9
Tabular Values for Figure NFA-9

Temp., °C	A	B, MPa
65	1.00 −05	3.45 −01
	7.92 −04	2.81 +01
	9.00	2.99
	1.00 −03	3.13
	1.50	3.48
	2.00	3.66
	4.00	4.06
	6.00	4.31
	2.00 −02	4.93
	1.00 −01	4.93

Table NFA-10
Tabular Values for Figure NFA-10

Temp., °C	A	B, MPa
40	1.00 −05	3.57 −01
	1.34 −03	4.99 +01
	1.50	5.35
	2.00	5.79
	2.50	5.92
	3.00	6.01
	5.00	6.12
	1.00 −02	6.21
	1.50	6.28
	2.50	6.31
	3.00	6.34
	4.00	6.35
	5.00	6.38
	1.00 −01	6.38

Table NFA-11
Tabular Values for Figure NFA-11

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
65 (Curve 1)	1.00 −05	3.51 −01	65 (Curve 2)	9.00	5.45	65 (Curve 4)	2.00	3.52
	3.01 −04	1.08 +01		1.00 −02	5.53		2.50	3.75
	5.00	1.78		1.74	5.94		3.00	3.92
	6.00	2.12		1.00 −01	5.94		4.00	4.18
	7.00	2.43					9.00	4.78
	1.00 −03	3.19	65 (Curve 3)	1.00 −05	3.51 −01		1.00 −02	4.87
	1.50	3.84		3.01 −04	1.08 +01		1.50	5.16
	2.00	4.23		5.00	1.73		1.74	5.19
	2.50	4.50		6.00	2.00		1.00 −01	5.19
	3.00	4.73		7.00	2.25			
	4.00	5.03		1.00 −03	2.80	65 (Curve 5)	1.00 −05	3.51 −01
	5.00	5.23		1.50	3.39		3.01 −04	1.08 +01
	9.00	5.76		2.00	3.71		5.00	1.66
	1.50 −02	6.16		2.50	3.95		6.00	1.90
	1.74	6.25		3.00	4.16		7.00	2.10
	1.00 −01	6.25		9.00	5.10		1.00 −03	2.56
				1.00 −02	5.19		1.50	3.03
65 (Curve 2)	1.00 −05	3.51 −01		1.74	5.59		2.00	3.31
	3.01 −04	1.08 +01		1.00 −01	5.59		2.50	3.50
	5.00	1.78					3.00	3.68
	8.00	2.58	65 (Curve 4)	1.00 −05	3.51 −01		4.00	3.90
	1.00 −03	2.96		3.01 −04	1.08 +01		9.00	4.45
	1.50	3.62		5.00	1.69		1.00 −02	4.54
	2.00	3.96		6.00	1.95		1.50	4.81
	2.50	4.23		7.00	2.18		1.74	4.87
	3.00	4.43		1.00 −03	2.70		1.00 −01	4.87
	4.00	4.73		1.50	3.21			
	5.00	4.94						

Table NFA-12
Tabular Values for Figure NFA-12

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
Up to 95	1.00 −05	3.48 −01	150	3.00	6.01
	1.19 −03	4.23 +01		4.00	6.24
	1.50	5.03		5.00	6.34
	2.00	5.82		1.00 −02	6.52
	2.50	6.20		2.50	6.65
	3.00	6.43			
	4.00	6.67	205	1.14 −05	3.45 −01
	7.00	6.89		8.91 −04	2.79 +01
	1.00 −02	7.03		1.00 −03	3.05
	2.00	7.17		1.50	3.76
				2.00	4.10
150	1.07 −05	3.45 −01		3.00	4.54
	1.22 −03	4.05 +01		5.00	4.90
	1.50	4.70		1.00 −02	5.17
	2.00	5.42		3.00	5.43
	2.50	5.78			

Table NFA-13
Tabular Values for Figure NFA-13

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
Up to 95	1.00 −05	3.45 −01	150	5.00	4.71
	7.87 −04	2.81 +01		1.00 −02	4.87
	9.00	3.14		3.00	5.01
	1.00 −03	3.45			
	1.50	4.30	205	1.13 −05	3.45 −01
	2.00	4.63		4.95 −04	1.55 +01
	2.50	4.80		6.00	1.85
	3.00	4.91		7.00	2.09
	4.00	5.04		8.00	2.29
	1.00 − 02	5.23		1.00 −03	2.57
	2.50	5.39		1.50	2.97
				2.00	3.19
150	1.07 −05	3.45 −01		2.50	3.33
	7.87 −04	2.65 +01		3.00	3.43
	1.00 −03	3.21		4.00	3.56
	1.50	4.03		5.00	3.65
	2.00	4.34		1.00 −02	3.83
	2.50	4.47		2.50	3.93
	3.00	4.53			

Table NFC-1
Tabular Values for Figure NFC-1

Temp., °C	A	B, MPa
65	1.00 −05	5.50 −01
	1.63 −04	9.24 +00
	2.50	1.04 +01
	5.00	1.25
	1.00 −03	1.48
	4.00	2.01
	2.50 −02	3.00
	1.00 −01	3.00

Table NFC-2
Tabular Values for Figure NFC-2

Temp., °C	A	B, MPa
204	0.100 −04	0.486 +00
	0.210	0.100 +01
	0.204 −03	0.972
	0.409	0.170 +02
	0.513	0.194
	0.651	0.219
	0.834	0.243
	0.141 −02	0.292
	0.240	0.340
	0.405	0.389
	0.665	0.437
	0.106 −01	0.486
	0.300	0.486
	0.600	0.486
	0.100 +00	0.486

Table NFC-3
Tabular Values for Figure NFC-3

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
65	1.00 −05	6.20 −01	315	1.00 −05	5.54 −01
	3.86 −04	2.43 +01		1.89 −04	1.06 +01
	3.00 −03	3.44		2.00	1.07
	4.00	3.59		2.50	1.14
	5.00	3.69		3.00	1.21
	1.00 −02	3.91		4.00	1.34
	2.00	4.08		5.00	1.48
	2.50	4.11		6.00	1.61
	5.00	4.22		1.00 −03	2.07
	1.00 −01	4.22		1.50	2.39
				2.00	2.58
205	1.00 −05	5.77 −01		2.50	2.70
	3.58 −04	2.12 +01		3.00	2.81
	3.00 −03	3.12		4.00	2.96
	4.00	3.25		1.00 −02	3.28
	1.00 −02	3.58		3.00	3.59
	1.50	3.70		4.00	3.65
	2.00	3.79		1.00 −01	3.65
	5.00	4.02			
	1.00 −01	4.02			

Table NFC-4
Tabular Values for Figure NFC-4

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
65	1.00 −05	7.93 −01	205	1.00 −05	7.45 −01
	2.30 −04	1.73 +01		2.48 −04	1.73 +01
	4.00	2.34		3.00	1.94
	5.00	2.59		4.00	2.18
	6.00	2.79		5.00	2.34
	1.00 −03	3.35		7.00	2.59
	1.50	3.80		1.00 −03	2.83
	3.00	4.41		1.50	3.13
	4.00	4.65		2.00	3.35
	7.00	5.04		2.50	3.47
	1.00 −02	5.27		3.00	3.59
	2.00	5.72		6.00	4.03
	4.00	6.03		1.00 −02	4.30
	1.00 −01	6.03		2.00	4.59
				4.00	4.71
120	1.00 −05	7.45 −01		1.00 −01	4.74
	2.48 −04	1.73 +01			
	3.00	1.93	370	1.00 −05	6.81 −01
	4.00	2.22		2.69 −04	1.73 +01
	5.00	2.42		3.00	1.81
	7.00	2.71		4.00	2.02
	1.00 −03	3.01		5.00	2.18
	1.50	3.36		7.00	2.37
	2.00	3.61		1.00 −03	2.58
	3.00	3.92		1.50	2.82
	4.00	4.14		2.00	2.98
	7.00	4.52		2.50	3.08
	1.00 −02	4.71		3.00	3.17
	1.50	4.96		6.00	3.32
	3.00	5.29		1.00 −02	3.63
	4.00	5.34		2.00	3.70
	1.00 −01	5.34		1.00 −01	3.72

Table NFC-5
Tabular Values for Figure NFC-5

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.50 −04	9.03 +00	40	1.00 −02	5.00
	2.00	1.21 +01		1.50	5.27
	2.50	1.51		1.90	5.31
	3.00	1.81			
	3.25	1.97	150	1.50 −04	8.69 +00
	4.00	2.07		2.00	1.16 +01
	1.00 −03	2.72		2.50	1.45
	4.00	4.14		3.00	1.74
	5.00	4.41		3.45	2.00
	6.00	4.55			
	8.00	4.83			

Table NFC-6
Tabular Values for Figure NFC-6

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
95	3.01 −04	1.72 +01	150	4.42	2.48
	6.69	3.83		7.00	3.14
	1.00 −03	4.48		1.00 −03	3.72
	2.00	5.65		2.00	4.96
	4.00	6.89		4.00	6.21
	6.00	7.58		6.00	6.89
	8.00	8.17		8.00	7.31
	1.00 −02	8.55		1.00 −02	7.65
	2.00	9.58		2.00	8.41
	4.00	1.03 +02		4.00	8.83
	6.00	1.03		6.00	8.96
150	3.07 −04	1.72 +01			

Table NFC-7
Tabular Values for Figure NFC-7

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
20	1.18 −05	6.89 −01	95	1.50	1.96
	1.00 −04	5.61 +00		1.75	1.99
	1.25	7.00		2.00	2.01
	2.00	1.12 +01		3.50	2.10
	3.00	1.68		5.00	2.16
	4.00	1.99		7.50	2.23
	6.00	2.17		1.00 −02	2.28
	8.00	2.26		2.00	2.41
	1.00 −03	2.32		3.71	2.52
	1.25	2.38			
	1.50	2.42	205	1.23 −05	6.89 −01
	1.75	2.46		1.00 −04	5.19 +00
	2.00	2.48		1.35	7.00
	3.50	2.61		2.00	1.03 +01
	5.00	2.68		3.00	1.41
	7.50	2.76		4.00	1.50
	1.00 −02	2.82		6.00	1.61
	2.00	2.96		8.00	1.66
	3.71	3.10		1.00 −03	1.70
				1.25	1.74
95	1.20 −05	6.89 −01		1.50	1.77
	1.00 −04	5.34 +00		1.75	1.79
	1.32	7.00		2.00	1.81
	2.00	1.06 +01		3.50	1.90
	3.00	1.52		5.00	1.96
	4.00	1.65		7.50	2.02
	6.00	1.77		1.00 −02	2.06
	8.00	1.83		2.00	2.17
	1.00 −03	1.88		3.67	2.28
	1.25	1.93			

Table NFC-8
Tabular Values for Figure NFC-8

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
65	1.00 −05	6.31 −01	205	2.00	6.25
	5.85 −04	3.79 +01		3.00	6.84
	7.00	4.38		4.00	7.24
	8.00	4.85		7.00	7.86
	1.00 −03	5.52		1.00 −02	8.14
	1.50	6.45		1.50	8.41
	2.00	6.96		3.00	8.89
	3.00	7.52		4.00	9.03
	4.00	7.86		1.00 −01	9.03
	7.00	8.34			
	1.00 −02	8.62	315	1.00 −05	3.65 −01
	1.50	8.83		7.88 −04	2.91 +01
	3.00	9.03		9.00	3.28
	5.00	9.17		1.00 −03	3.54
	1.00 −01	9.17		1.50	4.58
				2.00	5.16
205	1.00 −05	5.29 −01		2.50	5.54
	5.85 −04	3.18 +01		4.00	6.29
	7.00	3.68		6.00	6.84
	8.00	4.12		1.00 −02	7.45
	1.00 −03	4.76		2.50	8.34
	1.51	5.71		1.00 −01	8.34

Table NFN-1
Tabular Values for Figure NFN-1

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.00 −05	1.05 +00	315	1.00 −02	4.08
	1.97 −04	2.10 +01		1.84	4.52
	1.00 −03	2.79		1.00 −01	4.52
	1.00 −02	4.14			
	1.65	4.52	425	1.00 −05	9.10 −01
	1.00 −01	4.52		1.87 −04	1.74 +01
				1.00 −03	2.32
205	1.00 −05	9.79 −01		1.00 −02	3.43
	2.01 −04	2.01 +01		3.00	4.16
	1.00 −03	2.68		1.00 −01	4.16
	1.00 −02	4.08			
	1.84	4.52	540	1.00 −05	8.62 −01
	1.00 −01	4.52		1.62 −04	1.41 +01
				1.00 −03	1.98
315	1.00 −05	9.79 −01		1.00 −02	3.06
	2.01 −04	2.01 +01		3.00	3.77
	1.00 −03	2.68		1.00 −01	3.77

Table NFN-2
Tabular Values for Figure NFN-2

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.00 −05	1.05 +00	205	1.00 −05	9.86 −01
	2.57 −04	2.80 +01		2.76 −04	2.79 +01
	5.00	3.03		5.00	3.03
	1.78 −02	4.73		1.78 −02	4.73
	1.00 −01	4.73		1.00 −01	4.73
95	1.00 −05	1.02 +00	315	1.01 −05	9.51 −01
	2.65 −04	2.79 +01		2.91 −04	2.79 +01
	5.00	3.03		5.00	3.03
	1.78 −02	4.73		1.78 −02	4.73
	1.00 −01	4.73		1.00 −01	4.73

Table NFN-3
Tabular Values for Figure NFN-3

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.00 −05	9.10 −01	95	1.00 −01	8.27 +01	315	3.00 −02	7.38 +01
	5.23 −04	4.97 +01					1.00 −01	7.38
	7.00	5.32	205	1.00 −05	9.10 −01			
	1.00 −03	5.86		4.23 −04	4.01 +01	425	1.00 −05	7.58 −01
	2.00	6.81		7.00	4.50		5.00 −04	3.96 +01
	2.50	7.10		1.00 −03	4.91		1.00 −03	4.65
	3.00	7.38		1.50	5.35		2.00	5.35
	5.00	8.00		2.50	5.89		3.00	5.81
	6.00	8.20		3.00	6.08		4.00	6.05
	7.00	8.34		4.00	6.40		6.00	6.46
	8.00	8.41		6.00	6.78		8.00	6.67
	1.00 −02	8.62		7.00	6.89		1.00 −02	6.85
	2.00	8.96		9.00	7.10		1.50	7.10
	2.50	9.10		1.00 −02	7.17		2.00	7.24
	4.00	9.17		1.50	7.38		3.00	7.38
	1.00 −01	9.17		2.00	7.58		1.00 −01	7.38
				3.00	7.72			
95	1.00 −05	9.10 −01		1.00 −01	7.72	480	1.00 −05	6.88 −01
	4.68 −04	4.43 +01					5.28 −04	3.90 +01
	6.00	4.67	315	1.00 −05	8.41 −01		1.00 −03	4.56
	9.00	5.14		4.37 −04	3.87 +01		2.00	5.33
	1.00 −03	5.29		5.00	3.96		3.00	5.81
	1.50	5.75		1.00 −03	4.65		4.00	6.05
	2.00	6.07		2.00	5.35		6.00	6.46
	3.00	6.55		3.00	5.81		8.00	6.64
	4.00	6.86		4.00	6.05		1.00 −02	6.85
	5.00	7.10		6.00	6.46		1.50	7.10
	7.00	7.38		8.00	6.67		2.00	7.24
	1.00 −02	7.65		1.00 −02	6.85		3.00	7.38
	1.50	7.93		1.50	7.10		1.00 −01	7.38
	2.50	8.14		2.00	7.24			
	4.00	8.27						

Table NFN-4
Tabular Values for Figure NFN-4

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.00 −05	1.10 +00	315	4.00	7.45
	5.31 −04	5.96 +01		5.00	7.65
	1.00 −03	6.78		1.00 −02	8.07
	3.00	8.07		3.00	8.48
	4.00	8.41		1.00 −01	8.48
	1.00 −02	9.17			
	2.00	9.51	425	1.00 −05	9.93 −01
	1.00 −01	9.51		4.87 −04	4.98 +01
				1.00 −03	5.75
95	1.00 −05	1.10 +00		4.00	7.03
	4.94 −04	5.46 +01		1.50 −02	7.86
	1.00 −03	6.25		3.00	8.14
	2.00	7.03		1.00 −01	8.14
	3.00	7.45			
	9.00	8.34	540	1.00 −05	9.31 −01
	2.00 −02	8.69		4.71 −04	4.50 +01
	1.00 −01	8.83		1.00 −03	5.24
				2.00	5.83
205	1.00 −05	1.03 +00		5.00	6.49
	5.00 −04	5.30 +01		1.00 −02	6.85
	1.00 −03	6.09		3.00	7.31
	2.00	6.79		1.00 −01	7.31
	4.00	7.45			
	5.00	7.65	595	1.00 −05	8.83 −01
	1.00 −02	8.07		3.72 −04	3.35 +01
	3.00	8.48		4.00	3.35
	1.00 −01	8.48		1.00 −01	3.35
315	1.00 −05	1.03 +00	650	1.00 −05	8.83 −01
	5.00 −04	5.30 +01		2.50 −04	2.26 +01
	1.00 −03	6.09		1.00 −01	2.26
	2.00	6.79			

Table NFN-5
Tabular Values for Figure NFN-5

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.00 −05	1.02 +00	205	2.50	1.17
	5.51 −04	5.86 +01		1.00 −01	1.17
	2.50 −03	1.08 +02			
	3.00	1.15	315–345	1.00 −05	9.45 −01
	4.00	1.23		3.12 −04	3.01 +01
	5.00	1.28		9.00 −03	5.06
	7.00	1.32		1.50	6.61
	1.00 −02	1.35		2.00	7.45
	5.00	1.47		2.50	8.07
	1.00 −01	1.47		3.00	8.41
				4.00	8.96
205	1.00 −05	1.02 +00		5.00	9.31
	5.09 −04	5.40 +01		7.00	9.72
	4.00 −03	9.79		1.00 −02	1.01 +02
	5.00	1.03 +02		1.50	1.04
	9.00	1.11		2.50	1.07
	1.50 −02	1.14		1.00 −01	1.07

Table NFN-6
Tabular Values for Figure NFN-6

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.00 −05	1.11 +00	425	1.00 −03	8.00
	8.79 −04	1.01 +02		2.00	8.48
	1.00 −03	1.03		4.00	8.89
	1.00 −02	1.37		1.00 −02	9.31
	1.50	1.40		5.00	9.93
205	1.00 −05	1.01 +00	595	1.00 −05	8.55 −01
	8.47 −04	8.89 +01		7.86 −04	6.96 +01
	1.00 −03	9.03		1.00 −03	7.17
	3.00	9.93		2.00	7.58
	1.00 −02	1.09 +02		4.00	8.00
	4.00	1.16		1.00 −02	8.27
				2.00	8.48
315	1.00 −05	9.79 −01		6.00	8.69
	8.20 −04	8.34 +01			
	1.00 −03	8.55	650	1.00 −05	8.00 −01
	5.00	9.65		8.39 −04	6.85 +01
	1.00 −02	1.00 +02		1.00 −01	6.85
	3.00	1.03			
	1.00 −01	1.07	705	1.00 −05	7.72 −01
				4.93 −04	3.91 +01
425	1.00 −05	8.89 −01		1.00 −01	3.91
	8.51 −04	7.86 +01			

Table NFN-7
Tabular Values for Figure NFN-7

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.00 −05	9.65 −01	205	1.00 −05	9.10 −01
	8.25 −04	8.34 +01		7.45 −04	7.17 +01
	1.00 −03	8.55		1.00 −03	7.31
	2.00	9.17		4.00	8.00
	6.00	1.04 +02		1.00 −02	8.48
	1.00 −02	1.10		4.00	9.24
	2.00	1.19			
	2.50	1.23	370	1.00 −05	8.62 −01
				7.22 −04	6.57 +01
95	1.00 −05	9.86 −01		1.00 −03	6.67
	7.77 −04	7.79 +01		2.00	6.89
	1.00 −03	8.00		8.00	7.45
	4.00	9.17		2.00 −02	7.79
	1.00 −02	9.93		6.00	8.27
	4.00	1.08 +02			

Table NFN-8
Tabular Values for Figure NFN-8

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.00 −05	9.86 −01	425	6.87 −04	6.10 +01
	7.79 −04	8.07 +01		1.00 −03	6.38
	1.00 −03	8.34		2.00	6.76
	2.00	9.17		4.00	7.10
	4.00	9.72		1.00 −02	7.52
	1.00 −02	1.02 +02		2.50	7.86
	4.00	1.06		1.00 −01	7.86
	1.00 −01	1.06			
			540	1.00 −05	7.86 −01
205	1.00 −05	9.10 −01		6.72 −04	5.52 +01
	7.37 −04	7.03 +01		1.00 −03	5.87
	1.00 −03	7.24		2.00	6.43
	4.00	8.14		4.00	6.87
	1.00 −02	8.62		1.00 −02	7.24
	3.00	9.03		3.00	7.65
	1.00 −01	9.03		1.00 −01	7.65
315	1.00 −05	9.10 −01	595	1.00 −05	7.86 −01
	6.97 −04	6.60 +01		5.26 −04	4.31 +01
	1.00 −03	6.80		1.00 −03	5.05
	3.00	7.52		2.00	5.74
	1.00 −02	8.14		4.00	6.23
	3.00	8.62		1.00 −02	6.80
	1.00 −01	8.62		2.50	7.31
				1.00 −01	7.31
425	1.00 −05	8.41 −01			

Table NFN-9
Tabular Values for Figure NFN-9

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
20	1.00 −05	1.0	595	1.00 −05	0.8
	1.02	1.0		1.21	1.0
	5.26 −04	51.7		3.78 −04	31.0
	8.80	55.8		7.84	34.8
	1.53 −03	61.0		1.64 −03	38.8
	3.54	69.0		2.83	41.5
	6.96	75.8		5.02	44.8
	1.22 −02	82.7		9.91	48.8
	1.63	86.2		1.63 −02	51.7
	1.00 −01	86.2		1.00 −01	51.7
95	1.00 −05	1.0	760	1.00 −05	0.8
	1.04	1.0		1.32	1.0
	4.95 −04	47.6		3.38 −04	25.5
	1.43 −03	55.0		5.63	27.6
	1.98	57.4		1.24 −03	30.9
	3.57	62.7		3.17	34.6
	5.28	66.0		6.99	37.9
	1.15 −02	73.1		1.92 −02	42.4
	2.02	79.3		1.00 −01	42.4
	1.00 −01	79.3			
			870	1.00 −05	0.7
260	1.00 −05	0.9		1.50	1.0
	1.09	1.0		1.93 −04	12.9
	4.34 −04	40.0		7.71	15.9
	7.30	43.8		1.28 −03	17.1
	1.18 −03	47.6		1.97	18.1
	3.46	55.2		4.52	20.5
	1.04 −02	62.2		8.12	22.4
	2.08	66.5		1.49 −02	24.5
	1.00 −01	66.5		1.00 −01	24.5
425	1.00 −05	0.9	900	1.00 −05	0.7
	1.14	1.0		1.53	1.0
	3.94 −04	34.5		1.39 −04	9.1
	1.33 −03	42.4		6.00	11.0
	2.10	45.2		1.17 −03	12.2
	3.29	47.9		2.46	13.8
	6.43	51.7		6.62	16.5
	1.35 −02	55.5		8.33	17.2
	2.06	57.6		1.00 −01	17.2
	1.00 −01	57.6			

Table NFN-10
Tabular Values for Figure NFN-10

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.00 −05	1.03 +00	315	6.92 −04	6.47 +01
	8.97 −04	9.45 +01		1.00 −03	6.76
	2.00 −03	1.10 +02		2.00	7.45
	4.00	1.21		4.00	8.07
	6.00	1.25		6.00	8.41
	1.00 −02	1.30		1.00 −02	8.83
	2.00	1.35		2.00	9.31
	4.00	1.39		5.00	9.72
95	1.00 −05	1.03 +00	425	1.00 −05	8.62 −01
	8.22 −04	8.62 +01		6.67 −04	5.95 +01
	2.00 −03	1.00 +02		1.00 −03	6.26
	4.00	1.11		2.00	6.87
	6.00	1.16		4.00	7.45
	1.00 −02	1.21		6.00	7.72
	2.00	1.25		1.00 −02	8.14
	5.00	1.30		2.00	8.55
				6.00	8.96
205	1.00 −05	9.24 −01			
	7.32 −04	6.89 +01	540	1.00 −05	8.62 −01
	1.00 −03	7.17		6.55 −04	5.81 +01
	2.00	7.93		1.00 −03	6.09
	4.00	8.69		2.00	6.62
	6.00	9.10		4.00	7.10
	1.00 −02	9.65		6.00	7.45
	2.00	1.02 +02		1.00 −02	7.72
	6.00	1.08		2.00	8.07
				6.00	8.48
315	1.00 −05	9.24 −01			

Table NFN-11
Tabular Values for Figure NFN-11

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.00 −05	9.58 −01	205	6.35 −04	5.83 +01
	7.61 −04	7.45 +01		2.00 −03	6.54
	2.00 −03	8.27		6.00	7.17
	6.00	9.24		1.00 −02	7.38
	1.00 −02	9.65		2.00	7.65
	2.00	1.02 +02		3.00	7.79
	4.00	1.05			
			425 to 540	1.00 −05	8.00 −01
95	1.00 −05	9.58 −01		5.76 −04	4.69 +01
	6.87 −04	6.69 +01		2.00 −03	5.50
	2.00 −03	7.45		6.00	6.18
	6.00	8.20		1.00 −02	6.41
	1.00 −02	8.48		2.00	6.63
	2.00	8.89		3.00	6.75
	5.00	9.10		5.00	6.85
205	1.00 −05	9.03 −01			

Table NFN-12
Tabular Values for Figure NFN-12

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	2.00 −04	2.07 +01	205	2.00 −03	6.89
	4.00	4.14		4.00	8.27
	8.00	6.21		8.50	9.65
	3.00 −03	9.65			
	5.00	1.10 +02	315	3.00 −04	2.76 +01
	1.00 −02	1.24		4.50	4.14
				6.00	4.48
95	2.50 −04	2.48 +01		2.50 −03	6.83
	8.00	5.52		2.00 −02	9.65
	1.00 −03	6.89			
	5.00	9.65	425	4.00 −04	3.45 +01
	1.00 −02	1.10 +02		5.00	4.14
	2.50	1.17		2.00 −03	6.21
				3.00	6.89
205	4.00 −04	3.79 +01		7.00	8.27
	5.00	4.48		1.50 −02	8.96

Table NFN-13
Tabular Values for Figure NFN-13

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	2.00 −04	1.93 +01	205	4.00	6.89
	5.00	4.83		2.50 −02	7.79
	1.00 −03	6.41			
	3.00	8.27	425	2.50 −04	2.07 +01
	1.00 −02	9.65		5.00	4.14
	2.50	1.02 +02		6.00	5.03
				1.20 −03	5.52
95	2.00 −04	1.93 +01		5.00	6.21
	5.00	4.83		2.60 −02	6.62
	1.00 −03	6.21			
	1.80	6.89	650	6.00 −04	4.48 +01
	7.00	8.27		2.00 −03	4.83
	2.50 −02	8.96		4.00	4.93
				5.90	5.08
205	2.30 −04	2.07 +01		8.50	5.21
	5.00	4.48		1.15 −02	5.36
	8.00	5.52		1.70	5.58
	1.50 −03	6.21		3.00	5.76

Table NFN-14
Tabular Values for Figure NFN-14

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	2.00 −04	1.93 +01	205	8.50	8.27
	8.00	8.14		4.00 −03	9.65
	1.00 −03	1.03 +02		2.50 −02	1.10 +02
	2.00	1.10			
	6.00	1.24	315	2.50 −04	2.36 +01
	4.00 −02	1.38		5.00	4.83
				7.65	7.45
95	2.00 −04	1.93 +01		2.00 −03	8.27
	8.00	8.14		1.00 −02	9.65
	9.20	9.45		5.00	1.03 +02
	5.00 −03	1.10 +02			
	1.50 −02	1.17	540	2.70 −04	2.41 +01
	4.00	1.24		7.00	6.21
				1.50 −03	6.89
205	2.50 −04	2.36 +01		6.50	8.27
	5.00	4.83		3.00 −02	8.96

Table NFN-15
Tabular Values for Figure NFN-15

Temperature up to 40°C, $E = 2.0 \times 10^5$ MPa		Temperature 95°C, $E = 1.9 \times 10^5$ MPa		Temperature 205°C, $E = 1.9 \times 10^5$ MPa		Temperature 315°C, $E = 1.8 \times 10^5$ MPa		Temperature 425°C, $E = 1.8 \times 10^5$ MPa		Temperature 540°C, $E = 1.7 \times 10^5$ MPa	
A	B, MPa	A	B, MPa	A	B, MPa	A	B, MPa	A	B, MPa	A	B, MPa
0.00021	21	0.00022	21	0.00022	21	0.00023	21	0.00024	21	0.00025	21
0.00042	41	0.00043	41	0.00044	41	0.00045	41	0.00047	41	0.0005	41
0.00084	83 P.L.	0.00081	78 P.L.	0.00068	63 P.L.	0.00061	55 P.L.	0.00067	59 P.L.	0.00062	52 P.L.
0.001	84	0.001	80	0.0009	66	0.0008	61	0.0009	59	0.0009	53
0.0015	91	0.0015	85	0.001	68	0.001	63	0.001	61	0.001	54
0.002	96	0.002	88	0.0015	72	0.0015	65	0.0015	63	0.0015	57
0.003	101	0.003	92	0.002	74	0.002	69	0.002	66	0.002	59
0.004	105	0.004	97	0.003	79	0.003	72	0.0025	67	0.0025	61
0.006	110	0.006	98	0.004	83	0.004	73	0.003	68	0.003	63
0.008	112	0.008	100	0.006	84	0.006	75	0.004	70	0.004	65
0.01	115	0.01	101	0.008	86	0.008	78	0.006	71	0.006	67
0.02	121	0.015	103	0.01	88	0.01	79	0.008	73	0.008	68
0.03	122	0.02	104	0.015	90	0.015	80	0.01	74	0.01	70
0.04	123	0.04	107	0.02	92	0.02	81	0.015	74	0.015	71
0.06	123	0.06	108	0.03	93	0.03	81	0.02	75	0.02	73
0.08	123	0.08	108	0.04	94	0.04	81	0.03	76	0.04	74
0.1	123	0.1	108	0.06	94	0.06	81	0.04	76	0.06	74
...	...	...	...	0.08	94	0.08	81	0.06	76	0.08	74
...	...	...	...	0.1	94	0.08	81	0.06	76	0.1	74
...	...	...	...	...	...	...	...	0.08	76	...	...

Table NFN-16
Tabular Values for Figure NFN-16

Temperature up to 40°C, $E = 2.1 \times 10^5$ MPa		Temperature 95°C, $E = 2.1 \times 10^5$ MPa		Temperature 205°C, $E = 2.1 \times 10^5$ MPa		Temperature 315°C, $E = 2.0 \times 10^5$ MPa		Temperature 425°C, $E = 2.0 \times 10^5$ MPa	
A	B, MPa	A	B, MPa	A	B, MPa	A	B, MPa	A	B, MPa
0.00019	21	0.000195	21	0.0002	21	0.0002	21	0.00021	21
0.00038	41	0.00039	41	0.0004	41	0.00041	41	0.00042	41
0.00058	62	0.00058	62	0.0006	62	0.00061	62	0.00063	62
0.00077	83	0.00078	83	0.0008	83	0.00082	83	0.00085	83
0.00115	124	0.00114	121	0.00108	112	0.001	104	0.001	98
0.0012	131	0.0015	128	0.0015	116	0.0015	110	0.0015	108
0.0015	134	0.002	135	0.002	120	0.002	114	0.002	112
0.002	141	0.003	143	0.003	125	0.003	117	0.003	120
0.003	149	0.004	148	0.004	130	0.004	121	0.004	123
0.004	157	0.006	152	0.006	135	0.006	127	0.006	125
0.005	159	0.008	156	0.008	138	0.008	128	0.008	127
0.007	163	0.01	157	0.01	139	0.01	132	0.01	128
0.01	169	0.02	161	0.02	144	0.02	137	0.02	130
0.012	170	0.04	164	0.04	145	0.04	137	0.04	131
0.03	172	0.06	165	0.06	146	0.06	137	0.06	132
0.05	176	0.08	165	0.08	147	0.08	137	0.08	132
0.1	176	0.1	165	0.1	148	0.1	137	0.1	132

Table NFN-17
Tabular Values for Figure NFN-17

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	2.00 −04	2.07 +01	260	6.60 −04	6.21 +01
	9.30	9.65		8.00	7.58
	1.08 −03	1.10 +02		9.00	8.27
	1.16	1.17		9.50	8.62
	1.25	1.24		1.00 −03	8.96
	1.40	1.31		1.12	9.31
	1.60	1.38		1.25	9.65
	1.82	1.45		1.39	1.00 +02
	2.05	1.52		1.55	1.03
	2.40	1.59		1.90	1.10
	2.80	1.65		2.50	1.17
	3.50	1.72		3.40	1.24
	7.00	1.90		5.00	1.31
	2.00 −02	2.07		8.00	1.38
	1.00 −01	2.07		1.50 −02	1.45
				1.00 −01	1.45
150	2.10 −04	2.07 +01			
	8.50	8.27	425 to 650	2.50 −04	2.07 +01
	9.50	8.96		8.00	6.21
	1.05 −03	9.65		1.05 −03	7.58
	1.25	1.03 +02		1.25	8.27
	1.42	1.10		1.35	8.62
	1.65	1.17		1.48	8.96
	1.90	1.24		1.63	9.31
	2.30	1.31		1.80	9.65
	3.00	1.38		2.00	1.00 +02
	4.00	1.45		2.25	1.03
	5.20	1.52		2.80	1.10
	1.00 −02	1.59		3.70	1.17
	4.00	1.65		5.40	1.24
	8.00	1.68		8.30	1.31
	1.00 −01	1.68		1.65 −02	1.38
				3.00	1.41
260	2.20 −04	2.07 +01		1.00 −01	1.41

Table NFN-18
Tabular Values for Figure NFN-18

Temperature 20°C, $E = 2.0 \times 10^5$ MPa		Temperature 95°C, $E = 2.0 \times 10^5$ MPa		Temperature 175°C, $E = 1.9 \times 10^5$ MPa		Temperature 260°C, $E = 1.9 \times 10^5$ MPa		Temperature 345°C, $E = 1.8 \times 10^5$ MPa		Temperature 425°C, $E = 1.8 \times 10^5$ MPa	
A	B, MPa	A	B, MPa	A	B, MPa	A	B, MPa	A	B, MPa	A	B, MPa
0.0002	16	0.0002	20	0.0002	19	0.002	19	0.0002	18	0.0002	18
0.00079	78	0.00068	67	0.00064	59	0.00057	53	0.00049	43	0.00045	40
0.0008	79	0.0007	68	0.0007	61	0.0006	54	0.0005	44	0.0005	41
0.0009	80	0.0008	70	0.0008	63	0.0007	56	0.0006	46	0.0006	44
0.001	83	0.0009	72	0.0009	65	0.0008	58	0.0007	48	0.0007	46
0.0015	88	0.001	73	0.001	67	0.0009	59	0.0008	50	0.0008	48
0.002	95	0.0015	80	0.0015	72	0.001	61	0.0009	52	0.0009	50
0.0025	97	0.002	85	0.002	76	0.0015	62	0.001	54	0.001	51
0.003	100	0.0025	89	0.0025	79	0.002	70	0.0015	59	0.0015	55
0.004	104	0.003	92	0.003	81	0.0025	71	0.002	62	0.002	58
0.005	108	0.004	96	0.004	85	0.003	73	0.0025	64	0.0025	61
0.006	110	0.005	99	0.005	87	0.004	76	0.003	66	0.003	62
0.007	113	0.006	101	0.006	88	0.005	78	0.004	69	0.004	63
0.008	114	0.007	103	0.007	90	0.006	79	0.005	71	0.005	66
0.009	114	0.008	103	0.008	90	0.007	79	0.006	72	0.006	66
0.01	116	0.009	104	0.009	91	0.008	80	0.007	72	0.007	67
0.015	118	0.01	105	0.01	92	0.009	81	0.008	73	0.008	68
0.02	120	0.015	106	0.015	93	0.01	81	0.009	74	0.009	68
0.025	121	0.02	107	0.02	94	0.015	83	0.01	74	0.01	69
0.03	121	0.025	108	0.025	94	0.02	83	0.015	76	0.015	70
0.04	121	0.03	108	0.03	94	0.025	84	0.02	76	0.02	70
0.05	121	0.04	108	0.04	95	0.03	85	0.025	77	0.025	71
0.06	121	0.05	108	0.05	95	0.04	86	0.03	77	0.03	72
0.07	121	0.06	108	0.06	95	0.05	87	0.04	79	0.04	72
...	...	0.07	108	0.07	95	0.06	87	0.05	79	0.05	72
...	...	...	...	0.08	95	0.07	87	0.06	79	0.06	72
...	...	...	...	0.09	95	0.08	87	...	...	...	...

Table NFN-19
Tabular Values for Figure NFN-19

Temperature 20°C, $E = 2.0 \times 10^5$ MPa		Temperature 95°C, $E = 2.0 \times 10^5$ MPa		Temperature 175°C, $E = 1.9 \times 10^5$ MPa		Temperature 260°C, $E = 1.9 \times 10^5$ MPa		Temperature 345°C, $E = 1.7 \times 10^5$ MPa		Temperature 425°C, $E = 1.7 \times 10^5$ MPa	
A	B, MPa	A	B, MPa	A	B, MPa	A	B, MPa	A	B, MPa	A	B, MPa
0.0002	20	0.0002	20	0.0002	19	0.0002	19	0.0002	17	0.0002	17
0.00061	63	0.00056	55	0.00051	48	0.00045	42	0.0004	34	0.00037	32
0.0007	65	0.0006	56	0.0006	50	0.0005	43	0.0005	38	0.0004	33
0.0008	67	0.0007	59	0.0007	53	0.0006	46	0.0006	40	0.0005	35
0.0009	69	0.0008	60	0.0008	54	0.0007	48	0.0007	41	0.0006	36
0.001	71	0.0009	62	0.0009	56	0.0008	50	0.0008	43	0.0007	39
0.0015	78	0.001	63	0.001	57	0.0009	51	0.0009	44	0.0008	40
0.002	83	0.0015	69	0.0015	62	0.001	52	0.001	45	0.0009	41
0.0025	86	0.002	72	0.002	64	0.0015	55	0.0015	49	0.001	42
0.003	89	0.0025	76	0.0025	67	0.002	58	0.002	52	0.0015	46
0.004	92	0.003	78	0.003	69	0.0025	59	0.0025	54	0.002	49
0.005	95	0.004	81	0.004	71	0.003	61	0.003	55	0.0025	50
0.006	96	0.005	83	0.005	72	0.004	63	0.004	57	0.003	52
0.007	97	0.006	85	0.006	74	0.005	65	0.005	59	0.004	54
0.008	99	0.007	85	0.007	74	0.006	66	0.006	60	0.005	55
0.009	99	0.008	86	0.008	75	0.007	66	0.007	61	0.006	56
0.01	100	0.009	87	0.009	75	0.008	67	0.008	61	0.007	57
0.015	103	0.01	88	0.01	75	0.009	68	0.009	62	0.008	58
0.02	103	0.015	89	0.015	77	0.01	68	0.01	62	0.009	59
0.025	103	0.02	91	0.02	79	0.015	69	0.015	63	0.01	59
0.03	104	0.025	92	0.025	79	0.02	70	0.02	66	0.015	60
0.04	104	0.03	92	0.03	79	0.025	70	0.025	66	0.02	61
0.05	104	0.04	92	0.04	79	0.03	70	0.03	66	0.025	62
0.06	104	0.05	92	0.05	79	0.04	71	0.04	66	0.03	64
0.07	105	0.06	92	0.06	79	0.05	71	...	...	0.04	64
0.08	105	0.07	92	0.07	79	0.06	72	...	...	...	...
...	...	0.08	92	0.08	79	0.07	72	...	...	...	...
...	...	0.09	92	...	...	0.08	72	...	...	...	...

Table NFN-20
Tabular Values for Figure NFN-20

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.32 −04	1.38 +01	205	1.43 −04	1.38 +01
	5.13	5.34		5.54	5.34
	6.00	5.45		6.00	5.45
	1.00 −03	6.21		1.00 −03	6.21
	3.00	8.20		3.00	8.20
	4.00	8.69		4.00	8.69
	5.00	9.10		5.00	9.10
	6.00	9.38		6.00	9.38
	7.00	9.65		7.00	9.65
	8.00	9.79		8.00	9.79
	9.00	9.93		9.00	9.93
	1.00 −02	1.00 +02		1.00 −02	1.00 +02
	1.50	1.03		1.50	1.03
	2.00	1.03		2.00	1.03

Table NFN-22
Tabular Values for Figure NFN-22

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	0.0002	21	425	0.004	102
	0.0009	92		0.005	103
	0.002	108		0.1	103
	0.003	117			
	0.004	122	650	0.00025	21
	0.005	127		0.001	83
	0.007	132		0.002	94
	0.009	135		0.003	99
	0.012	138		0.004	100
	0.1	138		0.005	101
				0.1	101
95	0.0002	21			
	0.0009	92	730	0.00025	19
	0.002	108		0.001	79
	0.003	117		0.002	90
	0.004	122		0.003	94
	0.005	127		0.004	97
	0.1	127		0.1	97
205	0.0002	19	760	0.00025	19
	0.00095	94		0.001	78
	0.002	108		0.1	78
	0.0025	112			
	0.003	114	790	0.00025	19
	0.004	117		0.001	59
	0.1	117		0.1	59
425	0.0002	17	815	0.00025	19
	0.00095	86		0.001	42
	0.002	97		0.1	42
	0.003	101			

Table NFN-23
Tabular Values for Figure NFN-23

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.02 −05	1	260	1.00 −05	1
	1.03 −04	10		1.09 −04	10
	6.76	65		6.27	54
	7.74	73		7.41	61
	8.90	81		8.89	68
	1.04 −03	89		1.09 −03	75
	1.25	98		1.37	82
	2.06	114		2.37	95
	4.09	130		4.47	109
	9.27	146		8.92	122
	2.32 −02	163		1.88 −02	136
	1.00 −01	163		1.00 −01	136
150	1.00 −05	1	345	1.01 −05	1
	1.06 −04	10		1.12 −04	10
	6.37	57		6.35	53
	7.49	65		7.51	60
	8.91	72		9.03	67
	1.08 −03	79		1.11 −03	73
	1.36	86		1.40	80
	2.34	100		2.41	93
	4.44	115		4.50	112
	9.01	129		8.91	124
	1.94 −02	144		1.86 −02	134
	1.00 −01	144		1.00 −01	134

Table NFN-24
Tabular Values for Figure NFN-24

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
20	1.00 −05	1.14	705	1.00 −05	0.862
	8.74	10.0		1.16 −04	10.0
	7.48 −04	85.5		6.00	51.7
	9.68	106.9		8.48	64.8
	1.20 −03	117.2		1.20 −03	73.1
	1.65	124.1		2.88	85.5
	5.00	137.9		1.00 −02	98.6
	2.30 −02	155.1		3.00	107.6
	1.00 −01	155.1		1.00 −01	107.6
150	1.00 −05	1.02	870	1.00 −05	0.765
	9.80	10.0		1.31 −04	10.0
	6.00 −04	61.2		5.00	38.3
	7.28	71.7		7.50	55.2
	9.24	82.7		1.20 −03	69.0
	1.28 −03	93.1		1.90	75.2
	3.22	108.9		3.00	79.3
	2.00 −02	136.5		1.00 −01	79.3
	1.00 −01	136.5	925	1.00 −05	0.686
315	1.00 −05	0.952		1.46 −04	10.0
	1.05 −04	10.0		5.00	34.3
	6.00	57.3		8.14	55.8
	7.05	63.7		1.00 −01	55.8
	9.50	73.1			
	1.30 −03	80.0			
	4.60	97.9			
	2.00 −02	113.1			
	1.00 −01	113.1			

Table NFN-25
Tabular Values for Figure NFN-25

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
38	0.100 −04	0.103 +01	205	0.100 −04	0.983 +00
	0.100 −03	0.103 +02		0.100 −03	0.983 +01
	0.500	0.517		0.500	0.491 +02
	0.750	0.775		0.750	0.736
	0.100 −02	0.984		0.990	0.929
	0.124	0.106 +03		0.125 −02	0.101 +03
	0.145	0.109		0.145	0.104
	0.174	0.112		0.173	0.107
	0.192	0.113		0.192	0.108
	0.295	0.117		0.288	0.112
	0.465	0.121		0.493	0.117
	0.677	0.124		0.663	0.119
	0.927	0.126		0.972	0.122
	0.188 −01	0.131		0.194 −01	0.127
	0.500	0.137		0.500	0.132
	0.100 +00	0.138		0.100 +00	0.132

Table NFN-26
Tabular Values for Figure NFN-26

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
Up to 38	1.00 −05	0.958	205	8.90 −03	124.1
	1.04 −04	10.0		2.10 −02	136.5
	1.37 −03	131.0		1.00 −01	136.5
	2.00	137.9			
	5.00	151.7	315	1.00 −05	0.869
	1.10 −02	165.5		1.15 −04	10.0
	2.40	179.3		9.50	82.7
	1.00 −01	179.3		2.00 −03	96.5
				4.50	110.3
95	1.00 −05	0.938		1.20 −02	124.1
	1.07 −04	10.0		2.10	131.0
	1.22 −03	114.5		1.00 −01	131.0
	2.10	124.1			
	4.70	137.9	425	1.00 −05	0.834
	2.10 −02	166.2		1.20 −04	10.0
	1.00 −01	166.2		9.27	77.6
				1.70 −03	89.6
205	1.00 −05	0.903		3.50	103.4
	1.11 −04	10.0		8.50	117.2
	9.92	89.6		2.00 −02	128.9
	2.20 −03	103.4		1.00 −01	128.9
	5.50	117.2			

Table NFN-27
Tabular Values for Figure NFN-27

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
Room temp.	1.00 −05	0.986	260	1.10 −03	65.5
	1.01 −04	10.0		1.90	69.0
	8.01	79.3		4.61	72.4
	1.00 −03	89.6		1.83 −02	75.8
	1.55	103.4		1.00 −01	78.9
	3.00	110.3			
	1.65 −02	117.2	425	1.00 −05	0.883
	1.00 −01	120.7		1.13 −04	10.0
				5.47	48.3
95	1.00 −05	0.972		7.60	55.2
	1.03 −04	10.0		1.50 −03	62.1
	7.20	69.0		3.11	65.5
	9.50	79.3		1.26 −02	69.0
	1.30 −03	86.2		1.00 −01	71.7
	2.20	93.1			
	3.50	96.5	595	1.00 −05	0.834
	7.60	100.0		1.20 −04	10.0
	2.68 −02	103.4		4.96	41.4
	1.00 −01	105.5		5.60	44.8
				7.37	48.3
260	1.00 −05	0.786		2.20 −03	55.2
	1.08 −04	10.0		2.57 −02	62.1
	6.15	55.2		1.00 −01	63.4
	8.50	62.1			

Table NFT-1
Tabular Values for Figure NFT-1

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.00 −05	5.34 −01	205	1.00 −05	4.83 −01
	1.16 −03	6.20 +01		7.88 −04	3.80 +01
	1.50	8.02		9.00	4.07
	2.00	9.72		1.00 −03	4.29
	2.50	1.10 +02		1.50	5.21
	3.00	1.18		2.00	5.83
	4.00	1.31		2.50	6.29
	5.00	1.40		3.00	6.69
	6.00	1.45		4.00	7.38
	7.00	1.51		5.00	7.79
	8.00	1.55		6.00	8.20
	9.00	1.58		7.00	8.41
	1.00 −02	1.60		8.00	8.69
	1.50	1.69		9.00	8.96
	2.00	1.71		1.00 −02	9.10
	2.50	1.74		1.26	9.45
	1.00 −01	1.74		1.00 −01	9.45
95	1.00 −05	5.17 −01	315	1.00 −05	4.34 −01
	1.22 −03	6.31 +01		6.92 −04	3.01 +01
	1.50	7.30		8.00	3.23
	2.00	8.27		1.00 −03	3.53
	2.50	9.10		1.50	4.05
	3.00	9.72		2.00	4.46
	4.00	1.09 +02		2.50	4.77
	5.00	1.19		3.00	5.02
	6.00	1.25		4.00	5.34
	7.00	1.29		5.00	5.60
	8.00	1.32		7.00	5.90
	9.00	1.34		9.00	5.90
	1.00 −02	1.37		1.00 −02	5.90
	1.50	1.40		1.50	5.90
	2.00	1.42		1.00 −01	5.90
	2.50	1.43			
	3.00	1.44			
	1.00 −01	1.44			

Table NFT-2
Tabular Values for Figure NFT-2

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.00 −05	5.34 −01	205	6.85 −04	3.31 +01
	1.28 −03	6.84 +01		1.00 −03	4.10
	1.50	7.61		2.00	4.96
	2.00	8.94		4.00	5.97
	3.00	1.03 +02		6.00	6.46
	5.00	1.15		9.00	6.64
	8.00	1.23		1.00 −02	6.72
	1.00 −02	1.25		1.30	6.76
	2.00	1.30		1.00 −01	6.76
	6.00	1.38			
	1.00 −01	1.38	315	1.00 −05	4.34 −01
				6.41 −04	2.79 +01
95	1.00 −05	5.17 −01		6.85	2.95
	1.23 −03	6.36 +01		8.00	3.17
	1.50	7.03		1.00 −03	3.31
	2.00	7.79		2.00	3.44
	4.00	9.24		3.00	3.55
	7.00	1.02 +02		5.00	3.65
	1.00 −02	1.07		8.00	3.72
	2.00	1.12		1.00 −02	3.79
	4.00	1.16		1.50	3.86
	1.00 −01	1.16		1.80	3.90
				1.00 −01	3.93
205	1.00 −05	4.83 −01			

Table NFT-3
Tabular Values for Figure NFT-3

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	0.100 −04	0.534 +00	205	0.900	0.276
	0.129 −03	0.689 +01		0.200 −01	0.279
	0.187	0.100 +02		0.300	0.283
	0.900	0.481		0.400	0.283
	0.900	0.481		0.500	0.283
	0.250 −02	0.552		0.100 +00	0.283
	0.550	0.607			
	0.110 −01	0.642	315	0.100 −04	0.434 +00
	0.200	0.672		0.159 −03	0.689 +01
	0.300	0.688		0.230	0.100 +02
	0.400	0.689		0.330	0.143
	0.500	0.689		0.100 −02	0.159
	0.600	0.689		0.150	0.165
	0.100 +00	0.689		0.250	0.173
				0.400	0.179
205	0.100 −04	0.438 +00		0.700	0.183
	0.143 −03	0.689 +01		0.100 −01	0.183
	0.207	0.100 +02		0.200	0.183
	0.420	0.203		0.300	0.183
	0.200 −02	0.248		0.400	0.183
	0.400	0.262		0.100 +00	0.183
	0.700	0.274			

Table NFT-4
Tabular Values for Figure NFT-4

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	0.100 −04	0.574 +00	205	0.100 −04	0.478 +00
	0.120 −03	0.689 +01		0.144 −03	0.689 +01
	0.179	0.100 +02		0.209	0.100 +02
	0.735	0.414		0.745	0.356
	0.977	0.552		0.994	0.475
	0.124 −02	0.717		0.125 −02	0.594
	0.149	0.862		0.146	0.689
	0.173	0.979		0.167	0.786
	0.198	0.110 +03		0.189	0.876
	0.350	0.155		0.342	0.132 +03
	0.499	0.186		0.497	0.157
	0.749	0.214		0.749	0.172
	0.100 −01	0.241		0.993	0.172
	0.200	0.241		0.200 −01	0.172
	0.100 +00	0.241		0.100 +00	0.172
95	0.100 −04	0.526 +00	315	0.100 −04	0.428 +00
	0.131 −03	0.689 +01		0.161 −03	0.689 +01
	0.190	0.100 +02		0.233	0.100 +02
	0.781	0.414		0.748	0.319
	0.100 −02	0.525		0.992	0.421
	0.125	0.652		0.122 −02	0.512
	0.149	0.779		0.146	0.603
	0.173	0.889		0.172	0.689
	0.198	0.993		0.199	0.779
	0.346	0.145 +03		0.342	0.108 +03
	0.494	0.171		0.500	0.127
	0.746	0.198		0.748	0.143
	0.991	0.211		0.997	0.143
	0.200 −01	0.211		0.200 −01	0.143
	0.100 +00	0.211		0.100 +00	0.143

Table NFT-5
Tabular Values for Figure NFT-5

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	0.100 −03	0.534 +01	205	0.100 −03	0.483 +01
	0.129	0.689		0.143	0.689
	0.188	0.100 +02		0.207	0.100 +02
	0.998	0.530		0.244	0.118
	0.125 −02	0.658		0.295	0.143
	0.150	0.779		0.347	0.168
	0.174	0.889		0.398	0.192
	0.200	0.100 +03		0.449	0.216
	0.348	0.146		0.757	0.365
	0.470	0.169		0.213 −02	0.965
	0.750	0.172		0.265	0.107 +03
	0.100 −01	0.172		0.750	0.138
	0.200	0.172		0.200 −01	0.154
	0.500	0.172		0.500	0.154
	0.100 +00	0.172		0.100 +00	0.154
95	0.100 −03	0.517 +01	315	0.100 −03	0.434 +01
	0.133	0.689		0.159	0.689
	0.193	0.100 +02		0.230	0.100 +02
	0.298	0.154		0.549	0.239
	0.364	0.188		0.680	0.295
	0.430	0.223		0.810	0.352
	0.497	0.256		0.941	0.409
	0.563	0.291		0.107 −02	0.465
	0.961	0.496		0.186	0.807
	0.136 −02	0.689		0.265	0.965
	0.206	0.100 +03		0.750	0.120 +03
	0.380	0.139		0.100 −01	0.120
	0.200 −01	0.166		0.200	0.120
	0.500	0.166		0.500	0.120
	0.100 +00	0.166		0.100 +00	0.120

Table NFT-6
Tabular Values for Figure NFT-6

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.00 −05	5.76 −01	205	6.57	2.31
	1.74 −04	1.00 +01		1.17 −02	2.59
	4.67 −03	2.69 +02		2.00	2.76
	7.26	3.17		3.00	2.83
	1.05 −02	3.45		1.00 −01	2.83
	1.83	3.78			
	3.83	3.96	315	1.00 −05	5.14 −01
	1.00 −01	3.96		1.94 −04	1.00 +01
				3.36 −03	1.72 +02
95	1.00 −05	5.65 −01		4.78	1.92
	1.77 −04	1.00 +01		1.23 −02	2.24
	4.09 −03	2.31 +02		4.50	2.35
	5.97	2.69		1.00 −01	2.35
	1.01 −02	3.10			
	2.44	3.45	425	1.00 −05	4.90 −01
	4.11	3.54		2.04 −04	1.00 +01
	1.00 −01	3.54		3.38 −03	1.65 +02
				3.88	1.72
205	1.00 −05	5.38 −01		8.82	1.93
	1.85 −04	1.00 +01		5.45 −02	2.07
	3.53 −03	1.90 +02		1.00 −01	2.07

Table NFZ-1
Tabular Values for Figure NFZ-1

Temp., °C	A	B, MPa	Temp., °C	A	B, MPa
40	1.00 −05	4.90 −01	150	2.00 −02	6.11 +01
	1.08 −03	5.80 +01		4.00	6.28
	2.00	6.96			
	4.00	8.14	260	1.00 −05	3.96 −01
	6.00	8.83		3.83 −04	1.54 +01
	1.00 −02	9.58		1.00 −03	2.14
	1.50	1.00 +02		3.00	2.97
				9.00	3.78
150	1.00 −05	4.54 −01			
	6.72 −04	3.22 +01	370	1.00 −05	3.48 −01
	1.00 −03	3.85		2.93 −04	1.05 +01
	1.50	4.42		1.00 −03	1.48
	2.00	4.73		3.00	1.99
	4.00	5.32		9.00	2.59
	6.00	5.59			
	1.00 −02	5.83			

Table NFZ-2
Tabular Values for Figure NFZ-2

Temperature up to 40°C, $E = 1.0 \times 10^5$ MPa		Temperature 150°C, $E = 8.6 \times 10^4$ MPa		Temperature 260°C, $E = 7.5 \times 10^4$ MPa		Temperature 370°C, $E = 6.4 \times 10^4$ MPa	
A	B, MPa	A	B, MPa	A	B, MPa	A	B, MPa
0.00002	1	0.00002	0.86	0.00002	0.75	0.00002	0.67
0.00289	145	0.00196	84	0.00151	57	0.00126	42
0.003	148	0.0025	85	0.002	66	0.0015	43
0.004	153	0.003	90	0.0025	68	0.002	46
0.005	157	0.004	94	0.003	70	0.0025	47
0.006	159	0.005	97	0.004	72	0.003	48
0.007	163	0.006	99	0.005	74	0.004	49
0.008	165	0.007	101	0.006	74	0.005	50
0.009	166	0.008	103	0.007	75	0.006	51
0.01	167	0.009	104	0.008	76	0.007	52
0.015	169	0.01	105	0.009	76	0.008	52
0.02	172	0.015	106	0.01	77	0.009	53
0.03	173	0.02	107	0.015	77	0.01	54
0.035	174	0.03	108	0.02	77	0.012	54
...	...	0.04	108	0.03	78	...	...
...	...	0.045	109	0.04	78	...	...
...	...	...	...	0.05	78	...	...

MANDATORY APPENDIX 1
BASIS FOR ESTABLISHING STRESS VALUES IN TABLES 1A AND 1B

1-100 DERIVATION OF ALLOWABLE STRESS VALUES

The values in Tables 1A and 1B are established by the Committee only. In the determination of allowable stress values for materials, the Committee is guided by successful experience in service, insofar as evidence of satisfactory performance is available. Such evidence is considered equivalent to test data where operating conditions are known with reasonable certainty. In the evaluation of new materials, the Committee is guided to a certain extent by the comparison of test information with available data on successful applications of similar materials.

Nomenclature:

F_{avg} = multiplier applied to average stress for rupture in 100 000 h. At 815°C and below, F_{avg} = 0.67. Above 815°C, it is determined from the slope of the log time-to-rupture versus log stress plot at 100 000 h such that log F_{avg} = $1/n$, but it may not exceed 0.67.

R_T = ratio of the average temperature dependent trend curve value of tensile strength to the room temperature tensile strength

R_Y = ratio of the average temperature dependent trend curve value of yield strength to the room temperature yield strength

S_C = average stress to produce a creep rate of 0.01%/1 000 h

S_{Ravg} = average stress to cause rupture at the end of 100 000 h

S_{Rmin} = minimum stress to cause rupture at the end of 100 000 h

S_T = specified minimum tensile strength at room temperature, MPa

S_Y = specified minimum yield strength at room temperature, MPa

n = a negative number equal to Δ log time-to-rupture divided by Δ log stress at 100 000 h

NA = not applicable

The maximum allowable stress shall be the lowest value obtained from the criteria in Table 1-100 . The mechanical properties considered, and the factors applied to establish the maximum allowable stresses, are as given below.

(a) At temperatures below the range where creep and stress rupture strength govern the selection of stresses, the maximum allowable stress value is the lowest of the following:

(1) the specified minimum tensile strength at room temperature divided by 3.5

(2) the tensile strength at temperature divided by 3.5

(3) two-thirds of the specified minimum yield strength at room temperature

(4) two-thirds of the yield strength at temperature

In the application of these criteria, the Committee considers the yield strength at temperature to be $S_Y R_Y$, and the tensile strength at temperature to be $1.1 S_T R_T$.

Two sets of allowable stress values are provided in Tables 1A and 1B for austenitic stainless steels, nickel alloys, copper alloys, and cobalt alloys having an S_Y/S_T ratio less than 0.625. The higher alternative allowable stresses are identified by a footnote to the tables. These stresses exceed two-thirds but do not exceed 90% of the minimum yield strength at temperature. The higher stress values should be used only where slightly higher deformation is not in itself objectionable. These higher stresses are not recommended for the design of flanges or other strain-sensitive applications.

(b) At temperatures in the range where creep and stress rupture strength govern the selection of stresses, the maximum allowable stress value for all materials is established by the Committee not to exceed the lowest of the following:

(1) 100% of the average stress to produce a creep rate of 0.01%/1 000 h

(2) $100F_{avg}$% of the average stress to cause rupture at the end of 100 000 h

(3) 80% of the minimum stress to cause rupture at the end of 100 000 h

Stress values for high temperatures are based, whenever possible, on representative uniaxial properties of the materials obtained under standard ASTM testing conditions or equivalent. The stress values are based on basic properties of the materials and no consideration is given for corrosive environment, for abnormal temperature and stress conditions, or for other design considerations.

Table 1-100
Criteria for Establishing Allowable Stress Values for Tables 1A and 1B

Product/Material	Room Temperature and Below		Above Room Temperature						
	Tensile Strength	Yield Strength	Tensile Strength		Yield Strength		Stress Rupture		Creep Rate
Wrought or cast ferrous and nonferrous	$\frac{S_T}{3.5}$	$\frac{2}{3} S_Y$	$\frac{S_T}{3.5}$	$\frac{1.1}{3.5} S_T R_T$	$\frac{2}{3} S_Y$	$\frac{2}{3} S_Y R_Y$ or $0.9 S_Y R_Y$ [Note (1)]	$F_{avg} S_{Ravg}$	$0.8 S_{Rmin}$	$1.0 S_c$
Welded pipe or tube, ferrous and nonferrous	$\frac{0.85}{3.5} S_T$	$\frac{2}{3} \times 0.85 S_Y$	$\frac{0.85}{3.5} S_T$	$\frac{(1.1 \times 0.85)}{3.5} S_T R_T$	$\frac{2}{3} \times 0.85 S_Y$	$\frac{2}{3} \times 0.85 S_Y R_Y$ or $0.9 \times 0.85 S_Y R_Y$ [Note (1)]	$(F_{avg} \times 0.85) S_{Ravg}$	$(0.8 \times 0.85) S_{Rmin}$	$0.85 S_c$

NOTE:

(1) Two sets of allowable stress values may be provided for austenitic stainless steels in Table 1A; and nickel alloys, copper alloys, and cobalt alloys in Table 1B; having an S_Y/S_T ratio less than 0.625. The lower values are not specifically identified by a footnote. These lower values do not exceed two-thirds of the yield strength at temperature. The higher alternative allowable stresses are identified by a footnote. These higher stresses may exceed two-thirds but do not exceed 90% of the yield strength at temperature. The higher values should be used only where slightly higher deformation is not in itself objectionable. These higher stresses are not recommended for the design of flanges or for other strain-sensitive applications.

MANDATORY APPENDIX 2
BASIS FOR ESTABLISHING DESIGN STRESS INTENSITY VALUES FOR TABLES 2A, 2B, AND 4, AND ALLOWABLE STRESS VALUES FOR TABLE 3

2-100 DERIVATION OF STRESS INTENSITY VALUES

The values in Tables 2A, 2B, 3, and 4 are established by the Committee only. In the determination of allowable stress values for nonnuclear materials in Table 3, the Committee is guided by successful experience in service, insofar as evidence of satisfactory experience is available. Such evidence is considered equivalent to test data where operating conditions are known with reasonable certainty. In the evaluation of new materials for both nuclear and nonnuclear applications, it is sometimes necessary to be guided to a certain extent by the comparison of test information with available data on successful applications of similar materials.

The factors employed to determine design stress intensity values are provided in Tables 2-100(a), 2-100(b), and 2-100(c). Nomenclature for these Tables is as follows:

F_{avg} = multiplier applied to average stress for rupture in 100 000 h. At 815°C and below, F_{avg} = 0.67. Above 815°C, it is determined from the slope of the log time-to-rupture versus log stress plot at 100 000 h such that log $F_{avg} = 1/n$, but it may not exceed 0.67.

R_T = ratio of the average temperature dependent trend curve value of tensile strength to the room temperature tensile strength

R_Y = ratio of the average temperature dependent trend curve value of yield strength to the room temperature yield strength

S_T = specified minimum tensile strength at room temperature, MPa

S_Y = specified minimum yield strength at room temperature, MPa

n = a negative number equal to Δ log time-to-rupture divided by Δ log stress at 100 000 h

NA = not applicable

The maximum design stress intensity shall be the lowest value obtained from the criteria in Tables 2-100(a), 2-100(b), and 2-100(c). The mechanical properties considered, and the factors applied to establish the maximum allowable stresses, are given in 2-110 through 2-130.

2-110 CRITERIA FOR MATERIALS OTHER THAN BOLTING: TABLES 2A AND 2B

The design stress intensity values at any temperature are no larger than the least of the following:

(a) One-third of the specified minimum tensile strength at room temperature.

(b) One-third of the tensile strength at temperature.

(c) Two-thirds of the specified minimum yield strength at room temperature.

(d) Two-thirds of the yield strength at temperature, except that for austenitic stainless steels, nickel alloys, copper alloys, and cobalt alloys having an S_Y/S_T ratio less than 0.625, as indicated in Tables 2A and 2B, this value may be as large as 90% of the yield strength at temperature (but never more than two-thirds of the specified minimum yield strength).

In the application of these criteria, the Committee considers the yield strength at temperature to be $S_Y R_Y$, and the tensile strength at temperature to be $1.1 S_T R_T$.

When, in the judgment of the Committee, values have been in use for a sufficient period of time to have demonstrated successful experience in service, even at temperatures at which the behavior of the material is time dependent, such values shall be retained, but shall be identified by a different typeface (normally italics) and a note in the tables that indicates at what temperature the use of such values begins.

2-120 CRITERIA FOR BOLTING MATERIALS IN TABLE 3 FOR USE WITH SECTION III (CLASS 2 AND 3 RULES); SECTION VIII, DIVISION 1; SECTION VIII, DIVISION 2 (PART 4.16 RULES); AND SECTION XII

(a) For materials whose strength has not been enhanced by heat treatment or by strain hardening, the allowable stress value shown at any temperature in Table 3 is the least of the following:

(1) one-fourth of the specified minimum tensile strength at room temperature

(2) one-fourth of the tensile strength at temperature

(3) two-thirds of the specified minimum yield strength at room temperature

(4) two-thirds of the yield strength at temperature

(b) For materials whose strength has been enhanced by heat treatment or by strain hardening, the allowable stress value shown at any temperature in Table 3 is the least of the following, unless these values are lower than the annealed values, in which case the annealed values shall be used:

(1) one-fifth of the specified minimum tensile strength at room temperature

(2) one-fourth of the tensile strength at temperature

(3) one-fourth of the specified minimum yield strength at room temperature

(4) two-thirds of the yield strength at temperature

(c) In the application of these criteria, the Committee considers the yield strength at temperature to be $S_Y R_Y$, and the tensile strength at temperature to be $1.1 S_T R_T$.

(d) At temperatures in the range where creep and stress rupture strength govern the selection of stresses, the maximum allowable stress value for all materials is established by the Committee not to exceed the lowest of the following:

(1) 100% of the average stress to produce a creep rate of 0.01%/1 000 h

(2) $100F_{avg}$% of the average stress to cause rupture at the end of 100 000 h

(3) 80% of the minimum stress to cause rupture at the end of 100 000 h

Stress values for high temperatures are based, whenever possible, on representative uniaxial properties of the materials obtained under standard ASTM testing conditions or equivalent. The stress values are based on basic properties of the materials and no consideration is given for corrosive environment, for abnormal temperature and stress conditions, or for other design considerations.

2-130 CRITERIA FOR BOLTING MATERIALS IN TABLE 4 FOR USE WITH SECTION VIII, DIVISION 2, PART 5 AND ANNEX 5.F; AND WITH SECTION III, SUBSECTIONS NB AND WB

The allowable stress or design stress intensity value shown at any temperature in Table 4 is the least of the following:

(a) For materials whose strength has not been enhanced by heat treatment or strain hardening,

(1) one-fourth of the specified minimum tensile strength at room temperature;

(2) one fourth of the tensile strength at temperature;

(3) two-thirds of the specified minimum yield strength at room temperature;

(4) two-thirds of the yield strength at temperature.

(b) For materials whose strength has been enhanced by heat treatment or strain hardening,

(1) one-third of the specified minimum yield strength at room temperature;

(2) one-third of the yield strength at temperature.

In the application of these criteria, the Committee considers the yield strength at temperature to be $S_Y R_Y$, and the tensile strength at temperature to be $1.1 S_T R_T$.

Table 2-100(a)
Criteria for Establishing Design Stress Intensity Values for Tables 2A and 2B

	Room Temperature and Below		Above Room Temperature			
			Tensile Strength		Yield Strength	
Product/Material	Tensile Strength	Yield Strength				
Wrought or cast, ferrous and nonferrous	$\frac{S_T}{3}$	$\frac{2}{3}S_Y$	$\frac{S_T}{3}$	$\frac{1.1}{3}S_T R_T$	$\frac{2}{3}S_Y$	$\frac{2}{3}S_Y R_Y$ or $0.9 S_Y R_Y$ [Note (1)]
Welded pipe or tube, ferrous and nonferrous	$\frac{0.85}{3}S_T$	$\frac{2}{3} \times 0.85 S_Y$	$\frac{0.85}{3}S_T$	$\frac{1.1 \times 0.85}{3}S_T R_T$	$\frac{2}{3} \times 0.85 S_Y$	$\frac{2}{3} \times 0.85 S_Y R_Y$ or $0.9 \times 0.85 S_Y R_Y$ [Note (1)]

NOTE:
(1) For austenitic stainless steels, nickel alloys, copper alloys, and cobalt alloys having an S_Y/S_T ratio less than 0.625, the design stress intensity values in Tables 2A and 2B may exceed two-thirds and may be as high as 90% of the yield strength at temperature.

Table 2-100(b)
Criteria for Establishing Allowable Stress Values for Table 3

Product/Material	Room Temperature and Below		Above Room Temperature						
	Tensile Strength	Yield Strength	Tensile Strength		Yield Strength		Stress Rupture		Creep Rate
Bolting, annealed ferrous and nonferrous	$\frac{S_T}{4}$	$\frac{2}{3}S_Y$	$\frac{S_T}{4}$	$\frac{1.1}{4}S_TR_T$	$\frac{2}{3}S_Y$	$\frac{2}{3}S_YR_Y$	$F_{avg}S_{Ravg}$	$0.8S_{Rmin}$	$1.0S_C$
Bolting, with strength enhanced by heat treatment or strain hardening, ferrous and nonferrous [Note (1)]	$\frac{S_T}{5}$	$\frac{S_Y}{4}$	$\frac{1}{5}S_T$	$\frac{1.1}{4}S_TR_T$	$\frac{1}{4}S_Y$	$\frac{2}{3}S_YR_Y$	$F_{avg}S_{Ravg}$	$0.8S_{Rmin}$	$1.0S_C$

NOTE:
(1) For materials whose strength has been enhanced by heat treatment or by strain hardening, the criteria shown shall govern unless the values are lower than for the annealed material, in which case the annealed values shall be used.

Table 2-100(c)
Criteria for Establishing Allowable Stress or Design Stress Intensity Values for Table 4

Product/Material	Room Temperature and Below		Above Room Temperature	
	Tensile Strength	Yield Strength	Tensile Strength	Yield Strength
Bolting, with strength not enhanced by heat treatment or strain hardening, ferrous and nonferrous	$\frac{1}{4}S_T$	$\frac{2}{3}S_Y$	$\frac{1.1}{4}S_TR_T$	$\frac{2}{3}S_YR_Y$
Bolting, with strength enhanced by heat treatment or strain hardening, ferrous and nonferrous [Note (1)]	NA	$\frac{1}{3}S_Y$	NA	$\frac{1}{3}S_YR_Y$

NOTE:
(1) For materials whose strength has been enhanced by heat treatment or by strain hardening, the criteria shown shall govern unless the values are lower than for material whose strength is not enhanced by heat treatment or strain hardening, in which case the values for the material whose strength has not been enhanced by heat treatment or strain hardening shall be used.

MANDATORY APPENDIX 3
BASIS FOR ESTABLISHING EXTERNAL PRESSURE CHARTS

3-100 GENERAL

The charts in Subpart 3 were established in order to facilitate a conservative approach in determining external pressure ratings for components covering a wide range of geometries, materials, and conditions. The methods provide for a uniform basis of calculation for the referencing Section; the use of the charts eliminates the need for complex calculations by equations and incorporates realistic factors of safety for components of widely varying length-to-diameter and diameter-to-thickness ratios.

3-200 BASIS OF CHARTS IN SUBPART 3

Rules for allowable longitudinal compressive stress, rules for shells and tubes under external pressure, rules for stiffening rings, and rules for formed heads under external pressure make reference to and use material in Subpart 3, Charts and Tables for Determining Shell Thickness of Components Under External Pressure. Entrance into the charts is via the Factor A, abscissa, which is a nondimensional term related to certain geometrical considerations of the part in question, such as thickness, diameter, and length. These geometrical considerations are independent of material properties; thus a single geometry chart, Figure G, applies to all materials and is used in conjunction with the materials charts in Subpart 3.

3-300 USE OF CHARTS IN SUBPART 3

External pressure capability of cylinders, spheres, and formed heads, as well as allowable compressive stress for cylinders subject to axial compression, is obtained by reference to the charts in Subpart 3 along with instructions and equations given in the appropriate paragraphs in the body of the referencing Section.

3-400 BACKGROUND AND DEVELOPMENT OF THEORY

The development of the present rules for external pressure has a long history. Among the principal references used in developing these rules are Timoshenko's *Theory of Elasticity* (3-900 [1]), *Theory of Plates and Shells* (3-900 [2]), and *Theory of Elastic Stability* (3-900 [3]); a group of papers reprinted as Section 9 in ASME's publication *Pressure Vessel and Piping Design — Collected Papers 1927–1959* (3-900 [4]); and Sturm's 1941 University of Illinois Bulletin 329, *A Study of the Collapsing Pressure of Thin Walled Cylinders* (3-900 [5]). The format for the charts in Subpart 3 is detailed in Sturm's University of Illinois Bulletin 329 3-900 [5], with additional comments in Bergman's 1952 paper, The New Type Code Chart for the Design of Vessels Under External Pressure (included in 3-900 [4]). The Sturm and Bergman papers detail the mechanics involved in combining the materials and geometrical factors into a nomograph format; an important companion paper to those of Sturm and Bergman is Sturm and O'Brien's 1946 ASME paper, Computing Strength of Vessels Subjected to External Pressure (3-900 [6]).

Alternative rules for determining allowable compressive stress are given in BPVC Section VIII, Division 2. An equation is given (3.D.5) for the tangent modulus of the stress–strain curve that could be used to develop external pressure charts as in Subpart 3. The tangent modulus is derived from generic stress–strain relations, represented in equation form, to represent broad classes of materials.

3-500 DESIGN BASIS

As noted previously, stress and strain values for components are analytically and geometrically distilled into the two chart parameters A and B. The design is based on the following considerations.

(a) External Pressure on Cylinders. The geometric chart, Figure G,[2] for components is used in conjunction with the appropriate material chart and an equation for B to obtain a design external pressure. This is based on the following considerations.

(1) The assumed critical buckling stress without any reduction for tolerance, etc., is based upon the reference in 3-900 [5], assuming pressure on the ends of the vessel as well as radial to the cylinder, and assuming the ends of the cylinder are simply supported.

(2) The parameters and stresses are those at the design temperature.

(3) The tangent modulus is used for buckling stresses above the proportional limit. The point at which yield or creep governs (beyond the transition) is chosen at a relatively high value of A (i.e., t/R).

(4) The allowable tolerances are based on empirical relationships intended to limit the buckling pressure to not less than 80% of that for a perfectly uniform vessel.

