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2010 ASME Boiler & Pressure Vessel Code

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July 1, 2011

II

Part D

Properties (Customary)

MATERIALS

ASME Boiler and Pressure Vessel Committee on Materials



The American Society of
Mechanical Engineers

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ADDENDA

Addenda, which include additions and revisions to individual Sections of the Code, will be sent automatically to purchasers of the applicable Sections up to the publication of the 2013 Code. The 2010 Code is available only in the loose-leaf format; accordingly, the Addenda will be issued in the loose-leaf format.

INTERPRETATIONS

ASME issues written replies to inquiries concerning interpretation of technical aspects of the Code. The Interpretations for each individual Section will be published separately and will be included as part of the update service to that Section. Interpretations of Section III, Divisions 1 and 2, will be included with the update service to Subsection NCA.

Interpretations of the Code are posted in January and July at <http://cstools.asme.org/interpretations.cfm>.

CODE CASES

The Boiler and Pressure Vessel Committee meets regularly to consider proposed additions and revisions to the Code and to formulate Cases to clarify the intent of existing requirements or provide, when the need is urgent, rules for materials or constructions not covered by existing Code rules. Those Cases that have been adopted will appear in the appropriate 2010 Code Cases book: “Boilers and Pressure Vessels” and “Nuclear Components.” Supplements will be sent automatically to the purchasers of the Code Cases books up to the publication of the 2013 Code.

FOREWORD

The American Society of Mechanical Engineers set up a committee in 1911 for the purpose of formulating standard rules for the construction of steam boilers and other pressure vessels. This committee is now called the Boiler and Pressure Vessel Committee.

The Committee's function is to establish rules of safety, relating only to pressure integrity, governing the construction¹ of boilers, pressure vessels, transport tanks and nuclear components, and inservice inspection for pressure integrity of nuclear components and transport tanks, and to interpret these rules when questions arise regarding their intent. This Code does not address other safety issues relating to the construction of boilers, pressure vessels, transport tanks and nuclear components, and the inservice inspection of nuclear components and transport tanks. The user of the Code should refer to other pertinent codes, standards, laws, regulations, or other relevant documents. With few 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. Recognizing this, the Committee has approved a wide variety of construction rules in this Section to allow the user or his designee to select those which will provide a pressure vessel having a margin for deterioration in service so as to give a reasonably long, safe period of usefulness. Accordingly, it is not intended that this Section be used as a design handbook; rather, engineering judgment must be employed in the selection of those sets of Code rules suitable to any specific service or need.

This Code contains mandatory requirements, specific prohibitions, and nonmandatory guidance for construction 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 designers 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.

¹ *Construction*, as used in this Foreword, is an all-inclusive term comprising materials, design, fabrication, examination, inspection, testing, certification, and pressure relief.

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 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 they are responsible for the application of these programs to their design.

The Code does not fully address tolerances. When dimensions, sizes, or other parameters are not specified with tolerances, the values of these parameters are considered nominal and allowable tolerances or local variances may be considered acceptable when based on engineering judgment and standard practices as determined by the designer.

The Boiler and Pressure Vessel Committee deals with the care and inspection of boilers and pressure vessels in service only to the extent of providing suggested rules of good practice as an aid to owners and their inspectors.

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 Boiler and Pressure Vessel Committee meets regularly to consider revisions of the rules, new rules as dictated by technological development, Code Cases, and requests for interpretations. Only the Boiler and Pressure Vessel 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 Committee). Proposed revisions to the Code resulting from inquiries will be presented to the Standards Committees for appropriate action. The action of the Standards Committees becomes effective only after confirmation by letter ballot of the Committees and approval by ASME.

Proposed revisions to the Code approved by the Committee are submitted to the American National

Standards Institute and published at <http://cstools.asme.org/csconnect/public/index.cfm?PublicReview=Revisions> to invite comments from all interested persons. After the allotted time for public review and final approval by ASME, revisions are published in updates to the Code.

Code Cases may be used in the construction of components to be stamped with the Certification Mark beginning with the date of their approval by ASME.

After Code revisions are approved by ASME, they may be used beginning with the date of issuance. Revisions, except for revisions to material specifications in Section II, Parts A and B, become mandatory six months after such date of issuance, except for boilers or pressure vessels contracted for prior to the end of the six-month period. Revisions to material specifications are originated by the American Society for Testing and Materials (ASTM) and other recognized national or international organizations, and are usually adopted by ASME. However, those revisions may or may not have any effect on the suitability of material, produced to earlier editions of specifications, for use in ASME construction. ASME material specifications approved for use in each construction Code are listed in the Guideline for Acceptable ASTM Editions and in the Guideline for Acceptable Non-ASTM Editions, in Section II, Parts A and B. These Guidelines list, for each specification, the latest edition adopted by ASME, and earlier and later editions considered by ASME to be identical for ASME construction.

The Boiler and Pressure Vessel Committee in the formulation of its rules and in the establishment of maximum design and operating pressures considers materials, construction, method of fabrication, inspection, and safety devices.

The Code 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 ASME Boiler and Pressure Vessel Committee.

ASME is to be notified should questions arise concerning improper use of the Certification Mark.

The specifications for materials given in Section II are identical with or similar to those of specifications published by ASTM, AWS, and other recognized national or international organizations. When reference is made in an ASME material specification to a non-ASME specification for which a companion ASME specification exists, the reference shall be interpreted as applying to the ASME material specification. Not all materials included in the material specifications in Section II have been adopted for Code use. Usage is limited to those materials and grades adopted by at least one of the other Sections of the Code for application under rules of that Section. All materials allowed by these various Sections and used for construction within the scope of their rules shall be furnished in accordance with material specifications contained in Section II or referenced in the Guidelines for Acceptable Editions in Section II, Parts A and B, except where otherwise provided in Code Cases or in the applicable Section of the Code. Materials covered by these specifications are acceptable for use in items covered by the Code Sections only to the degree indicated in the applicable Section. Materials for Code use should preferably be ordered, produced, and documented on this basis; Guidelines for Acceptable Editions in Section II, Parts A and B list editions of ASME and year dates of specifications that meet ASME requirements and which may be used in Code construction. Material produced to an acceptable specification with requirements different from the requirements of the corresponding specifications listed in the Guidelines for Acceptable Editions in Part A or Part B may also be used in accordance with the above, provided the material manufacturer or vessel manufacturer certifies with evidence acceptable to the Authorized Inspector that the corresponding requirements of specifications listed in the Guidelines for Acceptable Editions in Part A or Part B have been met. Material produced to an acceptable material specification is not limited as to country of origin.

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.

(10)
(a)

STATEMENT OF POLICY ON THE USE OF THE 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 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 Certification Mark for the benefit of the users, the enforcement jurisdictions, and the holders of the 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 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 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 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 Certification Mark who may also use the facsimile in advertising to show that clearly specified items will carry the Certification Mark. General usage is permitted only when all of a manufacturer’s items are constructed under the rules.

(a)

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 official Certification Mark described in the governing Section of the Code.

Markings such as “ASME,” “ASME Standard,” or any other marking including “ASME” or the 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.

SUBMITTAL OF TECHNICAL INQUIRIES TO THE BOILER AND PRESSURE VESSEL COMMITTEE — MANDATORY

(a)

1 INTRODUCTION

(a) The following information provides guidance to Code users for submitting technical inquiries to the Committee. See Guideline on the Approval of New Materials Under the ASME Boiler and Pressure Vessel Code in Section II, Parts C and D for additional requirements for requests involving adding new materials to the Code. Technical inquiries include requests for revisions or additions to the Code rules, requests for Code Cases, and requests for Code interpretations, as described below.

(1) *Code Revisions*. Code revisions are considered to accommodate technological developments, address administrative requirements, incorporate Code Cases, or to clarify Code intent.

(2) *Code Cases*. Code Cases represent alternatives or additions to existing Code rules. Code Cases are written as a question and reply, and are usually intended to be incorporated into the Code at a later date. When used, Code Cases prescribe mandatory requirements in the same sense as the text of the Code. However, users are cautioned that not all jurisdictions or owners automatically accept Code Cases. The most common applications for Code Cases are:

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

(b) to permit the use of a new material for Code construction

(c) to gain experience with new materials or alternative rules prior to incorporation directly into the Code

(3) *Code Interpretations*. Code Interpretations provide clarification of the meaning of existing rules in the Code, and are also presented in question and reply format. Interpretations do not introduce new requirements. In cases where existing Code text does not fully convey the meaning that was intended, and revision of the rules is required to support an interpretation, an Intent Interpretation will be issued and the Code will be revised.

(b) The Code rules, Code Cases, and Code Interpretations established by the Committee 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 rules.

(c) Inquiries that do not comply with these provisions or that do not provide sufficient information for the Committee's full understanding may result in the request being returned to the inquirer with no action.

2 INQUIRY FORMAT

Submittals to the Committee shall include:

(a) *Purpose*. Specify one of the following:

(1) revision of present Code rules

(2) new or additional Code rules

(3) Code Case

(4) Code Interpretation

(b) *Background*. Provide the information needed for the Committee's understanding of the inquiry, being sure to include reference to the applicable Code Section, Division, Edition, Addenda (if applicable), paragraphs, figures, and tables. Preferably, provide a copy of the specific referenced portions of the Code.

(c) *Presentations*. The inquirer may desire or be asked to attend a meeting of the Committee to make a formal presentation or to answer questions from the Committee members with regard to the inquiry. Attendance at a Committee meeting shall be at the expense of the inquirer. The inquirer's attendance or lack of attendance at a meeting shall not be a basis for acceptance or rejection of the inquiry by the Committee.

3 CODE REVISIONS OR ADDITIONS

Requests for Code revisions or additions shall provide the following:

(a) *Proposed Revisions or Additions*. For revisions, identify the rules of the Code that require revision and submit a copy of the appropriate rules as they appear in the Code, marked up with the proposed revision. For additions, provide the recommended wording referenced to the existing Code rules.

(b) *Statement of Need*. Provide a brief explanation of the need for the revision or addition.

(c) *Background Information*. Provide background information to support the revision or addition, including any data or changes in technology that form the basis for the request that will allow the Committee to adequately evaluate the proposed revision or addition. Sketches, tables, figures, and graphs should be submitted as appropriate. When applicable, identify any pertinent paragraph in the Code that would be affected by the revision or addition and identify paragraphs in the Code that reference the paragraphs that are to be revised or added.

4 CODE CASES

Requests for Code Cases shall provide a Statement of Need and Background Information similar to that defined in 3(b) and 3(c), respectively, for Code revisions or additions. The urgency of the Code Case (e.g., project underway or imminent, new procedure, etc.) must be defined and it must be confirmed that the request is in connection with equipment that will bear the Certification Mark, with the exception of Section XI applications. The proposed Code Case should identify the Code Section and Division, and be written as a *Question* and a *Reply* in the same format as existing Code Cases. Requests for Code Cases should also indicate the applicable Code Editions and Addenda (if applicable) to which the proposed Code Case applies.

5 CODE INTERPRETATIONS

(a) Requests for Code Interpretations shall provide the following:

(1) *Inquiry*. Provide a condensed and precise question, omitting superfluous background information and, when possible, composed in such a way that a “yes” or a “no” *Reply*, with brief provisos if needed, is acceptable. The question should be technically and editorially correct.

(2) *Reply*. Provide a proposed *Reply* that will clearly and concisely answer the *Inquiry* question. Preferably, the

Reply should be “yes” or “no,” with brief provisos if needed.

(3) *Background Information*. Provide any background information that will assist the Committee in understanding the proposed *Inquiry* and *Reply*.

(b) Requests for Code Interpretations must be limited to an interpretation of a particular requirement in the Code or a Code Case. The Committee cannot consider consulting type requests such as the following:

(1) a review of calculations, design drawings, welding qualifications, or descriptions of equipment or parts to determine compliance with Code requirements;

(2) a request for assistance in performing any Code-prescribed functions relating to, but not limited to, material selection, designs, calculations, fabrication, inspection, pressure testing, or installation;

(3) a request seeking the rationale for Code requirements.

6 SUBMITTALS

Submittals to and responses from the Committee shall meet the following:

(a) *Submittal*. Inquiries from Code users shall be in English and preferably be submitted in typewritten form; however, legible handwritten inquiries will also be considered. They shall include the name, address, telephone number, fax number, and e-mail address, if available, of the inquirer and be mailed to the following address:

Secretary
ASME Boiler and Pressure Vessel Committee
Three Park Avenue
New York, NY 10016-5990

As an alternative, inquiries may be submitted via e-mail to: SecretaryBPV@asme.org.

(b) *Response*. The Secretary of the ASME Boiler and Pressure Vessel Committee or of the appropriate Subcommittee shall acknowledge receipt of each properly prepared inquiry and shall provide a written response to the inquirer upon completion of the requested action by the Code Committee.

PERSONNEL

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As of January 1, 2011

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H. E. Gordon	E. Uptis
W. S. Jacobs	J. Vattappilly
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K. Mokhtarian	

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D. M. Fryer	S. Terada
R. T. Hallman	J. L. Traud
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SUMMARY OF CHANGES

The 2011 Code, which includes Addenda changes, is being issued in its entirety. While the pages of the Code are printed in loose-leaf format for the users' convenience, it is advisable that the existing 2010 pages be retained for reference. The next Edition of the Code will be published in 2013.

A Special Notice may be posted on the ASME Web site in advance of the next edition of the Boiler and Pressure Vessel Code to provide approved revisions to Code requirements. Such revisions may be used on the date posted and will become mandatory 6 months after the date of issuance in the next edition. A Special Notice may also include a revision to a Code Case. The superseded version of the Code Case shall not be used.

Errata to the BPV Code may be posted on the ASME Web site to provide corrections to incorrectly published items, or to correct typographical or grammatical errors in BPV Codes. Such errata shall be used on the date posted.

Information regarding Special Notices and Errata is published on the ASME Web site under the Boiler and Pressure Vessel Code Resources Page at <http://www.asme.org/kb/standards/publications/bpvc-resources/>.

Changes in this Addenda, given below, are identified on the pages by a margin note, **(a)**, placed next to the affected area, except that in stress tables, changes affecting the table, columns, or a large number of lines are identified by **†**. Revisions to the 2010 Edition are indicated by **(10)** or **#**. For the listing below, the *Page* references the affected area. A margin note, **(a)** or **†**, placed next to the heading indicates *Location*. Revisions are listed under *Change*.

The Record Numbers listed below are explained in more detail in "List of Changes in Record Number Order" following the Summary of Changes.

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
x, xi	Foreword	Tenth and fourteenth paragraphs revised
xii	Statement of Policy on the Use of the Certification Mark and Code Authorization in Advertising	Revised
	Statement of Policy on the Use of ASME Marking to Identify Manufactured Items	Revised
xiii, xiv	Submittal of Technical Inquiries to the Boiler and Pressure Vessel Committee — Mandatory	Moved from Mandatory Appendix 4 and revised
xv–xxvii	Personnel	Updated
3	2.3	Revised (10-63)
14–17	Table 1A, Line 20	For Section I and Section VIII, Division 1, Carbon steel SA/AS 1548 7-430A deleted (08-1531)
	Table 1A, Line 21	For I and VIII-1, for SA/AS 1548 PT430N, Grade and Group No. revised (08-1531)

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
	Table 1A, Line 22	For I and VIII-1, for SA/AS 1548 PT430NR, Grade, Condition, Size/Thickness, and Group No. revised (08-1531)
	Table 1A, Line 38	For I and VIII-1, SA/AS 1548 7-460A deleted (08-1531)
	Table 1A, Line 39	For I and VIII-1, for SA/AS 1548 PT460N, Grade and Group No. revised (08-1531)
	Table 1A, Line 40	For I and VIII-1, for SA/AS 1548 PT460NR, Grade, Condition, Size/Thickness, and Group No. revised (08-1531)
18–21	Table 1A, Line 34	For VIII-1 and Section XII, for SA-537 Class 3, Note G21 deleted (10-825)
	Table 1A, Lines 42 & 43	For Sections III, VIII-1, and XII, for SA-537 Class 2 and SA-738 C, Note 21 deleted (10-825)
22–25	Table 1A, Line 5	For VIII-1, SA-841 A added (09-1349)
	Table 1A, Lines 6–8	For I and VIII-1, SA/AS 1548 7-490A, 7-490N, and 7-490R deleted (08-1531)
	Table 1A, Line 26	For III, VIII-1, and XII, for SA-738 C, Note G21 deleted (10-825)
	Table 1A, Line 36	For VIII-1, SA-841 B added (09-1349)
	Table 1A, Line 39	For III, VIII-1, and XII, for SA-738 B, Note G20 deleted (10-825)
26–29	Table 1A, Line 1	For III, VIII-1, and XII, for C–Mn–Si–Cb SA-737 B, Note G19 deleted (10-825)
	Table 1A, Line 2	For I, SA/AS 1548 5-490A deleted (08-1531)
	Table 1A, Line 3	(1) For I, for SA/AS 1548 PT490N, Grade revised (08-1531) (2) For VIII-1, SA/AS 1548 PT490N added (08-1531)
	Table 1A, Line 4	For I and VIII-1, SA/AS 1548 PT490NR added (08-1531)
	Table 1A, Line 5	For III, VIII-1, and XII, for C–Mn–Si–V SA-737 C, Note G20 deleted (10-825)
46–49	Table 1A, Line 21	For VIII-1, for 17Cr–4Ni–3Cu SA-747 CB7Cu-1, External Pressure Chart No. revised (09-935)
	Table 1A, Line 22	For III and VIII-1, for 17Cr–4Ni–4Cu SA-564 630 H1150, External Pressure Chart No. revised (09-935)
	Table 1A, Lines 23 & 24	For III, for SA-693 630 H1150 and SA-705 630 H1150, External Pressure Chart No. revised (09-935)
	Table 1A, Line 25	For III and VIII-1, for SA-564 630 H1100, External Pressure Chart No. revised (09-935)
	Table 1A, Lines 26–30	For III, for SA-693 630 H1100 and H1075, SA-705 630 H1100 and H1075, and SA-564 630 H1075, External Pressure Chart No. revised (09-935)
70–73	Table 1A, Lines 14 & 17	For VIII-1, 16Cr–12Ni–2Mo SA-451 CPF3M and CPF8M added (10-387)
102–105	Table 1A, Lines 12–15	For VIII-1, 18Cr–10Ni–Cb SA-213 TP347LN and SA-312 TP347LN added (10-794)
146	Table 1A	Notes G19, G20, and G21 deleted (10-825)
178–181	Table 1B, Line 23	For III and VIII-1, for C12200 H55 SB-359, Min. Tensile Strength, Min. Yield Strength, External Pressure Chart No., Notes, and stress values revised (10-478)

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
	Table 1B, Line 42	For I, III, VIII-1, and XII, for C23000 H58 SB-43, Note G7 deleted (10-827)
	Table 1B, Line 44	For III, VIII-1, and XII, for O60 SB-135, Note G7 deleted (10-827)
182–185	Table 1B, Line 1	For I, III, VIII-1, and XII, for O61 SB-43, Note G7 deleted (10-827)
	Table 1B, Lines 2 & 3	For III, VIII-1, and XII, for O61 SB-111 and SB-395, Note G7 deleted (10-827)
268–322	Table 2A	Title revised (10-63)
276–278	Table 2A, Line 14	Carbon steel SA-738 B added (10-63)
288–290	Table 2A, Lines 11–19	For 17Cr–4Ni–4Cu SA-564 630, SA-693 630, and SA-705 630, External Pressure Chart No. revised (09-935)
380–383	Table 5A, Lines 20 & 34	Carbon steel SA-841 A and B added (09-1349)
462, 463	Table U, Line 40	For Carbon steel SA/AS 1548 PT430, Grade revised (08-1531)
464, 465	Table U, Line 10	For SA/AS 1548 PT460, Grade revised (08-1531)
466, 467	Table U, Line 9	SA-841 A added (09-1349)
	Table U, Line 10	SA/AS 1548 7-490 deleted (08-1531)
	Table U, Line 38	SA-841 B added (09-1349)
468, 469	Table U, Line 11	For C–Mn–Si–Cb SA/AS 1548 PT490, Grade revised (08-1531)
496, 497	Table U, Lines 29 & 30	18Cr–10Ni–Cb SA-213 TP347LN and SA-312 TP347LN added (10-794)
510, 511	Table U, Line 23	For C12200 H55 SB-359, Min. Tensile Strength and tensile strength values revised (10-478)
540–543	Table Y-1, Lines 43–46	For Carbon steel SA/AS 1548 PT430, Grade revised (08-1531)
544–547	Table Y-1, Lines 16, 17, 20 & 22	For SA/AS 1548 PT460, Grade revised (08-1531)
548–551	Table Y-1, Line 22	SA-841 A added (09-1349)
	Table Y-1, Lines 23–26	SA/AS 1548 7-490 deleted (08-1531)
552–555	Table Y-1, Line 10	SA-841 B added (09-1349)
	Table Y-1, Lines 39–42	For C–Mn–Si–Cb SA/AS 1548 PT490, Grade revised (08-1531)
620–623	Table Y-1, Lines 6 & 7	18Cr–10Ni–Cb SA-213 TP347LN and SA-312 TP347LN added (10-794)
652–655	Table Y-1, Line 33	For C12200 H55 SB-359, Min. Tensile Strength, Min. Yield Strength, and yield strength values revised (10-478)
770	Fig. NFC-7	(1) Values for E deleted (07-1193) (2) General Note (b) added (07-1193)
814	Table NFC-7	Three values added for B = 0.100 +04 (07-1193)
852	Mandatory Appendix 4	Moved to the front matter and revised

LIST OF CHANGES IN RECORD NUMBER ORDER

Record Number	Change
07-1193	<ul style="list-style-type: none"> –Deleted E (modulus) from Fig. NFC-7. –Added General Note (b) to Fig. NFC-7.
08-1531	<ul style="list-style-type: none"> –Added tabular values for A to Table NFC-7 where B = 1,000 psi. –Deleted Grade 7-490 for SA/AS 1548. –Deleted all other grades with “A” designation. –Corrected Group No. for Grades PT430 and PT460, to be consistent with Section IX, Table QW/QB-422. –Increased the maximum thickness for normalized rolled (NR) plates to 6 in. from 1½ in. for as-rolled plates. –Changed Applicability column for Grade PT490N from NP to 1000°F for Section VIII, Division 1 use. –Added Grade PT490NR for Sections I and VIII, Division 1 use.
09-935	EPC reassigned from HA-7 to HT-1 for UNS S17400 in Tables 1A and 2A.
09-1349	Added SA-841, Grade A Class 1 and Grade B Class 2 to Tables 1A, 5A, U, and Y-1.
10-63	<ul style="list-style-type: none"> –Added SA-738 Grade B to Table 2A. –Added the designation “MC” to the title of Table 2A.
10-387	Incorporation of SA-451 J92800 (CPF3M) and J92900 (CPF8M) from Code Case 2456.
10-478	<ul style="list-style-type: none"> –In Table 1B, revised minimum tensile strength from 30 ksi to 36 ksi and minimum yield strength from 9 ksi to 30 ksi, to be consistent with H55 temper values listed in SB-359. –Revised allowable stress values to be the same as those listed for H55 SB-111 seamless tube. –Revised the EPC to NFC-6. –Corrected the Notes in Table 1B. –Tensile and yield strength values corrected in Tables U and Y-1.
10-794	Revised Tables 1A, U, and Y-1 to incorporate SA-213 TP347LN and SA-312 TP347LN, S34751.
10-825	Deleted Notes G19, G20, and G21 from Table 1A.
10-827	Deleted references to Note G7 in Table 1B for five C23000 stress lines.

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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 Subpart 1 of Section II, Part D are mandatory. It is vital to recognize that lines of information in Tables 1A, 1B, 2A, 2B, 3, and 4 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 and 2A, 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 two tables. See Appendix A. 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 nonstainless-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 and 2A, and Tables 1B and 2B, with regard to the mandatory/nonmandatory

nature of the information, is that in Tables 1B and 2B, 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, Size/Thickness, 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 and Minimum Yield Strength columns is nonmandatory. 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 values in Parts A and B 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, in the SI units version of the stress tables, values may be listed in the table 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, and 5B), tables of mechanical properties (Tables U, U-2, 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 Subpart 1 of Section II, Part D. Tables 1A, 1B, 3, 5A, and 5B cover allowable stresses, while Tables 2A, 2B, and 4 cover design stress intensities. 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.

(10) 2.1 TABLE 1A

Table 1A provides allowable stresses for ferrous¹ 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 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 25Cr-22Ni-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 Table QW/QB-422 of Section IX of the Code and find the corresponding nominal composition.

Now, for a given nominal composition, Table 1A is arranged by increasing tensile strength. For a given nominal composition and tensile strength, stress listings are provided in order of increasing specification number. Sometimes, for a given nominal composition, tensile strength, yield strength, and specification 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,

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 occurring over time. Therefore, some alloys that were formerly defined as nonferrous are still listed in the nonferrous tables or both.

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's 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.

(a) 2.3 TABLE 2A

Table 2A provides design stress intensities for ferrous materials for Section III, Division 1, Classes 1, MC, TC, and SC 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, TC, and SC 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

Part 4.16 of Section VIII, Division 2); 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, TC, and SC; and in Section VIII, Division 2 (using Part 5 and Annex 5.F of Section VIII, Division 2).

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 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 construction. This Table is organized in the same manner as Table 1B. Refer back to para. 2.2 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.

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 CXXXXX alloys, followed by NXXXXX and RXXXXX alloys. No tensile strength values are available at this time for the aluminum alloys. The ordering of materials within these three groups has been previously described in para. 2.2.

3.2 TABLE U-2

Table U-2 provides ultimate tensile strengths for special ferrous materials used in Section VIII, Division 3 construction. The only material covered is wire produced to either SA-231 or SA-232, and lines are arranged in order of decreasing tensile strength, resulting from increasing wire diameter.

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. And, unlike Table U, Table Y-1's nonferrous materials listings do 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 Subpart 2 of Section II, Part D 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 Table QW/QB-422 of Section IX, 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 materials.

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.

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	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
5	Carbon steel	Plate	SA-283	A	...	...	...	1	1
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
30	Carbon steel	Plate	SA-283	B	...	...	...	1	1
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
(10) 35	Carbon steel	Plate	SA/EN 10028-3	P275NH	...	...	$6 < t \leq 10$	1	1
(10) 36	Carbon steel	Plate	SA/EN 10028-3	P275NH	...	...	$4 < t \leq 6$	1	1
(10) 37	Carbon steel	Plate	SA/EN 10028-3	P275NH	...	...	$2 < t \leq 4$	1	1
38	Carbon steel	Bar	SA-675	55	...	...	...	1	1
39	Carbon steel	Bar	SA-675	55	...	...	...	1	1
40	Carbon steel	Wld. pipe	SA-134	A283C	K02401	...	...	1	1
41	Carbon steel	Plate	SA-283	C	K02401	...	...	1	1
42	Carbon steel	Plate	SA-285	C	K02801	...	...	1	1

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	40	20	NP	NP	650	NP	CS-6	...
2	40	20	NP	NP	650	NP	CS-6	...
3	45	22.5	NP	650 (Cl. 3 only)	900	650	CS-6	G10, G22, T10
4	45	24	NP	300 (Cl. 3 only)	NP	NP	CS-1	W12
5	45	24	NP	300 (Cl. 3 only)	650	650	CS-1	...
6	45	24	900	700	900	650	CS-1	G10, T2
7	45	24	NP	700	NP	NP	CS-1	S6, W10, W12
8	45	25	NP	NP	900	650	CS-1	G10, T2
9	47	26	1000	NP	NP	NP	CS-1	G4, G10, S1, T2, W13
10	47	26	1000	NP	1000	650	CS-1	G3, G10, G24, S1, T2, W6
11	47	26	NP	NP	900	650	CS-1	G10, T2
12	47	26	1000	NP	1000	650	CS-1	G10, S1, T2
13	47	26	NP	NP	1000	650	CS-1	G24, T2, W6
14	47	26	NP	NP	1000	650	CS-1	G10, T2
15	47	26	NP	NP	1000	650	CS-1	G24, T2, W6
16	48	30	900	NP	NP	NP	CS-2	G3, G10, S1, T2
17	48	30	900	300 (Cl. 3 only)	NP	NP	CS-2	G10, S1, T2, W12, W13
18	48	30	NP	NP	900	650	CS-2	G24, T2, W6
19	48	30	750	NP	NP	NP	CS-2	G2, G10, S10, T2, W15
20	48	30	900	300 (Cl. 3 only)	NP	NP	CS-2	G10, S1, T2
21	48	30	NP	700 (SPT)	900	650	CS-2	G10, T2
22	48	30	1000	700	1000	650	CS-2	G10, S1, T1
23	48	30	NP	NP	900	650	CS-2	G24, T2, W6
24	48	30	1000	NP	NP	NP	CS-2	G10, S1, T1
25	48	30	NP	300 (Cl. 3 only)	NP	NP	CS-2	...
26	48	30	NP	NP	850	650	CS-2	G24, T2, W6
27	50	25	NP	650 (Cl. 3 only)	NP	NP	CS-1	...
28	50	25	850	700 (SPT)	900	650	CS-1	G10, G15, G22, S1, T2
29	50	27	NP	300 (Cl. 3 only)	NP	NP	CS-1	W12
30	50	27	NP	300 (Cl. 3 only)	650	650	CS-1	...
31	50	27	900	NP	NP	NP	CS-1	G10, S1, T1
32	50	27	NP	700	900	650	CS-1	G10, T1
33	50	27	NP	700	NP	NP	CS-1	S6, T1, W10, W12
34	50	30	NP	NP	900	650	CS-2	G10, T1
35	51	31	NP	NP	400	NP	CS-2	G10
36	52	32.5	NP	NP	400	NP	CS-2	G10
37	53.5	34	NP	NP	400	NP	CS-2	G10
38	55	27.5	850	700 (SPT)	900	650	CS-1	G10, G15, G22, S1, T2
39	55	27.5	NP	650 (Cl. 3 only)	NP	NP	CS-1	...
40	55	30	NP	300 (Cl. 3 only)	NP	NP	CS-2	W12
41	55	30	NP	300 (Cl. 3 only)	650	650	CS-2	...
42	55	30	900	700	900	650	CS-2	G10, S1, T2

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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	11.4	11.4	11.4	...	11.4	11.4	10.9	10.2	9.9	...	...	...	...	...
2	11.4	11.4	11.4	...	11.4	11.4	10.9	10.2	9.9	...	...	...	...	...
3	12.9	12.9	12.9	...	12.9	12.8	12.2	11.5	11.1	10.7	10.4	9.2	7.9	5.9
4	12.9	...	12.9	...	12.9	...	...	...	...	...	...	...	...	...
5	12.9	12.9	12.9	...	12.9	12.9	12.9	12.3	11.9	...	...	...	...	...
6	12.9	12.9	12.9	...	12.9	12.9	12.9	12.3	11.9	11.5	10.7	9.2	7.9	5.9
7	12.9	...	12.9	...	12.9	12.9	12.9	12.3	11.9	11.5	...	...	...	...
8	12.9	12.9	12.9	...	12.9	12.9	12.9	12.8	12.4	11.9	10.7	9.2	7.9	5.9
9	13.4	...	13.4	...	13.4	13.4	13.4	13.3	12.8	12.4	10.7	9.2	7.9	5.9
10	11.4	11.4	11.4	...	11.4	11.4	11.4	11.3	10.9	10.5	9.1	7.8	6.7	5.0
11	13.4	13.4	13.4	...	13.4	13.4	13.4	13.3	12.8	12.4	10.7	9.2	7.9	5.9
12	13.4	13.4	13.4	...	13.4	13.4	13.4	13.3	12.8	12.4	10.7	9.2	7.9	5.9
13	11.4	11.4	11.4	...	11.4	11.4	11.4	11.3	10.9	10.5	9.1	7.8	6.7	5.0
14	13.4	13.4	13.4	...	13.4	13.4	13.4	13.3	12.8	12.4	10.7	9.2	7.9	5.9
15	11.4	11.4	11.4	...	11.4	11.4	11.4	11.3	10.9	10.5	9.1	7.8	6.7	5.0
16	11.7	...	11.7	...	11.7	11.7	11.7	11.7	11.7	10.6	9.1	7.7	6.1	4.3
17	13.7	...	13.7	...	13.7	13.7	13.7	13.7	13.7	12.5	10.7	9.0	7.1	5.0
18	11.7	11.7	11.7	...	11.7	11.7	11.7	11.7	11.7	10.6	9.1	7.9	6.7	5.5
19	8.2	...	8.2	...	8.2	8.2	8.2	8.2	8.2	7.5	6.4	...	...	...
20	13.7	...	13.7	...	13.7	13.7	13.7	13.7	13.7	12.5	10.7	9.0	7.1	5.0
21	13.7	13.7	13.7	...	13.7	13.7	13.7	13.7	13.7	12.5	10.7	9.3	7.9	6.5
22	13.7	13.7	13.7	...	13.7	13.7	13.7	13.7	13.7	12.5	10.7	9.3	7.9	6.5
23	11.7	11.7	11.7	...	11.7	11.7	11.7	11.7	11.7	10.6	9.1	7.9	6.7	5.5
24	13.7	...	13.7	...	13.7	13.7	13.7	13.7	13.7	12.5	10.7	9.0	7.1	5.0
25	13.7	...	13.7	...	13.7	...	...	...	...	...	...	...	...	...
26	11.7	11.7	11.7	...	11.7	11.7	11.7	11.7	11.7	10.6	9.1	7.9	6.7	...
27	14.3	...	14.3	...	14.3	14.2	13.6	12.8	12.4	...	...	...	...	...
28	14.3	14.3	14.3	...	14.3	14.2	13.6	12.8	12.4	11.9	10.7	9.3	7.9	6.5
29	14.3	...	14.3	...	14.3	...	...	...	...	...	...	...	...	...
30	14.3	14.3	14.3	...	14.3	14.3	14.3	13.8	13.3	...	...	...	...	...
31	14.3	...	14.3	...	14.3	14.3	14.3	13.8	13.3	12.5	11.0	9.4	7.3	5.0
32	14.3	14.3	14.3	...	14.3	14.3	14.3	13.8	13.3	12.5	11.2	9.6	8.1	5.9
33	14.3	...	14.3	...	14.3	14.3	14.3	13.8	13.3	12.5	...	...	...	...
34	14.3	14.3	14.3	...	14.3	14.3	14.3	14.3	14.3	12.5	11.2	9.6	8.1	5.9
(10) 35	14.5	14.5	14.5	...	14.5	14.5	...	...	...	...	...	...	...	...
(10) 36	14.9	14.9	14.9	...	14.9	14.9	...	...	...	...	...	...	...	...
(10) 37	15.3	15.3	15.3	...	15.3	15.3	...	...	...	...	...	...	...	...
38	15.7	15.7	15.7	...	15.7	15.7	14.9	14.1	13.6	13.1	12.7	10.8	8.7	5.9
39	15.7	...	15.7	...	15.7	15.7	14.9	14.1	13.6	...	...	...	...	...
40	15.7	...	15.7	...	15.7	...	...	...	...	...	...	...	...	...
41	15.7	15.7	15.7	...	15.7	15.7	15.7	15.3	14.8	...	...	...	...	...
42	15.7	15.7	15.7	...	15.7	15.7	15.7	15.3	14.8	14.3	13.0	10.8	8.7	5.9

TABLE 1A
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1
2
3
4
5
6
7
8
9	4.0	2.5
10	3.4	2.1
11
12	4.0	2.5
13	3.4	2.1
14	4.0	2.5
15	3.4	2.1
16
17
18
19
20
21
22	4.5	2.5
23
24	3.0	1.5
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	Carbon steel	Smls. & wld. pipe	SA-333	1	K03008	...	...	1	1
2	Carbon steel	Smls. & wld. tube	SA-334	1	K03008	...	...	1	1
3	Carbon steel	Wld. tube	SA-334	1	K03008	...	...	1	1
4	Carbon steel	Plate	SA-516	55	K01800	...	...	1	1
5	Carbon steel	Smls. pipe	SA-524	II	K02104	...	...	1	1
6	Carbon steel	Wld. pipe	SA-671	CA55	K02801	...	...	1	1
7	Carbon steel	Wld. pipe	SA-671	CE55	K02202	...	...	1	1
8	Carbon steel	Wld. pipe	SA-672	A55	K02801	...	...	1	1
9	Carbon steel	Wld. pipe	SA-672	B55	K02001	...	...	1	1
10	Carbon steel	Wld. pipe	SA-672	C55	K01800	...	...	1	1
11	Carbon steel	Wld. pipe	SA-672	E55	K02202	...	...	1	1
12	Carbon steel	Sheet	SA-414	C	K02503	...	...	1	1
13	Carbon steel	Plate	SA/EN 10028-3	P275NH	...	...	≤ 2	1	1
14	Carbon steel	Bar	SA-36	...	K02600	...	...	1	1
15	Carbon steel	Plate, sheet	SA-36	...	K02600	...	...	1	1
16	Carbon steel	Plate, sheet	SA-662	A	K01701	...	...	1	1
17	Carbon steel	Forgings	SA-181	...	K03502	60	...	1	1
18	Carbon steel	Castings	SA-216	WCA	J02502	...	...	1	1
19	Carbon steel	Forgings	SA-266	1	K03506	...	...	1	1
20	Carbon steel	Forgings	SA-350	LF1	K03009	1	...	1	1
21	Carbon steel	Castings	SA-352	LCA	J02504	...	...	1	1
22	Carbon steel	Cast pipe	SA-660	WCA	J02504	...	...	1	1
23	Carbon steel	Bar	SA-675	60	...	...	...	1	1
24	Carbon steel	Bar	SA-675	60	...	...	...	1	1
25	Carbon steel	Forgings	SA-765	I	K03046	...	...	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	Wld. pipe	SA-671	CB60	K02401	...	...	1	1
29	Carbon steel	Wld. pipe	SA-671	CC60	K02100	...	...	1	1
30	Carbon steel	Wld. pipe	SA-671	CE60	K02402	...	...	1	1
31	Carbon steel	Wld. pipe	SA-672	B60	K02401	...	...	1	1
32	Carbon steel	Wld. pipe	SA-672	C60	K02100	...	...	1	1
33	Carbon steel	Wld. pipe	SA-672	E60	K02402	...	...	1	1
34	Carbon steel	Wld. pipe	SA-134	A283D	K02702	...	...	1	1
35	Carbon steel	Plate	SA-283	D	K02702	...	...	1	1
36	Carbon steel	Wld. pipe	SA-53	E/B	K03005	...	...	1	1
37	Carbon steel	Wld. pipe	SA-53	E/B	K03005	...	...	1	1
38	Carbon steel	Smls. pipe	SA-53	S/B	K03005	...	...	1	1
39	Carbon steel	Smls. pipe	SA-53	S/B	K03005	...	...	1	1
40	Carbon steel	Smls. pipe	SA-106	B	K03006	...	...	1	1
41	Carbon steel	Wld. pipe	SA-135	B	...	...	...	1	1
42	Carbon steel	Smls. & wld. fittings	SA-234	WPB	K03006	...	...	1	1

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	55	30	NP	700	650	650	CS-2	W12, W14
2	55	30	NP	700	650	650	CS-2	W12, W14
3	55	30	NP	NP	650	650	CS-2	G24, W6
4	55	30	850	700	1000	650	CS-2	G10, S1, T2
5	55	30	NP	NP	1000	650	CS-2	G10, T2
6	55	30	NP	700	NP	NP	CS-2	S6, W10, W12
7	55	30	NP	700	NP	NP	CS-2	S6, W10, W12
8	55	30	NP	700	NP	NP	CS-2	S6, W10, W12
9	55	30	NP	700	NP	NP	CS-2	S6, W10, W12
10	55	30	NP	700	NP	NP	CS-2	S6, W10, W12
11	55	30	NP	700	NP	NP	CS-2	S6, W10, W12
12	55	33	NP	700	900	650	CS-2	G10, T1
13	56.5	38.5	NP	NP	400	400	CS-2	G10
14	58	36	650	650 (SPT)	900	650	CS-2	G10, G15, T1
15	58	36	NP	700	650	650	CS-2	G9, G10, T1
16	58	40	NP	NP	700	650	CS-2	T1
17	60	30	1000	700	1000	650	CS-2	G10, S1, T2
18	60	30	1000	700	1000	650	CS-2	G1, G10, G17, S1, T2
19	60	30	1000	700	1000	650	CS-2	G10, S1, T2
20	60	30	NP	700	1000	650	CS-2	G10, T2
21	60	30	NP	700	NP	NP	CS-2	G17
22	60	30	1000	700	NP	NP	CS-2	G1, G10, G17, S1, T2
23	60	30	850	700 (SPT)	NP	NP	CS-2	G10, G15, S1, T2
24	60	30	NP	650 (Cl. 3 only)	900	650	CS-2	G10, G22, T2
25	60	30	NP	NP	1000	650	CS-2	G10, T2
26	60	32	1000	700	1000	650	CS-2	G10, S1, T2
27	60	32	850	700	1000	650	CS-2	G10, S1, T2
28	60	32	NP	700	NP	NP	CS-2	S6, W10, W12
29	60	32	NP	700	NP	NP	CS-2	S6, W10, W12
30	60	32	NP	700	NP	NP	CS-2	S6, W10, W12
31	60	32	NP	700	NP	NP	CS-2	S6, W10, W12
32	60	32	NP	700	NP	NP	CS-2	S6, W10, W12
33	60	32	NP	700	NP	NP	CS-2	S6, W10, W12
34	60	33	NP	300 (Cl. 3 only)	NP	NP	CS-2	W12
35	60	33	NP	300 (Cl. 3 only)	650	650	CS-2	...
36	60	35	900	300 (Cl. 3 only)	NP	NP	CS-2	G10, S1, T1, W12, W13
37	60	35	900	NP	900	650	CS-2	G3, G10, G24, S1, T1, W6
38	60	35	900	300 (Cl. 3 only)	NP	NP	CS-2	G10, S1, T1
39	60	35	NP	700 (SPT)	900	650	CS-2	G10, T1
40	60	35	1000	700	1000	650	CS-2	G10, S1, T1
41	60	35	NP	NP	900	650	CS-2	G24, T1, W6
42	60	35	1000	700	1000	650	CS-2	G10, S1, T1

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	15.7	...	15.7	...	15.7	15.7	15.7	15.3	14.8	14.3	...	...	...	...
2	15.7	...	15.7	...	15.7	15.7	15.7	15.3	14.8	14.3	...	...	...	...
3	13.4	13.4	13.4	...	13.4	13.4	13.4	13.0	12.6	...	...	...	...	...
4	15.7	15.7	15.7	...	15.7	15.7	15.7	15.3	14.8	14.3	13.0	10.8	8.7	5.9
5	15.7	15.7	15.7	...	15.7	15.7	15.7	15.3	14.8	14.3	13.0	10.8	8.7	5.9
6	15.7	...	15.7	...	15.7	15.7	15.7	15.3	14.8	14.3	...	...	...	...
7	15.7	...	15.7	...	15.7	15.7	15.7	15.3	14.8	14.3	...	...	...	...
8	15.7	...	15.7	...	15.7	15.7	15.7	15.3	14.8	14.3	...	...	...	...
9	15.7	...	15.7	...	15.7	15.7	15.7	15.3	14.8	14.3	...	...	...	...
10	15.7	...	15.7	...	15.7	15.7	15.7	15.3	14.8	14.3	...	...	...	...
11	15.7	...	15.7	...	15.7	15.7	15.7	15.3	14.8	14.3	...	...	...	...
12	15.7	15.7	15.7	...	15.7	15.7	15.7	15.7	15.7	15.6	13.0	10.8	8.7	5.9
13	16.1	16.1	16.1	...	16.1	16.1	...	...	...	...	...	...	...	...
14	16.6	16.6	16.6	...	16.6	16.6	16.6	16.6	16.6	15.6	13.0	10.8	8.7	5.9
15	16.6	...	16.6	...	16.6	16.6	16.6	16.6	16.6	15.6	...	...	...	...
16	16.6	16.6	16.6	...	16.6	16.6	16.6	16.6	16.6	15.6	...	...	...	...
17	17.1	17.1	17.1	...	17.1	17.1	16.3	15.3	14.8	14.3	13.0	10.8	8.7	5.9
18	17.1	...	17.1	...	17.1	17.1	16.3	15.3	14.8	14.3	13.0	10.8	8.7	5.9
19	17.1	17.1	17.1	...	17.1	17.1	16.3	15.3	14.8	14.3	13.0	10.8	8.7	5.9
20	17.1	17.1	17.1	...	17.1	17.1	16.3	15.3	14.8	14.3	13.0	10.8	8.7	5.9
21	17.1	...	17.1	...	17.1	17.1	16.3	15.3	14.8	14.3	...	...	...	...
22	17.1	...	17.1	...	17.1	17.1	16.3	15.3	14.8	14.3	13.0	10.8	8.7	5.9
23	17.1	...	17.1	...	17.1	17.1	16.3	15.3	14.8	14.3	13.0	10.8	8.7	...
24	17.1	17.1	17.1	...	17.1	17.1	16.3	15.3	14.8	14.3	13.0	10.8	8.7	5.9
25	17.1	17.1	17.1	...	17.1	17.1	16.3	15.3	14.8	14.3	13.0	10.8	8.7	5.9
26	17.1	17.1	17.1	...	17.1	17.1	17.1	16.4	15.8	15.3	13.0	10.8	8.7	5.9
27	17.1	17.1	17.1	...	17.1	17.1	17.1	16.4	15.8	15.3	13.0	10.8	8.7	5.9
28	17.1	...	17.1	...	17.1	17.1	17.1	16.4	15.8	15.3	...	...	...	...
29	17.1	...	17.1	...	17.1	17.1	17.1	16.4	15.8	15.3	...	...	...	...
30	17.1	...	17.1	...	17.1	17.1	17.1	16.4	15.8	15.3	...	...	...	...
31	17.1	...	17.1	...	17.1	17.1	17.1	16.4	15.8	15.3	...	...	...	...
32	17.1	...	17.1	...	17.1	17.1	17.1	16.4	15.8	15.3	...	...	...	...
33	17.1	...	17.1	...	17.1	17.1	17.1	16.4	15.8	15.3	...	...	...	...
34	17.1	...	17.1	...	17.1	...	...	...	...	...	...	...	...	...
35	17.1	17.1	17.1	...	17.1	17.1	17.1	16.9	16.3	...	...	...	...	...
36	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
37	14.6	14.6	14.6	...	14.6	14.6	14.6	14.6	14.6	13.3	11.1	9.2	7.4	5.0
38	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
39	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
40	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
41	14.6	14.6	14.6	...	14.6	14.6	14.6	14.6	14.6	13.3	11.1	9.2	7.4	5.0
42	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
5	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
18	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
19	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
20	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
26	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
27	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	Carbon steel	Smls. & wld. pipe	SA-333	6	K03006	...	...	1	1
2	Carbon steel	Wld. pipe	SA-333	6	K03006	...	...	1	1
3	Carbon steel	Smls. & wld. tube	SA-334	6	K03006	...	...	1	1
4	Carbon steel	Wld. tube	SA-334	6	K03006	...	...	1	1
5	Carbon steel	Forged pipe	SA-369	FPB	K03006	...	...	1	1
6	Carbon steel	Forgings	SA-372	A	K03002	...	...	1	1
7	Carbon steel	Sheet	SA-414	D	K02505	...	...	1	1
8	Carbon steel	Smls. & wld. fittings	SA-420	WPL6	...	...	...	1	1
9	Carbon steel	Smls. pipe	SA-524	I	K02104	...	...	1	1
10	Carbon steel	Bar	SA-695	B/35	K03504	...	...	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	Wld. tube	SA-178	C	K03503	...	...	1	1
16	Carbon steel	Smls. tube	SA-210	A-1	K02707	...	...	1	1
17	Carbon steel	Smls. tube	SA-556	B2	K02707	...	...	1	1
18	Carbon steel	Wld. tube	SA-557	B2	K03007	...	...	1	1
19	Carbon steel	Plate, bar	SA/CSA-G40.21	38W	...	...	...	1	1
(a) 20	...	...	...	...	...	...	...	...	...
(a) 21	Carbon steel	Plate	SA/AS 1548	PT430N	...	Normalized	≤ 6	1	1
(a) 22	Carbon steel	Plate	SA/AS 1548	PT430NR	...	Norm. rld.	≤ 6	1	1
23	Carbon steel	Plate	SA/EN 10028-2	P295GH	...	...	6 < <i>t</i> ≤ 10	1	1
24	Carbon steel	Plate	SA/EN 10028-2	P295GH	...	...	4 < <i>t</i> ≤ 6	1	1
25	Carbon steel	Bar	SA-675	65	...	...	...	1	1
26	Carbon steel	Castings	SA-352	LCB	J03003	...	...	1	1
27	Carbon steel	Plate	SA-515	65	K02800	...	...	1	1
28	Carbon steel	Plate	SA-516	65	K02403	...	...	1	1
29	Carbon steel	Wld. pipe	SA-671	CB65	K02800	...	...	1	1
30	Carbon steel	Wld. pipe	SA-671	CC65	K02403	...	...	1	1
31	Carbon steel	Wld. pipe	SA-672	B65	K02800	...	...	1	1
32	Carbon steel	Wld. pipe	SA-672	C65	K02403	...	...	1	1
33	Carbon steel	Sheet	SA-414	E	K02704	...	...	1	1
34	Carbon steel	Plate	SA-662	B	K02203	...	...	1	1
35	Carbon steel	Plate	SA/GB 6654	16MnR	...	...	4 < <i>t</i> ≤ 5	1	1
36	Carbon steel	Plate	SA-537	...	K12437	1	2½ < <i>t</i> ≤ 4	1	2
37	Carbon steel	Wld. pipe	SA-691	CMSH-70	K12437	...	2½ < <i>t</i> ≤ 4	1	2
(a) 38	...	...	...	...	...	...	...	...	...
(a) 39	Carbon steel	Plate	SA/AS 1548	PT460N	...	Normalized	≤ 6	1	1
(a) 40	Carbon steel	Plate	SA/AS 1548	PT460NR	...	Norm. rld.	≤ 6	1	1
41	Carbon steel	Plate	SA/EN 10028-2	P295GH	...	...	2¼ < <i>t</i> ≤ 4	1	1
42	Carbon steel	Plate	SA/EN 10028-2	P295GH	...	...	≤ 2¼	1	1

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	60	35	700	700	1000	650	CS-2	G10, T1, W12, W13, W14
2	60	35	700	NP	NP	NP	CS-2	T1
3	60	35	NP	700	650	650	CS-2	T1, W12, W14
4	60	35	NP	NP	650	650	CS-2	G24, W6
5	60	35	1000	NP	NP	NP	CS-2	G10, S1, T1
6	60	35	NP	NP	650	650	CS-2	...
7	60	35	NP	NP	900	650	CS-2	G10, T1
8	60	35	NP	700	850	650	CS-2	G10, T1, W14
9	60	35	NP	NP	1000	650	CS-2	G10, T1
10	60	35	NP	700	1000	650	CS-2	G10, G22, T1
11	60	35	NP	700	NP	NP	CS-2	T1
12	60	36	NP	700	1000	650	CS-2	G10, G22, T1
13	60	37	1000	NP	NP	NP	CS-2	G4, G10, S1, T2
14	60	37	1000	700	NP	NP	CS-2	G10, S1, T1, W13
15	60	37	1000	NP	1000	650	CS-2	G3, G10, G24, S1, T2, W6
16	60	37	1000	700	1000	650	CS-2	G10, S1, T1
17	60	37	NP	NP	1000	650	CS-2	G10, T1
18	60	37	NP	NP	1000	650	CS-2	G24, T1, W6
19	60	38	NP	NP	650	650	CS-2	...
20	...	...	...	...	...	...	...	...
21	62.5	...	1000	NP	1000	NP	CS-2	G10, G18, S1, T1
22	62.5	...	1000	NP	1000	NP	CS-2	G10, G18, S1, T1
23	62.5	32	850	NP	1000	NP	CS-2	G10, S1, T2
24	64	34	850	NP	1000	NP	CS-2	G10, S1, T2
25	65	32.5	850	650 (Cl. 3 only)	1000	650	CS-2	G10, G15, G22, S1, T2
26	65	35	NP	700	650	650	CS-2	G1, G17
27	65	35	1000	700	1000	650	CS-2	G10, S1, T2
28	65	35	850	700	1000	650	CS-2	G10, S1, T2
29	65	35	NP	700	NP	NP	CS-2	S6, W10, W12
30	65	35	NP	700	NP	NP	CS-2	S6, W10, W12
31	65	35	NP	700	NP	NP	CS-2	S6, W10, W12
32	65	35	NP	700	NP	NP	CS-2	S6, W10, W12
33	65	38	NP	NP	900	650	CS-2	G10, T1
34	65	40	NP	NP	700	650	CS-2	T1
35	65	40	NP	NP	500	NP	CS-2	...
36	65	45	NP	700	650	650	CS-2	T1
37	65	45	NP	700	NP	NP	CS-2	G26, T1, W10, W12
38	...	...	...	...	...	...	...	...
39	66.5	...	1000	NP	1000	NP	CS-2	G10, G18, S1, T1
40	66.5	...	1000	NP	1000	NP	CS-2	G10, G18, S1, T1
41	66.5	37.5	850	NP	1000	NP	CS-2	G10, S1, T1
42	66.5	...	850	NP	1000	650	CS-2	G10, G18, S1, T1

(a)

(a)

(a)

i)

i)

i)

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
2	14.6	14.6	14.6	...	14.6	14.6	14.6	14.6	14.6	13.3	...	...	...	...
3	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	...	...	...	...
4	14.6	14.6	14.6	...	14.6	14.6	14.6	14.6	14.6	...	...	...	...	...
5	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
6	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	...	...	...	...	...
7	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
8	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	...
9	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
10	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
11	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	...	...	...	...
12	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
13	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.0
14	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
15	14.6	...	14.6	...	14.6	14.6	14.6	14.6	14.6	13.3	11.1	9.2	7.4	5.0
16	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
17	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	15.6	13.0	10.8	8.7	5.9
18	14.6	14.6	14.6	...	14.6	14.6	14.6	14.6	14.6	13.3	11.1	9.2	7.4	5.0
19	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	...	...	...	...	...
(a) 20	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(a) 21	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	16.9	13.9	11.4	8.7	5.9
(a) 22	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	16.9	13.9	11.4	8.7	5.9
23	17.9	17.9	17.9	17.9	17.9	17.9	17.4	16.4	15.8	15.3	13.9	11.4	8.7	5.9
24	18.3	18.3	18.3	18.3	18.3	18.3	18.3	17.4	16.8	16.2	13.9	11.4	8.7	5.9
25	18.6	18.6	18.6	18.6	18.6	18.5	17.7	16.6	16.1	15.5	13.9	11.4	8.7	5.0
26	18.6	18.6	18.6	...	18.6	18.6	18.6	17.9	17.3	16.7	...	...	...	...
27	18.6	18.6	18.6	...	18.6	18.6	18.6	17.9	17.3	16.7	13.9	11.4	8.7	5.9
28	18.6	18.6	18.6	...	18.6	18.6	18.6	17.9	17.3	16.7	13.9	11.4	8.7	5.9
29	18.6	...	18.6	...	18.6	18.6	18.6	17.9	17.3	16.7	...	...	...	...
30	18.6	...	18.6	...	18.6	18.6	18.6	17.9	17.3	16.7	...	...	...	...
31	18.6	...	18.6	...	18.6	18.6	18.6	17.9	17.3	16.7	...	...	...	...
32	18.6	...	18.6	...	18.6	18.6	18.6	17.9	17.3	16.7	...	...	...	...
33	18.6	18.6	18.6	...	18.6	18.6	18.6	18.6	18.6	16.9	13.9	11.4	8.7	5.9
34	18.6	18.6	18.6	...	18.6	18.6	18.6	18.6	18.6	16.9	...	...	...	...
35	18.6	18.6	18.6	18.6	18.6	18.6	18.6	...	...	...	...	...	...	...
36	18.6	...	18.6	...	18.6	18.6	18.6	18.6	18.6	16.9	...	...	...	...
37	18.6	...	18.6	...	18.6	18.6	18.6	18.6	18.6	16.9	...	...	...	...
(a) 38	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(a) 39	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	16.9	13.9	11.4	8.7	5.9
(a) 40	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	16.9	13.9	11.4	8.7	5.9
41	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	18.5	16.7	13.9	11.4	8.7	5.9
42	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	16.7	13.9	11.4	8.7	5.9

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
10	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
13	3.4	2.1	...	...	...	...	...	...	...	...	...	...	...	...	...
14	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
15	3.4	2.1	...	...	...	...	...	...	...	...	...	...	...	...	...
16	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
17	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
18	3.4	2.1	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	(a)
22	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	(a)
23	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	(a)
24	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
25	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
28	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	(a)
40	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	(a)
41	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	(a)
42	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	Carbon steel	Plate	SA/GB 6654	16MnR	...	...	$2.4 < t \leq 4$	1	1
2	Carbon steel	Plate	SA/GB 6654	16MnR	...	...	$1.5 < t \leq 2.4$	1	1
3	Carbon steel	Plate	SA-455	...	K03300	...	$0.58 < t \leq \frac{3}{4}$	1	2
4	Carbon steel	Bar	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	Castings	SA-216	WCB	J03002	...	...	1	2
8	Carbon steel	Forgings	SA-266	2	K03506	...	...	1	2
9	Carbon steel	Forgings	SA-266	4	K03017	...	...	1	2
10	Carbon steel	Forgings	SA-350	LF2	K03011	1	...	1	2
11	Carbon steel	Forgings	SA-350	LF2	K03011	2	...	1	2
12	Carbon steel	Forgings	SA-508	1	K13502	...	...	1	2
13	Carbon steel	Forgings	SA-508	1A	K13502	...	...	1	2
14	Carbon steel	Forgings	SA-541	1	K03506	...	...	1	2
15	Carbon steel	Forgings	SA-541	1A	K03020	...	...	1	2
16	Carbon steel	Cast pipe	SA-660	WCB	J03003	...	...	1	2
17	Carbon steel	Forgings	SA-765	II	K03047	...	...	1	2
18	Carbon steel	Plate	SA-515	70	K03101	...	...	1	2
19	Carbon steel	Plate	SA-516	70	K02700	...	...	1	2
20	Carbon steel	Plate	SA/JIS G3118	SGV480	...	...	...	1	2
21	Carbon steel	Wld. pipe	SA-671	CB70	K03101	...	...	1	2
22	Carbon steel	Wld. pipe	SA-671	CC70	K02700	...	...	1	2
23	Carbon steel	Wld. pipe	SA-672	B70	K03101	...	...	1	2
24	Carbon steel	Wld. pipe	SA-672	C70	K02700	...	...	1	2
25	Carbon steel	Smls. pipe	SA-106	C	K03501	...	...	1	2
26	Carbon steel	Wld. tube	SA-178	D	...	...	...	1	2
27	Carbon steel	Wld. tube	SA-178	D	...	...	...	1	2
28	Carbon steel	Wld. tube	SA-178	D	...	...	...	1	2
29	Carbon steel	Smls. tube	SA-210	C	K03501	...	...	1	2
30	Carbon steel	Castings	SA-216	WCC	J02503	...	...	1	2
31	Carbon steel	Smls. & wld. fittings	SA-234	WPC	K03501	...	...	1	2
32	Carbon steel	Castings	SA-352	LCC	J02505	...	...	1	2
33	Carbon steel	Castings	SA-487	16	...	A	...	1	2
(a) 34	Carbon steel	Plate	SA-537	...	K12437	3	$4 < t \leq 6$	1	3
35	Carbon steel	Smls. tube	SA-556	C2	K03006	...	...	1	2
36	Carbon steel	Wld. tube	SA-557	C2	K03505	...	...	1	2
37	Carbon steel	Cast pipe	SA-660	WCC	J02505	...	...	1	2
38	Carbon steel	Bar	SA-695	B/40	K03504	...	...	1	2
39	Carbon steel	Bar	SA-696	C	K03200	...	...	1	2
40	Carbon steel	Sheet	SA-414	F	K03102	...	...	1	2
41	Carbon steel	Plate	SA-662	C	K02007	...	...	1	2
(a) 42	Carbon steel	Plate	SA-537	...	K12437	2	$4 < t \leq 6$	1	3
(a) 43	Carbon steel	Plate	SA-738	C	K02008	...	$4 < t \leq 6$	1	3

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	67	41	NP	NP	482	NP	CS-2	...
2	68	44	NP	NP	482	NP	CS-2	...
3	70	35	NP	400 (Cl. 3 only)	650	650	CS-2	...
4	70	35	850	650 (Cl. 3 only)	1000	650	CS-2	G10, G15, G22, S1, T2
5	70	36	1000	700	1000	650	CS-2	G10, S1, T2
6	70	36	1000	700	1000	650	CS-2	G10, S1, T2
7	70	36	1000	700	1000	650	CS-2	G1, G10, G17, S1, T2
8	70	36	1000	700	1000	650	CS-2	G10, S1, T2
9	70	36	NP	NP	1000	650	CS-2	G10, T2
10	70	36	NP	700	1000	650	CS-2	G10, T2
11	70	36	NP	700	1000	650	CS-2	G10, T2
12	70	36	NP	700	1000	650	CS-2	G10, T2
13	70	36	NP	700	1000	650	CS-2	G10, T2
14	70	36	NP	700	1000	650	CS-2	G10, T2
15	70	36	NP	700	1000	650	CS-2	G10, T2
16	70	36	1000	700	NP	NP	CS-2	G1, G10, G17, S1, T2
17	70	36	NP	NP	1000	650	CS-2	G10, T2
18	70	38	1000	700	1000	650	CS-2	G10, S1, T2
19	70	38	850	700	1000	650	CS-2	G10, S1, T2
20	70	38	850	NP	NP	NP	CS-2	G10, S1, T2
21	70	38	NP	700	NP	NP	CS-2	S5, W10, W12
22	70	38	NP	700	NP	NP	CS-2	S6, W10, W12
23	70	38	NP	700	NP	NP	CS-2	S5, W10, W12
24	70	38	NP	700	NP	NP	CS-2	S6, W10, W12
25	70	40	1000	700	1000	650	CS-2	G10, S1, T1
26	70	40	1000	NP	NP	NP	CS-2	G10, S1, T1, W13
27	70	40	1000	NP	NP	NP	CS-2	G4, G10, S1, T4
28	70	40	1000	NP	NP	NP	CS-2	G3, G10, S1, T2
29	70	40	1000	NP	1000	650	CS-2	G10, S1, T1
30	70	40	1000	700	1000	650	CS-2	G1, G10, G17, S1, T1
31	70	40	800	700	800	650	CS-2	G10, T1, W14
32	70	40	NP	700	NP	NP	CS-2	G17, T1
33	70	40	NP	700	NP	NP	CS-2	...
34	70	40	NP	NP	700	650	CS-2	G23, W11 (a)
35	70	40	NP	NP	800	650	CS-2	G10, T1
36	70	40	NP	NP	1000	650	CS-2	G24, T2, W6
37	70	40	1000	700	NP	NP	CS-2	G1, G10, G17, S1, T1
38	70	40	NP	700	800	650	CS-2	G10, T1
39	70	40	NP	700	NP	NP	CS-2	T1
40	70	42	NP	NP	900	650	CS-2	G10, T1
41	70	43	NP	NP	700	650	CS-3	T1
42	70	46	NP	700	700	650	CS-3	G23, T1, W11 (a)
43	70	46	NP	650	650	650	CS-3	G23, W11 (a)

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	...	...	...	...	...	...	...
2	19.5	19.5	19.5	19.5	19.5	19.5	19.5	...	...	...	...	...	...	...
3	20.0	20.0	20.0	...	20.0	19.9	19.0	17.9	17.3	...	...	...	...	...
4	20.0	20.0	20.0	...	20.0	19.9	19.0	17.9	17.3	16.7	14.8	12.0	9.3	6.7
5	20.0	20.0	20.0	...	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
6	20.0	20.0	20.0	...	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
7	20.0	20.0	20.0	...	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
8	20.0	...	20.0	...	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
9	20.0	20.0	20.0	...	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
10	20.0	20.0	20.0	...	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
11	20.0	20.0	20.0	...	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
12	20.0	20.0	20.0	...	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
13	20.0	20.0	20.0	...	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
14	20.0	20.0	20.0	...	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
15	20.0	20.0	20.0	...	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
16	20.0	...	20.0	...	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
17	20.0	20.0	20.0	...	20.0	20.0	19.6	18.4	17.8	17.2	14.8	12.0	9.3	6.7
18	20.0	20.0	20.0	...	20.0	20.0	20.0	19.4	18.8	18.1	14.8	12.0	9.3	6.7
19	20.0	20.0	20.0	...	20.0	20.0	20.0	19.4	18.8	18.1	14.8	12.0	9.3	6.7
20	20.0	20.0	20.0	...	20.0	20.0	20.0	19.4	18.8	18.1	14.8	12.0	9.3	...
21	20.0	...	20.0	...	20.0	20.0	20.0	19.4	18.8	18.1	...	...	...	...
22	20.0	...	20.0	...	20.0	20.0	20.0	19.4	18.8	18.1	...	...	...	...
23	20.0	...	20.0	...	20.0	20.0	20.0	19.4	18.8	18.1	...	...	...	...
24	20.0	...	20.0	...	20.0	20.0	20.0	19.4	18.8	18.1	...	...	...	...
25	20.0	...	20.0	...	20.0	20.0	20.0	20.0	19.8	18.3	14.8	12.0	9.3	6.7
26	20.0	...	20.0	...	20.0	20.0	20.0	20.0	19.8	18.3	14.8	12.0	9.3	6.7
27	20.0	...	20.0	...	20.0	20.0	20.0	20.0	19.8	18.3	14.8	12.0	9.3	5.7
28	17.0	...	17.0	...	17.0	17.0	17.0	17.0	16.8	15.5	12.6	10.2	7.9	5.7
29	20.0	...	20.0	...	20.0	20.0	20.0	20.0	19.8	18.3	14.8	12.0	9.3	6.7
30	20.0	20.0	20.0	...	20.0	20.0	20.0	20.0	19.8	18.3	14.8	12.0	9.3	6.7
31	20.0	...	20.0	...	20.0	20.0	20.0	20.0	19.8	18.3	14.8	12.0	...	...
32	20.0	...	20.0	...	20.0	20.0	20.0	20.0	19.8	18.3	...	...	...	...
33	20.0	...	19.9	...	18.8	18.1	17.9	17.9	17.9	17.9	...	...	...	...
(a) 34	20.0	20.0	20.0	...	19.7	19.5	18.9	18.0	17.6	17.2	...	...	...	...
35	20.0	20.0	20.0	...	20.0	20.0	20.0	20.0	19.8	18.3	14.8	12.0	...	...
36	17.0	17.0	17.0	...	17.0	17.0	17.0	17.0	16.8	15.5	12.6	10.2	7.9	5.7
37	20.0	...	20.0	...	20.0	20.0	20.0	20.0	19.8	18.3	14.8	12.0	9.3	6.7
38	20.0	20.0	20.0	...	20.0	20.0	20.0	20.0	19.8	18.3	14.8	12.0	...	...
39	20.0	...	20.0	...	20.0	20.0	20.0	20.0	19.8	18.3	...	...	...	...
40	20.0	20.0	20.0	...	20.0	20.0	20.0	20.0	20.0	18.3	14.8	12.0	9.3	6.7
41	20.0	20.0	20.0	...	20.0	20.0	20.0	20.0	20.0	18.3	...	...	...	...
(a) 42	20.0	...	20.0	...	19.7	19.5	19.5	19.5	19.5	18.3	...	...	...	...
(a) 43	20.0	...	20.0	...	19.7	19.5	19.5	19.5	19.5	...	...	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
5	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
6	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
7	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
8	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
9	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
10	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
11	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
12	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
13	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
14	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
15	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
16	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
17	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
18	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
19	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
26	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
27	3.4	2.1	...	...	...	...	...	...	...	...	...	...	...	...	...
28	3.4	2.1	...	...	...	...	...	...	...	...	...	...	...	...	...
29	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
30	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	3.4	2.1	...	...	...	...	...	...	...	...	...	...	...	...	...
37	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

(a)

(a)

(a)

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	Carbon steel	Plate	SA-537	...	K12437	1	$\leq 2\frac{1}{2}$	1	2
2	Carbon steel	Wld. pipe	SA-671	CD70	K12437	...	$\leq 2\frac{1}{2}$	1	2
3	Carbon steel	Wld. pipe	SA-672	D70	K12437	...	$\leq 2\frac{1}{2}$	1	2
4	Carbon steel	Wld. pipe	SA-691	CMSH-70	K12437	...	$\leq 2\frac{1}{2}$	1	2
(a) 5	Carbon steel	Plate	SA-841	A	...	1	$\leq 2\frac{1}{2}$	1	2
(a) 6	...	...	...	...	...	...	...	...	...
(a) 7	...	...	...	...	...	...	...	...	...
(a) 8	...	...	...	...	...	...	...	...	...
9	Carbon steel	Plate	SA/GB 6654	16MnR	...	...	$0.65 < t \leq 1.5$	1	2
10	Carbon steel	Plate	SA-455	...	K03300	...	$\frac{3}{8} < t \leq 0.58$	1	2
(10) 11	Carbon steel	Plate	SA/GB 6654	16MnR	...	...	$0.25 \leq t \leq 0.65$	1	2
12	Carbon steel	Forgings	SA-266	3	K05001	...	...	1	2
13	Carbon steel	Plate	SA-455	...	K03300	...	$\leq \frac{3}{8}$	1	2
(10) 14	Carbon steel	Plate	SA-299	A	K02803	...	> 1	1	2
15	Carbon steel	Wld. pipe	SA-671	CK75	K02803	...	> 1	1	2
16	Carbon steel	Wld. pipe	SA-672	N75	K02803	...	> 1	1	2
17	Carbon steel	Wld. pipe	SA-691	CMS-75	K02803	...	> 1	1	2
(10) 18	Carbon steel	Plate	SA-299	A	K02803	...	≤ 1	1	2
19	Carbon steel	Wld. pipe	SA-691	CMS-75	K02803	...	≤ 1	1	2
20	Carbon steel	Forgings	SA-372	B	K04001	...	...	1	2
21	Carbon steel	Sheet	SA-414	G	K03103	...	...	1	2
22	Carbon steel	Plate	SA-738	A	K12447	...	...	1	2
23	Carbon steel	Plate	SA-537	...	K12437	3	$2\frac{1}{2} < t \leq 4$	1	3
24	Carbon steel	Plate	SA-537	...	K12437	2	$2\frac{1}{2} < t \leq 4$	1	3
25	Carbon steel	Wld. pipe	SA-691	CMSH-80	K12437	...	$2\frac{1}{2} < t \leq 4$	1	3
(a) 26	Carbon steel	Plate	SA-738	C	K02008	...	$2\frac{1}{2} < t \leq 4$	1	3
(10) 27	Carbon steel	Plate	SA-299	B	K02803	...	> 1	1	3
(10) 28	Carbon steel	Plate	SA-299	B	K02803	...	≤ 1	1	3
29	Carbon steel	Forgings	SA-765	IV	K02009	...	...	1	3
30	Carbon steel	Plate	SA-537	...	K12437	3	$\leq 2\frac{1}{2}$	1	3
31	Carbon steel	Plate	SA-537	...	K12437	2	$\leq 2\frac{1}{2}$	1	3
32	Carbon steel	Wld. pipe	SA-671	CD80	K12437	...	$\leq 2\frac{1}{2}$	1	3
33	Carbon steel	Wld. pipe	SA-672	D80	K12437	...	$\leq 2\frac{1}{2}$	1	3
34	Carbon steel	Wld. pipe	SA-691	CMSH-80	K12437	...	$\leq 2\frac{1}{2}$	1	3
35	Carbon steel	Plate	SA-738	C	K02008	...	$\leq 2\frac{1}{2}$	1	3
(a) 36	Carbon steel	Plate	SA-841	B	...	2	$\leq 2\frac{1}{2}$	1	3
37	Carbon steel	Plate	SA-612	...	K02900	...	$\frac{1}{2} < t \leq 1$	10C	1
38	Carbon steel	Plate	SA-612	...	K02900	...	$\leq \frac{1}{2}$	10C	1
(a) 39	Carbon steel	Plate	SA-738	B	K12007	...	...	1	3
40	Carbon steel	Forgings	SA-372	C	K04801	...	...	...	...
41	Carbon steel	Plate	SA-724	A	K11831	...	...	1	4
42	Carbon steel	Plate	SA-724	C	K12037	...	...	1	4
43	Carbon steel	Plate	SA-724	B	K12031	...	...	1	4

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes	
			I	III	VIII-1	XII			
1	70	50	NP	700	650	650	CS-3	G23, T1	
2	70	50	NP	700	NP	NP	CS-3	S6, T1, W10, W12	
3	70	50	NP	700	NP	NP	CS-3	S6, T1, W10, W12	
4	70	50	NP	700	NP	NP	CS-3	S6, T1, W10, W12	
5	70	50	NP	NP	650	NP	CS-3	...	(a)
6	...	...	...	...	...	...	...	...	(a)
7	...	...	...	...	...	...	...	...	(a)
8	...	...	...	...	...	...	...	...	(a)
9	71	47	NP	NP	482	NP	CS-2	...	
10	73	37	NP	400 (Cl. 3 only)	650	650	CS-2	...	
11	74	50	NP	NP	482	NP	CS-2	...	(10)
12	75	37.5	1000	700	1000	NP	CS-2	G10, S1, T2, W8, W11	
13	75	38	NP	400 (Cl. 3 only)	650	650	CS-2	...	
14	75	40	1000	700	1000	650	CS-2	G10, S1, T2	(10)
15	75	40	NP	700	NP	NP	CS-2	S6, W10, W12	
16	75	40	NP	700	NP	NP	CS-2	S6, W10, W12	
17	75	40	NP	700	NP	NP	CS-2	S6, W10, W12	
18	75	42	1000	700	1000	650	CS-2	G10, S1, T1	(10)
19	75	42	NP	700	NP	NP	CS-2	T1, W10, W12	
20	75	45	NP	NP	650	650	CS-3	W11	
21	75	45	NP	NP	900	650	CS-3	G10, T1	
22	75	45	NP	NP	700	650	CS-2	T1	
23	75	50	NP	NP	700	650	CS-5	G23, T1, W11	
24	75	55	NP	700	650	650	CS-5	G23, T1, W11	
25	75	55	NP	700	NP	NP	CS-5	G26, T1, W10, W12	
26	75	55	NP	650	650	650	CS-5	G23, W11	(a)
27	80	45	800	NP	1000	650	CS-3	G10, S1, T1	(10)
28	80	47	800	NP	1000	650	CS-3	G10, S1, T1	(10)
29	80	50	NP	NP	700	NP	CS-3	...	
30	80	55	NP	NP	700	650	CS-5	G23, T1, W11	
31	80	60	NP	700	650	650	CS-5	G23, S6, T1, W10, W11, W12	
32	80	60	NP	700	NP	NP	CS-5	S6, T1, W10, W12	
33	80	60	NP	700	NP	NP	CS-5	S6, T1, W10, W12	
34	80	60	NP	700	NP	NP	CS-5	S6, T1, W10, W12	
35	80	60	NP	650	650	650	CS-5	G23, W11	
36	80	60	NP	NP	650	NP	CS-3	...	(a)
37	81	50	NP	700	650	650	CS-3	T1	
38	83	50	NP	650	650	650	CS-3	...	
39	85	60	NP	650	650	650	CS-5	...	(a)
40	90	55	NP	NP	650	650	CS-3	W11	
41	90	70	NP	NP	700	650	CS-5	...	
42	90	70	NP	NP	700	650	CS-5	...	
43	95	75	NP	NP	700	650	CS-5	...	