(b) External Pressure on Spheres. The material charts are used together with equations to determine A from the geometry and to determine the pressure using B

determined from the chart to determine a design external pressure. This procedure is based upon the following considerations.

(1) The assumed critical elastic buckling stress including a reduction for tolerance, theory versus tests, etc., is based on

$$0.125\frac{Et}{R_0}$$

(2) The parameters and stresses are those at the design temperature.

(3) The tangent modulus is used for buckling stresses above the proportional limit [see (a)(3) above].

(4) The allowable tolerances are based upon empirical relationships intended to limit (along with reduction factors based on tests) the buckling pressure to not less than 60% of that obtained using the equation in (1) above.

NOTE: This gives results similar to those for the cylinder in the elastic range. However, the present material charts give more restrictive results for spheres than for cylinders in the plastic range.

(c) Axial Compression on Cylinders.[3] An equation is used to determine A from the geometry. Then A is used with the material chart to determine B, the allowable compressive stress for that geometry. This is based upon the following considerations.

(1) The assumed critical elastic buckling stress including a reduction for tolerance, theory versus tests, etc., is based upon

$$0.125\frac{Et}{R_0}$$

(2) The parameters and stresses are those at the design temperature.

(3) The tangent modulus is used for buckling stresses above the proportional limit [see (a)(3) above].

(4) The allowable tolerances are based upon empirical relationships intended to limit (along with reduction factors based upon tests) the critical buckling stress to not less than that obtained using the equation in (1) above for R/t values.

(d) Elevated Temperature Effects

(1) The design basis described here does not include the effects of creep on buckling. The Subpart 3 external pressure charts and tables are based on stress–strain properties that do not include time-dependent effects. At elevated temperatures, the effect of creep is to reduce buckling stress depending on the magnitude of load and time at load. At some temperatures for which limits are provided in the Subpart 3 charts, the material is in the creep range and buckling stresses are reduced, with the reduction increasing with time at load. The result is that for temperatures in the creep range, the actual design margins will be less than those intended by this design basis and the associated criteria for allowable stresses (see 3-600). However, the design margins may still be adequate due to conservatism of the design limits and the specific nature of creep buckling.

(2) Design limits for elevated temperature buckling and instability are given in Section III, Division 5, Subsection HB, Subpart B. Design guidance is given that may be used to address creep buckling for components designed to the limits of the Subpart 3 external pressure charts. However, if the design temperature of a component is less than the temperature limits provided in Figure 3-500.1 for a cylinder under external pressure, Figure 3-500.2 for a cylinder under axial compression, or Figure 3-500.3 for a sphere under external pressure, the design margin of the Subpart 3 charts is not reduced by creep.

(3) The temperature limits of Figures 3-500.1, 3-500.2, and 3-500.3 were obtained using the analysis method of WRC Bulletin 443, *External Pressure: Effect of Initial Imperfections and Temperature Limits* (see 3-900 [7]); the design limits of Section III, Division 5, Subsection HB, Subpart B; and 100 000 h materials property data except as noted for SA-533. Limits were developed only for materials where the necessary creep properties were available.

3-600 CRITERIA FOR ALLOWABLE STRESSES

In establishing allowable stresses for preparing the material charts, consideration is given not only to the available mechanical property data but also to service experience. The external pressure charts are based on short-term tensile properties and may not adequately account for creep effects. Creep reduces the critical buckling stress. In evaluating new or modified materials, reliance is also placed on comparison with test data and service experience for similar materials. Except for the overriding consideration of experience, the allowable stresses are based on the factors and properties given below.

(a) For cylindrical shells, under external pressures, the allowable stress is the least of

(1) 33% of the assumed critical buckling stress as defined in 3-500(a)(1) but limited by allowable tolerances defined in 3-500(a)(4)

(2) 33% of the specified minimum yield strength and yield strength at temperature

(3) 66% of the average stress to produce a creep rate of 0.01% per 1 000 h

(4) 100% of the allowable stress in tension

(b) For spheres and spherical portions of heads under external pressure, the allowable stress is the least of

(1) 25% of the assumed critical buckling stress as defined in 3-500(b)(1) but limited by allowable tolerances defined in 3-500(b)(4)

(2) 25% of the specified minimum yield strength and yield strength at temperature

(3) 50% of the average stress to produce a creep rate of 0.01% per 1 000 h

Figure 3-500.1
Temperature Limits for Application of Section II External Pressure Charts for Cylinder Under External Pressure

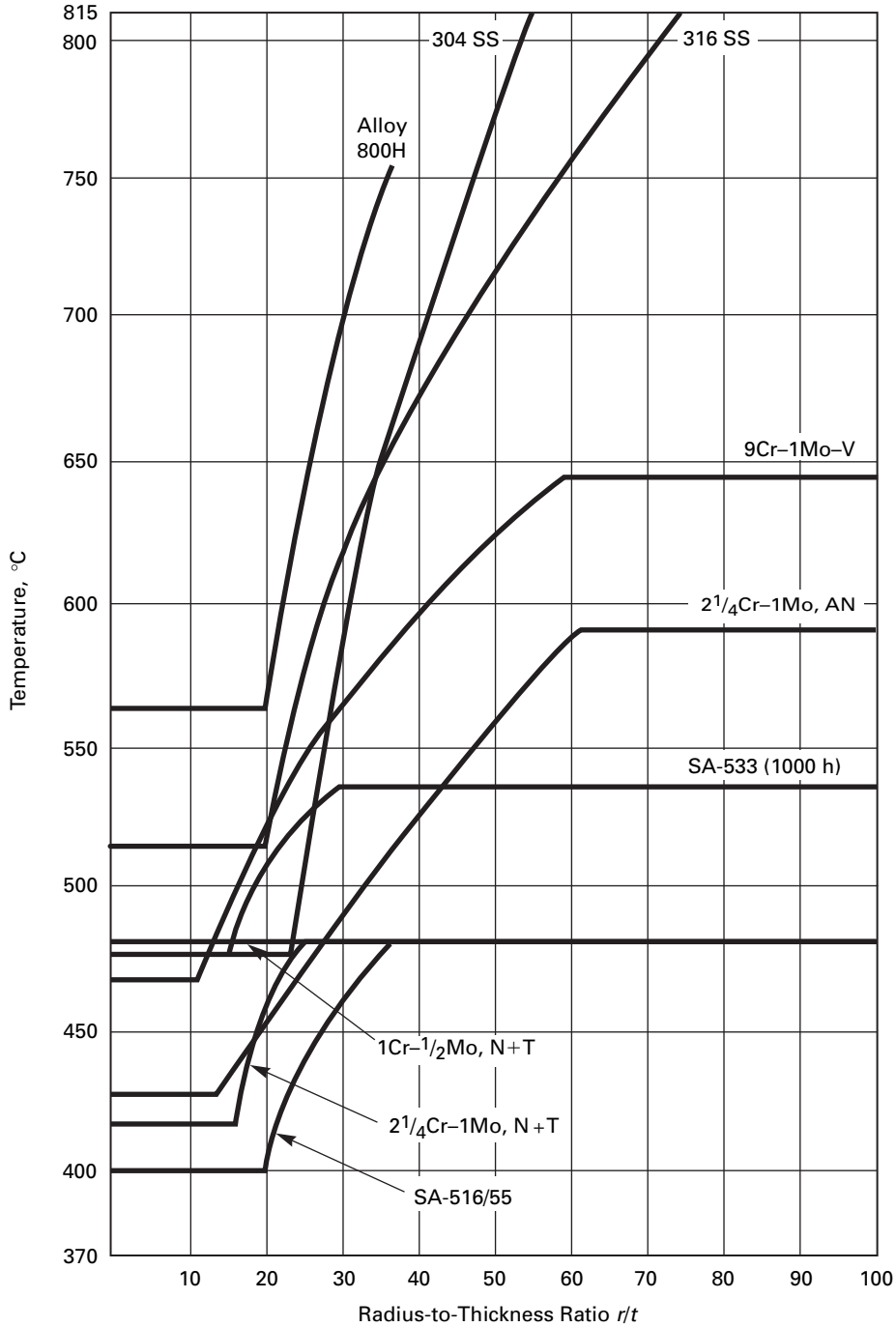
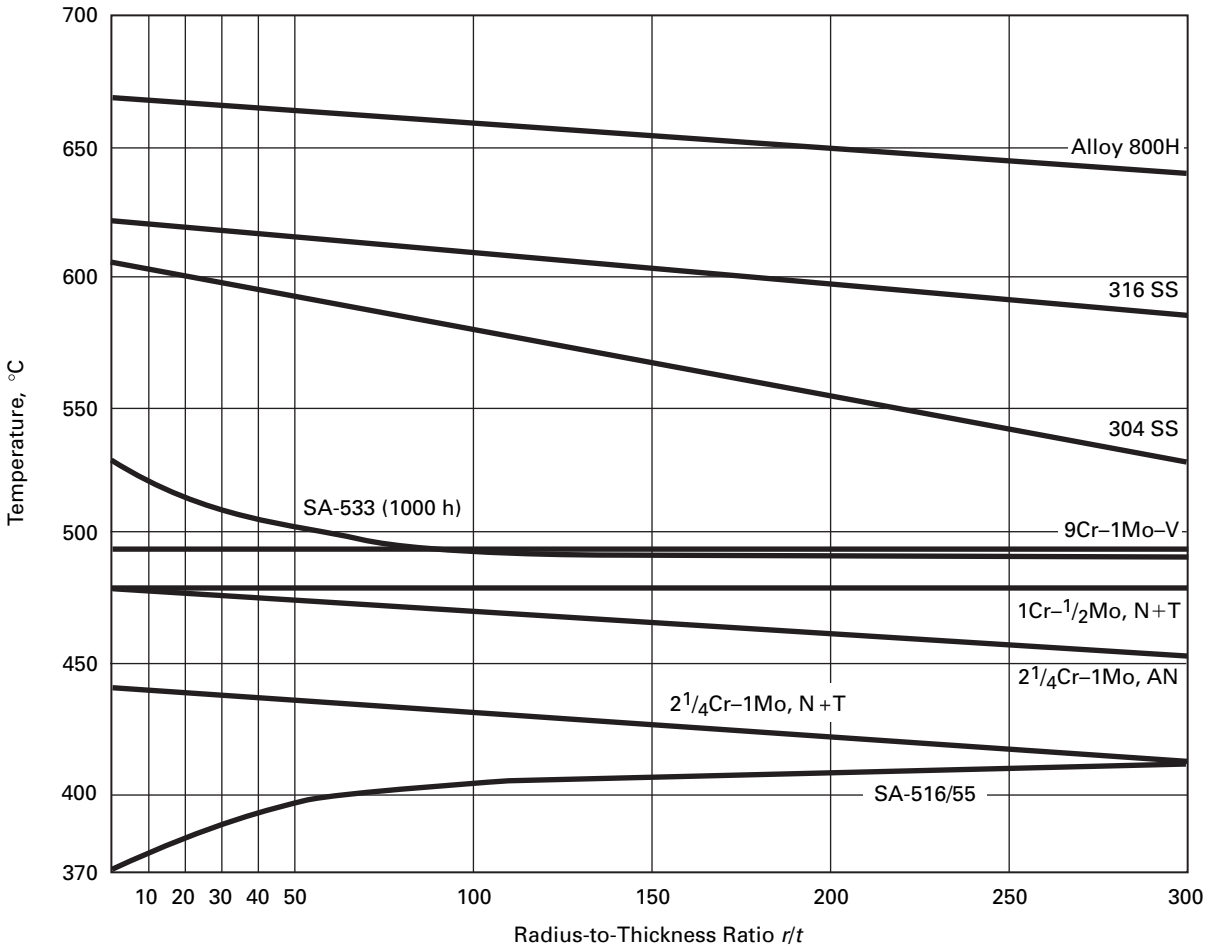


Figure 3-500.2
Temperature Limits for Application of Section II External Pressure Charts for Cylinder Under Axial Compression



(4) 100% of the allowable stress in tension

(c) For cylindrical shells under axial compression, the allowable stress is the least of

(1) 50% of the assumed critical buckling stress as defined in 3-500(c)(1) but limited by allowable tolerances defined in 3-500(c)(4)

(2) 50% of the specified minimum yield strength and yield strength at temperature

(3) 100% of the average stress to produce a creep rate of 0.01% per 1 000 h

(4) 100% of the allowable stress in tension

3-700 PROCEDURE AND RESPONSIBILITY FOR CHART DEVELOPMENT

Development of an external pressure chart for a new material requires materials data as specified in Mandatory Appendix 5, Guideline on the Approval of New Materials Under the ASME Boiler and Pressure Vessel Code. The requestor is responsible for providing these data in the specified form.

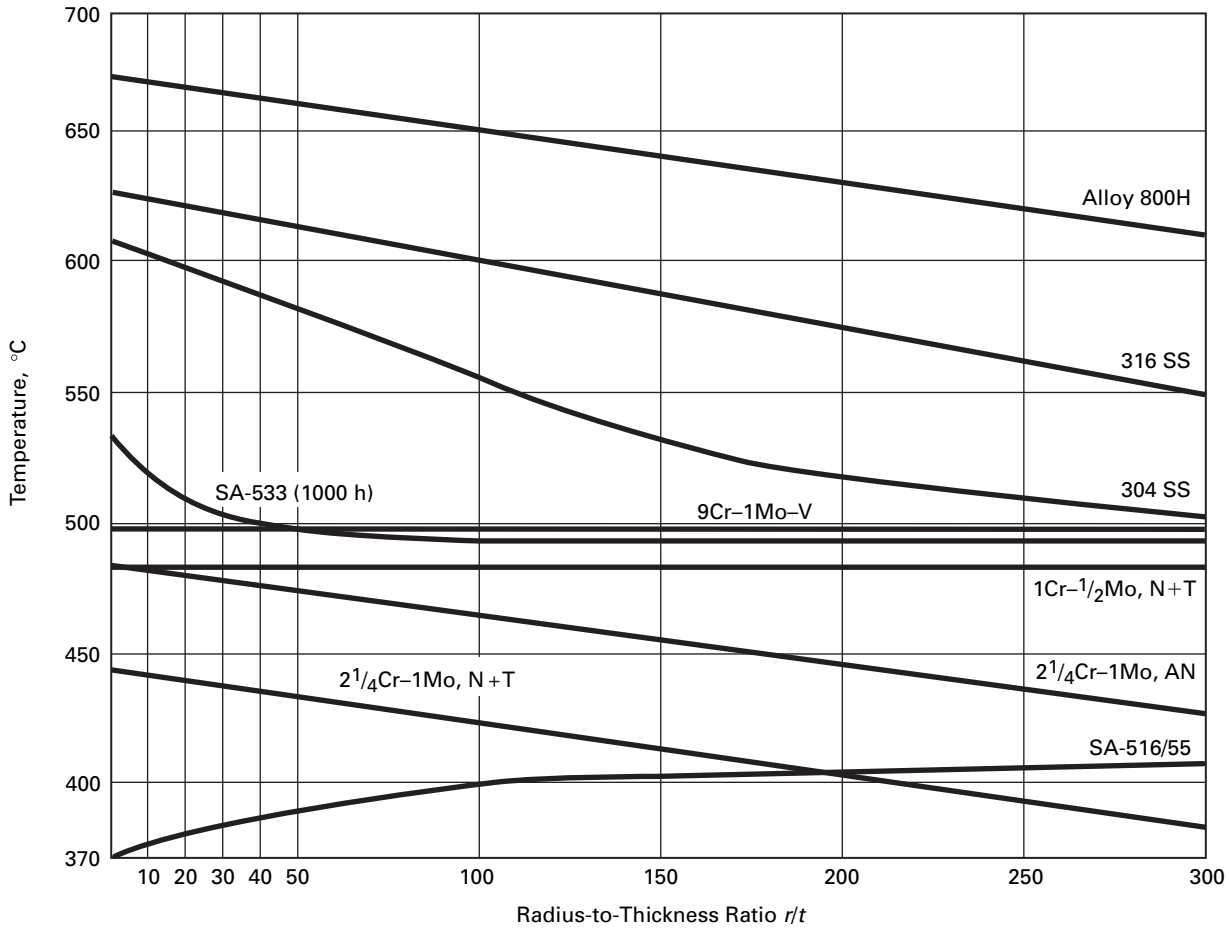
The following data are required for each temperature of interest:

(a) Elastic modulus, E, usually obtained by a dynamic test, and included in, or approved to be included in, Table TM-1, TM-2, TM-3, TM-4, or TM-5 of Section II, Part D.

(b) Minimum yield strength, σ_{ymin}, from the Section II, Part D yield strength table, Table Y-1, or approved for inclusion in Table Y-1.

(c) A representative stress–strain, $\sigma-\varepsilon$, curve that covers the range of strain from 0 to 1.0%.

Figure 3-500.3
Temperature Limits for Application of Section II External Pressure Charts for Sphere Under External Pressure

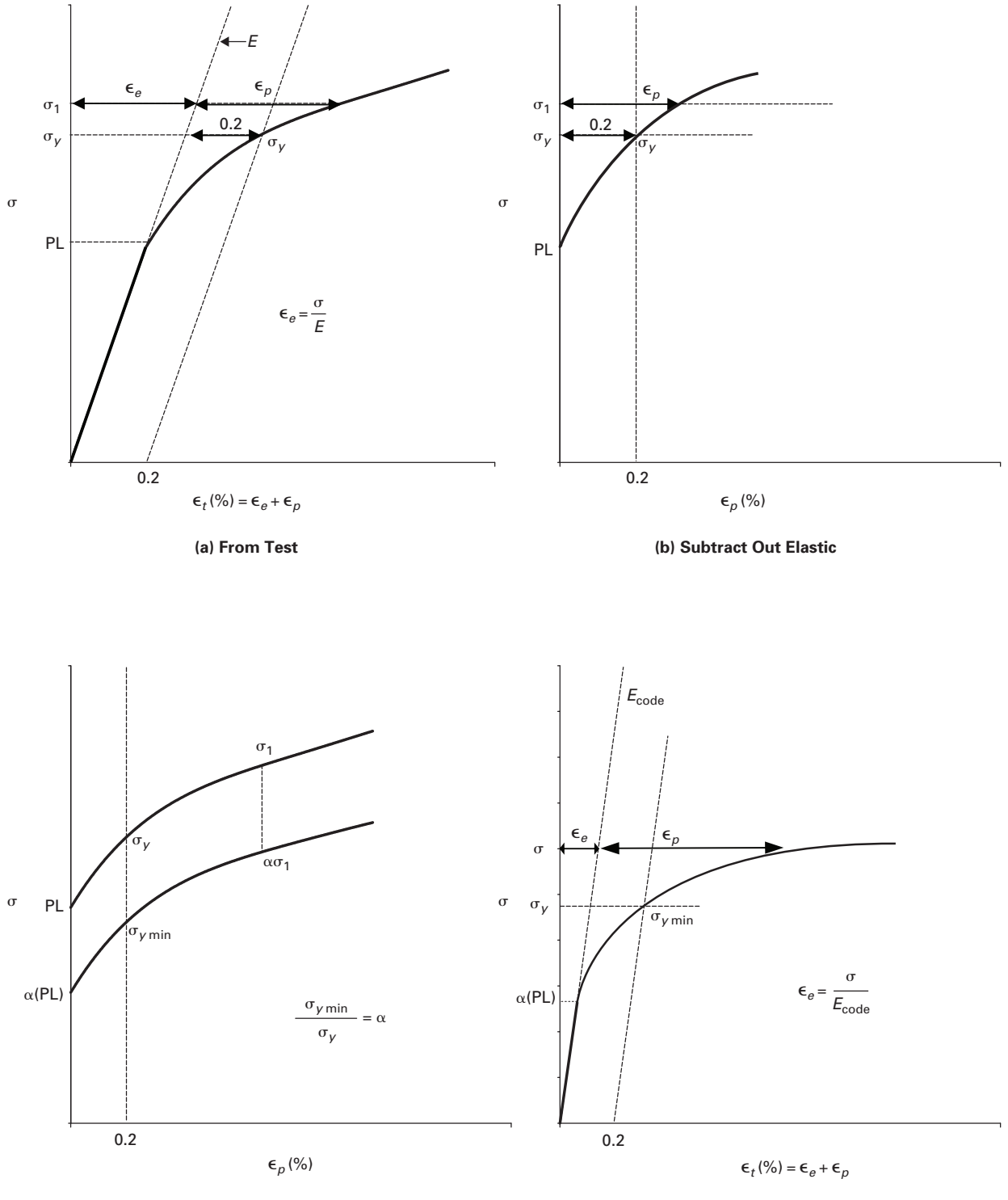


(1) Procedure. The procedure for developing the chart parameters, A and B, from the $\sigma-\varepsilon$ plots is described in the following:

Step 1. Select a representative $\sigma-\varepsilon$ curve. For a new material, $\sigma-\varepsilon$ curves are provided in accordance with the requirements of Mandatory Appendix 5. For multiple $\sigma-\varepsilon$ curves from multiple heats all at a specific temperature, select the curve that shows the largest plastic deformation at lower stresses, usually the one with the lowest ratio of proportional limit to yield stress. The shape of the curve is more important than the absolute value of stress, because the curve is going to be normalized to σ_{ymin}. A $\sigma-\varepsilon$ curve is required for each temperature for which an external pressure chart is desired, not to exceed the requirements of Mandatory Appendix 5.

Step 2. Normalize the $\sigma-\varepsilon$ curve for each temperature to the specified E and σ_{ymin} at that temperature. First, determine the yield stress, σ_y, on the representative $\sigma-\varepsilon$ curve in the usual manner, i.e., the stress at 0.2% plastic strain [see Figure 3-700.1, illustration (a)]. If the $\sigma-\varepsilon$ curve has no clearly defined elastic portion, then it is necessary to obtain E by constructing a line tangent to the $\sigma-\varepsilon$ curve at its origin. The total strain at a point is composed of an elastic component and a plastic component. The elastic strain is defined by E, i.e., elastic strain = σ/E. The rest of the strain at the point is plastic. The elastic strain measured by a tensile test is unreliable, so it is necessary to subtract it out from the total strain [see Figure 3-700.1, illustration (b)]. The $\sigma-\varepsilon$ curve is then normalized to σ_{ymin} by multiplying the stress at each value of plastic strain by the ratio σ_{ymin}/σ_y [see Figure 3-700.1, illustration (c)]. The normalized $\sigma-\varepsilon$ curve is then constructed by plotting the normalized stress against total strain, where the elastic strain is obtained using the Code approved value of E, i.e., elastic strain = (normalized stress)/E_{code}, for each temperature [see Figure 3-700.1, illustration (d)].

Figure 3-700.1
Normalization of Test σ–ε to $\sigma_{y\,min}$ and E_{code}



Step 3. Obtain the tangent modulus of the normalized $\sigma-\varepsilon$ plot as a function of stress. This can be done graphically by calculating the tangent (i.e., the slope of a straight line tangent to the curve) at a number of points along the $\sigma-\varepsilon$ curve and plotting the tangent against the stress at the associated points. Alternatively, if the $\sigma-\varepsilon$ curve is approximated in algebraic terms and represented in equation form, the tangent modulus is the first derivative of the equation, $d\sigma/d\varepsilon$, and can be represented in equation form.

Step 4. The values of A and B used to construct the external pressure charts can now be calculated from the following:

$$A = \text{stress} / \text{tangent modulus}$$

$$B = \text{stress}/2$$

where a different curve is plotted for each temperature.

(2) Chart Construction. The external pressure charts are plotted in log–log coordinates, with A as the abscissa and B as the ordinate. Section II, Part D, Subpart 3 limits B to one-half of $\sigma_{y\min}$. Thus, the curves can generally be plotted in two or three segments, which may be more convenient for curve fitting. The first segment is linear, representing the linear portion of the $\sigma-\varepsilon$ curve up to the proportional limit, if there is a proportional limit. It may be argued that there is no true proportional limit, and there may not be for a few metals, but definition of a proportional limit is required in Mandatory Appendix 5 and a practical limit can generally be constructed. The second segment is nonlinear and represents the $\sigma-\varepsilon$ curve beyond the proportional limit. It is not necessary that the tangent to the curve be continuous between the first and second segments. The allowable stress, B, increases with increasing A until it reaches $\frac{1}{2}\,\sigma_{y\min}$ or the maximum value of A on the chart. If B is restricted by the limit, then there is a third segment of the curve that is linear and parallel to the abscissa at $B = \frac{1}{2}\,\sigma_{y\min}$. In summary,

(a) Segment 1: $B = \frac{1}{2}\,AE$ up to the proportional limit (PL)

(b) Segment 2: $B = \frac{1}{2}\,AE_t$ from PL to $\frac{1}{2}\,\sigma_{y\min}$, where $E_t = d\sigma/d\varepsilon$

(c) Segment 3: $B = \frac{1}{2}\,\sigma_{y\min}$

Chart construction and the development of tabular values are the responsibility of the Subgroup on External Pressure of the BPV-II Committee on Materials.

3-800 ALTERNATE PROCEDURE FOR DETERMINING ALLOWABLE COMPRESSIVE STRESSES

Alternative rules for the design of shells under external pressure and allowable compressive stresses are given in Section VIII, Division 2, Part 4, para. 4.4. These rules are based on linear structural stability theory, modified by reduction factors to account for the effects of imperfections, boundary conditions, nonlinearity of material properties, and residual stresses. A step-by-step procedure is given to calculate the allowable compressive stress for components made of carbon and low alloy steel plate material at temperatures limited depending on the specific material. For materials other than carbon and low alloy steel, the procedure is modified by calculating the allowable compressive stress based on carbon and low alloy plate material, and then applying an adjustment that essentially replaces the elastic modulus with the tangent modulus of the material. The tangent modulus is determined based on a stress equal to the elastic compressive membrane failure stress of the component. This alternative procedure is applicable to a broader range of geometry and loading conditions than covered in the external pressure charts of Section II, Part D. Where comparisons have been made between the two methods, agreement is generally good.

3-900 REFERENCES

[1] Timoshenko, S. and Goodier, J. N., *Theory of Elasticity*, McGraw-Hill Book Co., New York, 1951

[2] Timoshenko, S. and Woinowsky-Krieger, S., *Theory of Plates and Shells*, McGraw-Hill Book Co., New York, 1959

[3] Timoshenko, S. and Gere, J. M., *Theory of Elastic Stability*, McGraw-Hill Book Co., New York, 1961

[4] *Pressure Vessel and Piping Design — Collected Papers 1927–1959*, ASME, New York, 1960

[5] Sturm, R. G., *A Study of the Collapsing Pressure of Thin Walled Cylinders*, University of Illinois Bulletin 329, 1941

[6] Sturm, R. G. and O'Brien, H. L., Computing Strength of Vessels Subjected to External Pressure, *Transactions of the ASME*, May 1947

[7] Griffin, D. S., *External Pressure: Effect of Initial Imperfections and Temperature Limits*, WRC Bulletin 443

MANDATORY APPENDIX 5
GUIDELINES ON THE APPROVAL OF NEW MATERIALS UNDER THE ASME BOILER AND PRESSURE VESSEL CODE

5-100 CODE POLICY

It is expected that requests for Code approval will normally be for materials for which there is a recognized national or international specification. It is the policy of the ASME Boiler and Pressure Vessel (BPV) Committee on Materials to approve, for inclusion in the Code Sections, only materials covered by specifications that have been issued by standards-developing organizations such as, but not limited to, American Petroleum Institute (API), American Society for Testing and Materials (ASTM), American Welding Society (AWS), Canadian Standards Association (CSA), European Committee for Standardization (CEN), Japan Industrial Standards (JIS), Standards Association of Australia (SAA), and China Standardization Committee (CSC).

Material specifications of other than national or international organizations, such as those of material producers/suppliers or equipment manufacturers, will not be considered for approval. The Committee will consider only official requests for specifications authorized by the originating standardization body and available in the English language and in U.S. Customary and/or SI/Metric units.

For materials made to a recognized national or international specification other than that of ASTM or AWS, the inquirer shall give notice to the standards-developing organization that a request has been made to ASME for approval of the specification under the ASME Code and should request that the issuing organization grant ASME permission to at least reproduce copies of the specification for Code Committee internal use and, if possible, reprint the specification. For other materials, a request shall be made to ASTM, AWS, or a recognized national or international standardization body to include the material in a specification that can be presented to the BPV Committee on Materials.

It is the policy of the ASME BPV Committee on Materials to consider requests to approve new materials only from boiler, pressure vessel, transport tank, nuclear facility component manufacturers, architect–engineers, or end users. Such requests should be for wrought, cast, or hot isostatically pressed powder materials for which there is a reasonable expectation of use in a boiler, pressure vessel, transport tank, or nuclear facility component constructed to the rules of one of the Sections of this Code. When a grade does exist in a defined wrought product form, a material producer/supplier may request the inclusion of additional wrought product forms or, provided all of the requirements of Table 5-100 of this Appendix are met, the inclusion of hot isostatically pressed (HIP) powder metallurgy components of this grade. When a grade does exist in a defined cast product form, a material producer/supplier may request the inclusion of additional cast product forms.

Any qualified organization requesting that an ASME BPV Committee approve a “new” material for use in their Code book should be aware that only the BPV Committee on Materials provides the appropriate design values for the Construction Codes (Sections I, III, IV, VIII, and XII of the BPV Code and B31 Codes).

The design values are calculated in accordance with the appropriate mandatory Code rules. If the inquirer considers the material to be essentially identical to one that has been approved by the BPV Committee on Materials, the inquirer shall so state in its request, and the BPV Committee on Materials shall evaluate that judgment. If the material is not essentially identical to one that has been approved by the BPV Committee on Materials, the inquirer shall provide all of the data cited in this Mandatory Appendix. Based on those data, the BPV Committee on Materials will provide the appropriate design values.

Before approval of a new material for inclusion in one of the Sections of the Code, use of this material may be permitted in the form of a Code Case. This Case shall fix at least the conditions of use and the necessary requirements linked to these conditions. It is the policy of the ASME BPV Committee to admit, in this way, material for which full experience on all working parameters has not yet been acquired.

5-200 APPLICATION

The inquirer shall identify to the BPV Committee the following:

(a) the Section or Sections and Divisions of the Code in which the new material is to be approved

(b) the temperature range of intended application

(c) whether cyclic service is to be considered

(d) whether external pressure is to be considered

The inquirer shall identify all product forms, size ranges, and specifications or specification requirements for the material for which approval is desired. When

Table 5-100
Hot Isostatically Pressed Component Requirements for Austenitic Stainless Steels, Austenitic–Ferritic (Duplex) Stainless Steels, Martensitic Stainless Steels, Ferritic Steels, and Nickel Alloys

Category	Requirement
Chemistry	The chemistry requirements of the hot isostatically pressed components shall be identical to those of the corresponding wrought product form.
Mechanical properties	The room-temperature mechanical properties of hot isostatically pressed components shall be identical to those that apply to the corresponding wrought product form.
Heat treatment	The heat-treatment requirements that apply to the hot isostatically pressed components shall be identical to those that apply to the corresponding wrought product form.
Grain size	The grain size requirements that apply to the hot isostatically pressed components shall be identical to those that apply to the corresponding wrought product form.
Control of powder prior to hot isostatic pressing	The maximum allowable powder size shall be 5 mm and the powder shall be produced by the gas atomization process. Immediately following atomization, the powder shall remain shielded by an inert gas until the powder is below a temperature of 40°C, to ensure that the detrimental absorption of oxygen and other deleterious contaminants is no longer possible. For austenitic stainless steels, duplex stainless steels, martensitic stainless steels, and nickel alloys, powder should be protected during storage to prevent the detrimental pickup of oxygen and other contaminants. For ferritic steels, following atomization, powders shall be stored under a positive nitrogen or argon atmosphere or vacuum to minimize potential oxidation or contamination.
Mandatory testing of hot isostatically pressed components	The chemical composition of a sample from one part from each lot of parts shall be determined by the manufacturer. The composition of the sample shall conform to the chemistry requirements of the defined wrought product form. The microstructure shall be examined at 20–50X, 100–200X, and 1,000–2,000X. The microstructure shall be reasonably uniform and shall be free of voids, laps, cracks, and porosity. One sample from each production lot shall be examined. The sample shall be taken from the component, stem, protrusion, or test part made from a single powder blend consolidated in the same hot isostatic press, using the same pressure, temperature, and time parameters, and heat treated in the same final heat-treatment charge at the option of the producer, after hot isostatic pressing or after final heat treatment. Samples for mechanical testing shall be from the component, stem, protrusion, or test part made from a single powder blend consolidated in the same hot isostatic press, using the same pressure, temperature, and time parameters, and heat-treated in the same final heat-treatment charge.
Material certification requirements	A manufacturer's certification shall be furnished to the purchaser stating that material has been manufactured, tested, and inspected in accordance with the applicable specification, and that the test results on representative samples meet specification requirements. A report of the test results shall be furnished.

GENERAL NOTES:

(a) When a grade does exist in a defined wrought product form for alloys other than those cited, an inquirer may request the inclusion of hot isostatically pressed (HIP) components of this grade. However, the Committee may have additional requirements placed on the grade to accept this request.

(b) If the material is to be used at temperatures where the time-dependent performance will determine the allowable stress values, the requirements of Mandatory Appendix 5 relative to the provision of data for new materials shall apply.

available, the inquirer shall furnish information describing service experience in the temperature range requested.

5-300 CHEMICAL COMPOSITION

The inquirer shall recommend to the BPV Committee on Materials whether the chemical composition specified in the reference specification applies or whether restrictions to this composition shall be imposed for the intended application. When coverage by a recognized national or international standardization body has been requested but not yet obtained, the inquirer shall indicate the detailed chemical composition in the inquiry. The inquirer shall explain the reasons for the chemistry and chemistry limits, and their relationship to the metallurgical structure (e.g., influence on precipitates and their morphology, grain size, and phases), heat treatment effect (e.g., strengthening mechanisms and their stability), and mechanical properties. Elements that significantly influence strength, ductility, toughness, weldability, and behavior under service conditions should be identified.

After review of the submitted data, the Committee reserves the right to modify the permitted compositional ranges for key elements so that they more accurately reflect the range of the elements of the submitted test heats.

5-400 METALLURGICAL STRUCTURE AND HEAT TREATMENT

When applicable for the proposed material, the inquirer shall indicate the intended metallurgical structure(s) to be achieved in order to comply with the mechanical properties requirements and, where applicable, fully describe the heat treatment (including cooling rates) to be applied to achieve this (or these) structure (s), the mechanical properties, and the expected behavior under service conditions.

An explanation for the proposed heat treatment temperature ranges shall be furnished. When such concepts apply, metallurgical transformation curves and information on the transformation points and conditions for appearance of the major phases in the microstructure (e.g., continuous cooling transformation diagram or time–temperature precipitation plots) would be beneficial for the Committee's consideration.

5-500 MECHANICAL PROPERTIES

Test methods employed for the properties tested shall be those referenced in or by the material specifications, or shall be the appropriate ASTM test methods, recommended practices, or test methods described in accepted international standards. The test methods used shall be indicated in the data package.

It is desired that the data be obtained using material representative of the range of effects of the key variables of composition, thickness, mechanical working, and heat treatment. It is desirable that, when applicable, test data also be provided for the range of heat treatment exposures that may influence properties such as tensile strength, toughness, and stress rupture behavior. After consideration of the submitted data, the Committee reserves the right to modify the specification requirements.

5-600 DEFINITIONS FOR DATA COLLECTION PURPOSES

casting lot: single production pour from a master heat.

heat: quantity of metal with one chemical composition, produced by a recognized production process from a single primary melt of the metal. Remelted ingot material is not recognized as a separate heat unless it is produced from a melt having a different chemical composition than the other heats.

hot isostatically pressed component lot: a number of parts made from a single powder blend consolidated in the same hot isostatic press using the same pressure, temperature, and time parameters, and heat treated in the same final heat-treatment charge.

powder blend: a homogeneous mixture of powder from one or more heats of the same grade. The term "powder blend" shall be substituted for the term "heat" for hot isostatically pressed powder material in 5-300, 5-700, 5-900, 5-1200, 5-1400, and 5-1800.

wrought lot: quantity of metal made by melting followed by working or by working and heat treatment as a unique batch. Different lots may come from the same heat and may be made into different product forms. Lot definitions are expected to be found in the applicable material specifications.

5-700 REQUIRED SAMPLING

For all mechanical properties, data shall be provided over the required range of test temperatures from at least three heats of material meeting all of the requirements of the applicable specifications. Data submitted on three heats of one wrought product form for which coverage is requested may be considered to be applicable for all other wrought product forms having the same chemistry.

For wrought materials and especially for those materials whose mechanical properties are enhanced by heat treatment, forming practices, or a combination thereof, and for other materials for which the mechanical properties may be reasonably expected to be thickness dependent, data from one additional lot from material of at least 75% of the maximum thickness for which coverage

is requested shall be submitted. If no maximum thickness is given, information shall be provided to support the suitability of the thickness used for the tested samples.

When adoption of cast product forms is requested, data from at least three heats for one of the cast product forms shall be submitted. The cast material shall be considered as a separate material even if its nominal composition is the same or very similar to that of an approved wrought material.

If the hot isostatically pressed powder material meets all of the requirements of Table 5-100, it shall be considered the same material as that of the approved wrought material for temperatures approximately 25°C below the temperature where time-dependent properties, as defined by the Time-Dependent Properties Notes (T-Notes) in the applicable allowable stress table for the approved wrought material, govern.

If the hot isostatically pressed material is to be used at temperatures where the time-dependent properties, as defined by the Time-Dependent Properties Notes (T-Notes) in the applicable allowable stress table for the approved wrought material, govern, the requirements of this Appendix relative to the provision of data for new materials shall apply.

If the hot isostatically pressed powder material does not meet all of the requirements of Table 5-100, it shall be considered as a separate material to that of the approved wrought material. In this case, the requirements of this Appendix relative to the provision of data for new materials shall apply.

Additional data for other heats tested to a lesser degree than described herein would be beneficial to the Committee's consideration.

5-800 TIME-INDEPENDENT PROPERTIES

For time-independent properties at and above room temperature, the required data include values of ultimate tensile strength, 0.2% offset yield strength, reduction of area (when specified in the material specification), and elongation. For steels, nickel alloys, cobalt alloys, and aluminum alloys, data shall be provided at room temperature and 50°C intervals, beginning at 100°C to 50°C above the maximum intended use temperature, unless the maximum intended use temperature does not exceed 40°C. For copper alloys, titanium alloys, and zirconium alloys, data shall be provided at room temperature, 65°C, and 100°C, and then at 50°C intervals, to 50°C above the maximum intended use temperature, unless the maximum intended use temperature does not exceed 40°C. The test methods shall be as given in ASTM A370, ASTM A1058, ASTM E8, ASTM E21, or other equivalent national or international test standards. In addition, when specified in the material specification, hardness values shall be provided at room temperature and shall be determined as specified in the material specification. Data provided shall be expressed in the units and to the number of significant figures shown in Table 5-800. When either the material specification or the applicable construction code (e.g., Section XII) permits or requires that yield strength be determined by other than the 0.2% offset method, those other yield strength values shall also be reported.

5-900 TIME-DEPENDENT PROPERTIES

If approval is desired for temperatures where time-dependent properties may be expected to control design, time-dependent data, as itemized below, shall be provided, starting at temperatures approximately 25°C below the temperature where time-dependent properties may govern and extending at least 50°C above the maximum intended use temperature. Exceptions to this rule are permitted, provided the inquirer provides suitable justification for the deviation. The creep–rupture test method shall be in accordance with ASTM E139 or other equivalent national or international test standard.

For time-dependent tests, the interval between successive temperatures shall be chosen such that it permits, in all cases, an accurate estimation of the slope of the stress-rupture curves. For normally stable materials (e.g., solid solution-strengthened materials), test temperatures shall be at intervals of 50°C or less. Where there is a possibility of degradation of strength related to metallurgical instability (e.g., for precipitation-strengthened materials), test temperatures shall be at intervals of 25°C or less. Data provided shall be expressed in the units and to the number of significant figures shown in Table 5-800.

In addition, for certain types of steels or alloys, it may be necessary to choose different temperature intervals in order to adequately reflect the evolution of the properties. In such cases, the interval between successive test temperatures shall be chosen such that rupture lives do not differ by more than a factor of 10 at any given stress for two adjacent temperatures. Data to be reported include stress, temperature, time to rupture, and, when available, either or both elongation and reduction of area. Additional comments regarding post-test specimen appearance (e.g., oxidation, necking, intergranular fracture, etc.), as well as photographs and photomicrographs, may be beneficial for the analysis.

Except as provided further below, the longest rupture time at each test temperature shall be in excess of 10 000 h for each required heat. At least three additional tests shall be conducted for each required heat at each test temperature, at stresses selected to provide shorter rupture times but at least 500 h (e.g., 500 h, 1 400 h, and 4 000 h).

Tests of shorter duration than about 500 h are not desired for long-term stress rupture prediction. Obviously, longer times and additional test data are beneficial. At successive temperatures, two or more test stresses should be selected to be preferably identical or in a close range.

Table 5-800
ASTM Test Methods and Units for Reporting

ASTM Designation	Title	Property	Metric Units	Metric Significant Figures
A370	Standard Test Methods and Definitions for Mechanical Testing of Steel Products	Tensile strength and yield strength	...	...
A1058	Standard Test Methods for Mechanical Testing of Steel Products—Metric	Tensile strength and yield strength	MPa	3
D2766	Standard Test Method for Specific Heat of Liquids and Solids	Specific heat [Note (1)]	J/kg-K	3
E8	Standard Test Methods for Tension Testing of Metallic Materials	Tensile strength and yield strength	MPa	3
		Density	kg/m^3	4
E21	Standard Test Methods for Elevated Temperature Tension Tests of Metallic Materials	Tensile strength and yield strength	MPa	3
E132	Standard Test Method for Poisson's Ratio at Room Temperature	Poisson's ratio	...	2
E139	Standard Test Methods for Conducting Creep, Creep–Rupture, and Stress–Rupture Tests of Metallic Materials	Rupture time	h	5
E228	Standard Test Method for Linear Thermal Expansion of Solid Materials With a Push-Rod Dilatometer	Instantaneous coefficient	$(mm/mm/°C) \times 10^{-6}$	3, except 2 for x <10
		Mean linear coefficient	$(mm/mm/°C) \times 10^{-6}$	
		Linear coefficient	mm/m	
E289	Standard Test Method for Linear Thermal Expansion of Rigid Solids With Interferometry	Instantaneous coefficient	$(mm/mm/°C) \times 10^{-6}$	3
		Mean coefficient	$(mm/mm/°C) \times 10^{-6}$	
		Linear coefficient	mm/m	
E831	Standard Test Method for Linear Thermal Expansion of Solid Materials by Thermomechanical Analysis	Instantaneous coefficient	$(mm/mm/°C) \times 10^{-6}$	3, except 2 for x < 10
		Mean linear coefficient	$(mm/mm/°C) \times 10^{-6}$	
		Linear coefficient	mm/m	
E1225	Standard Test Method for Thermal Conductivity of Solids Using the Guarded-Comparative-Longitudinal Heat Flow Technique	Thermal conductivity	W/m × °C	4, except 3 for x < 100
E1461	Standard Test Method for Thermal Diffusivity by the Flash Method	Thermal diffusivity	m^2/s	3
		Thermal conductivity	W/m × °C	4, except 3 for x < 10
E1875	Standard Test Method for Dynamic Young's Modulus, Shear Modulus, and Poisson's Ratio by Sonic Resonance	Modulus of elasticity	$MPa \times 10^3$	3

NOTE:
(1) Specific heat is not published but may be used to calculate thermal diffusivity from thermal conductivity.

Alternative test plans that deviate from the prior description but achieve the overall objective may be considered. This may, in particular, apply to solid solution alloys for which the stability of strength-controlling microstructures is certain.

For new materials for which the expectation of reasonable stability of strength-controlling microstructures is uncertain or suspect, and for extension of allowable stresses of more familiar classes of alloys into much higher temperature applications where such stability might come into question, either creep–rupture data with duration of more than 30 000 h or equivalent experience in service is required. A Code Case may be approved based on shorter duration test data, but inclusion of the material into one of the sections of the BPV Code may be deferred until longer-term creep–rupture data are available or until sufficient service experience is obtained to provide confidence that extrapolations from the existing database reasonably describe the long-term behavior of the material.

For at least two heats, strain–time plots or minimum creep rate (MCR) data shall be provided for at least two test stresses at each test temperature, including at least one stress for each material resulting in MCR values below 3×10^{-4} %/h. If it can be conclusively demonstrated that creep rate does not control the design stresses, the creep rate data may be sparse in relation to the above requirement. Creep rate data may be obtained in the course of stress–rupture testing or may be obtained on additional specimens.

5-1000 LOW-TEMPERATURE PROPERTIES

If use of the material below room temperature is contemplated, data should be provided at appropriate temperatures down to the lowest contemplated use temperature.

5-1100 TOUGHNESS DATA

Toughness data shall be provided for materials for which Construction Code toughness rules would be expected to apply. The test requirements shall be as required by the requested Construction Code(s). The data shall include test results for the intended lowest service metal temperature and for the range of material thicknesses desired.

5-1200 STRESS–STRAIN CURVES

Stress-strain data (tension or compression) shall be furnished for each of the three heats of material at 50°C intervals from room temperature up to 50°C above the maximum temperature desired. Engineering stress–strain data (stress versus strain) shall be provided in the form of stress–strain plots and digitized data, from which the plots were derived, in tabular form up to 1.2% strain. Digitized data shall be provided at intervals no greater than 0.01% strain. In addition, the minimum yield strength, modulus of elasticity, and proportional limit, for materials where a proportional limit can be identified, shall be reported for each temperature. The stress–strain plots (not load versus extension) shall be determined using a Class B-2 or better-accuracy extensometer as defined in ASTM E83. The plots shall include gridlines with the units marked on the gridlines: for strain, minor gridlines at intervals of 0.01% and major gridlines at 0.1%, up to 1.2% strain; and for stress, minor gridlines at 2 MPa and major gridlines at 20 MPa.

5-1300 FATIGUE DATA

If the material is to be used in cyclic service and the Construction Code in which adoption is desired requires explicit consideration of cyclic behavior, fatigue data for characterized samples shall also be furnished over the range of design temperatures desired, from 10^3 to at least 10^6 cycles.

5-1400 PHYSICAL PROPERTIES

For at least one heat meeting the requirements of the material specification, the inquirer shall furnish to the Boiler and Pressure Vessel Committee on Materials adequate data necessary to establish values for coefficient of thermal expansion, coefficients of thermal conductivity and diffusivity, modulus of elasticity, Poisson's ratio, and density. Test methods shall be as follows:

(a) ASTM E228, ASTM E289, or ASTM E831 for thermal expansion coefficients

(b) ASTM E1225 or ASTM E1461 and ASTM D2776 for thermal conductivity and thermal diffusivity

(c) ASTM E1875 for modulus of elasticity

(d) ASTM E1875 or ASTM E132 for Poisson's ratio

Data from other equivalent national or international test standards shall be acceptable in lieu of those listed above. Instantaneous, mean, and linear coefficients of thermal expansion shall be reported. Data for all physical properties shall be provided at least over the range of temperatures for which the material is to be used. It is recommended that data be collected at temperature intervals not greater than 50°C. If the material is intended to be used below room temperature, data should be provided for temperatures down to the minimum use temperature. Data provided shall be expressed in the units and to the number of significant figures shown in Table 5-800.

5-1500 DATA REQUIREMENTS FOR WELDS, WELDMENTS, AND WELDABILITY

The following three types of welding information are required for a new base metal for use in welded construction in an ASME BPV Construction Code: data on weldability, data on strength and toughness in the time-independent regime, and data on strength in the time-dependent regime.

The data requirements for weldability and for strength in the time-independent regime are the responsibility of the BPV IX Standards Committee and are to be found in Section II, Part C, Guideline on the Approval of New Welding and Brazing Material Classifications Under the ASME Boiler and Pressure Vessel Code; and in Section IX, Mandatory Appendix J, Guideline for Requesting P-Number Assignments for Base Metals Not Listed in Table QW/QB-422. The requirements for weld metal and weldment toughness data vary with the class of materials and their application, and are to be found in the Construction Codes that have toughness rules — Sections III, VIII, and XII.

Data for welds and weldments for a new base material for use in the time-dependent regime are the responsibility of the BPV II and BPV IX Standards Committees, and particularly of their joint Subgroup on Strength of Weldments. The following welding information shall be provided by the Inquirer, to support the request for a Code Case for, or incorporation of, a new base material for use in elevated temperature service:

(a) When there is one or more AWS, ASME, or equivalent consumable specification and classification suitable for use with the new base material, and when such consumable/process combinations can produce welds and weldments that have both good weldability and as high or higher strengths as the base metal over the range of expected service temperatures, no time-dependent test data is required. Rather, the inquirer shall submit a tabular or graphical comparison of time-dependent allowable stresses for base metals nominally matching the compositions of such welding consumables against the allowable stresses proposed for the new base metal. (Note that since neither ASME nor any other organization publishes allowable stresses for all-weld metal or for weldments, it is necessary to use, in this comparison, the allowable stresses for the base metals equivalent to the welding consumables as a reasonable first approximation.) An example of such a comparison appears in Table 5-1500.

(b) When there is no such suitable consumable having an AWS, ASME, or equivalent specification and classification, or when it is necessary or desirable to use a new, perhaps nominally matching, welding consumable, the following information shall be provided to the Committee:

(1) the chemistry ranges for each element specified for the consumable to be used. If the chemistry ranges vary for the consumables to be used for different processes, then the chemistry ranges of the consumables appropriate for each process shall be provided.

(2) creep–rupture data for weldments made with one lot of consumables for each process intended to be used with the new base material

(-a) at temperature intervals not greater than 100°C

(-b) over a temperature range spanning the range from the first rational temperature above the temperature at which time-dependent properties control the allowable stresses of the new base material to about 50°C above the maximum temperature for which allowable stresses for the base material are requested

(-c) at a minimum of four stresses calculated to produce rupture times of about 1 000, 2 500, and 4 500 h, and beyond 6 000 h

(-d) the test temperature; stress; rupture time; specimen size and configuration, including weld location; and failure location (base metal, weld metal, or heat affected zone), for each test condition

(-e) the creep–rupture data shall be compared to the scatter bands of data for the base metal

5-1600 LONG-TERM PROPERTIES STABILITY

For new materials, and particularly for those whose creep-rupture properties are affected by heat treatment or deformation processes or a combination of these, it is important to know the structural stability characteristics and the degree of retention of properties with long-term exposure at temperature. Where particular temperature ranges of service exposure or fabrication heat treatment, cooling rates, and combination of mechanical working and thermal treatments cause significant changes in the microstructure on which the creep-rupture properties depend, these shall be brought to the attention of the BPV Committee.

5-1700 REQUESTS FOR ADDITIONAL DATA

The Committee may request additional data, including data on properties or material behavior not explicitly treated in the Construction Code for which approval is desired.

5-1800 NEW MATERIALS CHECKLIST

To assist inquirers desiring Code coverage for new materials, or extending coverage of existing materials, the Committee has developed the following checklist of items that ought to be addressed in each inquiry. While taking into account the intended application of the

Table 5-1500
Example of a Comparison of Allowable Stresses of Base Metals With Compositions Similar to Those of Selected Welding Consumables and the Proposed New Base Metal

Comparison of Nominal Chemical Compositions, %, and Specified Mechanical Properties of Ni-Base Alloys in Section II, Part B

Grade	Ni	Cr	Fe	Mn	Mo	Co	Al	C	Cu	B	Si	Ti	W	Cb + Ta	Ultimate Tensile Strength, MPa	Yield Strength, MPa
N06230	Bal. ≈ 53	22	3	0.65	2	5	0.5	0.1	...	...	0.5	...	14	...	760	310
N06600	72 min.	15.5	8	0.5	...	...	...	0.1	0.25	...	0.25	...	...	...	550	240
N06617	44	22	1.5	0.5	9	12	1.2	0.1	0.25	0.005	0.5	0.4	...	...	665	240
N06625	58 min.	21.5	5	0.5	9	1	0.4	0.1	0.4	...	0.5	0.4	...	3.65	827	414
N06696	Bal. ≈ 60	30	4	0.2	2	...	...	0.07	2	...	1.5	0.2	...	...	586	240

Comparison of Allowable Stresses of Ni-Base Alloys in Section II, Part B (MPa at Temperature, °C, Estimated for N06696)

Grade	P-No.	500	550	600	650	700	750	800	850	900	950	1 000
N06230	43	194	194	151	102	75.5	50.4	32.9	18.4	10.2	5.2	2.4
N06600	43	79.7	40.1	19.0	13.8	...	...	...	...	...	...	...
N06617	43	108	106	106	105	81.0	50.4	31.3	19.4	12.3	7.5	...
N06625	43	184	182	178	136	84.3	50.2	30.3	16.5	...	...	...
N06696	TBD	139	87.0	55.6	35.5	22.8	13.9	9.0	4.9	3.2	2.1	1.4

GENERAL NOTE: In this example, the proposed new base metal is N06696.

product, the Committee may require specific information from the inquirer, as shown above for certain material characteristics.

(a) Has a qualified inquirer request been provided?

(b) Has a request either for revision to existing Code requirements or for a Code Case been defined?

(c) Has a letter to ASTM or AWS been submitted requesting coverage of the new material in a specification? Alternatively, is this material already covered by a specification issued by a recognized national or international organization and has an English language version been provided?

(d) Has the Construction Code and, if applicable, a Division, Subsection, or Part been identified?

(e) Have product forms, size range, and the applicable specification(s) been defined?

(f) Has the range (maximum/minimum) of temperature application been defined?

(g) Has the chemistry been submitted and the related requirements been addressed?

(h) Have the metallurgical structure and heat treatment requirements been submitted?

(i) Have mechanical property data been submitted (ultimate tensile strength, yield strength, reduction of area, and elongation at 50°C intervals, from room temperature to 50°C above the maximum intended use temperature, for three heats of appropriate product forms and sizes?

(j) If requested temperatures of coverage are above those at which time-dependent properties begin to govern design values, have appropriate time-dependent property data for base metal and weldments been submitted?

(k) If higher allowable stresses for material to be used below room temperature are requested, have appropriate mechanical property data below room temperature been submitted?

(l) Have toughness considerations required by the Construction Code been defined and have appropriate data been submitted?

(m) Have stress–strain curves been submitted for the establishment of External Pressure Charts?

(n) If cyclic service considerations are required by the requested Construction Code application, have appropriate fatigue data been submitted?

(o) Have physical properties data (coefficient of thermal expansion, thermal conductivity and diffusivity, modulus of elasticity, Poisson's ratio, and density) been submitted?

(p) Have welding requirements been defined, and weld metal and weldment data been submitted?

(q) Has the influence of fabrication practices on material properties been defined?

5-1900 REQUIREMENTS FOR RECOGNIZED NATIONAL OR INTERNATIONAL SPECIFICATIONS

Acceptable material specifications will be identified by date or edition. The latest approved edition(s) will be stated in the subtitle of the ASME specification. Eventually, acceptable previous editions will be listed in Section II, Parts A and B. Minimum requirements that shall be contained in a material specification for which acceptance is being requested include such items as the name of the national or international organization, scope, reference documents, process, manufacture, conditions for delivery, heat treatment, chemical and tensile requirements, forming properties, testing specifications and requirements, workmanship, finish, marking, inspection, and rejection.

5-2000 PUBLICATION OF RECOGNIZED NATIONAL OR INTERNATIONAL SPECIFICATIONS

Specifications for which ASME has been given publishing permission by the originating organization will be published in Section II, Parts A and B. Specifications for which ASME has not been given publishing permission by the originating organization will be referenced on a cover sheet in Section II, Parts A and B. Information on obtaining a copy of those referenced documents will be maintained in those Parts. Additions and exceptions to the material specification will be noted in the subtitle of the specification and in Table II-200-1 or II-200-2 in Section II, Parts A and B.

5-2100 CEN SPECIFICATIONS

European Standards are adopted by CEN in three official languages (English, French, and German) as an EN standard. After the CEN adoption, to become applicable in a member country of CEN, an EN standard shall be given the status of a national standard. During this process

(a) the text of the EN standard shall remain unaltered and shall be included as adopted by CEN

(b) national forewords and/or annexes may be added to cover specific national practices, but shall not be in contradiction with the EN standard

(c) a prefix XX (e.g., XX = BS for the United Kingdom, NF for France, and DIN for Germany) is added to the designation of the EN standard (e.g., BS EN 10028-1 or NF EN 10028-1)

(d) the date of adoption as a national standard will differ from the date of adoption as an EN standard, and may differ from one country to another

Written or electronic copies can only be obtained from European National Standardization Bodies as XX EN (CEN does not sell standards). Consequently, in order to

maintain coherence and homogeneity in the reference system, the mentions in the subtitle of the corresponding ASME specification will only refer to the EN standard number without any prefix and to the year of approval by CEN. It will also be mentioned in the cover sheet that the national parts do not apply for the ASME specification.

MANDATORY APPENDIX 6
BASIS FOR ESTABLISHING STRESS VALUES IN TABLES 6A, 6B, 6C, AND 6D

6-100 DERIVATION OF ALLOWABLE STRESS VALUES

The values in Tables 6A, 6B, 6C, and 6D are established by the Committee only. In the determination of allowable stress values for materials, the Committee is guided by successful experience in service, insofar as evidence of satisfactory performance is available. Such evidence is considered equivalent to test data where operating conditions are known with reasonable certainty. In the evaluation of new materials, the Committee is guided to a certain extent by the comparison of test information with available data on successful applications of similar materials.

The factors employed to determine the allowable stress values are provided in Tables 6-100(a), 6-100(b), and 6-100(c). Nomenclature for these tables is as follows:

R_T = ratio of the average temperature-dependent trend curve value of tensile strength to the room temperature tensile strength

R_Y = ratio of the average temperature-dependent yield curve value of yield strength to the room temperature yield strength

S_T = specified minimum tensile strength at room temperature, MPa

S_Y = specified minimum yield strength at room temperature, MPa

The maximum allowable stress shall be the lowest value obtained from the criteria in Tables 6-100(a), 6-100(b), and 6-100(c). The maximum use temperature for materials is limited to below the time-dependent regime. Allowable stresses are listed for temperatures up to 275°C. If a material reaches the time-dependent regime below 275°C, no allowable stress values are listed for that material above the cross-over temperature. The mechanical properties considered and the factors applied to establish the maximum allowable stresses are given below.

6-110 RULES FOR ESTABLISHING STRESS VALUES IN TABLES 6A AND 6B

(a) At any temperature below the creep range, the allowable stresses are established at no higher than the lowest of the following:

(1) one-fifth of the specified minimum tensile strength at room temperature

(2) one-fifth of the tensile strength at temperature

(3) two-thirds of the specified minimum yield strength at room temperature

(4) two-thirds of the yield strength at temperature

(b) For bolting materials, the basis for setting stresses is the same as for all other materials with the exception that (1) and (2) above are replaced by

(1) one-fourth of the specified minimum tensile strength at room temperature

(2) one-fourth of the tensile strength at temperature

The following limitation also applies to bolting materials: At temperatures below the creep range, the stresses for materials whose strength has been enhanced by heat treatment or by strain hardening shall not exceed the lesser of 20% of the specified minimum tensile strength at room temperature or 25% of the specified minimum yield strength at room temperature unless these values are lower than the annealed values, in which case the annealed values shall be used.

In the application of these criteria, the Committee considers the yield strength at temperature to be $S_Y R_Y$, and the tensile strength at temperature to be $1.1 S_T R_T$.

6-120 RULES FOR ESTABLISHING STRESS VALUES IN TABLES 6C AND 6D

At any temperature below the creep range, the allowable stresses are established at no higher than the lowest of the following:

(a) one-fourth of the specified minimum tensile strength at room temperature

(b) one-fourth of the tensile strength at temperature

(c) two-thirds of the specified minimum yield strength at room temperature

(d) two-thirds of the yield strength at temperature

Two sets of allowable stress values are provided in Table 6D for austenitic stainless steels. The higher values should be used only where slightly greater deformation is not in itself objectionable. The higher alternative allowable stresses are identified by a Note. These stresses exceed two-thirds for austenitic stainless steel materials but do not exceed 90% of the minimum yield strength

at temperature. These higher stresses are not recommended for the design of flanges and other strain-sensitive applications.

In the application of these criteria, the Committee considers the yield strength at temperature to be $S_Y R_Y$ and the tensile strength at temperature to be $1.1 S_T R_T$.

Table 6-100(a)
Criteria for Establishing Allowable Stress Values for Tables 6A and 6B

Product/Material	Room Temperature and Below		Above Room Temperature			
	Tensile Strength	Yield Strength	Tensile Strength		Yield Strength	
Wrought or cast, ferrous and nonferrous	$\frac{S_T}{5}$	$\frac{2}{3} S_Y$	$\frac{S_T}{5}$	$\frac{1.1}{5} S_T R_T$	$\frac{2}{3} S_Y$	$\frac{2}{3} S_Y R_Y$
Welded pipe or tube, ferrous and nonferrous	$\frac{0.85}{5} S_T$	$\frac{2}{3} \times 0.85\ S_Y$	$\frac{0.85}{5} S_T$	$\frac{1.1 \times 0.85}{5} S_T R_T$	$\frac{2}{3} \times 0.85\ S_Y$	$\frac{2}{3} \times 0.85\ S_Y R_Y$
Bolting, wrought ferrous	$\frac{S_T}{4}$	$\frac{2}{3} S_Y$	$\frac{S_T}{4}$	$\frac{1.1}{4} S_T R_T$	$\frac{2}{3} S_Y$	$\frac{2}{3} S_Y R_Y$

Table 6-100(b)
Criteria for Establishing Allowable Stress Values for Table 6C

Product/Material	Room Temperature and Below		Above Room Temperature			
	Tensile Strength	Yield Strength	Tensile Strength		Yield Strength	
Wrought or cast, ferrous and nonferrous	$\frac{S_T}{4}$	$\frac{2}{3} S_Y$	$\frac{S_T}{4}$	$\frac{1.1}{4} S_T R_T$	$\frac{2}{3} S_Y$	$\frac{2}{3} S_Y R_Y$
Welded pipe or tube, ferrous and nonferrous	$\frac{0.85}{4} S_T$	$\frac{2}{3} \times 0.85\ S_Y$	$\frac{0.85}{4} S_T$	$\frac{1.1 \times 0.85}{4} S_T R_T$	$\frac{2}{3} \times 0.85\ S_Y$	$\frac{2}{3} \times 0.85\ S_Y R_Y$

Table 6-100(c)
Criteria for Establishing Allowable Stress Values for Table 6D

Product/Material	Room Temperature and Below		Above Room Temperature			
	Tensile Strength	Yield Strength	Tensile Strength		Yield Strength	
Wrought or cast, ferrous and nonferrous	$\frac{S_T}{4}$	$\frac{2}{3} S_Y$	$\frac{S_T}{4}$	$\frac{1.1}{4} S_T R_T$	$\frac{2}{3} S_Y$	$0.9\ S_Y R_Y$ [Note (1)]
Welded pipe or tube, ferrous and nonferrous	$\frac{0.85}{4} S_T$	$\frac{2}{3} \times 0.85\ S_Y$	$\frac{0.85}{4} S_T$	$\frac{1.1 \times 0.85}{4} S_T R_T$	$\frac{2}{3} \times 0.85\ S_Y$	$0.9 \times 0.85\ S_Y R_Y$ [Note (1)]

NOTE:
(1) Two sets of allowable stress values may be provided in Table 6D for austenitic materials. The lower values are not specifically identified by a Note; these lower values do not exceed two-thirds of the yield strength at temperature. The higher alternate allowable stresses are identified by a Note; these higher stresses may exceed two-thirds but do not exceed 90% of the yield strength at temperature. The higher stress values should only be used where slightly higher deformation is not in itself objectionable. These higher stresses are not recommended for the design of flanges or for other strain-sensitive applications.

MANDATORY APPENDIX 7
GUIDELINES ON MULTIPLE MARKING OF MATERIALS

7-100 BACKGROUND

A common inquiry topic is the permissibility of using material that is identified with two or more specifications (or grades, classes, or types), even if they have different strengths, or even if one of them is not permitted for use in the construction code of application. The Committee has addressed variants of these questions in several interpretations: I-89-11, IIA-92-08, VIII-1-89-269, and VIII-1-89-197.

7-200 GUIDELINES

The construction codes individually define what materials may be used in boilers, vessels, and components constructed in compliance to their rules. If a material meets all of the requirements for a specification for which it is marked, including documentation, if any, and if it meets all requirements for use imposed by the construction code, it may be used. The construction codes, in general, do not address the case of materials marked with more than one specification, grade, class, or type, so these guidelines are offered for clarification.

7-210 ACCEPTABILITY OF MULTIPLE MARKING

Dual or multiple marking is acceptable, as long as the material so marked meets all of the requirements of all the specifications, grades, classes, and types with which it is marked.

All of the measured and controlled attributes of the multiply marked grades or specifications must overlap (e.g., chemistry, mechanical properties, dimensions, and tolerances) and the material so marked must exhibit values that fall within the overlaps. Further, the controlled but unmeasured attributes of the specifications or grades must overlap (e.g., melting practices, heat treatments, and inspection).

Many specifications or grades have significant overlap of chemistry ranges or properties. It is common for material manufacturers to produce materials that satisfy more than one specification, grade, class, or type. Examples are SA-53 and SA-106 (some grades and classes), SA-213 TP304L and TP304, SA-213 TP304 and TP304H, and SA-106 B and C.

7-220 PROHIBITION ON MULTIPLE MARKING

Dual or multiple marking is not acceptable if two or more specifications to which the material is marked have mutually exclusive requirements.

This prohibition includes more than just chemistry and property requirements. One example is SA-515 and SA-516; the former requires melting to coarse grain practice while the latter requires melting to fine grain practice. Another example is SA-213 TP304L and TP304H; the carbon content ranges of these grades have no overlap.

7-230 GRADE SUBSTITUTION

Grade substitution is not permitted. Grade substitution occurs when:

(a) the material contains an element (other than nitrogen) that is unspecified for one of the grades marked; and

(b) the amount of that element present in the material meets the minimum and maximum composition limits for that element in another grade of a specification contained in Section II, Part A or Part B, whether or not it is also so marked.

For example, a material meets all of the composition limits for SA-240 304, contains 0.06C and 0.02N, but also contains 0.45% Ti. This material cannot be marked or provided as meeting SA-240 304 because the Ti content meets the requirements of SA-240 321 [which is Ti greater than 5 × (C + N) but less than 0.70].

Another material, with identical composition, except 0.35% Ti, may be marked SA-240 304 because the Ti content does not meet the minimum requirement for 321. The Ti content is just a residual.

7-240 MARKING SELECTION

If a material is marked with specifications, grades, classes, or types, it may be used with the allowable stresses, design stress intensities, or ratings appropriate for any of the markings on the material, as long as the material specification, grade, class, and type is permitted by the code of construction governing the boiler, vessel, or component in which the material is to be used. However, once the designer has selected which marking applies (specification, grade, class, type, etc.), the designer must use all the design values appropriate for that selection and may not mix and match values from any other specifications, grades, classes, types, etc., with which the material may be marked.

7-250 OTHER MARKINGS

Any other markings, such as marking of non-ASME or non-ASTM material specifications, have no relevance, even if those markings are for materials explicitly prohibited by the construction code being used. That is, as long as the *one* marking, and the documentation required by the material and by the construction code, shows that it meets all the requirements for use of that material in that construction code, any additional markings are irrelevant.

MANDATORY APPENDIX 9
STANDARD UNITS FOR USE IN EQUATIONS

Table 9-100
Standard Units for Use in Equations

Quantity	U.S. Customary Units	SI Units
Linear dimensions (e.g., length, height, thickness, radius, diameter)	inches (in.)	millimeters (mm)
Area	square inches ($in.^2$)	square millimeters (mm^2)
Volume	cubic inches ($in.^3$)	cubic millimeters (mm^3)
Section modulus	cubic inches ($in.^3$)	cubic millimeters (mm^3)
Moment of inertia of section	$inches^4$ ($in.^4$)	$millimeters^4$ (mm^4)
Mass (weight)	pounds mass (lbm)	kilograms (kg)
Force (load)	pounds force (lbf)	newtons (N)
Bending moment	inch-pounds (in.-lb)	newton-millimeters (N·mm)
Pressure, stress, stress intensity, and modulus of elasticity	pounds per square inch (psi)	megapascals (MPa)
Energy (e.g., Charpy impact values)	foot-pounds (ft-lb)	joules (J)
Temperature	degrees Fahrenheit (°F)	degrees Celsius (°C)
Absolute temperature	Rankine (R)	kelvin (K)
Fracture toughness	ksi square root inches $\left(\text{ksi}\sqrt{\text{in.}}\right)$	MPa square root meters $\left(\text{MPa}\sqrt{\text{m}}\right)$
Angle	degrees or radians	degrees or radians
Boiler capacity	Btu/hr	watts (W)

MANDATORY APPENDIX 10
BASIS FOR ESTABLISHING MAXIMUM ALLOWABLE STRESS VALUES FOR TABLES 5A AND 5B

10-100 DERIVATION OF ALLOWABLE STRESS VALUES

The values in Tables 5A and 5B are established by the Committee only. In the determination of allowable stress values, the Committee is guided by successful experience in service, insofar as evidence of satisfactory performance is available. Such evidence is considered equivalent to test data where operating conditions are known with reasonable certainty. In the evaluation of new materials, it is sometimes necessary to be guided by the comparison of test information with available data on successful applications of similar materials.

The factors employed to determine the maximum allowable stress values are provided in Table 10-100. Nomenclature for this Table is as follows:

F_{avg} = multiplier applied to average stress for rupture in 100 000 h. At 815°C and below, F_{avg} = 0.67. Above 815°C, it is determined from the slope of the log time-to-rupture versus log stress plot at 100 000 h such that log $[F_{avg}] = 1/n$, but F_{avg} may not exceed 0.67.

NA = not applicable

n = a negative number equal to Δ log time-to-rupture divided by Δ log stress at 100 000 h

R_y = ratio of the average temperature dependent trend curve value of yield strength to the room temperature yield strength

S_{Cavg} = average stress to produce a creep rate of 0.01%/1 000 h

S_{Ravg} = average stress to cause rupture at the end of 100 000 h

S_{Rmin} = minimum stress to cause rupture at the end of 100 000 h

S_T = specified minimum tensile strength at room temperature

S_y = specified minimum yield strength at room temperature

10-110 CRITERIA FOR MATERIALS OTHER THAN BOLTING

The maximum allowable stress values at any temperature shall be the lowest value obtained from the criteria in Table 10-100. The mechanical properties considered and the factors applied to establish the maximum allowable stresses are as given below.

(a) At temperatures below the range where creep and stress rupture strength govern the selection of stresses, the maximum allowable stress value is the lowest of the following:

(1) the specified minimum tensile strength at room temperature divided by 2.4

(2) the specified minimum yield strength divided by 1.5

(3) the yield strength at temperature divided by 1.5, except for austenitic stainless steels, nickel alloys, copper alloys, and cobalt alloys

(4) for austenitic stainless steels, nickel alloys, copper alloys, and cobalt alloys having an S_y/S_T ratio less than 0.625, higher stress values are established at temperatures where the short-time tensile properties govern, to permit use of these alloys where slightly greater deformation is acceptable. The stress values in this range exceed $66^2/_3$%, but do not exceed 90%, of the yield strength at temperature, but never exceed two-thirds of the specified room-temperature minimum yield strength. These higher stress values are not recommended for the flanges of gasketed joints or other applications where slight amounts of distortion can cause leakage or malfunction. Table Y-2 lists multiplying factors that, when applied to the yield strength values shown in Table Y-1, will give allowable stresses that will result in lower levels of permanent strain.

In the application of these criteria, the Committee considers the yield strength at temperature to be $R_y S_y$.

(b) At temperatures in the range where creep and stress rupture govern the selection of stresses, the maximum allowable stress value for all materials is established by the Committee not to exceed the lowest of the following:

(1) 100% of the average stress to produce a creep rate of 0.01%/1 000 h

(2) $100F_{avg}$% of the average stress to cause rupture at the end of 100 000 h

(3) 80% of the minimum stress to cause rupture at the end of 100 000 h

Stress values for high temperature are based, whenever possible, on representative uniaxial properties of the materials obtained under standard testing conditions. The stress values are based on basic properties of the material

and no consideration is given for corrosive environment, for abnormal temperature and stress conditions, or for other design considerations.

10-120 CRITERIA FOR BOLTING MATERIALS

The criteria for bolting materials listed in Tables 3 and 4 are to be found in Mandatory Appendix 2.

Table 10-100
Criteria for Establishing Allowable Stress Values for Tables 5A and 5B

	Below Room Temperature		Room Temperature and Above			
Product/Material	Tensile Strength	Yield Strength	Tensile Strength	Yield Strength	Stress Rupture	Creep Rate
All wrought or cast ferrous and nonferrous product forms except bolting, and except for austenitic stainless steel, nickel alloy, copper alloy, and cobalt alloy product forms having an S_y/S_T ratio less than 0.625	$\frac{S_T}{2.4}$	$\frac{S_y}{1.5}$	$\frac{S_T}{2.4}$	$\frac{R_y S_y}{1.5}$	$\text{Min.}\left(F_{\text{avg}} S_{R\text{avg}},\ 0.8\, S_{R\text{min}}\right)$	$1.0\ S_{C\text{avg}}$
All wrought or cast austenitic stainless steel, nickel alloy, copper alloy, and cobalt alloy product forms except bolting, having an S_y/S_T ratio less than 0.625 [Note (1)]	$\frac{S_T}{2.4}$	$\frac{S_y}{1.5}$	$\frac{S_T}{2.4}$	$\text{Min.}\left(\frac{S_y}{1.5}, \frac{0.9\, S_y R_y}{1.0}\right)$	$\text{Min.}\left(F_{\text{avg}} S_{R\text{avg}},\ 0.8\, S_{R\text{min}}\right)$	$1.0\ S_{C\text{avg}}$

GENERAL NOTE: When using this stress basis criterion to determine the allowable stresses for a specific material as a function of temperature, the derived allowable stress at a higher temperature can never be greater than the derived allowable stress at a lower temperature.

NOTE:
(1) These higher stress values were established at temperatures where the short-time tensile properties govern, to permit the use of these materials where slightly greater deformation is acceptable. The stress values in this range exceed $66\frac{2}{3}$% but do not exceed 90% of the yield strength at temperature. These stress values are not recommended for the flanges of gasketed joints or other applications where slight amounts of distortion can cause leakage or malfunction. Table Y-2 lists multiplying factors that, when applied to the yield strength values shown in Table Y-1, will give allowable stresses that will result in lower values of permanent strain.

NONMANDATORY APPENDIX A
ISSUES ASSOCIATED WITH MATERIALS USED IN ASME CODE CONSTRUCTION

A-100 GENERAL

The performance over time of the various ferrous and nonferrous alloys permitted for use in Code construction may be influenced by many factors, ranging from the processes involved in their fabrication into components and their installation to changes in the material structure or direct damage to the material related to operation in the intended service. If Code-constructed equipment is to provide the reasonably long period of safe operation expected by the users of that equipment, then the equipment designers must be aware of any potential change in the material's properties related to fabrication, installation, or service as they go about selecting materials for Code usage. Although the Code does not mandate that all of the various metallurgical phenomena and environmental effects that can influence material performance be considered in the design of a Code component, such consideration is a part of the good engineering judgment that is expected to be exercised in all Code-related matters and, as such, this Nonmandatory Appendix is provided to designers and other Code users to assist in the material selection process.