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	20.0	...	20.0	...	19.7	19.5	19.5	19.5	19.5	18.3	...	...	...	...
2	20.0	...	20.0	...	19.7	19.5	19.5	19.5	19.5	18.3	...	...	...	...
3	20.0	...	20.0	...	19.7	19.5	19.5	19.5	19.5	18.3	...	...	...	...
4	20.0	...	20.0	...	19.7	19.5	19.5	19.5	19.5	18.3	...	...	...	...
(a) 5	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	...	...	...	...	...
(a) 6	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(a) 7	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(a) 8	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	20.3	20.3	20.3	20.3	20.3	20.3	20.3	...	...	...	...	...	...	...
10	20.9	20.9	20.9	...	20.9	20.9	20.1	18.9	18.3	...	...	...	...	...
(10) 11	21.1	21.1	21.1	21.1	21.1	21.1	21.1	...	...	...	...	...	...	...
12	21.4	21.4	21.4	...	21.4	21.4	20.4	19.2	18.5	17.9	15.7	12.6	9.3	6.7
13	21.4	21.4	21.4	...	21.4	21.4	20.6	19.4	18.8	...	...	...	...	...
(10) 14	21.4	21.4	21.4	...	21.4	21.4	21.4	20.4	19.8	19.1	15.7	12.6	9.3	6.7
15	21.4	...	21.4	...	21.4	21.4	21.4	20.4	19.8	19.1	...	...	...	...
16	21.4	...	21.4	...	21.4	21.4	21.4	20.4	19.8	19.1	...	...	...	...
17	21.4	...	21.4	...	21.4	21.4	21.4	20.4	19.8	19.1	...	...	...	...
(10) 18	21.4	21.4	21.4	...	21.4	21.4	21.4	21.4	20.8	19.6	15.7	12.6	9.3	6.7
19	21.4	...	21.4	...	21.4	21.4	21.4	21.4	20.8	19.6	...	...	...	...
20	21.4	...	21.4	...	21.4	21.4	21.4	21.4	21.4	...	...	...	...	...
21	21.4	21.4	21.4	...	21.4	21.4	21.4	21.4	21.4	19.6	15.7	12.6	9.3	6.7
22	21.4	...	21.4	...	21.4	21.4	21.4	21.4	21.4	19.6	...	...	...	...
23	21.4	...	21.4	...	21.1	20.9	20.9	20.9	20.9	18.3	...	...	...	...
24	21.4	...	21.4	...	21.1	20.9	20.9	20.9	20.9	19.6	...	...	...	...
25	21.4	...	21.4	...	21.1	20.9	20.9	20.9	20.9	19.6	...	...	...	...
(a) 26	21.4	...	21.4	...	21.1	20.9	20.9	20.9	20.9	...	...	...	...	...
(10) 27	22.9	22.9	22.9	...	22.9	22.9	22.9	22.9	22.2	19.6	15.7	12.6	9.3	6.7
(10) 28	22.9	22.9	22.9	...	22.9	22.9	22.9	22.9	22.2	19.6	15.7	12.6	9.3	6.7
29	22.9	...	22.9	...	22.9	22.6	22.6	22.6	22.5	22.2	...	...	...	...
30	22.9	...	22.9	...	22.6	22.3	22.3	22.3	22.3	19.6	...	...	...	...
31	22.9	...	22.9	...	22.6	22.3	22.3	22.3	22.3	19.6	...	...	...	...
32	22.9	...	22.9	...	22.6	22.3	22.3	22.3	22.3	19.6	...	...	...	...
33	22.9	...	22.9	...	22.6	22.3	22.3	22.3	22.3	19.6	...	...	...	...
34	22.9	...	22.9	...	22.6	22.3	22.3	22.3	22.3	19.6	...	...	...	...
35	22.9	...	22.9	...	22.6	22.3	22.3	22.3	22.3	...	...	...	...	...
(a) 36	22.9	22.9	22.9	22.9	22.9	22.9	22.9	22.9	22.9	...	...	...	...	...
37	23.1	...	23.1	...	22.8	22.6	22.6	22.5	22.0	19.6	...	...	...	...
38	23.7	...	23.7	...	23.4	23.2	23.2	22.5	22.0	...	...	...	...	...
(a) 39	24.3	24.3	24.3	24.3	24.3	24.3	24.3	24.1	23.7	...	...	...	...	...
40	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	24.4	...	...	...	...	...
41	25.7	25.7	25.7	25.6	25.4	25.1	25.1	25.1	24.4	21.9	...	...	...	...
42	25.7	25.7	25.7	25.6	25.4	25.1	25.1	25.1	24.4	21.9	...	...	...	...
43	27.1	27.1	27.1	27.0	26.8	26.5	26.5	26.5	24.4	23.1	...	...	...	...

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1
2
3
4
5	(a)
6	(a)
7	(a)
8	(a)
9
10
11	(10)
12	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...
13
14	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	(10)
15
16
17
18	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	(10)
19
20
21
22
23
24
25
26	(a)
27	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	(10)
28	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	(10)
29
30
31
32
33
34
35
36	(a)
37
38
39	(a)
40
41
42
43

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
(a) 1	C-Mn-Si-Cb	Plate	SA-737	B	K12001	...	...	1	2
(a) 2	...	...	...	...	...	...	...	...	...
(a) 3	C-Mn-Si-Cb	Plate	SA/AS 1548	PT490N	...	Normalized	≤ 6	1	2
(a) 4	C-Mn-Si-Cb	Plate	SA/AS 1548	PT490NR	...	Norm. rld.	≤ 6	1	2
(a) 5	C-Mn-Si-V	Plate	SA-737	C	K12202	...	...	1	3
6	C-Mn-Si-V-Cb	Plate	SA-656	T3	...	...	≤ 2	1	1
7	C-Mn-Si-V-Cb	Plate	SA-656	T7	...	...	≤ 2	1	1
8	C-Mn-Si-V-Cb	Plate	SA-656	T3	...	...	≤ 1½	1	2
9	C-Mn-Si-V-Cb	Plate	SA-656	T7	...	...	≤ 1½	1	2
10	C-Mn-Si-V-Cb	Plate	SA-656	T3	...	...	≤ 1	1	3
11	C-Mn-Si-V-Cb	Plate	SA-656	T7	...	...	≤ 1	1	3
12	C-Mn-Si-V-Cb	Plate	SA-656	T3	...	...	≤ ¾	1	4
13	C-Mn-Si-V-Cb	Plate	SA-656	T7	...	...	≤ ¾	1	4
14	C-Mn-Ti	Plate, sheet	SA-562	...	K11224	...	...	1	1
15	C-Si-Ti	Forgings	SA-836	...	...	1	...	1	1
16	C-½Mo	Smls. tube	SA-209	T1b	K11422	...	...	3	1
17	C-½Mo	Wld. tube	SA-250	T1b	K11422	...	...	3	1
18	C-½Mo	Wld. tube	SA-250	T1b	K11422	...	...	3	1
19	C-½Mo	Smls. tube	SA-209	T1	K11522	...	...	3	1
20	C-½Mo	Smls. & wld. fittings	SA-234	WP1	K12821	...	...	3	1
21	C-½Mo	Wld. tube	SA-250	T1	K11522	...	...	3	1
22	C-½Mo	Wld. tube	SA-250	T1	K11522	...	...	3	1
23	C-½Mo	Smls. pipe	SA-335	P1	K11522	...	...	3	1
24	C-½Mo	Forged pipe	SA-369	FP1	K11522	...	...	3	1
25	C-½Mo	Smls. tube	SA-209	T1a	K12023	...	...	3	1
26	C-½Mo	Wld. tube	SA-250	T1a	K12023	...	...	3	1
27	C-½Mo	Wld. tube	SA-250	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	Wld. pipe	SA-691	CM-65	K11820	...	...	3	1
35	C-½Mo	Forgings	SA-182	F1	K12822	...	...	3	2
36	C-½Mo	Plate	SA-204	B	K12020	...	...	3	2
37	C-½Mo	Forgings	SA-336	F1	K12520	...	...	3	2
38	C-½Mo	Wld. pipe	SA-672	L70	K12020	...	...	3	2
39	C-½Mo	Wld. pipe	SA-691	CM-70	K12020	...	...	3	2
40	C-½Mo	Wld. pipe	SA-691	CM-70	K12020	...	...	3	2
41	C-½Mo	Plate	SA-204	C	K12320	...	...	3	2
42	C-½Mo	Wld. pipe	SA-672	L75	K12320	...	...	3	2
43	C-½Mo	Wld. pipe	SA-691	CM-75	K12320	...	...	3	2
44	C-½Mo	Wld. pipe	SA-691	CM-75	K12320	...	...	3	2

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes	
			I	III	VIII-1	XII			
1	70	50	NP	700	700	650	CS-3	T1	(a)
2	...	...	...	...	...	...	...	...	(a)
3	71	...	1000	NP	1000	NP	CS-2	G10, G18, S1, T1	(a)
4	71	...	1000	NP	1000	NP	CS-2	G10, G18, S1, T1	(a)
5	80	60	NP	700	700	650	CS-3	...	(a)
6	60	50	NP	NP	NP	650	...	...
7	60	50	NP	NP	NP	650	...	...
8	70	60	NP	NP	NP	650	...	...
9	70	60	NP	NP	NP	650	...	...
10	80	70	NP	NP	NP	650	...	...
11	80	70	NP	NP	NP	650	...	...
12	90	80	NP	NP	NP	650	...	...
13	90	80	NP	NP	NP	650	...	...
14	71	30	NP	NP	650	NP	CS-6	G30	
15	55	25	NP	NP	650	650	CS-1	...	
16	53	28	1000	NP	1000	650	CS-1	G11, S3, T5	
17	53	28	1000	NP	NP	NP	CS-1	G11, S2, T5, W13	
18	53	28	1000	NP	1000	650	CS-1	G3, G11, G24, S2, T5	
19	55	30	1000	NP	1000	650	CS-2	G11, S3, T4	
20	55	30	1000	700	1000	650	CS-2	G11, T4, W14	
21	55	30	1000	NP	NP	NP	CS-2	G11, S2, T4, W13	
22	55	30	1000	NP	1000	650	CS-2	G3, G11, G24, S2, T4	
23	55	30	1000	700	1000	650	CS-2	G11, S2, T4	
24	55	30	1000	700	1000	650	CS-2	G11, S2, T4	
25	60	32	1000	NP	1000	650	CS-2	G11, S3, T4	
26	60	32	1000	NP	NP	NP	CS-2	G11, S2, T4, W13	
27	60	32	1000	NP	1000	650	CS-2	G3, G11, G24, S2, T4	
28	65	35	1000	700	1000	650	CS-2	G1, G11, G17, S2, T4	
29	65	35	NP	700	650	650	CS-2	G1, G17	
30	65	35	NP	700	NP	NP	CS-2	G17	
31	65	37	1000	700	1000	650	CS-2	G11, S2, T4	
32	65	37	NP	700	NP	NP	CS-2	G26, W10, W12	
33	65	37	NP	700	NP	NP	CS-2	G26, W10, W12	
34	65	37	NP	300 (Cl. 3 only)	NP	NP	CS-2	G27, W10, W12	
35	70	40	1000	700	1000	650	CS-2	G11, S2, T4	
36	70	40	1000	700	1000	650	CS-2	G11, S2, T4	
37	70	40	1000	700	1000	650	CS-2	G11, S2, T4	
38	70	40	NP	700	NP	NP	CS-2	G26, W10, W12	
39	70	40	NP	700	NP	NP	CS-2	G26, W10, W12	
40	70	40	NP	300 (Cl. 3 only)	NP	NP	CS-2	G27, W10, W12	
41	75	43	1000	700	1000	650	CS-2	G11, S2, T4, W12	
42	75	43	NP	700	NP	NP	CS-2	G26, W10, W12	
43	75	43	NP	700	NP	NP	CS-2	G26, W10, W12	
44	75	43	NP	300 (Cl. 3 only)	NP	NP	CS-2	G27, W10, W12	

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
(a) 1	20.0	20.0	20.0	...	20.0	20.0	20.0	20.0	20.0	19.6	...	...	...	...
(a) 2	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(a) 3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	18.3	14.8	12.0	9.3	6.7
(a) 4	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	18.3	14.8	12.0	9.3	6.7
(a) 5	22.9	...	22.9	...	22.9	22.9	22.9	22.9	22.9	20.0	...	...	...	...
6	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	...	...	...	...	...
7	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	...	...	...	...	...
8	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	...	...	...	...	...
9	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	...	...	...	...	...
10	22.9	...	22.9	...	22.9	22.9	22.9	22.9	22.9	...	...	...	...	...
11	22.9	...	22.9	...	22.9	22.9	22.9	22.9	22.9	...	...	...	...	...
12	25.7	...	25.7	...	25.7	25.7	25.7	25.7	25.7	...	...	...	...	...
13	25.7	...	25.7	...	25.7	25.7	25.7	25.7	25.7	...	...	...	...	...
14	12.9	...	11.5	...	10.6	10.4	10.4	10.4	10.4	...	...	...	...	...
15	15.7	...	14.3	...	13.3	13.0	13.0	12.9	12.7	...	...	...	...	...
16	15.1	15.1	15.1	...	15.1	15.1	15.1	15.1	15.0	14.7	14.3	14.0	13.5	13.0
17	15.1	...	15.1	...	15.1	15.1	15.1	15.1	15.0	14.7	14.3	14.0	13.5	13.0
18	12.9	12.9	12.9	...	12.9	12.9	12.9	12.9	12.7	12.5	12.2	11.9	11.5	11.1
19	15.7	15.7	15.7	...	15.7	15.7	15.7	15.7	15.7	15.7	15.4	14.9	14.5	13.7
20	15.7	15.7	15.7	...	15.7	15.7	15.7	15.7	15.7	15.7	15.4	14.9	14.5	13.7
21	15.7	...	15.7	...	15.7	15.7	15.7	15.7	15.7	15.7	15.4	14.9	14.5	13.7
22	13.4	13.4	13.4	...	13.4	13.4	13.4	13.4	13.4	13.4	13.1	12.7	12.3	11.6
23	15.7	15.7	15.7	...	15.7	15.7	15.7	15.7	15.7	15.7	15.4	14.9	14.5	13.7
24	15.7	15.7	15.7	...	15.7	15.7	15.7	15.7	15.7	15.7	15.4	14.9	14.5	13.7
25	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	16.8	16.4	15.9	15.4	13.7
26	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	16.8	16.4	15.9	15.4	13.7
27	14.6	...	14.6	...	14.6	14.6	14.6	14.6	14.6	14.3	13.9	13.6	13.1	11.6
28	18.6	...	18.6	...	18.6	18.6	18.6	18.6	18.6	18.4	17.9	17.4	16.9	13.7
29	18.6	...	18.6	...	18.6	18.6	18.6	18.6	18.6	18.4	...	...	...	...
30	18.6	...	18.6	...	18.6	18.6	18.6	18.6	18.6	18.4	...	...	...	...
31	18.6	...	18.6	...	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.4	17.9	13.7
32	18.6	...	18.6	...	18.6	18.6	18.6	18.6	18.6	18.6	...	...	...	...
33	18.6	...	18.6	...	18.6	18.6	18.6	18.6	18.6	18.6	...	...	...	...
34	18.6	...	18.6	...	18.6	...	...	...	...	...	...	...	...	...
35	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.9	19.3	13.7
36	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.9	19.3	13.7
37	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.9	19.3	13.7
38	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	...	...	...	...
39	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	...	...	...	...
40	20.0	...	20.0	...	20.0	...	...	...	...	...	...	...	...	...
41	21.4	...	21.4	...	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	20.7	13.7
42	21.4	...	21.4	...	21.4	21.4	21.4	21.4	21.4	21.4	...	...	...	...
43	21.4	...	21.4	...	21.4	21.4	21.4	21.4	21.4	21.4	...	...	...	...
44	21.4	...	21.4	...	21.4	...	...	...	...	...	...	...	...	...

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding															
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(a)
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(a)
3	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...	(a)
4	4.0	2.5	...	...	...	...	...	...	...	...	...	...	...	...	...	(a)
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(a)
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	8.2	4.8	...	...	...	...	...	...	...	...	...	...	...	...	...
17	8.2	4.8	...	...	...	...	...	...	...	...	...	...	...	...	...
18	7.0	4.1	...	...	...	...	...	...	...	...	...	...	...	...	...
19	8.2	4.8	...	...	...	...	...	...	...	...	...	...	...	...	...
20	8.2	4.8	...	...	...	...	...	...	...	...	...	...	...	...	...
21	8.2	4.8	...	...	...	...	...	...	...	...	...	...	...	...	...
22	7.0	4.1	...	...	...	...	...	...	...	...	...	...	...	...	...
23	8.2	4.8	...	...	...	...	...	...	...	...	...	...	...	...	...
24	8.2	4.8	...	...	...	...	...	...	...	...	...	...	...	...	...
25	8.2	4.8	...	...	...	...	...	...	...	...	...	...	...	...	...
26	8.2	4.8	...	...	...	...	...	...	...	...	...	...	...	...	...
27	7.0	4.1	...	...	...	...	...	...	...	...	...	...	...	...	...
28	8.2	4.8	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	8.2	4.8	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	8.2	4.8	...	...	...	...	...	...	...	...	...	...	...	...	...
36	8.2	4.8	...	...	...	...	...	...	...	...	...	...	...	...	...
37	8.2	4.8	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	8.2	4.8	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	$\frac{1}{2}\text{Cr}-\frac{1}{5}\text{Mo}$	Forgings	SA-372	G	K13049	70	...	...	...
2	$\frac{1}{2}\text{Cr}-\frac{1}{5}\text{Mo}$	Forgings	SA-372	H	K13547	70	...	...	...
3	$\frac{1}{2}\text{Cr}-\frac{1}{5}\text{Mo}-\text{V}$	Plate	SA-517	B	K11630	...	$\leq 1\frac{1}{4}$	11B	4
4	$\frac{1}{2}\text{Cr}-\frac{1}{4}\text{Mo}-\text{Si}$	Plate	SA-517	A	K11856	...	$\leq 1\frac{1}{4}$	11B	1
5	$\frac{1}{2}\text{Cr}-\frac{1}{4}\text{Mo}-\text{Si}$	Forgings	SA-592	A	K11856	...	$\leq 2\frac{1}{2}$	11B	1
6	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Smls. pipe	SA-335	P2	K11547	...	...	3	1
7	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Forged pipe	SA-369	FP2	K11547	...	...	3	1
8	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Plate	SA-387	2	K12143	1	...	3	1
9	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Wld. pipe	SA-691	$\frac{1}{2}\text{CR}$	K12143	...	...	3	1
10	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Wld. pipe	SA-691	$\frac{1}{2}\text{CR}$	K12143	...	...	3	1
11	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Smls. tube	SA-213	T2	K11547	...	...	3	1
12	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Wld. tube	SA-250	T2	K11547	...	...	3	1
13	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Wld. tube	SA-250	T2S1	K11547	...	...	3	1
14	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Cast pipe	SA-426	CP2	J11547	...	...	3	1
15	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Forgings	SA-182	F2	K12122	...	...	3	2
16	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Plate	SA-387	2	K12143	2	...	3	2
17	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Wld. pipe	SA-691	$\frac{1}{2}\text{CR}$	K12143	...	...	3	2
18	$\frac{1}{2}\text{Cr}-1\frac{1}{4}\text{Mn}-\text{Si}$	Plate	SA-202	A	K11742	...	...	4	1
19	$\frac{1}{2}\text{Cr}-1\frac{1}{4}\text{Mn}-\text{Si}$	Plate	SA-202	B	K12542	...	...	4	1
20	$\frac{3}{4}\text{Cr}-\frac{1}{2}\text{Ni}-\text{Cu}$	Smls. & wld. tube	SA-423	1	K11535	...	...	4	2
21	$\frac{3}{4}\text{Cr}-\frac{1}{2}\text{Ni}-\text{Cu}$	Wld. tube	SA-423	1	K11535	...	...	4	2
22	$\frac{3}{4}\text{Cr}-\frac{3}{4}\text{Ni}-\text{Cu}-\text{Al}$	Pipe	SA-333	4	K11267	...	...	4	2
23	$1\text{Cr}-\frac{1}{5}\text{Mo}$	Forgings	SA-372	E	K13047	65	...	...	...
24	$1\text{Cr}-\frac{1}{5}\text{Mo}$	Forgings	SA-372	J	K13548	65	...	...	...
25	$1\text{Cr}-\frac{1}{5}\text{Mo}$	Forgings	SA-372	E	K13047	70	...	...	...
26	$1\text{Cr}-\frac{1}{5}\text{Mo}$	Forgings	SA-372	F	G41350	70	...	...	...
27	$1\text{Cr}-\frac{1}{5}\text{Mo}$	Forgings	SA-372	J	K13548	70	...	...	...
28	$1\text{Cr}-\frac{1}{5}\text{Mo}$	Forgings	SA-372	J	G41370	110	...	...	...
29	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Plate	SA-387	12	K11757	1	...	4	1
30	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Wld. pipe	SA-691	1CR	K11757	...	...	4	1
31	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Cast pipe	SA-426	CP12	J11562	...	...	4	1
32	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Forgings	SA-182	F12	K11562	1	...	4	1
33	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Smls. tube	SA-213	T12	K11562	...	...	4	1
34	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Smls. & wld. fittings	SA-234	WP12	K12062	1	...	4	1
35	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Wld. tube	SA-250	T12	K11562	...	...	4	1
36	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Wld. tube	SA-250	T12S1	K11562	...	...	4	1
37	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Smls. pipe	SA-335	P12	K11562	...	...	4	1
38	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Forged pipe	SA-369	FP12	K11562	...	...	4	1
39	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Plate	SA-387	12	K11757	2	...	4	1
40	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Wld. pipe	SA-691	1CR	K11757	...	...	4	1
41	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Forgings	SA-182	F12	K11564	2	...	4	1
42	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Forgings	SA-336	F12	K11564	...	...	4	1
43	$1\text{Cr}-\text{V}$	Smls. tube	SA-213	T17	K12047	...	...	10B	1

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	120	70	NP	NP	200	200	CS-3	W11
2	120	70	NP	NP	200	200	CS-3	W11
3	115	100	NP	650 (SPT)	650	650	HT-1	...
4	115	100	NP	650 (SPT)	650	650	HT-1	...
5	115	100	NP	650 (SPT)	650	650	HT-1	...
6	55	30	1000	700	1000	650	CS-2	T5
7	55	30	1000	700	1000	650	CS-2	T5
8	55	33	1000	700	1000	650	CS-2	T5
9	55	33	NP	700	NP	NP	CS-2	G26, W10, W12
10	55	33	NP	300 (Cl. 3 only)	NP	NP	CS-2	G27, W10, W12
11	60	30	1000	700	1000	650	CS-2	T5
12	60	30	1000	NP	NP	NP	CS-2	G3, T5
13	60	30	1000	NP	NP	NP	CS-2	T5, W13
14	60	30	NP	700	NP	NP	CS-2	G17
15	70	40	1000	NP	1000	650	CS-2	T5
16	70	45	NP	700	1000	650	CS-3	T5
17	70	45	NP	700	NP	NP	CS-3	G26, W10, W12
18	75	45	1000	NP	1000	NP	CS-3	S1, T2
19	85	47	1000	NP	1000	NP	CS-3	S1, T2
20	60	37	700	NP	650	NP	CS-2	W13, W14
21	60	37	700	NP	650	NP	CS-2	G3, G24
22	60	35	NP	700	650	NP	CS-2	...
23	105	65	NP	NP	650	650	CS-2	W11
24	105	65	NP	NP	650	650	CS-2	W11
25	120	70	NP	NP	650	650	CS-5	W11
26	120	70	NP	NP	650	650	CS-5	W11
27	120	70	NP	NP	650	650	CS-5	W11
28	135	110	NP	NP	650	650	HT-1	W11
29	55	33	1200	700	1200	NP	CS-2	S4, T5
30	55	33	NP	700	NP	NP	CS-2	G26, W10, W12
31	60	30	NP	700	NP	NP	CS-2	G17
32	60	32	1200	NP	1200	NP	CS-2	T5
33	60	32	1200	700	1200	NP	CS-2	S4, T5
34	60	32	1200	700	1200	NP	CS-2	S4, T5, W14
35	60	32	1200	NP	NP	NP	CS-2	G3, S4, T5
36	60	32	1200	NP	NP	NP	CS-2	S4, T5, W13
37	60	32	1200	700	1200	NP	CS-2	S4, T5
38	60	32	1200	700	1200	NP	CS-2	S4, T5
39	65	40	1200	700	1200	NP	CS-2	S4, T5
40	65	40	NP	700	NP	NP	CS-2	G26, W10, W12
41	70	40	1200	700	1200	NP	CS-2	S4, T4
42	70	40	1200	700	1200	NP	CS-2	S4, T4
43	60	30	NP	NP	650	650	CS-2	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	34.3	...	34.3	...	...	...	...	...	...	...	...	...	...	...
2	34.3	...	34.3	...	...	...	...	...	...	...	...	...	...	...
3	32.9	...	32.9	32.9	32.9	32.9	32.9	32.9	32.8	...	...	...	...	...
4	32.9	...	32.9	32.9	32.9	32.9	32.9	32.9	32.8	...	...	...	...	...
5	32.9	...	32.9	...	32.9	32.9	32.9	32.9	32.8	...	...	...	...	...
6	15.7	...	15.7	...	15.7	15.7	15.7	15.7	15.7	15.7	15.4	14.9	14.5	13.9
7	15.7	...	15.7	...	15.7	15.7	15.7	15.7	15.7	15.7	15.4	14.9	14.5	13.9
8	15.7	...	15.7	...	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.3	14.3
9	15.7	...	15.7	...	15.7	15.7	15.7	15.7	15.7	15.7	...	...	...	...
10	15.7	...	15.7	...	15.7	...	...	...	...	...	...	...	...	...
11	17.1	...	17.1	...	17.1	17.1	16.9	16.4	16.1	15.7	15.4	14.9	14.5	13.9
12	14.5	...	14.5	...	14.5	14.5	14.4	13.9	13.7	13.3	13.1	12.7	12.3	11.8
13	17.1	...	17.1	...	17.1	17.1	16.9	16.4	16.1	15.7	15.4	14.9	14.5	13.9
14	17.1	...	17.1	...	17.1	17.1	16.9	16.4	16.1	15.7	...	...	...	...
15	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.9	19.3	18.6
16	20.0	20.0	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.5	18.6
17	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	...	...	...	...
18	21.4	...	21.4	...	21.4	21.4	21.4	21.4	21.4	20.2	15.7	12.0	7.8	5.0
19	24.3	24.3	24.3	...	24.3	24.3	24.3	23.5	22.4	21.1	17.7	12.0	7.8	5.0
20	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	17.1	...	...	...	...
21	14.6	...	14.6	...	14.6	14.6	14.6	14.6	14.6	14.6	...	...	...	...
22	17.1	17.1	17.1	...	17.1	17.1	17.1	17.1	17.1	17.1	...	...	...	...
23	30.0	...	30.0	...	30.0	30.0	30.0	30.0	29.8	...	...	...	...	...
24	30.0	...	30.0	...	30.0	30.0	30.0	30.0	29.8	...	...	...	...	...
25	34.3	34.3	34.3	...	34.3	34.3	34.3	34.3	34.1	...	...	...	...	...
26	34.3	...	33.3	...	32.6	32.3	32.2	31.8	30.6	...	...	...	...	...
27	34.3	...	34.3	...	34.3	34.3	34.3	34.3	34.1	...	...	...	...	...
28	38.5	...	36.9	...	36.7	36.5	36.1	35.9	34.3	...	...	...	...	...
29	15.7	...	15.4	...	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	14.7
30	15.7	...	15.4	...	15.1	15.1	15.1	15.1	15.1	15.1	...	...	...	...
31	17.1	...	16.8	...	16.5	16.2	15.7	15.2	15.0	14.8	...	...	...	...
32	17.1	17.1	16.8	...	16.5	16.5	16.5	16.3	16.0	15.8	15.5	15.3	14.9	14.5
33	17.1	...	16.8	...	16.5	16.5	16.5	16.3	16.0	15.8	15.5	15.3	14.9	14.5
34	17.1	...	16.8	...	16.5	16.5	16.5	16.3	16.0	15.8	15.5	15.3	14.9	14.5
35	14.5	14.5	14.3	...	14.0	14.0	14.0	13.8	13.6	13.4	13.2	13.0	12.7	12.3
36	17.1	17.1	16.8	...	16.5	16.5	16.5	16.3	16.0	15.8	15.5	15.3	14.9	14.5
37	17.1	...	16.8	...	16.5	16.5	16.5	16.3	16.0	15.8	15.5	15.3	14.9	14.5
38	17.1	...	16.8	...	16.5	16.5	16.5	16.3	16.0	15.8	15.5	15.3	14.9	14.5
39	18.6	18.6	18.2	...	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.4
40	18.6	...	18.2	...	17.9	17.9	17.9	17.9	17.9	17.9	...	...	...	...
41	20.0	...	19.6	...	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.1	18.6	18.0
42	20.0	20.0	19.6	...	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.1	18.6	18.0
43	17.1	17.1	17.1	...	17.1	16.8	16.2	15.7	15.4	...	...	...	...	...