Historically, some of the information contained in this Nonmandatory Appendix has been available in other Sections of the Boiler and Pressure Vessel Code, as well as in the Piping Code. In addition to information provided previously in Nonmandatory Appendix A, Metallurgical Phenomena, in Section II, Part D, there was information available in Section VIII and more recently in Section III Appendices, Nonmandatory Appendix W, Environmental Effects. A review of these various information sources revealed that there were many important issues not covered, and that there were other issues that required revision to incorporate new information. Thus, what follows is an expanded coverage of metallurgical phenomena and environmental effects. It is emphasized, however, that this is not a comprehensive coverage of all possible mechanisms, nor is it an exhaustive treatment of the individual topics. Rather, this revised Appendix is intended to serve as a more convenient resource for designers and users of Code equipment as they consider the many issues that could adversely affect materials in Code service.

A-110 ISSUES COVERED

Issues covered in this Nonmandatory Appendix include those listed below (it is recognized, of course, that some of these issues could be placed in more than one of the general categories). In the first section, on metallurgical changes (A-200), an attempt is made to identify the materials most commonly affected by the changes in question. In the remaining sections (A-300 through A-800), the various types of damage to which materials may be subject are described, with a strong emphasis on the environmental effects that, in the absence of appropriate preventive measures, can render the materials inoperable. Items covered in each section and paragraph are as follows:

Section/ Paragraph Number	Section/Paragraph Description
A-200	Metallurgical changes
A-201	Graphitization (occurs almost exclusively in carbon and C–Mo steels)
A-202	Softening (occurs in most ferritic alloys used for elevated temperature service)
A-203	Temper embrittlement (occurs in low alloy steels)
A-204	Strain aging (occurs in carbon and low alloy steels)
A-205	Cold working (effects occur in most steels, but are particularly important for the 300 series stainless steels)
A-206	Relaxation cracking
A-207	475°C embrittlement (occurs mostly in high chromium stainless steels and in the ferritic phase of duplex stainless steels)
A-208	Sigma phase embrittlement (occurs in 300 series stainless steels and in some 400 series stainless steels with Cr >17%)
A-209	Laves phase precipitation (occurs in some 300 series stainless steels, Fe–Ni base alloys, Co-base superalloys, and in the tungsten-bearing CSEF steels)
A-210	Sensitization (carbide formation) (occurs in both the 300 series stainless steels as well as in 400 series stainless grades)
A-211	Thermal aging embrittlement (occurs to varying degrees in most ferrous alloys)
A-212	Radiation embrittlement (affects all materials, both ferrous and nonferrous)
A-213	Solidification cracking in nickel alloys
A-300	Uniform corrosion
A-301	General corrosion and wastage
A-302	Atmospheric corrosion
A-303	Galvanic corrosion
A-304	Stray current corrosion

Table continued

Section/ Paragraph Number	Section/Paragraph Description
A-305	High-temperature corrosion
A-306	Soil corrosion
A-307	Caustic corrosion
A-308	Carbon dioxide corrosion
A-309	Concentration cell corrosion
A-310	Differential-temperature cell corrosion
A-311	Molten salt corrosion
A-312	Liquid metal corrosion
A-400	Localized corrosion
A-401	Pitting corrosion
A-402	Filiform corrosion
A-403	Crevice corrosion
A-404	Microbiologically induced corrosion
A-500	Metallurgically influenced corrosion
A-501	Intergranular corrosion
A-502	Dealloying corrosion (dezincification and graphite corrosion) (occurs mainly in brasses and gray cast iron)
A-503	Grooving (occurs mostly in ERW carbon steel pipe)
A-600	Mechanically assisted corrosion
A-601	Velocity-affected corrosion
A-602	Erosion-corrosion
A-603	Impingement corrosion
A-604	Cavitation erosion
A-605	Corrosion fatigue
A-700	Environmentally induced embrittlement and cracking
A-701	Stress corrosion cracking – Transgranular stress corrosion cracking – Intergranular stress corrosion cracking – Irradiation-assisted stress corrosion cracking
A-702	Hydrogen damage – Hydrogen embrittlement – Hydrogen stress cracking – Hydrogen attack (high-temperature damage)
A-703	Liquid metal embrittlement
A-704	Caustic embrittlement
A-705	Flow-assisted corrosion
A-706	Sulfur embrittlement
A-800	Mechanical damage mechanisms
A-801	Fretting and wear
A-802	Thermal fatigue
A-803	Dynamic loading
A-804	Anisotropy

Discussion of the above various issues in this Nonmandatory Appendix is limited to a definition of the phenomenon or environmental effect in question, which includes a brief description of the conditions under which the metallurgical change or the damage may occur. This is followed by a references section that is provided to guide the Code user to more-comprehensive sources of information. Some "authoritative sources" used in covering materials issues are listed below. These are not all of the possible references, but they are considered to be adequate for providing a general characterization of the various phenomena and environmental effects discussed.

A-120 GENERAL REFERENCES

ASM Handbooks

Volume 1, *Properties and Selection: Iron, Steels, and High-Performance Alloys*, 1993

Volume 2, *Properties and Selection: Nonferrous Alloys and Special-Purpose Materials*, 1993

Volume 9, *Metallography and Microstructures*, 2004

Volume 11, *Failure Analysis and Prevention*, 2002

Volume 13A, *Corrosion: Fundamentals, Testing, and Protection*, 2003

Volume 13B, *Corrosion: Materials*, 2005

Volume 13C, *Corrosion: Environments and Industries*, 2006

Garverick, L., *Corrosion in the Petrochemical Industry*, ASM, 1994

Collins, J. A., *Failure of Materials in Mechanical Design*, John Wiley and Sons, New York, 1981

Wulpi, D. J., *Understanding How Components Fail*, ASM, 1985

Smith, G. V., *Properties of Metals at Elevated Temperatures*, McGraw-Hill Book Co., New York, 1950

Revie, R. W. and Uhlig, H. H., *Corrosion and Corrosion Control*, John Wiley and Sons, New York, 2008

Dobis, J. D. and Bennett, D. C., *Damage Mechanisms Affecting Fixed Equipment in the Pulp and Paper Industry*, WRC Bulletin 488, January 2004

Dobis, J. D. et al., *Damage Mechanisms Affecting Fixed Equipment in the Refining Industry*, WRC Bulletin 489, February 2004

Dobis, J. D. and French, D. N., *Damage Mechanisms Affecting Fixed Equipment in the Fossil Electric Power Industry*, WRC Bulletin 490, April 2004

McGuire, M. F., *Stainless Steels for Design Engineers*, ASM International, 2008

References cited in

- Section II, Part D (2007 Edition), Materials Properties, Appendix A, Metallurgical Phenomena
- Section III, Division 1 (2007 Edition), Nuclear Construction, Appendix W, Environmental Effects
- ASME B31.1-2007, Power Piping
- ASME B31.3-2008, Process Piping

A-200 METALLURGICAL CHANGES THAT CAN OCCUR IN SERVICE

Materials purchased to ASTM or ASME specifications are, by intent, well-defined substances, each having a well-characterized database from which allowable stresses can be developed. However, there are certain manufacturing and installation processes, as well as many service conditions, that can affect the macrostructure and

microstructure of these materials and, in so doing, modify the behavior of these materials in service. These are the "bulk" effects where large parts of an entire structure have been altered – and these effects are sometimes called metallurgical phenomena. The various phenomena of potential interest to Code users are discussed below, in no particular order of importance.

A-201 GRAPHITIZATION

A-201.1 Definition. Graphitization is a process in which some portion of the carbon, present in the iron carbide that forms in the microstructure of carbon or carbon–0.5Mo steels during virtually all standard heat treatments for these steels, dissociates from the carbides and forms separate particles of free carbon, or graphite. This change will occur only over a relatively long period of time when the steel is operating in the temperature range of 425°C to 595°C and, depending on the nature of the distribution of the graphite particles in the microstructure, can result in a substantial loss of the material's strength and ductility. The graphite particles may be randomly distributed throughout the structure, in which case the effects on material performance will be minimal (although a modest loss of creep strength may be observed), or they may be aligned along certain preferred planes in the structure (e.g., at the edge of weld heat-affected zones or along cold-worked bands of material), in which case the loss of ductility can be severe, leading to unexpected failure of the component. Graphitization competes with another metallurgical phenomenon known as spheroidization (discussed in A-202), with graphitization more likely to occur at temperatures below approximately 550°C.

The relative susceptibility to graphitization of the carbon or carbon–moly steels can vary substantially, depending on the specific heat chemistry, and there is not at this time a good quantitative understanding of the influence of individual elements on susceptibility. For example, it has long been suspected that aluminum enhances the graphitization process, so that aluminum-killed steels are more susceptible to graphitization than are steels killed with silicon or titanium, but some investigators have disputed this, suggesting that the aluminum may hasten the process of the initial particle formation but does not influence the overall extent of the graphitization over time. Nor is there at this time a complete understanding of why in some cases the aligned-type particle formation is favored over the random-type formation. As noted above, graphitization will occur over a range of temperatures, with the rate of particle formation varying with temperature. Experience has shown that for the carbon–moly steels the temperatures of greatest susceptibility are approximately 30°C higher than for the plain carbon steels. The addition of approximately 0.5 weight % chromium to the steel will stabilize the carbides in the microstructure and prevent the occurrence of graphitization, which is an inducement to use other grades of steel containing chromium for service at elevated temperatures.

A-201.2 References. In addition to the general references cited in A-120, see also the following references for additional details:

[1] *Embrittlement of Components in Fossil Fueled Power Plants*, EPRI 1004515, 2003.
[2] *Boiler Tubes: Theory and Practice, Volume 3: Steam Touched Tubes*, EPRI TR-105261 – V3.
[3] French, D. N., "Microstructural Degradation," The National Board of Boiler and Pressure Vessel Inspectors, June 2001.
[4] Foulds, J. R. and R. Viswanathan, "Graphitization of Steels in Elevated Temperature Service," *Proceedings of the First International Symposium on Microstructures and Mechanical Properties of Aging Materials*, The Minerals, Metals and Materials Society, November 1992.
[5] Port, R. D., "Non-Weld-Related Graphitization Failures," *Corrosion/89*, Paper No. 248, NACE.
[6] Wilson, J. G., *Graphitization of Steel in Petroleum Refining Equipment and the Effect of Graphitization of Steel on Stress Rupture Properties*, WRC Bulletin 32, January 1957.
[7] Thielsch, H., *Defects and Failures in Pressure Vessels and Piping*, Reinhold Publishing Corp., 1965.
[8] Hemingway, W. L., "The Study of Graphitization," The Edwards Valve Co., 1952.

A-202 SPHEROIDIZATION (SOFTENING)

A-202.1 Definition. As noted in A-201.1, graphitization and spheroidization are competing processes in which the carbide phases of certain steels are altered as the result of prolonged exposure to temperatures in the range of 425°C to 760°C. In the case of spheroidization, the carbide does not break down to release the carbon, but it changes from an approximately planar shape developed during the original heat treatment (e.g., the platelike lamellae of pearlite in normalized carbon steel) to a lower-energy spheroidal shape, resulting in some loss of both room temperature and elevated temperature strength (by as much as 30%), but an increase in ductility.

Spheroidization may occur in any carbon or alloy steel, including the 9% Cr and 12% Cr creep strength-enhanced ferritic steels. Experience over the years has shown the following:

(a) Annealed steels are more resistant to spheroidization than normalized steels, since they are intentionally heat treated to exist in a more stable condition.

(b) Coarse-grained steels are more resistant to spheroidization than fine-grained steels.

(c) Fine-grained silicon-killed steels are more resistant than aluminum-killed steels.

For components operating in the time-dependent regime, spheroidization often is an inevitable part of the aging process, and qualitative correlations between the degree of spheroidization and the amount of remaining life have been used with a moderate degree of success.

A-202.2 References. In addition to the general references cited in A-120, see the references cited in A-201.2, particularly references [3] and [5].

A-203 TEMPER EMBRITTLEMENT

A-203.1 Definition. Temper embrittlement is a metallurgical phenomenon that can occur in several different classes of steel, including plain carbon steels, low alloy steels, and martensitic steels, in which the toughness of the material drops significantly when subjected to prolonged exposure to temperatures within what would be considered a normal range for either heat treatment or service. When testing for embrittlement is carried out by use of the Charpy V-notch test, the embrittlement manifests itself as an upward shift in the ductile-to-brittle transition temperature. The mechanisms of embrittlement vary somewhat with the type of steel involved, but in the application of materials for Code construction, the more significant embrittlement is that which occurs in some low alloy steels during long-time exposure in the temperature range of 345°C to 595°C. Temper embrittlement can occur either during fabrication or during prolonged exposure in the embrittling temperature range during service.

For the low alloy steels, the embrittling mechanism has been shown to involve the preferential segregation of certain residual and surface-active elements to the grain boundaries. Elements that are believed to be particularly harmful include phosphorous, arsenic, antimony, and tin, with other elements, such as manganese, silicon, chromium, nickel, and vanadium, playing a lesser role in the embrittlement process by facilitating the action of the more-harmful elements. The embrittled material is most vulnerable during equipment startups and shutdowns, during which times it is most likely to fracture in a brittle manner when rapidly loaded at temperatures within or below the transition temperature range.

One of the most commonly used low alloy steels, $2^{1}/_{4}$Cr–1Mo, is also one of the most susceptible steels, with 3Cr–1Mo being slightly less susceptible. High-strength low alloy (HSLA) chromium–molybdenum–vanadium steels are also susceptible to temper embrittlement. Steels of an older vintage (prior to approximately 1972) and those steels produced without the advantage of modern clean steel technologies also tend to be more susceptible to the embrittlement, due to the higher levels of impurities.

Various methods have been devised for controlling the susceptibility to temper embrittlement through control of chemical composition, with the use of the J and X factors having achieved a fairly broad range of acceptance. Through use of these factors, the amounts of the most deleterious elements are limited to levels known to confer a high degree of resistance to temper embrittlement. These factors are defined as follows:

$$\text{J factor (base metal)} = (\text{Si} + \text{Mn}) \times (\text{P} + \text{Sn}) \times 10{,}000 \leq 150 \text{ (elements calculated in wt. \%)}$$

$$\text{X factor (weld metal)} = (10\text{P} + 5\text{Sb} + 4\text{Sn} + \text{As})/100 \leq 15 \text{ (elements calculated in ppm)}$$

In addition to material composition, postweld heat treatment procedures should be carefully selected and/or qualified to avoid temper embrittlement before exposing the material to service conditions.

The effects of temper embrittlement can be reversed by heating the affected material to a minimum temperature of 620°C and holding for 2 h per 25.4 mm of thickness, followed by rapid cooling to room temperature. However, the material will quickly re-embrittle if it is reexposed to the conditions that caused the embrittlement in the first place.

A-203.2 References. In addition to the general references cited in A-120, see the following references for additional details:

[1] API RP 934, *Materials and Fabrication Requirements for $2^{1}/_{4}$Cr-1Mo and 3Cr-1Mo Steel Heavy Wall Pressure Vessels for High Temperature, High Pressure Hydrogen Service*, American Petroleum Institute.

[2] White, R. A. and E. F. Ehmke, *Materials Selection for Refineries and Associated Facilities*. NACE, 1991, pp. 53-54.

[3] Viswanathan, R., *Damage Mechanisms and Life Assessment of High Temperature Components*, ASM International, 1989.

[4] Swift, R. A., "Temper Embrittlement in Low Alloy Ferritic Steels," *Corrosion/76*, Paper No. 125, NACE.

A-204 STRAIN AGING

A-204.1 Definition. An early (1948 edition/1960 reprinting) edition of the ASM Metals Handbook defines strain aging as "aging induced by cold working." With improved understanding of the strain aging mechanism, strain aging now can be defined as an age-hardening phenomena in which the tensile strength and hardness of a cold-worked material are increased and the ductility reduced when that material is exposed to moderately elevated temperatures, normally as a result of service, although it can also occur during fabrication. The most common mechanism for the aging is the precipitation of nitrides at dislocations and other crystalline defects created during the cold working of the material, and it is for this reason that strain age damage is far more prevalent in older versions (pre-1980) of carbon and carbon–0.5 molybdenum steels, where control of the nitrogen content was less effective. Newer steels made in basic oxygen furnaces and fully killed with aluminum

have not shown as great a susceptibility to strain age damage. The effects of strain aging can be minimized or eliminated by a stress-relieving heat treatment following the cold working, where the temperature of the stress relief is sufficiently high to substantially reduce the number of available initiation sites for the nitride precipitation.

A-204.2 References. Most of what is needed to understand and deal with strain aging can be found in the general references cited in A-120.

A-205 COLD WORKING (COLD STRAIN)

A-205.1 Definition. Cold working is any process of plastic deformation of a metal that occurs at temperatures below the material's transformation or recrystallization temperature and in which the material is hardened by the strain. As the hardness of a cold-worked material is increased, the ductility of the material decreases. The amount of hardening that occurs with a given amount of cold work varies with the alloy system, and cold work effects are particularly pronounced in alloys like the austenitic (3XX series) stainless steels. When austenitic stainless steels that have been moderately to heavily cold worked are operated in the creep range (generally above about 540°C), recrystallization may occur and the grain size can be substantially reduced, particularly if the temperature is limited to a level only slightly above the recrystallization temperature. This can result in an increase in the creep rate, with a corresponding decrease in creep rupture strength. As discussed earlier (see A-201 and A-204), cold work contributes to certain types of microstructural instability. In addition, the residual stresses induced by cold work can substantially increase the risk of cracking in austenitic stainless steels and other austenitic alloys when these materials are exposed to certain types of aggressive environment (see A-701 on stress corrosion cracking).

Cold work can accelerate other forms of embrittlement; see reference [1]. Concern over the effects of cold work has led to the implementation of various requirements in the construction codes for heat treatment of certain cold-worked materials once a critical level of strain is exceeded. It is understood that because of the complexity of the relationship between cold work and material degradation, implementation of the heat treatment rules is not a guarantee that premature failures will be avoided in all situations. Likewise, violation of the limits defined in the rules will not inevitably result in premature failures. Factors such as melting practice, consolidation (forming) and heat treatment practices of the material producer, and the initial grain size all can play a role in determining whether a cold-worked material operates reliably in service. However, the rules represent a consensus of what can be considered good practice by parties representing disparate interests and, in general, serve to benefit the end user.

A-205.2 References. The general references cited in A-120 contain extensive information on the effects of cold work in materials used for Code construction. See the following reference for additional detail:

[1] Groebner, P. J. and R. F. Steigerwald, "Effect of Cold Work on the 885°F (475°C) Embrittlement of 18Cr-2Mo Ferritic Stainless Steels," Journal of Metals, July 1977, pp. 17–23.

A-206 RELAXATION CRACKING (STRAIN-INDUCED PRECIPITATION HARDENING)

A-206.1 Definition. Relaxation cracking is a condition that may develop in cold-worked or warm-worked austenitic materials when temper-resistant particles precipitate at excess defect sites generated by the cold or warm working operations; these precipitates act to "pin" the defects, which results in a substantial increase in the material's creep strength and hardness. The bulk of the strengthening occurs within the individual grains, while the grain boundaries remain comparatively weak, so that when the material is heated to intermediate temperatures in the range of 510°C to 760°C any strains that develop either in response to heat treatments or service temperatures concentrate in the grain boundaries. This can lead to rapid creep crack growth and ultimately failure of the component in a nonductile fashion. In the austenitic stainless steel alloys, the precipitates commonly are carbides and carbonitrides involving columbium or titanium, while in the nickel-base alloys titanium and aluminum contribute to the formation of gamma prime or gamma double-prime precipitates. There is substantial heat-to-heat variability in the relative susceptibility of an alloy to relaxation cracking, but in susceptible heats the rate of crack growth can be quite rapid if the amount of working and the temperature of exposure are unfavorable. In fact, pressure parts fabricated from susceptible heats of 347H material and 310HCbN have cracked through-wall during heat-up for solution annealing. The rules contained in PG-19 (BPVC Section I) and UHA-44 (Section VIII, Division 1) were developed, in part, to minimize the risk of relaxation cracking.

A-206.2 References.

[1] Truman, R. J. and H. W. Kirkby, "Some Ductility Aspects of 18-12-1Nb Steel," *Journal of the Iron and Steel Institute*, October 1960.

[2] Moore, N. E. and J. A. Griffiths, "Microstructural Causes of Heat-Affected Zone Cracking in Heavy Section 18-12-Nb Austenitic Stainless Steel Welded Joints," *Journal of the Iron and Steel Institute*, January 1961.

[3] Shingledecker, J. P. "Creep-Rupture Behavior and Recrystallization in Cold-Bent Boiler Tubing for USC Applications," *Proceedings of the 5th International Conference on Advances in Materials Technology for Fossil Power Plants*, Marco Island, Florida, 2007.

[4] Van Wortel, H. "Control of Relaxation Cracking in Austenitic High Temperature Components," *Corrosion/2007*, Paper No. 07423, NACE.

A-207 475°C EMBRITTLEMENT

A-207.1 Definition. Upon exposure to elevated temperatures, high chromium stainless steels and the ferrite phase of austenitic and austenitic–ferritic (duplex) stainless steels are subject to a type of embrittlement in which the material hardness increases and the tensile ductility and toughness decrease at and below the service temperature. This metallurgical phenomenon is observed at chromium levels in excess of 10% to 12% and the embrittlement may be due to carbide, nitride, or silicide precipitation, especially at the lower chromium levels, rather than precipitation of alpha prime chromium-rich particles. The severity of embrittlement increases with increasing chromium content, and the effect is enhanced by certain alloying elements, notably aluminum, molybdenum, and tungsten, which tend to increase and stabilize the ferrite content. While the maximum rate of embrittlement occurs at 475°C, a typical "C" curve time–temperature behavior is observed and some alloys with as little as 15% to 18% chromium have shown significant embrittlement with just a few thousand hours exposure at temperatures as low as 260°C. At very high chromium levels, alpha prime embrittlement proceeds via spinodal decomposition, rather than by nucleation and growth of discrete alpha prime particles. This may be the primary cause of embrittlement for alloys S44735 and S44660.

The 475°C embrittlement generally becomes apparent first as a reduction in Charpy impact ductile–brittle transition temperature (DBTT), and only in its last stages are changes in strength, hardness, and ductility observed. The embrittlement normally is not a problem at elevated temperatures, but it can become a problem when components are cooled to ambient temperatures.

A-207.2 References. In addition to the general references cited in A-120, see also the following references for additional information:

[1] Miller, G. E. "Experiences with 885°F Embrittlement in Ferritic Stainless Steels," *Materials Protection*, NACE International, May 1966.
[2] Groebner, P. J., "The 885°F (475°C) Embrittlement of Ferritic Steels," *Metallurgical Transactions*, Volume 4, January 1973, pp. 251–260.
[3] Nichol, T. J., A. Datta, and G. Aggen, "Embrittlement of Ferritic Stainless Steels," *Metallurgical Transactions*, Volume 11A, April 1980, pp. 573–585.

A-208 SIGMA PHASE EMBRITTLEMENT

A-208.1 Definition. Sigma phase embrittlement is a metallurgical phenomenon in which an iron–chromium intermetallic compound that is hard and brittle forms in certain high alloy steels after prolonged exposure at temperatures ranging from 565°C to 925°C. The embrittling effect is observed most immediately at lower temperatures, where there is a reduction in tensile ductility and a loss in toughness. The presence of sigma phase normally is less injurious at the higher temperatures where it forms. However, under certain conditions the presence of large amounts of the sigma phase has been linked to significant reductions in creep ductility, with a corresponding reduction in the creep life of a component.

Materials typically susceptible to sigma phase formation include the following:

(a) 300 series stainless steels, including both wrought and cast forms, as well as weld metal

(b) 400 series stainless steels, both ferritic and martensitic types, generally with chromium levels of 17% and more

(c) duplex stainless steels

Factors that influence the rate of sigma phase formation include the amount of delta ferrite present, time within the temperature range of formation, prior cold working, variations in composition due to progressive solidification, increased chromium content, and the presence of ferrite-stabilizing elements, particularly molybdenum, niobium, and titanium, which act to increase the chromium equivalent, while austenite-stabilizing elements, particularly carbon, nitrogen, nickel, and manganese, reduce the rate of sigma phase formation.

Sigma phase can nucleate preferentially at carbides and especially at ferrite–austenite interfaces in predominantly austenitic alloys, or in duplex alloys it can result from the transformation of the delta ferrite phase at temperatures following exposure to temperatures above approximately 650°C. It is possible to "de-sigmatize" affected materials by re-solution annealing at a minimum of 1 065°C for about 4 h, followed by a water quench, but the rate of reformation when reexposed to temperatures within the susceptible range is rapid.

A-208.2 References. In addition to the general references cited in A-120, see also the following references for additional details:

[1] Viswanathan, R., "Damage Mechanisms and Life Assessment of High Temperature Components," ASM International, 1989.
[2] API Publication 581, "Risk-Based Resource Document," American Petroleum Institute.
[3] Kiesheyer, H. and H. Brandis, "Precipitation and Embrittlement Behavior of Nickel-Containing Superferrites," Zeit. Werkst. 8, March 1977, pp. 69–77.

A-209 LAVES AND LAVES PHASE PRECIPITATION

A-209.1 Definition. Most austenitic (300 series) stainless steels are metastable materials, which means that during elevated temperature service a range of complex carbides and other noncarbide phases may form, depending on the time and temperature of exposure, the specific alloy composition, and prior cold working or

other fabrication process variables. One of those phases is the Laves phase, the formation of which may occur during alloy production or during service, and is another of the metallurgical phenomena that may occur during exposure of austenitic stainless steels containing molybdenum, titanium, and niobium, in the temperature range from just above 595°C to approximately 870°C. Laves phase may also develop in other iron-base, iron–nickel-base, or cobalt-base superalloys, including the tungsten-enriched grades of the creep strength-enhanced ferritic steels (e.g., Grades 92 and 122). Silicon and niobium promote formation of Laves phase in Alloy 718 (N07718). Laves phase precipitates within the grains (intragranularly) or intergranularly, forming into globular particles or into platelets.

Laves phase forms during solidification of high niobium alloys, most notably N07718, and its presence can result in the embrittlement of welded materials unless a very high temperature solution-annealing operation is performed as the postweld heat treatment. There is also an Ni_2Mg Laves phase that can form as a result of excessive desulfurization of N07718 and similar alloys.

A-209.2 References. In addition to the general references cited in A-120, see also the following references for additional details:

[1] Kriege, O. H., "Phase Separation as a Technique for the Characterization of Superalloys," STP 557, ASTM, 1974.
[2] Kuy, E., "On the Methodology of Phase Extraction in Nickel-Base Superalloys," *Practical Metallography*, Volume 13, November 1976.

A-210 SENSITIZATION (CARBIDE FORMATION)

A-210.1 Definition. Sensitization involves the precipitation of chromium carbides along the grain boundaries of austenitic (300 series) and ferritic/martensitic (400 series) stainless steels when they are exposed for significant periods of time in the temperature range of about 540°C to 845°C. Most high-temperature alloys are sensitized either as-produced or as the result of service. The grain boundary precipitation of the chromium carbides typically results in a strengthening of the alloy; however, because the formation of the carbides depletes the material immediately adjacent to the precipitates of chromium, the material can be highly susceptible to intergranular corrosion when exposed to corrosive aqueous environments at lower temperatures. The rate at which sensitization occurs and the degree of sensitization will depend on the specific material composition and the time and temperature of exposure. For example, the ferritic stainless grades will sensitize much more rapidly than the austenitic grades, due to the difference in diffusion rates in the two different crystal structures. Portions of a weld heat-affected zone in a susceptible material inevitably will be subjected to sensitizing temperatures and this should be considered if the welded component is to be subjected to a corrosive environment. For high-temperature applications, the material will desensitize over time as the chromium from the surrounding material diffuses back into the depleted region, but this process occurs much more slowly than the sensitization itself. Modifications have been made to the composition of some austenitic and ferritic grades to minimize the risk of sensitization, including the reduction of carbon (i.e., the so-called L grades) and the introduction of elements such as titanium and niobium that form carbides in preference to the chromium carbide (e.g., Type 321 and Type 347). It should be noted, however, that in high-temperature applications, the presence of "stabilizing" elements such as titanium or niobium will typically retard, but not prevent, the occurrence of sensitization, although the presence of these elements will alter the rate of its development.

It should be understood that the sensitized condition does not relate directly to the presence of the carbides in the grain boundaries; rather, the condition occurs because at a certain stage in the evolution of the carbides, chromium-depleted zones are created that render the material subject to intergranular attack. Different tests for sensitization (e.g., ASTM A262 Practices A, B, C, E, and F) will detect different levels of chromium depletion and may yield different results. Since the extent of chromium depletion can vary, the degree of sensitization (DOS) varies too. Standard electrochemical techniques (see ASTM G108) exist for quantifying the DOS and allow determination of whether the DOS is compatible with the intended service. Note that some of the intergranular corrosion tests (most commonly the ASTM A262, Practice C Nitric Acid Test) may detect susceptibility to intergranular corrosion caused by mechanisms other than carbide precipitation. Thus, test method selection and the proper interpretation of results are important.

A-210.2 References. In addition to the general references cited in A-120, see also the following reference for additional details:

[1] J. J. Demo and A. P. Bond, "Intergranular Corrosion and Embrittlement of Ferritic Stainless Steels," *Corrosion*, Volume 31, January 1975, pp. 21-22.

A-211 THERMAL AGING EMBRITTLEMENT

A-211.1 Definition. Several forms of thermally induced embrittlement have previously been covered in A-201 (graphitization), A-203 (temper embrittlement), A-204 (strain-aging embrittlement), A-207 (475°C embrittlement), and A-208 (sigma phase embrittlement). Issues not yet covered within the general subject of thermal aging embrittlement include blue brittleness, quench age embrittlement, stress-relief embrittlement, and tempered-martensite embrittlement. These last four issues all arise during fabrication-related heating activities.

Blue brittleness is an embrittling phenomenon that occurs when plain carbon steels and some alloy steels are heated into the temperature range of 230°C to 370°C. Blue brittleness is an accelerated form of strain-age

embrittlement and is characterized by an increase in strength and a marked decrease in ductility and toughness.

Quench-age embrittlement occurs in low carbon steels when the material undergoes hardening in response to the precipitation of carbides at existing dislocations due to differences in the solid solubility of carbon in ferrite at different temperatures. The hardening reaction is made possible by rapid cooling from temperatures slightly below the lower critical transformation temperature, at which temperature the solubility of carbon is substantially greater than at room temperature. As the hardness of the steel increases with increased aging at room temperature, the ductility decreases proportionally. An aging period of several weeks at room temperature is required for maximum embrittlement.

Stress-relief embrittlement is also known as *postweld heat treat cracking* or *reheat cracking*; where this mechanism is active, it will lead to intergranular cracking within the higher-strength portions of the weld zone (e.g., the coarse-grained heat-affected zone and the weld deposit itself) during stress relieving or during subsequent elevated temperature service. The metallurgical phenomenon occurs only in low alloy structural and pressure vessel steels, ferritic creep-resisting steels, austenitic stainless steels, and some nickel-base alloys. In all of these alloys, the rapid precipitation of temper-resistant phases during the early stages of heat treatment or service leads to a significant strengthening of the interior of grains within the material. The creep strain that is the mechanism of stress relief then concentrates within the grain boundary regions, which often are depleted of precipitates, leading to rapid intergranular cracking.

Tempered-martensite embrittlement is a metallurgical phenomenon affecting quenched and tempered high-strength low alloy steels over the temperature range of 205°C to 370°C. Tempered-martensite embrittlement is generally thought to be caused by ferrite networks that develop due to the precipitation of cementite platelets along prior-austenite grain boundaries. Steels containing significant percentages of chromium or manganese have the highest potential for this form of embrittlement.

A-211.2 References. Everything covered in this paragraph was derived from the general references cited in A-120, with particular emphasis on ASM Handbook Volumes 1 and 11.

A-212 RADIATION EMBRITTLEMENT

A-212.1 Definition. Radiation embrittlement is a metallurgical phenomenon affecting most structural materials exposed to high levels of high-energy neutrons, usually within or near the cores of nuclear reactors. The embrittlement is evident as a substantial loss in toughness and ductility, with accompanying gains in strength (hardening). For pressure-boundary materials, the most significant concern is the increase in the ductile-to-brittle transition temperature and a decrease in the upper-shelf energy observed during impact tests.

Extensive research over the years has revealed the following:

(a) High-strength steels that have lower initial nil-ductility transition temperatures than low-strength steels are generally less susceptible to radiation embrittlement.

(b) Steels with low initial nil-ductility transition temperatures, fine-grain microstructures, and structures with high dislocation densities generally show greater resistance to radiation embrittlement.

(c) Steels with tempered-martensite in the microstructures are less susceptible than those with tempered upper bainite or ferritic microstructures.

(d) Vacuum degassing and control of alloying elements such as copper, phosphorus, and possibly nickel help to reduce the susceptibility to radiation embrittlement.

A-212.2 References. In addition to the general references cited in A-120, additional useful information can be derived from the following references:

[1] Billington, D. S. and J. H. Crawford, *Radiation Damage in Solids*, Princeton University Press, 1961.

[2] Bement, A. L., STP 484, *Irradiation Effects on Structural Alloys for Nuclear Reactor Applications*, ASTM, 1970.

[3] Wechsler, M. S. and W. H. Smith, CONF-730801, *Symposium on Materials Performance in Operating Nuclear Systems*, National Technical Information Center, August 1973.

A-213 SOLIDIFICATION CRACKING

Solidification cracking is a form of hot cracking that can occur in weldments of nickel-base alloys. Solidification cracking occurs when alloying elements or impurities are present that segregate during solidification and form low-melting-point liquid films on grain boundaries. Tensile stresses, which build up during solidification and cooling of the weld metal, can cause cracking along the liquid films. Elements that can promote solidification cracking in nickel-base alloys include sulfur, phosphorus, silicon, boron, and zirconium. The problem may appear as macroscopic solidification cracks, typically along the weld centerline, or as microfissures within the weld metal. Solidification cracks may or may not be open to the surface. For a given material, the occurrence of solidification cracking is influenced by weld joint design and weld bead geometry. Solidification cracking is promoted by high heat input, a concave weld bead profile, and a teardrop-shaped weld pool. Heavy restraint, due to thick material or a rigid joint design, will also promote solidification cracking.

A-300 UNIFORM CORROSION

This is the simplest form of environmental damage – one that generally results in a uniform amount of wall loss over a defined period of time. It can usually be expressed as some amount of wall thickness lost per unit of time (e.g., mils per year). Most Sections of the Code have requirements for corrosion allowance, and uniform corrosion is usually what is addressed. The following are several possible uniform corrosion mechanisms, which are presented in no particular order of importance.

A-301 GENERAL CORROSION AND WASTAGE

A-301.1 Definition. General corrosion and wastage are terms frequently used to describe the phenomenon of uniform corrosion in a material. General corrosion refers to corrosion dominated by uniform wall thinning that typically proceeds without any obvious signs of localized attack. Weathering steels and copper alloys are classic examples of materials that undergo general attack or corrosion in the process of developing a semiprotective oxide layer that then resists subsequent attack. The term *wastage* is defined in Webster's Dictionary as that which is lost by "deterioration, wear, destruction, or the like." In general corrosion and wastage, electrochemical reactions develop between adjacent closely spaced micro-anode and micro-cathode areas, resulting in what appears to be (on a macro scale) a uniform loss of material. Consequently, general corrosion and wastage can be considered to be a specialized form of pitting attack, in which the number of individual electrochemical cells active on the material surface is so great that to the unaided eye it appears that the material is being removed uniformly over the entire surface of the component affected.

A-301.2 References. Most of what is needed to understand and effectively deal with general corrosion and wastage can be found in the general references cited in A-120.

A-302 ATMOSPHERIC CORROSION

A-302.1 Definition. Atmospheric corrosion is the process in which material cross-section is reduced as the result of the corrosive nature of the atmosphere. The relative corrosivity of the atmosphere depends heavily on the location of the metal parts under consideration. For example, metal parts exposed to dry desert air typically will suffer very little, if any, corrosion due to the absence of moisture – an essential component in any electrochemical reaction. On the other hand, metals exposed to warm and moist tropical conditions, particularly near a seacoast, may undergo rapid wall loss. A variety of factors can influence the rate of atmospheric corrosion, including temperature, humidity, the strength of prevailing winds, and the presence of pollutants in the air. If airborne particulate matter happens to deposit on the metal, then that substance, along with any moisture present, might lead to nonuniform attack (which is discussed in A-400, Localized Corrosion).

A-302.2 References. Most of what is needed to understand and effectively deal with atmospheric corrosion can be found in the general references cited in A-120.

A-303 GALVANIC CORROSION

A-303.1 Definition. A useful definition of galvanic corrosion comes from ASM Handbook Volume 11, which reads as follows: When dissimilar metals are in electrical contact in an electrolyte, the less noble metal (anode) is attacked to a greater degree than if it were exposed alone, and the more noble metal (cathode) is attacked to a lesser degree than if it were exposed alone. This behavior, which is known as galvanic corrosion, can often be recognized by the fact that the corrosion is more severe near the junction of the two metals than elsewhere on the metal surfaces. Galvanic corrosion is usually the result of poor design and selection of materials, or the plating out of a more noble metal from solution on a less noble metal. The greater the difference in potential between the two metals, the more rapid will be the galvanic attack. The textbook electromotive-force series ranks the metals according to their chemical reactivity, but applies only to the laboratory conditions under which the reactivity was determined. In practice, the solution potential of metals is affected by such factors as the presence of passive or other protective films on some metals, polarization effects, the degree of aeration, complexing agents, and temperature.

A-303.2 References. Information that can be of use in dealing with galvanic corrosion can be found in the general references cited in A-120.

A-304 STRAY CURRENT CORROSION

A-304.1 Definition. Stray current corrosion is damage to materials that occurs due to the influence of electric currents from a source (or sources) external to the component affected (typically extraneous current in the earth). This type of attack is most frequently seen in buried cast iron, carbon steel, and low alloy steel components – mostly because high alloy steels and most nonferrous materials are not typically buried. Sources of stray currents may include cathodic protection systems, electric welding machines, and grounded direct-current electric sources. However, temporary use of welding equipment during fabrication or repair on-site is unlikely to cause a long-term problem. Nearby aluminum pot line facilities, electroplating, electrolytic refining, or electrowinning facilities are more likely sources of stray currents. Other environmental factors, e.g., oxygen concentration, pH, and soil makeup, may play a role in the overall corrosion process.

At points where the current enters the metal, the site will become cathodic – and the site where the current leaves will become anodic. These coupled cells may be located hundreds of yards apart, or they may be located in close proximity to each other, e.g., on either side of a gasketed pipe joint. Bolted flange connections do not provide reliable electrical continuity in pipe systems unless electrical bonds are used that are carefully installed and maintained.

A-304.2 References. What is described above with regard to stray current corrosion was generally derived from the general references cited in A-120. Additional references that may prove useful include the following:

[1] Parker, M. E. and E. G. Peattie, *Pipeline Corrosion and Cathodic Protection*, Third Edition, Gulf Publishing, 1984.

[2] NACE Paper No. 98559, "Stray Currents Generation, Interference Effects and Control."

A-305 HIGH-TEMPERATURE CORROSION

A-305.1 Definition. High-temperature corrosion is the attack of a metal surface that occurs when the material is exposed to an oxidizing gas at elevated temperature. Corrosion or metal loss occurs by direct reaction with the gas, without the presence of a liquid electrolyte. This type of corrosion may also be called high-temperature oxidation, tarnishing, or scaling. As should be expected, the rate of attack typically increases with increasing temperature, although in some material/environment combinations the rate of attack may diminish with increasing temperature.

When exposed to a high-temperature environment, most engineering materials will spontaneously form an oxide film on their surface, and depending on the character of the film, it may substantially impede the corrosion process or have very little effect on the rate of attack. Initial film formation occurs rapidly, but subsequent increases in film thickness depend upon transport of reactive species through the film. Although these films are generally considered to be oxides, the films may also be sulfides, carbides, or mixtures of these species – or other species depending on the balance of oxidation and reduction, and the dissociation pressure.

A-305.2 References. The general references cited in A-120 provide information that is useful in understanding and dealing with this type of corrosion.

A-306 SOIL CORROSION

A-306.1 Definition. Soil corrosion is the deterioration of metals and alloys that occurs when they are exposed to soils. Since "soils" can consist of an endless variety of naturally occurring substances, as well as an equally large number of man-made contaminants, predicting under what conditions soil corrosion will occur and how rapidly it will proceed can be an extraordinarily difficult task. The materials that most often are found to have experienced soil corrosion are those materials, such as cast irons, carbon steels, and low alloy steels, from which buried piping is produced.

Naturally occurring factors that will influence susceptibility to soil corrosion include moisture content, oxygen availability, soil homogeneity, soil drainage, the presence of seashells (in coastal areas), and the overall soil chemistry. Chloride and sulfate content, together with soil pH, also strongly affect the susceptibility of a material to soil corrosion. Other factors that may affect soil corrosion include, but are not limited to, dissimilar soils, galvanic corrosion, stray currents, differential aeration cells, and microbiologically induced corrosion. These issues are all discussed in more detail elsewhere in this Nonmandatory Appendix.

Soil corrosion is characterized by external wall thinning (general corrosion), accompanied by areas of localized attack due to pitting. Corrosion rates tend to increase with higher metal temperatures.

A-306.2 References. In addition to the general references cited in A-120, the following references should be of use:

[1] Jones, D. A., *Principles and Prevention of Corrosion*, Macmillan Publishing Co., New York, 1992.

[2] NACE RP-0169, *Standard Recommended Practice: Control of External Corrosion on Underground or Submerged Metallic Piping Systems*, NACE International.

A-307 CAUSTIC CORROSION

A-307.1 Definition. Caustic corrosion is a form of localized attack of metals and alloys that occurs when caustic (or alkaline) salts, primarily NaOH and KOH, concentrate on a surface. However, more general corrosion can also occur, depending on the level of concentration. Caustic corrosion is an all-too-common problem in steam- or water-side boilers, where the caustic salts can concentrate under deposits formed on the internal surface of evaporative tubing. The caustics in these units often are intentionally added to control pH and to protect tube surfaces in the event of the introduction of acidic species, such as chlorides. Materials mostly affected by this type of corrosion include the carbon steels, low alloy steels, and some aluminum alloys.

A-307.2 References. Information useful in understanding the basics of caustic corrosion, including means of prevention, can be found in the general references cited in A-120.

A-308 CARBON DIOXIDE CORROSION

A-308.1 Definition. Carbon dioxide corrosion is a form of metal attack that occurs when carbon dioxide dissolves in water and forms carbonic acid, which is the actual corrodent. As with any acid, the pH of the solution is lowered and, with sufficient quantities, general corrosion and/or pitting will occur.

Materials most commonly affected by carbon dioxide corrosion are the carbon steels and, to a lesser extent, the low alloy steels Alloy steels containing at least 12% chromium tend to be immune to carbon dioxide corrosion.

A-308.2 References. The information needed to understand the basics of carbon dioxide corrosion can be found in the general references cited in A-120.

A-309 CONCENTRATION CELL CORROSION

A-309.1 Definition. Concentration cell corrosion is damage to a metal or alloy that occurs when an electrolytic cell develops, the electromotive driving force of which is caused by a local difference in the concentration of some component of the electrolyte. This concentration difference leads to the formation of discrete anodic and cathodic regions. If the difference in electromotive force or potential is great enough, the more anodic area corrodes preferentially.

There are many situations in which concentration cells may form, e.g.:

(a) The rate of diffusion of air produces differential aeration in the layers of water or aqueous solutions just below the liquid level and causes concentration cell corrosion in this region on partly immersed metal parts.

(b) In a metal part that is partly immersed in a liquid electrolyte, a concentration cell can develop if the gaseous phase above the electrolyte consists of a gas (or gases) other than air.

(c) Concentration cell corrosion can initiate on buried metals as a result of their being in contact with soils that have different chemical compositions, water contents, or degrees of aeration (oxygen supply).

See the paragraphs below for pitting, crevice, and microbiologically influenced corrosion, which are all special forms of concentration cell corrosion.

A-309.2 References. Information useful for understanding the basic causes of concentration cell corrosion can be found in the general references cited in A-120.

A-310 DIFFERENTIAL-TEMPERATURE CELL CORROSION

A-310.1 Definition. Differential-temperature cell corrosion is one of the more obscure corrosion processes that cause metal loss when different parts of the same metal or alloy are immersed in an electrolyte that varies in temperature from one location to another. If the anode and cathode are areas located on a single piece of metal (or on two electrically connected pieces of the same metal) immersed in the same electrolyte, corrosion will proceed as in any short-circuit galvanic cell.

For steels immersed in dilute aerated chloride solutions, the warmer area is anodic to the cooler area. But, as the reaction progresses, the polarity may reverse, depending on aeration, the solution velocity where it contacts the metal surface, and other factors.

For copper in aqueous salt solutions, the area of the metal at the higher temperature is the cathode and the area at the lower temperature is the anode. So, there is preferential attack at the anodic area, with copper dissolving from the cold area and depositing on the warmer cathodic area.

A-310.2 References. Information useful for understanding the basics of differential-temperature cell corrosion can be found in the general references cited in A-120.

A-311 MOLTEN SALT CORROSION

A-311.1 Definition. Molten salt corrosion is the attack that metals experience when a molten salt in contact with the surface completely or partially dissolves the protective oxide film that in more benign environments limits the rate of attack. In the absence of the protective oxide film, the reaction of the metal with dissolved or combined oxygen in the salt can occur very rapidly to form molten flux in the salt or nodular oxide on the metal surface, which then promotes galvanic corrosion. The molten salts may be fluorides, chlorides, nitrates, or sulfates, or they may be molten hydroxides or carbonates. Uniform metal loss is the most common form of molten salt corrosion. However, selective leaching of one or more elements from the metal may occur at the higher temperatures, whereas pitting and/or crevice corrosion may take place at the lower temperatures. All forms of corrosion observed in aqueous systems, such as stress-assisted corrosion, galvanic corrosion, erosion-corrosion, and fretting, have been experienced in molten salts. Molten salt exposure will exist where molten salts are used for heat transfer or storage, but may also occur in waste incineration, fossil-fuel combustion, and other high-temperature environments. In the latter environments, this phenomenon is often called hot corrosion.

A-311.2 References. Much of the information needed to understand the basics of molten salt corrosion can be found in the general references cited in A-120. Reputable material suppliers should also be contacted to determine if one or more of their materials has shown good performance under conditions similar to those where the problem exists.

A-312 LIQUID METAL CORROSION

A-312.1 Definition. Liquid metal corrosion is the attack experienced by susceptible materials in plants and/or systems that use liquid metals as coolants. These systems are generally associated with nuclear reactors, other than the conventional water-cooled or gas-cooled types. System coolants may be molten forms of sodium, sodium–potassium (NaK) eutectic, lead, lithium, mercury, cesium, lead–bismuth alloys, and lead–lithium alloys. An experience base exists showing which structural/pressure boundary materials are suitable at given time/temperature combinations for service with particular liquid metals.

Liquid metal corrosion may involve dissolution from a surface by direct dissolution; surface reaction, involving solid-metal atoms, the liquid metal, and an impurity element present in the liquid metal: or intergranular attack. It may also involve impurity and interstitial reactions, alloying (or dealloying), and compound reduction.

In evaluating instances of liquid metal corrosion, there are three important factors:

- surface attrition (loss in thickness)
- depth of depleted zone (altered base metal)
- presence of intergranular attack

A factor often overlooked is the probability that any material lost in a given region of a liquid metal system may turn up elsewhere in the system as a deposit, most likely in a cooler portion of the system.

A-312.2 References. Liquid metal corrosion is a fairly rare occurrence, since there are limited applications for the use of liquid metals. A general understanding of the corrosion mechanism can be derived from the general references cited in A-120. One additional source of information is

[1] Draley, J. E. and J. R. Weeks, *Corrosion by Liquid Metals*, Plenum Press, 1970.

A-400 LOCALIZED CORROSION

As the name implies, localized corrosion is a broad term describing any one of a number of corrosion processes in which damage takes place at small and well-defined locations on the surface of a material rather than uniformly over the entire surface. A concern with this type of corrosion is that often it is difficult to determine how serious is the degree of attack until leakage at one or more sites on the surface actually occurs. This type of corrosion usually does not lead to the catastrophic ruptures typically associated with gross wall loss over a period of time. The following are several mechanisms considered to be forms of localized corrosion, in no particular order of significance.

A-401 PITTING CORROSION

A-401.1 Definition. Pitting corrosion is defined as localized attack of a metal surface, with the attack confined to a point or small area in which the ratio of the depth of the attack to the amount of surface area affected is large. Pitting is one of the most difficult types of corrosion to manage, because of the lack of predictability regarding where the attack will occur and the speed with which the attack may proceed.

The mechanism driving pitting corrosion is thought to begin with a local breakdown of the passive film on the metal surface. The breakdown is followed by the formation of an electrolytic cell. The anode of this cell is the small area of active attack and the cathode is the remaining large area of passivated metal. Once pits begin, they tend to continue to grow in depth by a self-sustaining or autocatalytic process. Propagation of pits is thought to involve the dissolution of metal and the maintenance of a high degree of acidity at the bottom of the pit by hydrolysis of the dissolved metal ions.

A-401.2 References. Information that may be useful in effectively dealing with pitting corrosion can be found in the general references cited in A-120.

A-402 FILIFORM CORROSION

A-402.1 Definition. Filiform corrosion is that material deterioration that occurs under some coatings which assumes the form of randomly distributed threadlike filaments. Filiform corrosion usually occurs on metal surfaces that are coated with a thin layer (approximately 4 mils) of an organic coating. The corrosion usually initiates at a defect of some sort (i.e., a hole, a scratch, etc.) in the coating.

Filiform corrosion generally occurs when the coated material is exposed to temperatures in the range of 20°C to 35°C at relative humidity levels between 60% and 95%. The surrounding atmosphere must contain air or oxygen.

Filiform corrosion is characterized by its unique appearance, in which fine filaments emanate from one or more sources in somewhat random directions across the surface of the material. The filaments are fine tunnels composed of corrosion products underneath the bulged or cracked coating.

A-402.2 References. Most of what is needed to understand and deal with filiform corrosion can be found in the general references cited in A-120.

A-403 CREVICE CORROSION (AND DENTING)

A-403.1 Definition. Crevice corrosion is the localized attack of a metal surface that occurs when the surface is located immediately adjacent to an area that is shielded from full exposure to the environment by the surface of another material (not necessarily a metal). The environment, itself, may be relatively benign with respect to the metal experiencing the crevice corrosion. The term denting has a more specialized meaning, originating primarily from special crevice corrosion problems experienced in pressurized water nuclear reactor steam generators. Denting involves corrosion of the tube support plates, with the resulting denting of the tubes due to the impingement of the increased volume of the corrosion products on the surface of the tubing.

Crevices frequently occur as narrow openings or spaces (gaps) between metal-to-metal or nonmetal-to-metal components. These may occur as a normal part of any construction (e.g., the area around a washer on a bolted assembly). Unintentional crevices also occur as cracks, laps, seams, and other similar discontinuities. Underdeposit corrosion is another form of crevice corrosion.

Note also that the presence of weld spatter and unremoved heat tint has been identified as a potential source of pitting of welds in stainless steels.

In crevice corrosion, regardless of the materials involved, a common factor is the development of localized environments that differ from the bulk coolant environment. This condition is referred to as an oxygen differential cell and it develops as oxygen within the crevice is consumed while the bulk coolant remains constant in oxygen content. The bulk surfaces then become the larger cathode, while the crevice area becomes the anode, resulting in potentially rapid attack of the anodic area.

A-403.2 References. The information needed to understand and deal with crevice corrosion can be found in the general references cited in A-120.

A-404 MICROBIOLOGICALLY INFLUENCED CORROSION

A-404.1 Definition. Microbiologically influenced corrosion (MIC) is the deterioration that can occur in a broad range of alloys as the result of the metabolic activity of microorganisms. Attack from MIC typically is characterized by localized pitting under deposits or tubercles that are utilized by the organisms to sustain their metabolic activity. In cast irons and carbon steels, subsurface damage usually appears to be cup-shaped, while in stainless steels, subsurface cavities or "wormholes" tend to develop. MIC usually occurs in situations where water is present (either continuously or intermittently), particularly when stagnant or low-flow conditions exist, which fosters the growth of microorganisms. There are a large variety of microorganisms that potentially can be involved in the degradation of materials and they thrive on a variety of nutrients including inorganic substances (sulfur, ammonia, hydrogen sulfide, etc.) and organics, such as hydrocarbons and organic acids. All of these organisms require carbon, nitrogen, and phosphorus for their growth.

In most cases the conditions favoring the development of MIC will not exist over the entire surface of the component under attack, whether it is a pipe, a pump, or a boiler tube, but rather will be associated with the local formation of dispersed deposits or slime coatings. Welds often are preferentially affected by MIC. This corrosion mechanism has been encountered in numerous industries, including the chemical processing industry, the fossil and nuclear power industries, the petrochemical industry (both offshore and oil field), and generally in any application in which buried pipelines are involved.

A-404.2 References. In addition to the general references cited in A-120, the following sources of information may be helpful in dealing with MIC:

[1] Kobrin, G., ed., *A Practical Manual on Microbiologically Influenced Corrosion*, NACE International, 1993.

[2] Lucina, G. J., *Sourcebook for Microbiologically Influenced Corrosion in Nuclear Power Plants*, EPRI NP-5580, Electric Power Research Institute, 1988.

A-500 METALLURGICALLY INFLUENCED CORROSION

This group of corrosion mechanisms involves those cases where the structure of a material has been altered either during fabrication into a component or during relatively longtime exposure to service conditions. Examples of these mechanisms follow.

A-501 INTERGRANULAR CORROSION

A-501.1 Definition. Intergranular corrosion is the attack of a material that occurs preferentially at its grain boundaries, usually with slight or negligible attack on the adjacent grain surfaces. This is also known as intercrystalline corrosion, or intergranular attack (IGA).

One prerequisite for intergranular corrosion is the development of a condition in which the grain boundary or the material immediately adjacent to the grain boundary is rendered substantially less resistant to certain contaminants, due to a local concentration or loss of particular elements. This may involve the diffusion of certain types of impurities to the grain boundaries, or it may involve the depletion of critical alloying constituents from the material immediately adjacent to the grain boundary due to the precipitation of carbide or carbonitride phases in the grain boundaries. A second obvious prerequisite for intergranular corrosion is exposure of the susceptible material to an electrolyte, which may be either the system coolant or an external contaminant activated by the presence of moisture in some form.

The classic example of intergranular corrosion is the standard carbon grade of Type 304 stainless steel that has been joined by welding to another piece of metal (Type 304 SS or otherwise). With typical welding heat input and a slower rate of cooling from the temperatures of welding, and in the absence of a postweld solution-annealing heat treatment, chromium-rich carbides form in the grain boundaries located in the heat-affected zone. The formation of these carbides robs chromium from the adjoining material, setting up a significant difference in corrosion potential between the chromium-depleted material at the grain boundaries and the chromium-enriched material within the grains. In this condition, rapid dissolution of the chromium-depleted material can occur if the material is exposed to a contaminant, because the anodic area (i.e., the chromium-depleted material at the grain boundaries) is small compared to the cathodic area (i.e., the much larger intragranular area where the chromium is at "normal" levels). See also A-210, dealing with sensitization (carbide formation).

Several common aluminum alloys also suffer from intergranular corrosion (often called exfoliation corrosion) due to segregation of alloying elements such as copper and magnesium.

A-501.2 References. Information useful in understanding the basics of intergranular corrosion can be found in the general references cited in A-120.

A-502 DEALLOYING CORROSION (DEZINCIFICATION AND GRAPHITE CORROSION)

A-502.1 Definition. Dealloying involves the selective attack of one or more components of a metal solid solution. Also known as parting or selective leaching, it is the mechanism involved in such phenomena as decarburization, decobaltification, denickelification, dezincification, and graphite corrosion. One highly detrimental result of this type of selective attack is that with the loss of one or more of the alloy constituents, the density of the material may be reduced and the structure may become porous. In turn, this can lead to an undermining of the material's mechanical integrity, so that the material becomes subject to sudden unanticipated overload failure. The process by which dealloying occurs is not fully understood and, as a consequence, the variables controlling the process are difficult to quantify; however, it is known that damage may occur progressively over many years under conditions of operation that are otherwise regarded as innocuous.

Dezincification, which is one of the most common forms of dealloying corrosion, occurs in some brasses and involves the selective removal of zinc from the alloy. Inhibited alpha phase brasses containing certain minor alloying additions are less prone to dezincification, while the duplex alpha–beta phase brasses are more prone to this degradation mechanism. Graphitic corrosion is another very common form of dealloying that affects primarily gray cast iron. Ductile and malleable cast irons tend to be immune to dealloying corrosion.

A-502.2 References. Information needed to understand and effectively deal with dealloying corrosion can be found in the general references cited in A-120.

A-503 GROOVING

A-503.1 Definition. Grooving is a form of localized corrosion that is most typically encountered in electric resistance welded (ERW) carbon steel pipe exposed to aggressive aqueous coolants. The preferential corrosion, or grooving, is related to the redistribution of manganese sulfides along the weld line during the welding process. The higher temperatures that develop in the weld area during welding tend to break down the manganese sulfides, leading to local enrichment of the matrix in sulfur. The resulting heterogeneous structure can behave like a dissimilar metal couple, leading to selective attack of the sulfur-enriched anodic zone (the groove) in the presence of an electrolyte.

A-503.2 References. Information useful in effectively dealing with grooving can be found in the general references cited in A-120.

A-600 MECHANICALLY ASSISTED CORROSION

These are corrosion-related damage mechanisms in which the process of metal loss is substantially enhanced by the impinging action of a solid, liquid, or gas present in the operating environment on the surface of the component containing that environment. The impinging substance may be any impurity, corrosion product, or entrained gas contained within the operating system. The damage caused by any one of these mechanisms tends to be localized, reflecting the influence of variations in the flow pattern of the water or other process fluids. Examples of these mechanisms follow.

A-601 VELOCITY-AFFECTED CORROSION

A-601.1 Definition. Velocity-affected corrosion is a general term used to define the attack that occurs on metals immersed in flowing water. The extent of attack varies as a function of the water velocity and is most pronounced in metals that show passivity behavior or form protective films in water.

Velocity-affected corrosion is generally subdivided into the following categories:

- Effects of slow-moving and stagnant waters
- Swift-moving water
- Erosion-corrosion
- Impingement corrosion
- Cavitation corrosion

The latter three types of velocity-affected corrosion are handled in separate discussions; see A-602, A-603, and A-604.

In slow-moving and stagnant waters, loosely adherent solid corrosion products can deposit on component surfaces and aggravate corrosion. In closed systems, corrosion inhibitors can lose their effectiveness under very low flow conditions or within stagnant legs of the system.

Swift-moving water may carry away dissolved metal ions from a corroding area before protective films can reform, resulting in a continuous high rate of attack of the component surface. [Flow-accelerated corrosion (FAC) is a special form of velocity-affected corrosion in which the protective oxide film on a component surface is dissolved in the feedwater or boiler water under specific conditions of pH and electrochemical potential; see A-705.] Suspended solids in water can scour metal surfaces and continually expose fresh metal to corrosive attack. In fresh water, as velocities increase, the corrosion rate in a particular area of a component may first

increase, then decrease, and then increase again as the passivity of the metal breaks down under the effects of the erosive action.

Metals that perform well in swift-moving water may still be prone to pitting in stagnant waters or areas of low flow.

A-601.2 References. Information useful to an understanding of velocity-affected corrosion can be found in the general references cited in A-120.

A-602 EROSION-CORROSION

A-602.1 Definition. Erosion-corrosion is the damage to metals that occurs when particles transported in a liquid impinge on a component surface and remove the protective surface film. This exposes fresh metal surfaces that are anodic to neighboring protected surfaces, which results in rapid localized corrosion of the exposed areas. The areas attacked will often exhibit grooves, channels, or other asymmetric surface penetrations that reflect a directional pattern. Nearly all flowing or turbulent corrosive fluids can cause erosion-corrosion.

Metal loss rates vary greatly with coolant velocity, corrosion resistance of the materials, hardness of the materials, and corrosivity of the flowing media.

A-602.2 References. Useful information that will assist in understanding the issues surrounding erosion-corrosion can be found in the general references cited in A-120.

A-603 IMPINGEMENT CORROSION

A-603.1 Definition. Impingement corrosion is the attack of a metal surface caused by the impingement on that surface of turbulent flowing liquids. Attack may be accelerated by solids or gas bubbles entrained in the impinging liquid. This corrosion mechanism can be considered a severe form of erosion-corrosion.

Impingement corrosion most frequently occurs where there is a sharp change in fluid direction, at impellers (or turbine blades), or even in straight runs of tubing where there is a partial blockage disrupting the flow.

A-603.2 References. Most of what is needed to understand the issues surrounding impingement corrosion can be found in the general references cited in A-120.

A-604 CAVITATION EROSION

A-604.1 Definition. Cavitation erosion is the most severe form of erosion-corrosion, and occurs through the formation and collapse of gas bubbles under conditions of changing pressure in the liquid in direct contact with the affected surface. The gas bubbles form when the pressure in the liquid drops in response to some change in the operating environment and they collapse when the pressure increases. If the shock waves generated by the collapse of the gas bubbles impinge on a metal surface, the local pressures at the surface can be of sufficient magnitude to cause local plastic deformation of the metal and breakdown of the protective film at the metal surface. This permits a brief cycle of accelerated corrosion to occur until the protective film re-forms, and the cycle is repeated when another gas bubble collapses in the same area.

Damage is characterized by the appearance of sharp-edged pits, but it may also appear as gouges in rotating components. The damage tends to be limited to localized low-pressure zones.

A-604.2 References. Most of what is needed to understand issues associated with cavitation erosion can be found in the general references cited in A-120.

A-605 CORROSION FATIGUE

A-605.1 Definition. Corrosion fatigue is a form of damage that occurs through the interaction of repeated or fluctuating stresses and a corrosive environment, with the damage occurring at lower stress levels or fewer cycles than would be required in the absence of the corrosive environment. For a given operating environment in which corrosion-fatigue cracking occurs, the relative contribution of stress and corrosion can vary substantially, and the complexity of the interaction between the loading condition, the metallurgical variables, and the environmental parameters can complicate the identification of the root cause of the damage.

Corrosion-fatigue cracks invariably begin at the material surface; even in cases where there are near-surface defects that act as stress concentration sites and facilitate subsurface crack initiation, the damage cannot be defined as corrosion fatigue until the environmental influence is activated. Surface features that can be observed at the origin of a corrosion-fatigue crack can vary from alloy to alloy and will be strongly influenced by the environmental parameters. If a component suffering from corrosion fatigue eventually fails, corrosion products will generally be found on most of the fracture surfaces.

A-605.2 References. Most of what is needed to understand issues associated with corrosion fatigue can be found in the general references cited in A-120.

A-700 ENVIRONMMENTALLY INDUCED EMBRITTLEMENT AND CRACKING

This general category of damage could be included in the discussion of some of the other types of damage in which metallurgical changes and corrosion interact. However, because some of the specific types of damage have special significance in Code construction, they warrant individual coverage to draw attention to their importance.

A-701 STRESS CORROSION CRACKING

A-701.1 Definition. Stress corrosion cracking (SCC) is a type of damage that requires the simultaneous action of a corrodent at a critical concentration and a sustained

tensile stress of sufficient magnitude on a susceptible material in order for the cracking to occur. The elimination of any one of these three factors, or a change in the concentration of the corrodent or a reduction in the level of stress, can completely remove or significantly reduce the susceptibility to SCC.

Stress corrosion cracking frequently occurs in seemingly mild chemical environments, at tensile stresses well below the yield strength of the metal. Failures, when they occur, often take the form of fine cracks that penetrate deeply into the metal, with little or no evidence of corrosion on the adjoining surface. A casual visual inspection, or in some cases even a detailed inspection using one of the volumetric NDE methods, may fail to detect any signs of the cracking.

Stresses that contribute to SCC can arise during manufacturing/fabrication or in service. During manufacturing/fabrication/construction, residual tensile stresses can develop during thermal processing, surface finishing, various forming processes (particularly cold bending), and assembly operations such as fit-up and welding. The influence of these stresses can be substantially increased wherever stress risers may exist. During service, sources of stress include temperature differences that may occur during plant startup or during shutdowns. Stress raisers also can develop in the form of pitting corrosion. The design pressure loads in pressure vessels and piping systems also can be sufficiently high to cause SCC in certain environments.

Metal susceptibility to SCC has been the subject of extensive research. One of the better summaries of "specific ions and substances that have been known to cause SCC in various alloys when present at low concentrations and as impurities" is found in ASM Handbook Volume 11.

Chloride SCC is common, especially in the austenitic stainless steels. The 18–8 type alloys, such as TP304 and TP316, are the most susceptible to chloride SCC. They can suffer SCC whenever temperatures exceed 60°C when in contact with high chloride concentrations. Alloy substitution can reduce susceptibility; higher nickel austenitic alloys, ferritic stainless steels, and duplex (austenitic–ferritic) stainless steels are less susceptible. Nickel-free ferritic stainless steels, austenitic alloys with greater than 50% nickel content, and carbon steels are effectively immune to chloride SCC.

There are three basic forms of SCC, which are distinguished as follows:

- Transgranular stress corrosion cracking (TGSCC)
- Intergranular stress corrosion cracking (IGSCC)
- Irradiation-assisted stress corrosion cracking (IASCC)

Transgranular stress corrosion cracking is generally thought to be associated with higher stress levels, with cracks (cross-sections) beginning at the surface of a component in a single location — possibly a pit — and growing into the component in a continually branching mode.

Intergranular stress corrosion cracking typically occurs near welds, in heat-affected zones, or in base metal where the material has been subjected to a level of heating that has altered the material structure near the grain boundaries in such a way that the grain boundary region is less corrosion resistant than the material away from the grain boundaries. In response to residual stresses from welding or to applied service loads, cracking will develop in the material if the fluids in contact with the surface are corrosive. Cracking proceeds inward along the grain boundaries in a direction that is approximately normal to the dominant source of stress.

It is important to note, however, that under some conditions, stress corrosion cracking in certain steels may propagate by a mixed transgranular/intergranular mode of fracture.

Irradiation-assisted stress corrosion cracking is a special form of SCC in which the source or the driving force for the cracking is the high level of neutron bombardment to which the materials are subjected; the austenitic stainless steels used in the core region of nuclear reactors have shown particular susceptibility to this type of damage. It is believed that the passage of the neutrons through the material creates (through transmutation) both impurity species that concentrate in the grain boundaries and "residual" stresses. In the presence of a corrosive media, the grain boundaries are anodic to the grains themselves and if the level of tensile stress is sufficiently high, SCC will occur.

A-701.2 References. Stress corrosion cracking is covered in nearly every one of the sources identified in A-120. The extent of coverage above and in cited references should be enough to provide the necessary guidance for avoiding this form of environmental damage.

A-702 HYDROGEN DAMAGE

A-702.1 Definition. Hydrogen damage is a general term used to cover several types of possible material degradation for which hydrogen is the principal degrading agent, including the following:

- Hydrogen embrittlement
- Hydrogen-induced blistering
- Cracking from precipitation of internal hydrogen
- Hydrogen attack
- Cracking from hydride formation

Many metals and alloys are susceptible to hydrogen damage, but it occurs most frequently in carbon and low alloy steels. Hydrogen is one of the more abundant gases in the earth's atmosphere and it often is present during various phases of alloy production, during certain phases of the processing of the alloy, and once the alloy is placed in service. Corrosion reactions frequently are the source of damaging amounts of hydrogen. Thus, hydrogen damage can develop in a wide variety of environments

and under a broad range of circumstances. The following are brief discussions of each of the five most-common hydrogen-dominated damage mechanisms.

A-702.1.1 Hydrogen Embrittlement. This is a condition of induced low ductility or hydrogen-induced cracking in metals resulting from the absorption of hydrogen. A related term, *hydrogen-induced delayed cracking*, is sometimes used to identify a form of hydrogen embrittlement in which the metal or alloy appears to fracture spontaneously under a steady stress *less* than the yield stress. There is usually a delay between the application of stress (or exposure of the stressed metal to hydrogen) and the onset of cracking. This damage is sometimes referred to as static fatigue.

Steels can be embrittled by a very small amount of hydrogen (i.e., a few parts per million) from a wide variety of sources. Failure by hydrogen embrittlement occurs with very little plastic deformation, with the fracture surface characterized by brittle cleavage or quasi-cleavage.

The susceptibility of carbon and low alloy steels to hydrogen embrittlement tends to increase with increased strength of the steels. For a given hydrogen content, embrittlement tendency increases with decreased strain rate. Embrittlement is most prevalent at room temperature, with cracking tendency decreasing as temperatures rise. Above 200°C, susceptibility to hydrogen embrittlement disappears entirely in steels, due to the rapid diffusion of the small hydrogen atom through the crystal lattice at those temperatures.

A-702.1.2 Hydrogen-Induced Blistering. This is a condition that involves the formation of blisters on or below a metal surface due to excessive internal hydrogen pressure. The hydrogen may be generated during cleaning, pickling, plating, corrosion, etc. Hydrogen-induced blistering is most prevalent in low strength alloys that are exposed to hydrogen-charging conditions. When hydrogen is absorbed into the metal and diffuses inward, it can precipitate as molecular hydrogen at internal voids, laminations, or at inclusion/matrix interfaces. As the larger hydrogen molecules concentrate within a particular location in the material, pressure can increase to levels where internal cracks form. If these cracks are just below the surface, the gas pressure in the cracked area can cause the metal at the surface to become raised and bulge out, creating a blister-like protuberance on the surface. Although this type of damage is encountered in a variety of situations, it is worth noting that hydrogen blistering in line pipe steels is always associated with certain metallurgical features, such as inclusions, large precipitate particles, or martensite bands.

A-702.1.3 Cracking From the Precipitation of Internal Hydrogen. This can appear as flakes, fish eyes, or underbead cracking (also known as hydrogen-delayed cracking). Flakes frequently are encountered on the surfaces of heavy steel forgings, where they appear as small elliptically shaped cracks. These are formed during cooling after the first forging or rolling operation. The flakes are caused by localized hydrogen embrittlement resulting from the concentration of internal hydrogen. The source for the hydrogen frequently is the steelmaking process itself, with the hydrogen coming from moisture in the atmosphere or from moisture entrained in additives used in the steelmaking process. When the metal is cooled, any hydrogen present can precipitate as molecular hydrogen at inclusions, where flakes are subsequently formed due to the increased pressure of the gaseous hydrogen.

Fish eyes (small rounded shiny areas of fracture) also are associated with absorbed hydrogen, but they more typically appear on the fracture surface of tensile specimens from steel forgings or plates having high hydrogen contents. When fish eyes are found on the fracture surfaces of tensile specimens, there will be an associated loss in ductility. Baking or prolonged room-temperature aging allows a portion of the hydrogen to diffuse out of the material, and typically eliminates fish eyes and restores tensile ductility.

When this type of hydrogen damage occurs in welding, it is called underbead cracking. The cracking typically develops in the coarse-grained region of the heat-affected zone, running generally parallel to the fusion line. Since this cracking may not occur until several hours after welding, it is commonly referred to as hydrogen-delayed cracking. As the weld metal cools, it becomes supersaturated with hydrogen, and further cooling, coupled with residual stresses in the weld area, eventually leads to cracking.

A-702.1.4 Hydrogen Attack. This is damage that occurs when a material is exposed at high temperatures and high pressures to a hydrogen-rich environment, whereby the material appears to be unaffected for many days or months, and then suddenly loses its strength and ductility. The effects of high-temperature attack are irreversible. Failure by hydrogen attack is characterized by decarburization and fissuring at grain boundaries, or by bubbles in the metal matrix. Damage of this type is most commonly encountered in the petroleum industry where equipment experiences hydrogen and hydrogen–hydrocarbon substances at pressures as high as 20 kPa and temperatures up to 540°C. However, hydrogen attack also is a common mode of damage in the furnace wall tubing of high-pressure steam generators, where acid-forming constituents that concentrate at internal deposits instigate corrosion that liberates hydrogen. This hydrogen then diffuses through the metal lattice, where it combines with carbon from carbides to form methane. The methane diffuses to grain boundaries, where it causes fissuring, and ultimately the tube fails due to loss of effective thickness.

A-702.1.5 Cracking From Hydride Formation. This is the fifth in the list of hydrogen damage mechanisms unique to a variety of transition, rare-earth, and

alkaline-earth metals. For ASME Code applications, the only hydride-forming metals whose use is permitted are the alloys of titanium and zirconium. The presence of hydrides in these metals can cause significant increases in strength, accompanied by substantial losses in toughness and ductility. Hydrogen in these materials is picked up during melting or welding, with hydride formation taking place during the cooling process. Applied stresses can cause preferential alignment of hydrides, which typically are much less ductile than the matrix.

Hydride pickup from corrosion reactions in service also occurs and has been shown to cause fracture. Typically, elevated temperature exposure is required, as the mobility of hydrogen in these alloys at room temperature is insufficient to affect the bulk material.

(23) A-702.1.6 Hydrogen Environment Embrittlement of Cold-Worked Stainless Steels at Low Temperatures

Cold-worked austenitic stainless steels may be susceptible to hydrogen environment embrittlement when exposed to hydrogen charging conditions in the temperature range of –130°C to 95°C. The susceptibility to embrittlement may be worsened by the development of strain-induced martensite resulting from cold-forming operations, especially cold spinning. A full solution anneal after completion of cold-forming operations will reduce potential embrittlement and subsequent loss of ductility and toughness.

A-702.2 References. Most of what is needed to understand and deal with hydrogen damage can be found in the general references cited in A-120. An additional useful specific reference is:

[1] *Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petrochemical Practices*, API 941, American Petroleum Institute, Dallas, TX 1970.

A-703 LIQUID METAL EMBRITTLEMENT

A-703.1 Definition. Liquid metal embrittlement (LME) is the decrease in ductility of a metal caused by contact with a liquid metal, sometimes leading to catastrophic brittle fracture of a normally ductile metal. Liquid metals can include those purposely being contained by the system – or their source can be low-melting-point substances that inadvertently have come in contact with the pressure boundary material.

The following are considered critical factors in the development of LME:

(a) LME can occur in very specific combinations of structural/pressure boundary materials and low-melting-point metals, such as zinc, mercury, cadmium, lead, bismuth, copper, and tin.

(b) Very small quantities of the low-melting-point metals are sufficient to cause LME problems.

(c) High tensile stress promotes cracking, but cracking can occur simply through contact with the molten metal. Cracking under load can be very rapid.

(d) Cracking due to LME can also take a very long time to occur with some metal/liquid metal combinations.

(e) A susceptible metal in contact with a low-melting-point metal may not crack until the temperature of the materials rises above the melting point of the contaminating low-melting-point metal.

Copper checking is an example of LME that has been encountered with some frequency in the manufacture of thick-walled pressure parts with relatively high levels of residual copper. During high-temperature forming operations, the iron at the surface of the part will oxidize, leading to an enrichment of the surface in elemental copper. With further high-temperature processing, the material at the surface can develop shallow cracks due to the penetration of the copper into the grain boundaries of the host material.

A-703.2 References. Most of what is needed to understand the basics of liquid metal embrittlement can be found in the general references cited in A-120.

A-704 CAUSTIC EMBRITTLEMENT

A-704.1 Definition. Caustic embrittlement or caustic cracking is an obsolete historical term denoting a form of stress corrosion cracking (SCC) most frequently encountered in carbon steels or iron–chromium–nickel alloys that are exposed to concentrated hydroxide solutions at temperatures of 205°C to 250°C. In austenitic stainless steels (300 series), caustic cracking has been observed at temperatures as low as 90°C, is mostly transgranular, and is not easily distinguished from chloride stress-corrosion cracking. Alloys such as N06600 and N08800 generally exhibit intergranular SCC in high-temperature caustic environments.

A-704.2 References. Information related to the basics of caustic embrittlement and caustic stress corrosion cracking can be found in the general references cited in A-120.