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	9.2	5.9	...	...	...	...	...	...	...	...	...	...	...	...	...
7	9.2	5.9	...	...	...	...	...	...	...	...	...	...	...	...	...
8	9.2	5.9	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	9.2	5.9	...	...	...	...	...	...	...	...	...	...	...	...	...
12	7.8	5.0	...	...	...	...	...	...	...	...	...	...	...	...	...
13	9.2	5.9	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	9.2	5.9	...	...	...	...	...	...	...	...	...	...	...	...	...
16	9.2	5.9	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	3.0	1.5	...	...	...	...	...	...	...	...	...	...	...	...	...
19	3.0	1.5	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...	...	...	...
33	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...	...	...	...
34	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...	...	...	...
35	9.6	6.1	3.8	2.4	1.5	0.94	...	...	...	...	...	...	...	...	...
36	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...	...	...	...
37	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...	...	...	...
38	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...	...	...	...
39	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...	...	...	...
42	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	1 $\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo	Castings	SA-217	WC6	J12072	...	...	4	1
2	1 $\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo	Cast pipe	SA-426	CP11	J12072	...	...	4	1
3	1 $\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo	Bar	SA-739	B11	K11797	...	...	4	1
4	1 $\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Forgings	SA-182	F11	K11597	1	...	4	1
5	1 $\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Smls. tube	SA-213	T11	K11597	...	...	4	1
6	1 $\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Smls. & wld. fittings	SA-234	WP11	...	1	...	4	1
7	1 $\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Wld. tube	SA-250	T11	K11597	...	...	4	1
8	1 $\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Wld. tube	SA-250	T11S1	K11597	...	...	4	1
9	1 $\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Smls. pipe	SA-335	P11	K11597	...	...	4	1
10	1 $\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Forgings	SA-336	F11	K11597	1	...	4	1
11	1 $\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Forged pipe	SA-369	FP11	K11597	...	...	4	1
12	1 $\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Plate	SA-387	11	K11789	1	...	4	1
13	1 $\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Wld. pipe	SA-691	1 $\frac{1}{4}$ CR	K11789	...	...	4	1
14	1 $\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Wld. pipe	SA-691	1 $\frac{1}{4}$ CR	K11789	...	...	4	1
15	1 $\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Forgings	SA-182	F11	K11572	2	...	4	1
16	1 $\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Forgings	SA-336	F11	K11572	2	...	4	1
17	1 $\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Forgings	SA-336	F11	K11572	3	...	4	1
18	1 $\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Plate	SA-387	11	K11789	2	...	4	1
19	1 $\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Wld. pipe	SA-691	1 $\frac{1}{4}$ CR	K11789	...	...	4	1
20	1 $\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo-Cu	Forgings	SA-592	E	K11695	...	2 $\frac{1}{2}$ < <i>t</i> ≤ 4	11B	2
21	1 $\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo-Cu	Forgings	SA-592	E	K11695	...	≤ 2 $\frac{1}{2}$	11B	2
22	1 $\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo-Ti	Plate	SA-517	E	K21604	...	2 $\frac{1}{2}$ < <i>t</i> ≤ 6	11B	2
23	1 $\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo-Ti	Plate	SA-517	E	K21604	...	≤ 2 $\frac{1}{2}$	11B	2
24	2 $\frac{1}{4}$ Cr-1Mo	Forgings	SA-182	F22	K21590	1	...	5A	1
25	2 $\frac{1}{4}$ Cr-1Mo	Smls. tube	SA-213	T22	K21590	...	...	5A	1
26	2 $\frac{1}{4}$ Cr-1Mo	Smls. & wld. fittings	SA-234	WP22	K21590	1	...	5A	1
27	2 $\frac{1}{4}$ Cr-1Mo	Wld. tube	SA-250	T22	K21590	...	...	5A	1
28	2 $\frac{1}{4}$ Cr-1Mo	Wld. tube	SA-250	T22S1	K21590	...	...	5A	1
29	2 $\frac{1}{4}$ Cr-1Mo	Smls. pipe	SA-335	P22	K21590	...	...	5A	1
30	2 $\frac{1}{4}$ Cr-1Mo	Forgings	SA-336	F22	K21590	1	...	5A	1
31	2 $\frac{1}{4}$ Cr-1Mo	Forged pipe	SA-369	FP22	K21590	...	...	5A	1
32	2 $\frac{1}{4}$ Cr-1Mo	Plate	SA-387	22	K21590	1	...	5A	1
33	2 $\frac{1}{4}$ Cr-1Mo	Wld. pipe	SA-691	2 $\frac{1}{4}$ CR	K21590	...	...	5A	1
34	2 $\frac{1}{4}$ Cr-1Mo	Castings	SA-217	WC9	J21890	...	...	5A	1
35	2 $\frac{1}{4}$ Cr-1Mo	Cast pipe	SA-426	CP22	J21890	...	...	5A	1
36	2 $\frac{1}{4}$ Cr-1Mo	Forgings	SA-182	F22	K21590	3	...	5A	1
37	2 $\frac{1}{4}$ Cr-1Mo	Forgings	SA-336	F22	K21590	3	...	5A	1
38	2 $\frac{1}{4}$ Cr-1Mo	Plate	SA-387	22	K21590	2	...	5A	1
39	2 $\frac{1}{4}$ Cr-1Mo	Wld. pipe	SA-691	2 $\frac{1}{4}$ CR	K21590	...	...	5A	1
40	2 $\frac{1}{4}$ Cr-1Mo	Bar	SA-739	B22	K21390	...	...	5A	1

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	70	40	1100	700	1100	NP	CS-2	G1, G17, T4
2	70	40	NP	700	NP	NP	CS-2	G17
3	70	45	NP	700	1200	NP	CS-3	T4
4	60	30	1200	NP	1200	NP	CS-2	S4, T5
5	60	30	1200	700	1200	NP	CS-2	S4, T5
6	60	30	1200	700	1200	NP	CS-2	S4, T5, W14
7	60	30	1200	NP	NP	NP	CS-2	G3, S4, T5
8	60	30	1200	NP	NP	NP	CS-2	S4, T5, W13
9	60	30	1200	700	1200	NP	CS-2	S4, T5
10	60	30	1200	NP	NP	NP	CS-2	S4, T5
11	60	30	1200	700	1200	NP	CS-2	S4, T5
12	60	35	1200	700	1200	NP	CS-2	S4, T4
13	60	35	NP	300 (Cl. 3 only)	NP	NP	CS-2	G27, W10, W12
14	60	35	NP	700	NP	NP	CS-2	G26, W10, W12
15	70	40	1200	700	1200	NP	CS-2	S4, T4
16	70	40	1200	NP	1200	NP	CS-2	S4, T4
17	75	45	NP	NP	1200	NP	CS-3	T3
18	75	45	1200	700	1200	NP	CS-3	S4, T3
19	75	45	NP	700	NP	NP	CS-3	G26, W10, W12
20	105	90	NP	650 (SPT)	650	650	CS-5	S7
21	115	100	NP	NP	650	650	HT-1	...
22	105	90	NP	700 (SPT)	650	650	CS-5	...
23	115	100	NP	650 (SPT)	650	650	HT-1	...
24	60	30	1200	700	1200	NP	CS-2	S4, T4, W7, W9
25	60	30	1200	700	1200	NP	CS-2	S4, T4, W7, W9
26	60	30	1200	700	1200	NP	CS-2	S4, T4, W7, W9, W14
27	60	30	1200	NP	NP	NP	CS-2	G3, S4, T4, W9
28	60	30	1200	NP	NP	NP	CS-2	S4, T4, W9, W13
29	60	30	1200	700	1200	NP	CS-2	S4, T4, W7, W9
30	60	30	1200	700	1200	NP	CS-2	S4, T4, W7, W9
31	60	30	1200	700	1200	NP	CS-2	S4, T4, W7, W9
32	60	30	1200	700	1200	NP	CS-2	S4, T4, W7, W9
33	60	30	NP	700	NP	NP	CS-2	G26, W10, W12
34	70	40	1200	700	1200	NP	CS-2	G1, G17, S4, T4, W7, W9
35	70	40	NP	700	NP	NP	CS-2	G17
36	75	45	1200	700	1200	NP	CS-3	S4, T4, W7, W9
37	75	45	1200	700	1200	NP	CS-3	S4, T4, W7, W9
38	75	45	1200	700	1200	NP	CS-3	S4, T4, W7, W9
39	75	45	NP	700	NP	NP	CS-3	G26, W10, W12
40	75	45	NP	700	1200	NP	CS-3	T4, W7

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	19.7	19.2	18.7	13.7
2	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	...	...	...	...
3	20.0	20.0	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.4	13.7
4	17.1	...	17.1	...	17.1	16.8	16.2	15.7	15.4	15.1	14.8	14.4	14.0	13.6
5	17.1	...	17.1	...	17.1	16.8	16.2	15.7	15.4	15.1	14.8	14.4	14.0	13.6
6	17.1	...	17.1	...	17.1	16.8	16.2	15.7	15.4	15.1	14.8	14.4	14.0	13.6
7	14.5	...	14.5	...	14.5	14.3	13.8	13.3	13.1	12.8	12.6	12.2	11.9	11.6
8	17.1	...	17.1	...	17.1	16.8	16.2	15.7	15.4	15.1	14.8	14.4	14.0	13.6
9	17.1	...	17.1	...	17.1	16.8	16.2	15.7	15.4	15.1	14.8	14.4	14.0	13.6
10	17.1	...	17.1	...	17.1	16.8	16.2	15.7	15.4	15.1	14.8	14.4	14.0	13.6
11	17.1	...	17.1	...	17.1	16.8	16.2	15.7	15.4	15.1	14.8	14.4	14.0	13.6
12	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	17.1	17.1	16.8	16.4	13.7
13	17.1	...	17.1	...	17.1	...	...	...	...	...	...	...	...	...
14	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	17.1	...	...	...	...
15	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	19.7	19.2	18.7	13.7
16	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	19.7	19.2	18.7	13.7
17	21.4	21.4	21.4	...	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	20.2	13.7
18	21.4	...	21.4	...	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	20.2	13.7
19	21.4	...	21.4	...	21.4	21.4	21.4	21.4	21.4	21.4	...	...	...	...
20	30.0	...	30.0	...	30.0	30.0	30.0	30.0	30.0	...	...	...	...	...
21	32.9	...	32.9	...	32.9	32.9	32.9	32.9	32.9	...	...	...	...	...
22	30.0	...	30.0	30.0	30.0	30.0	30.0	30.0	30.0	29.9	...	...	...	...
23	32.9	...	32.9	32.9	32.9	32.9	32.9	32.9	32.9	...	...	...	...	...
24	17.1	...	17.1	...	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	13.6
25	17.1	...	17.1	...	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	13.6
26	17.1	17.1	17.1	...	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	13.6
27	14.5	...	14.5	...	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	11.6
28	17.1	...	17.1	...	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	13.6
29	17.1	17.1	17.1	...	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	13.6
30	17.1	17.1	17.1	...	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	13.6
31	17.1	17.1	17.1	...	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	13.6
32	17.1	...	17.1	...	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	13.6
33	17.1	...	17.1	...	16.6	16.6	16.6	16.6	16.6	16.6	...	...	...	...
34	20.0	...	20.0	...	19.7	19.4	19.3	19.2	19.1	18.8	18.5	17.9	17.2	15.8
35	20.0	...	20.0	...	19.7	19.4	19.3	19.2	19.1	18.8	...	...	...	...
36	21.4	...	21.4	...	20.9	20.6	20.5	20.4	20.2	20.0	19.7	19.3	18.7	15.8
37	21.4	...	21.4	...	20.9	20.6	20.5	20.4	20.2	20.0	19.7	19.3	18.7	15.8
38	21.4	...	21.4	...	20.9	20.6	20.5	20.4	20.2	20.0	19.7	19.3	18.7	15.8
39	21.4	...	21.4	...	20.9	20.6	20.5	20.4	20.2	20.0	...	...	...	...
40	21.4	...	21.4	...	20.9	20.6	20.5	20.4	20.2	20.0	19.7	19.3	18.7	15.8

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	9.3	6.3	4.2	2.8	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...	...	...	...
4	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...	...	...	...
5	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...	...	...	...
6	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...	...	...	...
7	7.9	5.4	3.6	2.4	1.6	1.0	...	...	...	...	...	...	...	...	...
8	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...	...	...	...
9	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...	...	...	...
10	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...	...	...	...
11	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...	...	...	...
12	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...	...	...	...
16	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...	...	...	...
17	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...	...	...	...
18	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	10.8	8.0	5.7	3.8	2.4	1.4	...	...	...	...	...	...	...	...	...
25	10.8	8.0	5.7	3.8	2.4	1.4	...	...	...	...	...	...	...	...	...
26	10.8	8.0	5.7	3.8	2.4	1.4	...	...	...	...	...	...	...	...	...
27	9.2	6.8	4.8	3.2	2.0	1.2	...	...	...	...	...	...	...	...	...
28	10.8	8.0	5.7	3.8	2.4	1.4	...	...	...	...	...	...	...	...	...
29	10.8	8.0	5.7	3.8	2.4	1.4	...	...	...	...	...	...	...	...	...
30	10.8	8.0	5.7	3.8	2.4	1.4	...	...	...	...	...	...	...	...	...
31	10.8	8.0	5.7	3.8	2.4	1.4	...	...	...	...	...	...	...	...	...
32	10.8	8.0	5.7	3.8	2.4	1.4	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	11.4	7.8	5.1	3.2	2.0	1.2	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	11.4	7.8	5.1	3.2	2.0	1.2	...	...	...	...	...	...	...	...	...
37	11.4	7.8	5.1	3.2	2.0	1.2	...	...	...	...	...	...	...	...	...
38	11.4	7.8	5.1	3.2	2.0	1.2	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	11.4	7.8	5.1	3.2	2.0	1.2	...	...	...	...	...	...	...	...	...

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	2 $\frac{1}{4}$ Cr-1Mo	Castings	SA-487	8	J22091	A	...	5C	1
2	2 $\frac{1}{4}$ Cr-1Mo	Forgings	SA-508	22	K21590	3	...	5C	1
3	2 $\frac{1}{4}$ Cr-1Mo	Forgings	SA-541	22	K21390	3	...	5C	1
4	2 $\frac{1}{4}$ Cr-1Mo	Plate	SA-542	B	K21590	4	...	5C	1
5	2 $\frac{1}{4}$ Cr-1Mo-V	Forgings	SA-182	F22V	K31835	...	...	5C	1
6	2 $\frac{1}{4}$ Cr-1Mo-V	Forgings	SA-336	F22V	K31835	...	...	5C	1
7	2 $\frac{1}{4}$ Cr-1Mo-V	Forgings	SA-541	22V	K31835	...	...	5C	1
8	2 $\frac{1}{4}$ Cr-1Mo-V	Plate	SA-542	D	K31835	4a	...	5C	1
9	2 $\frac{1}{4}$ Cr-1Mo-V	Plate	SA-832	22V	K31835	...	...	5C	1
10	3Cr-1Mo	Smls. tube	SA-213	T21	K31545	...	...	5A	1
11	3Cr-1Mo	Smls. pipe	SA-335	P21	K31545	...	...	5A	1
12	3Cr-1Mo	Forgings	SA-336	F21	K31545	1	...	5A	1
13	3Cr-1Mo	Forged pipe	SA-369	FP21	K31545	...	...	5A	1
14	3Cr-1Mo	Plate	SA-387	21	K31545	1	...	5A	1
15	3Cr-1Mo	Cast pipe	SA-426	CP21	J31545	...	...	5A	1
16	3Cr-1Mo	Forgings	SA-182	F21	K31545	...	...	5A	1
17	3Cr-1Mo	Forgings	SA-336	F21	K31545	3	...	5A	1
18	3Cr-1Mo	Plate	SA-387	21	K31545	2	...	5A	1
19	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Forgings	SA-182	F3V	K31830	...	...	5C	1
20	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Forgings	SA-336	F3V	K31830	...	...	5C	1
21	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Forgings	SA-508	3V	K31830	...	...	5C	1
22	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Forgings	SA-541	3V	K31830	...	...	5C	1
23	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Plate	SA-542	C	K31830	4a	...	5C	1
24	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Plate	SA-832	21V	K31830	...	...	5C	1
25	3Cr-1Mo- $\frac{1}{4}$ V-Cb-Ca	Forgings	SA-182	F3VCb	...	...	...	5C	1
26	3Cr-1Mo- $\frac{1}{4}$ V-Cb-Ca	Forgings	SA-336	F3VCb	...	...	...	5C	1
27	3Cr-1Mo- $\frac{1}{4}$ V-Cb-Ca	Forgings	SA-508	3VCb	...	...	...	5C	1
28	3Cr-1Mo- $\frac{1}{4}$ V-Cb-Ca	Forgings	SA-541	3VCb	...	...	...	5C	1
29	3Cr-1Mo- $\frac{1}{4}$ V-Cb-Ca	Plate	SA-542	E	...	4a	...	5C	1
30	3Cr-1Mo- $\frac{1}{4}$ V-Cb-Ca	Plate	SA-832	23V	...	...	...	5C	1
31	5Cr- $\frac{1}{2}$ Mo	Smls. tube	SA-213	T5	K41545	...	...	5B	1
32	5Cr- $\frac{1}{2}$ Mo	Smls. & wld. fittings	SA-234	WP5	K41545	...	...	5B	1
33	5Cr- $\frac{1}{2}$ Mo	Smls. pipe	SA-335	P5	K41545	...	...	5B	1
34	5Cr- $\frac{1}{2}$ Mo	Forged pipe	SA-369	FP5	K41545	...	...	5B	1
35	5Cr- $\frac{1}{2}$ Mo	Plate	SA-387	5	K41545	1	...	5B	1
36	5Cr- $\frac{1}{2}$ Mo	Wld. pipe	SA-691	5CR	K41545	...	...	5B	1
37	5Cr- $\frac{1}{2}$ Mo	Forgings	SA-336	F5	K41545	...	...	5B	1
38	5Cr- $\frac{1}{2}$ Mo	Forgings	SA-182	F5	K41545	...	...	5B	1
39	5Cr- $\frac{1}{2}$ Mo	Plate	SA-387	5	K41545	2	...	5B	1
40	5Cr- $\frac{1}{2}$ Mo	Forgings	SA-336	F5A	K42544	...	...	5B	1
41	5Cr- $\frac{1}{2}$ Mo	Castings	SA-217	C5	J42045	...	...	5B	1
42	5Cr- $\frac{1}{2}$ Mo	Cast pipe	SA-426	CP5	J42045	...	...	5B	1
43	5Cr- $\frac{1}{2}$ Mo	Forgings	SA-182	F5a	K42544	...	...	5B	1

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes	
			I	III	VIII-1	XII			
1	85	55	NP	NP	1000	NP	CS-3	G1, T4, W7	
2	85	55	NP	NP	850	NP	CS-2		...
3	85	55	NP	NP	850	NP	CS-2		...
4	85	55	NP	NP	850	NP	CS-2		...
5	85	60	NP	NP	900	NP	CS-2	...	
6	85	60	NP	NP	900	NP	CS-2	...	
7	85	60	NP	NP	900	NP	CS-2	...	
8	85	60	NP	NP	900	NP	CS-2	...	
9	85	60	NP	NP	900	NP	CS-2	...	
10	60	30	1200	700	1200	NP	CS-2	S4, T3	
11	60	30	1200	700	1200	NP	CS-2	S4, T3	
12	60	30	1200	700	1200	NP	CS-2	S4, T3	
13	60	30	1200	700	1200	NP	CS-2	S4, T3	
14	60	30	1200	700	1200	NP	CS-2	S4, T3	
15	60	30	NP	700	NP	NP	CS-2	G17	
16	75	45	1200	700	1200	NP	CS-3	S4, T3	
17	75	45	1200	700	1200	NP	CS-3	S4, T3	
18	75	45	1200	700	1200	NP	CS-3	S4, T3	
19	85	60	NP	NP	900	NP	CS-3	...	
20	85	60	NP	NP	900	NP	CS-3	...	
21	85	60	NP	NP	900	NP	CS-3	...	
22	85	60	NP	NP	900	NP	CS-3	...	
23	85	60	NP	NP	900	NP	CS-3	...	
24	85	60	NP	NP	900	NP	CS-3	...	
25	85	60	NP	NP	900	NP	CS-3	...	
26	85	60	NP	NP	900	NP	CS-3	...	
27	85	60	NP	NP	900	NP	CS-3	...	
28	85	60	NP	NP	900	NP	CS-3	...	
29	85	60	NP	NP	900	NP	CS-3	...	
30	85	60	NP	NP	900	NP	CS-3	...	
31	60	30	1200	700	1200	NP	CS-2	T4	
32	60	30	1200	700	1200	NP	CS-2	T4, W14	
33	60	30	1200	700	1200	NP	CS-2	T4	
34	60	30	1200	700	1200	NP	CS-2	T4	
35	60	30	1200	700	1200	NP	CS-2	T4	
36	60	30	NP	700	NP	NP	CS-2	G26, W10, W12	
37	60	36	1200	NP	1200	NP	CS-2	T4	
38	70	40	1200	700	1200	NP	CS-2	T3	
39	75	45	NP	700	1200	NP	CS-3	T3	
40	80	50	1200	NP	1200	NP	CS-3	T3	
41	90	60	1200	700	1200	NP	CS-3	G1, G17, T3	
42	90	60	NP	700	NP	NP	CS-3	G17	
43	90	65	1200	NP	1200	NP	CS-5	T3	

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	24.3	24.3	24.3	...	23.7	23.5	23.5	23.3	23.2	22.9	22.4	21.7	20.8	15.8
2	24.3	...	24.3	...	24.3	24.3	23.8	23.3	23.1	22.9	22.6	21.9	20.4	...
3	24.3	...	24.3	...	24.3	24.3	23.8	23.3	23.1	22.9	22.6	21.9	20.4	...
4	24.3	...	24.3	...	24.3	24.3	23.8	23.3	23.1	22.9	22.6	21.9	20.4	...
5	24.3	...	24.3	...	24.3	24.3	24.3	23.7	23.2	22.8	22.2	21.6	21.0	20.3
6	24.3	...	24.3	...	24.3	24.3	24.3	23.7	23.2	22.8	22.2	21.6	21.0	20.3
7	24.3	...	24.3	...	24.3	24.3	24.3	23.7	23.2	22.8	22.2	21.6	21.0	20.3
8	24.3	...	24.3	...	24.3	24.3	24.3	23.7	23.2	22.8	22.2	21.6	21.0	20.3
9	24.3	...	24.3	...	24.3	24.3	24.3	23.7	23.2	22.8	22.2	21.6	21.0	20.3
10	17.1	...	17.1	...	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.0	12.0
11	17.1	17.1	17.1	...	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.0	12.0
12	17.1	17.1	17.1	...	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.0	12.0
13	17.1	...	17.1	...	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.0	12.0
14	17.1	...	17.1	...	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.0	12.0
15	17.1	...	17.1	...	16.6	16.6	16.6	16.6	16.6	16.6	...	...	...	...
16	21.4	...	21.4	...	20.9	20.6	20.5	20.4	20.2	20.0	19.7	19.3	18.1	13.1
17	21.4	...	21.4	...	20.9	20.6	20.5	20.4	20.2	20.0	19.7	19.3	18.1	13.1
18	21.4	...	21.4	...	20.9	20.6	20.5	20.4	20.2	20.0	19.7	19.3	18.1	13.1
19	24.3	...	24.3	...	23.3	22.6	22.2	21.8	21.6	21.4	21.1	20.8	20.4	20.0
20	24.3	...	24.3	...	23.3	22.6	22.2	21.8	21.6	21.4	21.1	20.8	20.4	20.0
21	24.3	...	24.3	...	23.3	22.6	22.2	21.8	21.6	21.4	21.1	20.8	20.4	20.0
22	24.3	...	24.3	...	23.3	22.6	22.2	21.8	21.6	21.4	21.1	20.8	20.4	20.0
23	24.3	...	24.3	...	23.3	22.6	22.2	21.8	21.6	21.4	21.1	20.8	20.4	20.0
24	24.3	...	24.3	...	23.3	22.6	22.2	21.8	21.6	21.4	21.1	20.8	20.4	20.0
25	24.3	...	24.3	...	23.3	22.6	22.2	21.8	21.6	21.4	21.1	20.8	20.4	20.0
26	24.3	...	24.3	...	23.3	22.6	22.2	21.8	21.6	21.4	21.1	20.8	20.4	20.0
27	24.3	...	24.3	...	23.3	22.6	22.2	21.8	21.6	21.4	21.1	20.8	20.4	20.0
28	24.3	...	24.3	...	23.3	22.6	22.2	21.8	21.6	21.4	21.1	20.8	20.4	20.0
29	24.3	...	24.3	...	23.3	22.6	22.2	21.8	21.6	21.4	21.1	20.8	20.4	20.0
30	24.3	...	24.3	...	23.3	22.6	22.2	21.8	21.6	21.4	21.1	20.8	20.4	20.0
31	17.1	...	17.1	...	16.6	16.5	16.4	16.2	15.9	15.6	15.1	14.5	13.8	10.9
32	17.1	...	17.1	...	16.6	16.5	16.4	16.2	15.9	15.6	15.1	14.5	13.8	10.9
33	17.1	...	17.1	...	16.6	16.5	16.4	16.2	15.9	15.6	15.1	14.5	13.8	10.9
34	17.1	...	17.1	...	16.6	16.5	16.4	16.2	15.9	15.6	15.1	14.5	13.8	10.9
35	17.1	...	17.1	...	16.6	16.5	16.4	16.2	15.9	15.6	15.1	14.5	13.8	10.9
36	17.1	...	17.1	...	16.6	16.5	16.4	16.2	15.9	15.6	...	...	...	...
37	17.1	...	17.1	...	16.6	16.5	16.4	16.2	15.9	15.6	15.1	14.5	13.8	10.9
38	20.0	...	20.0	...	19.4	19.2	19.2	18.9	18.6	18.2	17.6	17.0	14.3	10.9
39	21.4	...	21.4	...	20.8	20.6	20.5	20.2	19.9	19.5	18.9	18.2	14.3	10.9
40	22.9	...	22.8	...	22.1	22.0	21.9	21.6	21.3	20.8	20.2	19.1	14.3	10.9
41	25.7	...	25.7	...	24.9	24.7	24.6	24.3	23.9	23.4	22.7	19.1	14.3	10.9
42	25.7	...	25.7	...	24.9	24.7	24.6	24.3	23.9	23.4	...	...	...	...
43	25.7	...	25.7	...	24.9	24.7	24.6	24.3	23.9	23.4	22.7	19.1	14.3	10.9

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	11.4	7.8	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	9.0	7.0	5.5	4.0	2.7	1.5	...	...	...	...	...	...	...	...	...
11	9.0	7.0	5.5	4.0	2.7	1.5	...	...	...	...	...	...	...	...	...
12	9.0	7.0	5.5	4.0	2.7	1.5	...	...	...	...	...	...	...	...	...
13	9.0	7.0	5.5	4.0	2.7	1.5	...	...	...	...	...	...	...	...	...
14	9.0	7.0	5.5	4.0	2.7	1.5	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	9.5	6.8	4.9	3.2	2.4	1.3	...	...	...	...	...	...	...	...	...
17	9.5	6.8	4.9	3.2	2.4	1.3	...	...	...	...	...	...	...	...	...
18	9.5	6.8	4.9	3.2	2.4	1.3	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...
32	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...
33	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...
34	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...
35	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...
38	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...
39	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...
40	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...
41	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	5Cr-½Mo-Si	Smls. tube	SA-213	T5b	K51545	...	...	5B	1
2	5Cr-½Mo-Si	Smls. pipe	SA-335	P5b	K51545	...	...	5B	1
3	5Cr-½Mo-Ti	Smls. tube	SA-213	T5c	K41245	...	...	5B	1
4	5Cr-½Mo-Ti	Smls. pipe	SA-335	P5c	K41245	...	...	5B	1
5	9Cr-1Mo	Smls. tube	SA-213	T9	K90941	...	...	5B	1
6	9Cr-1Mo	Fittings	SA-234	WP9	K90941	...	...	5B	1
7	9Cr-1Mo	Smls. pipe	SA-335	P9	K90941	...	...	5B	1
8	9Cr-1Mo	Forged pipe	SA-369	FP9	K90941	...	...	5B	1
9	9Cr-1Mo	Forgings	SA-182	F9	K90941	...	...	5B	1
10	9Cr-1Mo	Forgings	SA-336	F9	K90941	...	...	5B	1
11	9Cr-1Mo	Castings	SA-217	C12	J82090	...	...	5B	1
12	9Cr-1Mo	Cast pipe	SA-426	CP9	J82090	...	...	5B	1
(10)	13	9Cr-1Mo-V	Forgings	SA-182	F91	K90901	$t \leq 3$	15E	1
(10)	14	9Cr-1Mo-V	Forgings	SA-182	F91	K90901	$t > 3$	15E	1
	15	9Cr-1Mo-V	Smls. tube	SA-213	T91	K90901	$t \leq 3$	15E	1
	16	9Cr-1Mo-V	Smls. tube	SA-213	T91	K90901	$t > 3$	15E	1
	17	9Cr-1Mo-V	Fittings	SA-234	WP91	K90901	$t \leq 3$	15E	1
	18	9Cr-1Mo-V	Fittings	SA-234	WP91	K90901	$t > 3$	15E	1
	19	9Cr-1Mo-V	Smls. pipe	SA-335	P91	K90901	$t \leq 3$	15E	1
(10)	20	9Cr-1Mo-V	Smls. pipe	SA-335	P91	K90901	$t > 3$	15E	1
(10)	21	9Cr-1Mo-V	Forgings	SA-336	F91	K90901	$t \leq 3$	15E	1
(10)	22	9Cr-1Mo-V	Forgings	SA-336	F91	K90901	$t > 3$	15E	1
	23	9Cr-1Mo-V	Forged pipe	SA-369	FP91	K90901	$t \leq 3$	15E	1
	24	9Cr-1Mo-V	Forged pipe	SA-369	FP91	K90901	$t > 3$	15E	1
(10)	25	9Cr-1Mo-V	Plate	SA-387	91	K90901	$t \leq 3$	15E	1
(10)	26	9Cr-1Mo-V	Plate	SA-387	91	K90901	$t > 3$	15E	1
	27	11Cr-Ti	Plate	SA-240	...	S40910	...	7	1
	28	11Cr-Ti	Plate	SA-240	...	S40920	...	7	1
	29	11Cr-Ti	Plate	SA-240	...	S40930	...	7	1
	30	11Cr-Ti	Wld. tube	SA-268	TP409	S40900	...	7	1
	31	11Cr-Ti	Smls. tube	SA-268	TP409	S40900	...	7	1
	32	12Cr	Plate	SA-1010	40	S41003	$t \leq \frac{3}{4}$	7	1
	33	12Cr	Bar	SA-479	403	S40300	A	6	1
	34	12Cr	Bar	SA-479	403	S40300	1	6	1
	35	12Cr	Plate	SA-1010	50	S41003	$t \leq \frac{3}{4}$	7	1
	36	12Cr-Al	Plate	SA-240	405	S40500	...	7	1
	37	12Cr-Al	Plate	SA-240	405	S40500	...	7	1
	38	12Cr-Al	Bar	SA-479	405	S40500	...	7	1
	39	12Cr-Al	Bar	SA/JIS G4303	SUS405	...	...	7	1
	40	12Cr-Al	Smls. & wld. tube	SA-268	TP405	S40500	...	7	1
	41	12Cr-Al	Wld. tube	SA-268	TP405	S40500	...	7	1
	42	12Cr-Ti	Wld. tube	SA-268	...	S40800	...	7	1
	43	12Cr-Ti	Smls. tube	SA-268	...	S40800	...	7	1

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	60	30	1200	NP	1200	NP	CS-2	T4
2	60	30	1200	NP	1200	NP	CS-2	T4
3	60	30	1200	NP	1200	NP	CS-2	T4
4	60	30	1200	NP	1200	NP	CS-2	T4
5	60	30	1200	700	1200	NP	CS-2	T5
6	60	30	1200	NP	1200	NP	CS-2	T5
7	60	30	1200	700	1200	NP	CS-2	T5
8	60	30	1200	700	1200	NP	CS-2	T5
9	85	55	1200	NP	1200	NP	CS-3	T4
10	85	55	NP	NP	1200	NP	CS-3	T4
11	90	60	1200	700 (SPT)	1200	NP	CS-3	G1, T4
12	90	60	NP	700	NP	NP	CS-3	G17
13	85	60	1200	700	1200	NP	CS-3	T7
14	85	60	1200	NP	1200	NP	CS-3	T7
15	85	60	1200	700	1200	NP	CS-3	T7
16	85	60	1200	700	1200	NP	CS-3	T7
17	85	60	1200	NP	NP	NP	CS-3	T7
18	85	60	1200	NP	NP	NP	CS-3	T7
19	85	60	1200	700	1200	NP	CS-3	T7
20	85	60	1200	NP	1200	NP	CS-3	T7
21	85	60	1200	NP	1200	NP	CS-3	T7
22	85	60	1200	NP	1200	NP	CS-3	T7
23	85	60	1200	NP	NP	NP	CS-3	T7
24	85	60	1200	NP	NP	NP	CS-3	T7
25	85	60	1200	700	1200	NP	CS-3	T7
26	85	60	1200	NP	1200	NP	CS-3	T7
27	55	25	NP	NP	800	NP	CS-1	...
28	55	25	NP	NP	800	NP	CS-1	...
29	55	25	NP	NP	800	NP	CS-1	...
30	55	25	NP	NP	800	650	CS-1	G24
31	55	25	NP	NP	800	650	CS-1	...
32	66	40	NP	NP	600	600	CS-2	...
33	70	40	NP	700	NP	NP	...	...
34	70	40	NP	700	NP	NP	...	...
35	70	50	NP	NP	600	600	CS-3	...
36	60	25	700	NP	1000	650	CS-1	G32, T5
37	60	25	NP	700	NP	NP	CS-1	G32
38	60	25	NP	700	1000	650	CS-1	G32, T5
39	60	25	NP	700	1000	NP	CS-1	G32, T5
40	60	30	700	NP	1000	650	CS-2	G32, T5, W13, W14
41	60	30	700	NP	1000	650	CS-2	G3, G24, G32, T5
42	55	30	NP	NP	800	650	CS-2	G32, W14
43	55	30	NP	NP	800	650	CS-2	G32

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	17.1	...	17.1	...	16.6	16.5	16.4	16.2	15.9	15.6	15.1	14.5	13.8	10.9
2	17.1	...	17.1	...	16.6	16.5	16.4	16.2	15.9	15.6	15.1	14.5	13.8	10.9
3	17.1	...	17.1	...	16.6	16.5	16.4	16.2	15.9	15.6	15.1	14.5	13.8	10.9
4	17.1	...	17.1	...	16.6	16.5	16.4	16.2	15.9	15.6	15.1	14.5	13.8	10.9
5	17.1	...	17.1	...	16.6	16.5	16.4	16.2	15.9	15.6	15.1	14.5	13.8	13.0
6	17.1	...	17.1	...	16.6	16.5	16.4	16.2	15.9	15.6	15.1	14.5	13.8	13.0
7	17.1	...	17.1	...	16.6	16.5	16.4	16.2	15.9	15.6	15.1	14.5	13.8	13.0
8	17.1	...	17.1	...	16.6	16.5	16.4	16.2	15.9	15.6	15.1	14.5	13.8	13.0
9	24.3	...	24.2	...	23.5	23.4	23.3	22.9	22.6	22.1	21.4	20.6	19.6	16.4
10	24.3	...	24.2	...	23.5	23.4	23.3	22.9	22.6	22.1	21.4	20.6	19.6	16.4
11	25.7	...	25.7	...	24.9	24.7	24.6	24.3	23.9	23.4	22.7	21.8	20.8	16.4
12	25.7	...	25.7	...	24.9	24.7	24.6	24.3	23.9	23.4	...	...	...	...
(10) 13	24.3	...	24.3	...	24.3	24.2	24.1	23.7	23.4	22.9	22.2	21.3	20.3	19.1
(10) 14	24.3	...	24.3	...	24.3	24.2	24.1	23.7	23.4	22.9	22.2	21.3	20.3	19.1
15	24.3	...	24.3	...	24.3	24.2	24.1	23.7	23.4	22.9	22.2	21.3	20.3	19.1
16	24.3	...	24.3	...	24.3	24.2	24.1	23.7	23.4	22.9	22.2	21.3	20.3	19.1
17	24.3	...	24.3	...	24.3	24.2	24.1	23.7	23.4	22.9	22.2	21.3	20.3	19.1
18	24.3	...	24.3	...	24.3	24.2	24.1	23.7	23.4	22.9	22.2	21.3	20.3	19.1
19	24.3	...	24.3	...	24.3	24.2	24.1	23.7	23.4	22.9	22.2	21.3	20.3	19.1
(10) 20	24.3	...	24.3	...	24.3	24.2	24.1	23.7	23.4	22.9	22.2	21.3	20.3	19.1
(10) 21	24.3	...	24.3	...	24.3	24.2	24.1	23.7	23.4	22.9	22.2	21.3	20.3	19.1
(10) 22	24.3	...	24.3	...	24.3	24.2	24.1	23.7	23.4	22.9	22.2	21.3	20.3	19.1
23	24.3	...	24.3	...	24.3	24.2	24.1	23.7	23.4	22.9	22.2	21.3	20.3	19.1
24	24.3	...	24.3	...	24.3	24.2	24.1	23.7	23.4	22.9	22.2	21.3	20.3	19.1
(10) 25	24.3	...	24.3	...	24.3	24.2	24.1	23.7	23.4	22.9	22.2	21.3	20.3	19.1
(10) 26	24.3	...	24.3	...	24.3	24.2	24.1	23.7	23.4	22.9	22.2	21.3	20.3	19.1
27	15.7	...	14.5	...	13.1	12.1	11.6	11.3	11.3	11.3	11.2	11.1	...	...
28	15.7	...	14.5	...	13.1	12.1	11.6	11.3	11.3	11.3	11.2	11.1	...	...
29	15.7	...	14.5	...	13.1	12.1	11.6	11.3	11.3	11.3	11.2	11.1	...	...
30	13.4	...	12.3	...	11.1	10.3	9.9	9.6	9.6	9.6	9.5	9.4	...	...
31	15.7	...	14.5	...	13.1	12.1	11.6	11.3	11.3	11.3	11.2	11.1	...	...
32	18.9	...	18.9	...	18.9	18.4	17.7	17.1	...	...	...	...	...	...
33	20.0	...	20.0	...	19.6	19.3	19.0	18.5	18.1	17.7	...	...	...	...
34	20.0	...	20.0	...	19.6	19.3	19.0	18.5	18.1	17.7	...	...	...	...
35	20.0	...	20.0	...	20.0	19.5	18.8	18.1	...	...	...	...	...	...
36	16.7	...	15.3	...	14.8	14.5	14.3	14.0	13.8	13.5	13.1	12.6	12.0	11.3
37	16.7	...	15.3	...	14.8	14.5	14.3	14.0	13.8	13.5	...	...	...	...
38	16.7	...	15.3	...	14.8	14.5	14.3	14.0	13.8	13.5	13.1	12.6	12.0	11.3
39	16.7	...	15.3	...	14.8	14.5	14.3	14.0	13.8	13.5	13.1	12.6	12.0	11.3
40	17.1	...	17.1	...	16.8	16.5	16.3	15.9	15.6	15.2	14.7	14.1	13.4	12.6
41	14.6	...	14.6	...	14.3	14.0	13.8	13.5	13.2	12.9	12.5	12.0	11.4	10.7
42	13.4	...	13.4	...	13.1	12.9	12.7	12.4	12.1	11.8	11.4	11.0	...	...
43	15.7	...	15.7	...	15.4	15.1	14.9	14.5	14.3	13.9	13.5	12.9	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...
2	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...
3	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...
4	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...
5	10.6	7.4	5.0	3.3	2.2	1.5	...	...	...	...	...	...	...	...	...
6	10.6	7.4	5.0	3.3	2.2	1.5	...	...	...	...	...	...	...	...	...
7	10.6	7.4	5.0	3.3	2.2	1.5	...	...	...	...	...	...	...	...	...
8	10.6	7.4	5.0	3.3	2.2	1.5	...	...	...	...	...	...	...	...	...
9	11.0	7.4	5.0	3.3	2.2	1.5	...	...	...	...	...	...	...	...	...
10	11.0	7.4	5.0	3.3	2.2	1.5	...	...	...	...	...	...	...	...	...
11	11.0	7.4	5.0	3.3	2.2	1.5	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	17.8	16.3	14.0	10.3	7.0	4.3	...	...	...	...	...	...	...	...	(10)
14	17.8	16.3	12.9	9.6	7.0	4.3	...	...	...	...	...	...	...	...	(10)
15	17.8	16.3	14.0	10.3	7.0	4.3	...	...	...	...	...	...	...	...	...
16	17.8	16.3	12.9	9.6	7.0	4.3	...	...	...	...	...	...	...	...	...
17	17.8	16.3	14.0	10.3	7.0	4.3	...	...	...	...	...	...	...	...	...
18	17.8	16.3	12.9	9.6	7.0	4.3	...	...	...	...	...	...	...	...	...
19	17.8	16.3	14.0	10.3	7.0	4.3	...	...	...	...	...	...	...	...	...
20	17.8	16.3	12.9	9.6	7.0	4.3	...	...	...	...	...	...	...	...	(10)
21	17.8	16.3	14.0	10.3	7.0	4.3	...	...	...	...	...	...	...	...	(10)
22	17.8	16.3	12.9	9.6	7.0	4.3	...	...	...	...	...	...	...	...	(10)
23	17.8	16.3	14.0	10.3	7.0	4.3	...	...	...	...	...	...	...	...	...
24	17.8	16.3	12.9	9.6	7.0	4.3	...	...	...	...	...	...	...	...	...
25	17.8	16.3	14.0	10.3	7.0	4.3	...	...	...	...	...	...	...	...	(10)
26	17.8	16.3	12.9	9.6	7.0	4.3	...	...	...	...	...	...	...	...	(10)
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	8.4	4.0	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	8.4	4.0	...	...	...	...	...	...	...	...	...	...	...	...	...
39	8.4	4.0	...	...	...	...	...	...	...	...	...	...	...	...	...
40	8.4	4.0	...	...	...	...	...	...	...	...	...	...	...	...	...
41	7.1	3.4	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	13Cr	Plate	SA-240	410S	S41008	...	...	7	1
2	13Cr	Smls. & wld. tube	SA-268	TP410	S41000	...	...	6	1
3	13Cr	Wld. tube	SA-268	TP410	S41000	...	...	6	1
4	13Cr	Plate	SA-240	410	S41000	...	...	6	1
5	13Cr	Forgings	SA-182	F6a	S41000	1	...	6	1
6	13Cr	Bar	SA-479	410	S41000	...	...	6	1
7	13Cr	Bar	SA-479	410	S41000	A	...	6	1
8	13Cr	Bar	SA-479	410	S41000	1	...	6	1
9	13Cr	Forgings	SA-182	F6a	S41000	2	...	6	3
10	13Cr	Castings	SA-217	CA15	J91150	...	...	6	3
11	13Cr	Cast pipe	SA-426	CPCA15	J91150	...	...	6	3
12	13Cr-4Ni	Castings	SA-487	CA6NM	J91540	A	...	6	4
13	13Cr-4Ni	Forgings	SA-182	F6NM	S41500	...	...	6	4
14	15Cr	Wld. tube	SA-268	TP429	S42900	...	...	6	2
15	15Cr	Smls. & wld. tube	SA-268	TP429	S42900	...	...	6	2
16	15Cr	Plate	SA-240	429	S42900	...	...	6	2
17	17Cr	Wld. tube	SA-268	TP430	S43000	...	...	7	2
18	17Cr	Smls. & wld. tube	SA-268	TP430	S43000	...	...	7	2
19	17Cr	Plate	SA-240	430	S43000	...	...	7	2
20	17Cr	Bar	SA-479	430	S43000	...	...	7	2
(a) 21	17Cr-4Ni-3Cu	Castings	SA-747	CB7Cu-1	J92180	...	...	...	...
(a)(10) 22	17Cr-4Ni-4Cu	Bar	SA-564	630	S17400	H1150	...	...	...
(a)(10) 23	17Cr-4Ni-4Cu	Plate	SA-693	630	S17400	H1150	...	...	...
(a)(10) 24	17Cr-4Ni-4Cu	Forgings	SA-705	630	S17400	H1150	...	...	...
(a)(10) 25	17Cr-4Ni-4Cu	Bar	SA-564	630	S17400	H1100	...	...	...
(a)(10) 26	17Cr-4Ni-4Cu	Plate	SA-693	630	S17400	H1100	...	...	...
(a)(10) 27	17Cr-4Ni-4Cu	Forgings	SA-705	630	S17400	H1100	...	...	...
(a)(10) 28	17Cr-4Ni-4Cu	Bar	SA-564	630	S17400	H1075	...	...	...
(a)(10) 29	17Cr-4Ni-4Cu	Plate	SA-693	630	S17400	H1075	...	...	...
(a)(10) 30	17Cr-4Ni-4Cu	Forgings	SA-705	630	S17400	H1075	...	...	...
(10) 31	...	...	...	...	...	...	...	...	...
(10) 32	...	...	...	...	...	...	...	...	...
(10) 33	...	...	...	...	...	...	...	...	...
(10) 34	...	...	...	...	...	...	...	...	...
(10) 35	...	...	...	...	...	...	...	...	...
(10) 36	...	...	...	...	...	...	...	...	...
(10) 37	...	...	...	...	...	...	...	...	...
(10) 38	...	...	...	...	...	...	...	...	...
39	18Cr-2Mo	Plate	SA-240	...	S44400	...	...	7	2
40	18Cr-2Mo	Wld. tube	SA-268	...	S44400	...	...	7	2
41	18Cr-2Mo	Smls. tube	SA-268	...	S44400	...	...	7	2