A-705 FLOW-ACCELERATED CORROSION

A-705.1 Definition. Flow-accelerated corrosion (FAC) has emerged as a serious problem in both nuclear and fossil-fired power plants, where its occurrence has resulted in fatalities at several plants. It is a term used to describe a form of attack on metals that occurs as the result of the local dissolution of the protective oxide film and the simultaneous sweeping away of metal ions from the exposed surfaces by the flowing liquid. This type of attack is sometimes erroneously considered to be a form of erosion-corrosion, involving mechanical removal of the protective oxide film by the fluid and whatever suspended solids it might be carrying, whereas in FAC the damage to the oxide film that instigates the attack is chemical in nature. Also, as was the case in liquid metal

corrosion (discussed in A-312), if material is being dissolved away at one location, then it must be assumed that whatever was dissolved will eventually be deposited elsewhere in the system; if these deposits accumulate on heat transfer surfaces, they may lead to problems related to the under-deposit corrosion mechanisms, such as hydrogen attack, caustic gouging, or acid phosphate corrosion.

Flow-accelerated corrosion can occur under either single- or two-phase conditions and is influenced by a complex interaction between a number of variables, including base material composition, water/steam temperature and steam quality (dry versus wet), pH, oxygen content, fluid velocity, and geometry. Because FAC takes place as a gradual thinning in localized areas, piping has a tendency to rupture when it becomes sufficiently thinned. Relatively small amounts of chromium in the base metal — some studies have suggested as little as 0.10% (by weight) — can render the material immune to FAC.

A-705.2 References. In addition to the general references cited in A-120, the following additional references may be helpful in dealing with FAC:

[1] Wu, P. C., "Erosion/Corrosion-Induced Pipe Wall Thinning in U.S. Nuclear Power Plants," Final Report, U.S. NRC NUREG-1344, April 1989.

[2] Partlo, J. G., "Erosion/Corrosion-Induced Pipe Wall Thinning," U.S. NRC Generic Letter 89-08, May 2, 1989.

[3] Jonas, O., "Erosion-Corrosion of PWR Feedwater Piping Survey of Experience, Design, Water Chemistry, and Materials," Final Report, U.S. NRC NUREG/CR-5149, March 1988.

A-706 SULFUR EMBRITTLEMENT

Nickel combines with sulfur at elevated temperatures to form a brittle sulfide. This phenomenon takes place preferentially at the grain boundaries, and results in embrittlement that exhibits itself as a network of cracks when the material is stressed or bent. Nickel is affected most, nickel–copper somewhat less, and nickel–chromium–iron still less. The more sulfur present or the higher the temperature, the more rapid and deep will be the attack.

Material that has been sulfur embrittled cannot be salvaged. It must be scrapped.

Prior to any operation that involves heating to a higher temperature, such as welding, brazing, annealing, hot forming, and forging, it is imperative to remove all sulfur-containing substances, such as oil, grease, marking pencil marks, paint, and drawing or threading lubricants. In addition, the atmosphere of the furnace in which heating is done should be essentially sulfur-free. A city gas or natural gas containing less than 25 grains of sulfur per 2.8 m^3 or a fuel oil containing less than 0.5% sulfur will be satisfactory for heating. Coal and coke are not satisfactory.

A-800 MECHANICAL DAMAGE MECHANISMS

Mechanical damage mechanisms are those mechanisms in which the damage is not controlled by direct electrochemical reactions between the pressure-containing material and the substance contained. Instead, damage occurs to system materials as a result of simple mechanical contact with other materials — or from sudden changes in coolant temperature and/or velocity. The more important damage mechanisms are described as follows.

A-801 FRETTING AND WEAR

A-801.1 Definition. Fretting is defined as wear that occurs between tight-fitting surfaces subjected to oscillation at very small amplitudes. This type of wear can be a combination of oxidative wear and abrasive wear. If corrosion is a factor in the damage, then the deterioration at the interface is termed fretting corrosion. Wear is defined as the damage to a solid surface, generally involving progressive loss of material due to relative motion between one surface and a contacting surface or substance.

The term fretting covers numerous forms of deterioration, including fretting corrosion, false brinelling, friction oxidation, chafing fatigue, molecular attrition, and wear oxidation.

Wear may range in severity from mild polishing over a long period of time, to the rapid and aggressive removal of material with accompanying surface roughening. There are numerous wear modes and they may change in service as a component deteriorates.

Adhesive wear occurs generally under nonlubricated conditions when both contacting surfaces are metallic. It is also known as scoring, galling, seizing, or scuffing. Microscopic projections from the mating surfaces bond at the sliding interface under very high local pressure. As the bonds are broken, material may be torn from one surface and adhere to the other surface, or loose particles may be formed that then contribute to abrasive wear.

Abrasive wear occurs when hard particles of some origin slide or roll under pressure across a surface, cutting grooves in the surface. Both of the mating sliding surfaces may wear, or the particles may become embedded in one of the surfaces, causing abrasive wear to the mating surface. Abrasive wear may be grinding abrasion or low-stress scratching abrasion.

Corrosive wear is a form of abrasive wear in which chemical or electrochemical reactions accelerate the metal loss between mating surfaces where sliding occurs. In this mode of wear, it may be unclear whether the damage due to mechanical wear precedes the chemical reactions, or vice versa.

Surface fatigue is another mode of wear, in which particles of metal are detached from a surface under high cyclic contact stresses, causing pitting and spalling.

A-801.2 References. Most of what is needed to understand the various aspects of fretting and wear can be found in the general references cited in A-120. References specific to coating options include the following:

[1] Davis, J. R., *Handbook of Thermal Spray Technology*, ASM International, 2004.

[2] Davis, J. R., *Surface Engineering for Corrosion and Wear Resistance*, ASM International, 2001.

A-802 THERMAL FATIGUE

A-802.1 Definition. Thermal fatigue damage is defined as fracture resulting from the presence of temperature gradients that vary with time to produce cyclic stresses in a structure. Two conditions essential for thermal fatigue are some form of mechanical restraint and a temperature change. Thermal stresses are caused by the thermal expansions and contractions against restrained endpoints. In thick sections, temperature gradients may develop through the thickness, as well as longitudinally, causing triaxial stresses. Most thermal fatigue fractures are of the low-cycle, high-strain type. The resulting fracture surfaces are rough and faceted at or near the initiation sites, and are more fibrous with shear lips at the final fracture area.

A-802.2 References. Information that may be of assistance in understanding and dealing with thermal fatigue can be found in the general references cited in A-120.

A-803 DYNAMIC LOADING

A-803.1 Definition. Dynamic loading involves the application of moving, sometimes high-velocity stresses, that can produce high strain rates in the affected component. This type of loading is contrasted with static loadings of the type imposed by deadweights or the slow application (or variation) of pressure stresses within a system.

Dynamic loads may range from the mild application of cyclic loads during normal plant operations to severe impact loads experienced during abnormal plant excursions (transients) or during some type of component/plant failure. Impacts with tools, suspended loads, or mobile equipment are other sources of dynamic loading. Mobile equipment (i.e., BPVC Section XII) may demand additional considerations of dynamic loadings.

Toughness — the ability to absorb energy without fracturing — is one of the most important material properties for structures/components subjected to dynamic loads. A relatively simple gauge of a material's toughness can be made using the Charpy V-notch test, in which a notched material specimen at a controlled temperature is struck with a heavy pendulum, and the amount of energy absorbed in breaking the specimen is considered to be a relative measure of the material's toughness. As temperatures are reduced, materials will generally break at lower values of absorbed energy, with fractures displaying progressively more brittle rather than ductile characteristics.

A-803.2 References. Most of what is needed to understand and deal with a wide variety of dynamic loading events can be found in the general references cited in A-120.

A-804 ANISOTROPY

All materials possess some degree of directional dependence of properties, or *anisotropy.* For polycrystalline cubic metals, this anisotropy is not significant. For wrought hexagonal metals, such as titanium and zirconium, the anisotropy can be significant. Anisotropy is usually described with reference to the principal direction of mechanical working; for bar this is the axial direction and for plate it is the longitudinal direction. For titanium and zirconium, the axial/longitudinal direction has lower elastic modulus and lower yield strength than the circumferential long-transverse direction, which has lower elastic modulus and lower yield strength than the radial/short-transverse direction. Through-thickness modulus can be up to 45% greater than the axial/longitudinal modulus. Thermal expansion is also anisotropic, with expansion in the through-thickness direction being up to 15% greater than in the working direction.

NONMANDATORY APPENDIX B
DEVELOPING NOMINAL COMPOSITION DESIGNATIONS FOR ASME CODE MATERIALS

B-100 BACKGROUND

Nominal composition designations play an essential role in the ordering of materials in stress tables for ferrous materials in Section II, Part D of the ASME Boiler and Pressure Vessel Code and in other Sections of the Code containing such tables. In Code stress tables for nonferrous materials, alloys are ordered by increasing Unified Numbering System (UNS) numbers, except that nonferrous alloys without UNS numbers (alloys not listed in an ASTM specification) are listed following similar nonferrous alloys that do have UNS numbers. Nonferrous alloys include aluminum, copper, nickel, and the reactive and refractory alloys (cobalt, titanium, and zirconium). For nonferrous materials, Code stress tables provide nominal composition designations for information only, but only for nickel-base and the reactive and refractory alloys. A voted action within the Subcommittee on Materials (now BPV II on Materials) several years ago precluded the listing of nominal compositions for both aluminum and copper-base alloys. However, nominal compositions for all aluminum and copper alloys, along with all ferrous alloys and nickel-base alloys, can be found in other sources.[4, 5]

Nominal composition designations have existed in the Code stress tables for many years, but it was the publication of Section II, Part D that placed new significance on nominal composition designations, as they were used in the ordering of ferrous materials in the stress tables. At the same time, the Section II-D tables of thermophysical properties were also updated, with values for ferrous materials tied to their nominal compositions. It became necessary to resolve some conflicts where nominal compositions differed within a given alloy. No guidelines had ever been developed by those who established the earlier designations. This guideline now serves that need.

In the interest of helping those who have to define nominal composition designations for new alloys introduced to the Code through Construction Code Code Cases and incorporation into Section II, and to resolve discrepancies within established nominal composition descriptions, this guideline describes how these nominal compositions are developed for each class of Code materials – first for ferrous alloys, and then for the various nonferrous alloys.

B-200 GENERAL GUIDELINE FOR ALL MATERIALS

Any nominal composition designation is nothing more than a naming device, helping to describe the primary or most significant elements in a given alloy. The nominal composition is *not* meant to be construed as a specified composition, particularly since amounts of each element are shown as single values, rather than as maximums, minimums, or ranges.

To simplify the process of designating nominal compositions, a list consisting of between two and five elements should be used to distinguish one alloy from another. However, additional elements may be used, if necessary, to adequately describe the alloy or alloys.

It has been customary to list the elements comprising the nominal composition designations in order of decreasing amounts present. However, some existing nominal composition designations violate this guideline and there is no intent to revise those designations.

When small amounts of selected elements are added to the alloys to impart particular characteristics, they may be shown without a specified amount (percentage). Otherwise, the values shown for each element are considered weight percentages (corresponding to specified amounts in ASME, ASTM, or other approved materials specifications). Weight percentages are generally shown as whole percentage numbers, although sometimes it is necessary to show such percentages to one decimal place. Further, some designations have been in common usage for so long that they are still used, even though the designations may not reflect the midpoint of a composition range and even though the specified composition ranges may have been changed. Examples of such situations are austenitic stainless steel designations, such as 18Cr–8Ni and 18Cr–10Ni–Cb. Finally, some classes of such alloys that differ by small variations (examples are grades 347, 348, 347H, 347LN, etc.) may all be grouped into one nominal compositional designation (e.g., 18Cr–10Ni–Cb), differentiated by grade, and listed in the tables in order of increasing UNS number.

B-300 GUIDELINES FOR DEVELOPING NOMINAL COMPOSITION DESIGNATIONS FOR FERROUS MATERIALS

The first source for determining the nominal composition designations for a given ferrous material is the title of its specification. Those specification titles often identify the category to which the material belongs — carbon steel, alloy steel (low and intermediate), or high alloy steel (chromium, chromium–nickel, heat-resisting austenitics, etc.). If the title of the specification does not identify the class of materials covered, the scope paragraph of the specification may do so.

For all categories of ferrous materials, iron is always presumed to be present and is *never* shown in the nominal composition designation. Further, most steels contain customary amounts of sulfur, phosphorus, silicon, and manganese, and these elements, too, are *not* listed in the nominal compositions, unless they are intentionally added in higher amounts to impart special characteristics.

Primary alloying constituents, found in the specified chemical requirements as a minimum amount, are usually listed in the nominal composition at that numerical percentage value. If the specified chemical requirements show a range, then a value at the midpoint of the range is selected. Carbon steels, carbon–manganese steels, carbon–silicon steels, and carbon–manganese–silicon steels are simply listed as "Carbon steel." When a specification for an alloy otherwise similar to an alloy in the C steel group identifies or covers the alloy as "microalloyed" material, the principal alloying ingredients are listed without numerical values (since amounts are generally small fractions of 1%).

For all other classes of ferrous materials, simply two to five of the principal alloying constituents, in order of decreasing percentage amounts, are shown.

B-400 GUIDELINES FOR DEVELOPING NOMINAL COMPOSITION DESIGNATIONS FOR NONFERROUS MATERIALS

B-410 NICKEL ALLOYS

Many of the specifications for nickel alloys have complex titles that provide information about the primary elements comprising each alloy covered by a given specification, e.g., SB-574, SB-688, and SB-710. Most specifications for nickel alloys will generally list the nickel content as "balance" or "remainder." Since nominal composition designations for nickel alloys always begin with the percentage amount of nickel, it is necessary to add up the nominal or average percentage amounts of all other specified elements and then subtract their total from 100 to develop a value for the nickel content (i.e., determine by difference). After the amount of nickel is listed, then other alloying elements are listed in decreasing order of alloy content. For some complex alloys, it might seem necessary to list more than five elements to adequately differentiate one alloy from another, but since these alloys are sufficiently defined and ordered in the table by their UNS numbers, it is not necessary to be overly precise in developing such lists of alloying elements and the listing of more than five alloying elements is to be discouraged.

There are some alloys that were considered to be nickel alloys by the former definition of a nonferrous material (an alloy containing 50% or less of iron), but that are now considered to be ferrous materials (alloys whose principal element is iron). Those alloys have nominal compositions beginning with the amount of iron, unlike the other ferrous alloys described previously. However, an action plan was initiated in 2010 to move those alloys out of the nonferrous material tables and specifications.

B-420 ALUMINUM ALLOYS

Nominal composition designations for aluminum alloys always begin with "Al", with no designation of the amount of aluminum in the alloy. Other alloying elements should be listed in order of decreasing nominal content in the alloy as listed in the composition requirements of the specification.

B-430 COPPER ALLOYS

Nominal composition designations for copper alloys are developed in a manner similar to the process used for nickel alloys. First listed is the amount of copper present and again this is usually determined by difference. Then, using the nominal or average amounts of alloying elements, their amounts are selected and listed in decreasing order of concentration.

B-440 TITANIUM ALLOYS

Similarly to the guidelines for aluminum alloys, nominal composition designations for titanium alloys simply begin with "Ti," with no numerical designation of the amount of titanium. Then, using the specified chemical requirements, nominal or midrange values of principal alloy ingredients are identified and listed in order of decreasing amounts.

B-450 ZIRCONIUM ALLOYS

As with the guidelines for nickel and copper alloys, nominal composition designations for zirconium alloys always show the amount of zirconium. Also, the amount of zirconium is generally obtained by difference. After listing the amount of zirconium, then the percentage amounts of the other alloying ingredients are listed in order of decreasing content. However, for zirconium alloys used in Code construction, the *actual amounts* of alloying additions are *not* shown for the single alloying element.

B-460 COBALT ALLOYS

Cobalt alloys are identified as R3XXXX alloys in the Unified Numbering System designations. The cobalt alloys have their own unique nominal composition designation system. New cobalt alloys should follow the precedent used for those now listed.

B-500 SUMMARY

This guideline follows the existing historical conventions to the extent possible. Thus, it is based in large part on precedent and does not create a new convention that could be applied to all alloys. If it did not, a very large part of the Code would have to be revised and that would not be a fruitful use of resources.

In developing *new* nominal composition designations, refer first to these new guidelines, but remember to also do the following:

(a) Try to conform new nominal compositions to existing designations found in specifications or other sources.

(b) Follow precedent to the extent possible.

(c) Add up the percentage amounts of all elements shown in the nominal composition designation and ensure that the total does not exceed 100. Totals less than 100 are acceptable, particularly for those alloy systems (e.g., ferrous, aluminum, and titanium alloys) that do not list the amounts of the principal alloying elements in the nominal composition.

(d) Avoid, to the extent possible, the listing of more than five alloying elements.

Since most of the use of nominal composition designations is in the stress and property tables of Section II, Part D, the BPV II Committee on Materials retains the final approval authority over any revisions to, or development of, any new nominal composition designations.

NONMANDATORY APPENDIX C
GUIDANCE FOR THE USE OF U.S. CUSTOMARY AND SI UNITS IN THE ASME BOILER AND PRESSURE VESSEL CODE

C-100 USE OF UNITS IN EQUATIONS

The equations in this Section are suitable for use with either the U.S. Customary or the SI units provided in Mandatory Appendix 9, or with the units provided in the nomenclatures associated with the equations. It is the responsibility of the individual and organization performing the calculations to ensure that appropriate units are used. Either U.S. Customary or SI units may be used as a consistent set. When necessary to convert from one system of units to another, the units shall be converted to at least three significant figures for use in calculations and other aspects of construction.

C-200 GUIDELINES USED TO DEVELOP SI EQUIVALENTS

The following guidelines were used to develop SI equivalents:

(a) SI units are placed in parentheses after the U.S. Customary units in the text.

(b) In general, separate SI tables are provided if interpolation is expected. The table designation (e.g., table number) is the same for both the U.S. Customary and SI tables, with the addition of suffix "M" to the designator for the SI table, if a separate table is provided. In the text, references to a table use only the primary table number (i.e., without the "M"). For some small tables, where interpolation is not required, SI units are placed in parentheses after the U.S. Customary unit.

(c) Separate SI versions of graphical information (charts) are provided, except that if both axes are dimensionless, a single figure (chart) is used.

(d) In most cases, conversions of units in the text were done using hard SI conversion practices, with some soft conversions on a case-by-case basis, as appropriate. This was implemented by rounding the SI values to the number of significant figures of implied precision in the existing U.S. Customary units. For example, 3,000 psi has an implied precision of one significant figure. Therefore, the conversion to SI units would typically be to 20 000 kPa. This is a difference of about 3% from the "exact" or soft conversion of 20 684.27 kPa. However, the precision of the conversion was determined by the Committee on a case-by-case basis. More significant digits were included in the SI equivalent if there was any question. The values of allowable stress in Section II, Part D generally include three significant figures.

(e) Minimum thickness and radius values that are expressed in fractions of an inch were generally converted according to the following table:

Fraction, in.	Proposed SI Conversion, mm	Difference, %
1/32	0.8	−0.8
3/64	1.2	−0.8
1/16	1.5	5.5
3/32	2.5	−5.0
1/8	3	5.5
5/32	4	−0.8
3/16	5	−5.0
7/32	5.5	1.0
1/4	6	5.5
5/16	8	−0.8
3/8	10	−5.0
7/16	11	1.0
1/2	13	−2.4
9/16	14	2.0
5/8	16	−0.8
11/16	17	2.6
3/4	19	0.3
7/8	22	1.0
1	25	1.6

(f) For nominal sizes that are in even increments of inches, even multiples of 25 mm were generally used. Intermediate values were interpolated rather than converting and rounding to the nearest mm. See examples in the following table. [Note that this table does not apply to nominal pipe sizes (NPS), which are covered below.]

Size, in.	Size, mm
1	25
1 1/8	29
1 1/4	32
1 1/2	38
2	50
2 1/4	57
2 1/2	64
3	75
3 1/2	89
4	100
4 1/2	114
5	125
6	150

Table continued

Size, in.	Size, mm
8	200
12	300
18	450
20	500
24	600
36	900
40	1 000
54	1 350
60	1 500
72	1 800

Size or Length, ft	Size or Length, m
3	1
5	1.5
200	60

(g) For nominal pipe sizes, the following relationships were used:

U.S. Customary Practice	SI Practice	U.S. Customary Practice	SI Practice
NPS 1/8	DN 6	NPS 20	DN 500
NPS 1/4	DN 8	NPS 22	DN 550
NPS 3/8	DN 10	NPS 24	DN 600
NPS 1/2	DN 15	NPS 26	DN 650
NPS 3/4	DN 20	NPS 28	DN 700
NPS 1	DN 25	NPS 30	DN 750
NPS 1 1/4	DN 32	NPS 32	DN 800
NPS 1 1/2	DN 40	NPS 34	DN 850
NPS 2	DN 50	NPS 36	DN 900
NPS 2 1/2	DN 65	NPS 38	DN 950
NPS 3	DN 80	NPS 40	DN 1000
NPS 3 1/2	DN 90	NPS 42	DN 1050
NPS 4	DN 100	NPS 44	DN 1100
NPS 5	DN 125	NPS 46	DN 1150
NPS 6	DN 150	NPS 48	DN 1200
NPS 8	DN 200	NPS 50	DN 1250
NPS 10	DN 250	NPS 52	DN 1300
NPS 12	DN 300	NPS 54	DN 1350
NPS 14	DN 350	NPS 56	DN 1400
NPS 16	DN 400	NPS 58	DN 1450
NPS 18	DN 450	NPS 60	DN 1500

(h) Areas in square inches ($in.^2$) were converted to square millimeters (mm^2), and areas in square feet (ft^2) were converted to square meters (m^2). See examples in the following table:

Area (U.S. Customary)	Area (SI)
1 $in.^2$	650 mm^2
6 $in.^2$	4 000 mm^2
10 $in.^2$	6 500 mm^2
5 ft^2	0.5 m^2

(i) Volumes in cubic inches ($in.^3$) were converted to cubic millimeters (mm^3), and volumes in cubic feet (ft^3) were converted to cubic meters (m^3). See examples in the following table:

Volume (U.S. Customary)	Volume (SI)
1 $in.^3$	16 000 mm^3
6 $in.^3$	100 000 mm^3
10 $in.^3$	160 000 mm^3
5 ft^3	0.14 m^3

(j) Although the pressure should always be in MPa for calculations, there are cases where other units are used in the text. For example, kPa is used for small pressures. Also, rounding was to one significant figure (two at the most) in most cases. See examples in the following table. (Note that 14.7 psi converts to 101 kPa, while 15 psi converts to 100 kPa. While this may seem at first glance to be an anomaly, it is consistent with the rounding philosophy.)

Pressure (U.S. Customary)	Pressure (SI)
0.5 psi	3 kPa
2 psi	15 kPa
3 psi	20 kPa
10 psi	70 kPa
14.7 psi	101 kPa
15 psi	100 kPa
30 psi	100 kPa
50 psi	350 kPa
100 psi	700 kPa
150 psi	1 MPa
200 psi	1.5 MPa
250 psi	1.7 MPa
300 psi	2 MPa
350 psi	2.5 MPa
400 psi	3 MPa
500 psi	3.5 MPa
600 psi	4 MPa
1,200 psi	8 MPa
1,500 psi	10 MPa

(k) Material properties that are expressed in psi or ksi (e.g., allowable stress, yield and tensile strength, elastic modulus) were generally converted to MPa to three significant figures. See example in the following table:

Strength (U.S. Customary)	Strength (SI)
95,000 psi	655 MPa

(l) In most cases, temperatures (e.g., for PWHT) were rounded to the nearest 5°C. Depending on the implied precision of the temperature, some were rounded to the nearest 1°C or 10°C or even 25°C. Temperatures colder than 0°F (negative values) were generally rounded to

the nearest 1°C. The examples in the table below were created by rounding to the nearest 5°C, with one exception:

Temperature, °F	Temperature, °C
70	20
100	38
120	50
150	65
200	95
250	120
300	150
350	175
400	205
450	230
500	260
550	290
600	315
650	345
700	370
750	400
800	425
850	455
900	480
925	495
950	510
1,000	540
1,050	565
1,100	595
1,150	620
1,200	650
1,250	675
1,800	980
1,900	1 040
2,000	1 095
2,050	1 120

C-300 SOFT CONVERSION FACTORS

The following table of "soft" conversion factors is provided for convenience. Multiply the U.S. Customary value by the factor given to obtain the SI value. Similarly, divide the SI value by the factor given to obtain the U.S. Customary value. In most cases it is appropriate to round the answer to three significant figures.

U.S. Customary	SI	Factor	Notes
in.	mm	25.4	...
ft	m	0.3048	...
$in.^2$	mm^2	645.16	...
ft^2	m^2	0.09290304	...
$in.^3$	mm^3	16,387.064	...
ft^3	m^3	0.02831685	...
U.S. gal	m^3	0.003785412	...
U.S. gal	liters	3.785412	...
psi	MPa (N/mm^2)	0.0068948	Use exclusively in equations
psi	kPa	6.894757	Use only in text and for nameplate
psi	bar	0.06894757	...
ft-lb	J	1.355818	...
°F	°C	$\frac{5}{9} \times (°F - 32)$	Not for temperature difference
°F	°C	$\frac{5}{9}$	For temperature differences only
R	K	$\frac{5}{9}$	Absolute temperature
lbm	kg	0.4535924	...
lbf	N	4.448222	...
in.-lb	N·mm	112.98484	Use exclusively in equations
ft-lb	N·m	1.3558181	Use only in text
$ksi\sqrt{in.}$	$MPa\sqrt{m}$	1.0988434	...
Btu/hr	W	0.2930711	Use for boiler rating and heat transfer
lb/ft^3	kg/m^3	16.018463	...

NONMANDATORY APPENDIX D
GUIDELINES FOR ROUNDING MINIMUM SPECIFIED TENSILE AND YIELD STRENGTH VALUES AND FOR ESTABLISHING ANCHOR POINTS FOR TENSILE AND YIELD STRENGTH TREND CURVES IN TABLES 1A, 1B, 2A, 2B, 3, 4, 5A, 5B, U, AND Y-1

D-100 MINIMUM TENSILE STRENGTH AND MINIMUM YIELD STRENGTH COLUMNS

D-110 DUAL UNIT SPECIFICATIONS

For specifications that contain both U.S. Customary and Metric minimum specified tensile and yield strength values, do the following:

(a) List the U.S. Customary values from the material specification in the columns for Minimum Tensile Strength, ksi and Minimum Yield Strength, ksi in the U.S. Customary edition tables of Section II, Part D.

(b) List the Metric values from the material specification in the columns for Minimum Tensile Strength, MPa and Minimum Yield Strength, MPa in the Metric edition tables of Section II, Part D.

D-120 TWO SEPARATE SPECIFICATIONS FOR THE SAME PRODUCT FORM

When two separate specifications exist for the same product form, one in U.S. Customary units and one in Metric units (a common situation for some fastener specifications), do the following:

(a) List the values from the U.S. Customary edition of the material specification in the columns for Minimum Tensile Strength, ksi and Minimum Yield Strength, ksi in the U.S. Customary edition tables of Section II, Part D.

(b) List the values from the Metric edition of the material specification in the columns for Minimum Tensile Strength, MPa and Minimum Yield Strength, MPa in the Metric edition tables of Section II, Part D.

D-130 SPECIFICATION EXISTS IN ONLY ONE SET OF UNITS

When a specification exists for only one set of units (common for EN and other non-U.S. specifications for which only Metric editions exist), do the following:

(a) Specification Exists Only in U.S. Customary Units

(1) List the U.S. Customary values in the columns for Minimum Tensile Strength, ksi and Minimum Yield Strength, ksi in the U.S. Customary edition tables of Section II, Part D.

(2) Multiply the U.S. Customary specification values by 6.894757, round to the nearest MPa (i.e., do a soft conversion), and list these rounded values in the columns for Minimum Tensile Strength, MPa and Minimum Yield Strength, MPa in the Metric edition tables of Section II, Part D.

(b) Specification Exists Only in Metric Units

(1) List the Metric values in the columns for Minimum Tensile Strength, MPa and Minimum Yield Strength, MPa in the Metric edition tables of Section II, Part D.

(2) Divide the Metric specification values by 6.894757, round to the nearest 0.5 ksi (i.e., do a soft conversion), and list these rounded values in the columns for Minimum Tensile Strength, ksi and Minimum Yield Strength, ksi in the U.S. Customary edition tables of Section II, Part D.

D-200 SELECTING ANCHOR POINT FOR TENSILE AND YIELD STRENGTH TREND CURVES FOR ALL SITUATIONS IN WHICH THE MINIMUM RT SPECIFIED VALUES IN ONE UNIT SYSTEM ARE NOT PRECISE CONVERSIONS OF THE UNITS IN THE OTHER SYSTEM

D-210 ONE MATERIAL HAS ONE TREND CURVE RULE

This rule requires that the trend curves in either system of units are precisely congruent with one another. That is, if the Metric and U.S. Customary curves are placed on top of one another, they appear to be only one curve. Thus, a material does not have two trend curves of the same shape, but has one curve.

It should be recognized that following the “one material: one trend curve” rule will result in certain inconsistencies with the criteria established by Section II, Part D, Mandatory Appendices 1, 2, and 10. The rule was first established when the Section II-D tables were metricated. An example of the inconsistency with Appendix 1 can be seen in the Metric values for Type 347H stainless steel, on pp. 102–105 of the 2010 Edition, 2011 Addenda of

Section II, Part D Metric. Inspection of Line No. 1 on these pages, for SA-312 seamless pipe, shows that the values in the Min. Tensile Strength and Min. Yield Strength columns on p. 103 are, respectively, 515 MPa and 205 MPa, as they appear in the SA-312 specification in Section II, Part A. However, the value in the −30 to 40°C and the 65°C columns, 138 MPa, is not equal to either 515/3.5 = 147.14 = 147 MPa or (205 × 2)/3 = 136.67 = 137 MPa. Instead, 138 MPa is obtained from (30 ksi × 6.894757 × 2)/3 = 137.89514 = 138 MPa. In this example, the "one material: one trend curve" rule results in a value at two temperatures that is slightly higher than would have been obtained from applying the Appendix 1 criteria to the Metric minimum specified yield strength. For other materials, slightly lower values might result. However, in either example, the values will be identical (within rounding variances) to those of the U.S. Customary values at the same temperatures.

D-220 ANCHORING THE TREND CURVE

When anchoring the yield and tensile strength trend curve, the U.S. Customary tensile and yield strengths are used when the specification is either a dual unit specification or exists only in U.S. Customary units. The Metric trend curve is then anchored to the conversion of the U.S. Customary values — the U.S. Customary values multiplied by 6.894757. Rounding is delayed until the last step (see D-300). However, when the specification exists only in a Metric version, the U.S. Customary trend curves are anchored to the soft conversion from the Metric-specified minimum tensile and yield strengths, in all cases, i.e., the U.S. Customary trend curves are anchored to the Metric-specified minimum tensile and yield strengths divided by 6.894757. Again, rounding is delayed until the last step.

D-230 EQUIVALENT MATERIALS

When a non-ASTM specification that, in the judgment of the Committee, has chemistry and heat treatment requirements so similar to an ASTM specification and grade that is already listed in Section II, Part D, that it is indistinguishable from the ASTM material, the Committee may choose to use the same trend curves for the non-ASTM specification as were used to develop the values for the ASTM material, regardless of any differences between the U.S. Customary minimum specified values and the Metric minimum specified values.

D-300 SIGNIFICANT FIGURES IN THE ALLOWABLE STRESS, TENSILE STRENGTH, AND YIELD STRENGTH TABLES IN SECTION II, PART D AND IN CODE CASES

D-310 U.S. CUSTOMARY TABLES

When listing allowable stress values in ksi, the last step in the analysis is to round the calculated values to three significant figures for values of 10.0 ksi and greater, and to two significant figures for values less than 10.0 ksi. When listing tensile strength and yield strength values in ksi, the last step in the analysis is to round the calculated values to four significant figures for values of 100.0 ksi and greater, to three significant figures for values less than 100.0 ksi down to and including 10.0 ksi, and to two significant figures for values less than 10.0 ksi..

D-320 METRIC TABLES

When listing allowable stress, tensile strength, and yield strength values in MPa, the last step in the analysis is to round the calculated values to three significant figures, except that, for values greater than 999 MPa, round the value of the fourth figure to 0 or 5. For example, 1 022 rounds to 1 020, while 1 023 rounds to 1 025 MPa.

NONMANDATORY APPENDIX E
MATERIAL DATA FOR STRESS ANALYSIS IN THE TIME-DEPENDENT REGIME

E-100 INTRODUCTION

Tables E-100.1-1 through Table E-100.23-1 and Figures E-100.2-1 through E-100.22-11 were drawn from the 2015 Edition of Section III, Subsection NH. They are intended to be used in the time-dependent stress analysis for nonnuclear applications using the strain method. A cross-reference between the table and figure numbers in this Appendix and those in the 2015 Edition of Section III, Subsection NH is provided in Table E-100.24-1.

Table E-100.1-1
Tensile Strength Values, S_u

For Metal Temperature Not Exceeding, °C	See Table U for Values up to 538°C				
	304 SS	316 SS	Ni–Fe–Cr UNS N08810	2¼Cr–1Mo	9Cr–1Mo–V
550	388	435	402	358	379
575	373	417	391	327	341
600	355	396	378	290	303
625	335	373	362	248	265
650	314	347	345	202	228
675	289	318	326	...	...
700	264	288	305	...	...
725	238	255	282	...	...
750	211	221	258	...	...
775	185	185	233	...	...
800	159	149	208	...	...
825	...	...	182	...	...
850	...	...	157	...	...
875	...	...	132	...	...
900	...	...	109	...	...

GENERAL NOTES:

(a) At temperatures above room temperature, the values of tensile strength tend toward an average or expected value which may be as much as 10% above the tensile strength trend curve adjusted to the minimum specified room temperature tensile strength. At temperatures above room temperature, the yield strength values correspond to the yield strength trend curve adjusted to the minimum specified room temperature yield strength. Neither the tensile strength nor the yield strength values correspond exactly to either *average* or *minimum* as these terms are applied to a statistical treatment of a homogeneous set of data.

(b) Neither the ASME Material Specifications nor the rules of Sections I, IV, VIII, or XII require elevated temperature testing for tensile or yield strengths of production material for use in Code components. It is not intended that results of such tests, if performed, be compared with these tabulated tensile and yield strength values for ASME Code acceptance/rejection purposes for materials. If some elevated temperature test results on production material appear lower than the tabulated values by a large amount (more than the typical variability of material and suggesting the possibility of some error), further investigation by retest or other means should be considered.

Table E-100.1-2
Tensile and Yield Strength Reduction Factor Due to Long Time Prior Elevated Temperature Service

Material	Service Temp., °C	YS Reduction Factor	TS Reduction Factor
304 SS	≥480	1.00	0.80
316 SS	≥480	1.00	0.80
800H	≥730	0.90	0.90
2¼Cr–1Mo	≥425	[Note (1)]	[Note (1)]
9Cr–1Mo–V	≥480	1.0	[Note (2)]

GENERAL NOTE: No reduction factor required for service below the indicated temperature.

NOTES:
(1) Tables E-100.1-3 and E-100.1-4 are selected to correspond to the maximum wall-averaged temperature achieved during any Level A, B, or C Service Loading.
(2) See Table E-100.1-5.

Table E-100.1-3
Yield Strength Reduction Factors for 2¼Cr–1Mo

	Time, h										
Temp., °C	1	10	30	10^2	3×10^2	10^3	3×10^3	10^4	3×10^4	10^5	3×10^5
375	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
400	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
425	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
450	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.93
475	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.95	0.88
500	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.94	0.89	0.82
525	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.95	0.88	0.82	0.77
550	1.00	1.00	1.00	1.00	1.00	0.98	0.95	0.88	0.82	0.76	0.71
575	1.00	1.00	1.00	1.00	1.00	0.94	0.88	0.82	0.76	0.71	0.66
600	1.00	1.00	1.00	1.00	0.99	0.90	...	...	...	...	...
625	1.00	1.00	1.00	0.99	0.93	0.85	...	...	...	...	...
650	1.00	1.00	1.00	0.96	0.89	0.82	...	...	...	...	...

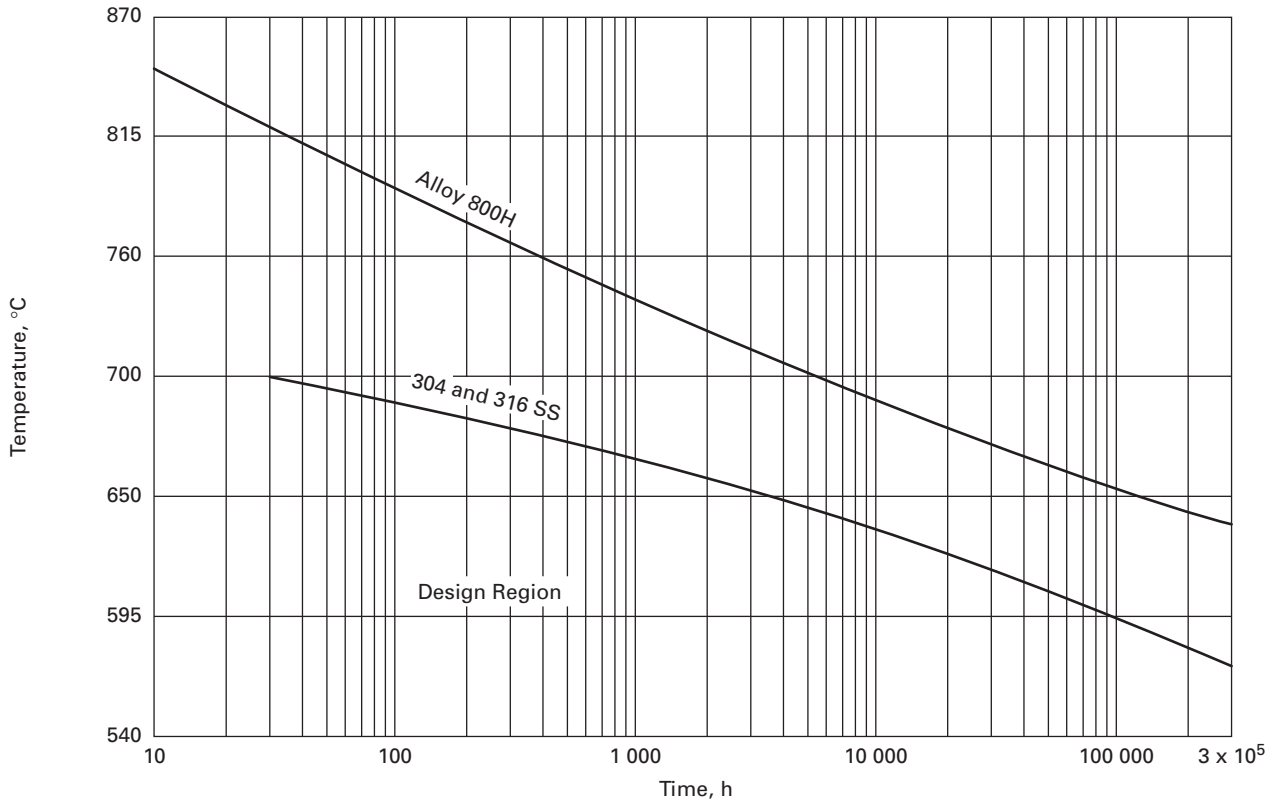
Table E-100.1-4
Tensile Strength Reduction Factors for 2¼Cr–1Mo

	Time, h										
Temp.,°C	1	10	30	10^2	3×10^2	10^3	3×10^3	10^4	3×10^4	10^5	3×10^5
375	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
400	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
425	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
450	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.93	0.89
475	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.94	0.88	0.84
500	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.93	0.88	0.83	0.79
525	1.00	1.00	1.00	1.00	1.00	0.98	0.94	0.88	0.84	0.79	0.74
550	1.00	1.00	1.00	1.00	1.00	0.95	0.90	0.84	0.80	0.74	0.70
575	1.00	1.00	1.00	1.00	0.98	0.91	0.86	0.80	0.75	0.70	0.65
600	1.00	1.00	1.00	1.00	0.93	0.87	...	...	...	...	...
625	1.00	1.00	1.00	0.94	0.88	0.82	...	...	...	...	...
650	1.00	1.00	1.00	0.90	0.84	0.78	...	...	...	...	...

Table E-100.1-5
Tensile Strength Reduction Factors for 9Cr–1Mo–V

	Time, h										
Temp.,°C	1	10	30	10^2	3×10^2	10^3	3×10^3	10^4	3×10^4	10^5	3×10^5
375	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
400	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
425	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
450	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
475	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98
500	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.97
525	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.94	0.91
550	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.94	0.92	0.89
575	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.92	0.88	0.83
600	1.00	1.00	1.00	1.00	1.00	1.00	0.96	0.92	0.89	0.85	0.84
625	1.00	1.00	1.00	1.00	1.00	0.97	0.94	0.90	0.87	0.83	0.81
650	1.00	1.00	1.00	1.00	0.98	0.94	0.91	0.87	0.84	0.81	0.78

Figure E-100.2-1
Permissible Time/Temperature Conditions for Material That Has Been Cold Worked >5% and <20% and Subjected to Short-Time High Temperature Transients



GENERAL NOTE: The sum of time at every temperature shall determine a point within the design region of the figure for the specific material. For multiple temperature/time combinations, the linear summation of life fraction shall not exceed 1.0, the material limit.

Table E-100.3-1
Permissible Base Materials for Structures Other Than Bolting

Base Material	Spec. No.	Product Form	Types, Grades, or Classes
Types 304 SS and 316 SS [Note (1)], [Note (2)]	SA-182	Fittings & forgings	F304, F304H, F316, F316H
	SA-213	Smls. tube	TP304, TP304H, TP316, TP316H
	SA-240	Plate	304, 316, 304H, 316H
	SA-249	Welded tube	TP304, TP304H, TP316, TP316H
	SA-312	Welded & smls. pipe	TP304, TP304H, TP316, TP316H
	SA-358	Welded pipe	304, 316, 304H, 316H
	SA-376	Smls. pipe	TP304, TP304H, TP316, TP316H
	SA-403	Fittings	WP304, WP304H, WP316, WP316H, WP304W, WP304HW, WP316W, WP316HW
	SA-479	Bar	304, 304H, 316, 316H
	SA-965	Forgings	F304, F304H, F316, F316H
	SA-430	Forged & bored pipe	FP304, FP304H, FP316, FP316H
Ni–Fe–Cr (Alloy 800H) [Note (3)]	SB-163	Smls. tube	UNS N08810
	SB-407	Smls. pipe & tube	UNS N08810
	SB-408	Rod & bar	UNS N08810
	SB-409	Plate, sheet & strip	UNS N08810
	SB-564	Forgings	UNS N08810
$2\frac{1}{4}$Cr–1Mo [Note (4)]	SA-182	Forgings	F22, Class 1
	SA-213	Smls. tube	T22
	SA-234	Piping fittings	WP22, WP22W [Note (5)]
	SA-335	Forged pipe	P22
	SA-336	Fittings, forgings	F22a
	SA-369	Forged pipe	FP22
	SA-387	Plate	Grade 22, Class 1
	SA-691	Welded pipe	Pipe $2\frac{1}{4}$CR (SA-387, Grade 22, Class 1)
9Cr–1Mo–V	SA-182	Forgings	F91
	SA-213	Smls. tube	T91
	SA-335	Smls. pipe	P91
	SA-387	Plate	91

NOTES:
(1) These materials shall have a minimum specified room temperature yield strength of 207 MPa and a minimum specified carbon content of 0.04%.
(2) For use at temperatures above 540°C, these materials may be used only if the material is heat treated by heating to a minimum temperature of 1 040°C and quenching in water or rapidly cooling by other means.
(3) These materials shall have a total aluminum-plus-titanium content of at least 0.50% and shall have been heat treated at a temperature of 1 120°C or higher.
(4) This material shall have a minimum specified room temperature yield strength of 207 MPa, a minimum specified room temperature ultimate strength of 414 MPa, a maximum specified room temperature ultimate strength of 586 MPa, and a minimum specified carbon content of 0.07%.
(5) The material allowed under SA-234 shall correspond to one of the following:
(a) SA-335, Grade P22
(b) SA-387, Grade 22, Class 1
(c) SA-182, Grade F22, Class 1 in compliance with Note (3).

Table E-100.3-2
Permissible Weld Materials

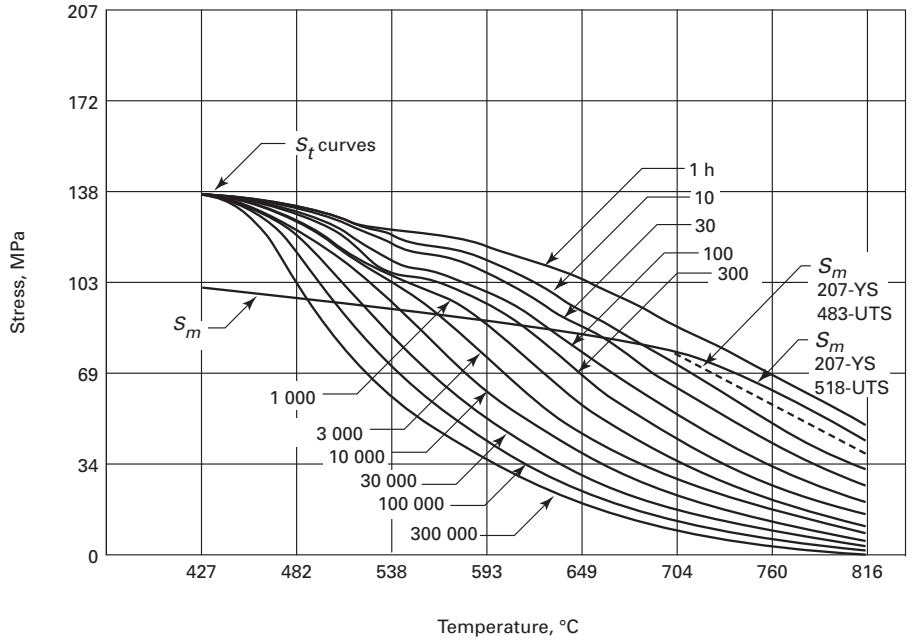
Base Material	Spec. No.	Class
Types 304 SS and 316 SS	SFA-5.4	E308, E308L, E316, E316L, E16-8-2
	SFA-5.9	ER308, ER308L, ER316, ER316L, ER16-8-2
	SFA-5.22	E308, E308T, E308LT, E316T, E316LT-1, EXXXT-G (16-8-2 chemistry)
Ni–Fe–Cr (Alloy 800H)	SFA-5.11	ENiCrFe-2
	SFA-5.14	ERNiCr-3
$2^1/_4$Cr–1Mo	SFA-5.5	E90XX-B3 (>0.05% carbon)
	SFA-5.23	EB3, ECB3
	SFA-5.28	E90C-B3 (>0.05% carbon), ER90S-B3
	SFA-5.29	E90T-B3 (>0.05% carbon)
9Cr–1Mo–V	SFA-5.5	E90XX-B9
	SFA-5.23	EB9
	SFA-5.28	ER90S-B9

Table E-100.3-3
S_o — Maximum Allowable Stress Intensity, MPa, for Design Condition Calculations

For Metal Temperature Not Exceeding, °C	304 SS	316 SS	Ni–Fe–Cr (Solution Annealed) UNS N08810	$2^1/_4$Cr–1Mo	9Cr–1Mo–V
375	...	...	...	123	184
400	...	...	...	123	178
425	105	110	105	116	172
450	102	108	104	116	165
475	101	108	103	99	154
500	99	107	101	81	133
525	86	101	99	64	117
550	74	88	89	48	102
575	69	77	74	35	81
600	65	76	68	26 [Note (1)]	62
625	51	62	62	...	46
650	42	51	51	...	29
675	34	39	41	...	...
700	27	30	34	...	...
725	21	23	28	...	...
750	17	18	23 [Note (2)]	...	...
775	14	13	...	...	...
800	11 [Note (3)]	11 [Note (4)]	...	...	...

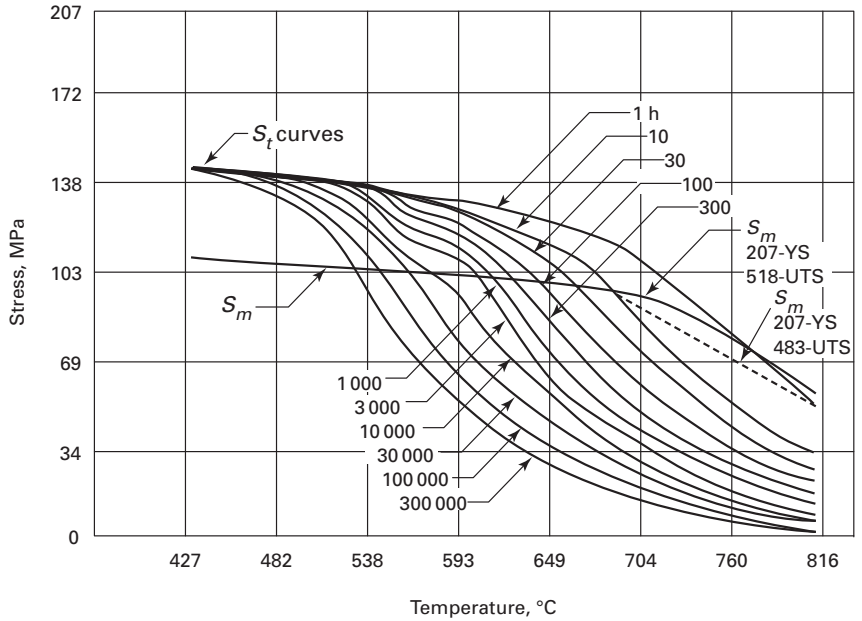
NOTES:
(1) This is the value of S_o for $2^1/_4$Cr–1Mo at 593°C.
(2) At 760°C the value of S_o for UNS N08810 is 21 MPa.
(3) At 816°C the value of S_o for 304 SS is 9.7 MPa.
(4) At 816°C the value of S_o for 316 SS is 9.0 MPa.

Figure E-100.4-1
S_{mt} — Allowable Stress Intensity Values, MPa, Type 304 SS — 207-YS, 518-UTS (207-YS, 483-UTS)



Temp., °C	1 h	10 h	30 h	10^2 h	3 × 10^2 h	10^3 h	3 × 10^3 h	10^4 h	3 × 10^4 h	10^5 h	3 × 10^5 h
425	105	105	105	105	105	105	105	105	105	105	105
450	102	102	102	102	102	102	102	102	102	102	102
475	101	101	101	101	101	101	101	101	101	101	101
500	99	99	99	99	99	99	99	99	99	99	93
525	98	98	98	98	98	98	98	98	98	87	73
550	96	96	96	96	96	96	96	94	82	70	58
575	93	93	93	93	93	93	91	78	66	56	46
600	91	91	91	91	91	89	75	63	54	44	37
625	89	89	89	89	87	74	62	51	43	36	29
650	88	88	88	84	73	61	51	42	35	28	23
675	85	85	83	77	61	51	42	35	28	22	19
700	82 (81)	80	69	61	50	42	34	28	23	18	15
725	77 (74)	70	61	52	43	35	29	22	18	15	12
750	69 (66)	60	52	44	36	29	23	18	15	12	9
775	61 (57)	51	44	36	29	24	19	15	12	9	7
800	53 (49)	43	37	29	23	18	15	11	9	7	5

Figure E-100.4-2
S_{mt} — Allowable Stress Intensity Values, MPa, Type 316 SS — 207-YS, 518-UTS (207-YS, 483-UTS)



Temp., °C	1 h	10 h	30 h	10^2 h	3 × 10^2 h	10^3 h	3 × 10^3 h	10^4 h	3 × 10^4 h	10^5 h	3 × 10^5 h
425	110	110	110	110	110	110	110	110	110	110	110
450	108	108	108	108	108	108	108	108	108	108	108
475	107	107	107	107	107	107	107	107	107	107	107
500	106	106	106	106	106	106	106	106	106	106	106
525	105	105	105	105	105	105	105	105	105	105	105
550	104	104	104	104	104	104	104	104	104	101	87
575	104	104	104	104	104	104	104	104	95	79	67
600	102	102	102	102	102	102	102	91	75	62	51
625	101	101	101	101	101	94	86	72	59	48	40
650	101	101	101	98	84	72	64	57	48	38	31
675	98	98	98	80	69	58	51	44	38	30	24
700	95 (92)	91	78	65	54	46	41	34	28	22	18
725	90 (85)	75	63	52	44	36	31	25	21	16	13
750	82 (76)	62	51	41	35	29	24	19	16	11	9
775	70 (65)	50	40	32	27	23	18	14	12	8	7
800	61 (58)	40	32	25	21	17	13	10	8	5	4

Figure E-100.4-3
S_{mt} — Allowable Stress Intensity Values, MPa, Ni–Fe–Cr (Alloy 800H)

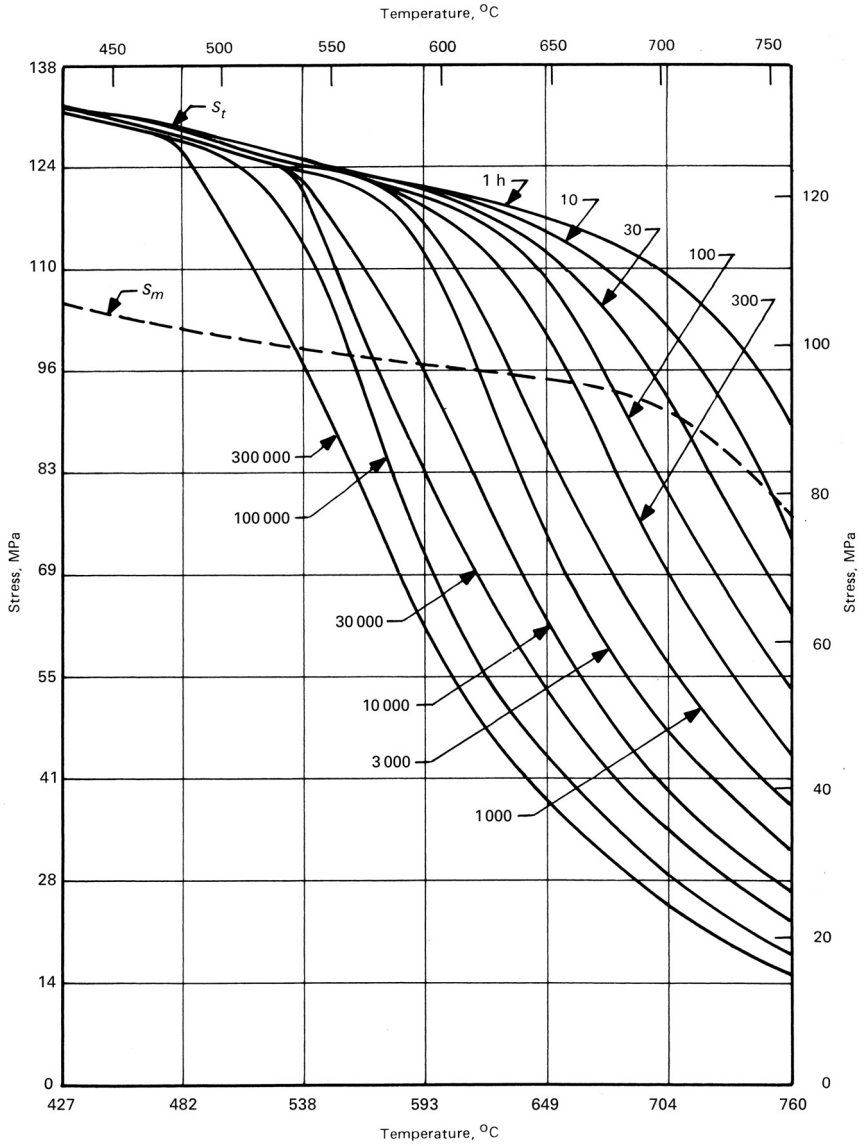
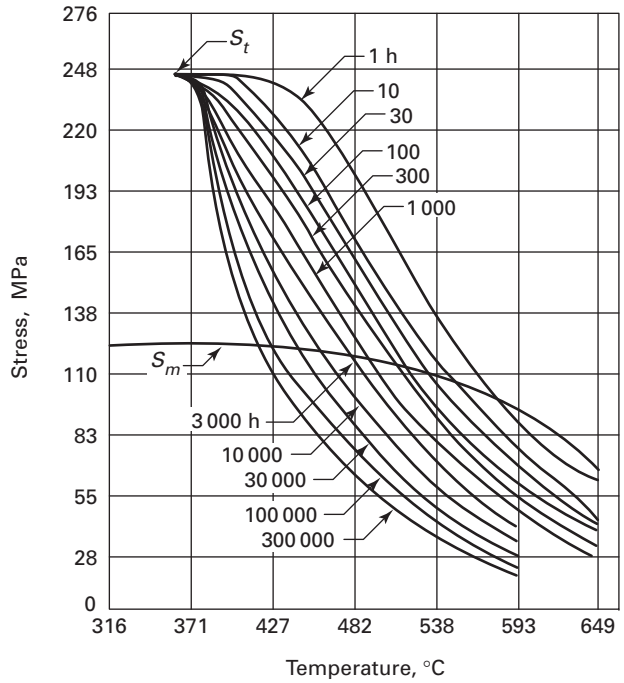


Figure E-100.4-3
S_{mt} — Allowable Stress Intensity Values, MPa, Ni–Fe–Cr (Alloy 800H) (Cont'd)

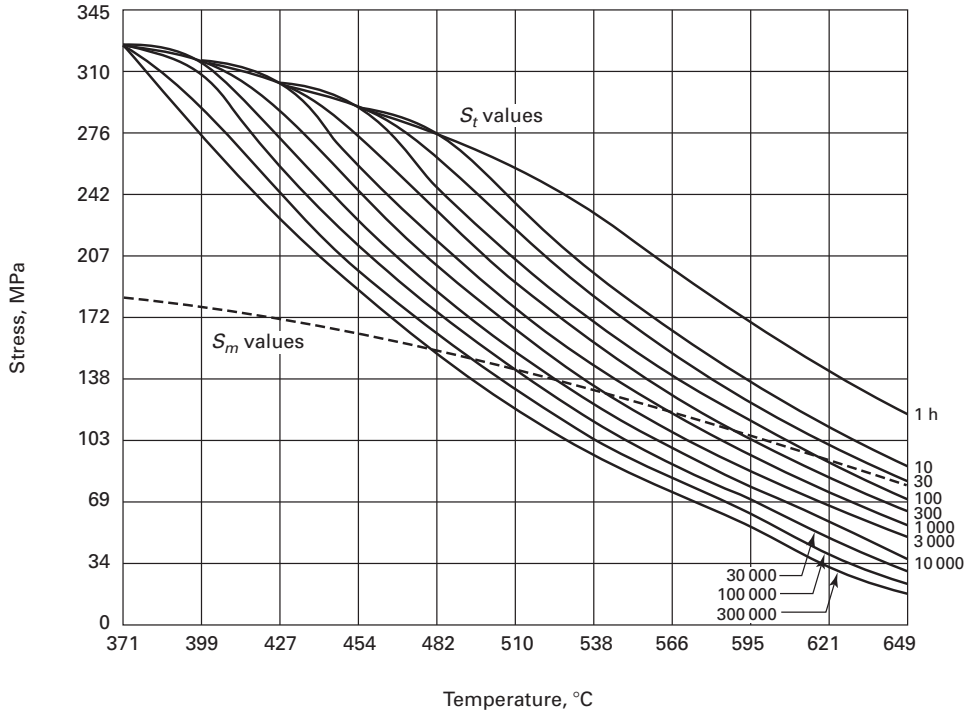
Temp., °C	1 h	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
425	105	105	105	105	105	105	105	105	105	105	105
450	104	104	104	104	104	104	104	104	104	104	104
475	103	103	103	103	103	103	103	103	103	103	103
500	101	101	101	101	101	101	101	101	101	101	101
525	100	100	100	100	100	100	100	100	100	100	98
550	99	99	99	99	99	99	99	99	99	94	88
575	98	98	98	98	98	98	98	98	94	82	72
600	97	97	97	97	97	97	96	91	79	67	58
625	96	96	96	96	96	96	92	80	68	59	50
650	95	95	95	95	95	84	73	62	53	45	39
675	93	93	93	93	84	71	60	51	44	37	31
700	91	91	91	82	70	59	50	41	35	29	25
725	85	85	81	69	58	49	41	34	30	24	20
750	78	77	69	58	49	40	34	28	24	20	16

Figure E-100.4-4
S_{mt} — Allowable Stress Intensity Values, MPa, 2¼Cr–1Mo



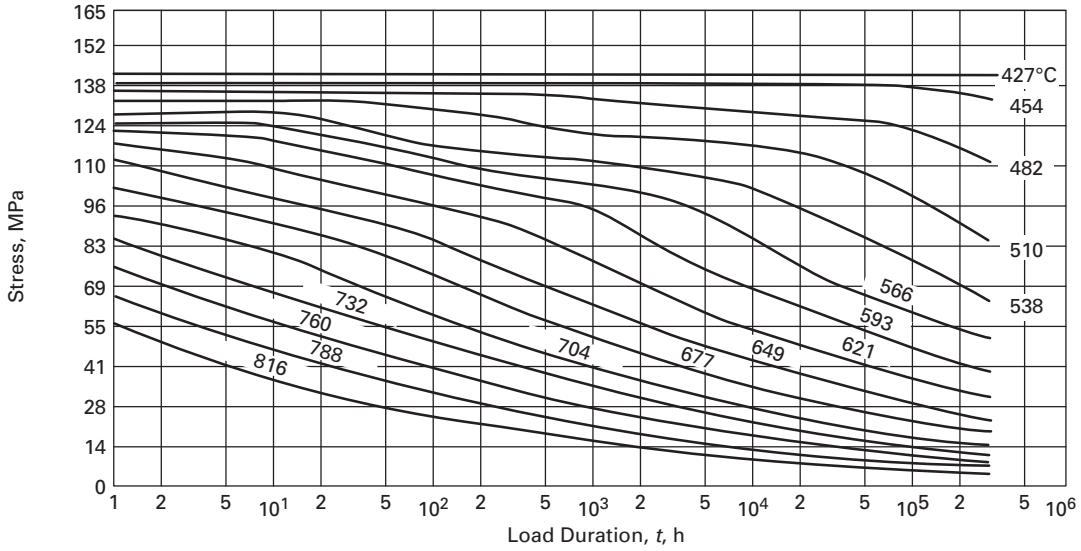
Temp., °C	1 h	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
375	...	123	123	123	123	123	123	123	123	123	123
400	123	123	123	123	123	123	123	123	123	123	123
425	123	123	123	123	123	123	123	123	123	123	112
450	122	122	122	122	122	122	122	122	116	101	89
475	119	119	119	119	119	119	114	106	92	80	71
500	116	116	116	116	116	111	99	85	74	64	56
525	112	112	112	106	97	89	78	66	57	48	41
550	107	107	98	89	81	74	64	54	46	38	33
575	100	89	80	72	66	59	50	42	35	29	25
600	89	72	66	59	53	47	...	...	...	...	...
625	72	58	53	49	42	36	...	...	...	...	...
650	62	43	42	41	35	28	...	...	...	...	...

Figure E-100.4-5
S_{mt} — Allowable Stress Intensity Values, MPa, 9Cr–1Mo–V



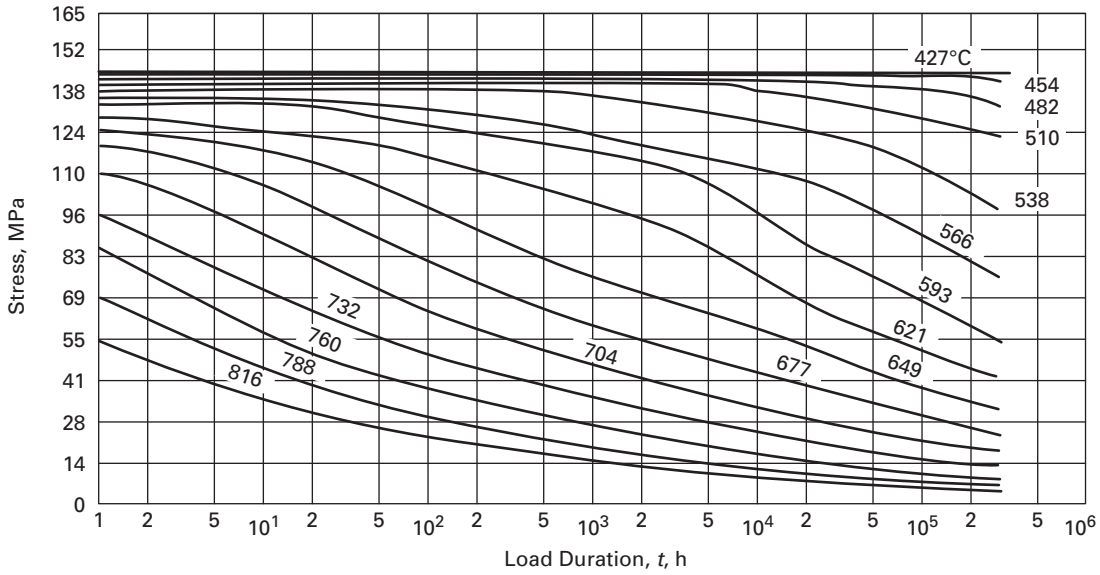
Temp., °C	1 h	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
375	183	183	183	183	183	183	183	183	183	183	183
400	179	179	179	179	179	179	179	179	179	179	179
425	172	172	172	172	172	172	172	172	172	172	172
450	165	165	165	165	165	165	165	165	165	165	165
475	156	156	156	156	156	156	156	156	156	156	154
500	147	147	147	147	147	147	147	147	147	138	131
525	136	136	136	136	136	136	136	132	126	115	106
550	125	125	125	125	125	125	121	111	102	93	85
575	114	114	114	114	114	108	99	90	81	73	66
600	101	101	101	101	97	86	80	71	63	54	48
625	88	88	88	86	78	70	63	54	44	36	30
650	76	76	76	69	62	54	44	36	29	22	17

Figure E-100.5-1
S_t — Allowable Stress Intensity Values, MPa, Type 304 SS



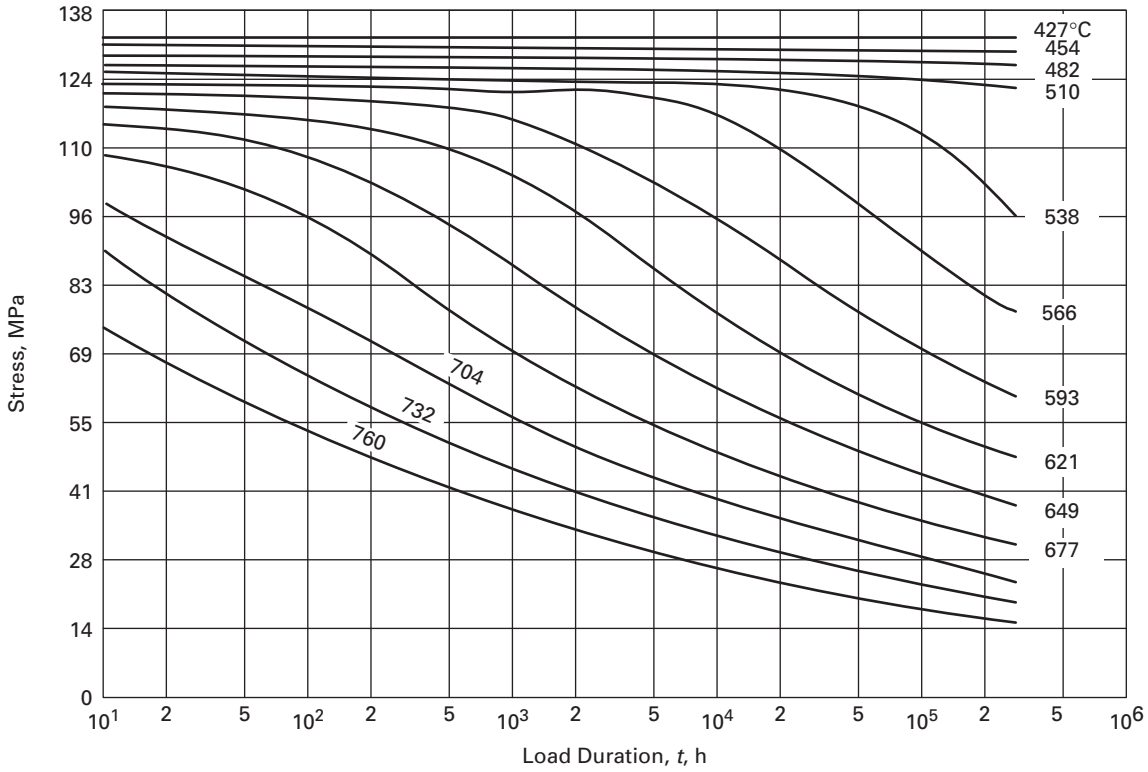
Temp., °C	1 h	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
425	141	141	141	141	141	141	141	141	141	141	141
450	138	138	138	138	138	138	138	138	138	137	134
475	136	136	135	135	135	134	132	130	129	126	116
500	133	133	132	131	128	125	123	121	117	107	93
525	130	129	127	122	118	115	113	108	100	87	73
550	126	125	121	115	110	107	103	94	82	70	58
575	123	121	116	110	105	100	91	78	66	56	46
600	120	115	109	102	97	88	75	63	54	44	37
625	116	107	101	93	87	74	62	51	43	36	29
650	110	98	92	84	73	61	51	42	35	28	23
675	102	90	83	72	61	51	42	35	28	22	19
700	93	80	71	61	50	42	34	28	23	18	15
725	86	70	61	52	43	35	29	22	18	15	12
750	78	60	52	44	36	29	23	18	15	12	9
775	69	51	44	36	29	24	19	15	12	9	7
800	60	43	37	29	23	18	15	11	9	7	5

Figure E-100.5-2
S_t — Allowable Stress Intensity Values, MPa, Type 316 SS



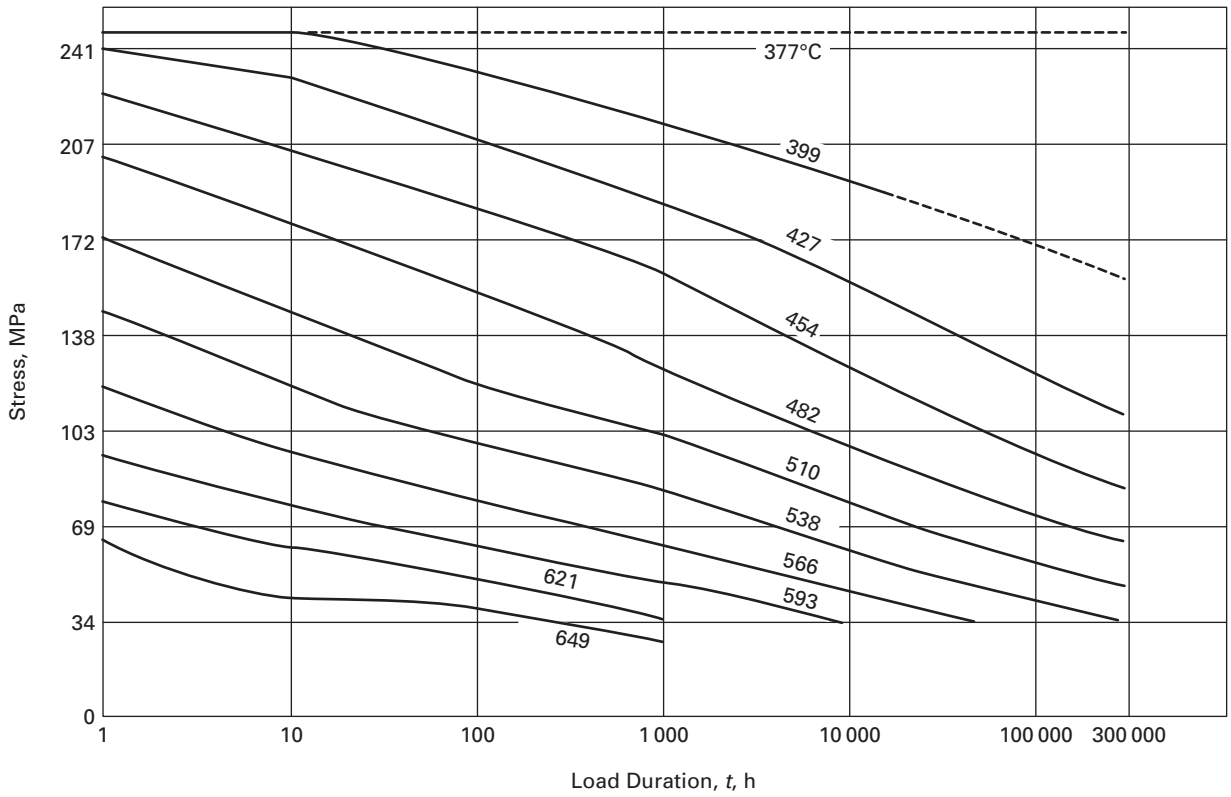
Temp., °C	1 h	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
425	143	143	143	143	143	143	143	143	143	143	143
450	142	142	142	142	142	142	142	142	142	142	140
475	141	141	141	141	141	141	141	141	140	138	135
500	140	140	140	140	140	139	139	138	134	131	125
525	138	138	138	138	138	136	134	130	126	118	108
550	136	136	135	134	132	128	125	119	113	101	87
575	133	133	131	127	124	119	114	105	95	79	67
600	131	129	126	121	116	110	105	91	75	62	51
625	127	121	118	111	103	94	86	72	59	48	40
650	123	116	108	97	84	72	64	57	48	38	31
675	118	106	94	80	69	58	51	44	38	30	24
700	112	91	78	65	54	46	41	34	28	22	18
725	101	75	63	52	44	36	31	25	21	16	13
750	88	62	51	41	35	29	24	19	16	11	9
775	74	50	40	32	27	23	18	14	12	8	7
800	61	40	32	25	21	17	13	10	8	5	4

Figure E-100.5-3
S_t — Allowable Stress Intensity Values, MPa, Ni–Fe–Cr (Alloy 800H)



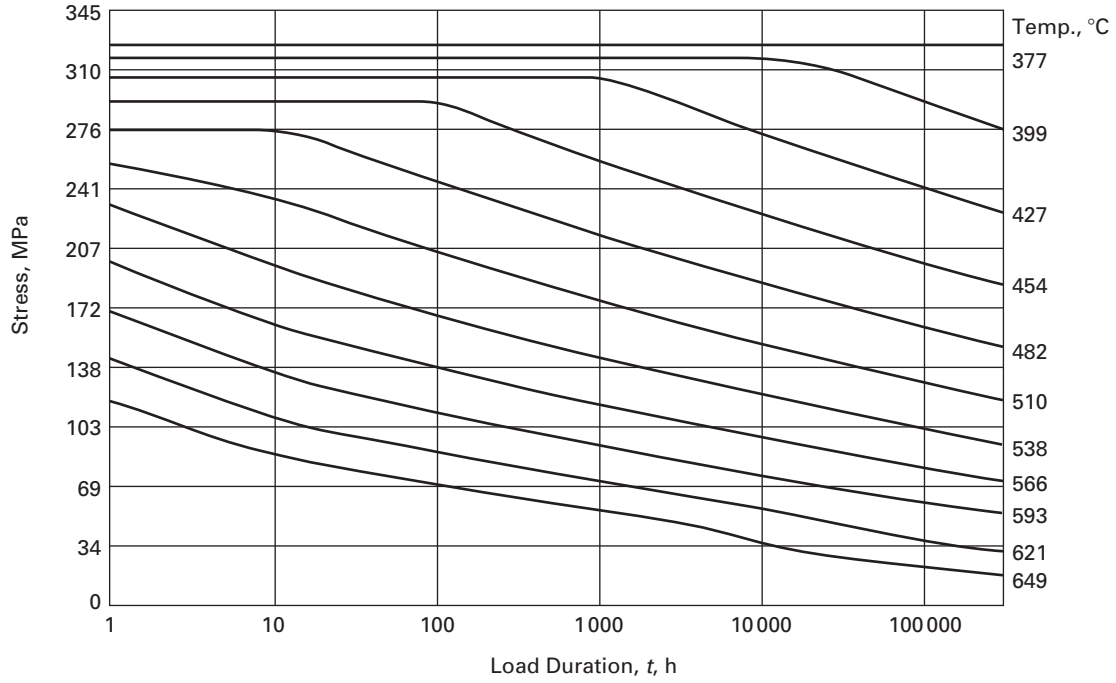
Temp., °C	1 h	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
425	132	132	132	132	132	132	132	132	132	132	132
450	130	130	130	130	130	130	130	130	130	130	130
475	129	129	129	129	129	129	128	128	128	127	126
500	128	128	128	128	128	128	127	126	126	125	124
525	126	126	126	126	126	125	124	124	122	119	109
550	124	124	124	124	124	123	122	121	113	103	88
575	123	123	123	122	121	120	117	111	96	83	72
600	121	121	120	119	117	114	107	91	79	67	58
625	119	118	116	115	109	102	89	75	64	55	47
650	117	115	112	109	101	85	74	62	53	45	39
675	114	109	105	98	85	72	61	52	44	37	31
700	110	100	94	82	70	59	50	41	35	29	25
725	99	88	82	70	58	49	41	34	29	24	20
750	94	80	69	58	49	40	34	28	24	20	16

Figure E-100.5-4
S_t — Allowable Stress Intensity Values, MPa, $2\frac{1}{4}$Cr–1Mo



Temp., °C	1 h	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
375	...	245	245	245	245	245	245	245	245	245	245
400	243	243	239	231	224	216	205	196	183	172	161
425	241	230	220	211	200	186	173	160	142	125	112
450	226	207	197	186	176	164	149	130	116	101	89
475	206	183	170	159	147	136	122	106	92	80	71
500	182	156	144	132	122	111	99	85	74	64	56
525	153	127	116	106	97	89	78	66	57	48	41
550	131	108	98	89	81	74	64	54	46	38	33
575	109	89	80	72	66	59	50	42	35	29	25
600	89	72	66	59	53	47	...	...	...	...	...
625	72	58	53	49	42	36	...	...	...	...	...
650	62	43	42	41	35	28	...	...	...	...	...