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes	
			I	III	VIII-1	XII			
1	60	30	NP	700	1200	650	CS-2	T4	
2	60	30	700	NP	1200	650	CS-2	T4, W13, W14	
3	60	30	700	NP	1200	650	CS-2	G3, G24, T4	
4	65	30	NP	NP	1200	650	CS-2	T4	
5	70	40	NP	700	1000	650	CS-2	T4	
6	70	40	NP	NP	1000	650	CS-2	G22, T4	
7	70	40	NP	700	NP	NP	CS-2	...	
8	70	40	700	700	NP	NP	CS-2	...	
9	85	55	NP	700	1200	650	CS-3	T3	
10	90	65	NP	700	1200	650	CS-5	G1, G17, T3	
11	90	65	NP	700	NP	NP	CS-5	G17	
12	110	80	NP	700	800	650	CS-5	G1, G17	
13	115	90	NP	700	NP	NP	CS-3	G17	
14	60	35	700	NP	700	650	CS-2	G3, G32, W14	
15	60	35	700	NP	1200	650	CS-2	G32, T4, W13, W14	
16	65	30	NP	NP	1200	650	CS-2	G32, T4	
17	60	35	700	NP	1200	650	CS-2	G3, G24, G32, T4	
18	60	35	700	700	1200	650	CS-2	G32, T4, W12, W13, W14	
19	65	30	NP	NP	1200	650	CS-2	G32, T4	
20	70	40	700	700	1000	650	CS-2	G22, G32, T4	
21	150	140	NP	NP	200	NP	HT-1	G1, G28, W1	(a)
22	135	105	NP	650	650	NP	HT-1	G31, G32, W1	(a)(10)
23	135	105	NP	650	NP	NP	HT-1	G32, W1	(a)(10)
24	135	105	NP	650	NP	NP	HT-1	G32, W1	(a)(10)
25	140	115	NP	650	650	NP	HT-1	G31, G32, W1	(a)(10)
26	140	115	NP	650	NP	NP	HT-1	G32, W1	(a)(10)
27	140	115	NP	650	NP	NP	HT-1	G32, W1	(a)(10)
28	145	125	NP	650	NP	NP	HT-1	G32, W1	(a)(10)
29	145	125	NP	650	NP	NP	HT-1	G32, W1	(a)(10)
30	145	125	NP	650	NP	NP	HT-1	G32, W1	(a)(10)
31	...	...	...	...	...	...	...	...	(10)
32	...	...	...	...	...	...	...	...	(10)
33	...	...	...	...	...	...	...	...	(10)
34	...	...	...	...	...	...	...	...	(10)
35	...	...	...	...	...	...	...	...	(10)
36	...	...	...	...	...	...	...	...	(10)
37	...	...	...	...	...	...	...	...	(10)
38	...	...	...	...	...	...	...	...	(10)
39	60	40	NP	NP	650	650	CS-2	G32	
40	60	40	NP	NP	650	650	CS-2	G24, G32	
41	60	40	NP	NP	650	650	CS-2	G32	

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	17.1	...	17.1	...	16.8	16.5	16.3	15.9	15.6	15.2	14.7	14.1	13.4	12.3
2	17.1	...	17.1	...	16.8	16.5	16.3	15.9	15.6	15.2	14.7	14.1	13.4	12.3
3	14.6	...	14.6	...	14.3	14.0	13.8	13.5	13.2	12.9	12.5	12.0	11.4	10.5
4	18.6	...	18.4	...	17.8	17.4	17.2	16.8	16.6	16.2	15.7	15.1	14.4	12.3
5	20.0	...	20.0	...	19.6	19.3	19.0	18.5	18.1	17.7	17.1	16.4	15.6	12.3
6	20.0	...	20.0	...	19.6	19.3	19.0	18.5	18.1	17.7	17.1	16.4	15.6	12.3
7	20.0	...	20.0	...	19.6	19.3	19.0	18.5	18.1	17.7	...	...	...	...
8	20.0	...	20.0	...	19.6	19.3	19.0	18.5	18.1	17.7	...	...	...	...
9	24.3	...	24.3	...	23.8	23.4	23.0	22.5	22.0	21.5	20.8	19.9	17.2	12.3
10	25.7	...	25.7	...	25.2	24.8	24.4	23.8	23.3	22.7	22.0	21.1	15.9	11.0
11	25.7	...	25.7	...	25.2	24.8	24.4	23.8	23.3	22.7	...	...	...	...
12	31.4	...	31.4	31.3	30.8	30.1	29.4	28.8	28.4	27.9	27.4	26.7	...	...
13	32.9	...	32.9	...	32.9	32.5	31.3	30.0	29.4	28.7	...	...	...	...
14	14.6	...	14.6	...	14.3	14.0	13.8	13.5	13.2	12.9	...	...	...	...
15	17.1	...	17.1	...	16.8	16.5	16.3	15.9	15.6	15.2	14.7	14.1	13.4	12.0
16	18.6	...	18.4	...	17.8	17.4	17.2	16.8	16.6	16.2	15.7	15.1	14.4	12.0
17	14.6	...	14.6	...	14.3	14.0	13.8	13.5	13.2	12.9	12.5	12.0	11.4	10.2
18	17.1	...	17.1	...	16.8	16.5	16.3	15.9	15.6	15.2	14.7	14.1	13.4	12.0
19	18.6	...	18.4	...	17.8	17.4	17.2	16.8	16.6	16.2	15.7	15.1	14.4	12.0
20	20.0	...	20.0	...	19.6	19.3	19.0	18.5	18.1	17.7	17.1	16.4	15.6	12.0
(a) 21	32.0	...	32.0	...	...	...	...	...	...	...	...	...	...	...
(a)(10) 22	38.6	...	38.6	...	38.6	37.5	36.8	36.2	35.9	...	...	...	...	...
(a)(10) 23	38.6	...	38.6	...	38.6	37.5	36.8	36.2	35.9	...	...	...	...	...
(a)(10) 24	38.6	...	38.6	...	38.6	37.5	36.8	36.2	35.9	...	...	...	...	...
(a)(10) 25	40.0	...	40.0	...	40.0	38.9	38.1	37.5	37.2	...	...	...	...	...
(a)(10) 26	40.0	...	40.0	...	40.0	38.9	38.1	37.5	37.2	...	...	...	...	...
(a)(10) 27	40.0	...	40.0	...	40.0	38.9	38.1	37.5	37.2	...	...	...	...	...
(a)(10) 28	41.4	...	41.4	...	41.4	40.3	39.5	38.9	38.5	...	...	...	...	...
(a)(10) 29	41.4	...	41.4	...	41.4	40.3	39.5	38.9	38.5	...	...	...	...	...
(a)(10) 30	41.4	...	41.4	...	41.4	40.3	39.5	38.9	38.5	...	...	...	...	...
(10) 31	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 32	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 33	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 34	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 35	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 36	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 37	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 38	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	17.1	...	17.1	...	16.6	16.2	15.9	15.4	15.1	...	...	...	...	...
40	14.6	...	14.6	...	14.1	13.8	13.5	13.1	12.8	...	...	...	...	...
41	17.1	...	17.1	...	16.6	16.2	15.9	15.4	15.1	...	...	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	8.8	6.4	4.4	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...
2	8.8	6.4	4.4	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...
3	7.5	5.4	3.7	2.5	1.5	0.85	...	...	...	...	...	...	...	...	...
4	8.8	6.4	4.4	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...
5	8.8	6.4	...	...	...	...	...	...	...	...	...	...	...	...	...
6	8.8	6.4	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	8.8	6.4	4.4	2.9	1.8	1.0	...	...	...	...	...	...	...	...	...
10	7.6	5.0	3.3	2.2	1.5	1.0	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	9.2	6.5	4.5	3.2	2.4	1.8	...	...	...	...	...	...	...	...	...
16	9.2	6.5	4.5	3.2	2.4	1.8	...	...	...	...	...	...	...	...	...
17	7.8	5.5	3.8	2.7	2.0	1.5	...	...	...	...	...	...	...	...	...
18	9.2	6.5	4.5	3.2	2.4	1.8	...	...	...	...	...	...	...	...	...
19	9.2	6.5	4.5	3.2	2.4	1.8	...	...	...	...	...	...	...	...	...
20	9.2	6.5	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(a)
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(a)(10)
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(a)(10)
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(a)(10)
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(a)(10)
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(a)(10)
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(a)(10)
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(a)(10)
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(a)(10)
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(a)(10)
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(10)
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(10)
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(10)
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(10)
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(10)
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(10)
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(10)
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(10)
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	18Cr-Ti	Wld. tube	SA-268	TP439	S43035	...	...	7	2
2	18Cr-Ti	Smls. tube	SA-268	TP439	S43035	...	...	7	2
3	18Cr-Ti	Wld. tube	SA-803	TP439	S43035	...	...	7	2
4	18Cr-Ti	Wld. pipe	SA-731	TP439	S43035	...	...	7	2
5	18Cr-Ti	Smls. pipe	SA-731	TP439	S43035	...	...	7	2
(10) 6	18Cr-Ti	Smls. tube	SA-268	TP430 Ti	S43036	...	...	7	2
(10) 7	18Cr-Ti	Wld. tube	SA-268	TP430 Ti	S43036	...	...	7	2
8	18Cr-Ti	Bar	SA-479	439	S43035	...	...	7	2
9	26Cr-3Ni-3Mo	Plate	SA-240	26-3-3	S44660	...	$\leq \frac{2}{10}$	10K	1
10	26Cr-3Ni-3Mo	Smls. tube	SA-268	26-3-3	S44660	...	$\leq \frac{2}{10}$	10K	1
11	26Cr-3Ni-3Mo	Wld. tube	SA-268	26-3-3	S44660	...	$\leq \frac{2}{10}$	10K	1
12	26Cr-3Ni-3Mo	Wld. tube	SA-268	26-3-3	S44660	...	$\leq \frac{2}{10}$	10K	1
13	26Cr-3Ni-3Mo	Wld. tube	SA-803	26-3-3	S44660	...	$\leq \frac{2}{10}$	10K	1
(10) 14	...	...	...	...	...	...	...	...	...
(10) 15	...	...	...	...	...	...	...	...	...
(10) 16	...	...	...	...	...	...	...	...	...
(10) 17	...	...	...	...	...	...	...	...	...
(10) 18	...	...	...	...	...	...	...	...	...
(10) 19	...	...	...	...	...	...	...	...	...
(10) 20	...	...	...	...	...	...	...	...	...
(10) 21	...	...	...	...	...	...	...	...	...
(10) 22	...	...	...	...	...	...	...	...	...
(10) 23	...	...	...	...	...	...	...	...	...
24	27Cr	Smls. tube	SA-268	TP446-1	S44600	...	...	10I	1
25	27Cr-1Mo	Forgings	SA-182	FXM-27Cb	S44627	...	...	10I	1
26	27Cr-1Mo	Plate	SA-240	XM-27	S44627	...	...	10I	1
27	27Cr-1Mo	Wld. tube	SA-268	TPXM-27	S44627	...	...	10I	1
28	27Cr-1Mo	Smls. tube	SA-268	TPXM-27	S44627	...	...	10I	1
29	27Cr-1Mo	Bar	SA-479	XM-27	S44627	...	...	10I	1
30	27Cr-1Mo	Smls. pipe	SA-731	TPXM-27	S44627	...	...	10I	1
31	27Cr-1Mo	Wld. pipe	SA-731	TPXM-27	S44627	...	...	10I	1
32	27Cr-1Mo-Ti	Smls. pipe	SA-731	TPXM-33	S44626	...	...	10I	1
33	27Cr-1Mo-Ti	Wld. pipe	SA-731	TPXM-33	S44626	...	...	10I	1
34	27Cr-1Mo-Ti	Plate	SA-240	XM-33	S44626	...	...	10I	1
35	27Cr-1Mo-Ti	Smls. tube	SA-268	TPXM-33	S44626	...	...	10I	1
36	27Cr-1Mo-Ti	Wld. tube	SA-268	TPXM-33	S44626	...	...	10I	1
37	29Cr-4Mo	Bar	SA-479	...	S44700	...	...	10J	1
38	29Cr-4Mo	Plate	SA-240	...	S44700	...	...	10J	1
39	29Cr-4Mo	Smls. tube	SA-268	29-4	S44700	...	...	10J	1
40	29Cr-4Mo	Wld. tube	SA-268	29-4	S44700	...	...	10J	1

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes	
			I	III	VIII-1	XII			
1	60	30	800	NP	800	650	CS-2	G24, G32	
2	60	30	800	NP	800	650	CS-2	G32	
3	60	30	NP	NP	600	600	CS-2	G24, G32	
4	60	30	800	NP	NP	NP	CS-2	G24, G32	
5	60	30	800	NP	NP	NP	CS-2	G32	
6	60	35	NP	NP	800	NP	CS-2	G32	(10)
7	60	35	NP	NP	800	NP	CS-2	G24, G32	(10)
8	70	40	NP	NP	1000	650	CS-2	G22, G32, T4	
9	85	65	NP	NP	700	650	HA-5	G32	
10	85	65	NP	700	700	650	HA-5	G32, H5	
11	85	65	NP	700	NP	NP	HA-5	G32, H5, W12	
12	85	65	NP	NP	700	650	HA-5	G24, G32	
13	85	65	NP	NP	600	600	HA-5	G24, G32	
14	...	...	...	...	...	...	...	...	(10)
15	...	...	...	...	...	...	...	...	(10)
16	...	...	...	...	...	...	...	...	(10)
17	...	...	...	...	...	...	...	...	(10)
18	...	...	...	...	...	...	...	...	(10)
19	...	...	...	...	...	...	...	...	(10)
20	...	...	...	...	...	...	...	...	(10)
21	...	...	...	...	...	...	...	...	(10)
22	...	...	...	...	...	...	...	...	(10)
23	...	...	...	...	...	...	...	...	(10)
24	70	40	700	NP	650	650	CS-2	G32	
25	60	35	NP	NP	650	650	HA-2	G32	
26	65	40	NP	650	650	650	HA-2	G32	
27	65	40	NP	NP	650	650	HA-2	G24, G32	
28	65	40	NP	650	650	650	HA-2	G32	
29	65	40	NP	700	650	650	HA-2	G22, G32	
30	65	40	NP	NP	650	650	HA-2	G32	
31	65	40	NP	NP	650	650	HA-2	G24, G32	
32	65	40	NP	NP	650	650	HA-2	G32	
33	65	40	NP	NP	650	650	HA-2	G24, G32	
34	68	45	NP	NP	650	650	HA-6	G32	
35	68	45	NP	NP	650	650	HA-6	G32	
36	68	45	NP	NP	650	650	HA-6	G24, G32	
37	70	55	NP	NP	600	600	HA-6	G22, G32	
38	80	60	NP	NP	600	600	HA-6	G32	
39	80	60	NP	NP	600	600	HA-6	G32	
40	80	60	NP	NP	600	600	HA-6	G24, G32	

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	14.6	...	14.6	...	13.3	12.4	11.8	11.6	11.5	11.5	11.4	11.2	...	...
2	17.1	...	17.1	...	15.7	14.6	13.9	13.6	13.6	13.5	13.4	13.2	...	...
3	14.6	...	14.6	...	13.3	12.4	11.8	11.6	...	...	...	...	...	...
4	14.6	...	14.6	...	13.3	12.4	11.8	11.6	11.5	11.5	11.4	11.2	...	...
5	17.1	...	17.1	...	15.7	14.6	13.9	13.6	13.6	13.5	13.4	13.2	...	...
(10) 6	17.1	...	17.1	...	16.6	16.1	15.8	15.4	15.1	14.8	14.5	14.0	...	...
(10) 7	14.6	...	14.6	...	14.1	13.7	13.4	13.1	12.9	12.6	12.3	11.9	...	...
8	20.0	...	20.0	...	19.3	18.8	18.4	17.9	17.7	17.3	16.9	16.4	15.8	12.2
9	24.3	...	24.3	...	24.2	23.9	23.8	23.6	23.5	23.4	...	...	...	...
10	24.3	...	24.3	...	24.2	23.9	23.8	23.6	23.5	23.4	...	...	...	...
11	24.3	...	24.3	...	24.2	23.9	23.8	23.6	23.5	23.4	...	...	...	...
12	20.6	...	20.6	...	20.6	20.3	20.2	20.1	20.0	19.9	...	...	...	...
13	20.6	...	20.6	...	20.6	20.3	20.2	20.1	...	...	...	...	...	...
(10) 14	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 15	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 16	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 17	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 18	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 19	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 20	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 21	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 22	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 23	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	20.0	...	20.0	...	19.3	18.8	18.4	17.9	17.7	17.3	...	...	...	...
25	17.1	...	17.1	...	16.6	16.1	16.1	16.1	16.1	...	...	...	...	...
26	18.6	...	18.6	...	18.3	18.1	18.1	18.1	18.1	...	...	...	...	...
27	15.8	...	15.8	...	15.5	15.4	15.4	15.4	15.4	...	...	...	...	...
28	18.6	...	18.6	...	18.3	18.1	18.1	18.1	18.1	...	...	...	...	...
29	18.6	...	18.6	...	18.3	18.1	18.1	18.1	18.1	18.1	...	...	...	...
30	18.6	...	18.6	...	18.3	18.1	18.1	18.1	18.1	...	...	...	...	...
31	15.8	...	15.8	...	15.5	15.4	15.4	15.4	15.4	...	...	...	...	...
32	18.6	...	18.6	...	18.4	18.2	18.0	17.6	17.3	...	...	...	...	...
33	15.8	...	15.8	...	15.7	15.4	15.3	15.0	14.7	...	...	...	...	...
34	19.4	...	19.4	...	19.3	19.0	18.8	18.4	18.1	...	...	...	...	...
35	19.4	...	19.4	...	19.3	19.0	18.8	18.4	18.1	...	...	...	...	...
36	16.5	...	16.5	...	16.4	16.2	16.0	15.7	15.4	...	...	...	...	...
37	20.0	...	20.0	...	19.3	19.2	19.2	19.2	...	...	...	...	...	...
38	22.9	...	22.8	...	22.1	21.9	21.9	21.9	...	...	...	...	...	...
39	22.9	...	22.8	...	22.1	21.9	21.9	21.9	...	...	...	...	...	...
40	19.4	...	19.4	...	18.8	18.6	18.6	18.6	...	...	...	...	...	...

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1
2
3
4
5
6
7
8	9.2	6.5
9
10
11
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(10)
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(10)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	29Cr-4Mo-2Ni	Bar	SA-479	...	S44800	...	...	10K	1
2	29Cr-4Mo-2Ni	Plate	SA-240	...	S44800	...	...	10K	1
3	29Cr-4Mo-2Ni	Smls. tube	SA-268	29-4-2	S44800	...	...	10K	1
4	29Cr-4Mo-2Ni	Wld. tube	SA-268	29-4-2	S44800	...	...	10K	1
5	29Cr-4Mo-Ti	Smls. tube	SA-268	...	S44735	...	...	10J	1
6	29Cr-4Mo-Ti	Wld. tube	SA-268	...	S44735	...	...	10J	1
7	Mn- $\frac{1}{4}$ Mo	Forgings	SA-372	D	K14508	...	...	...	...
8	Mn- $\frac{1}{4}$ Mo-V	Castings	SA-487	2	J13005	A	...	3	3
9	Mn- $\frac{1}{4}$ Mo-V	Castings	SA-487	2	J13005	B	...	3	3
10	Mn- $\frac{1}{2}$ Mo	Plate	SA-302	A	K12021	...	...	3	2
11	Mn- $\frac{1}{2}$ Mo	Wld. pipe	SA-672	H75	K12021	...	...	3	2
12	Mn- $\frac{1}{2}$ Mo	Plate	SA-302	B	K12022	...	...	3	3
13	Mn- $\frac{1}{2}$ Mo	Plate	SA-533	A	K12521	1	...	3	3
14	Mn- $\frac{1}{2}$ Mo	Plate	SA-533	A	K12521	2	...	3	3
15	Mn- $\frac{1}{2}$ Mo	Plate	SA-533	A	K12521	3	...	11A	4
16	Mn- $\frac{1}{2}$ Mo- $\frac{1}{4}$ Ni	Plate	SA-533	D	K12529	1	...	3	3
17	Mn- $\frac{1}{2}$ Mo- $\frac{1}{4}$ Ni	Plate	SA-533	D	K12529	2	...	3	3
18	Mn- $\frac{1}{2}$ Mo- $\frac{1}{4}$ Ni	Plate	SA-533	D	K12529	3	...	11A	4
19	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Plate	SA-302	C	K12039	...	...	3	3
20	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Plate	SA-533	B	K12539	1	...	3	3
21	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Wld. pipe	SA-672	H80	K12039	...	...	3	3
22	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Wld. pipe	SA-672	J80	K12539	...	...	3	3
23	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Plate	SA-533	B	K12539	2	...	3	3
24	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Wld. pipe	SA-672	J90	K12539	...	...	3	3
25	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Plate	SA-533	B	K12539	3	...	11A	4
26	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Wld. pipe	SA-672	J100	K12539	...	...	11A	4
27	Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni	Plate	SA-302	D	K12054	...	...	3	3
28	Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni	Plate	SA-533	C	K12554	1	...	3	3
29	Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni	Plate	SA-533	C	K12554	2	...	3	3
30	Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni	Plate	SA-533	C	K12554	3	...	11A	4
31	Mn- $\frac{1}{2}$ Ni-V	Plate	SA-225	C	K12524	...	...	10A	1
32	Mn-V	Castings	SA-487	1	J13002	A	...	10A	1
33	Mn-V	Castings	SA-487	1	J13002	A	...	10A	1
34	Mn-V	Castings	SA-487	1	J13002	B	...	10A	1
35	1 $\frac{1}{2}$ Si- $\frac{1}{2}$ Mo	Smls. pipe	SA-335	P15	K11578	...	...	3	1
36	$\frac{1}{2}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-V	Castings	SA-487	4	J13047	A	...	3	3
37	$\frac{1}{2}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-V	Castings	SA-487	4	J13047	B	...	11A	3
38	$\frac{1}{2}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-V	Castings	SA-487	4	J13047	E	...	11A	3
39	$\frac{1}{2}$ Ni- $\frac{1}{2}$ Mo-V	Forgings	SA-541	3	K12045	1	...	3	3
40	$\frac{1}{2}$ Ni- $\frac{1}{2}$ Mo-V	Forgings	SA-541	3	K12045	2	...	3	3
41	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-592	F	K11576	...	$2\frac{1}{2} < t \leq 4$	11B	3
42	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Plate	SA-517	F	K11576	...	$\leq 2\frac{1}{2}$	11B	3
43	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-592	F	K11576	...	$\leq 2\frac{1}{2}$	11B	3

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	70	55	NP	NP	600	600	HA-6	G22, G32
2	80	60	NP	NP	600	600	HA-6	G32
3	80	60	NP	NP	600	600	HA-6	G32
4	80	60	NP	NP	600	600	HA-6	G24, G32
5	75	60	NP	NP	600	600	HA-6	G32
6	75	60	NP	NP	600	600	HA-6	G24, G32
7	105	65	NP	650	650	650	CS-5	G25, W2, W11
8	85	53	NP	700 (SPT)	650	650	CS-3	G1
9	90	65	NP	NP	650	650	CS-5	G1
10	75	45	1000	700	1000	650	CS-3	G11, S2, T3
11	75	45	NP	700	NP	NP	CS-3	S6, W10, W12
12	80	50	1000	700	1000	650	CS-3	G11, S2, T3
13	80	50	NP	700	1000	NP	CS-5	G23, T4
14	90	70	NP	700	800	NP	CS-5	...
15	100	83	NP	700	NP	NP	CS-5	...
16	80	50	NP	700	NP	NP	CS-5	...
17	90	70	NP	700	800	NP	CS-5	...
18	100	83	NP	700	750	650	CS-5	...
19	80	50	1000	700	1000	650	CS-3	G11, S2, T3
20	80	50	NP	700	800	NP	CS-5	G23
21	80	50	NP	700	NP	NP	CS-3	G26, W10, W12
22	80	50	NP	700	NP	NP	CS-5	G26, W10, W12
23	90	70	NP	700	800	NP	CS-5	...
24	90	70	NP	700	NP	NP	CS-5	G26, W10, W12
25	100	83	NP	700	750	650	CS-5	...
26	100	83	NP	700	NP	NP	CS-5	G26, W10, W12
27	80	50	1000	700	1000	650	CS-3	G11, S2, T3
28	80	50	NP	700	800	NP	CS-5	G23
29	90	70	NP	700	800	NP	CS-5	...
30	100	83	NP	700	NP	NP	CS-5	...
31	105	70	NP	NP	700	650	CS-5	...
32	85	55	NP	700 (SPT)	NP	NP	CS-3	...
33	85	55	NP	NP	650	650	CS-3	G1
34	90	65	NP	NP	650	650	CS-5	G1
35	60	30	NP	NP	1000	650	CS-2	T3
36	90	60	NP	650	650	650	CS-3	G1
37	105	85	NP	NP	700	650	CS-5	G1
38	115	95	NP	NP	700	650	CS-5	G1
39	80	50	NP	700	800	650	CS-5	G23
40	90	65	NP	700	700	NP	CS-5	...
41	105	90	NP	650 (SPT)	650	650	CS-5	S7
42	115	100	NP	650 (SPT)	650	650	HT-1	...
43	115	100	NP	NP	650	650	HT-1	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	20.0	...	19.6	...	19.3	19.2	18.9	18.6	...	...	...	...	...	...
2	22.9	...	22.4	...	22.1	21.9	21.6	21.3	...	...	...	...	...	...
3	22.9	...	22.4	...	22.1	21.9	21.6	21.3	...	...	...	...	...	...
4	19.4	...	19.1	...	18.8	18.6	18.4	18.1	...	...	...	...	...	...
5	21.4	...	21.0	...	20.7	20.5	20.3	20.0	...	...	...	...	...	...
6	18.2	...	17.9	...	17.6	17.5	17.2	17.0	...	...	...	...	...	...
7	30.0	...	30.0	30.0	30.0	30.0	30.0	30.0	30.0	...	...	...	...	...
8	24.3	...	24.3	...	24.3	24.2	24.2	24.2	24.1	24.1	...	...	...	...
9	25.7	...	25.7	...	25.7	25.6	25.6	25.6	25.6	...	...	...	...	...
10	21.4	...	21.4	...	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	20.0	13.7
11	21.4	...	21.4	...	21.4	21.4	21.4	21.4	21.4	21.4	...	...	...	...
12	22.9	...	22.9	...	22.9	22.9	22.9	22.9	22.9	22.9	22.9	22.9	20.0	13.7
13	22.9	22.9	22.9	...	22.9	22.9	22.9	22.9	22.9	22.9	22.9	22.9	22.1	13.3
14	25.7	...	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	...	...
15	28.6	...	28.6	...	28.6	28.6	28.6	28.6	28.6	28.6	...	...	...	...
16	22.9	...	22.9	...	22.9	22.9	22.9	22.9	22.9	22.9	...	...	...	...
17	25.7	...	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	...	...
18	28.6	...	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	...	...	...
19	22.9	...	22.9	...	22.9	22.9	22.9	22.9	22.9	22.9	22.9	22.9	20.0	13.7
20	22.9	22.9	22.9	...	22.9	22.9	22.9	22.9	22.9	22.9	22.9	22.9	...	...
21	22.9	...	22.9	...	22.9	22.9	22.9	22.9	22.9	22.9	...	...	...	...
22	22.9	...	22.9	...	22.9	22.9	22.9	22.9	22.9	22.9	...	...	...	...
23	25.7	...	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	...	...
24	25.7	...	25.7	...	25.7	25.7	25.7	25.7	25.7	25.7	...	...	...	...
25	28.6	...	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	28.6	...	...	...
26	28.6	...	28.6	...	28.6	28.6	28.6	28.6	28.6	28.6	...	...	...	...
27	22.9	...	22.9	...	22.9	22.9	22.9	22.9	22.9	22.9	22.9	22.9	20.0	13.7
28	22.9	22.9	22.9	...	22.9	22.9	22.9	22.9	22.9	22.9	22.9	22.9	...	...
29	25.7	...	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	...	...
30	28.6	...	28.6	...	28.6	28.6	28.6	28.6	28.6	28.6	...	...	...	...
31	30.0	30.0	30.0	...	30.0	30.0	30.0	30.0	30.0	30.0	...	...	...	...
32	24.3	...	23.0	...	22.4	22.4	22.4	21.9	21.5	20.9	...	...	...	...
33	24.3	...	23.1	...	22.5	22.5	22.5	21.9	21.5	...	...	...	...	...
34	25.7	...	24.6	...	24.2	24.1	24.1	23.9	23.4	...	...	...	...	...
35	17.1	17.1	17.1	...	17.1	17.1	17.1	16.8	16.6	16.3	15.9	15.4	13.8	12.5
36	25.7	...	25.7	25.7	25.7	25.7	25.7	25.7	25.7	...	...	...	...	...
37	30.0	...	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	...	...	...	...
38	32.9	32.9	32.9	32.9	32.9	32.9	32.9	32.9	32.9	32.9	...	...	...	...
39	22.9	22.9	22.9	...	22.9	22.9	22.9	22.9	22.9	22.9	22.9	22.9	...	...
40	25.7	...	25.7	...	25.7	25.7	25.7	25.7	25.7	25.7	...	...	...	...
41	30.0	...	30.0	...	30.0	30.0	30.0	30.0	30.0	...	...	...	...	...
42	32.9	...	32.9	...	32.9	32.9	32.9	32.9	32.8	...	...	...	...	...
43	32.9	...	32.9	...	32.9	32.9	32.9	32.9	32.8	...	...	...	...	...