Figure E-100.5-5
S_t — Allowable Stress Intensity Values, MPa, 9Cr–1Mo–V



Temp., °C	1 h	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
375	325	325	325	325	325	325	325	325	325	325	325
400	317	317	317	317	317	317	316	316	307	290	275
425	307	307	307	307	307	307	292	276	262	246	232
450	294	294	294	294	279	264	249	234	220	206	193
475	275	275	271	256	241	225	211	197	184	171	160
500	262	249	235	219	205	191	178	165	153	141	131
525	242	214	200	185	172	163	148	136	126	115	106
550	217	182	170	156	144	132	119	111	102	93	85
575	189	154	142	130	119	108	99	90	81	73	66
600	164	126	115	107	97	86	79	71	63	54	48
625	139	106	96	86	78	70	62	54	44	36	30
650	117	87	78	69	62	54	47	36	29	22	17

Table E-100.6-1
Yield Strength Values, S_y, Versus Temperature

	Stresses, MPa					
Temp., °C	304 SS	316 SS	Ni–Fe–Cr UNS N08810	$2\frac{1}{4}$Cr–1Mo	9Cr–1Mo–V	Ni–Cr–Fe–Mo–Cb UNS N07718
RT						1 034
50						1 016
100						989
150						970
200						955
250						945
300						937
350			See Table Y-1 for values up to 538°C			929
375						925
400						922
425						918
450						914
475						909
500						902
525						896
550	106	116	108	160	269	888
575	104	115	108	151	243	883 [Note (1)]
600	102	114	108	139	218	...
625	100	112	108	126	193	...
650	97	110	107	110	165	...
675	94	107	105	...	...	...
700	91	103	102	...	...	...
725	87	99	99.1	...	...	...
750	82	94	95.6	...	...	...
775	76	88	91.5	...	...	...
800	69 [Note (2)]	81 [Note (3)]	86.9	...	...	...
825	...	...	81.8	...	...	...
850	...	...	76.3	...	...	...
875	...	...	70.3	...	...	...
900	...	...	64.0	...	...	...

GENERAL NOTES:

(a) At temperatures above room temperature, the yield strength values correspond to the yield strength trend curve adjusted to the minimum specified room temperature yield strength. The yield strength values do not correspond exactly to either *average* or *minimum* as these terms are applied to a statistical treatment of a homogeneous set of data.

(b) Neither the ASME Materials Specifications nor the rules of Sections I, IV, VIII, or XII require elevated temperature testing for yield strengths of production material for use in Code components. It is not intended that results of such tests, if performed, be compared with these tabulated yield strength values for ASME Code acceptance/rejection purposes for materials. If some elevated temperature test results on production material appear lower than the tabulated values by a large amount (more than the typical variability of material and suggesting the possibility of some error), further investigation by retests or other means should be considered.

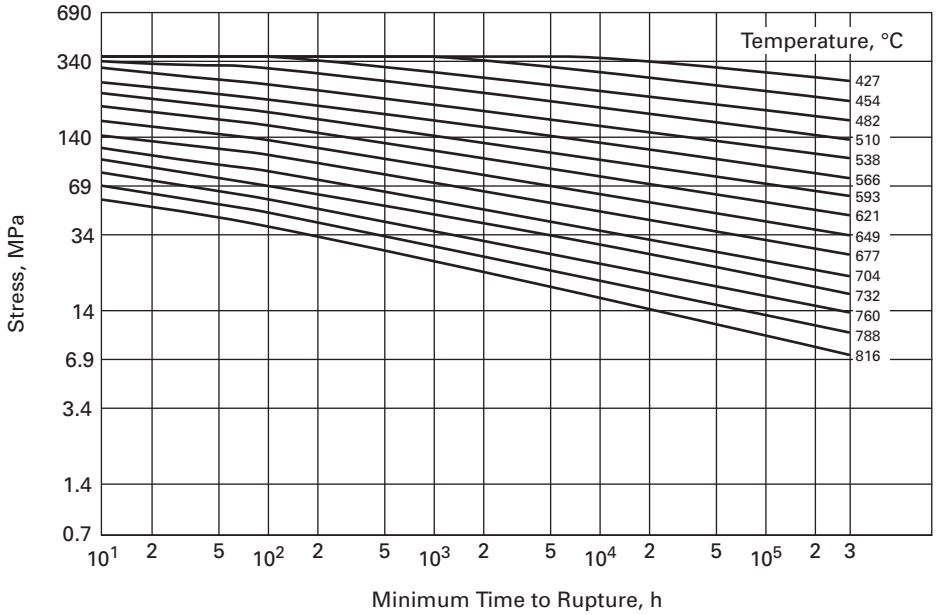
NOTES:

(1) At 566°C the yield strength, S_y, is 883 MPa for UNS N07718.

(2) At 816°C the yield strength, S_y, is 64 MPa for 304 SS.

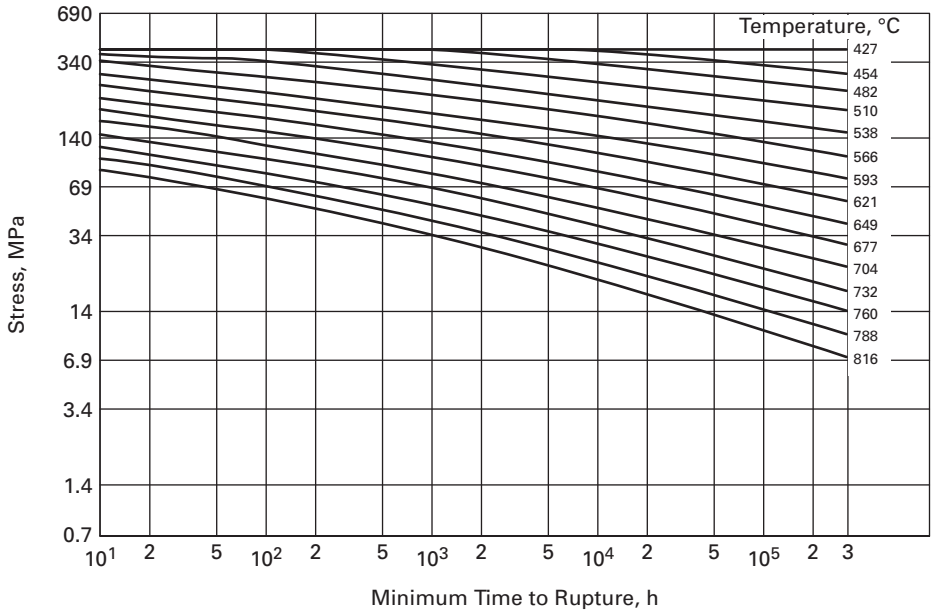
(3) At 816°C the yield strength, S_y, is 75 MPa for 316 SS.

Figure E-100.7-1
Expected Minimum Stress-to-Rupture Values, MPa, Type 304 SS



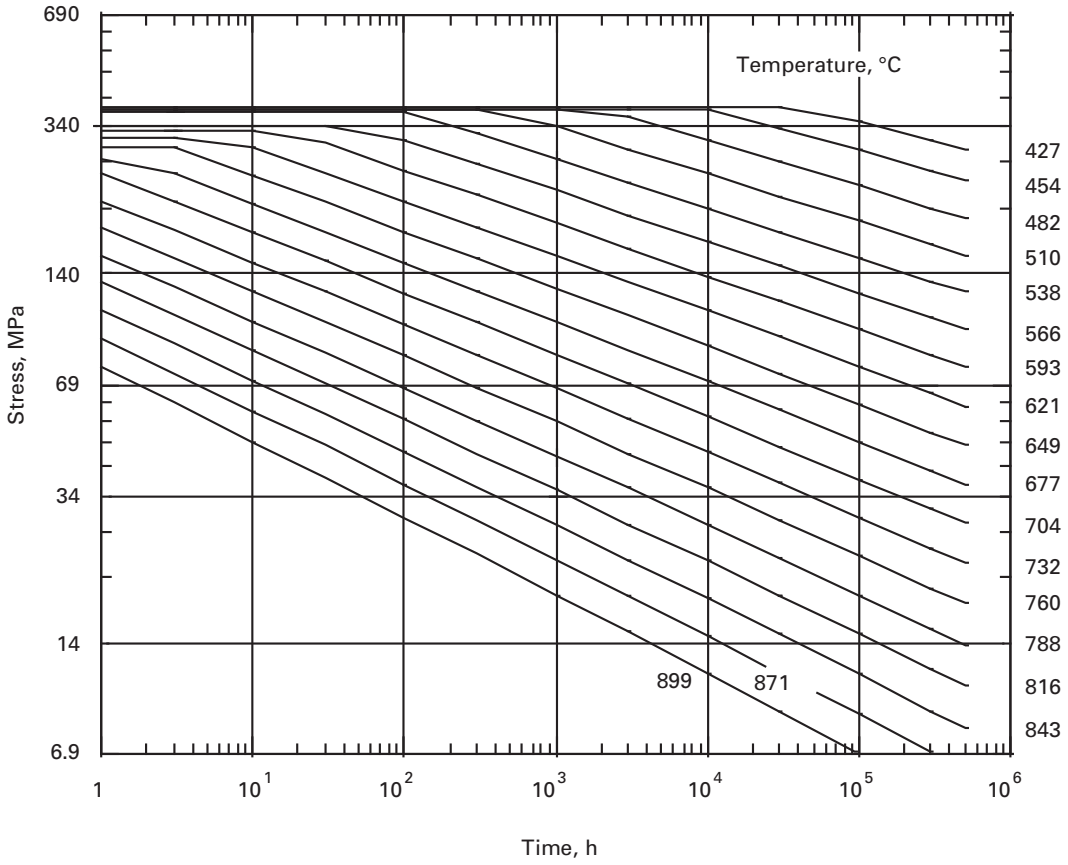
Temp., °C	1 h	10 h	30 h	10^2 h	3 × 10^2 h	10^3 h	3 × 10^3 h	10^4 h	3 × 10^4 h	10^5 h	3 × 10^5 h
425	393	393	393	393	393	393	393	393	354	308	272
450	390	390	390	390	390	390	353	325	287	249	219
475	385	385	385	385	364	340	300	265	232	201	176
500	377	377	363	350	317	284	250	217	188	161	140
525	368	358	328	301	267	236	205	177	153	129	114
550	355	321	285	254	223	195	168	144	124	104	91
575	333	274	241	214	188	161	139	113	100	83	59
600	298	233	205	180	157	134	113	95	80	66	56
625	256	198	175	151	130	111	93	78	64	53	44
650	220	169	147	127	110	92	77	63	52	43	34
675	189	145	125	108	91	75	62	51	42	35	28
700	162	123	106	91	75	63	52	41	34	27	22
725	140	106	91	77	64	53	43	34	28	22	18
750	121	89	77	67	54	44	35	28	23	18	14
775	105	76	66	55	45	36	29	23	18	14	11
800	91	65	56	46	37	29	24	19	14	10	9

Figure E-100.7-2
Expected Minimum Stress-to-Rupture Values, MPa, Type 316 SS



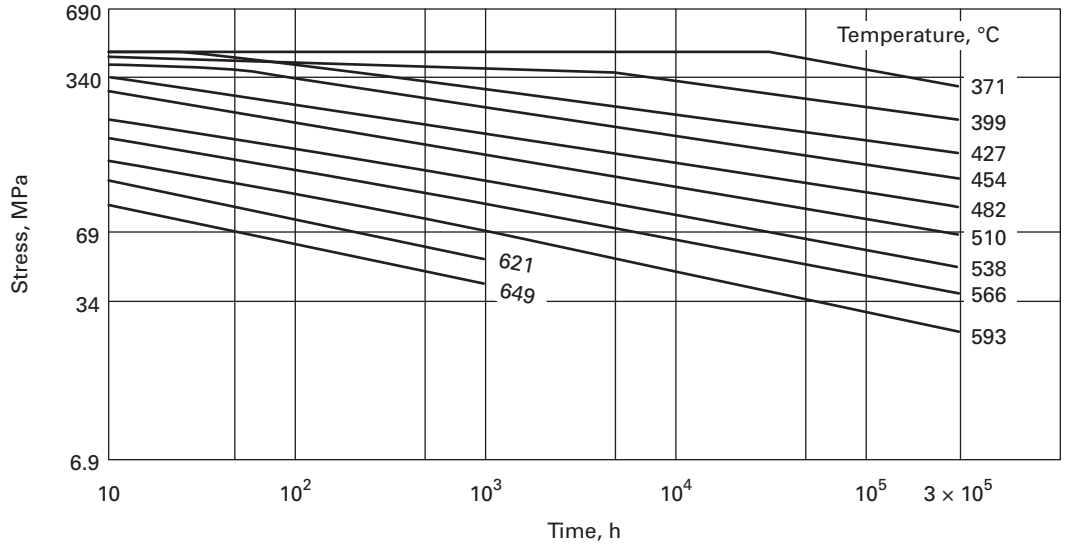
Temp., °C	1 h	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
425	445	445	445	445	445	445	445	445	445	445	445
450	437	437	437	437	437	437	437	437	419	395	372
475	431	431	431	431	430	429	409	389	352	317	286
500	419	419	419	419	401	381	349	322	285	248	219
525	406	406	388	371	340	307	275	248	226	183	158
550	393	381	350	323	289	268	230	203	173	147	125
575	380	347	311	283	249	223	194	169	142	120	100
600	357	300	266	241	212	185	159	136	112	94	79
625	315	259	229	205	179	155	130	110	89	72	59
650	275	224	199	176	151	129	107	88	70	57	46
675	244	194	170	150	127	108	89	71	57	44	35
700	212	167	147	128	106	89	72	57	45	34	27
725	186	144	127	108	92	76	60	47	36	27	21
750	163	125	109	91	76	63	50	38	29	21	16
775	144	109	94	78	64	52	41	30	23	16	12
800	124	92	79	65	54	42	32	24	18	12	9

Figure E-100.7-3
Expected Minimum Stress-to-Rupture Values, MPa, Ni–Fe–Cr (Alloy 800H)



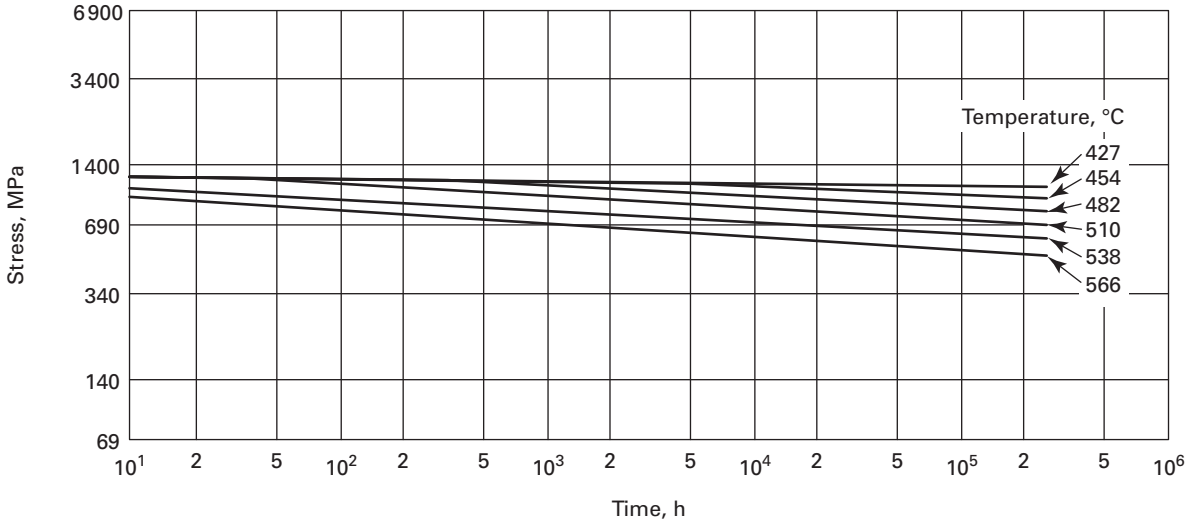
Temp., °C	1 h	3 h	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h	5×10^5 h
425	387	387	387	387	387	387	387	387	387	387	374	330	312
450	385	385	385	385	385	385	385	385	385	354	307	270	254
475	384	384	384	384	384	384	384	384	333	292	252	220	207
500	382	382	382	382	382	382	369	321	276	241	207	180	168
525	379	379	379	379	379	361	309	268	229	198	169	146	137
550	352	352	352	352	351	303	258	223	189	163	138	119	111
575	342	342	342	342	297	255	216	185	156	134	113	96	90
600	331	331	331	297	250	214	180	154	129	110	92	78	72
625	317	317	296	252	211	180	150	127	106	90	75	63	58
650	302	302	252	214	178	150	125	105	87	73	61	51	47
675	285	259	215	181	150	126	104	87	72	60	49	41	38
700	264	221	183	153	126	105	86	72	59	49	40	33	30
725	227	189	155	129	106	88	71	59	48	40	32	26	24
750	195	162	132	109	89	73	59	49	39	32	26	21	19
775	167	138	112	92	74	61	49	40	32	26	21	17	15
800	143	118	95	77	62	51	40	33	26	21	17	13	12
825	123	100	80	65	52	42	33	27	21	17	13	11	9.7
850	105	85	68	55	43	35	27	22	17	14	11	8.5	7.6
875	90	72	57	46	36	29	23	18	14	11	8.5	6.7	6.0
900	77	61	48	38	30	24	18	15	11	8.9	6.8	5.3	4.7

Figure E-100.7-4
Expected Minimum Stress-to-Rupture Values, MPa, 2¼Cr–1Mo



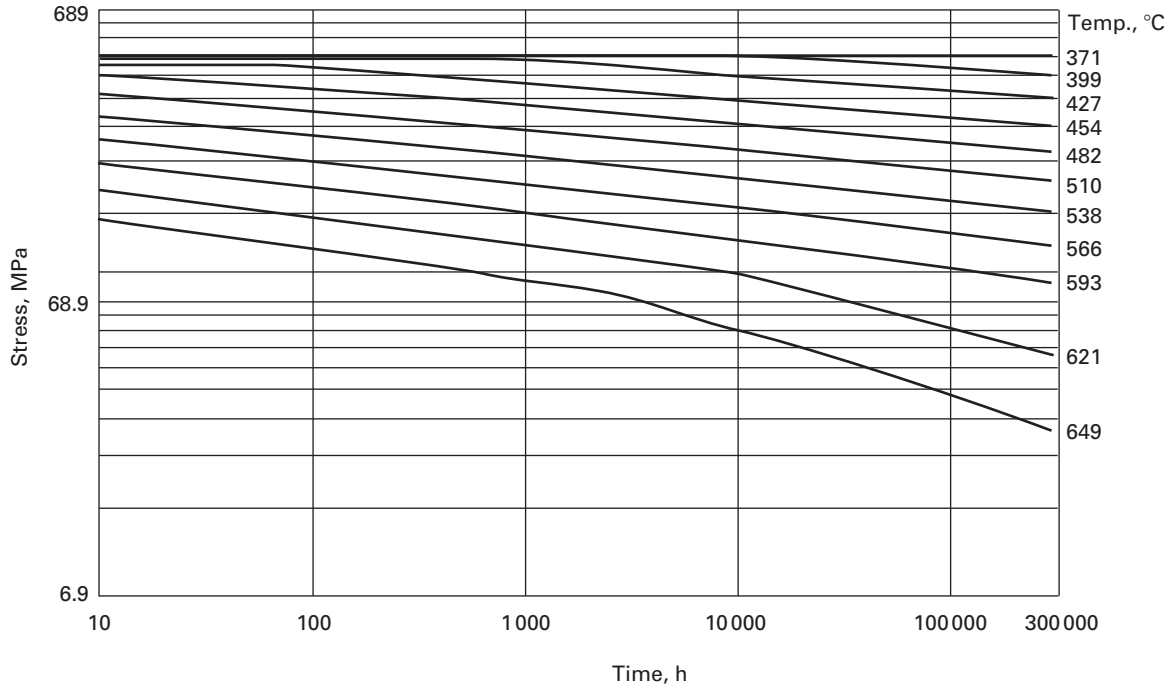
Temp., °C	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
375	406	405	404	403	401	399	396	392	356	323
400	400	393	386	375	363	350	328	296	256	233
425	387	384	373	337	301	266	245	216	191	170
450	363	353	325	287	249	221	197	172	151	133
475	328	299	265	236	205	183	159	140	121	105
500	291	256	222	194	167	148	128	112	96	83
525	244	214	184	161	137	118	103	88	71	70
550	196	175	150	132	112	96	81	68	58	48
575	168	145	122	106	89	76	63	52	43	36
600	138	117	98	85	69	...	...	...	...	...
625	114	94	77	65	52	...	...	...	...	...
650	92	76	62	51	43	...	...	...	...	...

Figure E-100.7-5
Expected Minimum Stress-to-Rupture Values, MPa, Ni–Cr–Fe–Mo–Cb (Alloy 718)



Temp., °C	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
425	1 160	1 160	1 160	1 160	1 160	1 160	1 160	1 160	1 100	1 060
450	1 180	1 180	1 180	1 180	1 180	1 150	1 110	1 060	1 020	985
475	1 180	1 180	1 180	1 150	1 110	1 070	1 020	974	924	883
500	1 170	1 150	1 120	1 070	1 030	975	926	881	825	775
525	1 123	1 060	1 020	962	920	865	812	759	704	649
550	1 050	987	938	891	833	778	723	672	609	558

Figure E-100.7-6
Expected Minimum Stress-to-Rupture Values, MPa, 9Cr–1Mo–V



Temp., °C	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
375	487	487	487	487	487	487	487	487	487	487
400	475	475	475	475	475	475	475	461	435	412
425	459	459	459	459	459	436	412	390	366	345
450	440	440	440	418	396	374	350	329	308	289
475	419	404	385	361	338	317	295	276	257	240
500	374	353	329	307	285	266	247	229	212	196
525	322	301	278	259	239	222	204	189	173	159
550	274	251	234	216	198	178	166	153	139	127
575	231	213	194	179	163	149	135	122	110	99
600	192	176	160	146	132	118	106	94	82	72
625	159	145	130	117	105	94	81	67	53	42
650	130	117	104	93	81	72	54	44	33	25

Table E-100.8-1
Stress Rupture Factors for Type 304 Stainless Steel Welded With SFA-5.22 E308T and E308LT, SFA-5.4 E308 and E308L, and SFA-5.9 ER308 and ER308L

Temp., °C	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
450	1.00	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.97	0.97
475	1.00	0.99	0.98	0.97	0.97	0.97	0.97	0.97	0.96	0.95
500	1.00	0.98	0.97	0.96	0.96	0.96	0.96	0.96	0.94	0.92
525	1.00	0.98	0.96	0.95	0.94	0.94	0.94	0.94	0.92	0.89
550	1.00	0.99	0.97	0.96	0.95	0.95	0.95	0.94	0.91	0.87
575	1.00	0.99	0.98	0.98	0.98	0.98	0.98	0.95	0.90	0.84
600	1.00	0.99	0.98	1.00	1.00	1.00	0.98	0.94	0.87	0.80
625	1.00	1.00	1.00	1.00	1.00	0.98	0.94	0.89	0.80	0.70
650	1.00	1.00	1.00	1.00	0.98	0.95	0.88	0.81	0.71	0.60
675	1.00	1.00	0.97	0.97	0.92	0.88	0.79	0.70	0.58	0.47

Table E-100.8-2
Stress Rupture Factors for Type 304 Stainless Steel Welded With SFA-5.22 EXXXT-G (16-8-2 Chemistry), SFA-5.4 E16-8-2, and SFA-5.9 ER16-8-2

Temp., °C	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
450	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
475	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
500	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
525	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
550	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
575	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
600	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
625	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
650	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Table E-100.8-3
Stress Rupture Factors for Type 304 Stainless Steel Welded With SFA-5.22 E316T and E316LT-1, -2, and -3; SFA-5.4 E316 and E316L; and SFA-5.9 ER316 and ER316L

Temp., °C	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
450	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.98	0.95
475	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.96	0.91
500	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.96	0.93	0.87
525	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.95	0.90	0.84
550	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.96	0.89	0.81
575	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.89	0.79
600	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.87	0.77
625	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.96	0.84	0.75
650	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.79	0.68
675	1.00	1.00	1.00	1.00	1.00	1.00	0.96	0.86	0.73	0.62
700	1.00	1.00	1.00	1.00	1.00	1.00	0.90	0.79	0.66	0.55
725	1.00	1.00	1.00	1.00	1.00	0.94	0.83	0.72	0.61	0.50
750	1.00	1.00	1.00	1.00	0.95	0.87	0.76	0.65	0.54	0.46

Table E-100.9-1
Stress Rupture Factors for Type 316 Stainless Steel Welded With SFA-5.22 E308T and E308LT, SFA-5.4 E308 and E308L, and SFA-5.9 ER308 and ER308L

Temp., °C	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
450	1.00	0.98	0.96	0.96	0.96	0.95	0.93	0.93	0.93	0.93
475	1.00	0.95	0.90	0.90	0.90	0.89	0.86	0.86	0.85	0.85
500	1.00	0.91	0.83	0.83	0.83	0.83	0.79	0.79	0.76	0.76
525	1.00	0.88	0.78	0.78	0.77	0.76	0.73	0.72	0.68	0.67
550	1.00	0.88	0.76	0.76	0.75	0.74	0.72	0.70	0.65	0.61
575	1.00	0.89	0.79	0.79	0.78	0.77	0.75	0.72	0.68	0.61
600	0.98	0.90	0.82	0.81	0.79	0.79	0.76	0.72	0.68	0.62
625	0.91	0.88	0.85	0.82	0.79	0.77	0.74	0.70	0.65	0.58
650	0.81	0.80	0.79	0.79	0.76	0.75	0.70	0.64	0.57	0.49
675	0.79	0.78	0.76	0.74	0.73	0.69	0.64	0.57	0.49	0.40
700	0.75	0.74	0.71	0.69	0.64	0.60	0.54	0.47	0.39	0.31

Table E-100.9-2
Stress Rupture Factors for Type 316 Stainless Steel Welded With SFA-5.22 EXXXT-G (16-8-2 Chemistry), SFA-5.4 E16-8-2, and SFA-5.9 ER16-8-2

Temp., °C	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
450	1.00	0.97	0.92	0.92	0.92	0.91	0.91	0.90	0.89	0.88
475	1.00	0.95	0.89	0.84	0.84	0.83	0.80	0.79	0.77	0.76
500	1.00	0.93	0.87	0.85	0.84	0.82	0.81	0.79	0.77	0.76
525	1.00	0.93	0.88	0.88	0.88	0.86	0.85	0.84	0.83	0.82
550	0.97	0.93	0.91	0.91	0.91	0.90	0.89	0.90	0.87	0.85
575	0.92	0.92	0.92	0.93	0.93	0.93	0.93	0.94	0.92	0.89
600	0.91	0.91	0.93	0.94	0.94	0.96	0.96	0.97	0.97	0.97
625	0.91	0.91	0.93	0.95	0.95	0.96	0.98	0.99	0.99	1.00
650	0.89	0.89	0.90	0.92	0.93	0.97	0.99	1.00	1.00	1.00

Table E-100.9-3
Stress Rupture Factors for Type 316 Stainless Steel Welded With SFA-5.22 E316T and E316LT-1 and -2, SFA-5.4 E316 and E316L, and SFA-5.9 ER316 and ER316L

Temp., °C	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
450	1.00	1.00	0.99	0.98	0.97	0.97	0.96	0.95	0.93	0.90
475	1.00	1.00	0.98	0.96	0.93	0.91	0.90	0.88	0.85	0.81
500	1.00	1.00	0.96	0.91	0.88	0.86	0.83	0.81	0.76	0.72
525	1.00	1.00	0.91	0.88	0.85	0.81	0.77	0.74	0.67	0.63
550	1.00	1.00	0.90	0.87	0.85	0.81	0.76	0.72	0.64	0.57
575	1.00	1.00	0.93	0.92	0.88	0.84	0.79	0.74	0.67	0.57
600	1.00	1.00	0.97	0.95	0.90	0.87	0.81	0.75	0.68	0.61
625	1.00	1.00	1.00	0.96	0.91	0.87	0.81	0.75	0.65	0.58
650	1.00	1.00	0.96	0.95	0.90	0.87	0.81	0.72	0.64	0.55
675	1.00	1.00	0.96	0.93	0.89	0.84	0.77	0.69	0.60	0.51
700	1.00	0.98	0.93	0.90	0.84	0.80	0.73	0.66	0.57	0.48
725	0.99	0.96	0.90	0.85	0.79	0.74	0.67	0.61	0.53	0.46
750	0.96	0.92	0.84	0.79	0.73	0.69	0.62	0.56	0.49	0.43

Table E-100.10-1
Stress Rupture Factors for Alloy 800H Welded With SFA-5.11 ENiCrFe-2 (INCO A)

Temp., °C	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
450–475	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
500	1.00	1.00	1.00	1.00	0.99	0.97	0.95	0.94	0.91	0.89
525	1.00	1.00	1.00	1.00	0.98	0.94	0.91	0.88	0.84	0.80
550	1.00	1.00	1.00	1.00	0.98	0.94	0.90	0.86	0.82	0.77
575	1.00	1.00	1.00	1.00	0.98	0.94	0.89	0.85	0.80	0.76
600	1.00	1.00	1.00	1.00	0.98	0.94	0.89	0.84	0.79	0.74
625	1.00	1.00	1.00	1.00	0.98	0.93	0.88	0.83	0.77	0.72
650	1.00	1.00	1.00	1.00	0.98	0.93	0.87	0.81	0.75	0.70
675	1.00	1.00	1.00	1.00	0.98	0.92	0.85	0.80	0.73	0.68
700	1.00	1.00	1.00	1.00	0.97	0.91	0.84	0.77	0.71	0.65
725	1.00	1.00	1.00	1.00	0.96	0.90	0.83	0.76	0.69	0.63
750	1.00	1.00	1.00	1.00	0.95	0.88	0.81	0.74	0.66	0.60

Table E-100.10-2
Stress Rupture Factors for Alloy 800H Welded With SFA-5.14 ERNiCr-3 (INCO 82)

Temp., °C	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
450–475	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
500	0.93	0.94	0.94	0.94	0.93	0.93	0.92	0.92	0.91	0.91
525	0.87	0.88	0.88	0.88	0.87	0.87	0.86	0.85	0.84	0.83
550	0.86	0.87	0.87	0.87	0.86	0.85	0.84	0.84	0.82	0.81
575	0.89	0.89	0.89	0.89	0.88	0.88	0.86	0.84	0.83	0.81
600	0.92	0.92	0.92	0.91	0.89	0.88	0.87	0.85	0.83	0.81
625	0.94	0.93	0.93	0.92	0.90	0.89	0.87	0.85	0.83	0.81
650	0.96	0.96	0.95	0.93	0.92	0.90	0.88	0.86	0.83	0.81
675	0.99	0.98	0.96	0.95	0.93	0.91	0.88	0.85	0.82	0.80
700	1.00	1.00	0.98	0.96	0.93	0.91	0.88	0.85	0.82	0.78
725	1.00	1.00	0.99	0.96	0.94	0.91	0.87	0.84	0.78	0.71
750	1.00	1.00	1.00	0.97	0.94	0.90	0.82	0.76	0.67	0.59

Table E-100.11-1
Stress Rupture Factors for 2¼Cr–1Mo (415/205) Welded With SFA-5.28 E90C-B3, SFA-5.28 ER90S-B3, SFA-5.5 E90XX-B3 (>0.05C), SFA-5.23 EB3, SFA-5.23 ECB3 (>0.05C), and SFA-5.29 E90T1-B3 (>0.05C)

Temp., °C	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
400–450	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
475	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
500	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.97
525	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.97	0.94
550	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.97	0.94	0.90
575	1.00	1.00	1.00	1.00	1.00	0.99	0.97	0.93	0.89	0.85
600	1.00	1.00	1.00	1.00	0.99	0.97	0.93	0.89	0.84	0.79
625	1.00	1.00	1.00	1.00	0.98	0.94	0.90	0.86	0.80	0.75
650	1.00	1.00	1.00	0.98	0.93	0.89	0.83	0.78	0.71	0.66

Table E-100.12-1
Stress Rupture Factors for 9Cr–1Mo–V Welded With SFA-5.28 ER90S-B9, SFA-5.5 E90XX-B9, and SFA-5.23 EB9

Temp., °C	Ratio
425	1.0
450	0.95
475	0.93
500	0.92
525	0.91
550	0.89
575	0.87
600	0.84
625	0.80
650	0.76

Table E-100.13-1
Permissible Materials for Bolting

Material	Spec. No.	Grades
Type 304 SS	SA-193	B8, Class 1 and B8A, Class 1A [Note (1)]
Type 316 SS	SA-193	B8M, Class 1 and B8MA, Class 1A [Note (1)]
Ni–Cr–Fe–Mo–Cb Alloy 718 [Note (2)], [Note (3)], [Note (4)]	SB-637	N07718

GENERAL NOTE: If bolting temperatures do not exceed those given in Table 4 for the bolting material, the S_m values in Table 4 shall apply. For elevated temperatures, the list of materials shown above can be used in bolting applications.

NOTES:
(1) For use at temperatures above 540°C, these materials may be used only if the material is heat treated by heating to a minimum temperature of 1 040°C and quenching in water or rapidly cooling by other means.
(2) Maximum forging diameter shall be limited to 150 mm.
(3) Welding is not permitted.
(4) Precautionary Note: In use of Alloy 718, consideration shall be given to a reduction in toughness caused by long-term exposure at a temperature of 540°C or greater.

Table E-100.14-1
S_o — Maximum Allowable Stress Intensity, MPa, for Design Condition Calculations of Bolting Materials

For Metal Temperature Not Exceeding, °C	304 SS	316 SS	Alloy 718
425	38	40	230
450	38	40	228
475	37	39	227
500	37	39	226
525	36	39	224
550	35	39	222
575	35	39	...
600	34	38	...
625	33	37	...
650	32	37	...
675	32	37	...
700	27	29	...

Figure E-100.15-1
S_{mt} — Allowable Stress Intensity, Type 304 SS, Bolting

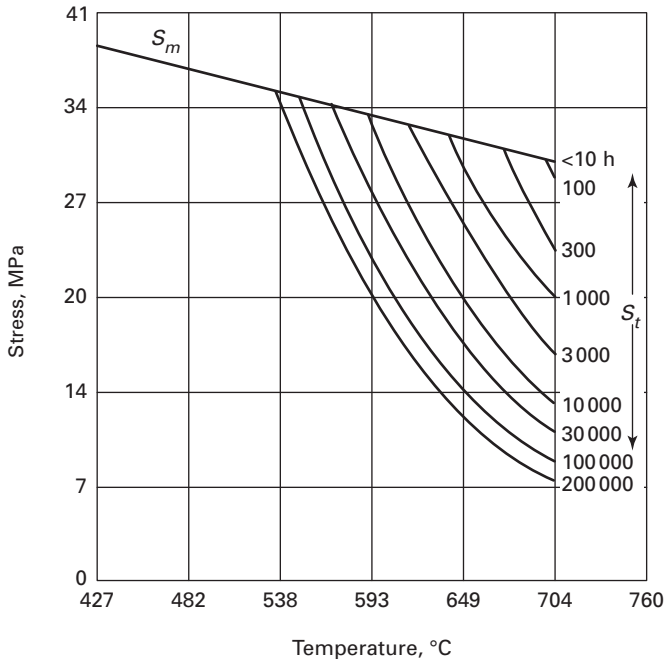


Figure E-100.15-2
S_{mt} — Allowable Stress Intensity, Type 316 SS, Bolting

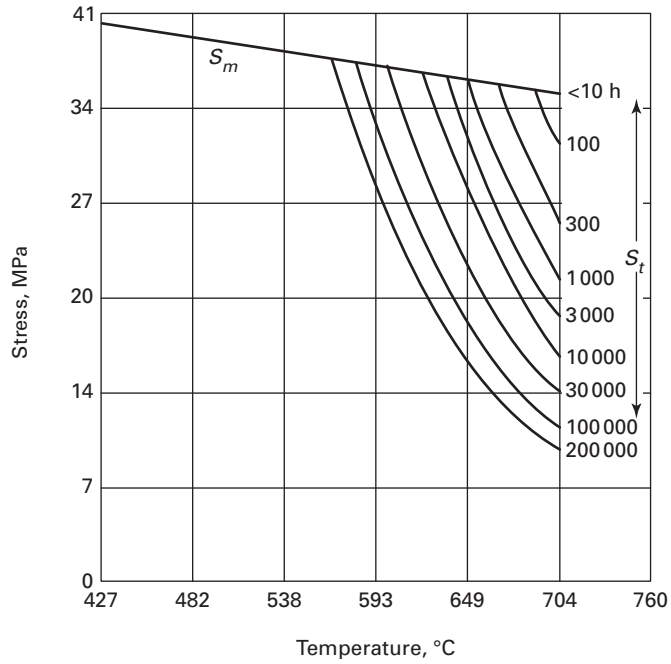
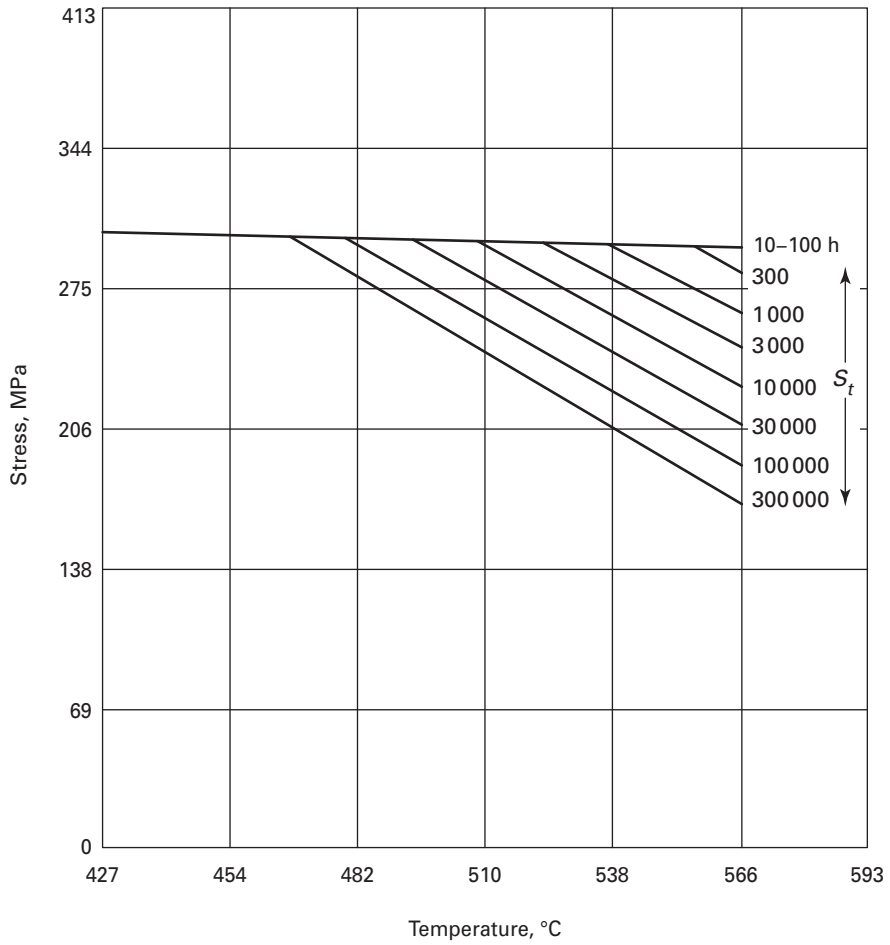
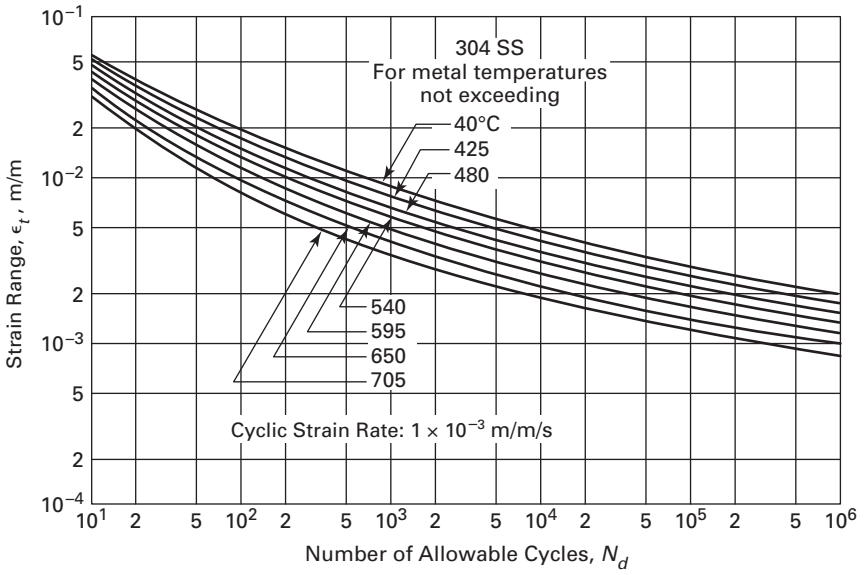


Figure E-100.15-3
S_{mt} — Allowable Stress Values, MPa, Alloy 718, Bolting



Temp., °C	10 h	30 h	10^2 h	3×10^2 h	10^3 h	3×10^3 h	10^4 h	3×10^4 h	10^5 h	3×10^5 h
425	306	306	306	306	306	306	306	306	306	306
450	304	304	304	304	304	304	304	304	304	304
475	303	303	303	303	303	303	303	303	300	300
500	301	301	301	301	301	301	298	288	275	263
525	298	298	298	298	298	290	282	261	242	224
550	296	296	296	292	282	265	250	228	208	191

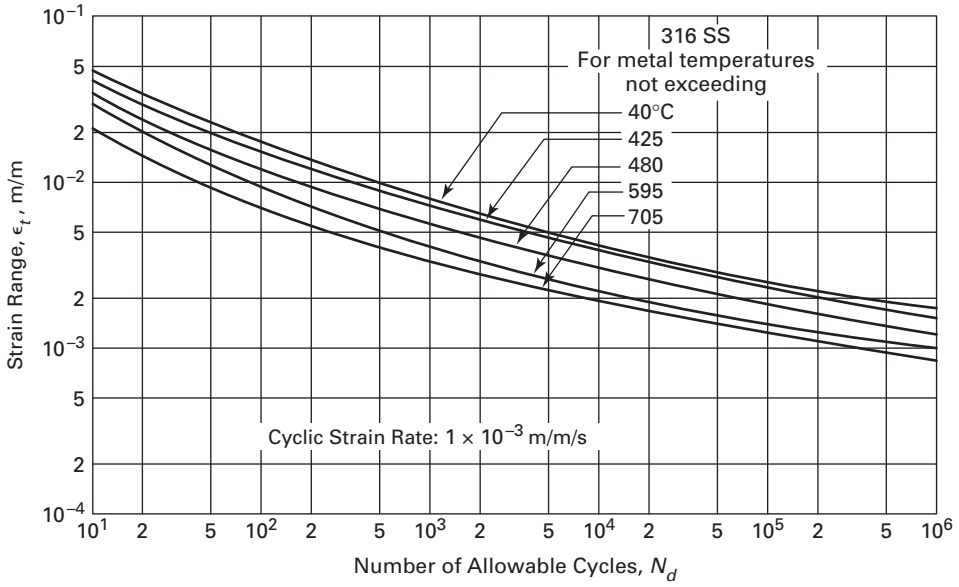
Figure E-100.16-1
Design Fatigue Strain Range, ϵ_t, for 304 SS



Number of Cycles, N_d [Note (1)]	Strain Range, ϵ_t (m/m), at Temperature						
	40°C	425°C	480°C	540°C	595°C	650°C	705°C
10	0.051	0.050	0.0465	0.0425	0.0382	0.0335	0.0297
20	0.036	0.0345	0.0315	0.0284	0.025	0.0217	0.0186
40	0.0263	0.0246	0.0222	0.0197	0.017	0.0146	0.0123
10^2	0.018	0.0164	0.0146	0.0128	0.011	0.0093	0.0077
2×10^2	0.0142	0.0125	0.011	0.0096	0.0082	0.0069	0.0057
4×10^2	0.0113	0.00965	0.00845	0.00735	0.0063	0.00525	0.00443
10^3	0.00845	0.00725	0.0063	0.0055	0.0047	0.00385	0.00333
2×10^3	0.0067	0.0059	0.0051	0.0045	0.0038	0.00315	0.00276
4×10^3	0.00545	0.00485	0.0042	0.00373	0.0032	0.00263	0.0023
10^4	0.0043	0.00385	0.00335	0.00298	0.0026	0.00215	0.00185
2×10^4	0.0037	0.0033	0.0029	0.00256	0.00226	0.00187	0.00158
4×10^4	0.0032	0.00287	0.00254	0.00224	0.00197	0.00162	0.00138
10^5	0.00272	0.00242	0.00213	0.00188	0.00164	0.0014	0.00117
2×10^5	0.0024	0.00215	0.0019	0.00167	0.00145	0.00123	0.00105
4×10^5	0.00215	0.00192	0.0017	0.0015	0.0013	0.0011	0.00094
10^6	0.0019	0.00169	0.00149	0.0013	0.00112	0.00098	0.00084

NOTE:
(1) Cyclic strain rate: 1×10^{-3} m/m/s.

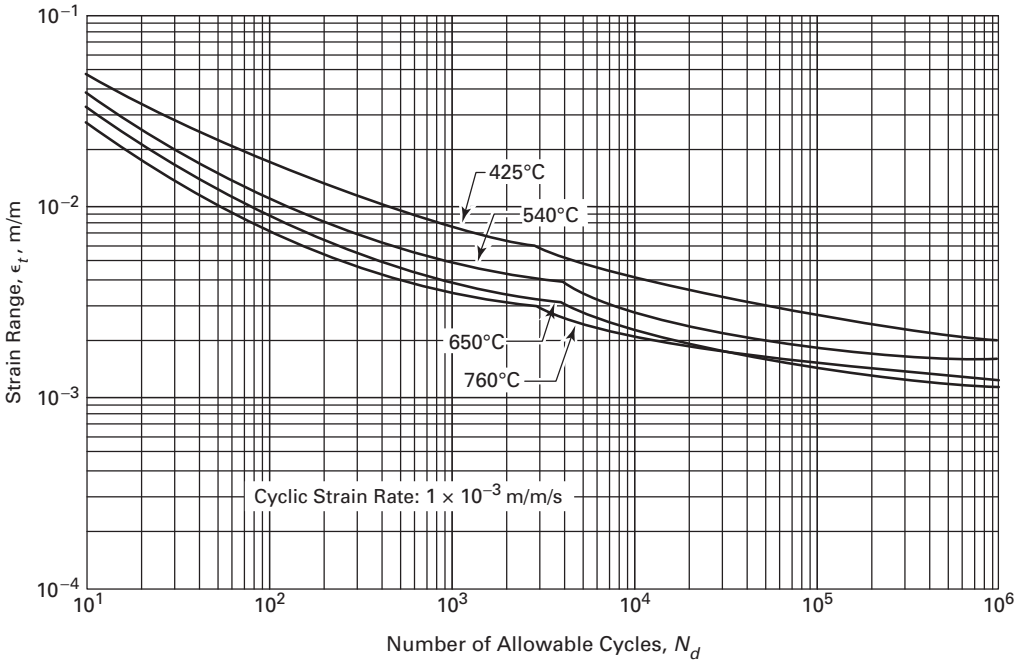
Figure E-100.16-2
Design Fatigue Strain Range, ϵ_t, for 316 SS



Number of Cycles, N_d [Note (1)]	Strain Range, ϵ_t (m/m), at Temperature				
	40°C	425°C	480°C	540°C to 650°C	705°C
10^1	0.0507	0.0438	0.0378	0.0318	0.0214
2×10^1	0.0357	0.0318	0.0251	0.0208	0.0149
4×10^1	0.026	0.0233	0.0181	0.0148	0.0105
10^2	0.0177	0.0159	0.0123	0.00974	0.00711
2×10^2	0.0139	0.0125	0.00961	0.00744	0.00551
4×10^2	0.0110	0.00956	0.00761	0.00574	0.00431
10^3	0.00818	0.00716	0.00571	0.00424	0.00328
2×10^3	0.00643	0.00581	0.00466	0.00339	0.00268
4×10^3	0.00518	0.00476	0.00381	0.00279	0.00226
10^4	0.00403	0.00376	0.00301	0.00221	0.00186
2×10^4	0.00343	0.00316	0.00256	0.00186	0.00162
4×10^4	0.00293	0.00273	0.00221	0.00161	0.00144
10^5	0.00245	0.00226	0.00182	0.00136	0.00121
2×10^5	0.00213	0.00196	0.00159	0.00121	0.00108
4×10^5	0.00188	0.00173	0.00139	0.00109	0.000954
10^6	0.00163	0.00151	0.00118	0.000963	0.000834

NOTE:
(1) Cyclic strain rate: 1×10^{-3} m/m/s.

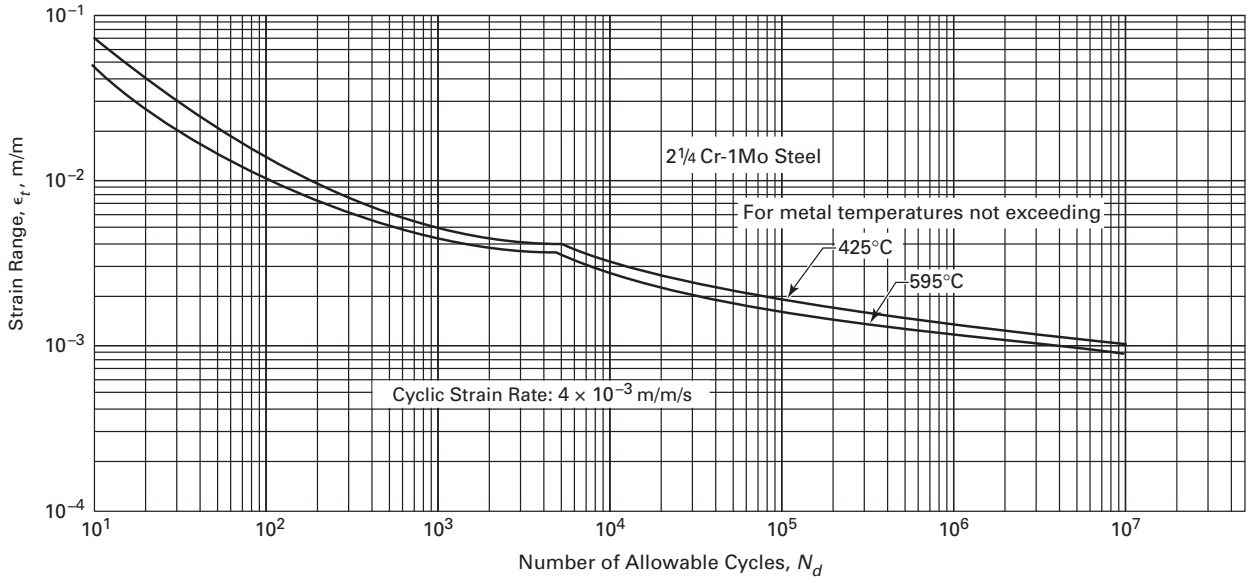
Figure E-100.16-3
Design Fatigue Strain Range, ϵ_t, for Ni–Fe–Cr Alloy 800H



Number of Cycles, N_d [Note (1)]	Strain Range, ϵ_t (m/m), at Temperature			
	425°C	540°C	650°C	760°C
10^1	0.0500	0.0424	0.03414	0.02841
2×10^1	0.0362	0.02735	0.02199	0.01829
4×10^1	0.0027	0.01849	0.01483	0.01233
10^2	0.0184	0.01164	0.00932	0.00774
2×10^2	0.0142	0.00849	0.00678	0.00562
4×10^2	0.0113	0.00660	0.00533	0.00469
10^3	0.00841	0.00515	0.00417	0.00388
2×10^3	0.00685	0.00454	0.00366	0.00349
3×10^3	0.00644	0.00433	0.00347	0.00309
4×10^3	0.00572	0.00409	0.00327	0.00270
10^4	0.00452	0.00293	0.00234	0.00212
2×10^4	0.00392	0.00243	0.00197	0.00183
4×10^4	0.00343	0.00212	0.00175	0.00164
10^5	0.00288	0.00194	0.00155	0.00149
2×10^5	0.00254	0.00186	0.00147	0.00140
4×10^5	0.00229	0.00178	0.00140	0.00132
10^6	0.00200	0.00169	0.00131	0.00122

NOTE:
(1) Cyclic strain rate: 1×10^{-3} m/m/s.

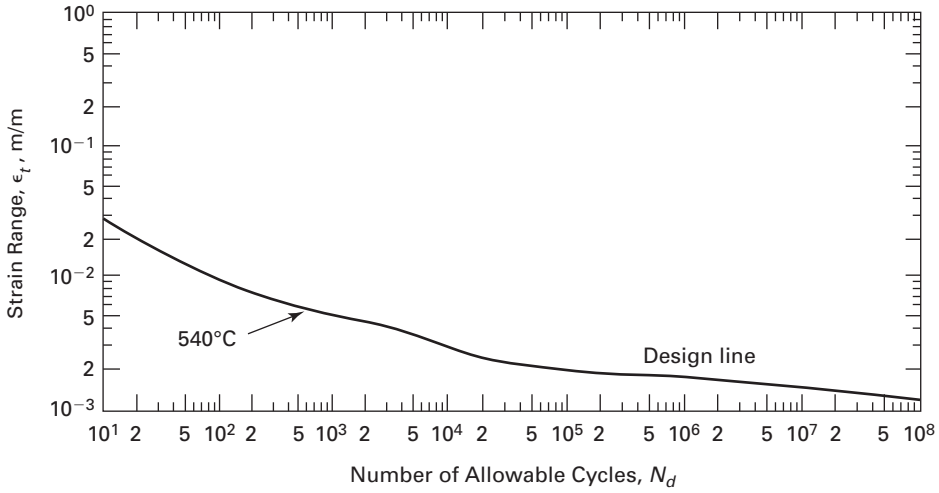
Figure E-100.16-4
Design Fatigue Strain Range, ϵ_t, for 2¼Cr–1Mo Steel



Number of Cycles, N_d [Note (1)]	Strain Range, ϵ_t (m/m), at Temperature	
	425°C	480°C to 595°C
10^1	0.056	0.040
4×10^1	0.023	0.0163
10^2	0.013	0.0097
2×10^2	0.0094	0.0070
4×10^2	0.0070	0.0056
10^3	0.0052	0.0042
2×10^3	0.0044	0.0039
4×10^3	0.0040	0.0035
10^4	0.0032	0.00265
2×10^4	0.0026	0.00215
4×10^4	0.0023	0.00182
10^5	0.00195	0.00158
2×10^5	0.00173	0.00142
4×10^5	0.00155	0.00130
10^6	0.00137	0.00118

NOTE:
(1) Cyclic strain rate: 4×10^{-3} m/m/s.

Figure E-100.16-5
Design Fatigue Strain Range, ϵ_t, for 9Cr–1Mo–V Steel



Number of Cycles, N_d [Note (1)]	Strain Range, ϵ_t (m/m), at 540°C Temperature
10	0.028
20	0.019
40	0.0138
10^2	0.0095
2×10^2	0.0075
4×10^2	0.0062
10^3	0.0050
2×10^3	0.0044
4×10^3	0.0039
10^4	0.0029
2×10^4	0.0024
4×10^4	0.0021
10^5	0.0019
2×10^5	0.00176
4×10^5	0.0017
10^6	0.00163
2×10^6	0.00155
4×10^6	0.00148
10^7	0.00140
2×10^7	0.00132
4×10^7	0.00125
10^8	0.00120

NOTE:
(1) Cyclic strain rate: 4×10^{-3} m/m/s.

Figure E-100.17-1
Time–Temperature Limits for Application of Section II External Pressure Charts for Cylinder Under Axial Compression

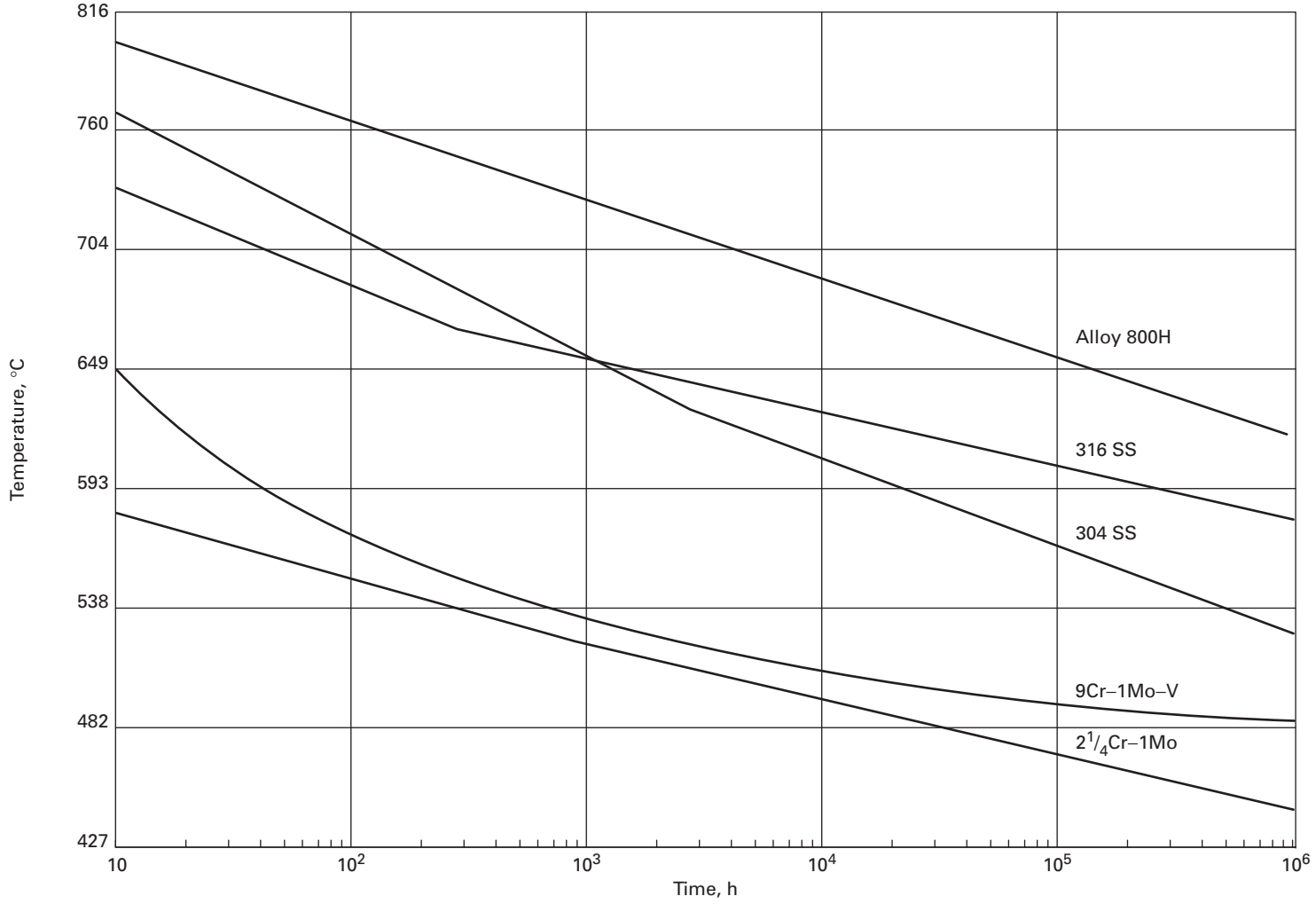


Figure E-100.17-2
Time–Temperature Limits for Application of Section II External Pressure Charts for Sphere Under External Pressure

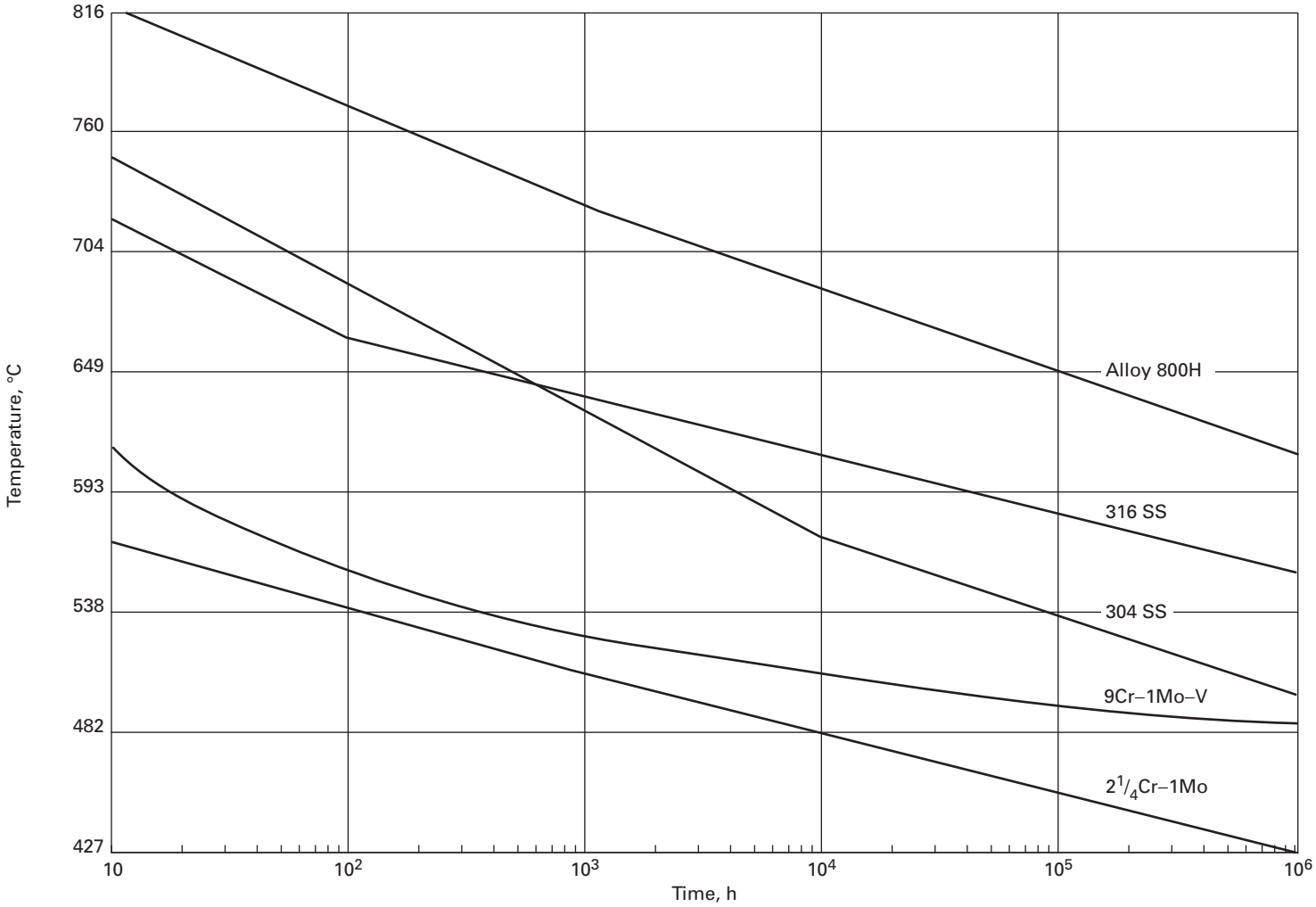


Figure E-100.17-3
Temperature Limits for Application of Section II External Pressure Charts for Cylinder Under External Pressure

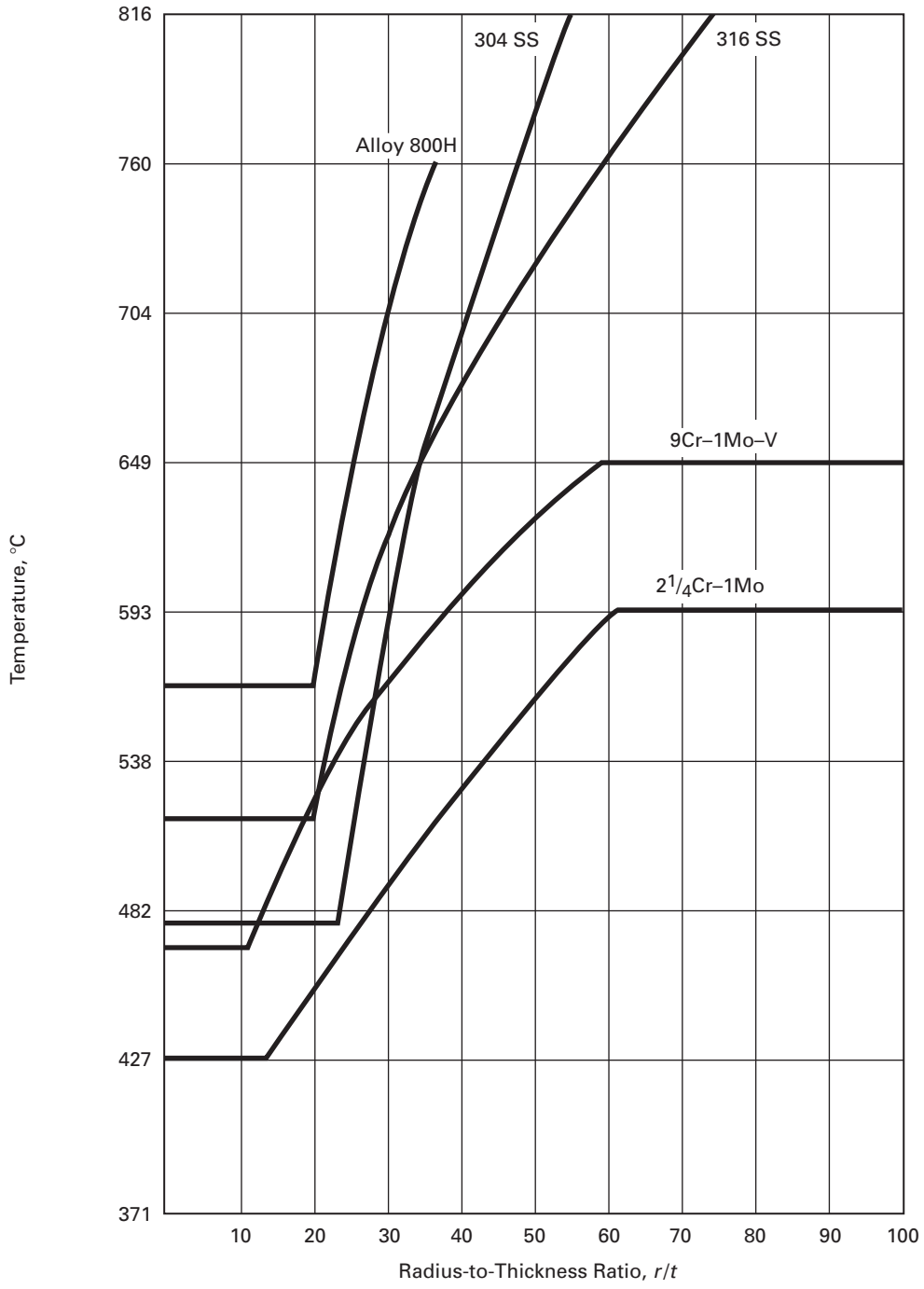


Figure E-100.18-1
Average Isochronous Stress–Strain Curves for Type 304 SS at 427°C

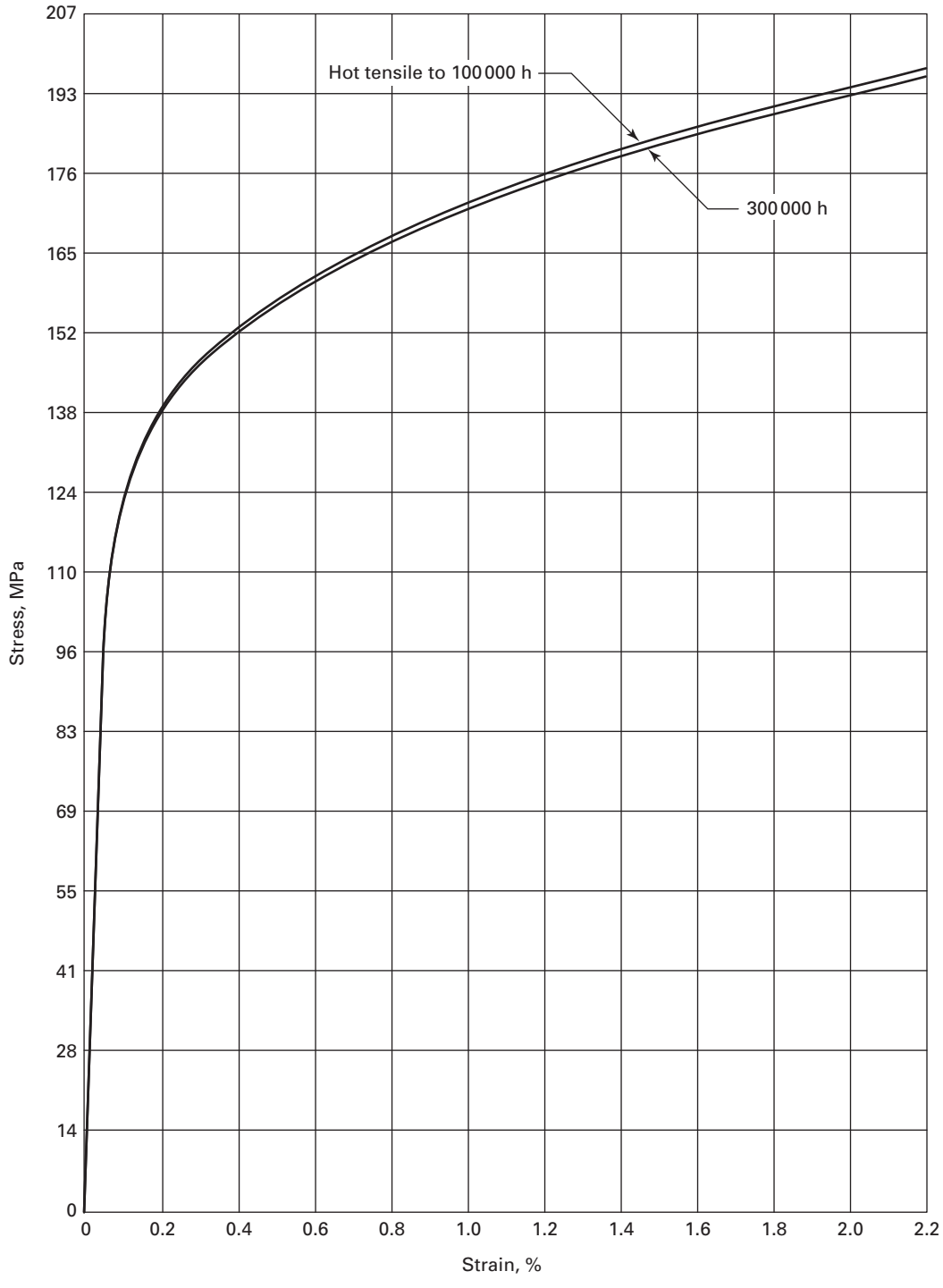


Figure E-100.18-2
Average Isochronous Stress–Strain Curves for Type 304 SS at 454°C

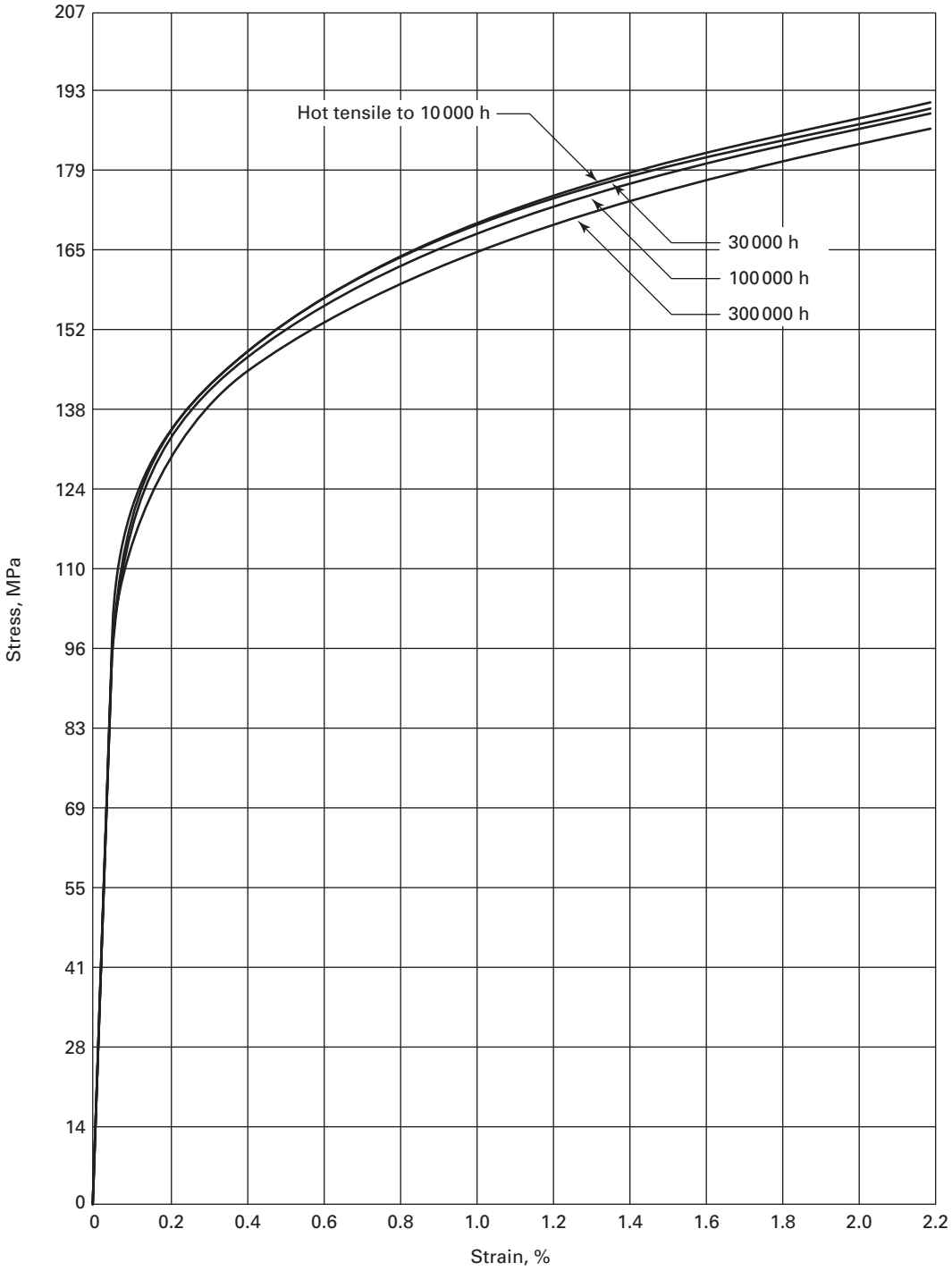


Figure E-100.18-3
Average Isochronous Stress–Strain Curves for Type 304 SS at 482°C