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1
2
3
4
5
6
7
8
9
10	8.2	4.8	...	...	...	...	...	...	...	...	...	...	...	...	...
11
12	8.2	4.8	...	...	...	...	...	...	...	...	...	...	...	...	...
13	10.0	6.3	...	...	...	...	...	...	...	...	...	...	...	...	...
14
15
16
17
18
19	8.2	4.8	...	...	...	...	...	...	...	...	...	...	...	...	...
20
21
22
23
24
25
26
27	8.2	4.8	...	...	...	...	...	...	...	...	...	...	...	...	...
28
29
30
31
32
33
34
35	10.0	6.3	...	...	...	...	...	...	...	...	...	...	...	...	...
36
37
38
39
40
41
42
43

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	$\frac{3}{4}\text{Ni}-\frac{1}{2}\text{Cu}-\text{Mo}$	Smls. & wld. tube	SA-423	2	K11540	...	...	4	2
2	$\frac{3}{4}\text{Ni}-\frac{1}{2}\text{Cu}-\text{Mo}$	Wld. tube	SA-423	2	K11540	...	...	4	2
3	$\frac{3}{4}\text{Ni}-\frac{1}{2}\text{Mo}-\frac{1}{3}\text{Cr}-\text{V}$	Forgings	SA-508	2	K12766	1	...	3	3
4	$\frac{3}{4}\text{Ni}-\frac{1}{2}\text{Mo}-\frac{1}{3}\text{Cr}-\text{V}$	Forgings	SA-541	2	K12765	1	...	3	3
5	$\frac{3}{4}\text{Ni}-\frac{1}{2}\text{Mo}-\frac{1}{3}\text{Cr}-\text{V}$	Forgings	SA-508	2	K12766	2	...	3	3
6	$\frac{3}{4}\text{Ni}-\frac{1}{2}\text{Mo}-\frac{1}{3}\text{Cr}-\text{V}$	Forgings	SA-541	2	K12765	2	...	3	3
7	$\frac{3}{4}\text{Ni}-\frac{1}{2}\text{Mo}-\text{Cr}-\text{V}$	Forgings	SA-508	3	K12042	1	...	3	3
8	$\frac{3}{4}\text{Ni}-\frac{1}{2}\text{Mo}-\text{Cr}-\text{V}$	Forgings	SA-508	3	K12042	2	...	3	3
9	$\frac{3}{4}\text{Ni}-1\text{Mo}-\frac{3}{4}\text{Cr}$	Castings	SA-217	WC5	J22000	...	...	4	1
10	$1\text{Ni}-\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Castings	SA-217	WC4	J12082	...	...	4	1
11	$1\frac{1}{4}\text{Ni}-1\text{Cr}-\frac{1}{2}\text{Mo}$	Plate	SA-517	P	K21650	...	$2\frac{1}{2} < t \leq 4$	11B	8
12	$1\frac{1}{4}\text{Ni}-1\text{Cr}-\frac{1}{2}\text{Mo}$	Plate	SA-517	P	K21650	...	$\leq 2\frac{1}{2}$	11B	8
13	$1\frac{1}{2}\text{Ni}$	Forgings	SA-350	LF5	K13050	1	...	9A	1
14	$1\frac{1}{2}\text{Ni}$	Forgings	SA-350	LF5	K13050	2	...	9A	1
15	$1\frac{3}{4}\text{Ni}-\frac{3}{4}\text{Cr}-\text{Mo}$	Forgings	SA-372	L	K24055	...	...	...	...
16	$2\text{Ni}-1\text{Cu}$	Forgings	SA-182	FR	K22035	...	...	9A	1
17	$2\text{Ni}-1\text{Cu}$	Fittings	SA-234	WPR	K22035	...	...	9A	1
18	$2\text{Ni}-1\text{Cu}$	Pipe	SA-333	9	K22035	...	...	9A	1
19	$2\text{Ni}-1\text{Cu}$	Smls. pipe	SA-333	9	K22035	...	...	9A	1
20	$2\text{Ni}-1\text{Cu}$	Wld. pipe	SA-333	9	K22035	...	...	9A	1
21	$2\text{Ni}-1\text{Cu}$	Tube	SA-334	9	K22035	...	...	9A	1
22	$2\text{Ni}-1\text{Cu}$	Forgings	SA-350	LF9	K22036	...	...	9A	1
23	$2\text{Ni}-1\text{Cu}$	Smls. & wld. fittings	SA-420	WPL9	K22035	...	...	9A	1
24	$2\text{Ni}-1\frac{1}{2}\text{Cr}-\frac{1}{4}\text{Mo}-\text{V}$	Forgings	SA-723	1	K23550	1	...	...	...
25	$2\text{Ni}-1\frac{1}{2}\text{Cr}-\frac{1}{4}\text{Mo}-\text{V}$	Forgings	SA-723	1	K23550	2	...	...	...
26	$2\text{Ni}-1\frac{1}{2}\text{Cr}-\frac{1}{4}\text{Mo}-\text{V}$	Forgings	SA-723	1	K23550	3	...	...	...
27	$2\text{Ni}-1\frac{1}{2}\text{Cr}-\frac{1}{4}\text{Mo}-\text{V}$	Forgings	SA-723	1	K23550	4	...	...	...
28	$2\text{Ni}-1\frac{1}{2}\text{Cr}-\frac{1}{4}\text{Mo}-\text{V}$	Forgings	SA-723	1	K23550	5	...	...	...
29	$2\frac{1}{2}\text{Ni}$	Pipe	SA-333	7	K21903	...	...	9A	1
30	$2\frac{1}{2}\text{Ni}$	Wld. pipe	SA-333	7	K21903	...	...	9A	1
31	$2\frac{1}{2}\text{Ni}$	Tube	SA-334	7	K21903	...	...	9A	1
32	$2\frac{1}{2}\text{Ni}$	Wld. tube	SA-334	7	K21903	...	...	9A	1
33	$2\frac{1}{2}\text{Ni}$	Plate	SA-203	A	K21703	...	...	9A	1
34	$2\frac{1}{2}\text{Ni}$	Plate	SA-203	B	K22103	...	...	9A	1
35	$2\frac{1}{2}\text{Ni}$	Castings	SA-352	LC2	J22500	...	...	9A	1
36	$2\frac{3}{4}\text{Ni}-1\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Plate	SA-543	C	...	3	...	3	3
37	$2\frac{3}{4}\text{Ni}-1\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Plate	SA-543	C	...	1	...	11A	5
38	$2\frac{3}{4}\text{Ni}-1\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Plate	SA-543	C	...	2	...	11B	10
39	$2\frac{3}{4}\text{Ni}-1\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Forgings	SA-723	2	K34035	1	...	...	...
40	$2\frac{3}{4}\text{Ni}-1\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Forgings	SA-723	2	K34035	2	...	...	...
41	$2\frac{3}{4}\text{Ni}-1\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Forgings	SA-723	2	K34035	3	...	...	...
42	$2\frac{3}{4}\text{Ni}-1\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Forgings	SA-723	2	K34035	4	...	...	...
43	$2\frac{3}{4}\text{Ni}-1\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Forgings	SA-723	2	K34035	5	...	...	...

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	60	37	650	NP	650	NP	CS-2	W13, W14
2	60	37	650	NP	650	NP	CS-2	G3, G24
3	80	50	NP	700	800	650	CS-5	G23
4	80	50	NP	700	800	650	CS-5	G23
5	90	65	NP	700	700	NP	CS-5	...
6	90	65	NP	700	700	NP	CS-5	...
7	80	50	NP	700	800	650	CS-5	G23
8	90	65	NP	700	700	NP	CS-5	...
9	70	40	1100	700	1100	NP	CS-2	G1, G17, T4
10	70	40	1000	700	1000	NP	CS-2	G1, G17, T4
11	105	90	NP	700 (SPT)	650	650	CS-5	...
12	115	100	NP	650 (SPT)	650	650	HT-1	...
13	60	30	NP	NP	500	500	CS-2	...
14	70	37.5	NP	NP	500	500	CS-2	...
15	155	135	NP	NP	650	650	...	W11
16	63	46	NP	NP	100	100	CS-3	...
17	63	46	NP	NP	100	NP	CS-3	...
18	63	46	NP	NP	100	100	CS-3	...
19	63	46	NP	100	NP	NP	CS-3	...
20	63	46	NP	NP	100	100	CS-3	G24
21	63	46	NP	NP	100	100	CS-3	...
22	63	46	NP	NP	100	100	CS-3	...
23	63	46	NP	100	100	100	CS-3	W14
24	115	100	NP	700 (SPT)	NP	NP	HT-1	W1
25	135	120	NP	700 (SPT)	NP	NP	HT-1	W1
26	155	140	NP	700 (SPT)	NP	NP	HT-1	W1
27	175	160	NP	700 (SPT)	NP	NP	HT-1	W1
28	190	180	NP	700 (SPT)	NP	NP	HT-1	W1
29	65	35	NP	NP	650	650	CS-2	...
30	65	35	NP	NP	650	650	CS-2	G24
31	65	35	NP	NP	650	650	CS-2	...
32	65	35	NP	NP	650	650	CS-2	G24
33	65	37	NP	700	1000	650	CS-2	T2
34	70	40	NP	650	1000	650	CS-2	S1, T2
35	70	40	NP	100	650	650	CS-2	G1
36	90	70	NP	NP	650	NP	CS-5	...
37	105	85	NP	NP	650	NP	CS-5	...
38	115	100	NP	NP	650	NP	HT-1	...
39	115	100	NP	700 (SPT)	NP	NP	HT-1	W1
40	135	120	NP	700 (SPT)	NP	NP	HT-1	W1
41	155	140	NP	700 (SPT)	NP	NP	HT-1	W1
42	175	160	NP	700 (SPT)	NP	NP	HT-1	W1
43	190	180	NP	700 (SPT)	NP	NP	HT-1	W1

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	17.1	...	17.1	...	17.1	17.1	17.1	17.1	17.1	...	...	...	...	...
2	14.6	...	14.6	...	14.6	14.6	14.6	14.6	14.6	...	...	...	...	...
3	22.9	22.9	22.9	...	22.9	22.9	22.9	22.9	22.9	22.9	22.9	22.9	...	...
4	22.9	22.9	22.9	...	22.9	22.9	22.9	22.9	22.9	22.9	22.9	22.9	...	...
5	25.7	...	25.7	...	25.7	25.7	25.7	25.7	25.7	25.7	...	...	...	...
6	25.7	...	25.7	...	25.7	25.7	25.7	25.7	25.7	25.7	...	...	...	...
7	22.9	22.9	22.9	...	22.9	22.9	22.9	22.9	22.9	22.9	22.9	22.9	...	...
8	25.7	...	25.7	...	25.7	25.7	25.7	25.7	25.7	25.7	...	...	...	...
9	20.0	20.0	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.3	16.3
10	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.3	15.0
11	30.0	...	30.0	30.0	30.0	30.0	30.0	30.0	30.0	29.4	...	...	...	...
12	32.9	...	32.9	32.9	32.9	32.9	32.9	32.9	32.8	...	...	...	...	...
13	17.1	...	16.5	...	15.7	15.3	15.3	...	...	...	...	...	...	...
14	20.0	...	19.2	...	18.3	17.8	17.8	...	...	...	...	...	...	...
15	44.3	...	44.3	...	44.3	44.3	44.3	44.1	42.9	...	...	...	...	...
16	18.1	...	...	...	...	...	...	...	...	...	...	...	...	...
17	18.1	...	...	...	...	...	...	...	...	...	...	...	...	...
18	18.1	...	...	...	...	...	...	...	...	...	...	...	...	...
19	17.9	...	...	...	...	...	...	...	...	...	...	...	...	...
20	15.3	...	...	...	...	...	...	...	...	...	...	...	...	...
21	18.1	...	...	...	...	...	...	...	...	...	...	...	...	...
22	18.1	...	...	...	...	...	...	...	...	...	...	...	...	...
23	18.1	...	...	...	...	...	...	...	...	...	...	...	...	...
24	32.9	...	32.9	...	32.9	32.9	32.9	32.9	32.4	31.6	...	...	...	...
25	38.6	...	38.6	...	38.6	38.6	38.6	38.6	38.0	37.1	...	...	...	...
26	44.3	...	44.3	...	44.3	44.3	44.3	44.3	43.6	42.6	...	...	...	...
27	50.0	...	50.0	...	50.0	50.0	50.0	50.0	49.2	48.0	...	...	...	...
28	54.3	...	54.3	...	54.3	54.3	54.3	54.3	53.5	52.2	...	...	...	...
29	18.6	18.6	18.6	...	18.6	18.6	18.6	17.5	16.7	...	...	...	...	...
30	15.8	...	15.8	...	15.8	15.8	15.8	14.9	14.2	...	...	...	...	...
31	18.6	18.6	18.6	...	18.6	18.6	18.6	17.5	16.7	...	...	...	...	...
32	15.8	15.8	15.8	...	15.8	15.8	15.8	14.9	14.2	...	...	...	...	...
33	18.6	18.6	18.6	...	18.6	18.6	18.6	18.5	17.6	16.6	13.9	11.4	9.0	6.5
34	20.0	20.0	20.0	...	20.0	20.0	20.0	20.0	19.0	18.0	14.8	12.0	9.3	6.5
35	20.0	20.0	20.0	...	20.0	20.0	20.0	20.0	19.0	...	...	...	...	...
36	25.7	...	25.7	25.7	25.7	25.5	25.3	25.0	24.6	...	...	...	...	...
37	30.0	...	30.0	30.0	30.0	29.7	29.5	29.1	28.7	...	...	...	...	...
38	32.9	...	32.9	32.9	32.9	32.5	32.3	31.9	31.5	...	...	...	...	...
39	32.9	...	32.9	...	32.9	32.9	32.9	32.9	32.4	31.6	...	...	...	...
40	38.6	...	38.6	...	38.6	38.6	38.6	38.6	38.0	37.1	...	...	...	...
41	44.3	...	44.3	...	44.3	44.3	44.3	44.3	43.6	42.6	...	...	...	...
42	50.0	...	50.0	...	50.0	50.0	50.0	50.0	49.2	48.0	...	...	...	...
43	54.3	...	54.3	...	54.3	54.3	54.3	54.3	53.5	52.2	...	...	...	...

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1
2
3
4
5
6
7
8
9	11.0	6.9	4.6	2.8	...	...	...	...	...	...	...	...	...	...	...
10	9.2	5.9
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33	4.5	2.5
34	4.5	2.5
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	3Ni-1 $\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo	Plate	SA-543	B	K42339	3	...	3	3
2	3Ni-1 $\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo	Forgings	SA-372	M	K42365	85	...	...	...
3	3Ni-1 $\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo	Plate	SA-543	B	K42339	1	...	11A	5
4	3Ni-1 $\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo	Plate	SA-543	B	K42339	2	...	11B	10
5	3Ni-1 $\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo	Forgings	SA-372	M	K42365	100	...	...	...
6	3 $\frac{1}{2}$ Ni	Pipe	SA-333	3	K31918	...	...	9B	1
7	3 $\frac{1}{2}$ Ni	Wld. pipe	SA-333	3	K31918	...	...	9B	1
8	3 $\frac{1}{2}$ Ni	Tube	SA-334	3	K31918	...	...	9B	1
9	3 $\frac{1}{2}$ Ni	Wld. tube	SA-334	3	K31918	...	...	9B	1
10	3 $\frac{1}{2}$ Ni	Fittings	SA-420	WPL3	...	...	...	9B	1
11	3 $\frac{1}{2}$ Ni	Plate	SA-203	D	K31718	...	...	9B	1
12	3 $\frac{1}{2}$ Ni	Forgings	SA-350	LF3	K32025	1	...	9B	1
13	3 $\frac{1}{2}$ Ni	Forgings	SA-350	LF3	K32025	2	...	9B	1
14	3 $\frac{1}{2}$ Ni	Forgings	SA-765	III	K32026	...	...	9B	1
15	3 $\frac{1}{2}$ Ni	Plate	SA-203	E	K32018	...	...	9B	1
16	3 $\frac{1}{2}$ Ni	Plate	SA-203	E	K32018	...	...	9B	1
17	3 $\frac{1}{2}$ Ni	Castings	SA-352	LC3	J31550	...	...	9B	1
18	3 $\frac{1}{2}$ Ni	Plate	SA-203	F	...	...	> 2	9B	1
19	3 $\frac{1}{2}$ Ni	Plate	SA-203	F	...	...	≤ 2	9B	1
20	3 $\frac{1}{2}$ Ni-1 $\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-508	4N	K22375	3	...	3	3
21	3 $\frac{1}{2}$ Ni-1 $\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-508	4N	K22375	1	...	11A	5
22	3 $\frac{1}{2}$ Ni-1 $\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-508	4N	K22375	2	...	11B	10
23	4Ni-1 $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-723	3	K44045	1	...	...	...
24	4Ni-1 $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-723	3	K44045	2	...	...	...
25	4Ni-1 $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-723	3	K44045	3	...	...	...
26	4Ni-1 $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-723	3	K44045	4	...	...	...
27	4Ni-1 $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-723	3	K44045	5	...	...	...
(10) 28	5Ni- $\frac{1}{4}$ Mo	Plate	SA-645	A	K41583	...	...	11A	2
29	8Ni	Forgings	SA-522	II	K71340	...	...	11A	1
30	8Ni	Plate	SA-553	II	K71340	...	...	11A	1
31	8Ni	Plate	SA-553	II	K71340	...	...	11A	1
32	9Ni	Smls. & wld. pipe	SA-333	8	K81340	...	...	11A	1
33	9Ni	Smls. & wld. pipe	SA-333	8	K81340	...	...	11A	1
34	9Ni	Smls. pipe	SA-333	8	K81340	...	...	11A	1
35	9Ni	Smls. pipe	SA-333	8	K81340	...	...	11A	1
36	9Ni	Wld. pipe	SA-333	8	K81340	...	...	11A	1
37	9Ni	Wld. tube	SA-334	8	K81340	...	...	11A	1
38	9Ni	Smls. & wld. tube	SA-334	8	K81340	...	...	11A	1
39	9Ni	Smls. tube	SA-334	8	K81340	...	...	11A	1
40	9Ni	Smls. tube	SA-334	8	K81340	...	...	11A	1
41	9Ni	Wld. tube	SA-334	8	K81340	...	...	11A	1
42	9Ni	Plate	SA-353	...	K81340	...	...	11A	1
43	9Ni	Plate	SA-353	...	K81340	...	...	11A	1
44	9Ni	Plate	SA-353	...	K81340	...	...	11A	1

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	90	70	NP	NP	650	NP	CS-5	...
2	105	85	NP	NP	650	650	...	W11
3	105	85	NP	NP	650	NP	CS-5	...
4	115	100	NP	NP	650	NP	HT-1	...
5	120	100	NP	NP	650	650	...	W11
6	65	35	NP	NP	650	650	CS-2	...
7	65	35	NP	NP	650	650	CS-2	G24
8	65	35	NP	NP	650	650	CS-2	...
9	65	35	NP	NP	650	650	CS-2	G24
10	65	35	NP	NP	650	650	CS-2	...
11	65	37	NP	700	1000	650	CS-2	T2
12	70	37.5	NP	650	650	650	CS-2	...
13	70	37.5	NP	650	650	650	CS-2	...
14	70	37.5	NP	NP	650	650	CS-2	...
15	70	40	NP	300 (SPT)	NP	NP	CS-2	S1
16	70	40	NP	650	1000	650	CS-2	T2
17	70	40	NP	100	650	650	CS-2	G1
18	75	50	NP	NP	650	650	CS-3	...
19	80	55	NP	NP	650	650	CS-3	...
20	90	70	NP	NP	650	650	CS-5	...
21	105	85	NP	600 (SPT)	650	NP	CS-5	...
22	115	100	NP	NP	650	NP	HT-1	...
23	115	100	NP	700 (SPT)	NP	NP	HT-1	W1
24	135	120	NP	700 (SPT)	NP	NP	HT-1	W1
25	155	140	NP	700 (SPT)	NP	NP	HT-1	W1
26	175	160	NP	700 (SPT)	NP	NP	HT-1	W1
27	190	180	NP	700 (SPT)	NP	NP	HT-1	W1
28	95	65	NP	NP	250	250	CS-3	...
29	100	75	NP	200 (Cl. 3 only)	NP	NP	CS-3	G33, W5
30	100	85	NP	200 (Cl. 3 only)	250	250	CS-3	G33, W5
31	100	85	NP	200 (Cl. 3 only)	250	250	CS-3	G33, W4
32	100	75	NP	200 (Cl. 3 only)	NP	NP	CS-3	G33, W12
33	100	75	NP	200 (Cl. 3 only)	NP	NP	CS-3	G33, W5, W12
34	100	75	NP	NP	250	250	CS-3	G33, W4
35	100	75	NP	NP	250	250	CS-3	G33, W5
36	100	75	NP	NP	250	250	CS-3	G24, G33, W3
37	100	75	NP	200 (Cl. 3 only)	NP	NP	CS-3	G33, W12
38	100	75	NP	200 (Cl. 3 only)	NP	NP	CS-3	G33, W5, W12
39	100	75	NP	NP	250	250	CS-3	G33, W4
40	100	75	NP	NP	250	250	CS-3	G33, W5
41	100	75	NP	NP	250	250	CS-3	G24, G33, W3
42	100	75	NP	200 (Cl. 3 only)	250	250	CS-3	G33, W4
43	100	75	NP	NP	250	250	CS-3	G33, W5
44	100	75	NP	200 (Cl. 3 only)	NP	NP	CS-3	G33, W5

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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	25.7	...	25.7	25.7	25.7	25.5	25.3	25.0	24.6	...	...	...	...	...
2	30.0	...	30.0	30.0	30.0	29.7	29.5	29.1	28.7	...	...	...	...	...
3	30.0	...	30.0	30.0	30.0	29.7	29.5	29.1	28.7	...	...	...	...	...
4	32.9	...	32.9	32.9	32.9	32.5	32.3	31.9	31.5	...	...	...	...	...
5	34.3	...	34.3	34.3	34.3	33.9	33.7	33.3	32.9	...	...	...	...	...
6	18.6	18.6	18.6	...	18.6	18.6	18.6	17.5	16.7	...	...	...	...	...
7	15.8	...	15.8	...	15.8	15.8	15.8	14.9	14.2	...	...	...	...	...
8	18.6	18.6	18.6	...	18.6	18.6	18.6	17.5	16.7	...	...	...	...	...
9	15.8	15.8	15.8	...	15.8	15.8	15.8	14.9	14.2	...	...	...	...	...
10	18.6	18.6	18.6	...	18.6	18.6	18.6	17.5	16.7	...	...	...	...	...
11	18.6	18.6	18.6	...	18.6	18.6	18.6	18.5	17.6	16.6	13.9	11.4	9.0	6.5
12	20.0	...	20.0	...	20.0	20.0	20.0	18.8	17.9	...	...	...	...	...
13	20.0	...	20.0	...	20.0	20.0	20.0	18.8	17.9	...	...	...	...	...
14	20.0	20.0	20.0	...	20.0	20.0	20.0	18.8	17.9	...	...	...	...	...
15	20.0	...	20.0	...	20.0	...	...	...	...	...	...	...	...	...
16	20.0	...	20.0	...	20.0	20.0	20.0	20.0	19.0	18.0	14.8	12.0	9.3	6.5
17	20.0	20.0	20.0	...	20.0	20.0	20.0	20.0	19.0	...	...	...	...	...
18	21.4	21.4	21.4	...	21.4	21.4	21.4	21.4	20.5	...	...	...	...	...
19	22.9	22.9	22.9	...	22.9	22.9	22.9	22.9	20.5	...	...	...	...	...
20	25.7	...	25.7	25.7	25.7	25.5	25.3	25.0	24.6	...	...	...	...	...
21	30.0	...	30.0	30.0	30.0	29.7	29.5	29.1	28.7	...	...	...	...	...
22	32.9	...	32.9	32.9	32.9	32.5	32.3	31.9	31.5	...	...	...	...	...
23	32.9	...	32.9	...	32.9	32.9	32.9	32.9	32.4	31.6	...	...	...	...
24	38.6	...	38.6	...	38.6	38.6	38.6	38.6	38.0	37.1	...	...	...	...
25	44.3	...	44.3	...	44.3	44.3	44.3	44.3	43.6	42.6	...	...	...	...
26	50.0	...	50.0	...	50.0	50.0	50.0	50.0	49.2	48.0	...	...	...	...
27	54.3	...	54.3	...	54.3	54.3	54.3	54.3	53.5	52.2	...	...	...	...
(10) 28	27.1	...	27.1	26.6	...	...	...	...	...	...	...	...	...	...
29	27.1	27.1	25.4	...	...	...	...	...	...	...	...	...	...	...
30	27.1	27.1	25.4	24.6	...	...	...	...	...	...	...	...	...	...
31	28.6	28.6	26.7	25.9	...	...	...	...	...	...	...	...	...	...
32	28.6	28.6	26.7	...	...	...	...	...	...	...	...	...	...	...
33	27.1	27.1	25.4	...	...	...	...	...	...	...	...	...	...	...
34	28.6	28.6	26.7	25.9	...	...	...	...	...	...	...	...	...	...
35	27.1	27.1	25.4	24.6	...	...	...	...	...	...	...	...	...	...
36	24.3	24.3	22.7	22.1	...	...	...	...	...	...	...	...	...	...
37	28.6	28.6	26.7	...	...	...	...	...	...	...	...	...	...	...
38	27.1	27.1	25.4	...	...	...	...	...	...	...	...	...	...	...
39	28.6	28.6	26.7	25.9	...	...	...	...	...	...	...	...	...	...
40	27.1	27.1	25.4	24.6	...	...	...	...	...	...	...	...	...	...
41	24.3	24.3	22.7	22.1	...	...	...	...	...	...	...	...	...	...
42	28.6	28.6	26.7	25.9	...	...	...	...	...	...	...	...	...	...
43	27.1	27.1	25.4	24.6	...	...	...	...	...	...	...	...	...	...
44	27.1	27.1	25.4	...	...	...	...	...	...	...	...	...	...	...

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1
2
3
4
5
6
7
8
9
10
11	4.5	2.5
12
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14
15
16	4.5	2.5
17
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	9Ni	Smls. & wld. fittings	SA-420	WPL8	K81340	...	...	11A	1
2	9Ni	Smls. & wld. fittings	SA-420	WPL8	K81340	...	...	11A	1
3	9Ni	Forgings	SA-522	I	K81340	...	...	11A	1
4	9Ni	Forgings	SA-522	I	K81340	...	...	11A	1
5	9Ni	Plate	SA-553	I	K81340	...	...	11A	1
6	9Ni	Plate	SA-553	I	K81340	...	...	11A	1
7	25Ni-15Cr-2Ti	Bar	SA-638	660	S66286	...	...	...	...
8	27Ni-22Cr-7Mo-Mn-Cu-N	Smls. tube	SA-213	...	S31277	...	...	45	...
9	27Ni-22Cr-7Mo-Mn-Cu-N	Smls. tube	SA-213	...	S31277	...	...	45	...
10	27Ni-22Cr-7Mo-Mn-Cu-N	Plate	SA-240	...	S31277	...	...	45	...
11	27Ni-22Cr-7Mo-Mn-Cu-N	Plate	SA-240	...	S31277	...	...	45	...
12	27Ni-22Cr-7Mo-Mn-Cu-N	Wld. tube	SA-249	...	S31277	...	...	45	...
13	27Ni-22Cr-7Mo-Mn-Cu-N	Wld. tube	SA-249	...	S31277	...	...	45	...
(10) 14	...	...	...	...	...	...	...	...	...
(10) 15	...	...	...	...	...	...	...	...	...
(10) 16	...	...	...	...	...	...	...	...	...
(10) 17	...	...	...	...	...	...	...	...	...
(10) 18	...	...	...	...	...	...	...	...	...
(10) 19	...	...	...	...	...	...	...	...	...
20	29Ni-20Cr-3Cu-2Mo	Castings	SA-351	CN7M	J95150	...	...	45	...
21	29Ni-20Cr-3Cu-2Mo	Castings	SA-351	CN7M	J95150	...	...	45	...
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
26	16Cr-12Ni-2Mo	Forgings	SA-182	F316L	S31603	...	> 5	8	1
27	16Cr-12Ni-2Mo	Forgings	SA-182	F316L	S31603	...	> 5	8	1
28	16Cr-12Ni-2Mo	Forgings	SA-965	F316L	S31603	...	...	8	1
29	16Cr-12Ni-2Mo	Forgings	SA-965	F316L	S31603	...	...	8	1
30	16Cr-12Ni-2Mo	Forgings	SA-182	F316L	S31603	...	≤ 5	8	1
31	16Cr-12Ni-2Mo	Forgings	SA-182	F316L	S31603	...	≤ 5	8	1
32	16Cr-12Ni-2Mo	Smls. tube	SA-213	TP316L	S31603	...	...	8	1
33	16Cr-12Ni-2Mo	Smls. tube	SA-213	TP316L	S31603	...	...	8	1
34	16Cr-12Ni-2Mo	Plate	SA-240	316L	S31603	...	...	8	1
35	16Cr-12Ni-2Mo	Plate	SA-240	316L	S31603	...	...	8	1
36	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316L	S31603	...	...	8	1
37	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316L	S31603	...	...	8	1
38	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316L	S31603	...	...	8	1
39	16Cr-12Ni-2Mo	Smls. & wld. pipe	SA-312	TP316L	S31603	...	...	8	1
40	16Cr-12Ni-2Mo	Smls. pipe	SA-312	TP316L	S31603	...	...	8	1
41	16Cr-12Ni-2Mo	Wld. pipe	SA-312	TP316L	S31603	...	...	8	1
42	16Cr-12Ni-2Mo	Wld. pipe	SA-312	TP316L	S31603	...	...	8	1

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	100	75	NP	NP	250	250	CS-3	G33, W4
2	100	75	NP	NP	250	250	CS-3	G33, W3
3	100	75	NP	200 (Cl. 3 only)	250	250	CS-3	G33, S8, W4
4	100	75	NP	NP	250	250	CS-3	G33, S8, W5
5	100	85	NP	200 (Cl. 3 only)	250	250	CS-3	G33, W4
6	100	85	NP	200 (Cl. 3 only)	250	250	CS-3	G33, W5
7	130	85	NP	700	700	NP	HA-5	W1
8	112	52	NP	NP	800	NP	NFN-26	G5
9	112	52	NP	NP	800	NP	NFN-26	...
10	112	52	NP	NP	800	NP	NFN-26	G5
11	112	52	NP	NP	800	NP	NFN-26	...
12	112	52	NP	NP	800	NP	NFN-26	G3, G5
13	112	52	NP	NP	800	NP	NFN-26	...
14	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...
20	62	25	600	600 (Cl. 3 only)	600	NP	NFN-9	G1, G5
21	62	25	600	NP	600	NP	NFN-9	G1
22	95	45	NP	NP	800	650	HA-6	G5
23	95	45	NP	NP	800	650	HA-6	...
24	95	48	NP	NP	900	650	HA-6	G5
25	95	48	NP	NP	900	650	HA-6	...
26	65	25	850	800	850	650	HA-4	G5, G34
27	65	25	850	NP	850	650	HA-4	G34
28	65	25	850	800	850	650	HA-4	G5, G34
29	65	25	850	NP	850	650	HA-4	G34
30	70	25	850	800	850	650	HA-4	G5, G34
31	70	25	850	NP	850	650	HA-4	G34
32	70	25	850	800	850	NP	HA-4	G5, G34
33	70	25	850	NP	850	NP	HA-4	G34
34	70	25	850	800	850	650	HA-4	G5, G34
35	70	25	850	NP	850	650	HA-4	G34
36	70	25	NP	800	NP	NP	HA-4	G5, W12
37	70	25	850	NP	850	650	HA-4	G5, G24, G34
38	70	25	850	NP	850	650	HA-4	G24, G34
39	70	25	850	800	850	650	HA-4	G5, G34, W12, W14
40	70	25	850	NP	850	650	HA-4	G34
41	70	25	850	NP	850	650	HA-4	G5, G24, G34
42	70	25	850	NP	850	650	HA-4	G24, G34

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	28.6	28.6	26.7	25.9	...	...	...	...	...	...	...	...	...	...
2	27.1	27.1	25.4	24.6	...	...	...	...	...	...	...	...	...	...
3	28.6	28.6	26.7	25.9	...	...	...	...	...	...	...	...	...	...
4	27.1	27.1	25.4	24.6	...	...	...	...	...	...	...	...	...	...
5	28.6	28.6	26.7	25.9	...	...	...	...	...	...	...	...	...	...
6	27.1	27.1	25.4	24.6	...	...	...	...	...	...	...	...	...	...
7	37.1	...	37.1	...	37.1	37.1	36.5	35.8	35.4	35.0	...	...	...	...
8	32.0	32.0	32.0	31.5	30.7	29.4	28.4	27.5	27.1	26.8	26.5	26.3	...	...
9	32.0	32.0	32.0	30.4	28.8	26.5	25.5	25.4	25.4	25.3	25.1	24.9	...	...
10	32.0	32.0	32.0	31.5	30.7	29.4	28.4	27.5	27.1	26.8	26.5	26.3	...	...
11	32.0	32.0	32.0	30.4	28.8	26.5	25.5	25.4	25.4	25.3	25.1	24.9	...	...
12	27.2	27.2	27.2	26.8	26.1	24.9	24.1	23.4	23.1	22.7	22.5	22.3	...	...
13	27.2	27.2	27.2	25.8	24.5	22.5	21.7	21.6	21.6	21.5	21.3	21.2	...	...
(10) 14	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 15	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 16	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 17	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 18	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(10) 19	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	16.7	...	16.0	...	13.6	12.8	12.1	11.6	...	...	...	...	...	...
21	16.7	...	14.4	...	12.9	11.8	10.8	10.0	...	...	...	...	...	...
22	27.1	...	23.7	...	21.2	20.1	20.0	19.6	19.6	19.4	19.2	18.8	...	...
23	27.1	...	23.7	...	21.2	20.1	19.7	19.2	18.6	18.0	17.4	16.7	...	...
24	27.1	...	23.6	...	20.6	18.9	18.1	17.9	17.9	17.9	17.8	17.7	17.4	16.9
25	27.1	...	23.6	...	20.3	17.9	16.5	15.8	15.6	15.5	15.3	15.1	14.8	14.3
26	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	12.7	...
27	16.7	...	14.2	...	12.7	11.7	10.9	10.4	10.2	10.0	9.8	9.6	9.4	...
28	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	12.7	...
29	16.7	...	14.2	...	12.7	11.7	10.9	10.4	10.2	10.0	9.8	9.6	9.4	...
30	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	12.7	...
31	16.7	...	14.2	...	12.7	11.7	10.9	10.4	10.2	10.0	9.8	9.6	9.4	...
32	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	12.7	...
33	16.7	...	14.2	...	12.7	11.7	10.9	10.4	10.2	10.0	9.8	9.6	9.4	...
34	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	12.7	...
35	16.7	...	14.2	...	12.7	11.7	10.9	10.4	10.2	10.0	9.8	9.6	9.4	...
36	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
37	14.2	...	14.2	...	14.2	13.4	12.5	11.9	11.7	11.4	11.2	11.0	10.8	...
38	14.2	...	12.1	...	10.8	9.9	9.3	8.8	8.7	8.5	8.3	8.1	8.0	...
39	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	12.7	...
40	16.7	...	14.2	...	12.7	11.7	10.9	10.4	10.2	10.0	9.8	9.6	9.4	...
41	14.2	...	14.2	...	14.2	13.4	12.5	11.9	11.7	11.4	11.2	11.0	10.8	...
42	14.2	...	12.1	...	10.8	9.9	9.3	8.8	8.7	8.5	8.3	8.1	8.0	...