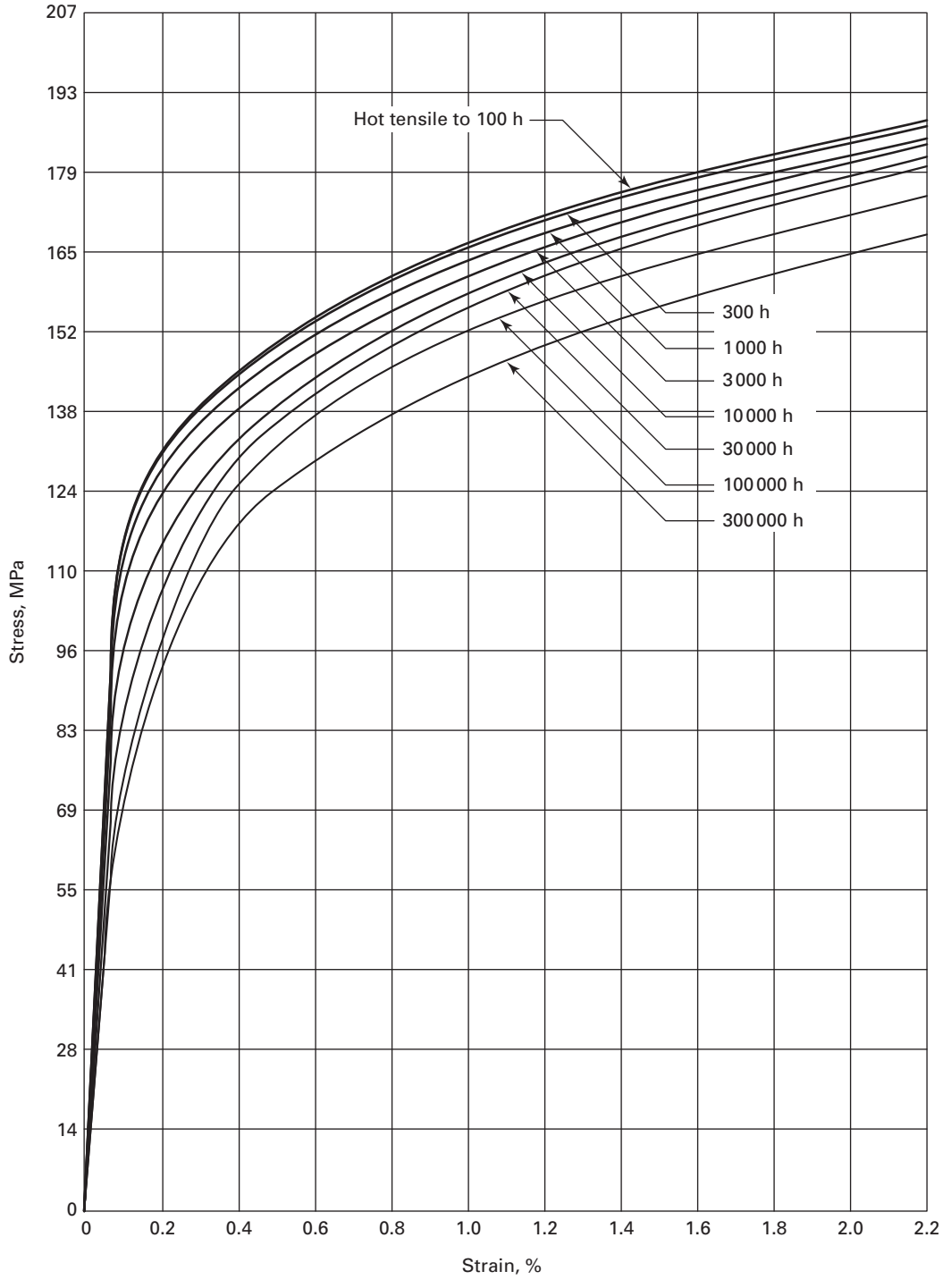


Figure E-100.18-4
Average Isochronous Stress–Strain Curves for Type 304 SS at 510°C

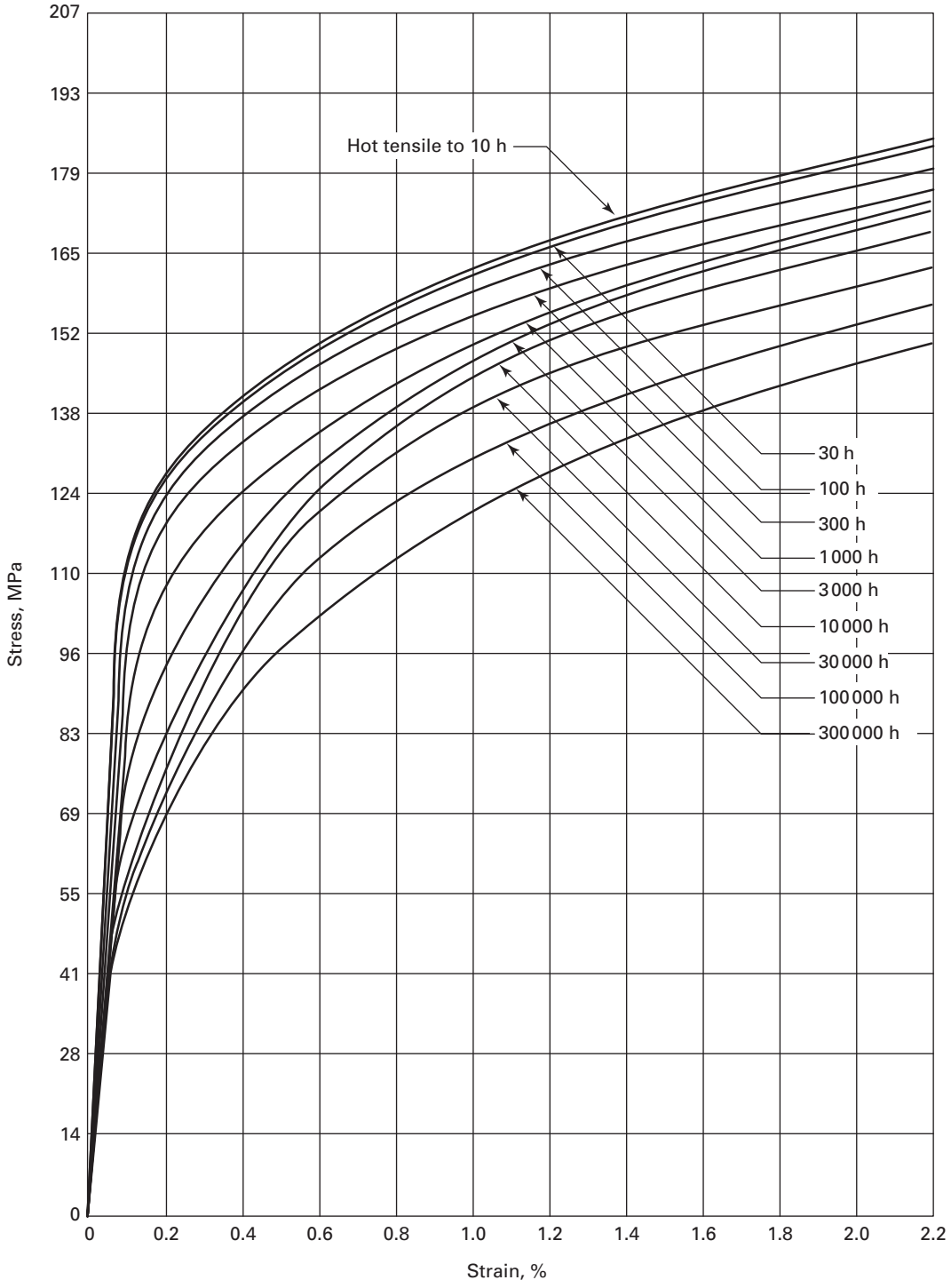


Figure E-100.18-5
Average Isochronous Stress–Strain Curves for Type 304 SS at 538°C

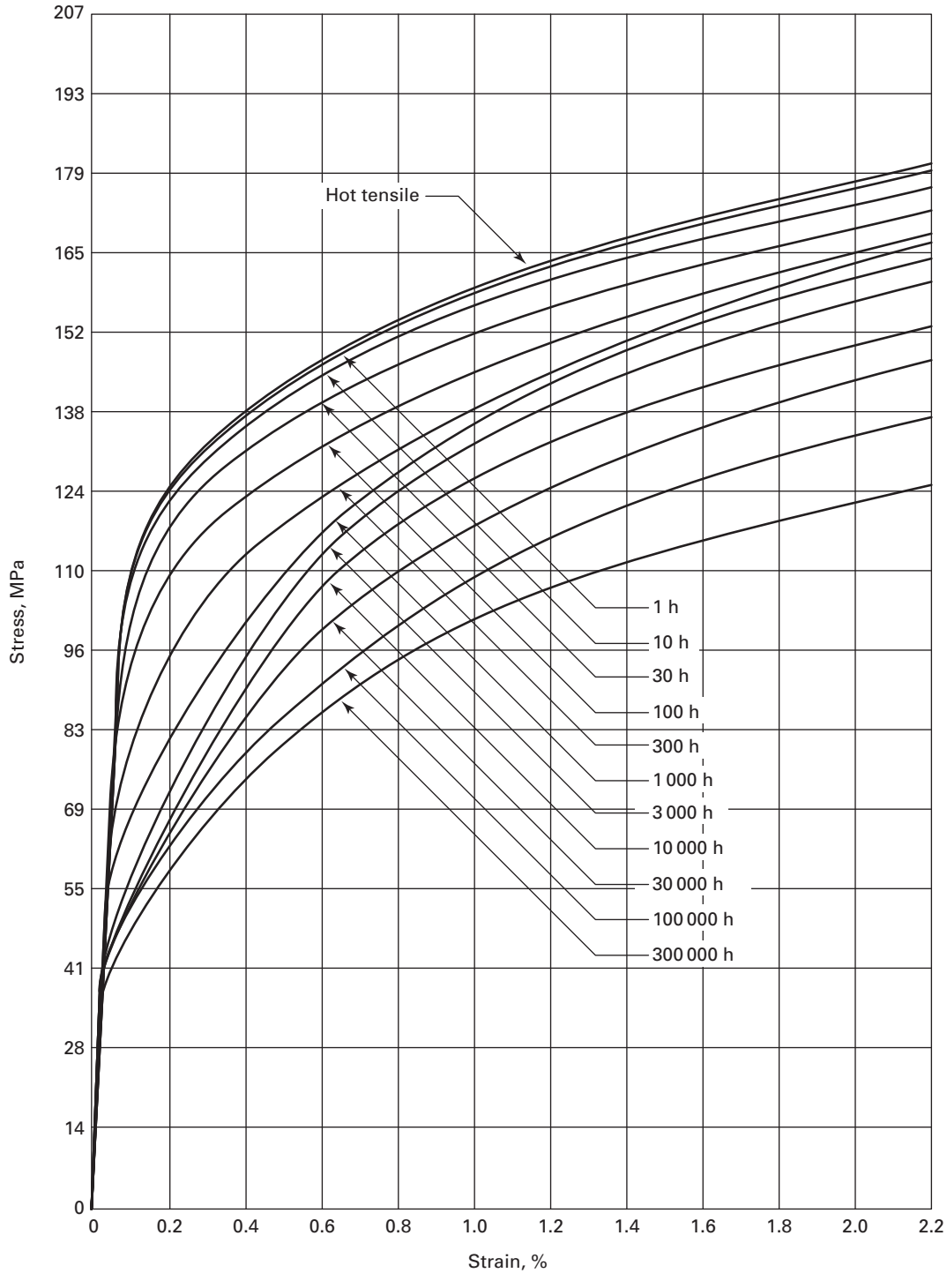


Figure E-100.18-6
Average Isochronous Stress–Strain Curves for Type 304 SS at 566°C

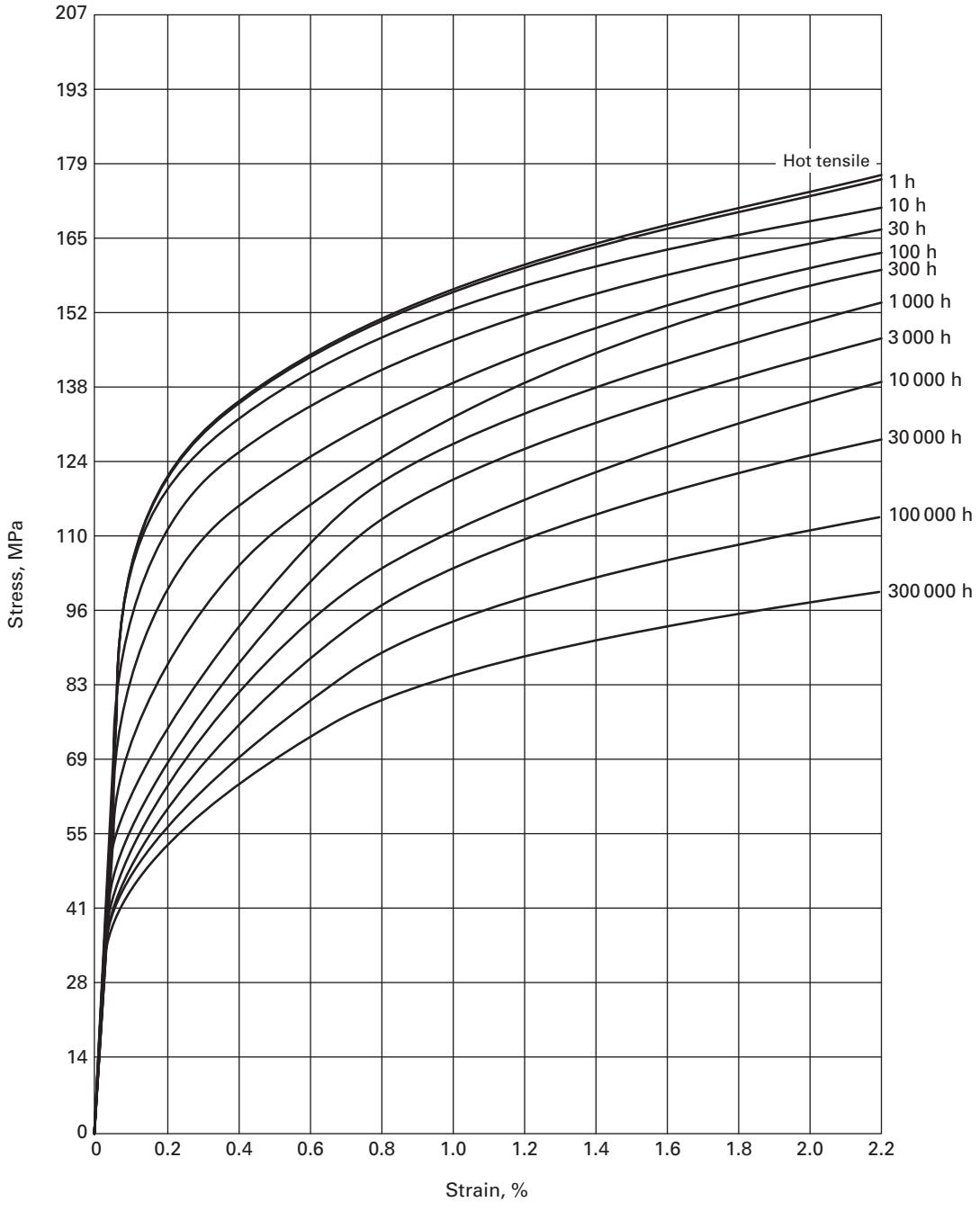


Figure E-100.18-7
Average Isochronous Stress–Strain Curves for Type 304 SS at 593°C

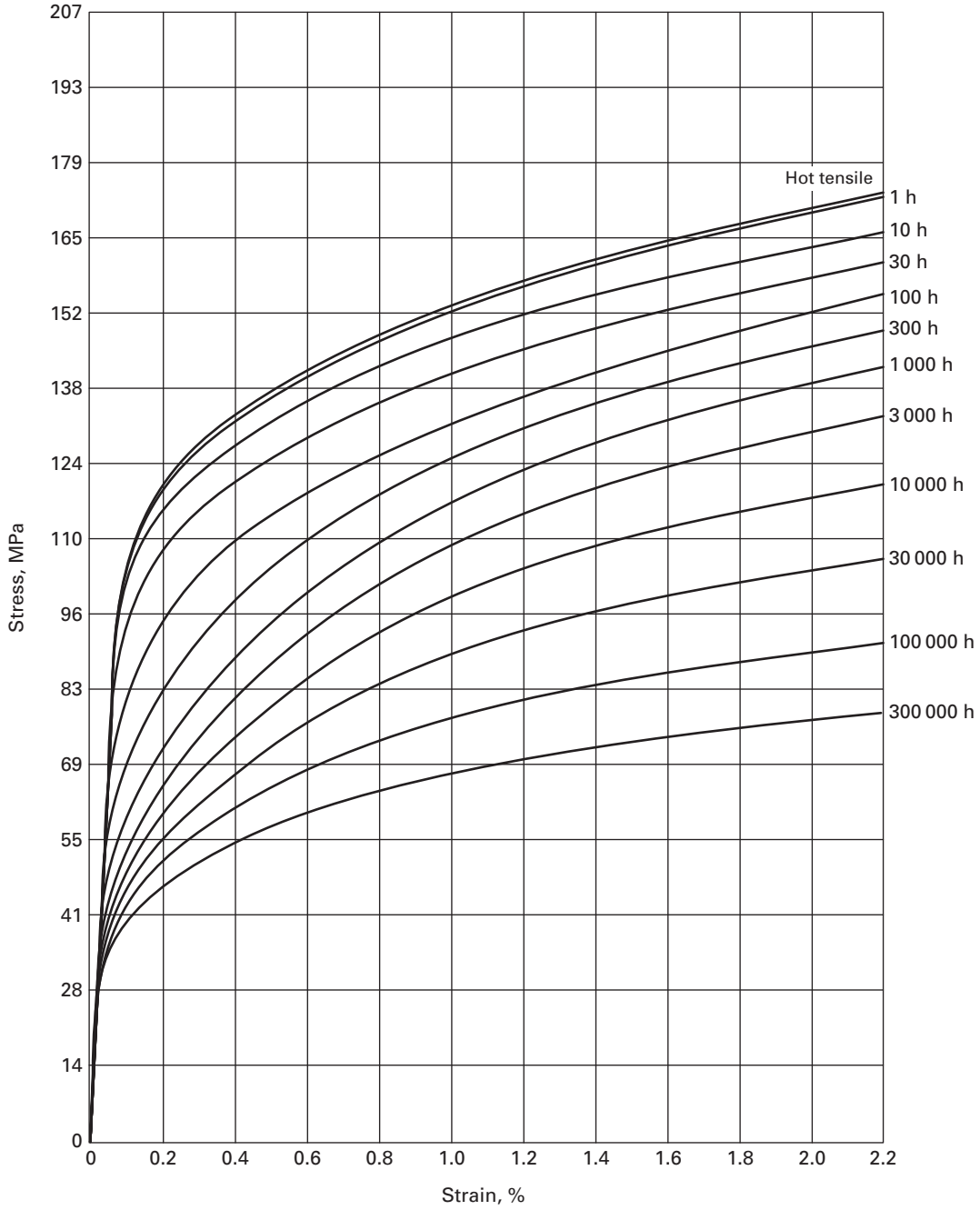


Figure E-100.18-8
Average Isochronous Stress–Strain Curves for Type 304 SS at 621°C

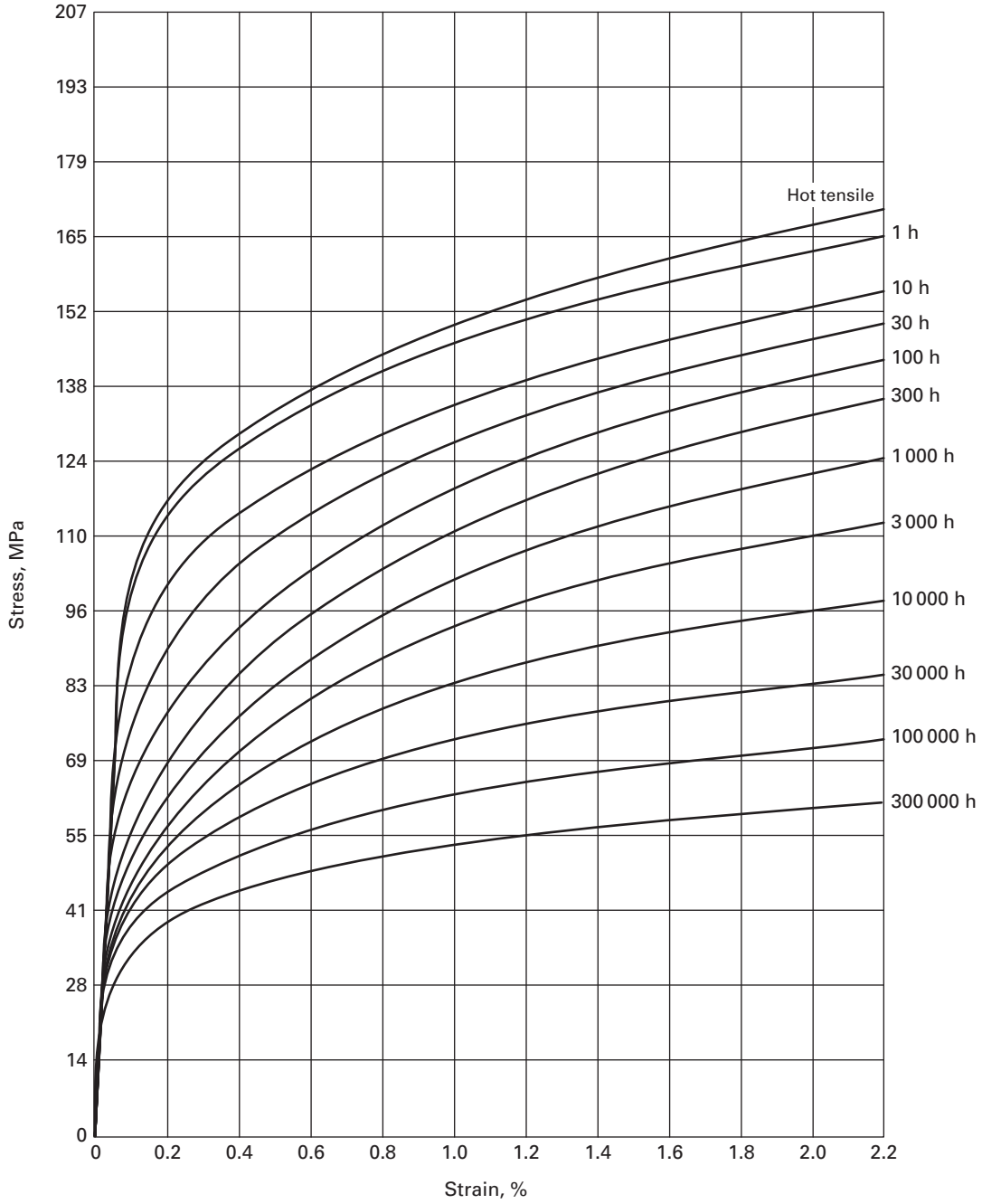


Figure E-100.18-9
Average Isochronous Stress–Strain Curves for Type 304 SS at 649°C

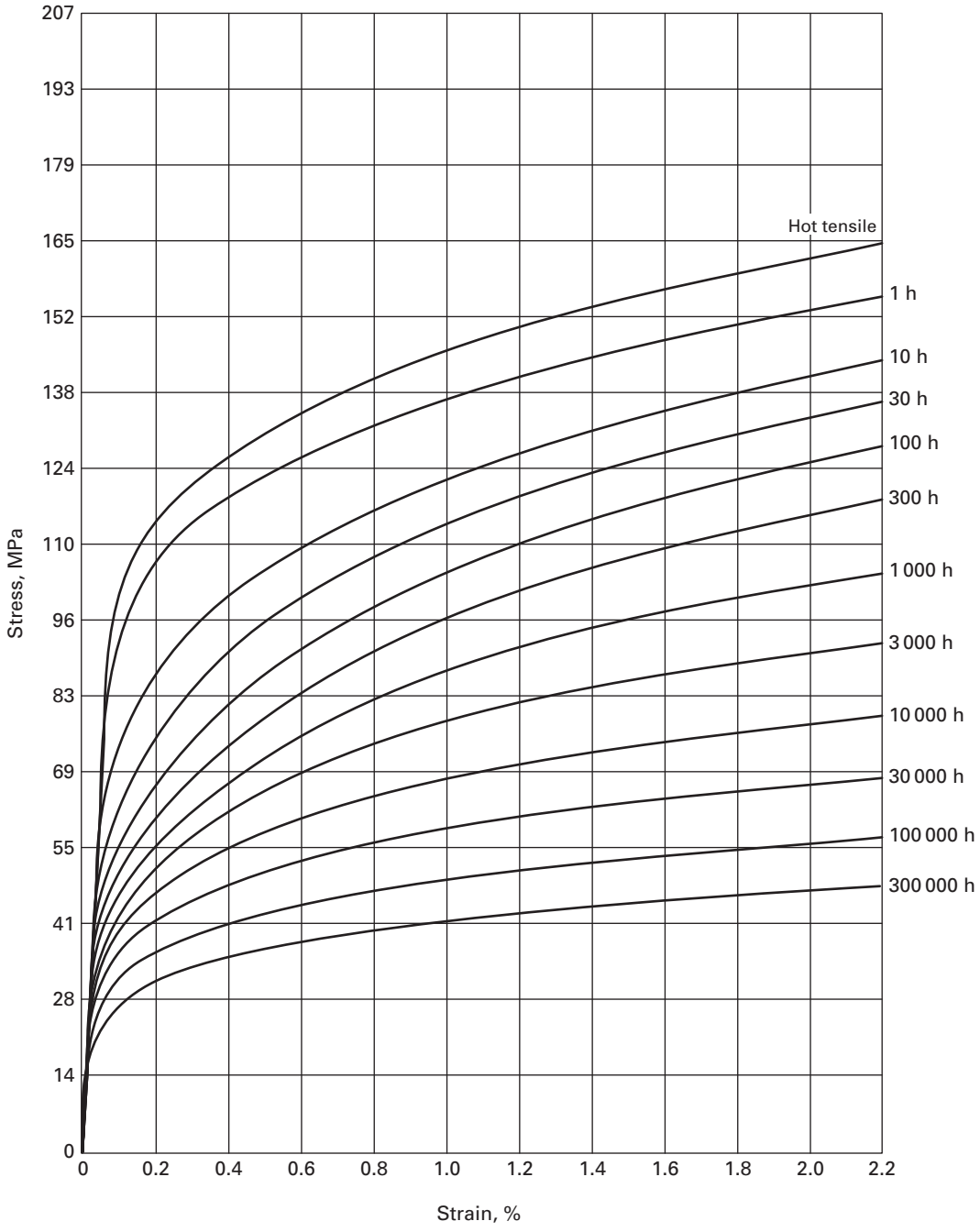


Figure E-100.18-10
Average Isochronous Stress–Strain Curves for Type 304 SS at 677°C

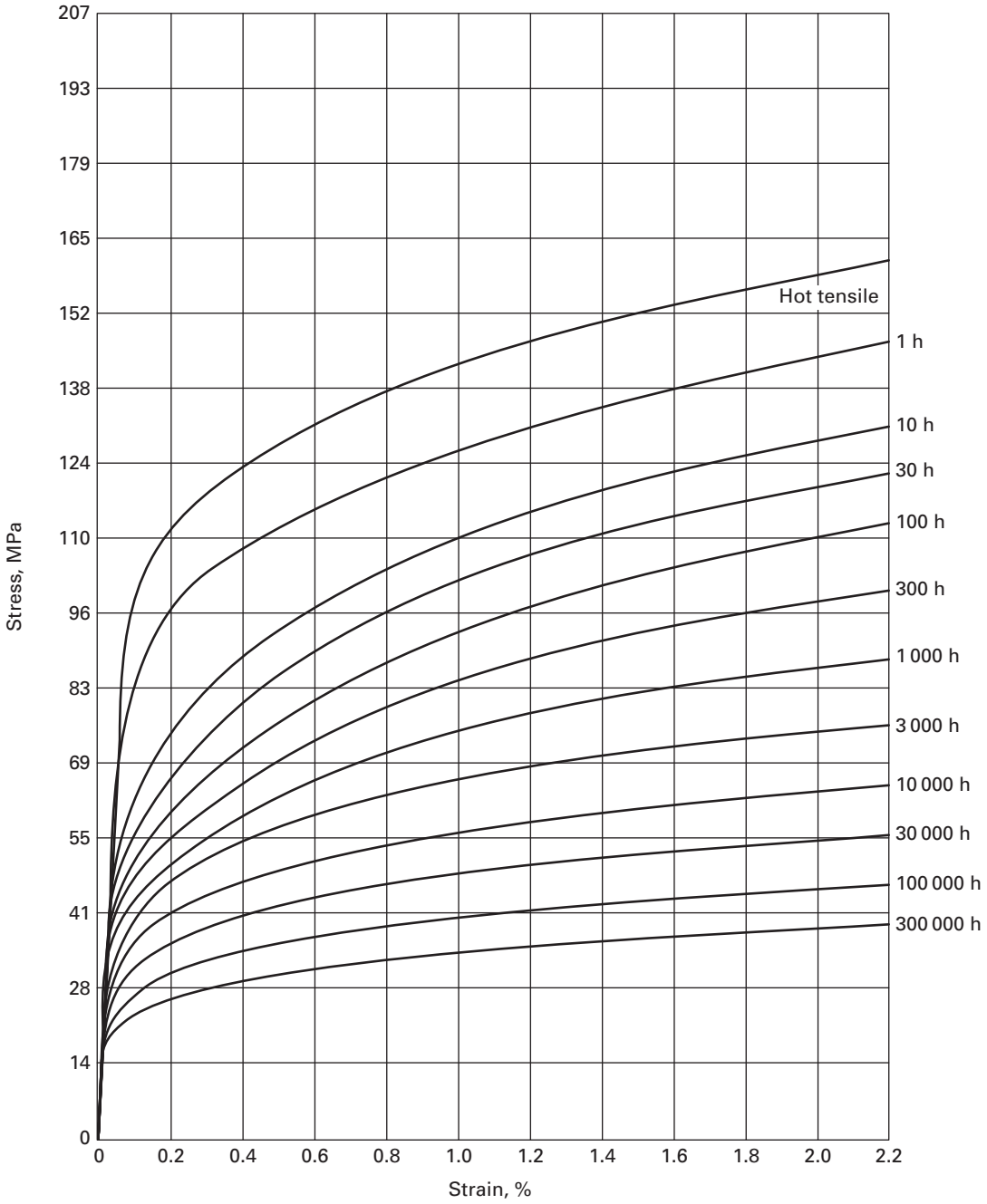


Figure E-100.18-11
Average Isochronous Stress–Strain Curves for Type 304 SS at 704°C

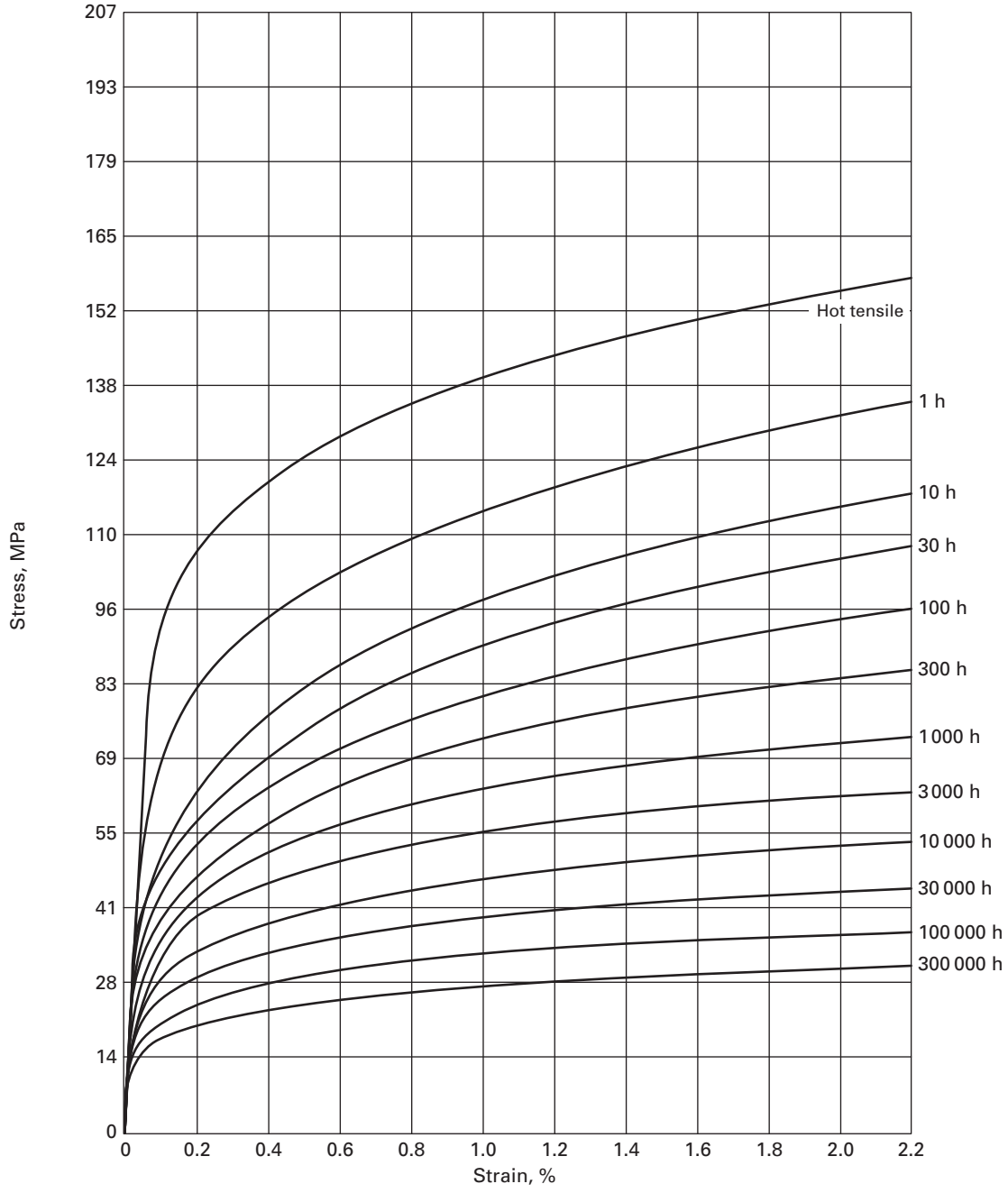


Figure E-100.18-12
Average Isochronous Stress–Strain Curves for Type 304 SS at 732°C

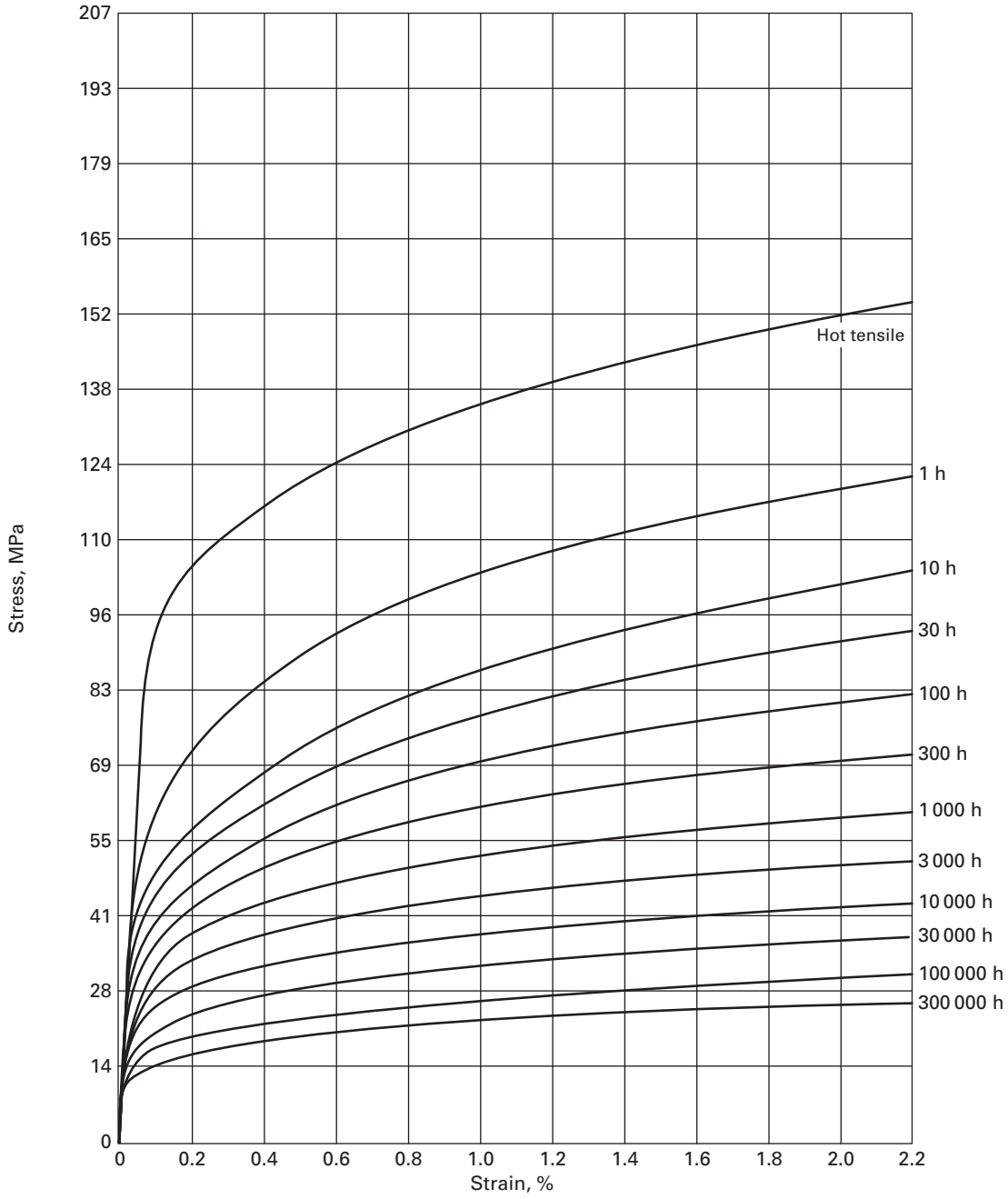


Figure E-100.18-13
Average Isochronous Stress–Strain Curves for Type 304 SS at 760°C

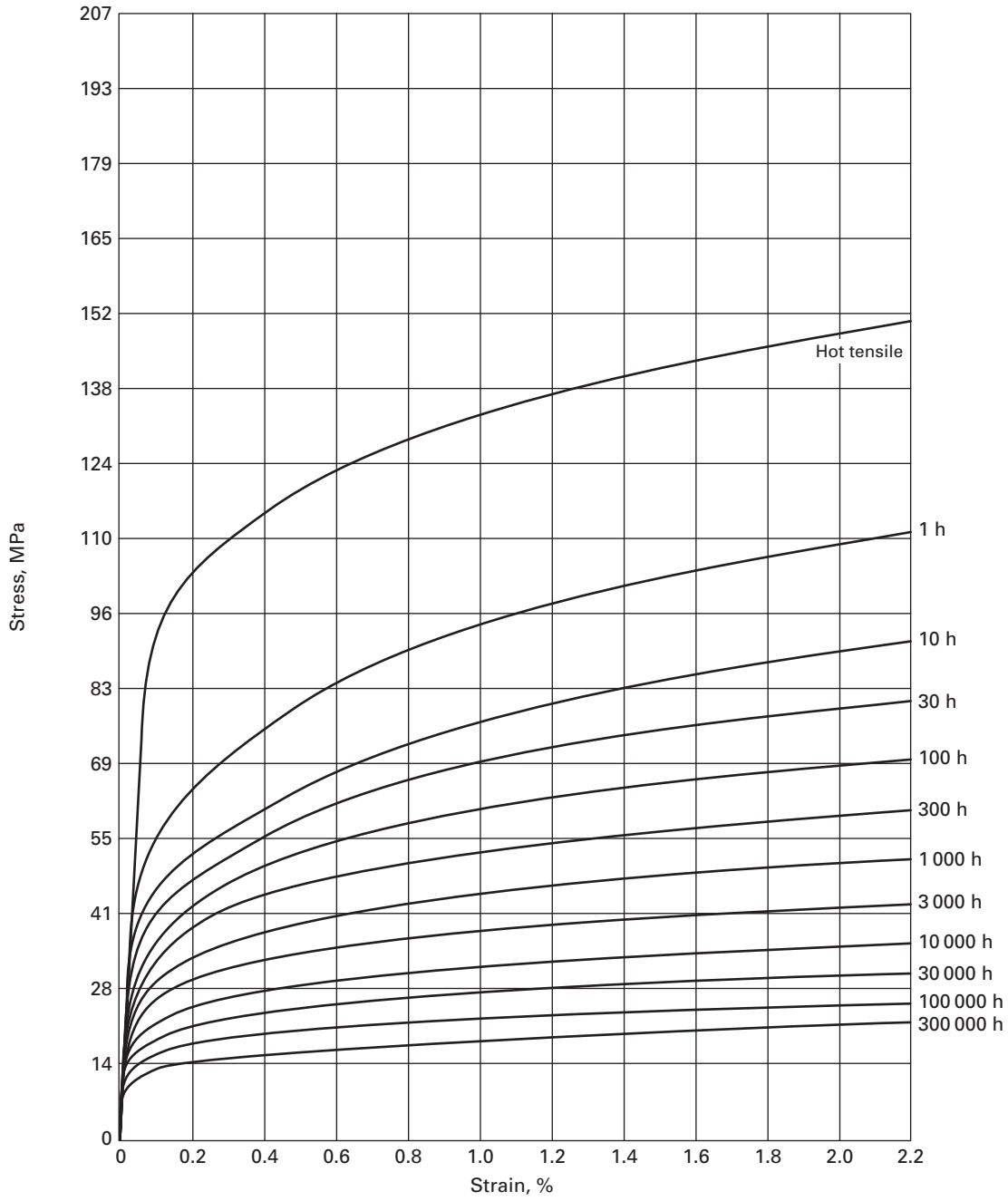


Figure E-100.18-14
Average Isochronous Stress–Strain Curves for Type 304 SS at 788°C

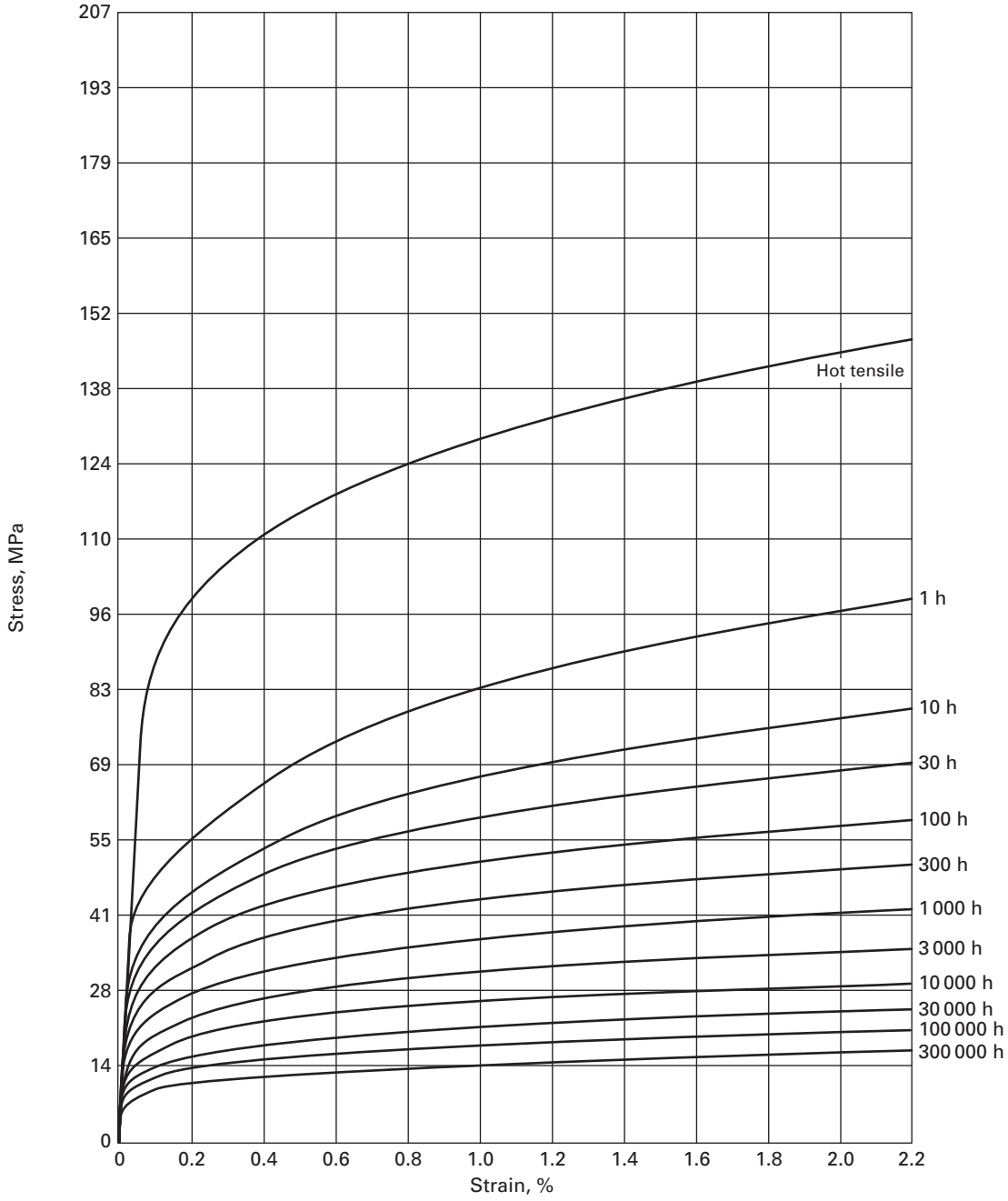


Figure E-100.18-15
Average Isochronous Stress–Strain Curves for Type 304 SS at 816°C

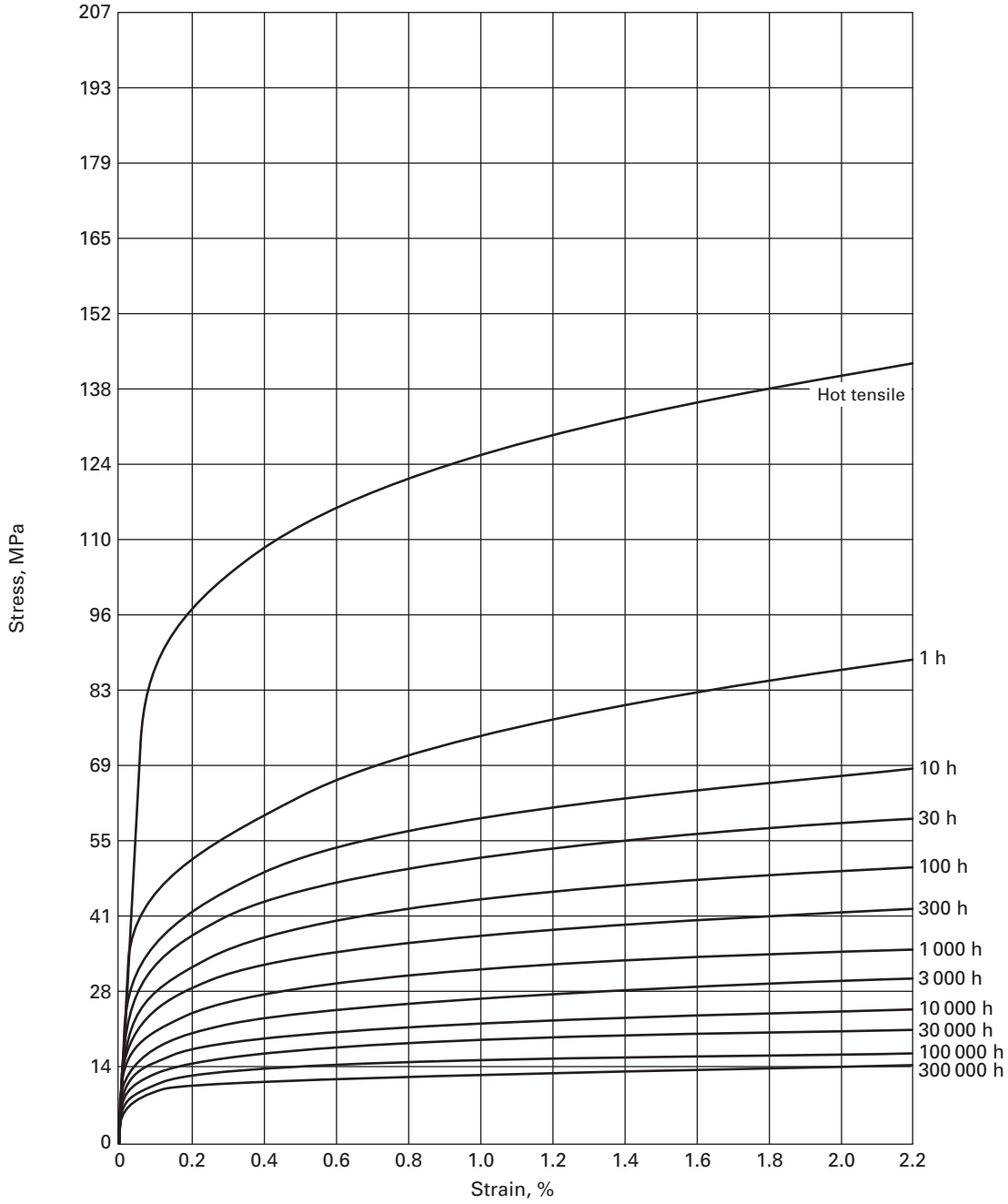


Figure E-100.19-1
Average Isochronous Stress–Strain Curves for Type 316 SS at 427°C

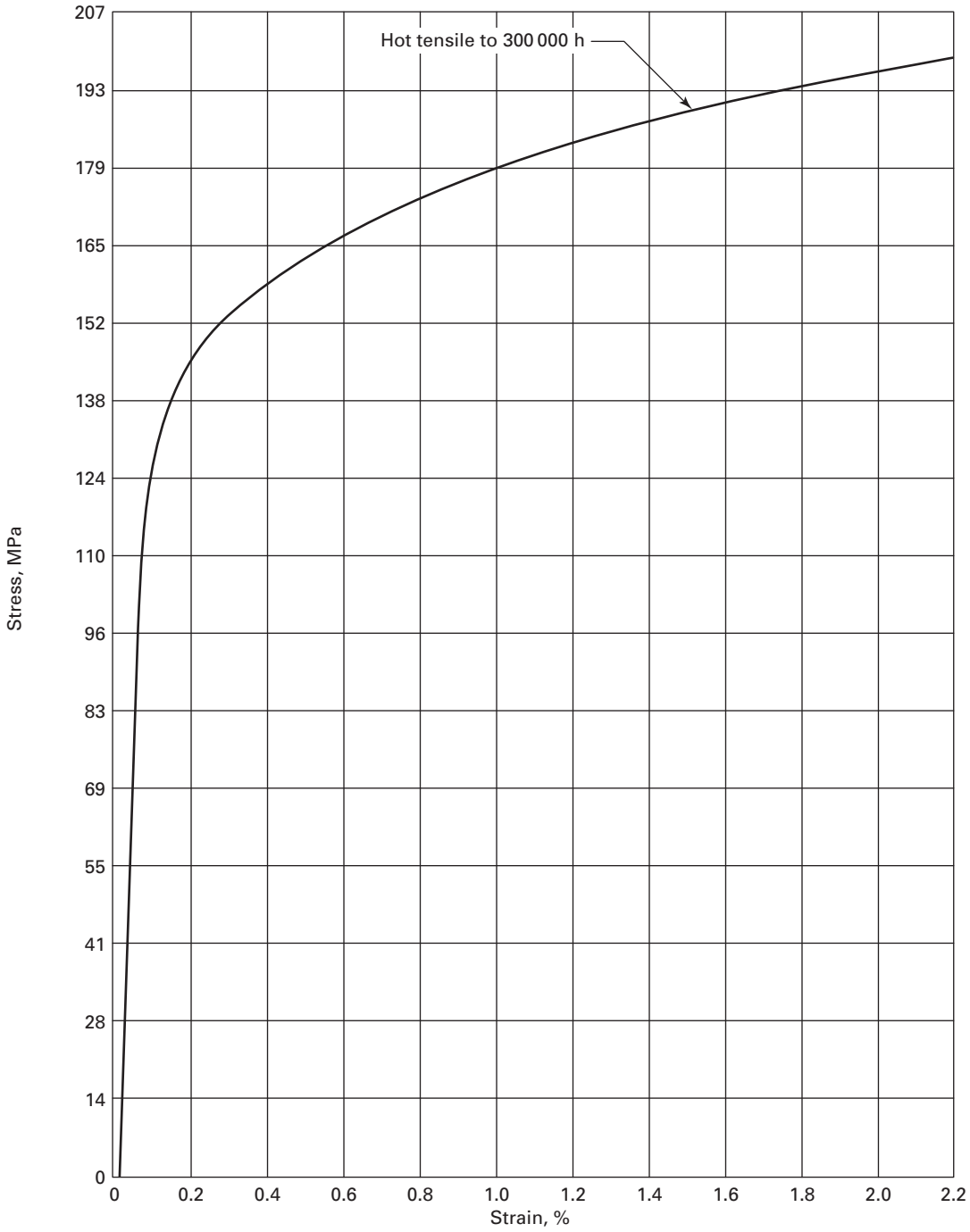


Figure E-100.19-2
Average Isochronous Stress–Strain Curves for Type 316 SS at 454°C

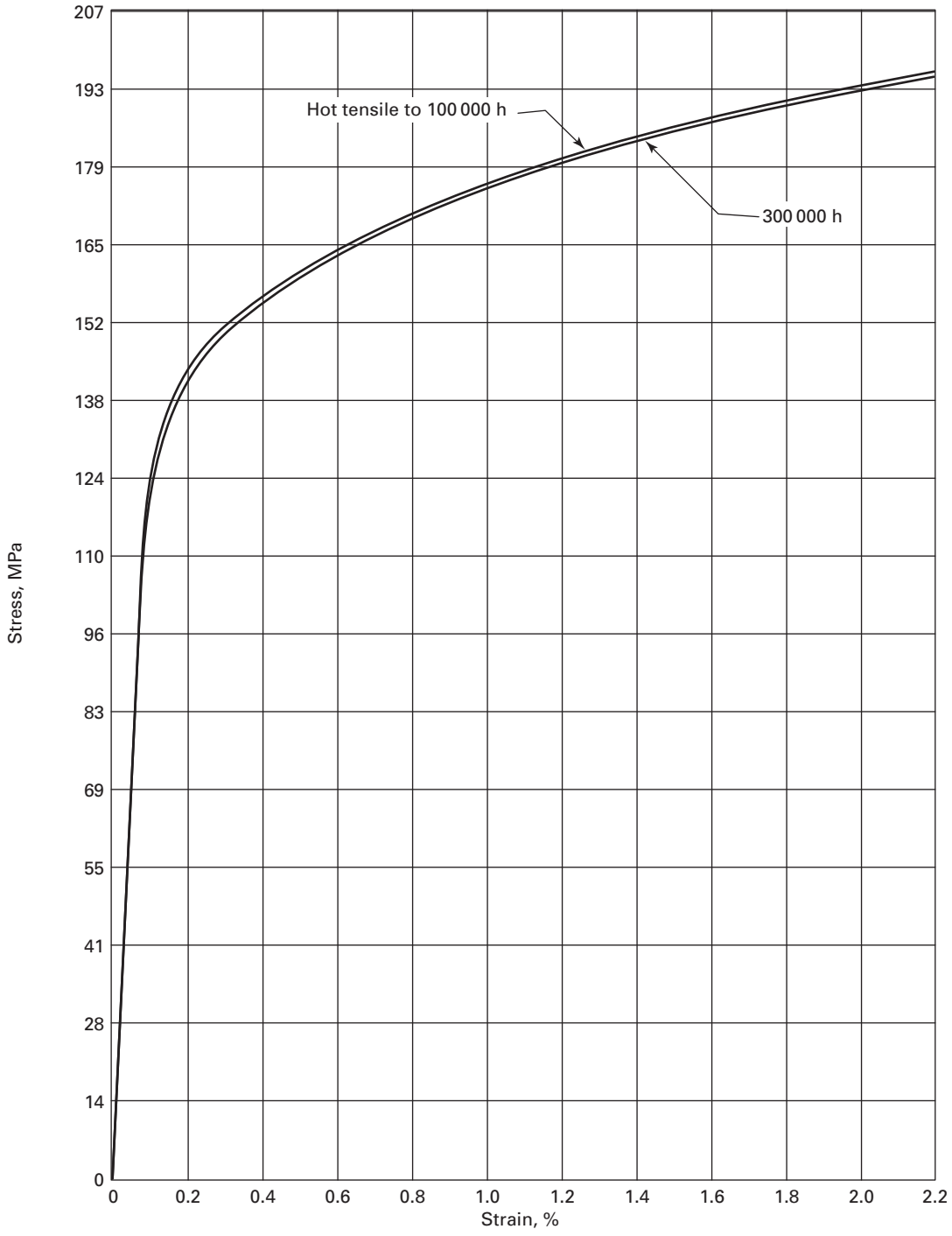


Figure E-100.19-3
Average Isochronous Stress–Strain Curves for Type 316 SS at 482°C

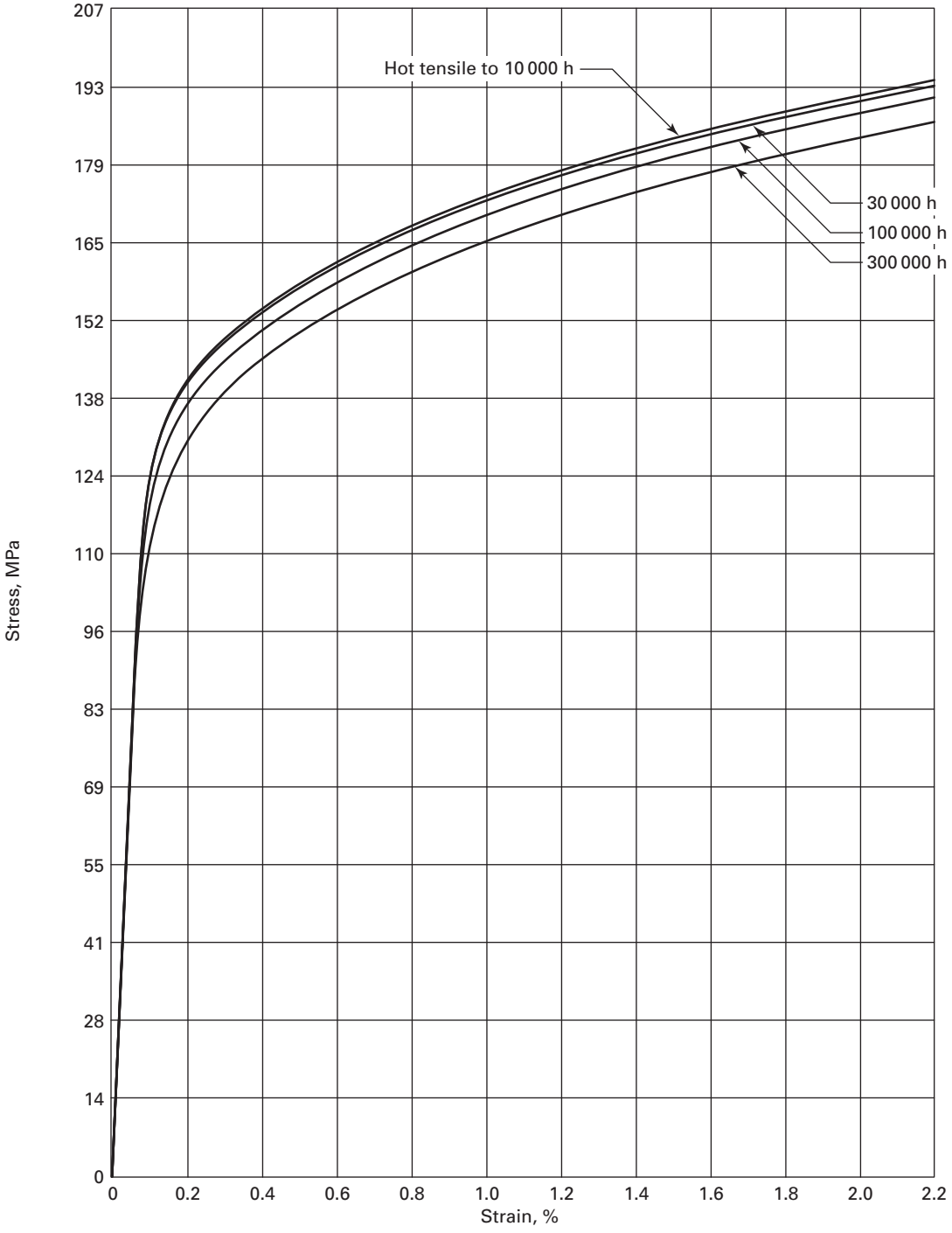


Figure E-100.19-4
Average Isochronous Stress–Strain Curves for Type 316 SS at 510°C

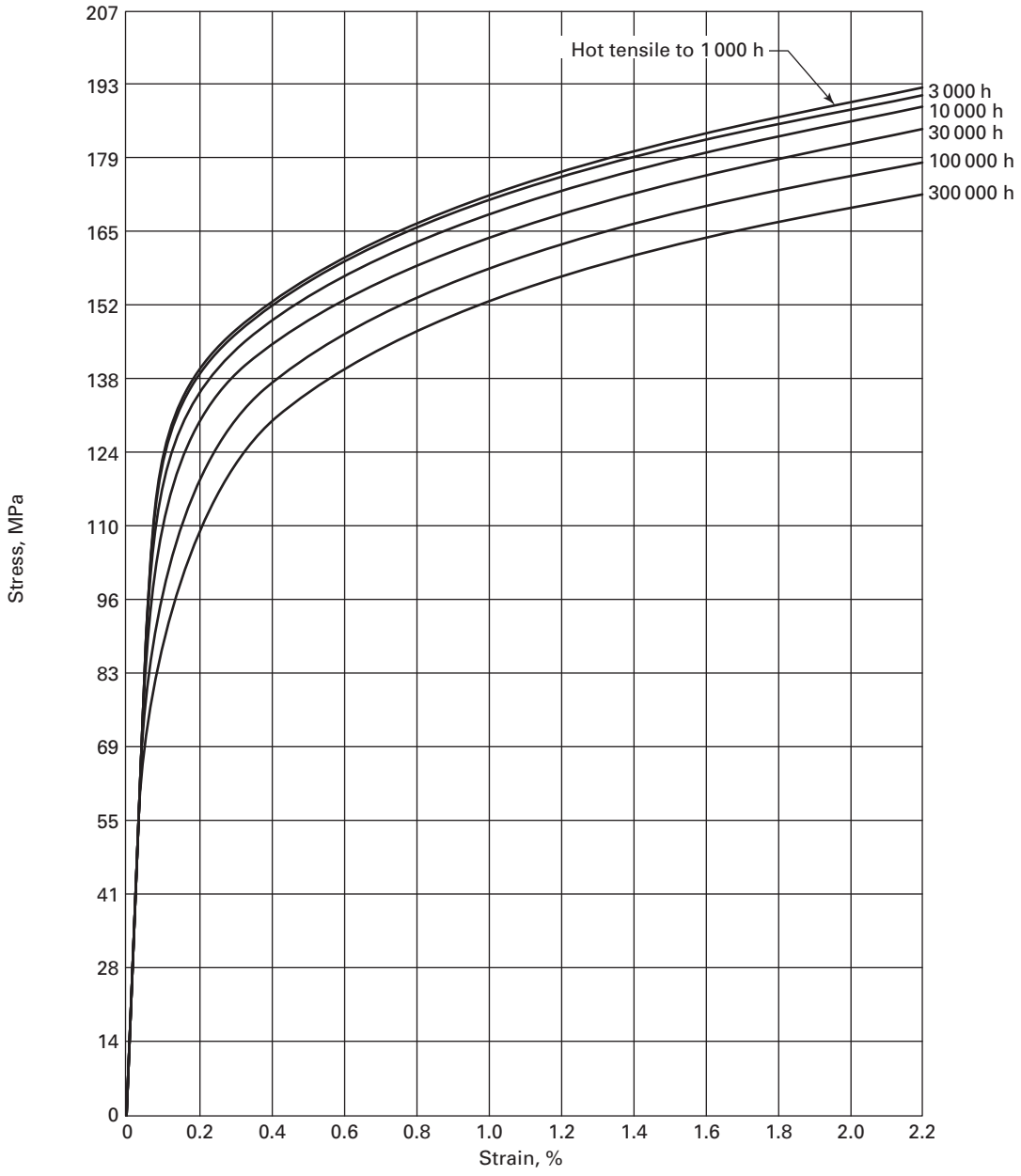


Figure E-100.19-5
Average Isochronous Stress–Strain Curves for Type 316 SS at 538°C

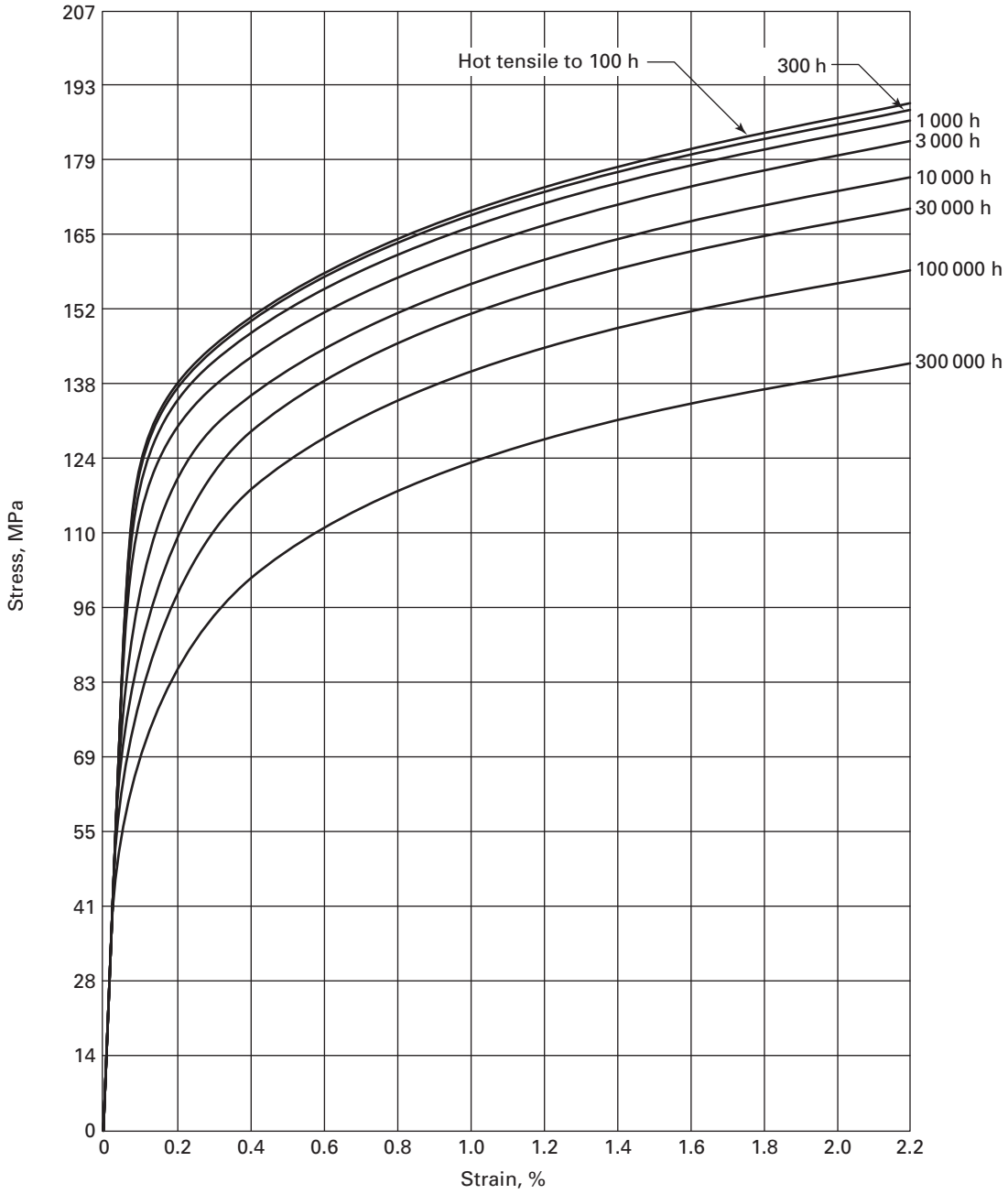


Figure E-100.19-6
Average Isochronous Stress–Strain Curves for Type 316 SS at 566°C

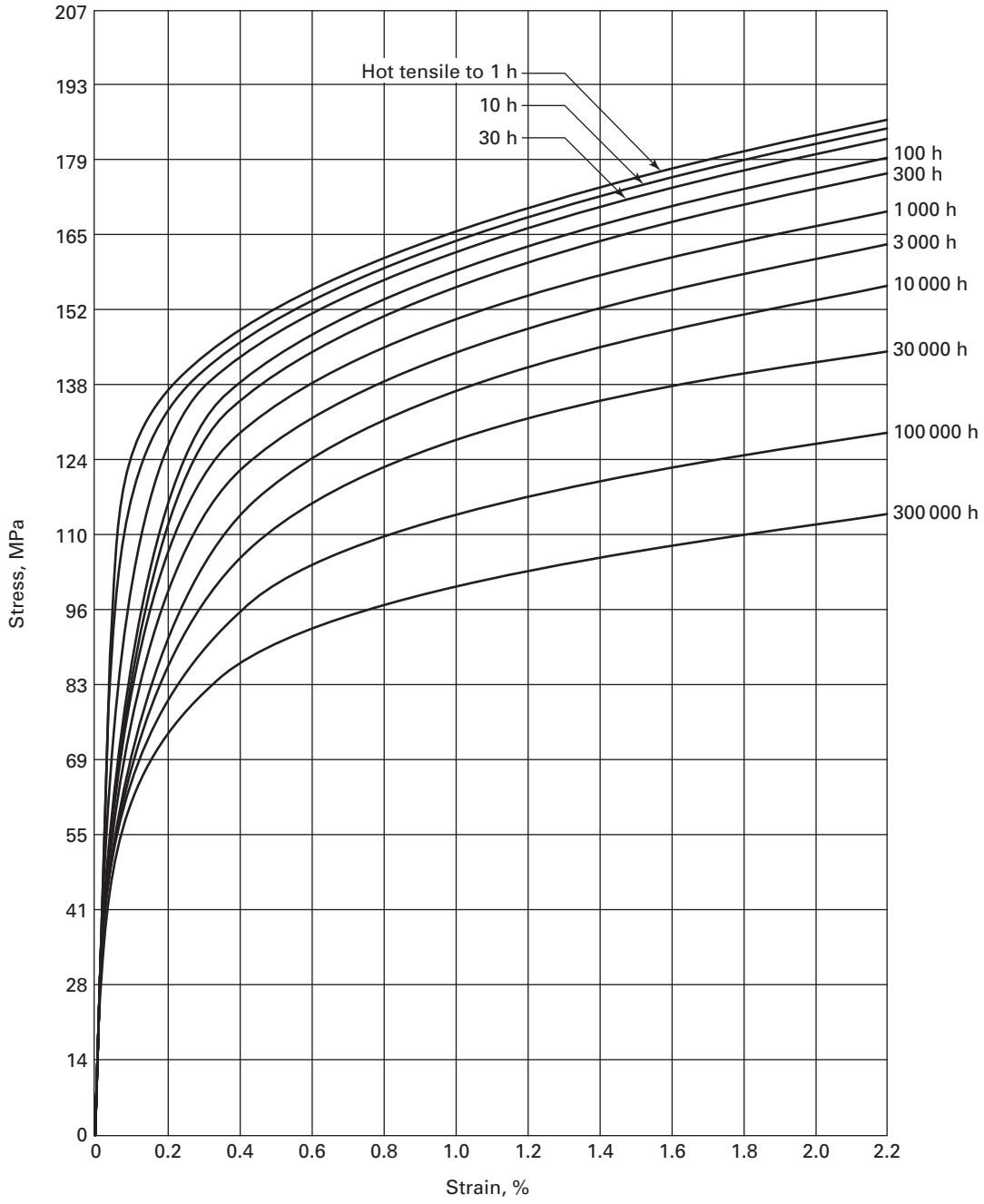


Figure E-100.19-7
Average Isochronous Stress–Strain Curves for Type 316 SS at 593°C

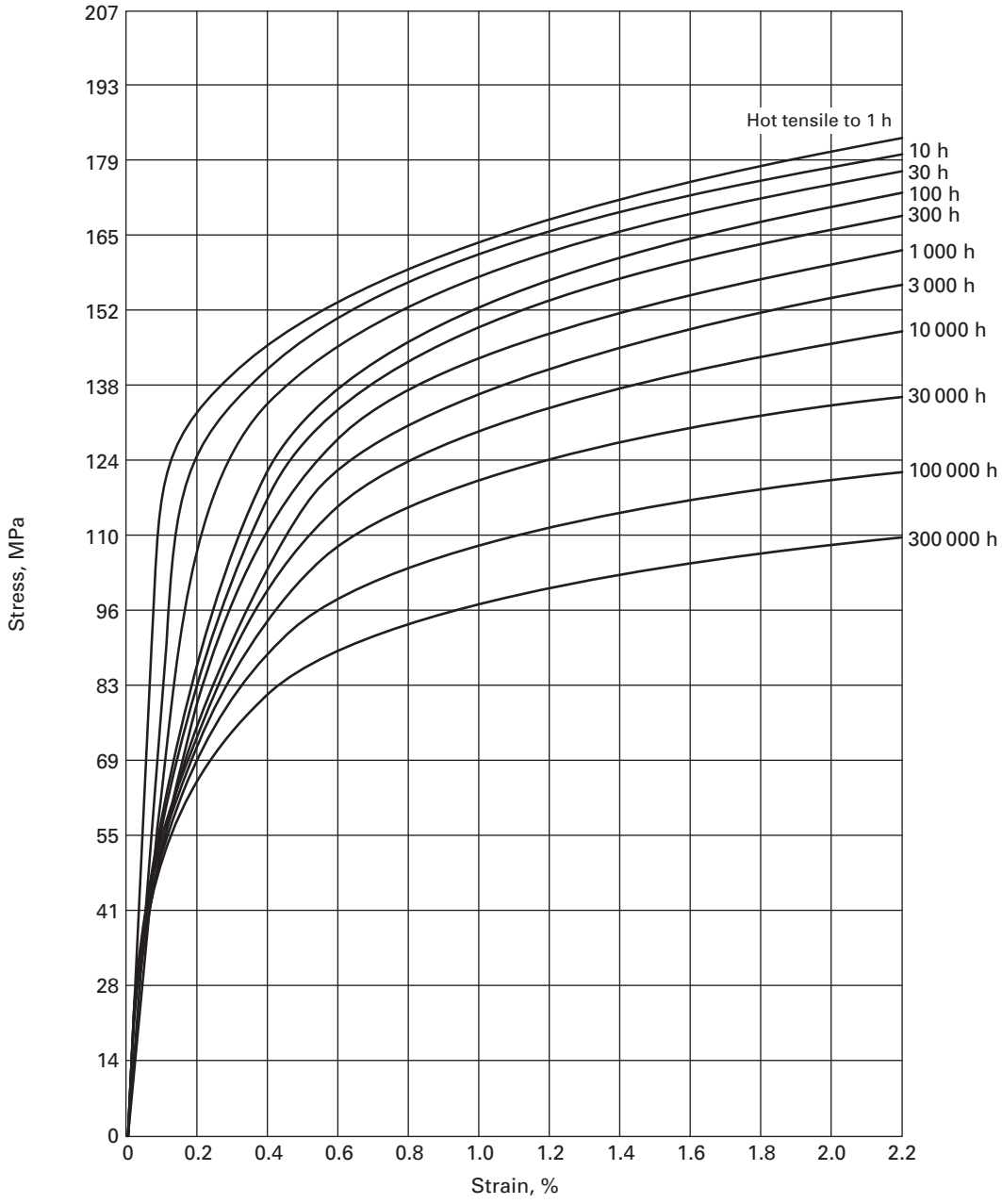


Figure E-100.19-8
Average Isochronous Stress–Strain Curves for Type 316 SS at 621°C

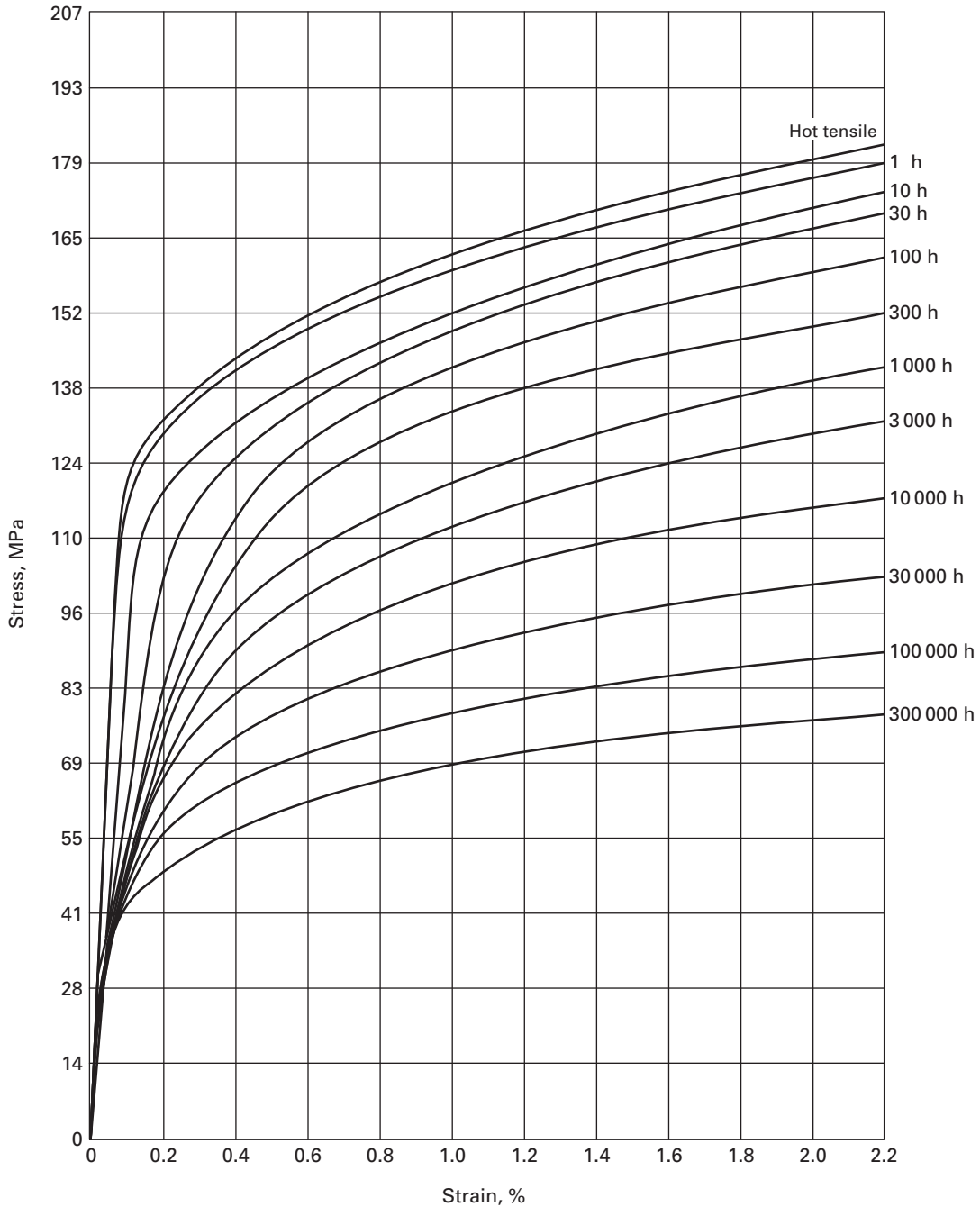


Figure E-100.19-9
Average Isochronous Stress–Strain Curves for Type 316 SS at 649°C

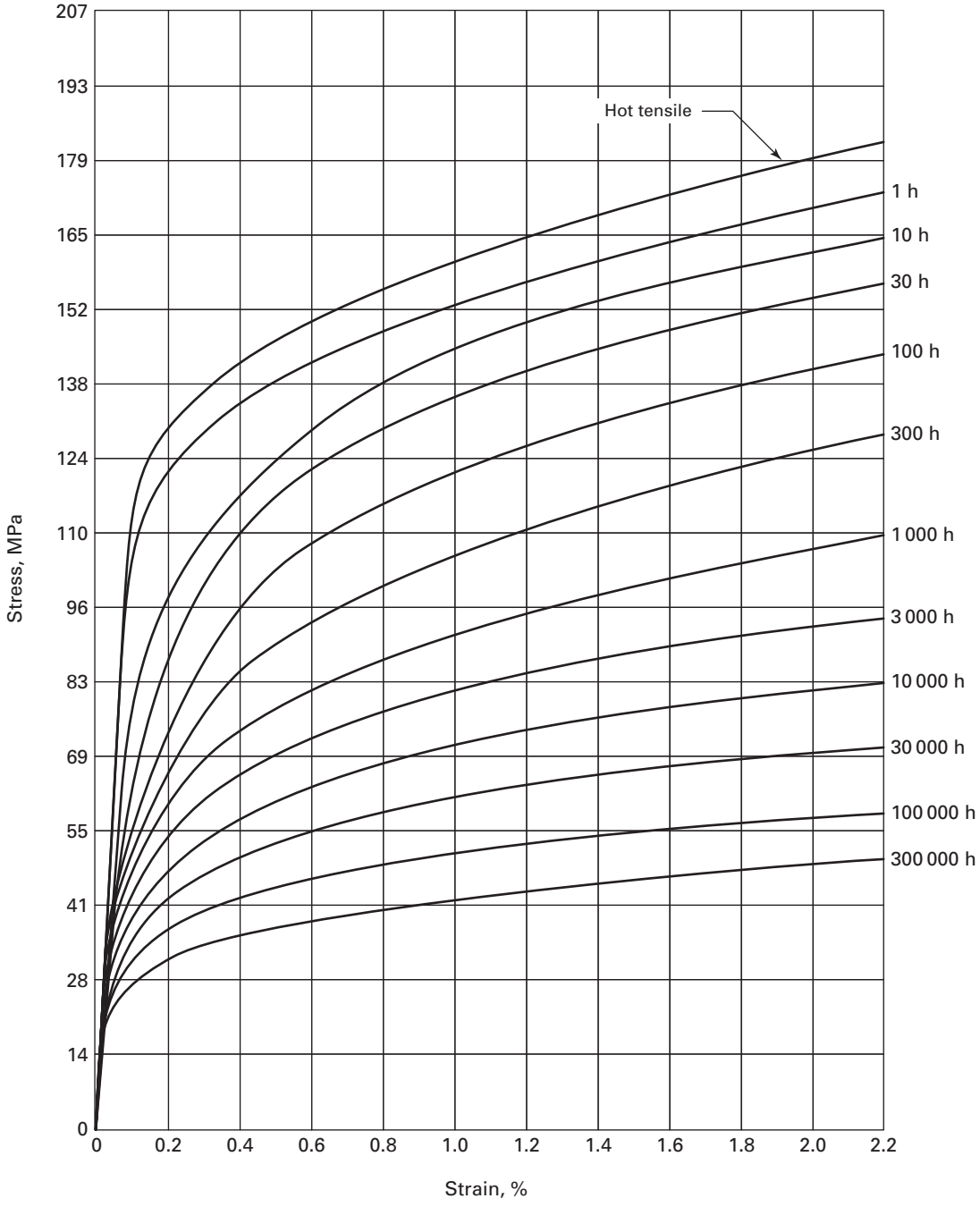


Figure E-100.19-10
Average Isochronous Stress–Strain Curves for Type 316 SS at 677°C

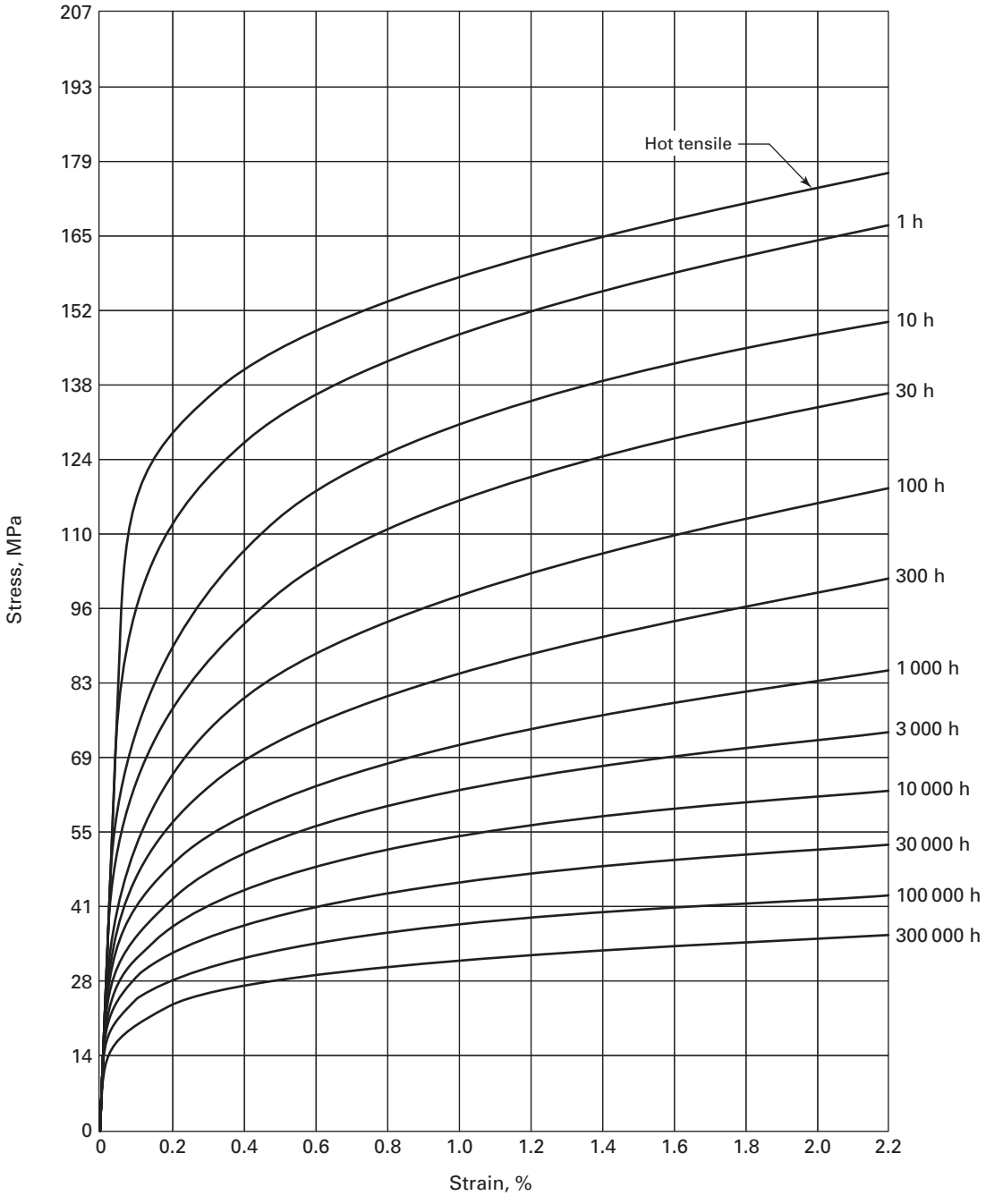


Figure E-100.19-11
Average Isochronous Stress–Strain Curves for Type 316 SS at 704°C

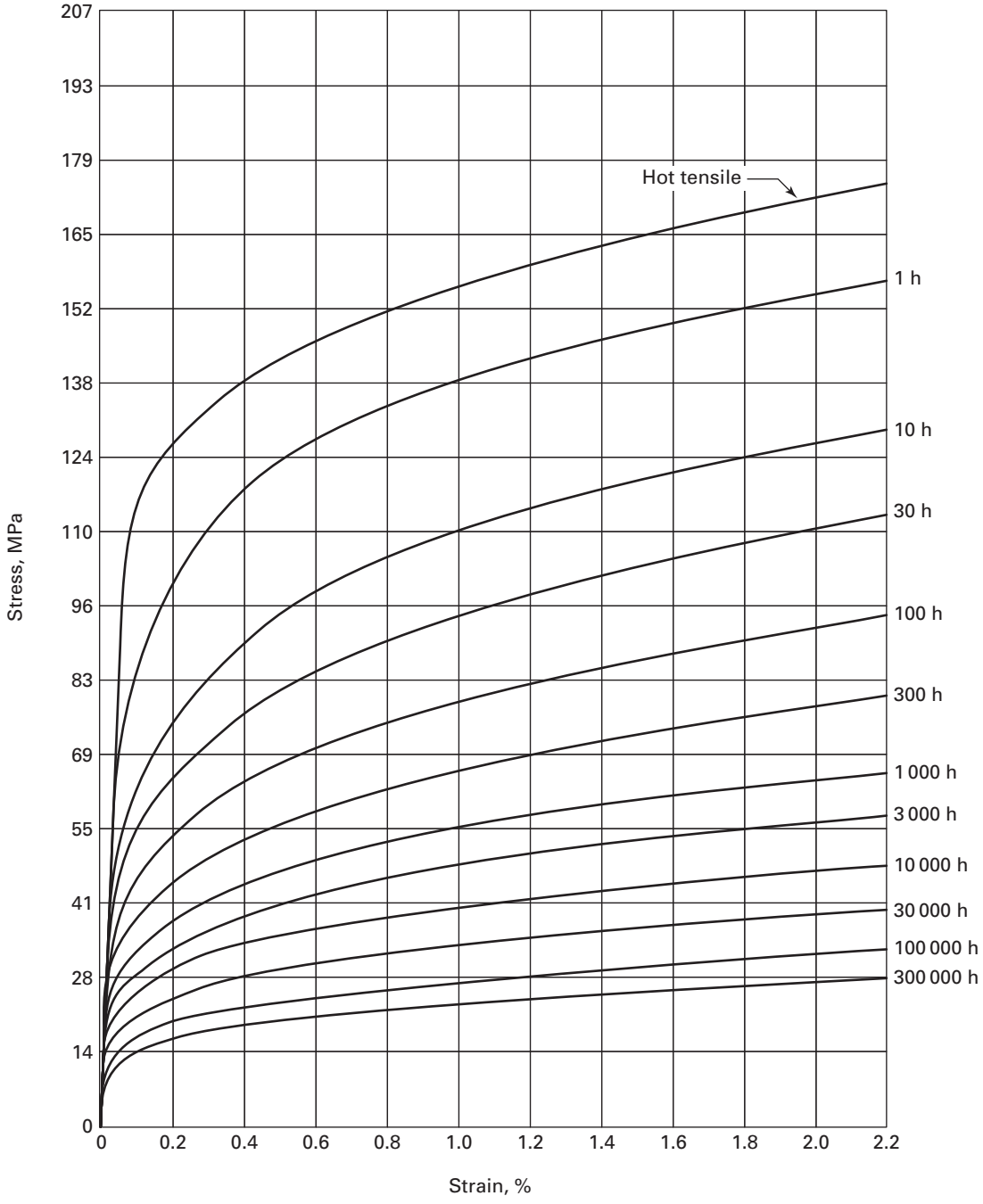


Figure E-100.19-12
Average Isochronous Stress–Strain Curves for Type 316 SS at 732°C

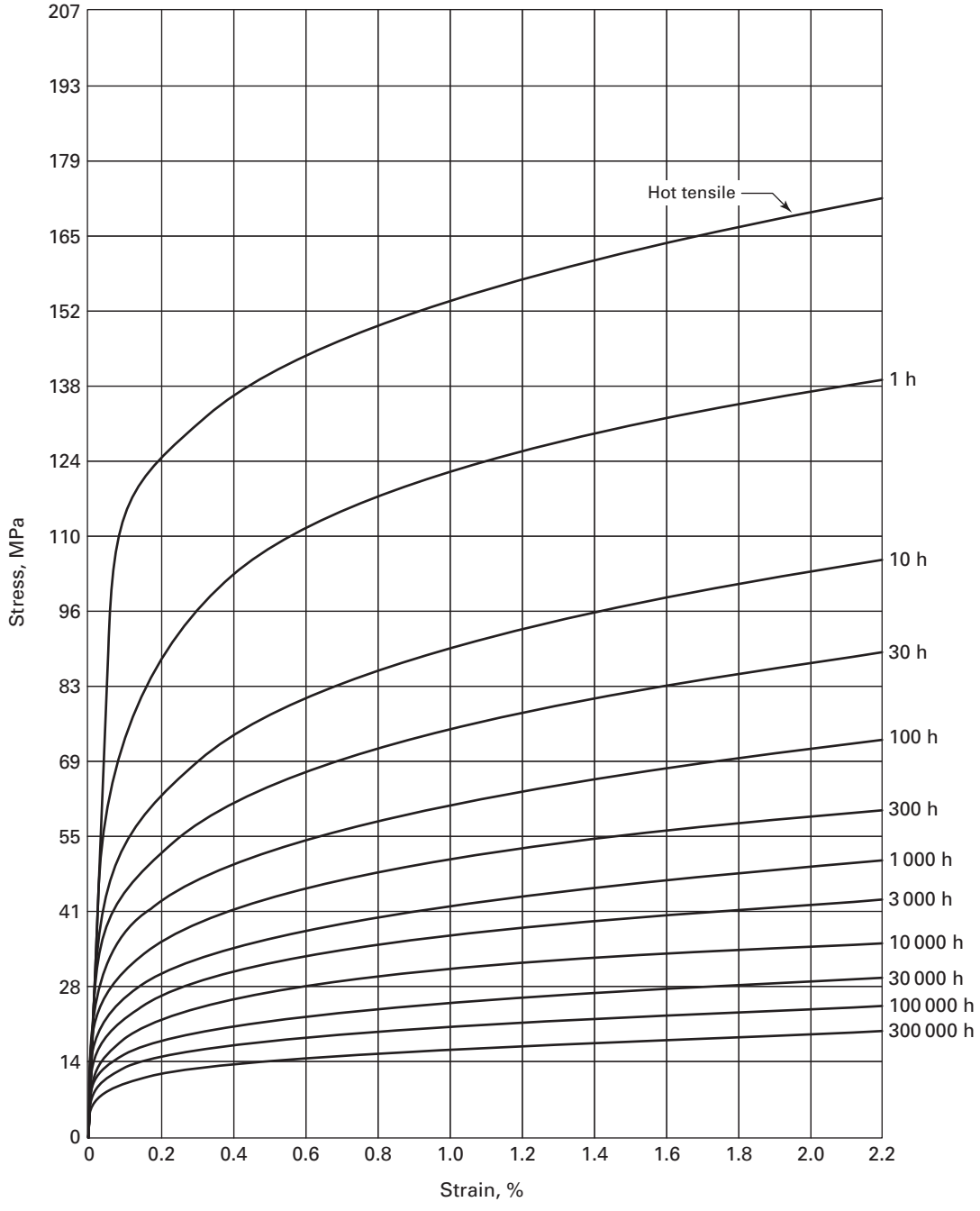


Figure E-100.19-13
Average Isochronous Stress–Strain Curves for Type 316 SS at 760°C

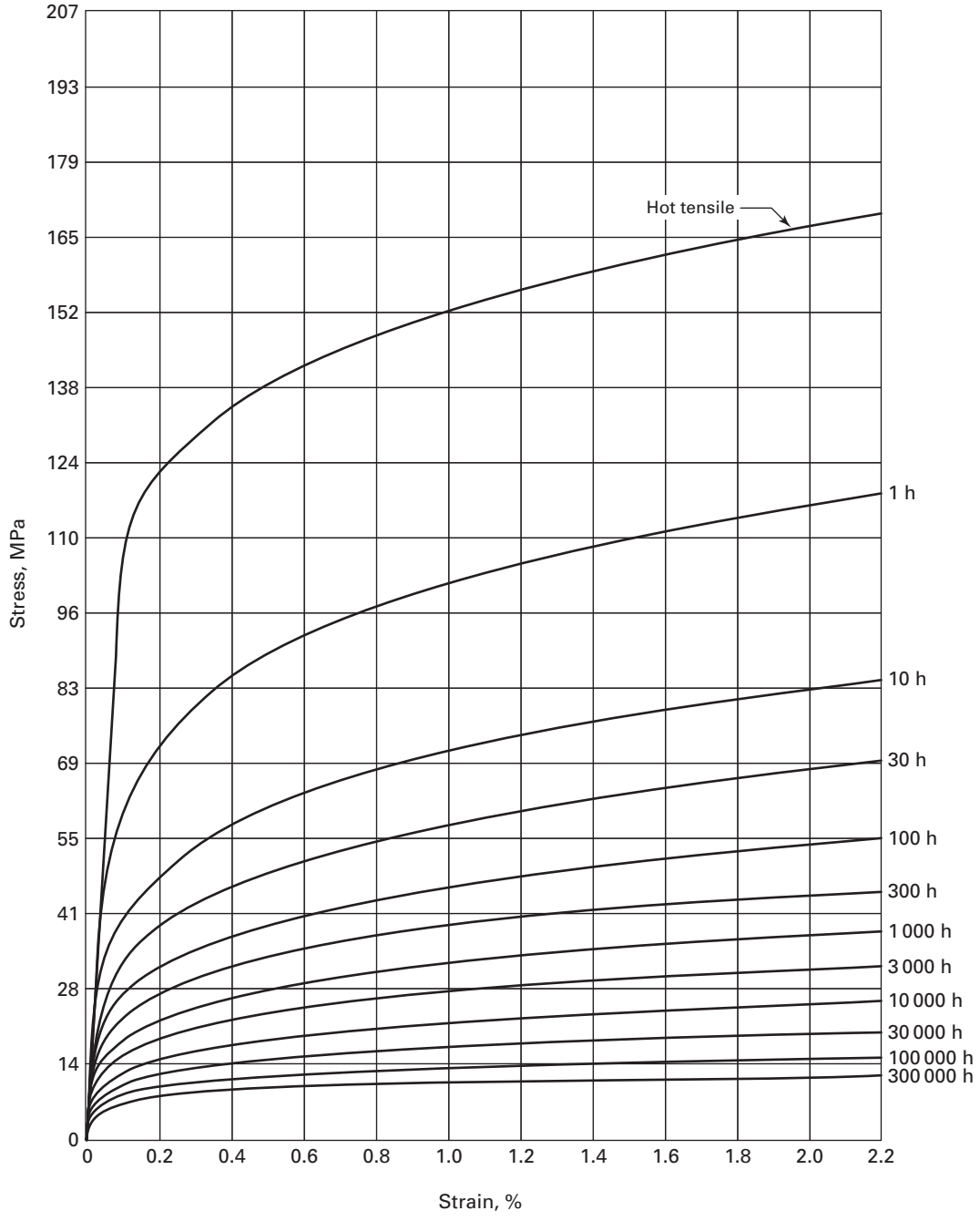


Figure E-100.19-14
Average Isochronous Stress–Strain Curves for Type 316 SS at 788°C

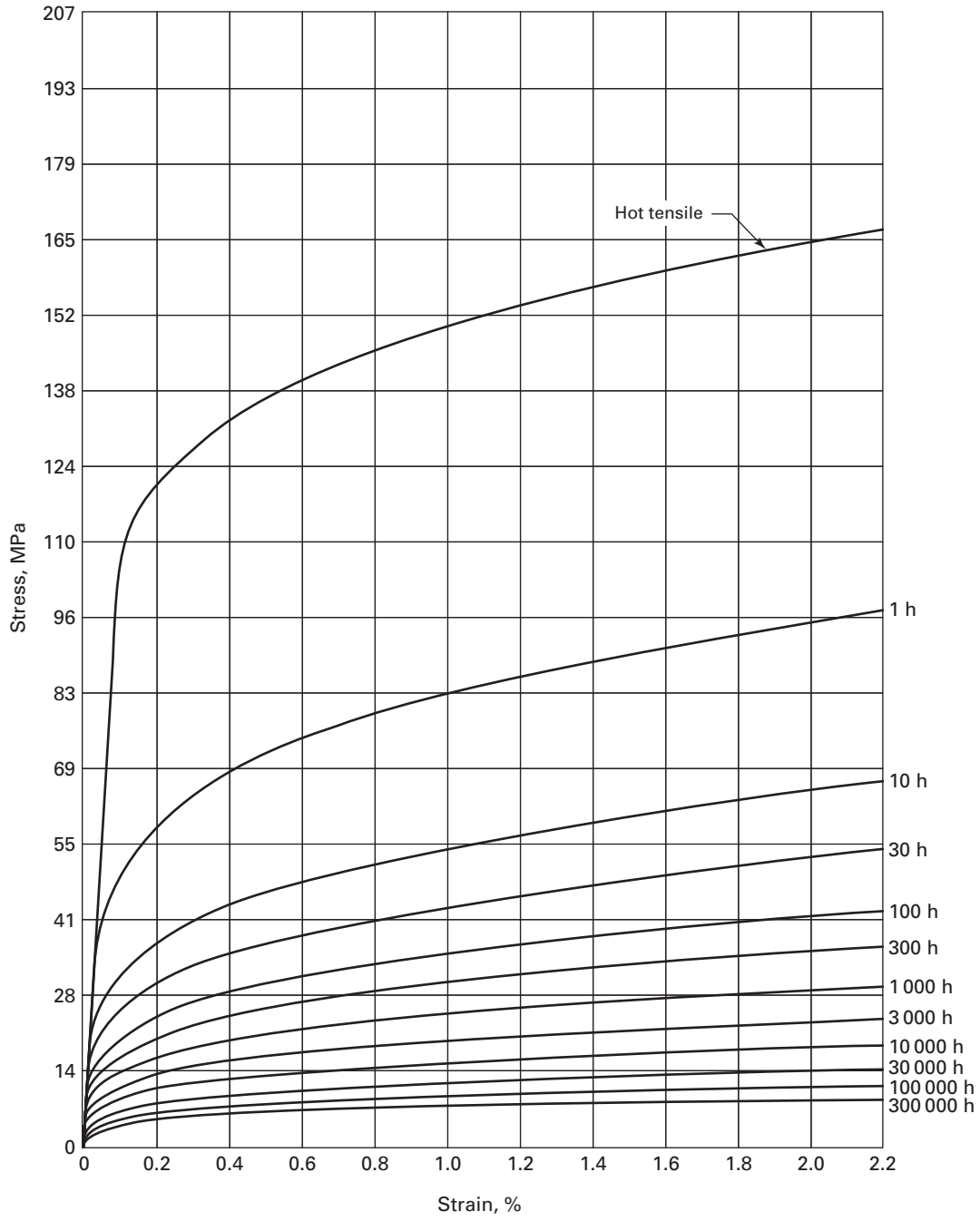


Figure E-100.19-15
Average Isochronous Stress–Strain Curves for Type 316 SS at 816°C

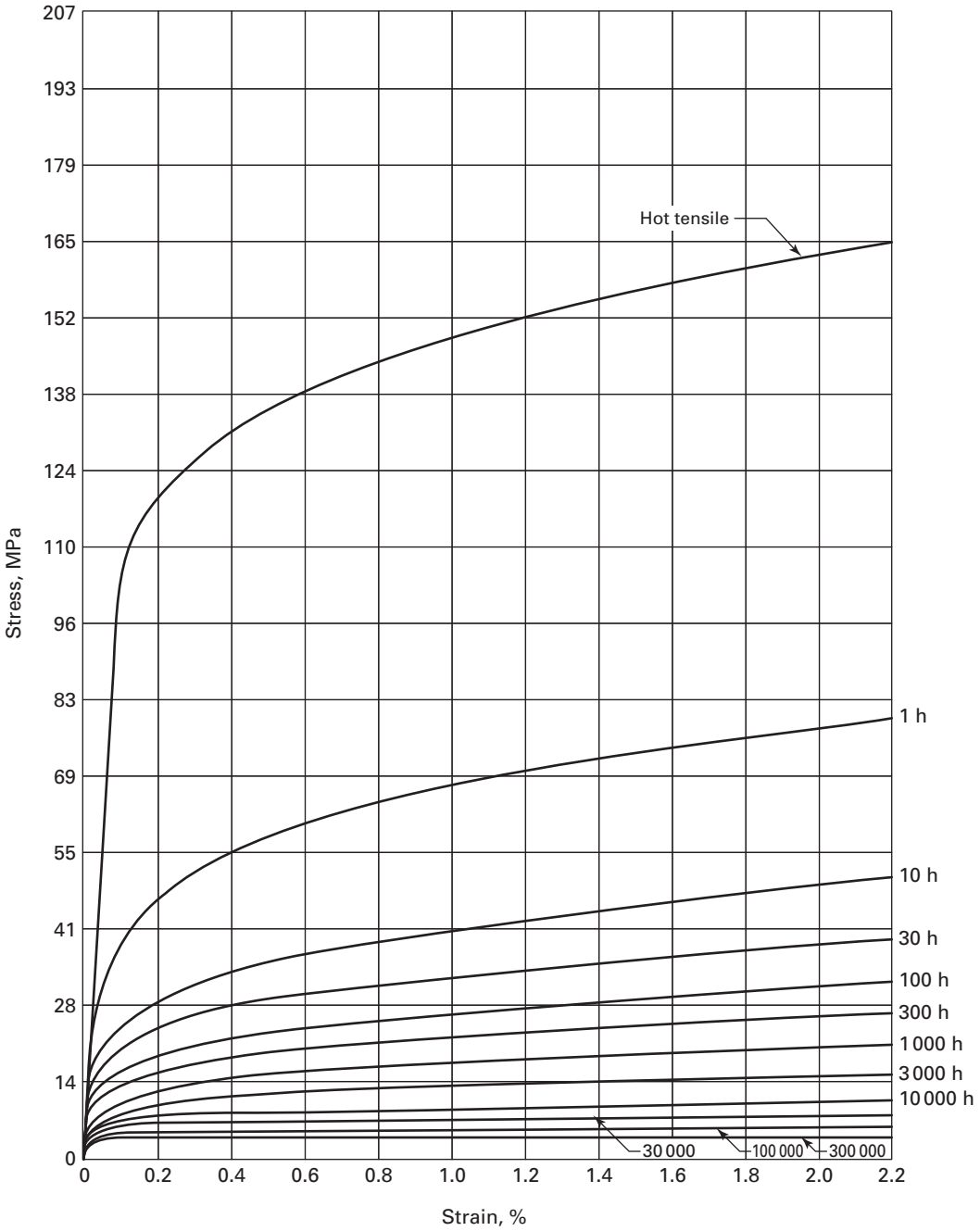


Figure E-100.20-1
Average Isochronous Stress–Strain Curves for Alloy 800H at 427°C and 454°C

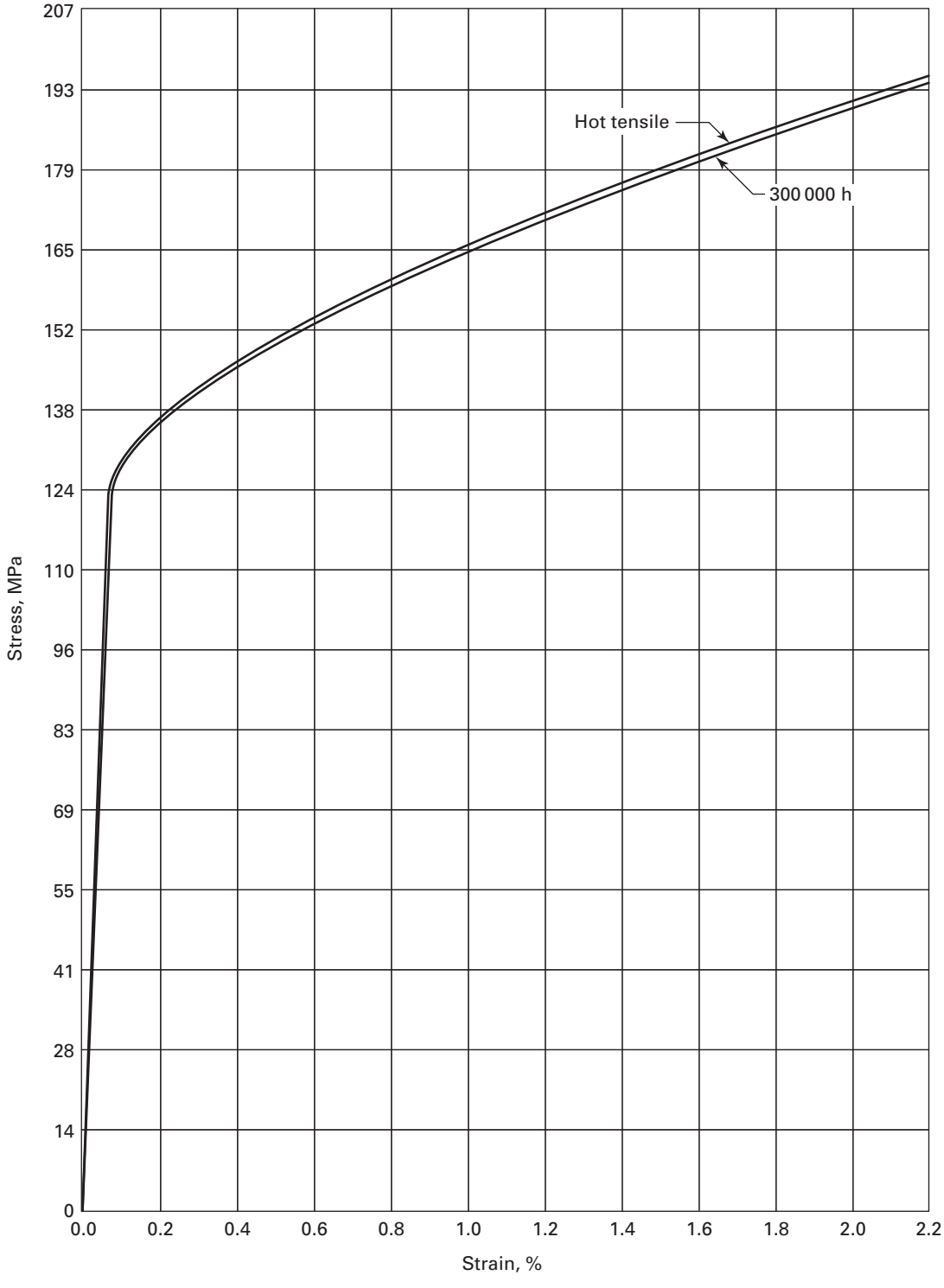


Figure E-100.20-2
Average Isochronous Stress–Strain Curves for Alloy 800H at 482°C

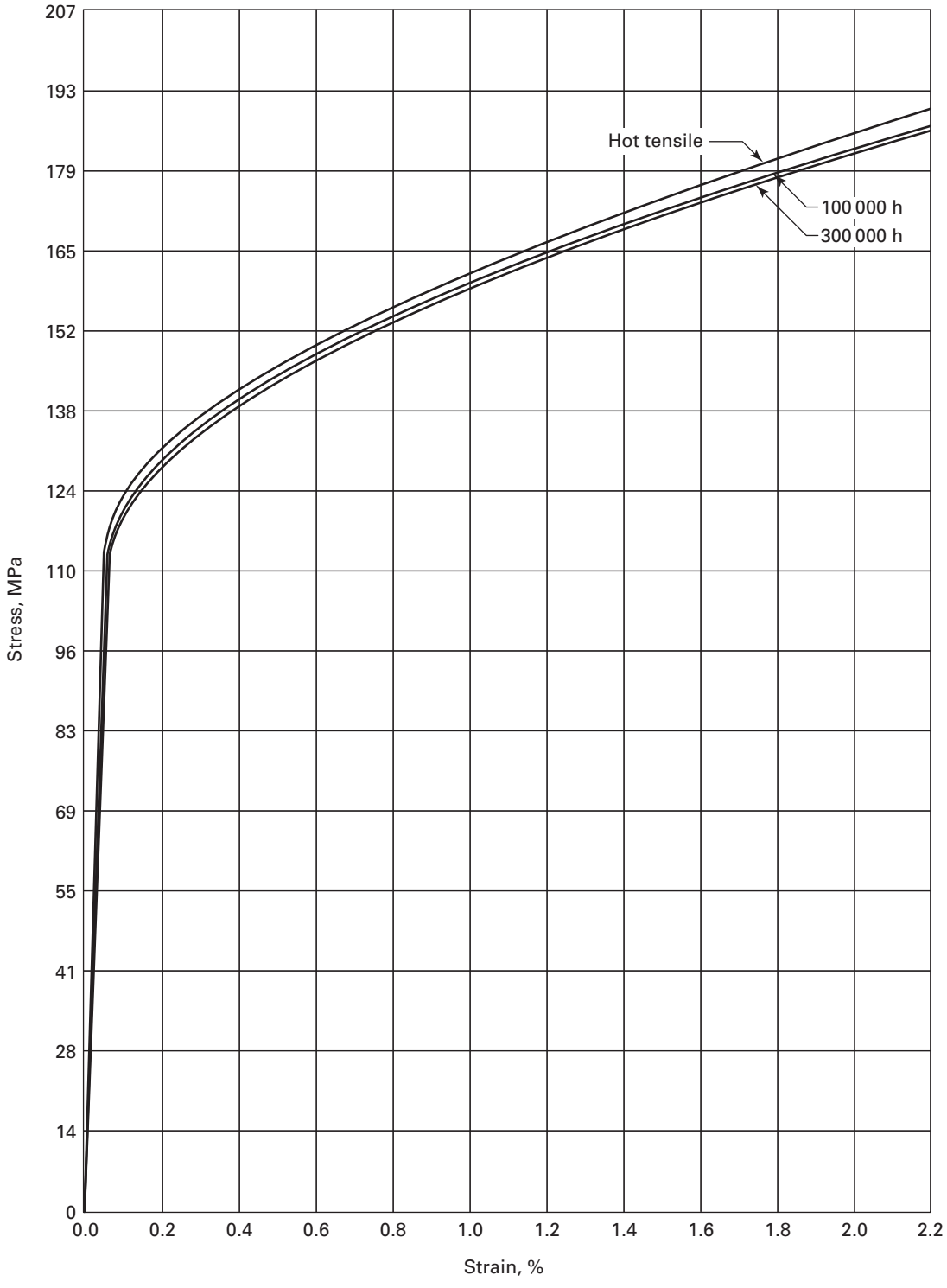


Figure E-100.20-3
Average Isochronous Stress–Strain Curves for Alloy 800H at 510°C

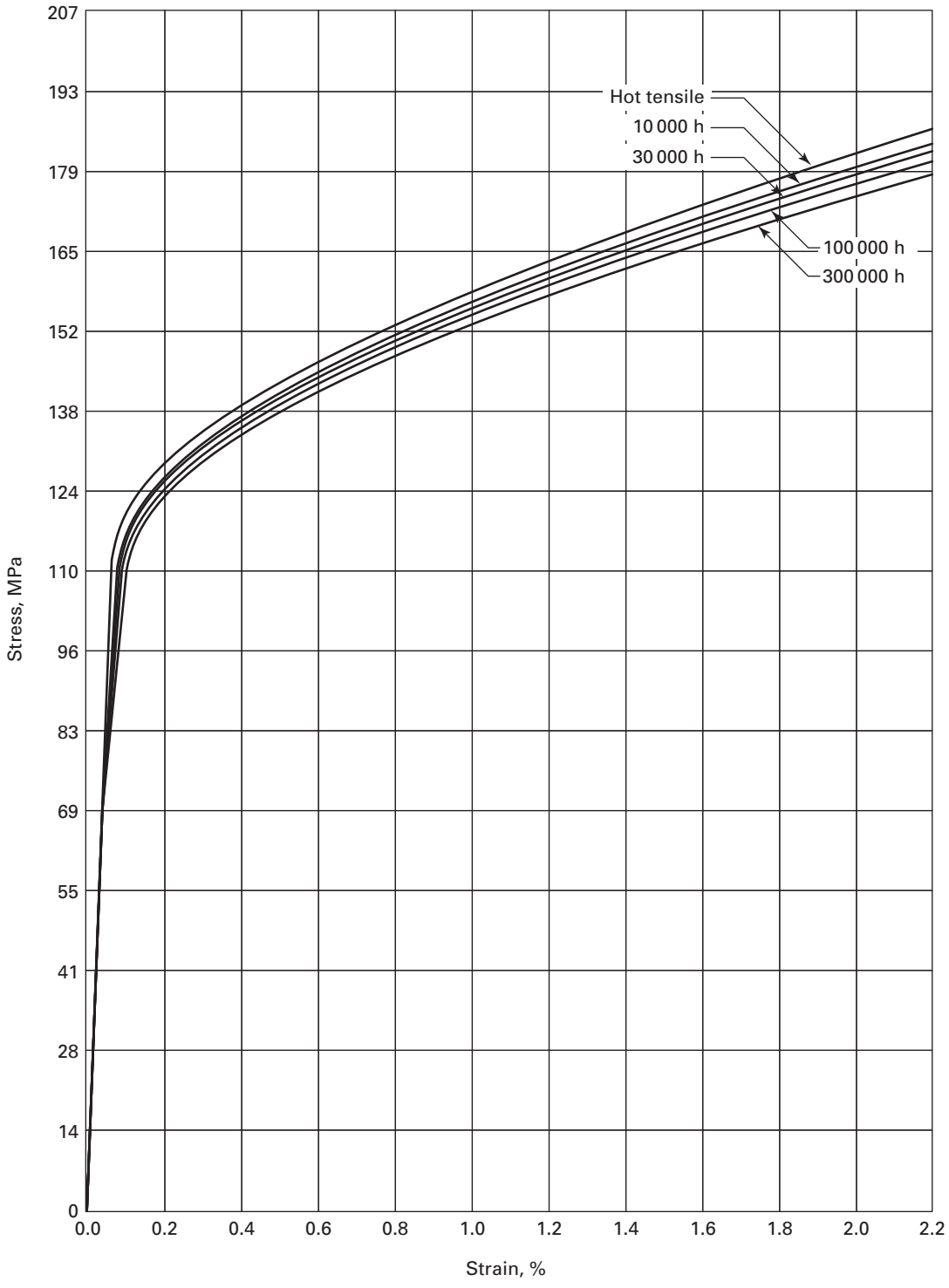


Figure E-100.20-4
Average Isochronous Stress–Strain Curves for Alloy 800H at 538°C

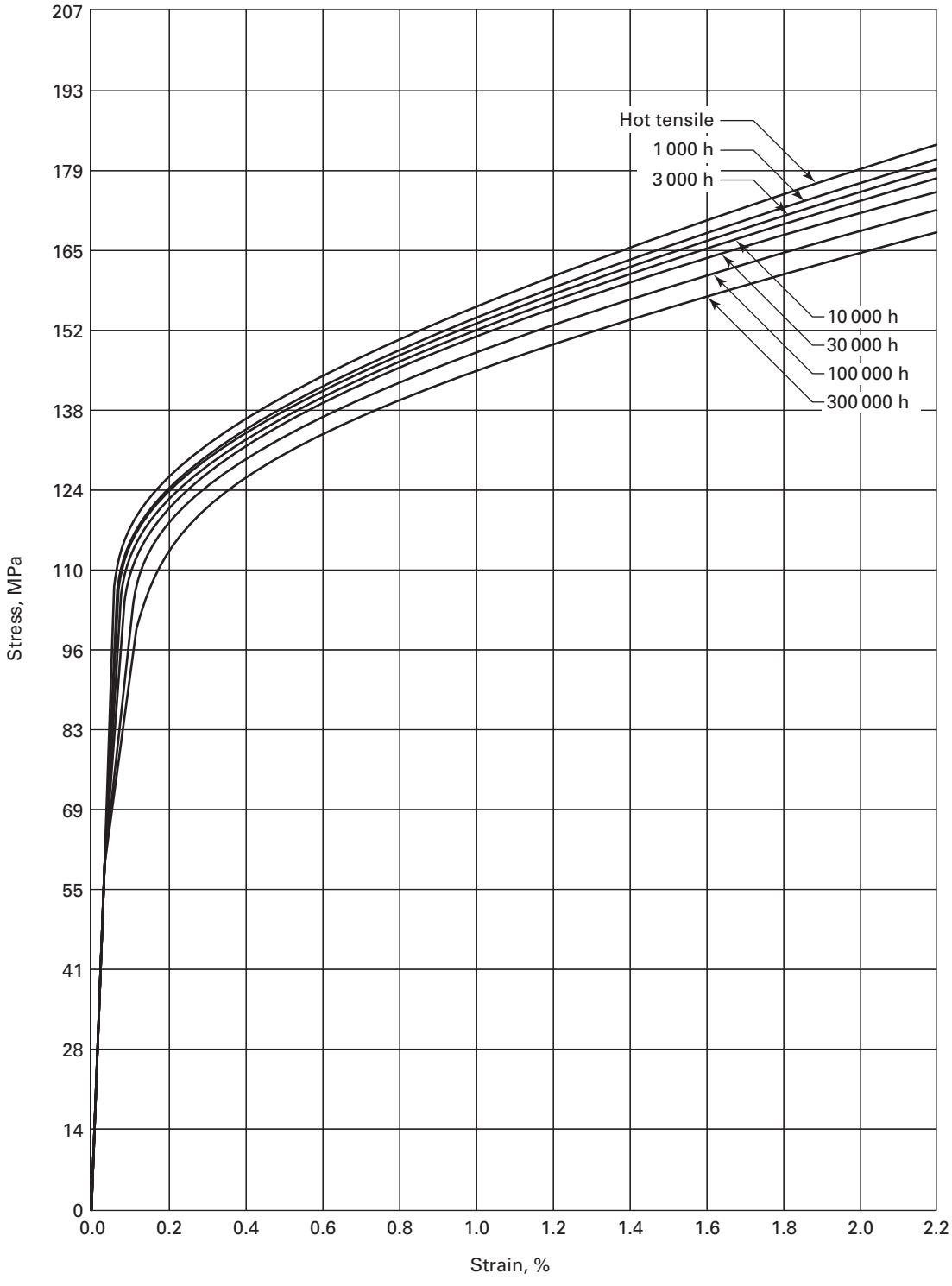


Figure E-100.20-5
Average Isochronous Stress–Strain Curves for Alloy 800H at 566°C

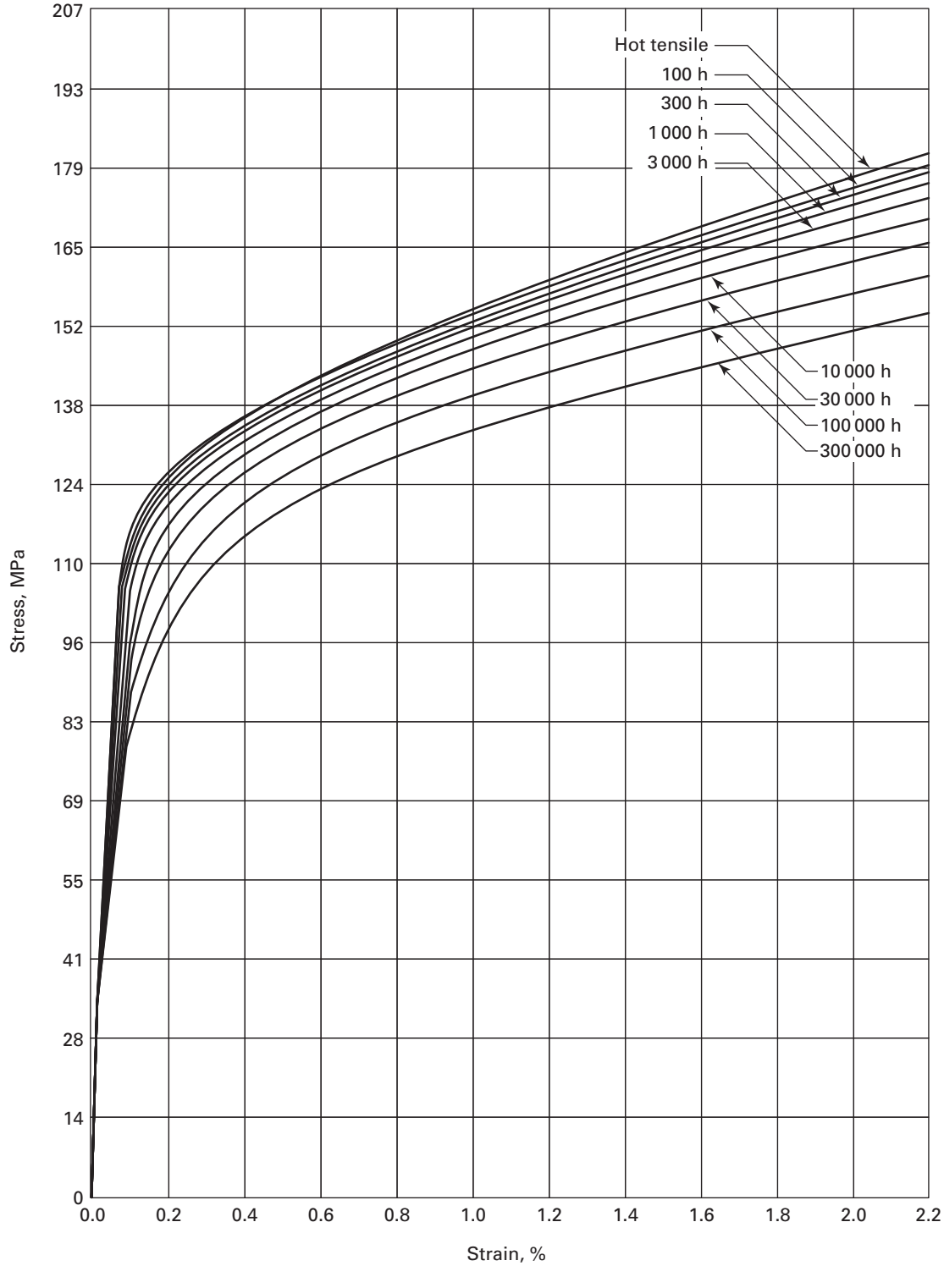


Figure E-100.20-6
Average Isochronous Stress–Strain Curves for Alloy 800H at 593°C

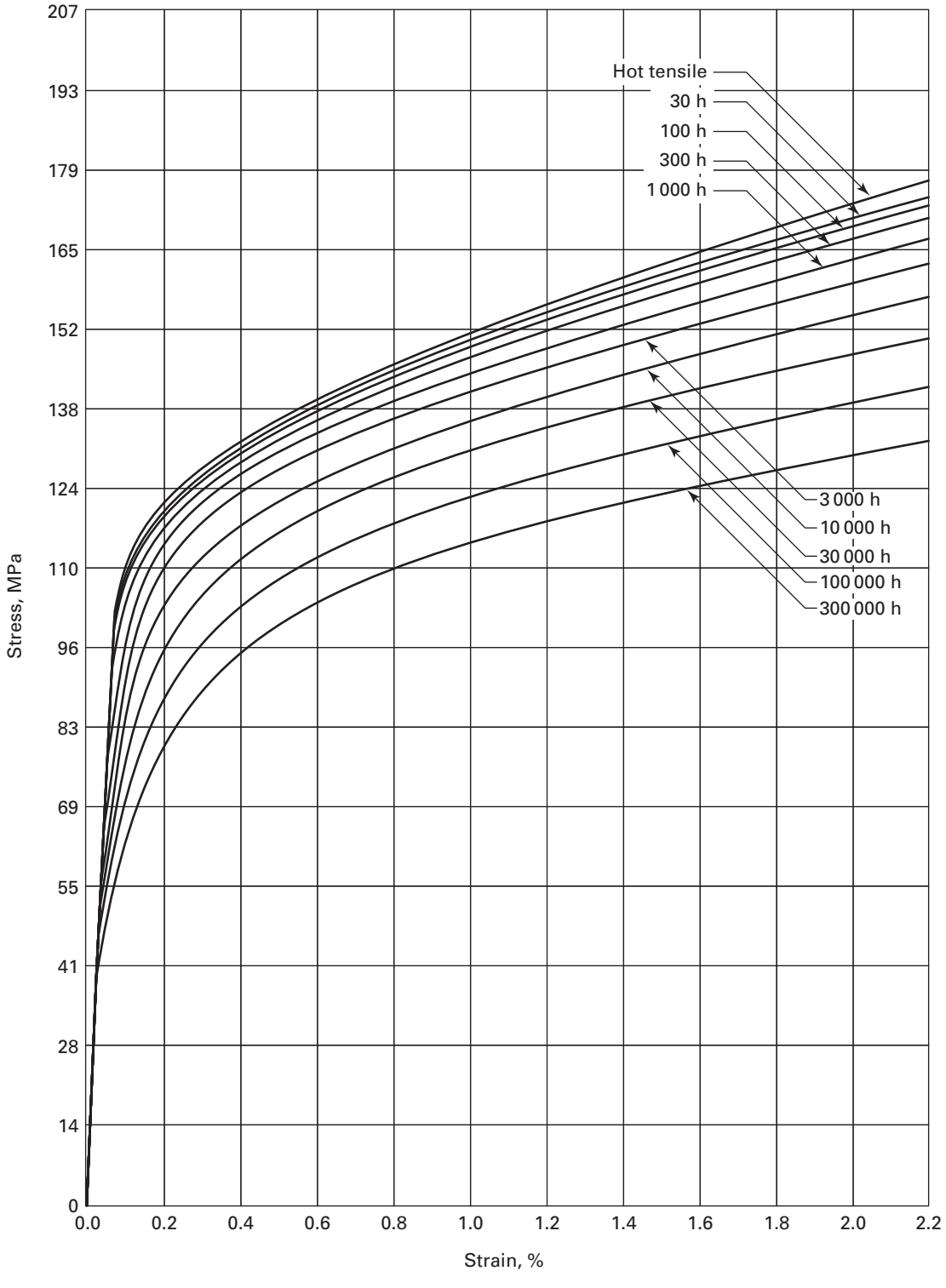


Figure E-100.20-7
Average Isochronous Stress–Strain Curves for Alloy 800H at 621°C

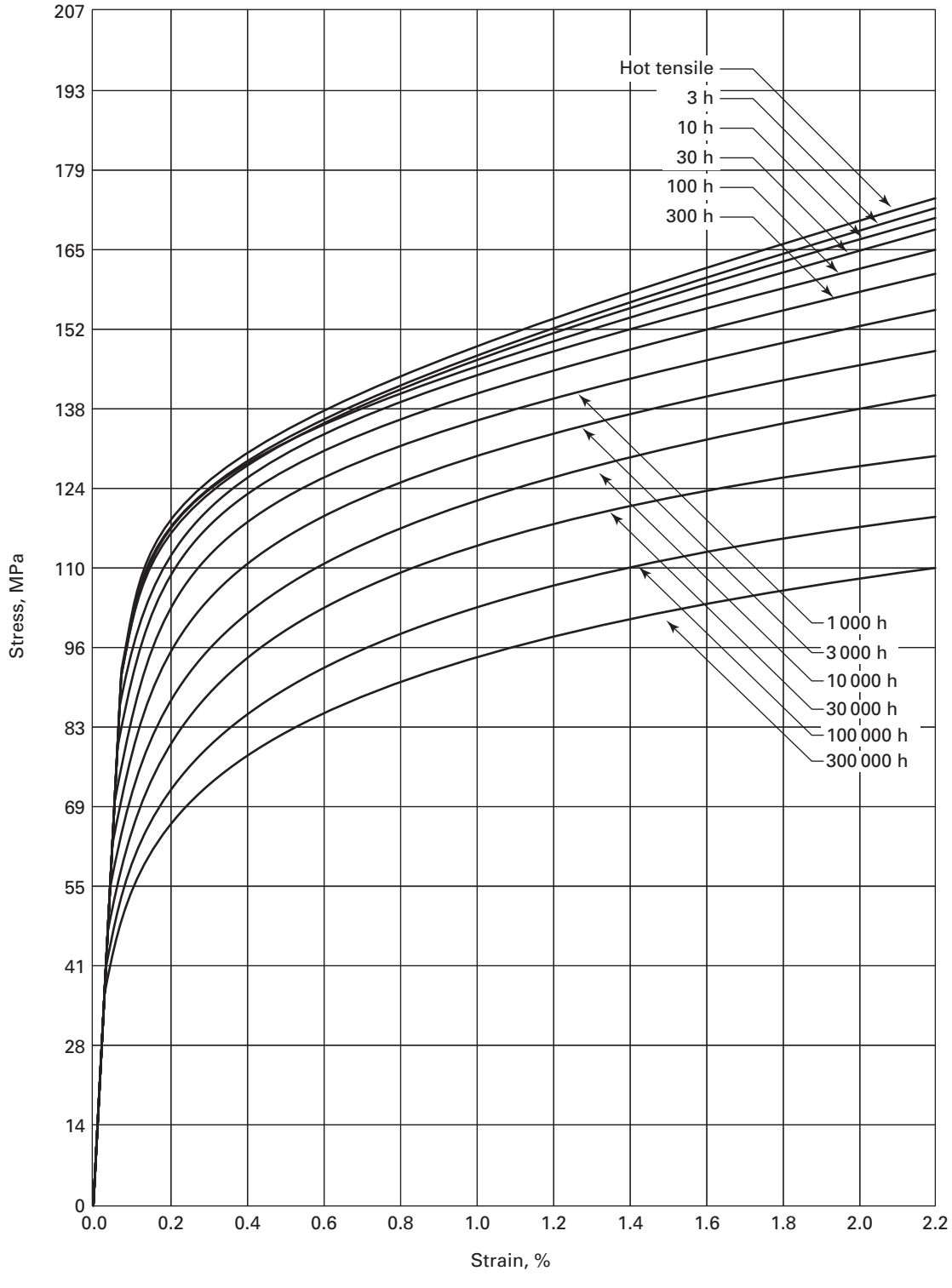


Figure E-100.20-8
Average Isochronous Stress–Strain Curves for Alloy 800H at 649°C

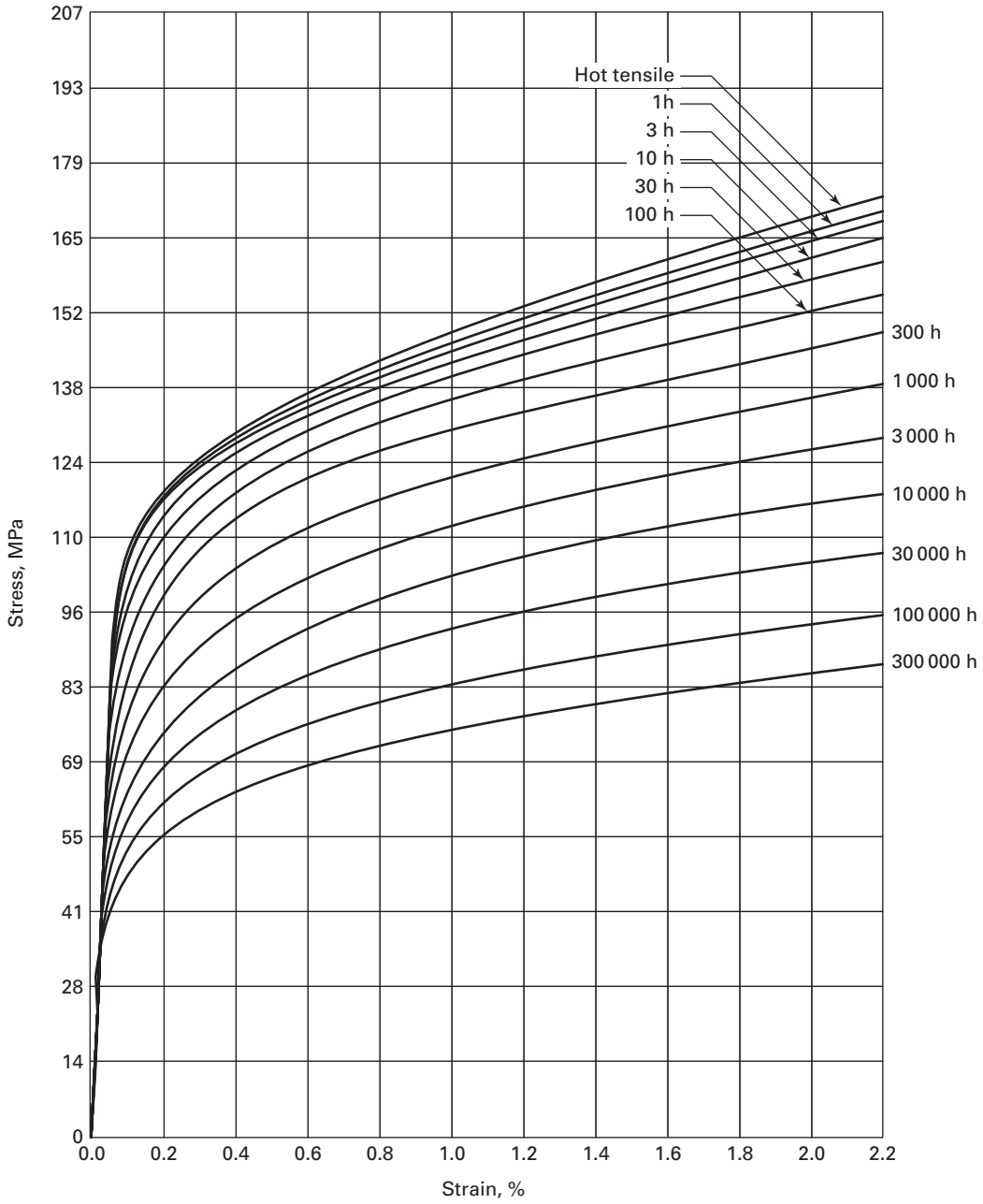


Figure E-100.20-9
Average Isochronous Stress–Strain Curves for Alloy 800H at 677°C

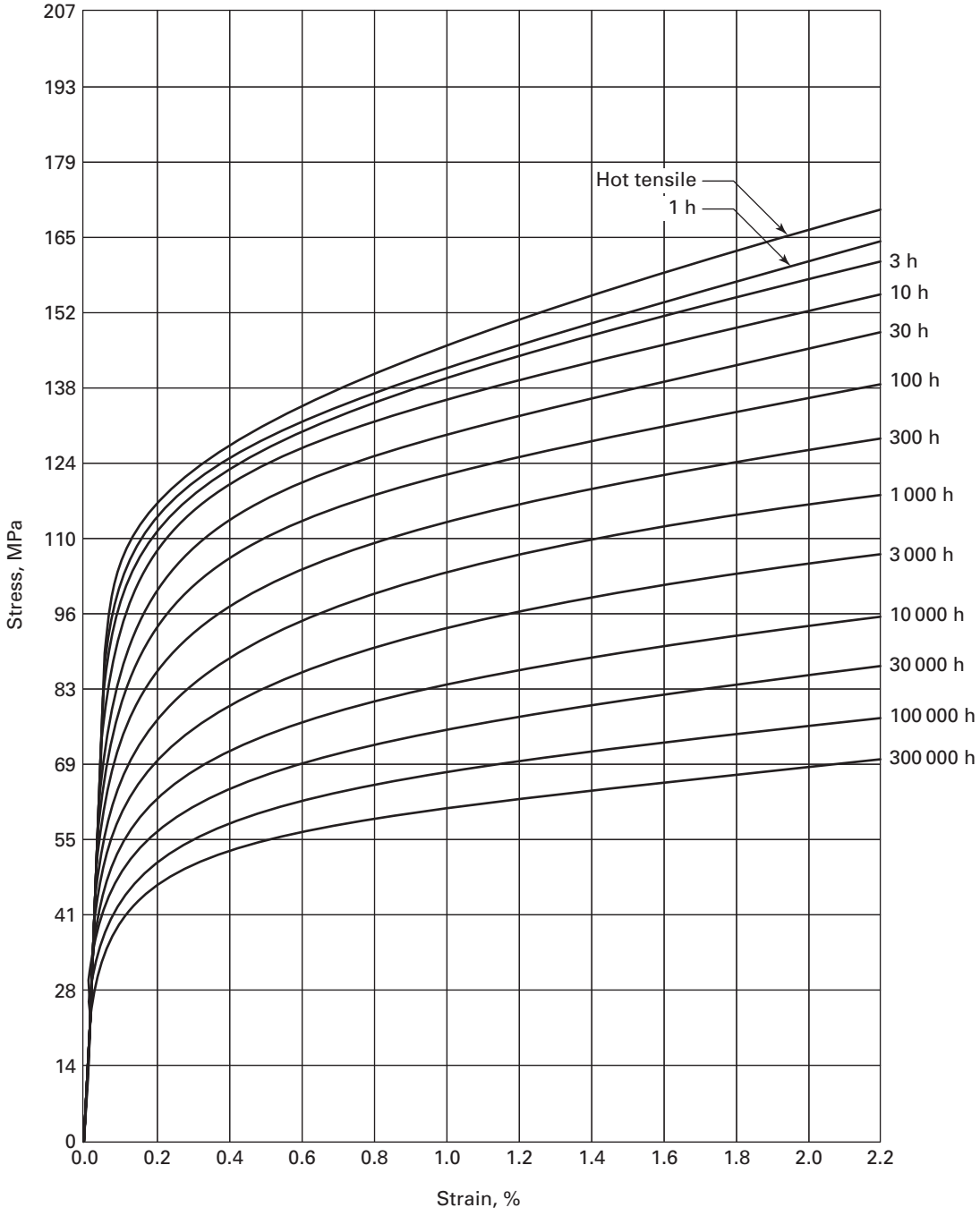


Figure E-100.20-10
Average Isochronous Stress–Strain Curves for Alloy 800H at 704°C

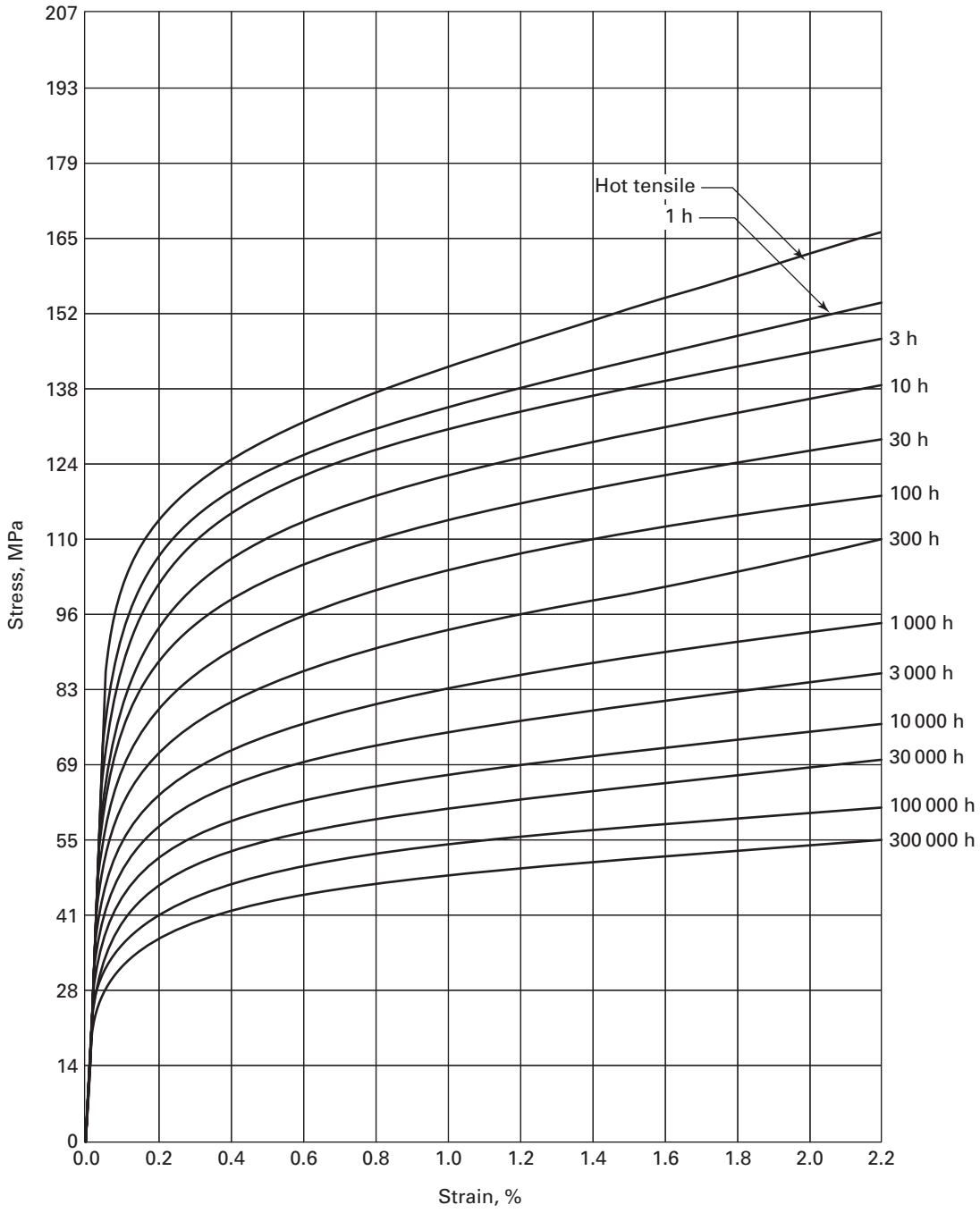


Figure E-100.20-11
Average Isochronous Stress–Strain Curves for Alloy 800H at 732°C

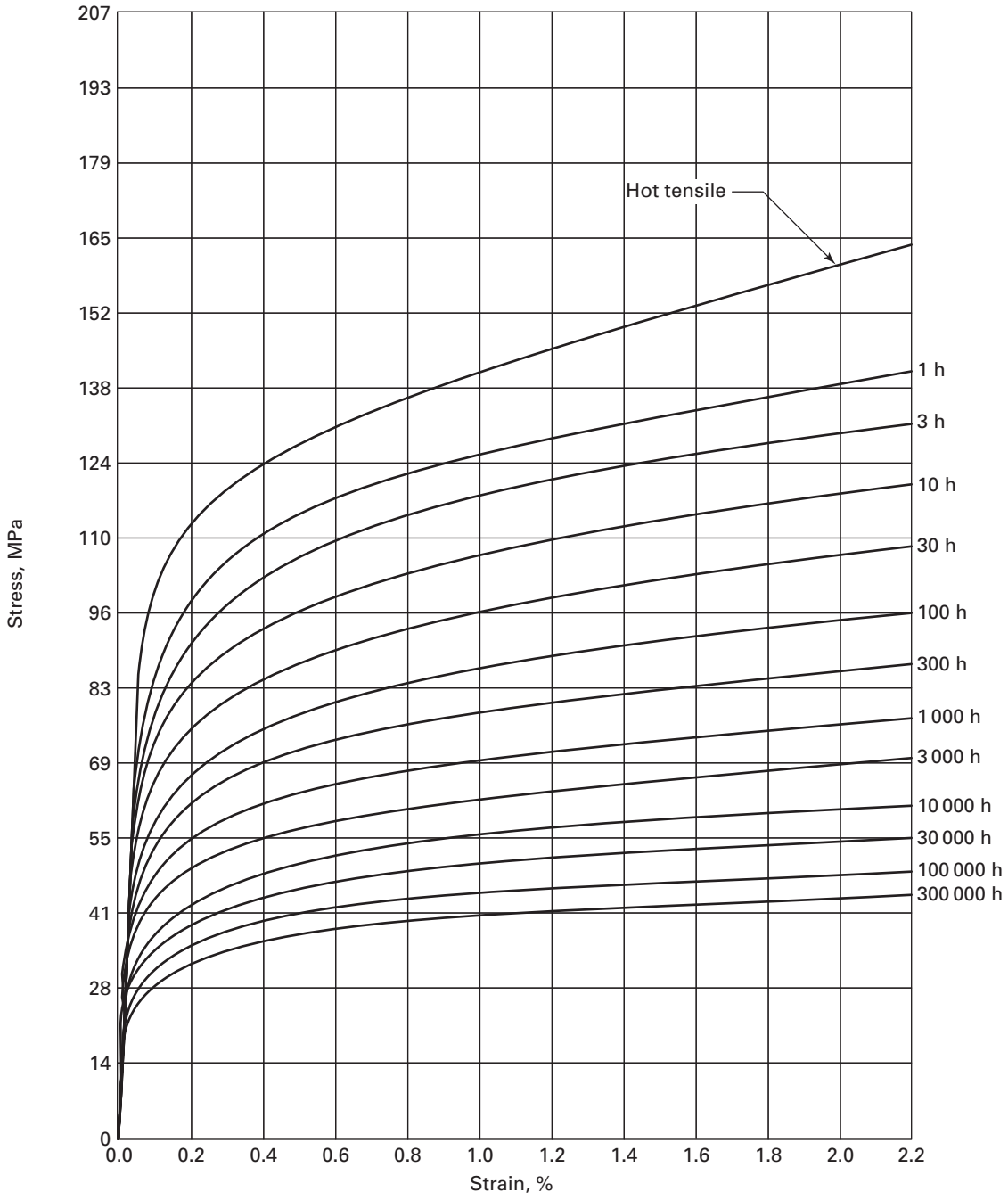


Figure E-100.20-12
Average Isochronous Stress–Strain Curves for Alloy 800H at 760°C