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1
2
3
4
5
6
7
8
9
10
11
12
13
14	(10)
15	(10)
16	(10)
17	(10)
18	(10)
19	(10)
20	
21	
22	
23	
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	16Cr-12Ni-2Mo	Wld. pipe	SA-358	316L	S31603	1	...	8	1
2	16Cr-12Ni-2Mo	Smls. & wld. fittings	SA-403	316L	S31603	...	...	8	1
3	16Cr-12Ni-2Mo	Wld. pipe	SA-409	TP316L	S31603	...	...	8	1
4	16Cr-12Ni-2Mo	Bar	SA-479	316L	S31603	...	...	8	1
5	16Cr-12Ni-2Mo	Bar	SA-479	316L	S31603	...	...	8	1
6	16Cr-12Ni-2Mo	Wld. tube	SA-688	TP316L	S31603	...	...	8	1
7	16Cr-12Ni-2Mo	Wld. tube	SA-688	TP316L	S31603	...	...	8	1
8	16Cr-12Ni-2Mo	Wld. tube	SA-688	TP316L	S31603	...	...	8	1
9	16Cr-12Ni-2Mo	Wld. pipe	SA-813	TP316L	S31603	...	...	8	1
10	16Cr-12Ni-2Mo	Wld. pipe	SA-814	TP316L	S31603	...	...	8	1
11	16Cr-12Ni-2Mo	Bar	SA/JIS G4303	SUS316L	...	...	...	8	1
12	16Cr-12Ni-2Mo	Castings	SA-351	CF3M	J92800	...	...	8	1
13	16Cr-12Ni-2Mo	Castings	SA-351	CF3M	J92800	...	...	8	1
(a) 14	16Cr-12Ni-2Mo	Cast pipe	SA-451	CPF3M	J92800	...	...	8	1
15	16Cr-12Ni-2Mo	Castings	SA-351	CF8M	J92900	...	...	8	1
16	16Cr-12Ni-2Mo	Castings	SA-351	CF8M	J92900	...	...	8	1
(a) 17	16Cr-12Ni-2Mo	Cast pipe	SA-451	CPF8M	J92900	...	...	8	1
18	16Cr-12Ni-2Mo	Forgings	SA-182	F316	S31600	...	> 5	8	1
19	16Cr-12Ni-2Mo	Forgings	SA-182	F316	S31600	...	> 5	8	1
20	16Cr-12Ni-2Mo	Forgings	SA-965	F316	S31600	...	...	8	1
21	16Cr-12Ni-2Mo	Forgings	SA-965	F316	S31600	...	...	8	1
22	16Cr-12Ni-2Mo	Forgings	SA-182	F316	S31600	...	≤ 5	8	1
23	16Cr-12Ni-2Mo	Forgings	SA-182	F316	S31600	...	≤ 5	8	1
24	16Cr-12Ni-2Mo	Smls. tube	SA-213	TP316	S31600	...	...	8	1
25	16Cr-12Ni-2Mo	Smls. tube	SA-213	TP316	S31600	...	...	8	1
26	16Cr-12Ni-2Mo	Plate	SA-240	316	S31600	...	...	8	1
27	16Cr-12Ni-2Mo	Plate	SA-240	316	S31600	...	...	8	1
28	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316	S31600	...	...	8	1
29	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316	S31600	...	...	8	1
30	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316	S31600	...	...	8	1
31	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316	S31600	...	...	8	1
32	16Cr-12Ni-2Mo	Smls. & wld. pipe	SA-312	TP316	S31600	...	...	8	1
33	16Cr-12Ni-2Mo	Smls. & wld. pipe	SA-312	TP316	S31600	...	...	8	1
34	16Cr-12Ni-2Mo	Wld. pipe	SA-312	TP316	S31600	...	...	8	1
35	16Cr-12Ni-2Mo	Wld. pipe	SA-312	TP316	S31600	...	...	8	1
36	16Cr-12Ni-2Mo	Wld. pipe	SA-358	316	S31600	1	...	8	1
37	16Cr-12Ni-2Mo	Smls. pipe	SA-376	TP316	S31600	...	...	8	1
38	16Cr-12Ni-2Mo	Smls. pipe	SA-376	TP316	S31600	...	...	8	1
39	16Cr-12Ni-2Mo	Smls. & wld. fittings	SA-403	316	S31600	...	...	8	1
40	16Cr-12Ni-2Mo	Wld. pipe	SA-409	TP316	S31600	...	...	8	1
41	16Cr-12Ni-2Mo	Bar	SA-479	316	S31600	...	...	8	1
42	16Cr-12Ni-2Mo	Bar	SA-479	316	S31600	...	...	8	1

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	70	25	NP	800	NP	NP	HA-4	G5
2	70	25	NP	800	850	650	HA-4	G5, W12, W14
3	70	25	NP	800	NP	NP	HA-4	G5
4	70	25	850	800	850	650	HA-4	G5, G22, G34
5	70	25	850	NP	850	650	HA-4	G22, G34
6	70	25	NP	800	NP	NP	HA-4	G5, W12
7	70	25	NP	NP	850	650	HA-4	G5, G24
8	70	25	NP	NP	850	650	HA-4	G24
9	70	25	NP	800	NP	NP	HA-4	G5, W12
10	70	25	NP	800	NP	NP	HA-4	G5, W12
11	70	25	850	800	850	NP	HA-4	G5, G22, G34
12	70	30	NP	800	850	650	HA-4	G1, G5, G16, G17, G32
13	70	30	NP	NP	850	650	HA-4	G1, G32
14	70	30	NP	800	800	NP	HA-4	G1, G5, G16, G17, G32 (a)
15	70	30	1500	800	1500	650	HA-2	G1, G5, G12, G16, G17, G32, H1, T6
16	70	30	1500	NP	1500	650	HA-2	G1, G12, G32, H1, T8
17	70	30	NP	800	800	NP	HA-2	G1, G5, G16, G17, G32 (a)
18	70	30	1500	800	1500	650	HA-2	G5, G12, T8
19	70	30	1500	NP	1500	650	HA-2	G12, T9
20	70	30	1500	800	1500	650	HA-2	G5, G12, T8
21	70	30	1500	NP	1500	650	HA-2	G12, T9
22	75	30	1500	800	1500	NP	HA-2	G5, G12, T8
23	75	30	1500	NP	1500	NP	HA-2	G12, T9
24	75	30	1500	800	1500	NP	HA-2	G5, G12, T8
25	75	30	1500	NP	1500	NP	HA-2	G12, T9
26	75	30	1500	800	1500	650	HA-2	G5, G12, T8
27	75	30	1500	NP	1500	650	HA-2	G12, T9
28	75	30	1500	NP	NP	NP	HA-2	G12, T9, W13
29	75	30	1500	800	NP	NP	HA-2	G5, G12, T8, W12, W13
30	75	30	1500	NP	1500	650	HA-2	G3, G5, G12, G24, T7
31	75	30	1500	NP	1500	650	HA-2	G3, G12, G24, T9
32	75	30	1500	800	1500	650	HA-2	G5, G12, T8, W12, W13, W14
33	75	30	1500	NP	1500	650	HA-2	G12, T9, W13, W14
34	75	30	1500	NP	1500	650	HA-2	G3, G5, G12, G24, T7
35	75	30	1500	NP	1500	650	HA-2	G3, G12, G24, T9
36	75	30	NP	800	NP	NP	HA-2	G5, W12
37	75	30	1500	800	1500	650	HA-2	G5, G12, H1, T8, W12
38	75	30	1500	NP	1500	650	HA-2	G12, H1, T9
39	75	30	NP	800	1500	650	HA-2	G5, G12, T8, W12, W14
40	75	30	NP	800	NP	NP	HA-2	G5, W12
41	75	30	1500	800	1500	650	HA-2	G5, G12, G22, H1, T8
42	75	30	1500	NP	1500	650	HA-2	G12, G22, H1, T9

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
2	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	12.7	...
3	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
4	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	12.7	...
5	16.7	...	14.2	...	12.7	11.7	10.9	10.4	10.2	10.0	9.8	9.6	9.4	...
6	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
7	14.2	...	14.2	...	14.2	13.4	12.5	11.9	11.7	11.4	11.2	11.0	10.8	...
8	14.2	...	12.1	...	10.8	9.9	9.3	8.8	8.7	8.5	8.3	8.1	8.0	...
9	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
10	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
11	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	12.7	...
12	20.0	...	20.0	...	19.4	19.2	17.9	17.0	16.6	16.3	16.0	15.8	15.7	...
13	20.0	...	17.2	...	15.5	14.2	13.3	12.6	12.3	12.1	11.9	11.7	11.6	...
(a) 14	20.0	...	20.0	...	19.4	19.2	17.9	17.0	16.6	16.3	16.1	15.8	...	...
15	20.0	...	20.0	...	19.4	19.2	17.9	17.0	16.6	16.3	16.0	15.8	15.7	15.5
16	20.0	...	17.2	...	15.5	14.2	13.3	12.6	12.3	12.1	11.9	11.7	11.6	11.5
(a) 17	20.0	...	20.0	...	19.4	19.2	17.9	17.0	16.6	16.3	16.0	15.8	...	...
18	20.0	...	20.0	...	19.4	19.2	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
19	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
20	20.0	...	20.0	...	19.4	19.2	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
21	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
22	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
23	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
24	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
25	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
26	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
27	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
28	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
29	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
30	17.0	...	17.0	...	17.0	16.4	15.3	14.5	14.1	13.9	13.7	13.5	13.4	13.2
31	17.0	...	14.7	...	13.2	12.1	11.3	10.7	10.5	10.3	10.1	10.0	9.9	9.8
32	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
33	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
34	17.0	...	17.0	...	17.0	16.4	15.3	14.5	14.1	13.9	13.7	13.5	13.4	13.2
35	17.0	...	14.7	...	13.2	12.1	11.3	10.7	10.5	10.3	10.1	10.0	9.9	9.8
36	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
37	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
38	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
39	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
40	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
41	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
42	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	15.4	14.9	11.5	8.9	6.9	5.4	4.3	3.4	2.8	2.3	1.9	1.6	...	...	...
16	11.4	11.3	11.2	8.9	6.9	5.4	4.3	3.4	2.8	2.3	1.9	1.6	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
19	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
20	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
21	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
22	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
23	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
24	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
25	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
26	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
27	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
28	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
29	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
30	13.1	13.0	12.9	10.5	8.3	6.3	4.7	3.5	2.6	1.9	1.4	1.1	...	...	...
31	9.7	9.6	9.5	9.4	8.3	6.3	4.7	3.5	2.6	1.9	1.4	1.1	...	...	...
32	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
33	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
34	13.1	13.0	12.9	10.5	8.3	6.3	4.7	3.5	2.6	1.9	1.4	1.1	...	...	...
35	9.7	9.6	9.5	9.4	8.3	6.3	4.7	3.5	2.6	1.9	1.4	1.1	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
38	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
39	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
42	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...

(a)

(a)

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	16Cr-12Ni-2Mo	Wld. tube	SA-688	TP316	S31600	...	...	8	1
2	16Cr-12Ni-2Mo	Wld. tube	SA-688	TP316	S31600	...	...	8	1
3	16Cr-12Ni-2Mo	Wld. tube	SA-688	TP316	S31600	...	...	8	1
4	16Cr-12Ni-2Mo	Wld. pipe	SA-813	TP316	S31600	...	...	8	1
5	16Cr-12Ni-2Mo	Wld. pipe	SA-814	TP316	S31600	...	...	8	1
6	16Cr-12Ni-2Mo	Bar	SA/JIS G4303	SUS316	...	...	...	8	1
7	16Cr-12Ni-2Mo	Forgings	SA-182	F316H	S31609	...	> 5	8	1
8	16Cr-12Ni-2Mo	Forgings	SA-182	F316H	S31609	...	> 5	8	1
9	16Cr-12Ni-2Mo	Forgings	SA-965	F316H	S31609	...	...	8	1
10	16Cr-12Ni-2Mo	Forgings	SA-965	F316H	S31609	...	...	8	1
11	16Cr-12Ni-2Mo	Forgings	SA-182	F316H	S31609	...	≤ 5	8	1
12	16Cr-12Ni-2Mo	Forgings	SA-182	F316H	S31609	...	≤ 5	8	1
13	16Cr-12Ni-2Mo	Smls. tube	SA-213	TP316H	S31609	...	...	8	1
14	16Cr-12Ni-2Mo	Smls. tube	SA-213	TP316H	S31609	...	...	8	1
15	16Cr-12Ni-2Mo	Plate	SA-240	316H	S31609	...	...	8	1
16	16Cr-12Ni-2Mo	Plate	SA-240	316H	S31609	...	...	8	1
17	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316H	S31609	...	...	8	1
18	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316H	S31609	...	...	8	1
19	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316H	S31609	...	...	8	1
20	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316H	S31609	...	...	8	1
21	16Cr-12Ni-2Mo	Smls. & wld. pipe	SA-312	TP316H	S31609	...	...	8	1
22	16Cr-12Ni-2Mo	Smls. & wld. pipe	SA-312	TP316H	S31609	...	...	8	1
23	16Cr-12Ni-2Mo	Wld. pipe	SA-312	TP316H	S31609	...	...	8	1
24	16Cr-12Ni-2Mo	Wld. pipe	SA-312	TP316H	S31609	...	...	8	1
25	16Cr-12Ni-2Mo	Wld. pipe	SA-358	316H	S31609	1	...	8	1
26	16Cr-12Ni-2Mo	Smls. pipe	SA-376	TP316H	S31609	...	...	8	1
27	16Cr-12Ni-2Mo	Smls. pipe	SA-376	TP316H	S31609	...	...	8	1
28	16Cr-12Ni-2Mo	Smls. & wld. fittings	SA-403	316H	S31609	...	...	8	1
29	16Cr-12Ni-2Mo	Bar	SA-479	316H	S31609	...	...	8	1
30	16Cr-12Ni-2Mo	Bar	SA-479	316H	S31609	...	...	8	1
31	16Cr-12Ni-2Mo	Wld. pipe	SA-813	TP316H	S31609	...	...	8	1
32	16Cr-12Ni-2Mo	Wld. pipe	SA-814	TP316H	S31609	...	...	8	1
33	16Cr-12Ni-2Mo	Plate	SA/EN 10028-7	X5CrNiMo17-12-2	...	...	≤ 3	8	1
34	16Cr-12Ni-2Mo	Plate	SA/EN 10028-7	X5CrNiMo17-12-2	...	...	≤ 3	8	1
35	16Cr-12Ni-2Mo-Cb	Plate	SA-240	316Cb	S31640	...	...	8	1
36	16Cr-12Ni-2Mo-Cb	Plate	SA-240	316Cb	S31640	...	...	8	1
37	16Cr-12Ni-2Mo-N	Forgings	SA-182	F316LN	S31653	...	> 5	8	1
38	16Cr-12Ni-2Mo-N	Forgings	SA-965	F316LN	S31653	...	...	8	1
39	16Cr-12Ni-2Mo-N	Forgings	SA-182	F316LN	S31653	...	≤ 5	8	1
40	16Cr-12Ni-2Mo-N	Smls. tube	SA-213	TP316LN	S31653	...	...	8	1
41	16Cr-12Ni-2Mo-N	Plate	SA-240	316LN	S31653	...	...	8	1
42	16Cr-12Ni-2Mo-N	Wld. tube	SA-249	TP316LN	S31653	...	...	8	1
43	16Cr-12Ni-2Mo-N	Smls. & wld. pipe	SA-312	TP316LN	S31653	...	...	8	1
44	16Cr-12Ni-2Mo-N	Wld. pipe	SA-358	316LN	S31653	1	...	8	1
45	16Cr-12Ni-2Mo-N	Smls. pipe	SA-376	TP316LN	S31653	...	...	8	1

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	75	30	NP	800	NP	NP	HA-2	G5, W12
2	75	30	NP	NP	1500	650	HA-2	G5, G12, G24, T7
3	75	30	NP	NP	1500	650	HA-2	G12, G24, T9
4	75	30	NP	800	NP	NP	HA-2	G5, W12
5	75	30	NP	800	NP	NP	HA-2	G5, W12
6	75	30	1500	800	1500	NP	HA-2	G5, G12, G22, H1, T8
7	70	30	1500	800	1500	NP	HA-2	G5, G12, T8
8	70	30	1500	NP	1500	NP	HA-2	T9
9	70	30	NP	800	1500	NP	HA-2	G5, T8
10	70	30	NP	NP	1500	NP	HA-2	T9
11	75	30	1500	800	1500	NP	HA-2	G5, T8
12	75	30	1500	NP	1500	NP	HA-2	T9
13	75	30	1500	800	1500	NP	HA-2	G5, T8
14	75	30	1500	NP	1500	NP	HA-2	T9
15	75	30	1500	800	1500	NP	HA-2	G5, T8
16	75	30	1500	NP	1500	NP	HA-2	T9
17	75	30	1500	NP	1500	NP	HA-2	G3, G5, G24, T7
18	75	30	1500	NP	1500	NP	HA-2	G3, G24, T9
19	75	30	1500	NP	NP	NP	HA-2	T9, W13
20	75	30	1500	800	NP	NP	HA-2	G5, T8, W12, W13
21	75	30	1500	800	1500	NP	HA-2	G5, T8, W12, W13
22	75	30	1500	NP	1500	NP	HA-2	T9, W13
23	75	30	1500	NP	1500	NP	HA-2	G3, G5, G24, T7
24	75	30	1500	NP	1500	NP	HA-2	G3, G24, T9
25	75	30	NP	800	NP	NP	HA-2	G5, W12
26	75	30	1500	800	1500	NP	HA-2	G5, H1, T8
27	75	30	1500	NP	1500	NP	HA-2	H1, T9
28	75	30	NP	800	1500	NP	HA-2	G5, G12, T8, W12, W14
29	75	30	1500	800	NP	NP	HA-2	G5, H1, T8
30	75	30	1500	NP	NP	NP	HA-2	H1, T9
31	75	30	NP	800	NP	NP	HA-2	G5, W12
32	75	30	NP	800	NP	NP	HA-2	G5, W12
33	75	32	NP	NP	1022	NP	HA-2	G5
34	75	32	NP	NP	1022	NP	HA-2	...
35	75	30	NP	NP	1500	650	HA-2	G5, G12, T8
36	75	30	NP	NP	1500	650	HA-2	G12, T9
37	70	30	NP	800	NP	NP	HA-2	G5
38	70	30	NP	800	NP	NP	HA-2	G5
39	75	30	NP	800	NP	NP	HA-2	G5
40	75	30	NP	800	NP	NP	HA-2	G5
41	75	30	NP	800	NP	NP	HA-2	G5
42	75	30	NP	800	NP	NP	HA-2	G5, W12
43	75	30	NP	800	NP	NP	HA-2	G5, W12
44	75	30	NP	800	NP	NP	HA-2	G5, W12
45	75	30	NP	800	NP	NP	HA-2	G5

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
2	17.0	...	17.0	...	17.0	16.4	15.3	14.5	14.1	13.9	13.7	13.5	13.4	13.2
3	17.0	...	14.7	...	13.2	12.1	11.3	10.7	10.5	10.3	10.1	10.0	9.9	9.8
4	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
5	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
6	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
7	20.0	...	20.0	...	19.4	19.2	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
8	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
9	20.0	...	20.0	...	19.4	19.2	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
10	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
11	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
12	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
13	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
14	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
15	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
16	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
17	17.0	...	17.0	...	17.0	16.4	15.3	14.5	14.1	13.9	13.7	13.5	13.4	13.2
18	17.0	...	14.7	...	13.2	12.1	11.3	10.7	10.5	10.3	10.1	10.0	9.9	9.8
19	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
20	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
21	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
22	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
23	17.0	...	17.0	...	17.0	16.4	15.3	14.5	14.1	13.9	13.7	13.5	13.4	13.2
24	17.0	...	14.7	...	13.2	12.1	11.3	10.7	10.5	10.3	10.1	10.0	9.9	9.8
25	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
26	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
27	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
28	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
29	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
30	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
31	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
32	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
33	21.3	...	21.3	...	20.9	20.5	19.1	18.1	17.7	17.4	17.1	16.9	16.7	16.6
34	21.3	...	18.4	...	15.6	15.2	14.2	13.4	13.1	12.9	12.7	12.5	12.4	12.3
35	20.0	...	20.0	...	20.0	19.4	17.8	16.8	16.5	16.2	16.0	15.9	15.8	15.7
36	20.0	...	17.7	...	15.8	14.3	13.2	12.4	12.2	12.0	11.9	11.8	11.7	11.6
37	20.0	...	20.0	...	18.9	17.9	17.2	16.5	16.0	15.6	15.2	14.8	...	...
38	20.0	...	20.0	...	18.9	17.9	17.2	16.5	16.0	15.6	15.2	14.8	...	...
39	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
40	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
41	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
42	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
43	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
44	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
45	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	13.1	13.0	12.9	10.5	8.3	6.3	4.7	3.5	2.6	1.9	1.4	1.1	...	...	...
3	9.7	9.6	9.5	9.4	8.3	6.3	4.7	3.5	2.6	1.9	1.4	1.1	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
7	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
8	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
9	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
10	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
11	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
12	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
13	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
14	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
15	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
16	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
17	13.1	13.0	12.9	10.5	8.3	6.3	4.7	3.5	2.6	1.9	1.4	1.1	...	...	...
18	9.7	9.6	9.5	9.4	8.3	6.3	4.7	3.5	2.6	1.9	1.4	1.1	...	...	...
19	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
20	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
21	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
22	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
23	13.1	13.0	12.9	10.5	8.3	6.3	4.7	3.5	2.6	1.9	1.4	1.1	...	...	...
24	9.7	9.6	9.5	9.4	8.3	6.3	4.7	3.5	2.6	1.9	1.4	1.1	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
27	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
28	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
29	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
30	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	16.4	16.3	16.1	...	...	...	...	...	...	...	...	...	...	...	...
34	12.2	12.0	11.9	...	...	...	...	...	...	...	...	...	...	...	...
35	15.5	15.3	15.1	12.3	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3
36	11.5	11.4	11.2	11.0	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	16Cr-12Ni-2Mo-N	Fittings	SA-403	316LN	S31653	...	...	8	1
2	16Cr-12Ni-2Mo-N	Bar	SA-479	316LN	S31653	...	...	8	1
3	16Cr-12Ni-2Mo-N	Wld. tube	SA-688	TP316LN	S31653	...	...	8	1
4	16Cr-12Ni-2Mo-N	Forgings	SA-182	F316N	S31651	...	...	8	1
5	16Cr-12Ni-2Mo-N	Smls. tube	SA-213	TP316N	S31651	...	...	8	1
6	16Cr-12Ni-2Mo-N	Smls. tube	SA-213	TP316N	S31651	...	...	8	1
7	16Cr-12Ni-2Mo-N	Plate	SA-240	316N	S31651	...	...	8	1
8	16Cr-12Ni-2Mo-N	Plate	SA-240	316N	S31651	...	...	8	1
9	16Cr-12Ni-2Mo-N	Wld. tube	SA-249	TP316N	S31651	...	...	8	1
10	16Cr-12Ni-2Mo-N	Wld. tube	SA-249	TP316N	S31651	...	...	8	1
11	16Cr-12Ni-2Mo-N	Wld. tube	SA-249	TP316N	S31651	...	...	8	1
12	16Cr-12Ni-2Mo-N	Wld. tube	SA-249	TP316N	S31651	...	...	8	1
13	16Cr-12Ni-2Mo-N	Smls. & wld. pipe	SA-312	TP316N	S31651	...	...	8	1
14	16Cr-12Ni-2Mo-N	Smls. & wld. pipe	SA-312	TP316N	S31651	...	...	8	1
15	16Cr-12Ni-2Mo-N	Wld. pipe	SA-312	TP316N	S31651	...	...	8	1
16	16Cr-12Ni-2Mo-N	Wld. pipe	SA-312	TP316N	S31651	...	...	8	1
17	16Cr-12Ni-2Mo-N	Wld. pipe	SA-358	316N	S31651	1	...	8	1
18	16Cr-12Ni-2Mo-N	Smls. pipe	SA-376	TP316N	S31651	...	...	8	1
19	16Cr-12Ni-2Mo-N	Smls. pipe	SA-376	TP316N	S31651	...	...	8	1
20	16Cr-12Ni-2Mo-N	Smls. & wld. fittings	SA-403	316N	S31651	...	...	8	1
21	16Cr-12Ni-2Mo-N	Bar	SA-479	316N	S31651	...	...	8	1
22	16Cr-12Ni-2Mo-N	Bar	SA-479	316N	S31651	...	...	8	1
23	16Cr-12Ni-2Mo-N	Wld. tube	SA-688	TP316N	S31651	...	...	8	1
24	16Cr-12Ni-2Mo-N	Wld. pipe	SA-813	TP316N	S31651	...	...	8	1
25	16Cr-12Ni-2Mo-N	Wld. pipe	SA-814	TP316N	S31651	...	...	8	1
26	16Cr-12Ni-2Mo-N	Forgings	SA-965	F316N	S31651	...	...	8	1
27	16Cr-12Ni-2Mo-N	Forgings	SA-965	F316N	S31651	...	...	8	1
28	16Cr-12Ni-2Mo-Ti	Plate	SA-240	316Ti	S31635	...	...	8	1
29	16Cr-12Ni-2Mo-Ti	Plate	SA-240	316Ti	S31635	...	...	8	1
(10) 30	17Cr-4Ni-6Mn	Plate	SA-240	201-1	S20100	...	...	8	3
(10) 31	17Cr-4Ni-6Mn	Plate	SA-240	201-1	S20100	...	...	8	3
(10) 32	17Cr-4Ni-6Mn	Plate	SA-666	201-1	S20100	...	...	8	3
(10) 33	17Cr-4Ni-6Mn	Plate	SA-666	201-1	S20100	...	...	8	3
(10) 34	17Cr-4Ni-6Mn	Plate	SA-240	201-2	S20100	...	...	8	3
(10) 35	17Cr-4Ni-6Mn	Plate	SA-666	201-2	S20100	...	...	8	3
(10) 36	17Cr-7Ni	Plate, sheet, strip	SA-240	301	S30100	...	...	8	1
(10) 37	17Cr-7Ni	Plate, sheet, strip	SA-240	301	S30100	...	...	8	1
38	17.5Cr-17.5Ni-5.3Si	Plate	SA-240	...	S30601	Sol. ann.	...	8	1
39	17.5Cr-17.5Ni-5.3Si	Plate	SA-240	...	S30601	Sol. ann.	...	8	1
40	18Cr-3Ni-12Mn	Plate	SA-240	XM-29	S24000	...	...	8	3
41	18Cr-3Ni-12Mn	Plate	SA-240	XM-29	S24000	...	...	8	3
42	18Cr-3Ni-12Mn	Wld. tube	SA-249	XM-29	S24000	...	...	8	3
43	18Cr-3Ni-12Mn	Wld. tube	SA-249	XM-29	S24000	...	...	8	3

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	75	30	NP	800	NP	NP	HA-2	G5, W12
2	75	30	NP	800	NP	NP	HA-2	G5
3	75	30	NP	800	NP	NP	HA-2	G5, W12
4	80	35	NP	800	NP	NP	HA-2	G5
5	80	35	1200	800	1200	NP	HA-2	G5, G12, T7
6	80	35	1200	NP	1200	NP	HA-2	G12, T8
7	80	35	NP	800	1200	650	HA-2	G5, G12, T7
8	80	35	NP	NP	1200	650	HA-2	G12, T8
9	80	35	1200	NP	NP	NP	HA-2	G5, G12, T7, W13
10	80	35	1200	NP	NP	NP	HA-2	G12, T8, W13
11	80	35	1200	NP	1200	650	HA-2	G3, G12, G24, T8
12	80	35	1200	NP	1200	650	HA-2	G3, G5, G12, G24, T7
13	80	35	1200	800	1200	650	HA-2	G5, G12, T7, W12, W13, W14
14	80	35	1200	NP	1200	650	HA-2	G12, T8, W13, W14
15	80	35	1200	NP	1200	650	HA-2	G3, G12, G24, T8
16	80	35	1200	NP	1200	650	HA-2	G3, G5, G12, G24, T7
17	80	35	NP	800	NP	NP	HA-2	G5, W12
18	80	35	1200	800	1200	650	HA-2	G5, G12, H1, T7
19	80	35	1200	NP	1200	650	HA-2	G12, H1, T8
20	80	35	NP	800	1200	650	HA-2	G5, G12, T7, W12, W14
21	80	35	1200	800	NP	NP	HA-2	G5, G12, H1, T7
22	80	35	1200	NP	NP	NP	HA-2	G12, H1, T8
23	80	35	NP	800	NP	NP	HA-2	G5, W12
24	80	35	NP	800	NP	NP	HA-2	G5, W12
25	80	35	NP	800	NP	NP	HA-2	G5, W12
26	80	35	NP	800	1200	650	HA-2	G5, G12, T7
27	80	35	NP	NP	1200	650	HA-2	G12, T8
28	75	30	NP	NP	1500	650	HA-2	G5, G12, T8
29	75	30	NP	NP	1500	650	HA-2	G12, T9
30	75	38	NP	NP	300	300	HA-2	...
31	75	38	NP	NP	300	300	HA-2	G5
32	75	38	NP	NP	300	300	HA-2	...
33	75	38	NP	NP	300	300	HA-2	G5
34	95	45	NP	NP	300	300	HA-6	...
35	95	45	NP	NP	300	300	HA-6	...
36	75	30	NP	NP	800	NP	HA-1	G5
37	75	30	NP	NP	800	NP	HA-1	...
38	78	37	NP	NP	500	NP	HA-1	G5, H6
39	78	37	NP	NP	500	NP	HA-1	H6
40	100	55	NP	NP	800	650	HA-6	G5
41	100	55	NP	NP	800	650	HA-6	...
42	100	55	NP	NP	800	650	HA-6	G5, G24
43	100	55	NP	NP	800	650	HA-6	G24

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
2	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
3	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
4	22.9	...	22.9	...	22.0	21.5	21.2	21.0	20.5	20.0	19.6	19.2	...	...
5	22.9	...	22.9	...	22.0	21.5	21.2	21.0	20.5	20.0	19.6	19.2	18.8	18.5
6	22.9	...	20.7	...	19.0	17.6	16.5	15.6	15.2	14.9	14.5	14.2	13.9	13.7
7	22.9	...	22.9	...	22.0	21.5	21.2	21.0	20.5	20.0	19.6	19.2	18.8	18.5
8	22.9	...	20.7	...	19.0	17.6	16.5	15.6	15.2	14.9	14.5	14.2	13.9	13.7
9	22.9	...	22.9	...	22.0	21.5	21.2	21.0	20.5	20.0	19.6	19.2	18.8	18.5
10	22.9	...	20.7	...	19.0	17.6	16.5	15.6	15.2	14.9	14.5	14.2	13.9	13.7
11	19.4	...	17.6	...	16.1	15.0	14.0	13.3	12.9	12.6	12.3	12.1	11.9	11.6
12	19.4	...	19.4	...	18.7	18.2	18.1	17.9	17.4	17.0	16.7	16.3	16.0	15.7
13	22.9	...	22.9	...	22.0	21.5	21.2	21.0	20.5	20.0	19.6	19.2	18.8	18.5
14	22.9	...	20.7	...	19.0	17.6	16.5	15.6	15.2	14.9	14.5	14.2	13.9	13.7
15	19.4	...	17.6	...	16.1	15.0	14.0	13.3	12.9	12.6	12.3	12.1	11.9	11.6
16	19.4	...	19.4	...	18.7	18.2	18.1	17.9	17.4	17.0	16.7	16.3	16.0	15.7
17	22.9	...	22.9	...	22.0	21.5	21.2	21.0	20.5	20.0	19.6	19.2	...	...
18	22.9	...	22.9	...	22.0	21.5	21.2	21.0	20.5	20.0	19.6	19.2	18.8	18.5
19	22.9	...	20.7	...	19.0	17.6	16.5	15.6	15.2	14.9	14.5	14.2	13.9	13.7
20	22.9	...	22.9	...	22.0	21.5	21.2	21.0	20.5	20.0	19.6	19.2	18.8	18.5
21	22.9	...	22.9	...	22.0	21.5	21.2	21.0	20.5	20.0	19.6	19.2	18.8	18.5
22	22.9	...	20.7	...	19.0	17.6	16.5	15.6	15.2	14.9	14.5	14.2	13.9	13.7
23	22.9	...	22.9	...	22.0	21.5	21.2	21.0	20.5	20.0	19.6	19.2	...	...
24	22.9	...	22.9	...	22.0	21.5	21.2	21.0	20.5	20.0	19.6	19.2	...	...
25	22.9	...	22.9	...	22.0	21.5	21.2	21.0	20.5	20.0	19.6	19.2	...	...
26	22.9	...	22.9	...	22.0	21.5	21.2	21.0	20.5	20.0	19.6	19.2	18.8	18.5
27	22.9	...	20.7	...	19.0	17.6	16.5	15.6	15.2	14.9	14.5	14.2	13.9	13.7
28	20.0	...	20.0	...	20.0	19.4	17.8	16.8	16.5	16.2	16.0	15.9	15.8	15.7
29	20.0	...	17.7	...	15.8	14.3	13.2	12.4	12.2	12.0	11.9	11.8	11.7	11.6
(10) 30	21.4	...	18.7	...	16.6	...	...	...	...	...	...	...	...	...
(10) 31	21.4	...	18.7	...	17.2	...	...	...	...	...	...	...	...	...
(10) 32	21.4	...	18.7	...	16.6	...	...	...	...	...	...	...	...	...
(10) 33	21.4	...	18.7	...	17.2	...	...	...	...	...	...	...	...	...
(10) 34	27.1	...	22.8	...	19.7	...	...	...	...	...	...	...	...	...
(10) 35	27.1	...	22.8	...	19.7	...	...	...	...	...	...	...	...	...
(10) 36	20.0	...	17.5	...	15.7	15.4	15.4	15.4	15.4	15.3	15.0	14.6	...	...
(10) 37	20.0	...	16.1	...	14.4	13.5	13.0	12.5	12.2	11.9	11.5	11.1	...	...
38	22.3	...	22.3	...	21.1	20.0	18.9	...	...	...	...	...	...	...
39	22.3	...	20.3	...	18.1	16.5	15.1	...	...	...	...	...	...	...
40	28.6	...	27.9	...	26.0	24.9	24.3	23.8	23.4	23.0	22.4	21.8	...	...
41	28.6	...	27.9	...	25.0	21.9	20.1	19.2	18.8	18.5	18.2	17.8	...	...
42	24.3	...	23.7	...	22.1	21.2	20.7	20.2	19.9	19.5	19.1	18.5	...	...
43	24.3	...	23.7	...	21.3	18.7	17.1	16.3	16.0	15.7	15.4	15.1	...	...