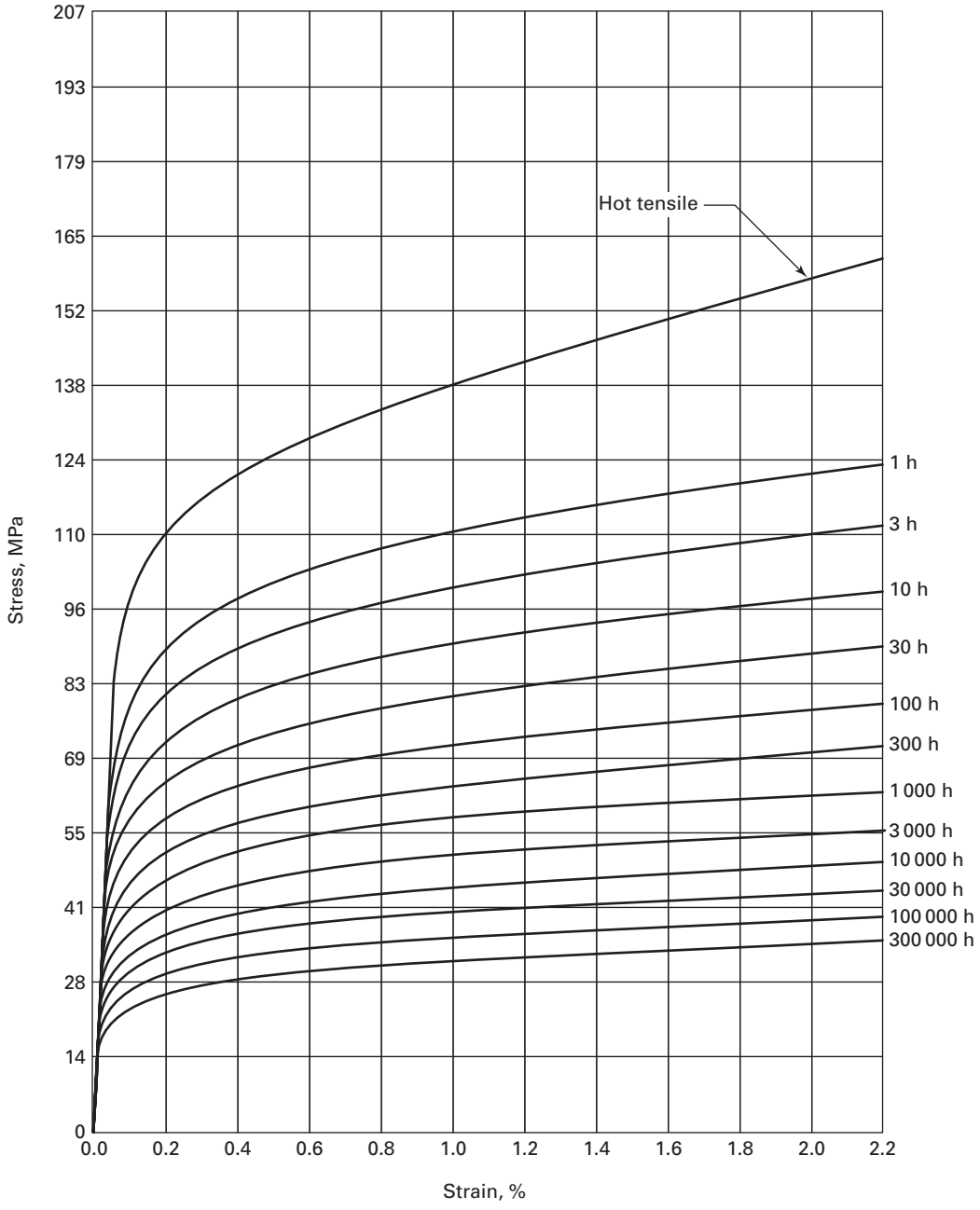


Figure E-100.21-1
Average Isochronous Stress–Strain Curves for Annealed 2¼Cr–1Mo at 371°C

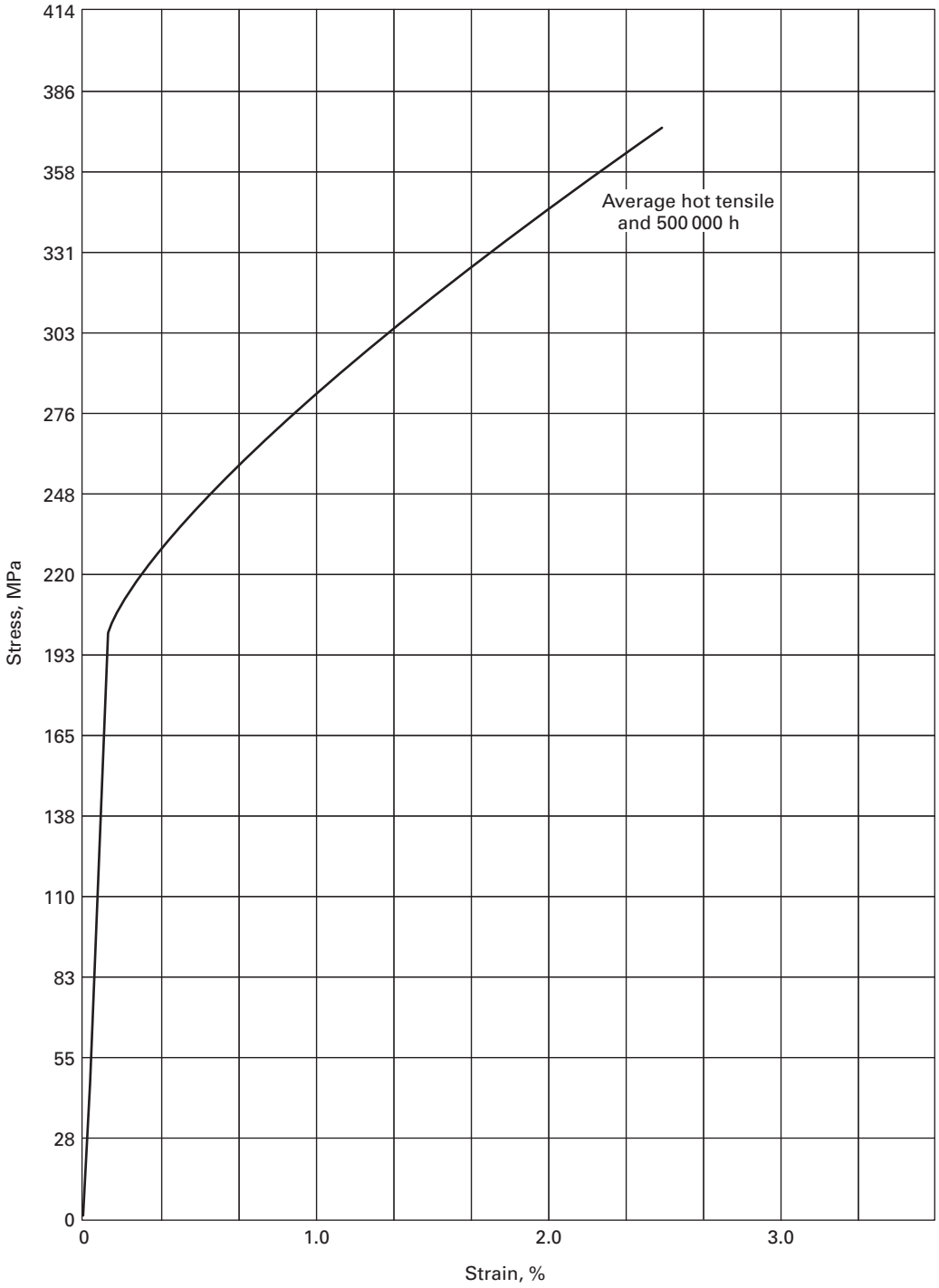


Figure E-100.21-2
Average Isochronous Stress–Strain Curves for Annealed 2¼Cr–1Mo at 399°C

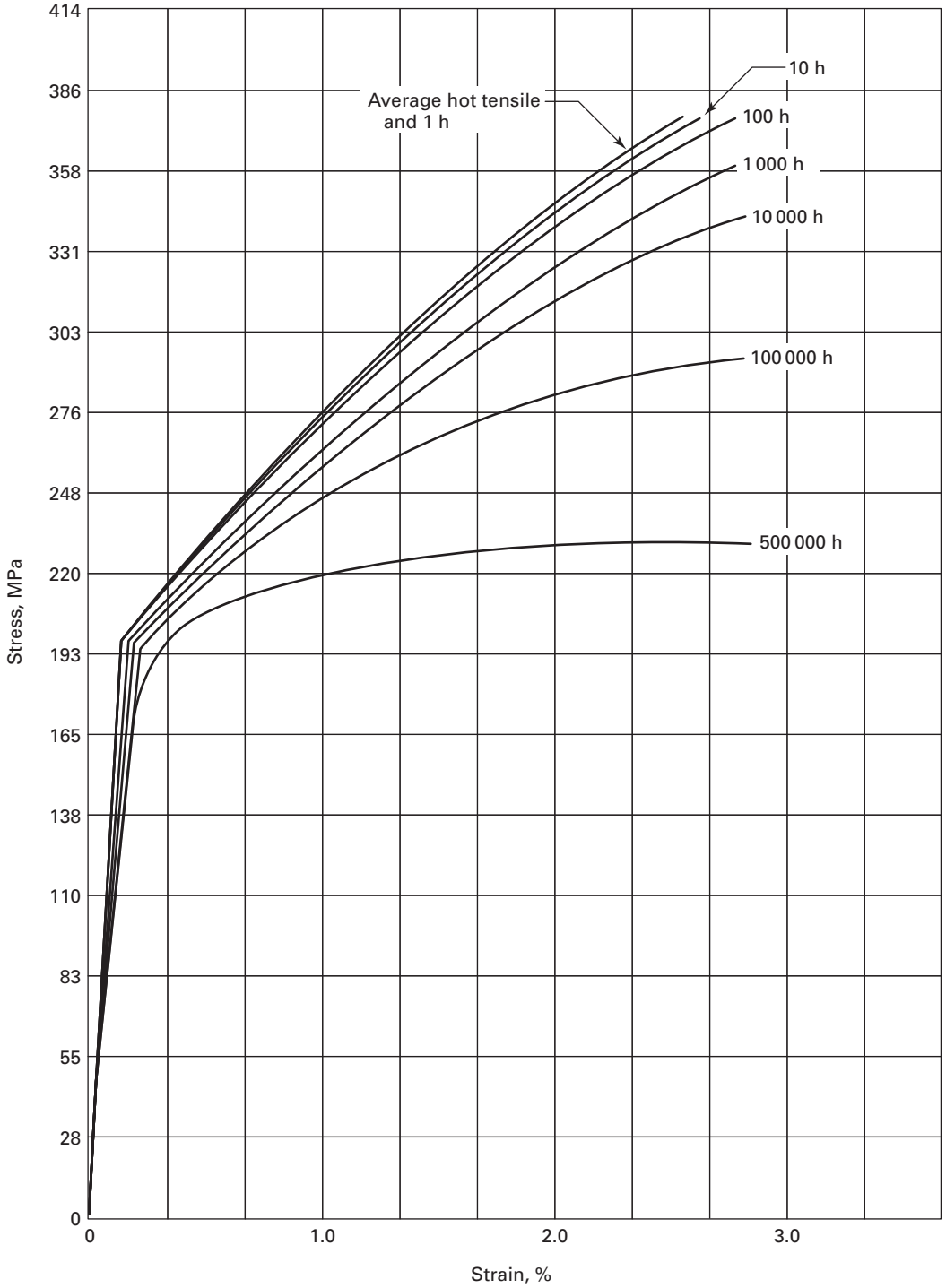


Figure E-100.21-3
Average Isochronous Stress–Strain Curves for Annealed $2\frac{1}{4}$Cr–1Mo at 427°C

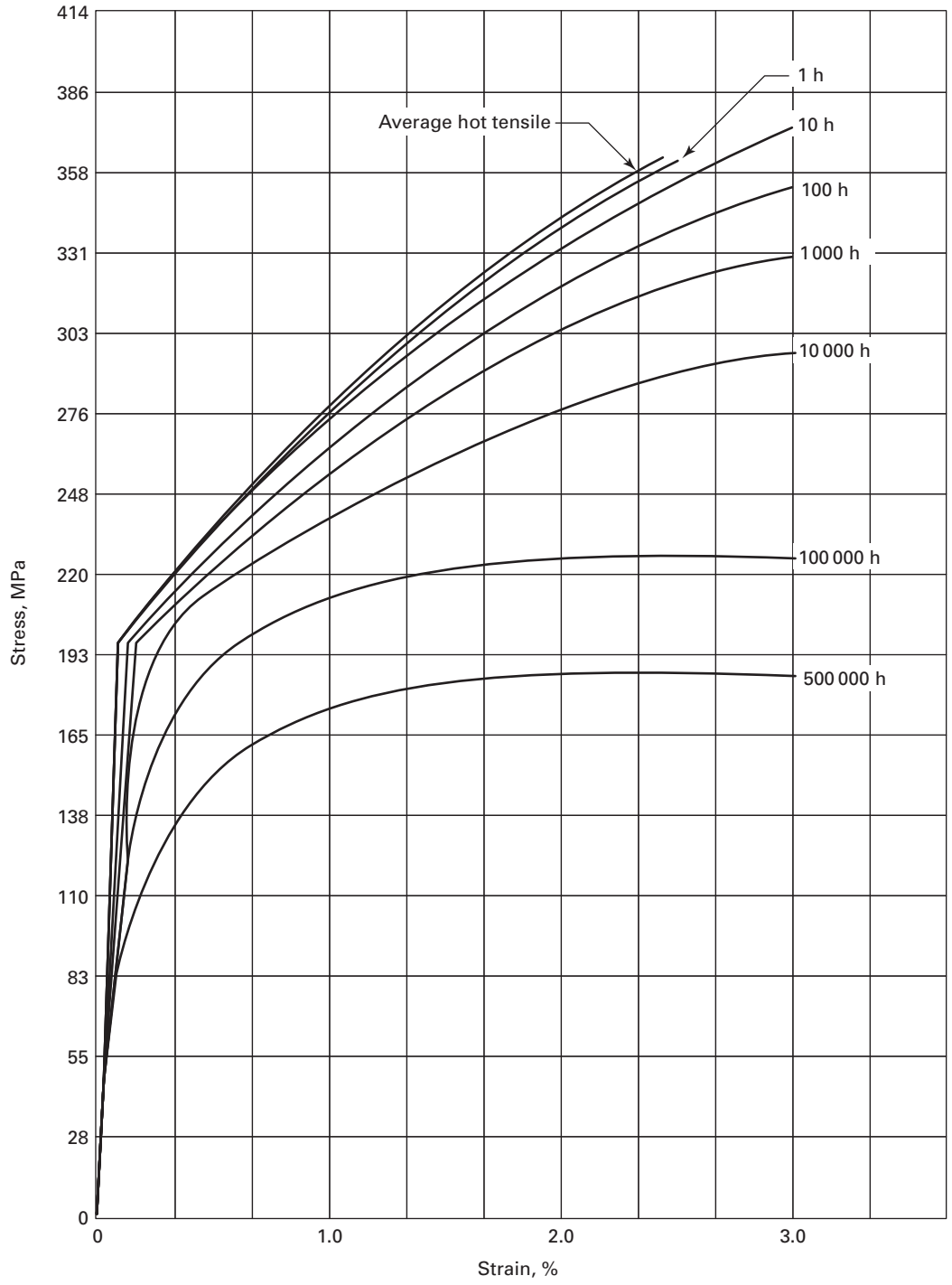


Figure E-100.21-4
Average Isochronous Stress–Strain Curves for Annealed 2¼Cr–1Mo at 454°C

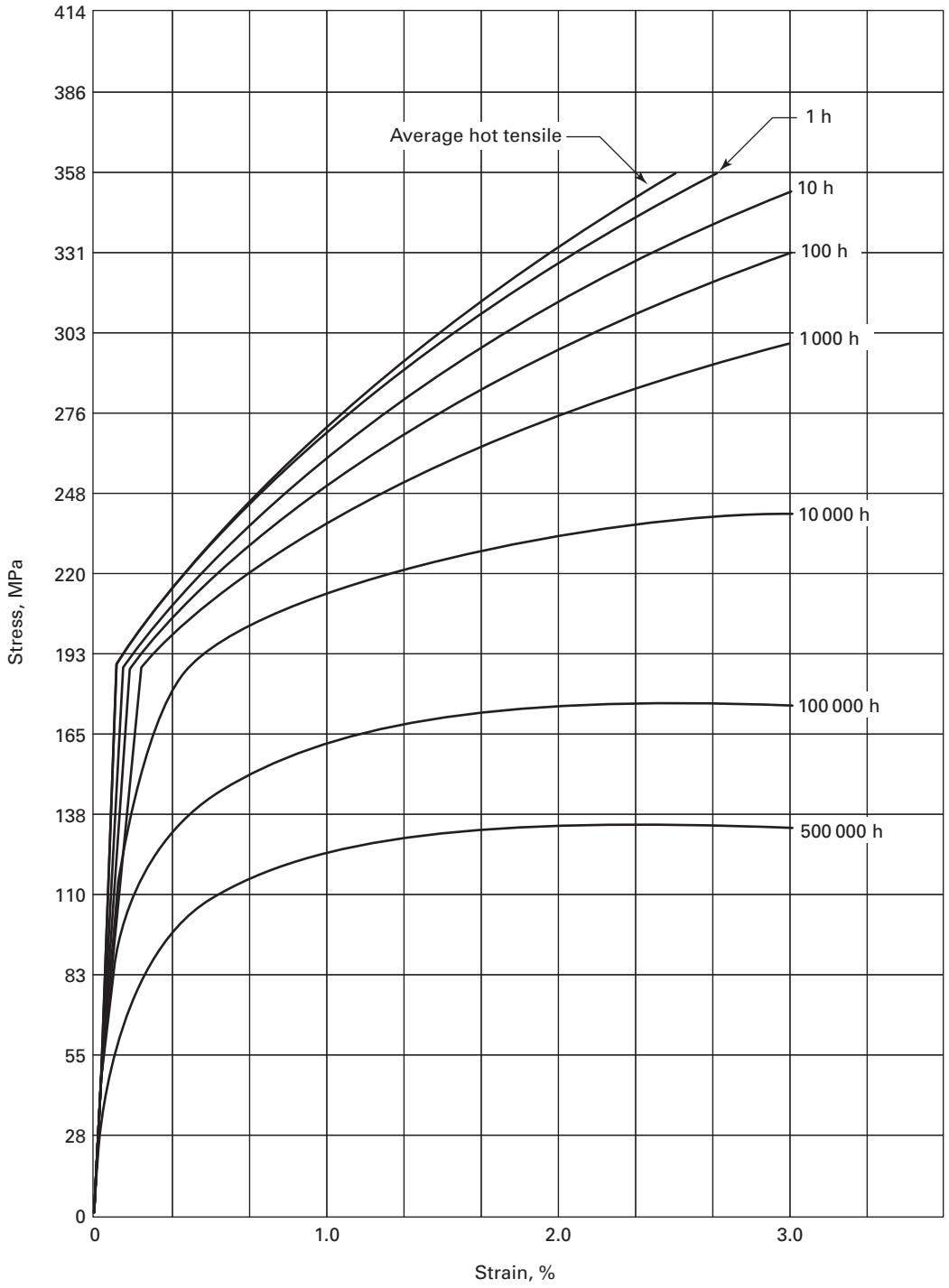


Figure E-100.21-5
Average Isochronous Stress–Strain Curves for Annealed $2\frac{1}{4}$Cr–1Mo at 482°C

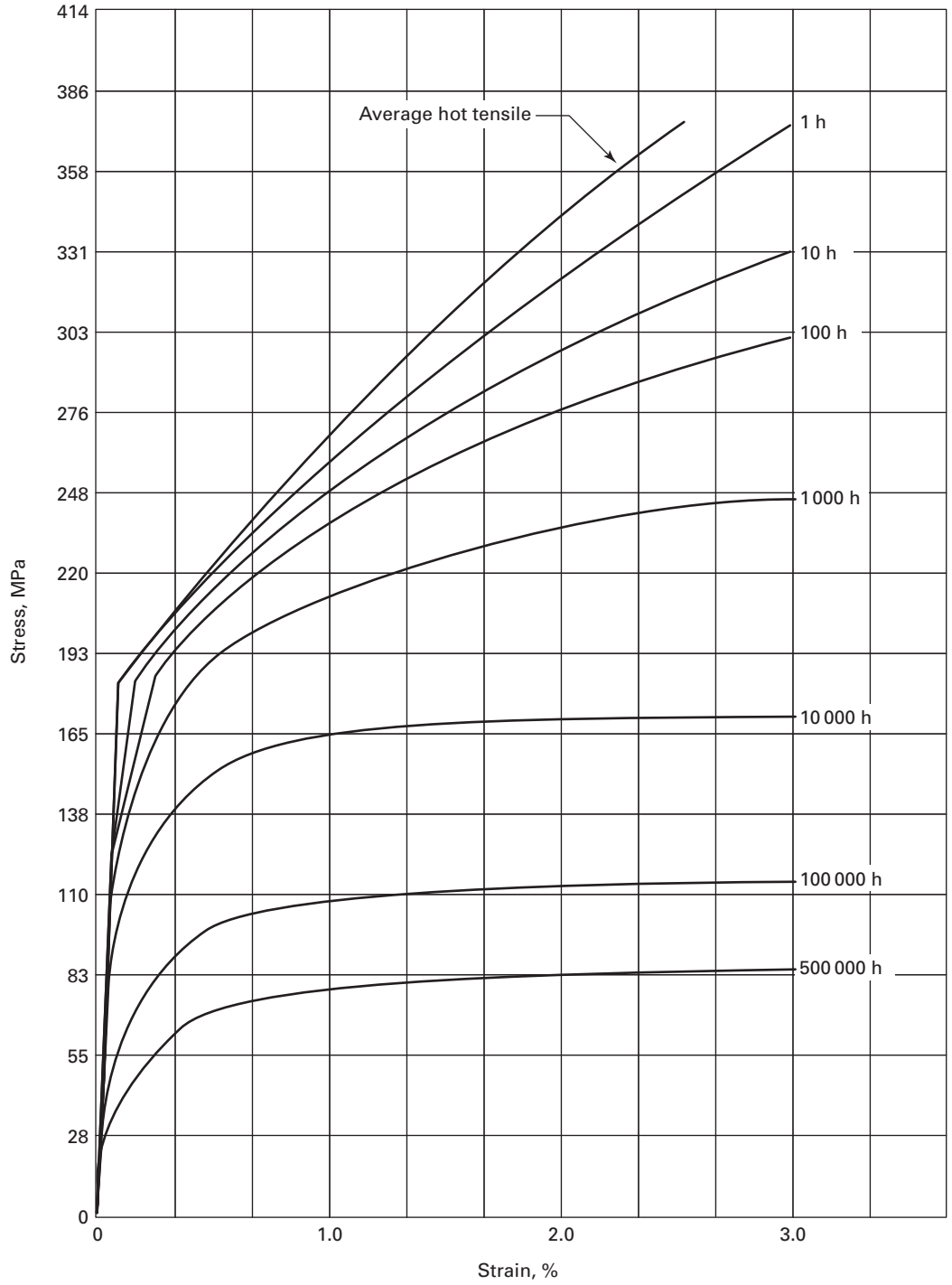


Figure E-100.21-6
Average Isochronous Stress–Strain Curves for Annealed 2¼Cr–1Mo at 510°C

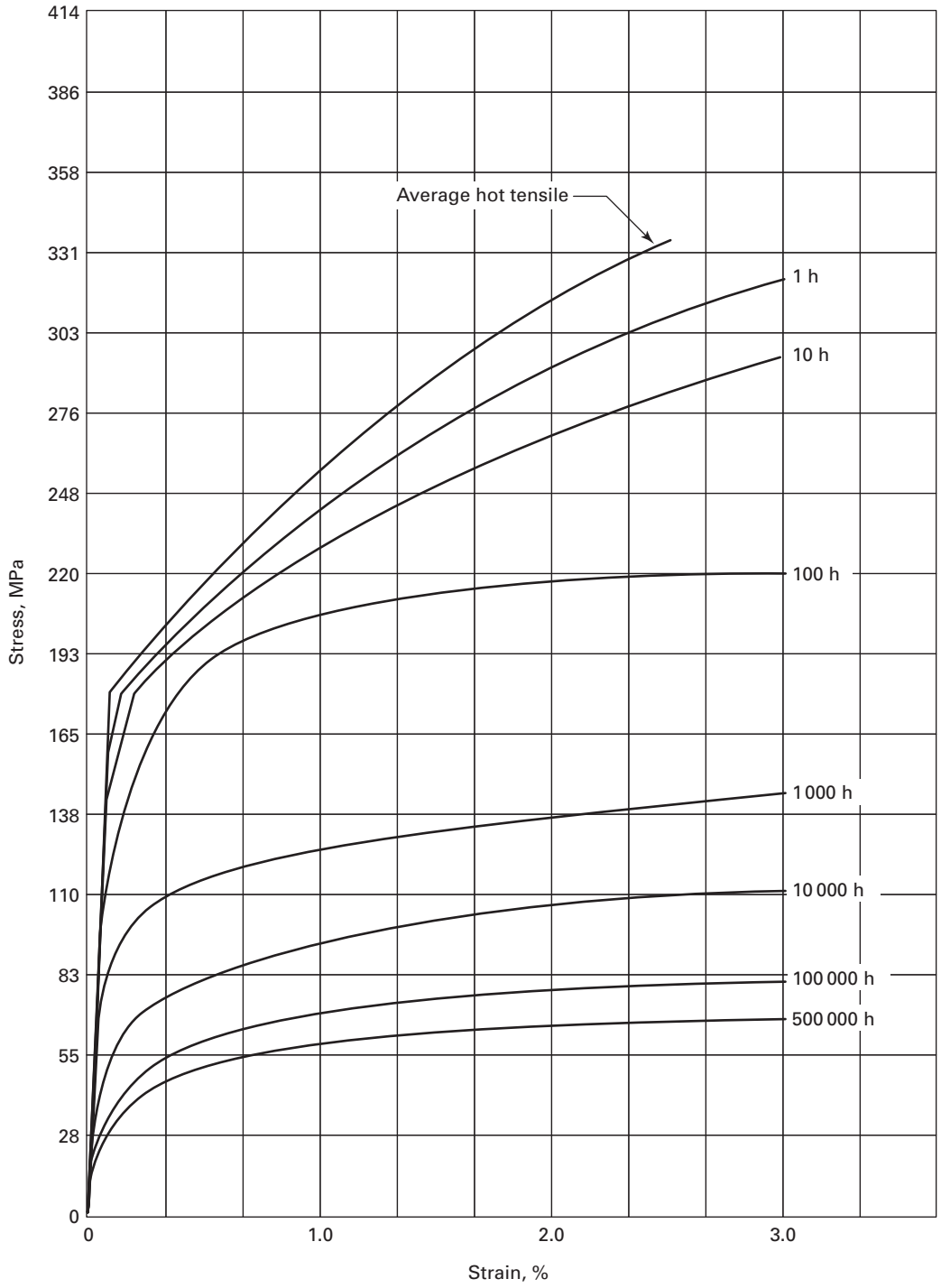


Figure E-100.21-7
Average Isochronous Stress–Strain Curves for Annealed 2¼Cr–1Mo at 538°C

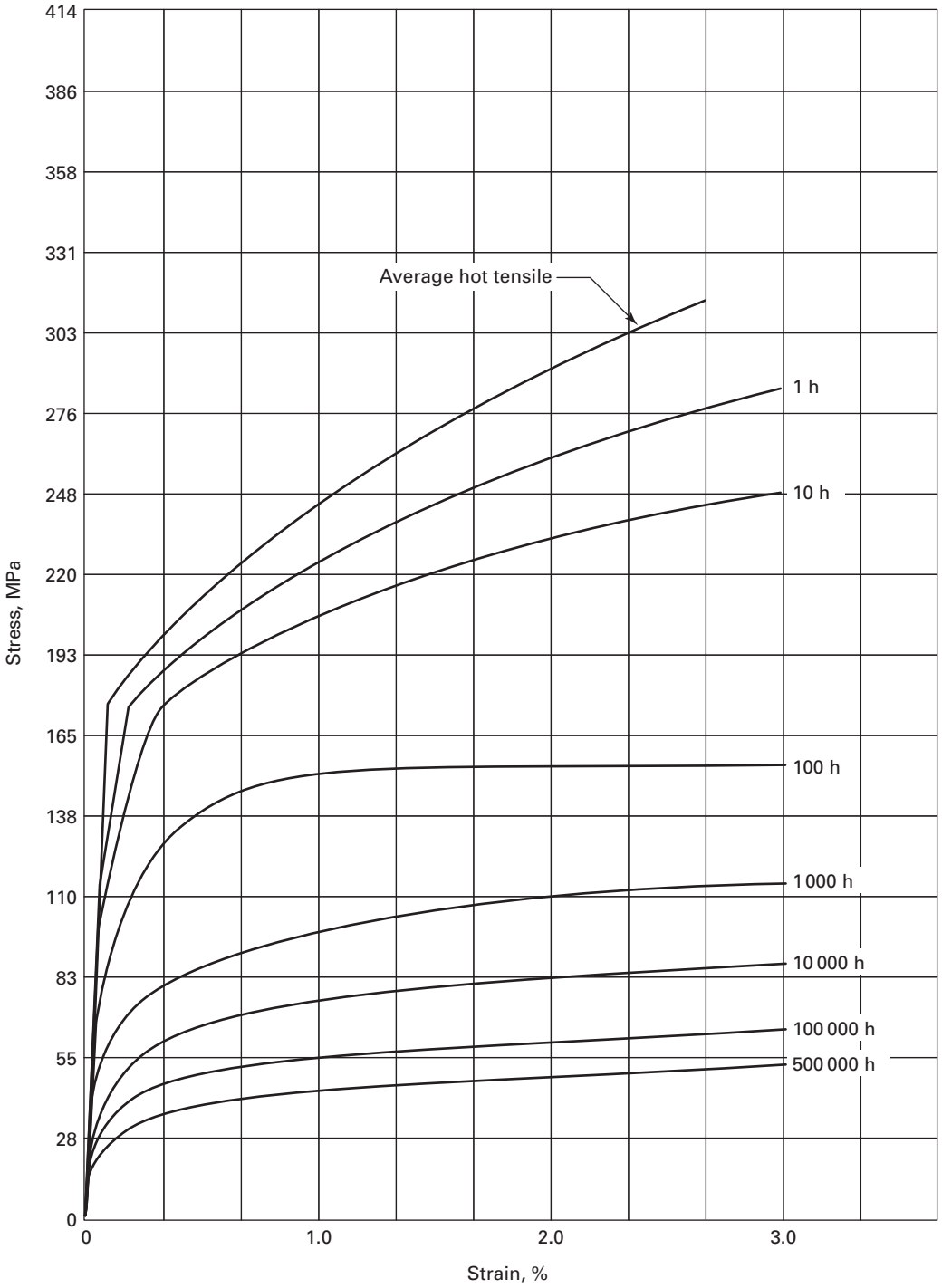


Figure E-100.21-8
Average Isochronous Stress–Strain Curves for Annealed 2¼Cr–1Mo at 566°C

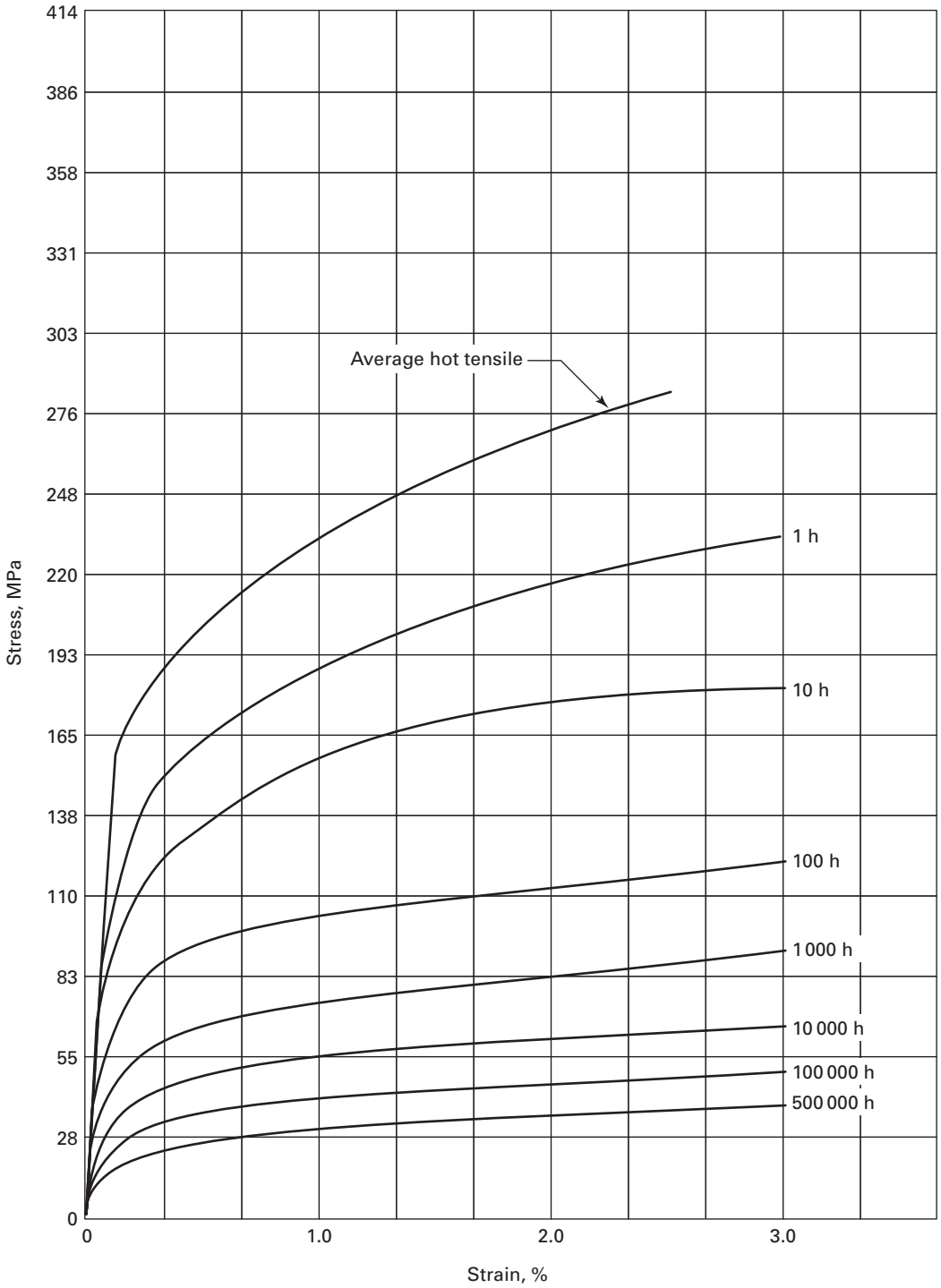


Figure E-100.21-9
Average Isochronous Stress–Strain Curves for Annealed 2¼Cr–1Mo at 593°C

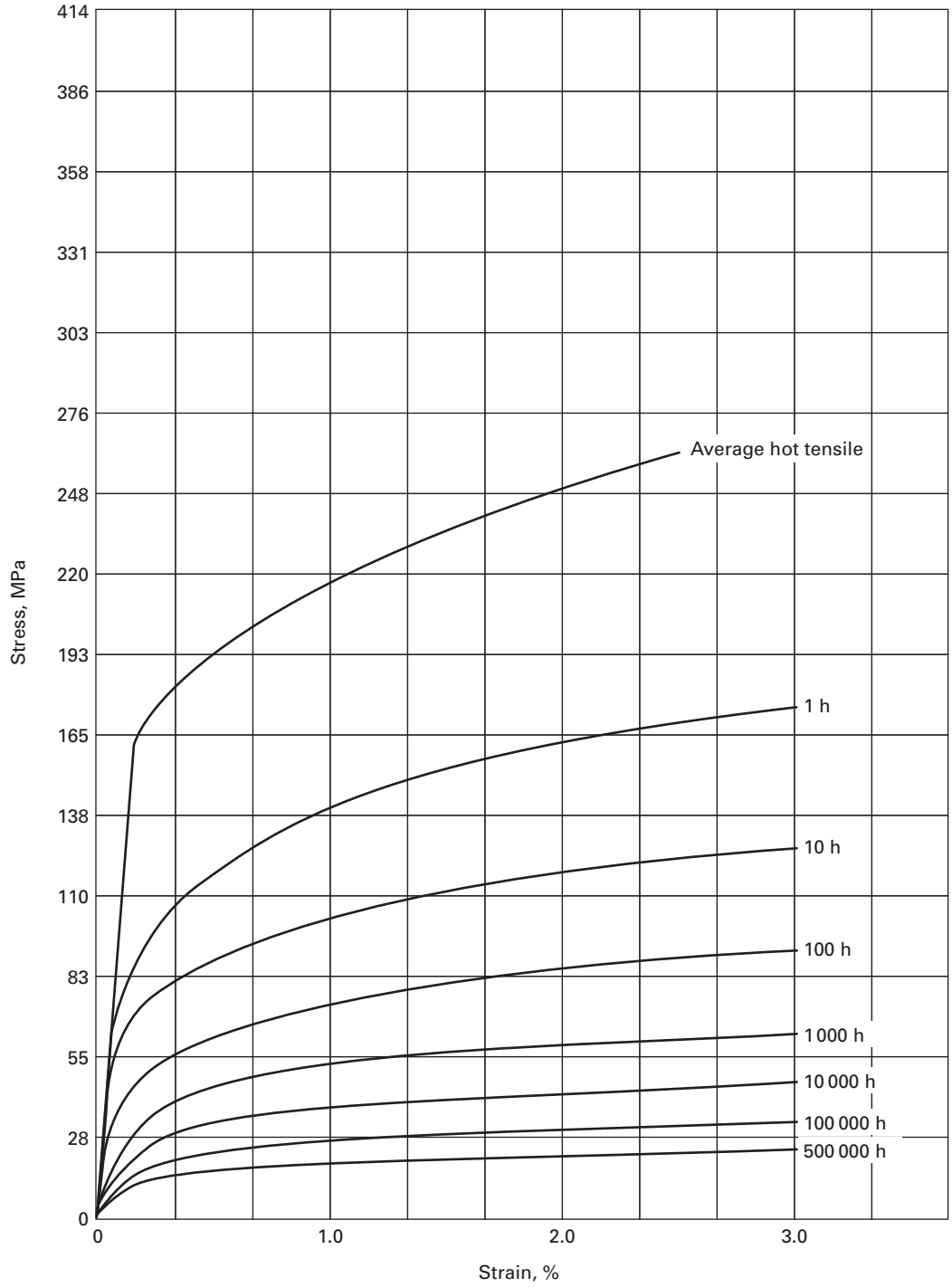


Figure E-100.21-10
Average Isochronous Stress–Strain Curves for Annealed 2¼Cr–1Mo at 621°C

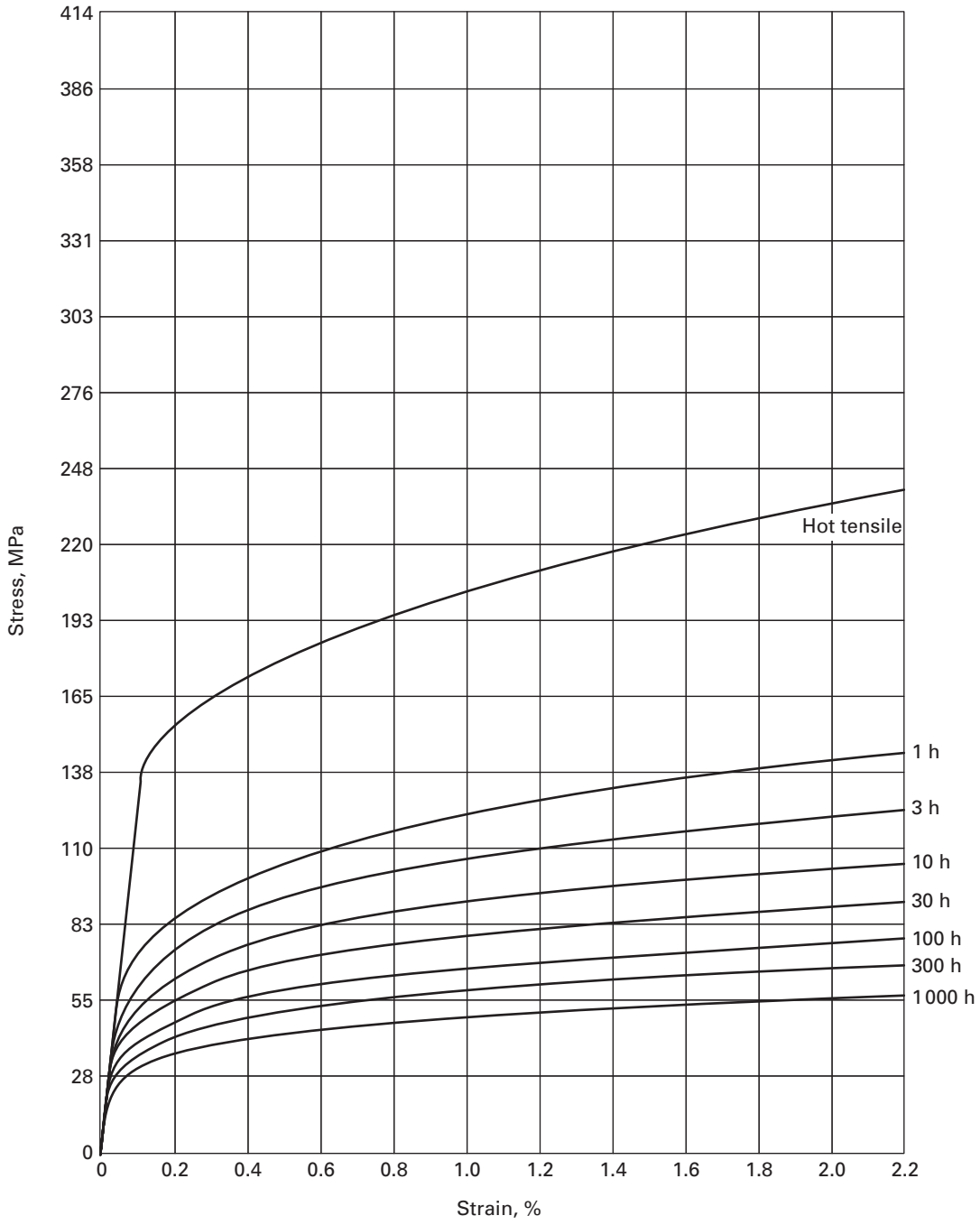


Figure E-100.21-11
Average Isochronous Stress–Strain Curves for Annealed 2¼Cr–1Mo at 649°C

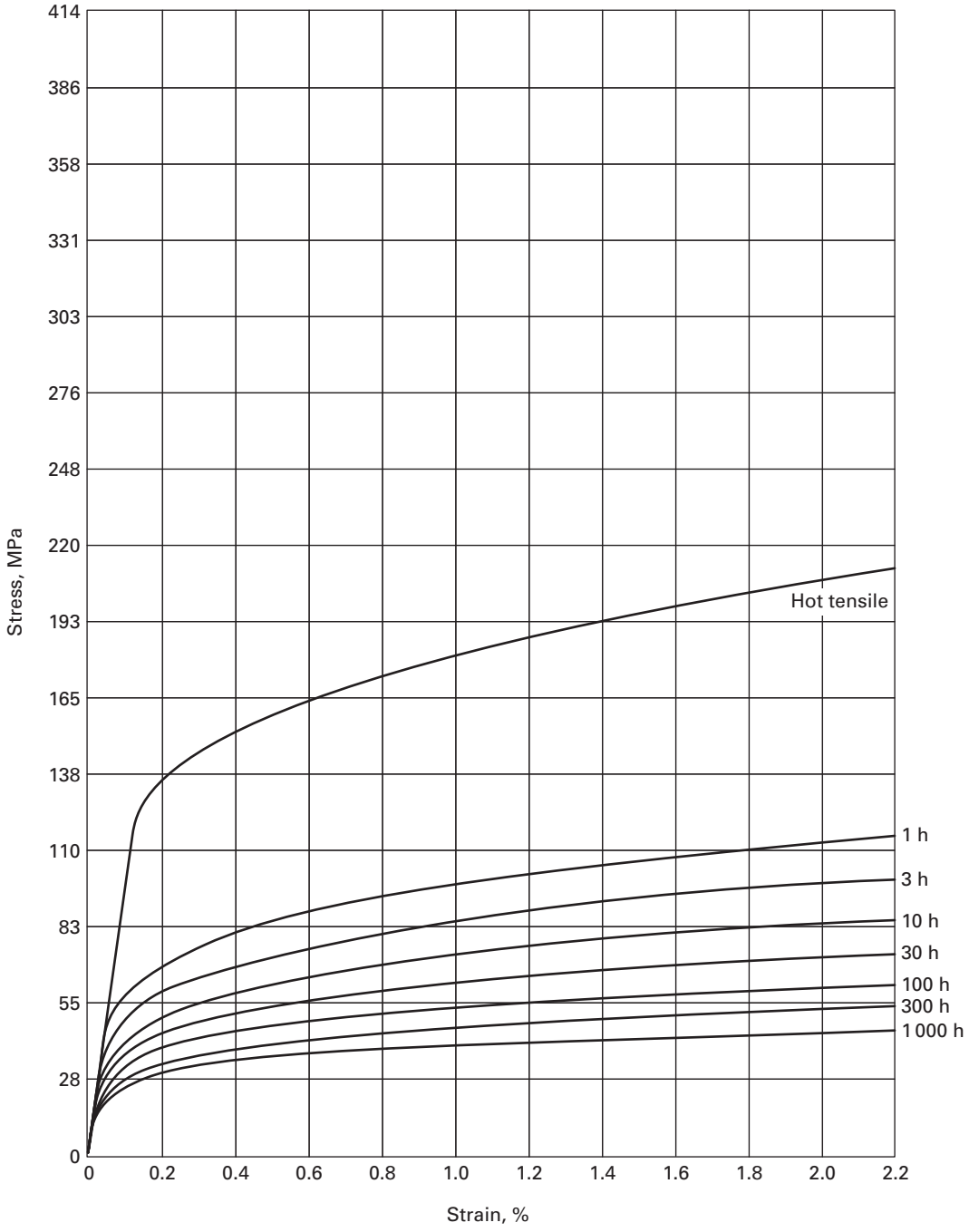


Figure E-100.22-1
Average Isochronous Stress–Strain Curves for 9Cr–1Mo–V at 371°C

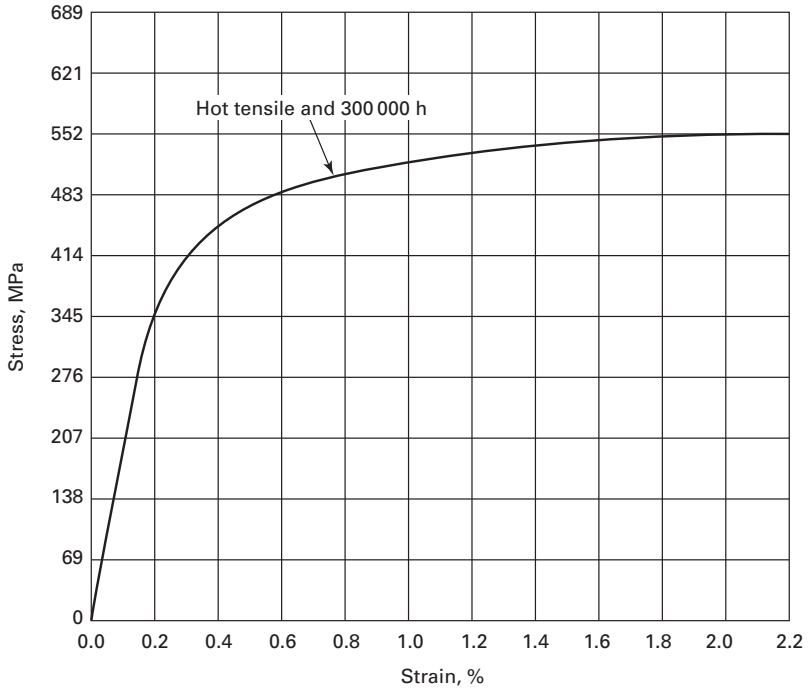


Figure E-100.22-2
Average Isochronous Stress–Strain Curves for 9Cr–1Mo–V at 399°C

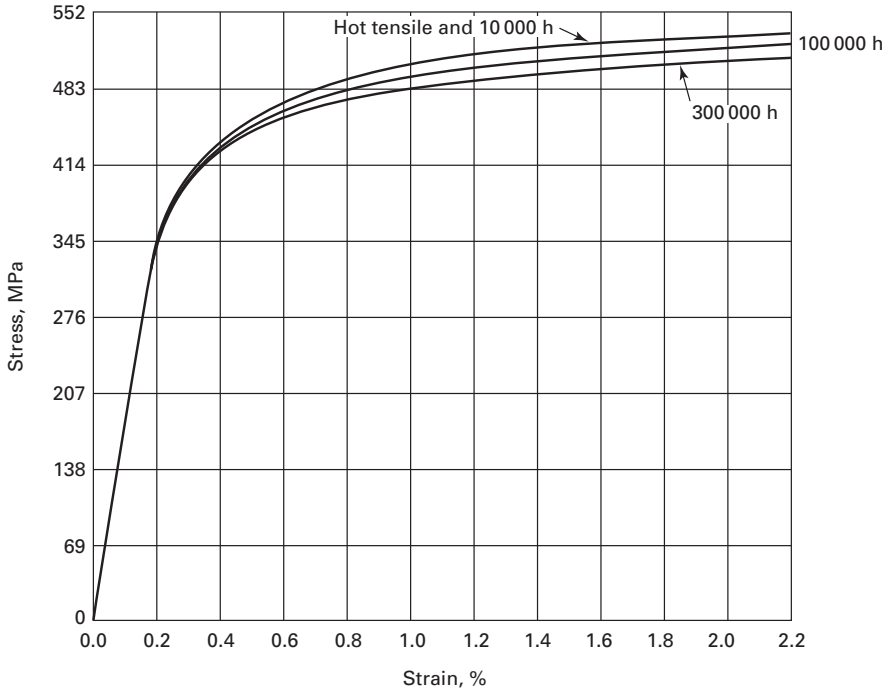


Figure E-100.22-3
Average Isochronous Stress–Strain Curves for 9Cr–1Mo–V at 426°C

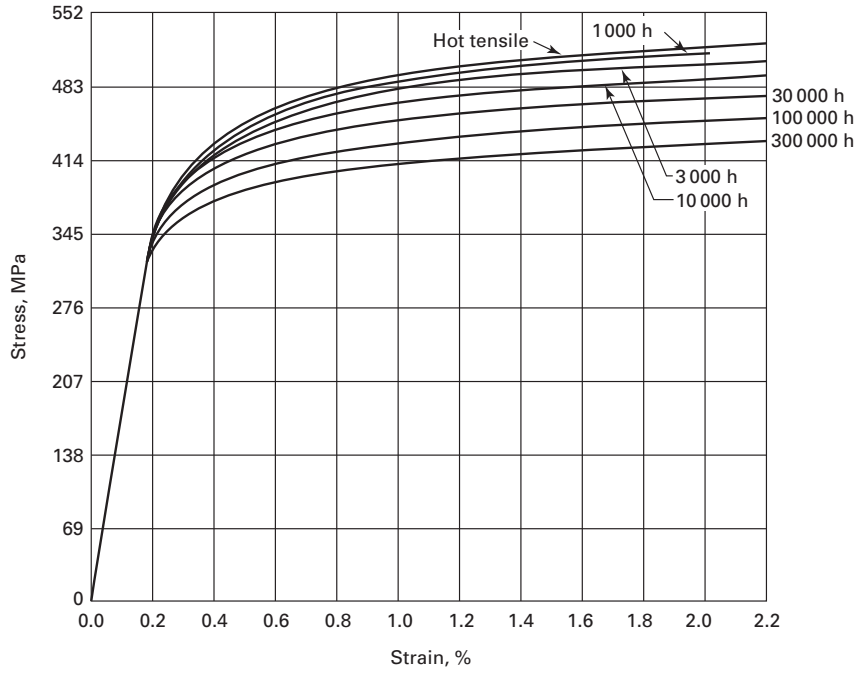


Figure E-100.22-4
Average Isochronous Stress–Strain Curves for 9Cr–1Mo–V at 454°C

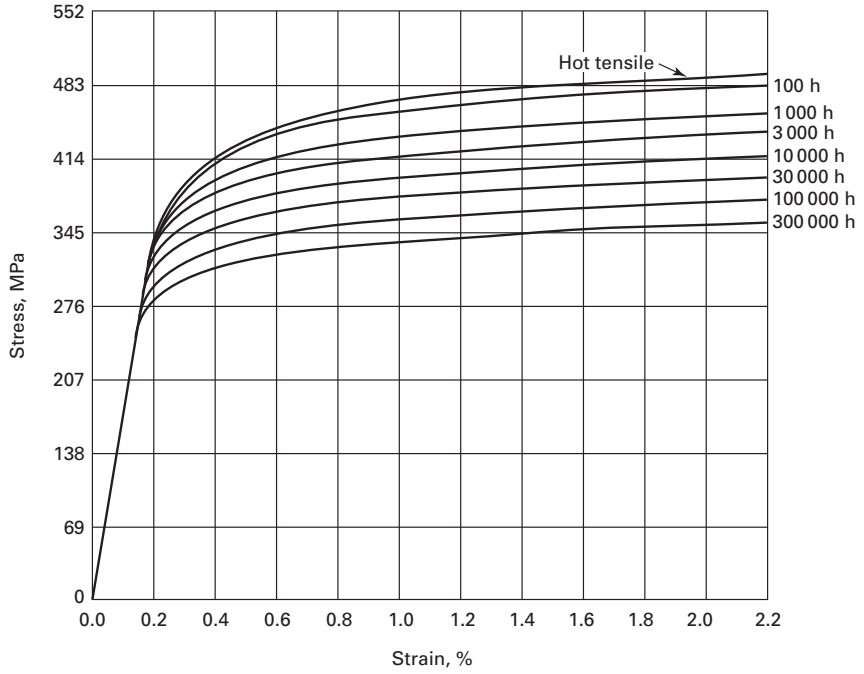


Figure E-100.22-5
Average Isochronous Stress–Strain Curves for 9Cr–1Mo–V at 482°C

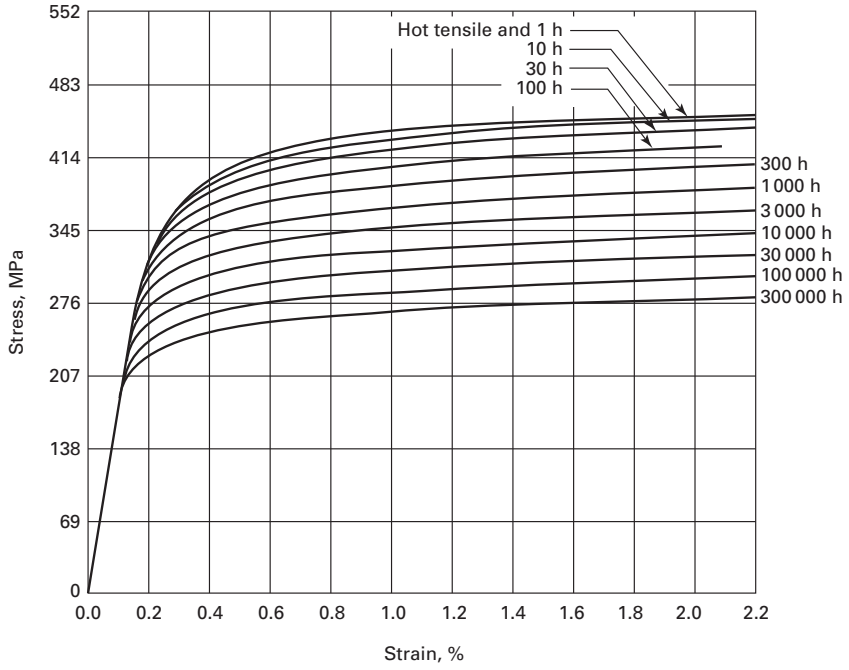


Figure E-100.22-6
Average Isochronous Stress–Strain Curves for 9Cr–1Mo–V at 510°C

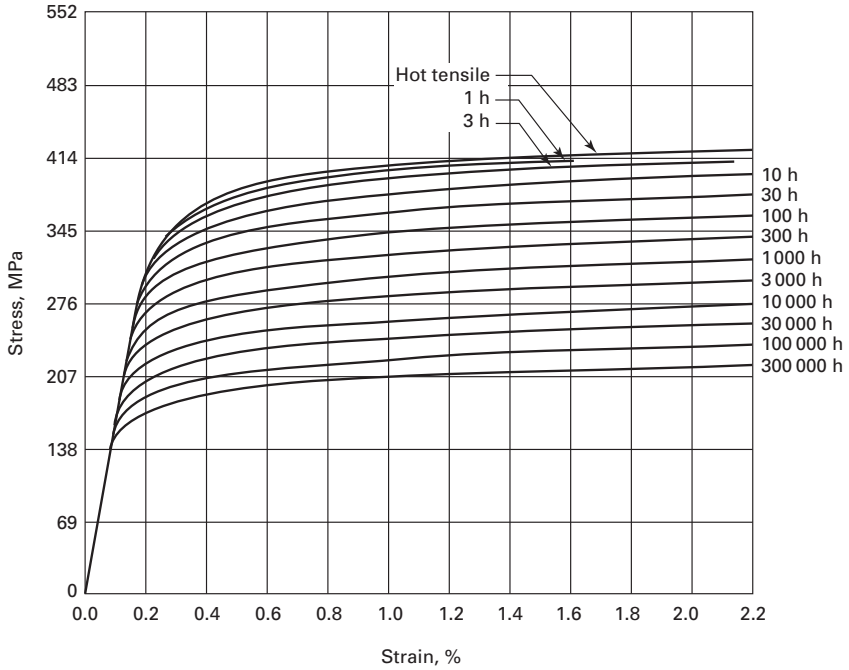


Figure E-100.22-7
Average Isochronous Stress–Strain Curves for 9Cr–1Mo–V at 538°C

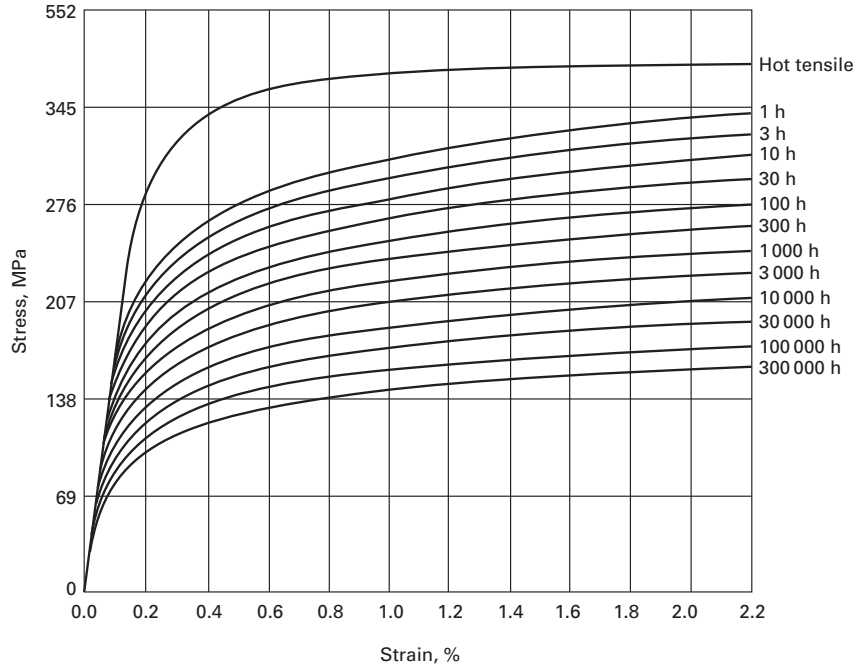


Figure E-100.22-8
Average Isochronous Stress–Strain Curves for 9Cr–1Mo–V at 566°C

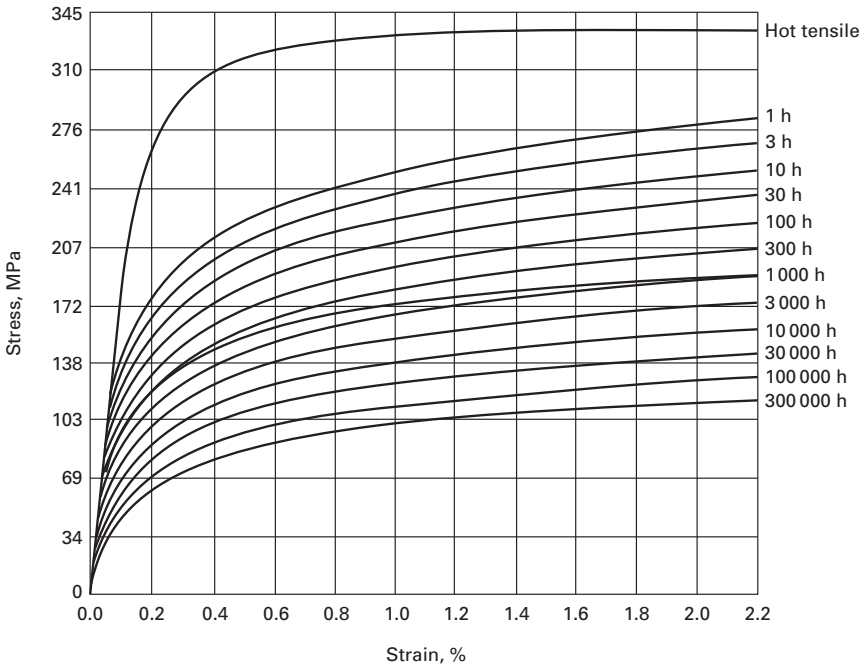


Figure E-100.22-9
Average Isochronous Stress–Strain Curves for 9Cr–1Mo–V at 593°C

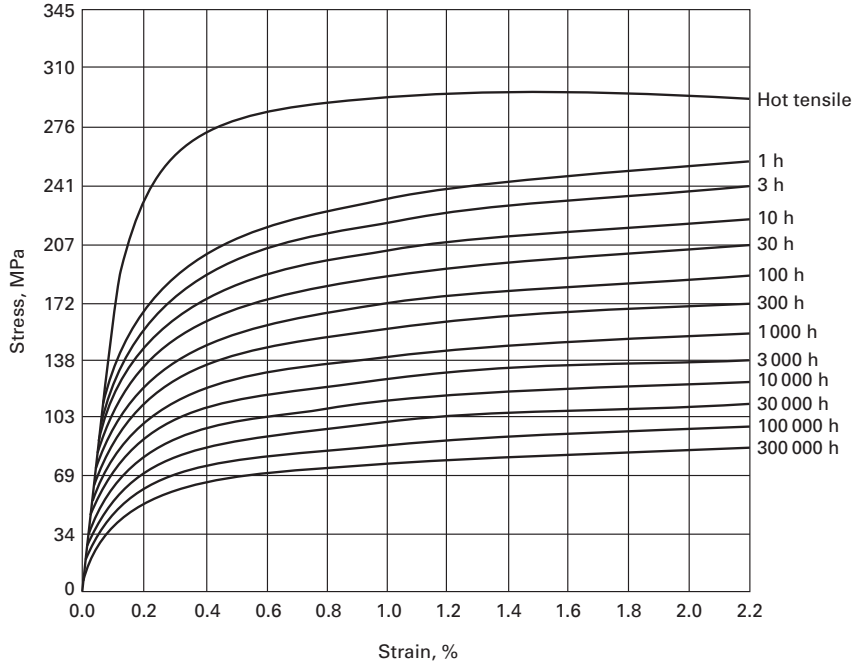


Figure E-100.22-10
Average Isochronous Stress–Strain Curves for 9Cr–1Mo–V at 621°C

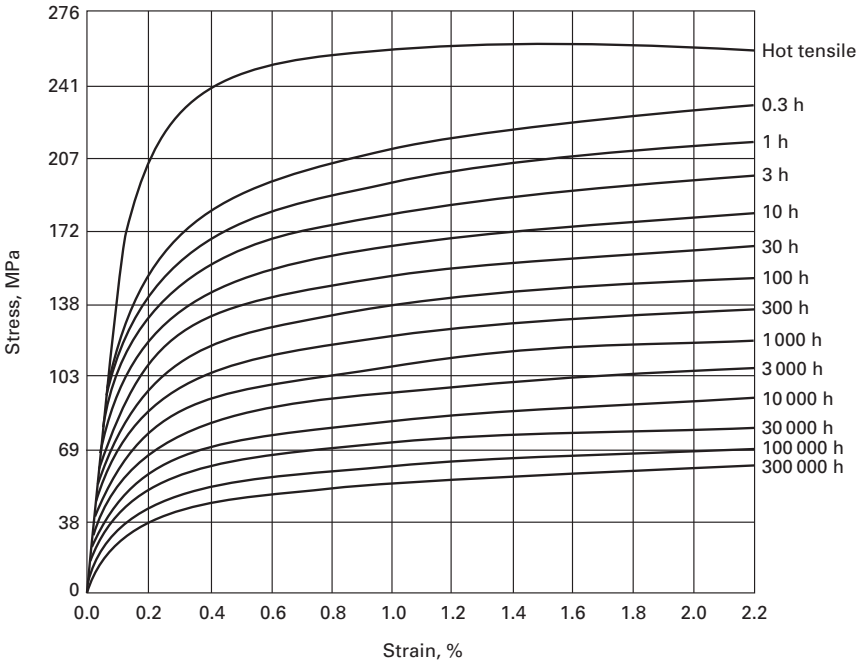


Figure E-100.22-11
Average Isochronous Stress–Strain Curves for 9Cr–1Mo–V at 649°C

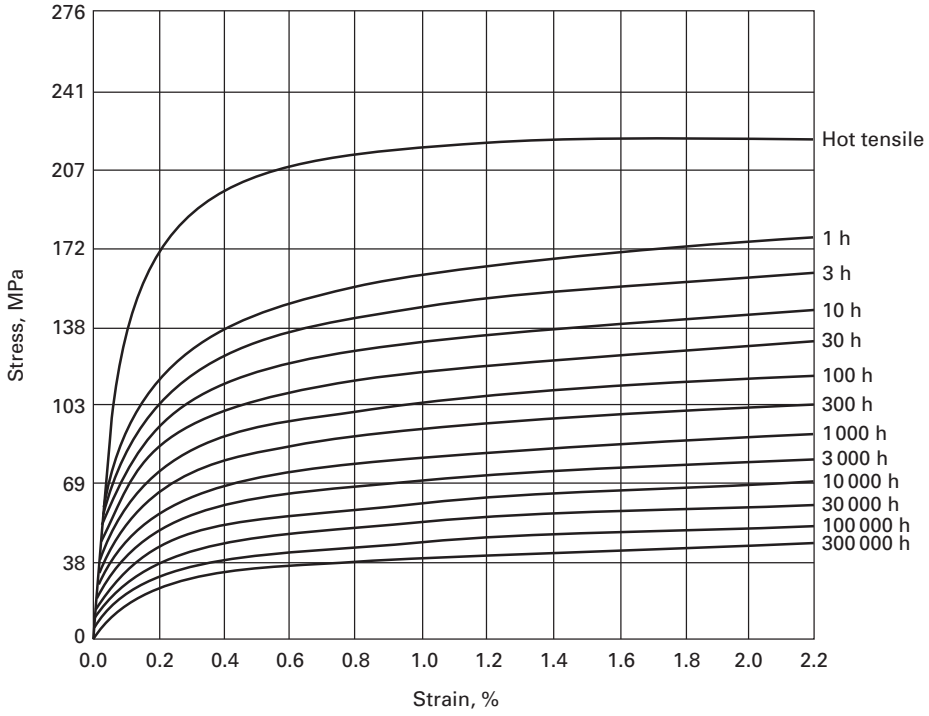


Table E-100.23-1
Recommended Restrictions

Element	Type 304	Type 316
(a) Chemical composition [Note (1)]		
Carbon	0.04–0.06	0.04–0.06
Nitrogen	0.04–0.07	0.04–0.07
Silicon	0.6	0.6
Manganese	1.0–2.0	1.0–2.0
Nickel	8.00–10.00	11.00–12.5
Chromium	18.5–20.00	17.00–18.00
Molybdenum	0.2	2.5–3.0
Sulfur	0.02	<0.02
Phosphorus	0.045	<0.03
Niobium	0.02 [Note (2)]	...
Aluminum	0.05	0.05
Antimony	0.02	0.02
Boron	...	0.003 [Note (3)]
Lead	0.003	0.003
Selenium	0.015	0.015
Tin	0.015	0.015
Vanadium	0.05	0.05
Zinc	0.01	0.01
(b) Grain size (ASTM)	3–6	3–6
(c) Melt practice	AOD or AOD/ESR	AOD or AOD/ESR
(d) Suggested upper long-term use limit for improved performance:		
Temperature, °C	595	595

NOTES:
(1) All values are maximum percentages unless indicated as ranges.
(2) To further reduce data scatter, a minimum value of 0.005% should be specified.
(3) To further reduce data scatter, a minimum value of 0.0015% should be specified.

Table E-100.24-1
Cross-Reference Table of Section II, Part D and Section III, Subsection NH 2015 Edition

Subsection NH Designation	Subsection NH Title	Nonmandatory Appendix E Designation
Figure NH-4212-1	Permissible Time/Temperature Conditions for Material Which Has Been Cold Worked > 5% and < 20% and Subjected to Short-Time High Temperature Transients	Figure E-100.2-1
Figure NH-I-14.3A	S_{mt} — Type 304 SS	Figure E-100.4-1
Figure NH-I-14.3B	S_{mt} — Type 316 SS	Figure E-100.4-2
Figure NH-I-14.3C	S_{mt} — Ni–Fe–Cr (Alloy 800H)	Figure E-100.4-3
Figure NH-I-14.3D	S_{mt} — $2^1/_4$Cr–1Mo	Figure E-100.4-4
Figure NH-I-14.3E	S_{mt} — 9Cr–1Mo–V	Figure E-100.4-5
Figure NH-I-14.4A	S_t — Type 304 SS	Figure E-100.5-1
Figure NH-I-14.4B	S_t — Type 316 SS	Figure E-100.5-2
Figure NH-I-14.4C	S_t — Ni–Fe–Cr (Alloy 800H)	Figure E-100.5-3
Figure NH-I-14.4D	S_t — $2^1/_4$Cr–1Mo	Figure E-100.5-4
Figure NH-I-14.4E	S_t — 9Cr–1Mo–V	Figure E-100.5-5
Figure NH-I-14.6A	Minimum Stress-to-Rupture	Figure E-100.7-1
Figure NH-I-14.6B	Minimum Stress-to-Rupture	Figure E-100.7-2
Figure NH-I-14.6C	Minimum Stress-to-Rupture — Ni–Fe–Cr (Alloy 800H)	Figure E-100.7-3
Figure NH-I-14.6D	$2^1/_4$Cr–1Mo — 100% of the Minimum Stress-to-Rupture	Figure E-100.7-4
Figure NH-I-14.6E	Minimum Stress-to-Rupture, Alloy 718	Figure E-100.7-5
Figure NH-I-14.6F	9Cr–1Mo–V — Expected Minimum Stress-to-Rupture, MPa	Figure E-100.7-6
Figure NH-I-14.13A	S_{mt} — Allowable Stress Intensity, Type 304 SS, Bolting	Figure E-100.15-1
Figure NH-I-14.13B	S_{mt} — Allowable Stress Intensity, Type 316 SS, Bolting	Figure E-100.15-2
Figure NH-I-14.13C	S_{mt} — Allowable Stress, Alloy 718, Bolting	Figure E-100.15-3
Figure NH-T-1420-1A	Design Fatigue Strain Range, ε_t, for 304 SS	Figure E-100.16-1
Figure NH-T-1420-1B	Design Fatigue Strain Range, ε_t, for 316 SS	Figure E-100.16-2
Figure NH-T-1420-1C	Design Fatigue Strain Range, ε_t, for Ni–Fe–Cr Alloy 800H	Figure E-100.16-3
Figure NH-T-1420-1D	Design Fatigue Strain Range, ε_t, for $2^1/_4$Cr–1Mo Steel	Figure E-100.16-4
Figure NH-T-1420-1E	Design Fatigue Strain Range, ε_t, for 9Cr–1Mo–V Steel	Figure E-100.16-5
Figure NH-T-1522-1	Time–Temperature Limits for Application of Section II External Pressure Charts	Figure E-100.17-1
Figure NH-T-1522-2	Time–Temperature Limits for Application of Section II External Pressure Charts	Figure E-100.17-2
Figure NH-T-1522-3	Temperature Limits for Application of Section II External Pressure Charts	Figure E-100.17-3
Figure NH-T-1800-A-1	Average Isochronous Stress–Strain Curves (304 SS 427°C)	Figure E-100.18-1
Figure NH-T-1800-A-2	Average Isochronous Stress–Strain Curves (304 SS 454°C)	Figure E-100.18-2
Figure NH-T-1800-A-3	Average Isochronous Stress–Strain Curves (304 SS 482°C)	Figure E-100.18-3
Figure NH-T-1800-A-4	Average Isochronous Stress–Strain Curves (304 SS 510°C)	Figure E-100.18-4
Figure NH-T-1800-A-5	Average Isochronous Stress–Strain Curves (304 SS 538°C)	Figure E-100.18-5
Figure NH-T-1800-A-6	Average Isochronous Stress–Strain Curves (304 SS 566°C)	Figure E-100.18-6
Figure NH-T-1800-A-7	Average Isochronous Stress–Strain Curves (304 SS 593°C)	Figure E-100.18-7
Figure NH-T-1800-A-8	Average Isochronous Stress–Strain Curves (304 SS 621°C)	Figure E-100.18-8
Figure NH-T-1800-A-9	Average Isochronous Stress–Strain Curves (304 SS 649°C)	Figure E-100.18-9
Figure NH-T-1800-A-10	Average Isochronous Stress–Strain Curves (304 SS 677°C)	Figure E-100.18-10
Figure NH-T-1800-A-11	Average Isochronous Stress–Strain Curves (304 SS 704°C)	Figure E-100.18-11
Figure NH-T-1800-A-12	Average Isochronous Stress–Strain Curves (304 SS 732°C)	Figure E-100.18-12
Figure NH-T-1800-A-13	Average Isochronous Stress–Strain Curves (304 SS 760°C)	Figure E-100.18-13
Figure NH-T-1800-A-14	Average Isochronous Stress–Strain Curves (304 SS 788°C)	Figure E-100.18-14
Figure NH-T-1800-A-15	Average Isochronous Stress–Strain Curves (304 SS 816°C)	Figure E-100.18-15
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ENDNOTES

1 ASME uses the current ASTM definition of *ferrous alloy*: an alloy whose major constituent is iron, even if the iron content is less than 50% of the total composition. However, this is a recently adopted definition and the change to specifications is occuring over time. Therefore, some alloys that were formerly defined as nonferrous are still listed in the nonferrous tables or both.

2 This chart is used only for this condition and is only applicable to uniform external pressure.

3 This applies to unstiffened cylinders.

4 *CASTI Guidebook to ASME Section II, B31.1 & B31.3 – Materials Index*, latest edition.

5 *Metals & Alloys in the Unified Numbering System*, SAE HS-1086 and ASTM DS-56, latest edition.

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