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	18.1	17.8	15.8	12.3	9.8	7.4	...	...	...	...	...	...	...	...	...
6	13.4	13.2	12.9	12.3	9.8	7.4	...	...	...	...	...	...	...	...	...
7	18.1	17.8	15.8	12.3	9.8	7.4	...	...	...	...	...	...	...	...	...
8	13.4	13.2	12.9	12.3	9.8	7.4	...	...	...	...	...	...	...	...	...
9	18.1	17.8	15.8	12.3	9.8	7.4	...	...	...	...	...	...	...	...	...
10	13.4	13.2	12.9	12.3	9.8	7.4	...	...	...	...	...	...	...	...	...
11	11.4	11.2	11.0	10.5	8.3	6.3	...	...	...	...	...	...	...	...	...
12	15.4	15.1	13.4	10.5	8.3	6.3	...	...	...	...	...	...	...	...	...
13	18.1	17.8	15.8	12.3	9.8	7.4	...	...	...	...	...	...	...	...	...
14	13.4	13.2	12.9	12.3	9.8	7.4	...	...	...	...	...	...	...	...	...
15	11.4	11.2	11.0	10.5	8.3	6.3	...	...	...	...	...	...	...	...	...
16	15.4	15.1	13.4	10.5	8.3	6.3	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	18.1	17.8	15.8	12.3	9.8	7.4	...	...	...	...	...	...	...	...	...
19	13.4	13.2	12.9	12.3	9.8	7.4	...	...	...	...	...	...	...	...	...
20	18.1	17.8	15.8	12.3	9.8	7.4	...	...	...	...	...	...	...	...	...
21	18.1	17.8	15.8	12.3	9.8	7.4	...	...	...	...	...	...	...	...	...
22	13.4	13.2	12.9	12.3	9.8	7.4	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	18.1	17.8	15.8	12.3	9.8	7.4	...	...	...	...	...	...	...	...	...
27	13.4	13.2	12.9	12.3	9.8	7.4	...	...	...	...	...	...	...	...	...
28	15.5	15.3	15.1	12.3	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
29	11.5	11.4	11.2	11.0	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3
30	(10)
31	(10)
32	(10)
33	(10)
34	(10)
35	(10)
36	(10)
37	(10)
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	18Cr-3Ni-12Mn	Wld. pipe	SA-312	XM-29	S24000	...	...	8	3
2	18Cr-3Ni-12Mn	Wld. pipe	SA-312	XM-29	S24000	...	...	8	3
3	18Cr-3Ni-12Mn	Bar	SA-479	XM-29	S24000	...	...	8	3
4	18Cr-3Ni-12Mn	Bar	SA-479	XM-29	S24000	...	...	8	3
5	18Cr-3Ni-12Mn	Wld. tube	SA-688	TPXM-29	S24000	...	...	8	3
6	18Cr-3Ni-12Mn	Wld. tube	SA-688	TPXM-29	S24000	...	...	8	3
7	18Cr-5Ni-3Mo	Smls. tube	SA-789	...	S31500	...	...	10H	1
8	18Cr-5Ni-3Mo	Wld. tube	SA-789	...	S31500	...	...	10H	1
9	18Cr-5Ni-3Mo	Smls. pipe	SA-790	...	S31500	...	...	10H	1
10	18Cr-5Ni-3Mo	Wld. pipe	SA-790	...	S31500	...	...	10H	1
11	18Cr-8Ni	Forgings	SA-182	F304L	S30403	...	> 5	8	1
12	18Cr-8Ni	Forgings	SA-182	F304L	S30403	...	> 5	8	1
13	18Cr-8Ni	Forgings	SA-965	F304L	S30403	...	...	8	1
14	18Cr-8Ni	Forgings	SA-965	F304L	S30403	...	...	8	1
15	18Cr-8Ni	Forgings	SA-182	F304L	S30403	...	≤ 5	8	1
16	18Cr-8Ni	Forgings	SA-182	F304L	S30403	...	≤ 5	8	1
17	18Cr-8Ni	Smls. tube	SA-213	TP304L	S30403	...	...	8	1
18	18Cr-8Ni	Smls. tube	SA-213	TP304L	S30403	...	...	8	1
19	18Cr-8Ni	Plate	SA-240	304L	S30403	...	...	8	1
20	18Cr-8Ni	Plate	SA-240	304L	S30403	...	...	8	1
21	18Cr-8Ni	Wld. tube	SA-249	TP304L	S30403	...	...	8	1
22	18Cr-8Ni	Wld. tube	SA-249	TP304L	S30403	...	...	8	1
23	18Cr-8Ni	Wld. tube	SA-249	TP304L	S30403	...	...	8	1
24	18Cr-8Ni	Smls. & wld. pipe	SA-312	TP304L	S30403	...	...	8	1
25	18Cr-8Ni	Smls. pipe	SA-312	TP304L	S30403	...	...	8	1
26	18Cr-8Ni	Wld. pipe	SA-312	TP304L	S30403	...	...	8	1
27	18Cr-8Ni	Wld. pipe	SA-312	TP304L	S30403	...	...	8	1
28	18Cr-8Ni	Wld. pipe	SA-358	304L	S30403	1	...	8	1
29	18Cr-8Ni	Smls. & wld. fittings	SA-403	304L	S30403	...	...	8	1
30	18Cr-8Ni	Wld. pipe	SA-409	TP304L	S30403	...	...	8	1
31	18Cr-8Ni	Bar	SA-479	304L	S30403	...	...	8	1
32	18Cr-8Ni	Bar	SA-479	304L	S30403	...	...	8	1
33	18Cr-8Ni	Wld. tube	SA-688	TP304L	S30403	...	...	8	1
34	18Cr-8Ni	Wld. tube	SA-688	TP304L	S30403	...	...	8	1
35	18Cr-8Ni	Wld. tube	SA-688	TP304L	S30403	...	...	8	1
36	18Cr-8Ni	Wld. pipe	SA-813	TP304L	S30403	...	...	8	1
37	18Cr-8Ni	Wld. pipe	SA-814	TP304L	S30403	...	...	8	1
38	18Cr-8Ni	Bar	SA/JIS G4303	SUS304L	...	...	...	8	1
39	18Cr-8Ni	Forgings	SA-182	F304	S30400	...	> 5	8	1
40	18Cr-8Ni	Forgings	SA-182	F304	S30400	...	> 5	8	1
41	18Cr-8Ni	Forgings	SA-182	F304H	S30409	...	> 5	8	1
42	18Cr-8Ni	Forgings	SA-182	F304H	S30409	...	> 5	8	1

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	100	55	NP	NP	800	650	HA-6	G5, G24
2	100	55	NP	NP	800	650	HA-6	G24
3	100	55	NP	NP	800	650	HA-6	G5, G22
4	100	55	NP	NP	800	650	HA-6	G22
5	100	55	NP	NP	800	650	HA-6	G5, G24
6	100	55	NP	NP	800	650	HA-6	G24
7	92	64	NP	NP	750	650	HA-5	G32
8	92	64	NP	NP	750	650	HA-5	G24, G32
9	92	64	NP	NP	750	650	HA-5	G32
10	92	64	NP	NP	750	650	HA-5	G24, G32
11	65	25	800	800	1200	650	HA-3	G5, G34, T4
12	65	25	800	NP	1200	650	HA-3	G34, T6
13	65	25	800	800	1200	650	HA-3	G5, G34, T4
14	65	25	800	NP	1200	650	HA-3	G34, T6
15	70	25	800	800	1200	650	HA-3	G5, G34, T4
16	70	25	800	NP	1200	650	HA-3	G34, T6
17	70	25	800	800	1200	NP	HA-3	G5, G34, T4
18	70	25	800	NP	1200	NP	HA-3	G34, T6
19	70	25	800	800	1200	650	HA-3	G5, G34, T4
20	70	25	800	NP	1200	650	HA-3	G34, T6
21	70	25	NP	800	NP	NP	HA-3	G5, W12
22	70	25	800	NP	1200	650	HA-3	G5, G24, G34, T4
23	70	25	800	NP	1200	650	HA-3	G24, G34, T6
24	70	25	800	800	1200	650	HA-3	G5, G34, T4, W12, W14
25	70	25	800	NP	1200	650	HA-3	G34, T6
26	70	25	800	NP	1200	650	HA-3	G5, G24, G34, T4
27	70	25	800	NP	1200	650	HA-3	G24, G34, T6
28	70	25	NP	800	NP	NP	HA-3	G5, W12
29	70	25	NP	800	1200	650	HA-3	G5, T4, W12, W14
30	70	25	NP	800	NP	NP	HA-3	G5, W12
31	70	25	800	800	1200	650	HA-3	G5, G22, G34, T4
32	70	25	800	NP	1200	650	HA-3	G22, G34, T6
33	70	25	NP	800	NP	NP	HA-3	G5, W12
34	70	25	NP	NP	1200	650	HA-3	G5, G24, T4
35	70	25	NP	NP	1200	650	HA-3	G24, T6
36	70	25	NP	800	NP	NP	HA-3	G5, W12
37	70	25	NP	800	NP	NP	HA-3	G5, W12
38	70	25	800	800	1200	NP	HA-3	G5, G22, G34, T4
39	70	30	1500	800	1500	650	HA-1	G5, G12, T7
40	70	30	1500	NP	1500	650	HA-1	G12, T8
41	70	30	1500	800	1500	NP	HA-1	G5, T7
42	70	30	1500	NP	1500	NP	HA-1	T8

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	24.3	...	23.7	...	22.1	21.2	20.7	20.2	19.9	19.5	19.1	18.5	...	...
2	24.3	...	23.7	...	21.3	18.7	17.1	16.3	16.0	15.7	15.4	15.1	...	...
3	28.6	...	27.9	...	26.0	24.9	24.3	23.8	23.4	23.0	22.4	21.8	...	...
4	28.6	...	27.9	...	25.0	21.9	20.1	19.2	18.8	18.5	18.2	17.8	...	...
5	24.3	...	23.7	...	22.1	21.2	20.7	20.2	19.9	19.5	19.1	18.5	...	...
6	24.3	...	23.7	...	21.3	18.7	17.1	16.3	16.0	15.7	15.4	15.1	...	...
7	26.3	...	25.4	...	24.4	24.2	24.2	24.2	24.2	24.2	24.2	...	...	...
8	22.3	...	21.6	...	20.7	20.6	20.6	20.6	20.6	20.6	20.6	...	...	...
9	26.3	...	25.4	...	24.4	24.2	24.2	24.2	24.2	24.2	24.2	...	...	...
10	22.3	...	21.6	...	20.7	20.6	20.6	20.6	20.6	20.6	20.6	...	...	...
11	16.7	...	16.7	...	16.2	15.6	14.7	14.0	13.7	13.5	13.3	13.0	12.8	11.9
12	16.7	...	14.3	...	12.8	11.7	10.9	10.4	10.2	10.0	9.8	9.7	9.5	9.3
13	16.7	...	16.7	...	16.2	15.6	14.7	14.0	13.7	13.5	13.3	13.0	12.8	11.9
14	16.7	...	14.3	...	12.8	11.7	10.9	10.4	10.2	10.0	9.8	9.7	9.5	9.3
15	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	12.8	11.9
16	16.7	...	14.3	...	12.8	11.7	10.9	10.4	10.2	10.0	9.8	9.7	9.5	9.3
17	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	12.8	11.9
18	16.7	...	14.3	...	12.8	11.7	10.9	10.4	10.2	10.0	9.8	9.7	9.5	9.3
19	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	12.8	11.9
20	16.7	...	14.3	...	12.8	11.7	10.9	10.4	10.2	10.0	9.8	9.7	9.5	9.3
21	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	...	...
22	14.2	...	14.2	...	14.2	13.4	12.5	11.9	11.7	11.4	11.3	11.1	10.9	10.1
23	14.2	...	12.1	...	10.9	9.9	9.3	8.8	8.6	8.5	8.3	8.2	8.1	7.9
24	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	12.8	11.9
25	16.7	...	14.3	...	12.8	11.7	10.9	10.4	10.2	10.0	9.8	9.7	9.5	9.3
26	14.2	...	14.2	...	14.2	13.4	12.5	11.9	11.7	11.4	11.3	11.1	10.9	10.1
27	14.2	...	12.1	...	10.9	9.9	9.3	8.8	8.6	8.5	8.3	8.2	8.1	7.9
28	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	...	...
29	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	12.8	11.9
30	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	...	...
31	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	12.8	11.9
32	16.7	...	14.3	...	12.8	11.7	10.9	10.4	10.2	10.0	9.8	9.7	9.5	9.3
33	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	...	...
34	14.2	...	14.2	...	14.2	13.4	12.5	11.9	11.7	11.4	11.3	11.1	10.9	10.1
35	14.2	...	12.1	...	10.9	9.9	9.3	8.8	8.6	8.5	8.3	8.2	8.1	7.9
36	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	...	...
37	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	...	...
38	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	12.8	11.9
39	20.0	...	18.9	...	17.7	17.1	16.9	16.6	16.2	15.8	15.5	15.2	14.9	14.6
40	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
41	20.0	...	18.9	...	17.7	17.1	16.9	16.6	16.2	15.8	15.5	15.2	14.9	14.6
42	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	9.9	7.8	6.3	5.1	4.0	3.2	...	...	...	...	...	...	...	...	...
12	9.1	7.8	6.3	5.1	4.0	3.2	...	...	...	...	...	...	...	...	...
13	9.9	7.8	6.3	5.1	4.0	3.2	...	...	...	...	...	...	...	...	...
14	9.1	7.8	6.3	5.1	4.0	3.2	...	...	...	...	...	...	...	...	...
15	9.9	7.8	6.3	5.1	4.0	3.2	...	...	...	...	...	...	...	...	...
16	9.1	7.8	6.3	5.1	4.0	3.2	...	...	...	...	...	...	...	...	...
17	9.9	7.8	6.3	5.1	4.0	3.2	...	...	...	...	...	...	...	...	...
18	9.1	7.8	6.3	5.1	4.0	3.2	...	...	...	...	...	...	...	...	...
19	9.9	7.8	6.3	5.1	4.0	3.2	...	...	...	...	...	...	...	...	...
20	9.1	7.8	6.3	5.1	4.0	3.2	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	8.4	6.6	5.4	4.3	3.4	2.7	...	...	...	...	...	...	...	...	...
23	7.7	6.6	5.4	4.3	3.4	2.7	...	...	...	...	...	...	...	...	...
24	9.9	7.8	6.3	5.1	4.0	3.2	...	...	...	...	...	...	...	...	...
25	9.1	7.8	6.3	5.1	4.0	3.2	...	...	...	...	...	...	...	...	...
26	8.4	6.6	5.4	4.3	3.4	2.7	...	...	...	...	...	...	...	...	...
27	7.7	6.6	5.4	4.3	3.4	2.7	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	9.9	7.8	6.3	5.1	4.0	3.2	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	9.9	7.8	6.3	5.1	4.0	3.2	...	...	...	...	...	...	...	...	...
32	9.1	7.8	6.3	5.1	4.0	3.2	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	8.4	6.6	5.4	4.3	3.4	2.7	...	...	...	...	...	...	...	...	...
35	7.7	6.6	5.4	4.3	3.4	2.7	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	9.9	7.8	6.3	5.1	4.0	3.2	...	...	...	...	...	...	...	...	...
39	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
40	10.6	10.4	10.1	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
41	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
42	10.6	10.4	10.1	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	18Cr-8Ni	Castings	SA-351	CF3	J92500	...	...	8	1
2	18Cr-8Ni	Castings	SA-351	CF3	J92500	...	...	8	1
3	18Cr-8Ni	Castings	SA-351	CF8	J92600	...	...	8	1
4	18Cr-8Ni	Castings	SA-351	CF8	J92600	...	...	8	1
5	18Cr-8Ni	Castings	SA-351	CF8	J92600	...	...	8	1
6	18Cr-8Ni	Smls. pipe	SA-376	TP304	S30400	...	...	8	1
7	18Cr-8Ni	Smls. pipe	SA-376	TP304	S30400	...	...	8	1
8	18Cr-8Ni	Cast pipe	SA-451	CPF3	J92500	...	...	8	1
9	18Cr-8Ni	Cast pipe	SA-451	CPF8	J92600	...	...	8	1
10	18Cr-8Ni	Forgings	SA-965	F304	S30400	...	...	8	1
11	18Cr-8Ni	Forgings	SA-965	F304	S30400	...	...	8	1
12	18Cr-8Ni	Forgings	SA-965	F304H	S30409	...	...	8	1
13	18Cr-8Ni	Forgings	SA-965	F304H	S30409	...	...	8	1
14	18Cr-8Ni	Forgings	SA-182	F304	S30400	...	≤ 5	8	1
15	18Cr-8Ni	Forgings	SA-182	F304	S30400	...	≤ 5	8	1
16	18Cr-8Ni	Forgings	SA-182	F304H	S30409	...	≤ 5	8	1
17	18Cr-8Ni	Forgings	SA-182	F304H	S30409	...	≤ 5	8	1
18	18Cr-8Ni	Smls. tube	SA-213	TP304	S30400	...	...	8	1
19	18Cr-8Ni	Smls. tube	SA-213	TP304	S30400	...	...	8	1
20	18Cr-8Ni	Smls. tube	SA-213	TP304H	S30409	...	...	8	1
21	18Cr-8Ni	Smls. tube	SA-213	TP304H	S30409	...	...	8	1
22	18Cr-8Ni	Plate	SA-240	302	S30200	...	...	8	1
23	18Cr-8Ni	Plate	SA-240	302	S30200	...	...	8	1
24	18Cr-8Ni	Plate	SA-240	304	S30400	...	...	8	1
25	18Cr-8Ni	Plate	SA-240	304	S30400	...	...	8	1
26	18Cr-8Ni	Plate	SA-240	304H	S30409	...	...	8	1
27	18Cr-8Ni	Plate	SA-240	304H	S30409	...	...	8	1
28	18Cr-8Ni	Wld. tube	SA-249	TP304	S30400	...	...	8	1
29	18Cr-8Ni	Wld. tube	SA-249	TP304	S30400	...	...	8	1
30	18Cr-8Ni	Wld. tube	SA-249	TP304	S30400	...	...	8	1
31	18Cr-8Ni	Wld. tube	SA-249	TP304	S30400	...	...	8	1
32	18Cr-8Ni	Wld. tube	SA-249	TP304H	S30409	...	...	8	1
33	18Cr-8Ni	Wld. tube	SA-249	TP304H	S30409	...	...	8	1
34	18Cr-8Ni	Wld. tube	SA-249	TP304H	S30409	...	...	8	1
35	18Cr-8Ni	Wld. tube	SA-249	TP304H	S30409	...	...	8	1
36	18Cr-8Ni	Smls. & wld. pipe	SA-312	TP304	S30400	...	...	8	1
37	18Cr-8Ni	Smls. & wld. pipe	SA-312	TP304	S30400	...	...	8	1
38	18Cr-8Ni	Wld. pipe	SA-312	TP304	S30400	...	...	8	1
39	18Cr-8Ni	Wld. pipe	SA-312	TP304	S30400	...	...	8	1
40	18Cr-8Ni	Smls. & wld. pipe	SA-312	TP304H	S30409	...	...	8	1
41	18Cr-8Ni	Smls. & wld. pipe	SA-312	TP304H	S30409	...	...	8	1
42	18Cr-8Ni	Wld. pipe	SA-312	TP304H	S30409	...	...	8	1
43	18Cr-8Ni	Wld. pipe	SA-312	TP304H	S30409	...	...	8	1

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	70	30	NP	800	800	650	HA-3	G1, G5, G16, G17, G32
2	70	30	NP	NP	800	650	HA-3	G1, G32
3	70	30	1500	800	NP	NP	HA-1	G1, G5, G12, G16, G17, G32, H1, T6
4	70	30	1500	NP	1500	650	HA-1	G1, G12, G32, H1, T7
5	70	30	NP	NP	1500	650	HA-1	G1, G5, G12, G32, T6
6	70	30	NP	800	1500	650	HA-1	G5, G12, S9, T7
7	70	30	NP	NP	1500	650	HA-1	G12, S9, T8
8	70	30	NP	800	NP	NP	HA-3	G5, G16, G17, G32
9	70	30	NP	800	NP	NP	HA-1	G5, G16, G17, G32
10	70	30	1500	800	1500	650	HA-1	G5, G12, T7
11	70	30	1500	NP	1500	650	HA-1	G12, T8
12	70	30	NP	800	1500	NP	HA-1	G5, T7
13	70	30	NP	NP	1500	NP	HA-1	T8
14	75	30	1500	NP	1500	NP	HA-1	G12, T8
15	75	30	1500	800	1500	NP	HA-1	G5, G12, T7
16	75	30	1500	NP	1500	NP	HA-1	T8
17	75	30	1500	800	1500	NP	HA-1	G5, T7
18	75	30	1500	NP	1500	NP	HA-1	G12, T8
19	75	30	1500	800	1500	NP	HA-1	G5, G12, T7
20	75	30	1500	NP	1500	NP	HA-1	T8
21	75	30	1500	800	1500	NP	HA-1	G5, T7
22	75	30	NP	NP	750	650	HA-1	G5
23	75	30	NP	NP	750	650	HA-1	...
24	75	30	1500	NP	1500	650	HA-1	G12, T8
25	75	30	1500	800	1500	650	HA-1	G5, G12, H1, T7
26	75	30	1500	800	1500	NP	HA-1	G5, T7
27	75	30	1500	NP	1500	NP	HA-1	T8
28	75	30	1500	NP	NP	NP	HA-1	G12, T8, W13
29	75	30	1500	800	NP	NP	HA-1	G5, G12, T7, W12, W13
30	75	30	1500	NP	1500	650	HA-1	G3, G5, G12, G24, T7
31	75	30	1500	NP	1500	650	HA-1	G3, G12, G24, T8
32	75	30	1500	NP	NP	NP	HA-1	T8, W13
33	75	30	1500	800	NP	NP	HA-1	G5, T7, W12, W13
34	75	30	1500	NP	1500	NP	HA-1	G3, G5, G24, T7
35	75	30	1500	NP	1500	NP	HA-1	G3, G24, T8
36	75	30	1500	800	1500	650	HA-1	G5, G12, T7, W12, W13, W14
37	75	30	1500	NP	1500	650	HA-1	G12, T8, W13, W14
38	75	30	1500	NP	1500	650	HA-1	G3, G5, G12, G24, T7
39	75	30	1500	NP	1500	650	HA-1	G3, G12, G24, T8
40	75	30	1500	800	1500	NP	HA-1	G5, T7, W12, W13, W14
41	75	30	1500	NP	1500	NP	HA-1	T8, W13, W14
42	75	30	1500	NP	1500	NP	HA-1	G3, G5, G24, T7
43	75	30	1500	NP	1500	NP	HA-1	G3, G24, T8

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	20.0	...	18.9	...	17.7	17.1	16.9	16.6	16.2	15.8	15.5	15.2	...	...
2	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	...	...
3	20.0	...	18.9	...	17.7	17.1	16.9	16.6	16.2	15.8	15.5	15.2	14.9	14.6
4	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
5	20.0	...	18.9	...	17.7	17.1	16.9	16.6	16.2	15.8	15.5	15.2	14.9	14.6
6	20.0	...	18.9	...	17.7	17.1	16.9	16.6	16.2	15.8	15.5	15.2	14.9	14.6
7	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
8	20.0	...	18.9	...	17.7	17.1	16.9	16.6	16.2	15.8	15.5	15.2	...	...
9	20.0	...	18.9	...	17.7	17.1	16.9	16.6	16.2	15.8	15.5	15.2	...	...
10	20.0	...	18.9	...	17.7	17.1	16.9	16.6	16.2	15.8	15.5	15.2	14.9	14.6
11	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
12	20.0	...	18.9	...	17.7	17.1	16.9	16.6	16.2	15.8	15.5	15.2	14.9	14.6
13	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
14	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
15	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	14.9	14.6
16	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
17	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	14.9	14.6
18	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
19	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	14.9	14.6
20	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
21	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	14.9	14.6
22	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	...	...	...
23	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	...	...	...
24	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
25	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	14.9	14.6
26	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	14.9	14.6
27	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
28	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
29	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	14.9	14.6
30	17.0	...	17.0	...	16.1	15.5	14.8	14.1	13.8	13.5	13.2	12.9	12.6	12.4
31	17.0	...	14.2	...	12.7	11.7	11.0	10.4	10.2	10.0	9.8	9.6	9.4	9.2
32	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
33	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	14.9	14.6
34	17.0	...	17.0	...	16.1	15.5	14.8	14.1	13.8	13.5	13.2	12.9	12.6	12.4
35	17.0	...	14.2	...	12.7	11.7	11.0	10.4	10.2	10.0	9.8	9.6	9.4	9.2
36	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	14.9	14.6
37	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
38	17.0	...	17.0	...	16.1	15.5	14.8	14.1	13.8	13.5	13.2	12.9	12.6	12.4
39	17.0	...	14.2	...	12.7	11.7	11.0	10.4	10.2	10.0	9.8	9.6	9.4	9.2
40	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	14.9	14.6
41	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
42	17.0	...	17.0	...	16.1	15.5	14.8	14.1	13.8	13.5	13.2	12.9	12.6	12.4
43	17.0	...	14.2	...	12.7	11.7	11.0	10.4	10.2	10.0	9.8	9.6	9.4	9.2

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	14.3	12.2	9.5	7.5	6.0	4.8	3.9	3.3	2.7	2.3	2.0	1.7	...	...	...
4	10.6	10.4	9.5	7.5	6.0	4.8	3.9	3.3	2.7	2.3	2.0	1.7	...	...	...
5	14.3	12.2	9.5	7.5	6.0	4.8	3.9	3.3	2.7	2.3	2.0	1.7	...	...	...
6	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
7	10.6	10.4	10.1	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
11	10.6	10.4	10.1	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
12	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
13	10.6	10.4	10.1	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
14	10.6	10.4	10.1	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
15	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
16	10.6	10.4	10.1	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
17	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
18	10.6	10.4	10.1	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
19	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
20	10.6	10.4	10.1	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
21	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	10.6	10.4	10.1	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
25	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
26	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
27	10.6	10.4	10.1	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
28	10.6	10.4	10.1	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
29	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
30	12.1	11.9	10.5	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2	...	...	...
31	9.0	8.8	8.6	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2	...	...	...
32	10.6	10.4	10.1	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
33	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
34	12.1	11.9	10.5	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2	...	...	...
35	9.0	8.8	8.6	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2	...	...	...
36	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
37	10.6	10.4	10.1	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
38	12.1	11.9	10.5	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2	...	...	...
39	9.0	8.8	8.6	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2	...	...	...
40	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
41	10.6	10.4	10.1	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
42	12.1	11.9	10.5	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2	...	...	...
43	9.0	8.8	8.6	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	18Cr-8Ni	Wld. pipe	SA-358	304	S30400	1	...	8	1
2	18Cr-8Ni	Wld. pipe	SA-358	304H	S30409	1	...	8	1
3	18Cr-8Ni	Wld. pipe	SA-358	304LN	S30453	1	...	8	1
4	18Cr-8Ni	Smls. pipe	SA-376	TP304	S30400	...	...	8	1
5	18Cr-8Ni	Smls. pipe	SA-376	TP304	S30400	...	...	8	1
6	18Cr-8Ni	Smls. pipe	SA-376	TP304H	S30409	...	...	8	1
7	18Cr-8Ni	Smls. pipe	SA-376	TP304H	S30409	...	...	8	1
8	18Cr-8Ni	Smls. & wld. fittings	SA-403	304	S30400	...	...	8	1
9	18Cr-8Ni	Smls. & wld. fittings	SA-403	304H	S30409	...	...	8	1
10	18Cr-8Ni	Wld. pipe	SA-409	TP304	S30400	...	...	8	1
11	18Cr-8Ni	Bar	SA-479	302	S30200	...	...	8	1
12	18Cr-8Ni	Bar	SA-479	302	S30200	...	...	8	1
13	18Cr-8Ni	Bar	SA-479	304	S30400	...	...	8	1
14	18Cr-8Ni	Bar	SA-479	304	S30400	...	...	8	1
15	18Cr-8Ni	Bar	SA-479	304H	S30409	...	...	8	1
16	18Cr-8Ni	Bar	SA-479	304H	S30409	...	...	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-688	TP304	S30400	...	...	8	1
20	18Cr-8Ni	Wld. pipe	SA-813	TP304	S30400	...	...	8	1
21	18Cr-8Ni	Wld. pipe	SA-813	TP304H	S30409	...	...	8	1
22	18Cr-8Ni	Wld. pipe	SA-814	TP304	S30400	...	...	8	1
23	18Cr-8Ni	Wld. pipe	SA-814	TP304H	S30409	...	...	8	1
24	18Cr-8Ni	Bar	SA/JIS G4303	SUS302	...	...	...	8	1
25	18Cr-8Ni	Bar	SA/JIS G4303	SUS304	...	...	...	8	1
26	18Cr-8Ni	Plate	SA/EN 10028-7	X5CrNi18-10	...	...	≤ 3	8	1
27	18Cr-8Ni	Plate	SA/EN 10028-7	X5CrNi18-10	...	...	≤ 3	8	1
28	18Cr-8Ni	Castings	SA-351	CF3A	J92500	...	...	8	1
29	18Cr-8Ni	Castings	SA-351	CF3A	J92500	...	...	8	1
30	18Cr-8Ni	Castings	SA-351	CF8A	J92600	...	...	8	1
31	18Cr-8Ni	Castings	SA-351	CF8A	J92600	...	...	8	1
32	18Cr-8Ni	Cast pipe	SA-451	CPF3A	J92500	...	...	8	1
33	18Cr-8Ni	Cast pipe	SA-451	CPF8A	J92600	...	...	8	1
34	18Cr-8Ni-N	Forgings	SA-182	F304LN	S30453	...	> 5	8	1
35	18Cr-8Ni-N	Forgings	SA-965	F304LN	S30453	...	...	8	1
36	18Cr-8Ni-N	Forgings	SA-182	F304LN	S30453	...	≤ 5	8	1
37	18Cr-8Ni-N	Smls. tube	SA-213	TP304LN	S30453	...	...	8	1
38	18Cr-8Ni-N	Plate	SA-240	304LN	S30453	...	...	8	1
39	18Cr-8Ni-N	Wld. tube	SA-249	TP304LN	S30453	...	...	8	1
40	18Cr-8Ni-N	Smls. & wld. pipe	SA-312	TP304LN	S30453	...	...	8	1
41	18Cr-8Ni-N	Smls. pipe	SA-376	TP304LN	S30453	...	...	8	1

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	75	30	NP	800	NP	NP	HA-1	G5, W12
2	75	30	NP	800	NP	NP	HA-1	G5, W12
3	75	30	NP	800	NP	NP	HA-1	G5, W12
4	75	30	1500	800	1500	650	HA-1	G5, G12, H1, T7
5	75	30	1500	NP	1500	650	HA-1	G12, H1, T8
6	75	30	1500	800	1500	NP	HA-1	G5, H1, T7
7	75	30	1500	NP	1500	NP	HA-1	H1, T8
8	75	30	NP	800	1500	650	HA-1	G5, G12, T7, W12, W14
9	75	30	NP	800	1500	NP	HA-1	G5, T7, W12, W14
10	75	30	NP	800	NP	NP	HA-1	G5, W12
11	75	30	NP	800	750	650	HA-1	G5, G24
12	75	30	NP	NP	750	650	HA-1	G22
13	75	30	1500	800	1500	650	HA-1	G5, G12, G22, T7
14	75	30	1500	NP	1500	650	HA-1	G12, G22, T8
15	75	30	1500	800	1500	NP	HA-1	G5, G22, T7
16	75	30	1500	NP	1500	NP	HA-1	G22, T8
17	75	30	NP	800	NP	NP	HA-1	G5, W12
18	75	30	NP	NP	1500	650	HA-1	G5, G12, G24, T7
19	75	30	NP	NP	1500	650	HA-1	G12, G24, T8
20	75	30	NP	800	NP	NP	HA-1	G5, W12
21	75	30	NP	800	NP	NP	HA-1	G5, W12
22	75	30	NP	800	NP	NP	HA-1	G5, W12
23	75	30	NP	800	NP	NP	HA-1	G5, W12
24	75	30	NP	800	750	NP	HA-1	G5, G24
25	75	30	1500	800	1500	NP	HA-1	G5, G12, G22, T7
26	75	31	NP	NP	1022	NP	HA-1	G5
27	75	31	NP	NP	1022	NP	HA-1	...
28	77	35	NP	650	700	650	HA-3	G1, G5, G16, G17, G32
29	77	35	NP	NP	700	650	HA-3	G1, G32
30	77	35	NP	650	650	650	HA-1	G1, G5, G16, G17, G32
31	77	35	NP	NP	650	650	HA-1	G1, G32
32	77	35	NP	650	NP	NP	HA-3	G5, G16, G17, G32
33	77	35	NP	650	NP	NP	HA-1	G5, G16, G17, G32
34	70	30	NP	800	NP	NP	HA-1	G5
35	70	30	NP	800	NP	NP	HA-1	G5
36	75	30	NP	800	NP	NP	HA-1	G5
37	75	30	NP	800	NP	NP	HA-1	G5
38	75	30	NP	800	NP	NP	HA-1	G5
39	75	30	NP	800	NP	NP	HA-1	G5, W12
40	75	30	NP	800	NP	NP	HA-1	G5, W12, W14
41	75	30	NP	800	NP	NP	HA-1	G5

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
2	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
3	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
4	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	14.9	14.6
5	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
6	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	14.9	14.6
7	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
8	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	14.9	14.6
9	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	14.9	14.6
10	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
11	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
12	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	...	...	...
13	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	14.9	14.6
14	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
15	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	14.9	14.6
16	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
17	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
18	17.0	...	17.0	...	16.1	15.5	14.8	14.1	13.8	13.5	13.2	12.9	12.6	12.4
19	17.0	...	14.2	...	12.7	11.7	11.0	10.4	10.2	10.0	9.8	9.6	9.4	9.2
20	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
21	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
22	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
23	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
24	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
25	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	14.9	14.6
26	20.3	...	20.3	...	19.0	18.4	17.7	16.8	16.4	16.1	15.7	15.4	15.1	14.8
27	20.3	...	16.9	...	15.2	14.0	13.1	12.5	12.2	11.9	11.7	11.4	11.2	11.0
28	22.0	...	20.8	...	19.4	18.8	18.6	18.6	18.6	18.5	...	...	...	...
29	22.0	...	19.5	...	17.5	16.1	15.1	14.3	14.0	13.7	...	...	...	...
30	22.0	...	20.8	...	19.4	18.8	18.6	18.6	18.6	...	...	...	...	...
31	22.0	...	19.5	...	17.5	16.1	15.1	14.3	14.0	...	...	...	...	...
32	22.0	...	20.8	...	19.4	18.8	18.6	18.6	18.6	...	...	...	...	...
33	22.0	...	20.8	...	19.4	18.8	18.6	18.6	18.6	...	...	...	...	...
34	20.0	...	18.9	...	17.7	17.1	16.9	16.6	16.2	15.8	15.5	15.2	...	...
35	20.0	...	18.9	...	17.7	17.1	16.9	16.6	16.2	15.8	15.5	15.2	...	...
36	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
37	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
38	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
39	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
40	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
41	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
5	10.6	10.4	10.1	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
6	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
7	10.6	10.4	10.1	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
8	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
9	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
14	10.6	10.4	10.1	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
15	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
16	10.6	10.4	10.1	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	12.1	11.9	10.5	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2	...	...	...
19	9.0	8.8	8.6	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2	...	...	...
20
21
22
23
24
25	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4
26	14.5	14.2	12.4
27	10.7	10.5	10.3
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	18Cr-8Ni-N	Smls. & wld. fittings	SA-403	304LN	S30453	WP	...	8	1
2	18Cr-8Ni-N	Bar	SA-479	304LN	S30453	...	...	8	1
3	18Cr-8Ni-N	Wld. tube	SA-688	TP304LN	S30453	...	...	8	1
4	18Cr-8Ni-N	Wld. pipe	SA-813	TP304LN	S30453	...	...	8	1
5	18Cr-8Ni-N	Wld. pipe	SA-814	TP304LN	S30453	...	...	8	1
6	18Cr-8Ni-N	Forgings	SA-182	F304N	S30451	...	...	8	1
7	18Cr-8Ni-N	Smls. tube	SA-213	TP304N	S30451	...	...	8	1
8	18Cr-8Ni-N	Smls. tube	SA-213	TP304N	S30451	...	...	8	1
9	18Cr-8Ni-N	Plate	SA-240	304N	S30451	...	...	8	1
10	18Cr-8Ni-N	Plate	SA-240	304N	S30451	...	...	8	1
11	18Cr-8Ni-N	Wld. tube	SA-249	TP304N	S30451	...	...	8	1
12	18Cr-8Ni-N	Wld. tube	SA-249	TP304N	S30451	...	...	8	1
13	18Cr-8Ni-N	Wld. tube	SA-249	TP304N	S30451	...	...	8	1
14	18Cr-8Ni-N	Wld. tube	SA-249	TP304N	S30451	...	...	8	1
15	18Cr-8Ni-N	Wld. tube	SA-249	TP304N	S30451	...	...	8	1
16	18Cr-8Ni-N	Smls. & wld. pipe	SA-312	TP304N	S30451	...	...	8	1
17	18Cr-8Ni-N	Smls. & wld. pipe	SA-312	TP304N	S30451	...	...	8	1
18	18Cr-8Ni-N	Wld. pipe	SA-312	TP304N	S30451	...	...	8	1
19	18Cr-8Ni-N	Wld. pipe	SA-312	TP304N	S30451	...	...	8	1
20	18Cr-8Ni-N	Wld. pipe	SA-358	304N	S30451	1	...	8	1
21	18Cr-8Ni-N	Smls. pipe	SA-376	TP304N	S30451	...	...	8	1
22	18Cr-8Ni-N	Smls. pipe	SA-376	TP304N	S30451	...	...	8	1
23	18Cr-8Ni-N	Smls. & wld. fittings	SA-403	304N	S30451	...	...	8	1
24	18Cr-8Ni-N	Bar	SA-479	304N	S30451	...	...	8	1
25	18Cr-8Ni-N	Bar	SA-479	304N	S30451	...	...	8	1
26	18Cr-8Ni-N	Wld. tube	SA-688	TP304N	S30451	...	...	8	1
27	18Cr-8Ni-N	Wld. tube	SA-688	TP304N	S30451	...	...	8	1
28	18Cr-8Ni-N	Wld. tube	SA-688	TP304N	S30451	...	...	8	1
29	18Cr-8Ni-N	Wld. pipe	SA-813	TP304N	S30451	...	...	8	1
30	18Cr-8Ni-N	Wld. pipe	SA-814	TP304N	S30451	...	...	8	1
31	18Cr-8Ni-N	Forgings	SA-965	F304N	S30451	...	...	8	1
32	18Cr-8Ni-N	Forgings	SA-965	F304N	S30451	...	...	8	1
33	18Cr-8Ni-4Si-N	Bar	SA-479	...	S21800	...	...	8	3
34	18Cr-10Ni-Cb	Forgings	SA-965	F348H	S34809	...	...	8	1
35	18Cr-10Ni-Cb	Forgings	SA-965	F348H	S34809	...	...	8	1
36	18Cr-10Ni-Cb	Castings	SA-351	CF8C	J92710	...	...	8	1
37	18Cr-10Ni-Cb	Castings	SA-351	CF8C	J92710	...	...	8	1
38	18Cr-10Ni-Cb	Castings	SA-351	CF8C	J92710	...	...	8	1
39	18Cr-10Ni-Cb	Cast pipe	SA-451	CPF8C	J92710	...	...	8	1
40	18Cr-10Ni-Cb	Forgings	SA-182	F347	S34700	...	> 5	8	1
41	18Cr-10Ni-Cb	Forgings	SA-965	F347	S34700	...	...	8	1
42	18Cr-10Ni-Cb	Forgings	SA-965	F347	S34700	...	...	8	1

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	75	30	NP	800	NP	NP	HA-1	G5, W12, W14
2	75	30	NP	800	NP	NP	HA-1	G5
3	75	30	NP	800	NP	NP	HA-1	G5, W12
4	75	30	NP	800	NP	NP	HA-1	G5, W12
5	75	30	NP	800	NP	NP	HA-1	G5, W12
6	80	35	NP	800	NP	NP	HA-1	G5
7	80	35	1200	800	1200	NP	HA-1	G5, G12, T7
8	80	35	1200	NP	1200	NP	HA-1	G12, T8
9	80	35	NP	800	1200	650	HA-1	G5, G12, T7
10	80	35	NP	NP	1200	650	HA-1	G12, T8
11	80	35	1200	NP	NP	NP	HA-1	G5, G12, T7, W13
12	80	35	1200	NP	NP	NP	HA-1	G12, T8, W13
13	80	35	1200	NP	NP	NP	HA-1	G3, G5, G12, T5
14	80	35	1200	NP	1200	650	HA-1	G3, G12, G24, T8
15	80	35	NP	NP	1200	650	HA-1	G5, G12, G24, T5
16	80	35	1200	800	1200	650	HA-1	G5, G12, T7, W12, W13, W14
17	80	35	1200	NP	1200	650	HA-1	G12, T8, W13, W14
18	80	35	1200	NP	1200	650	HA-1	G3, G5, G12, G24, T5
19	80	35	1200	NP	1200	650	HA-1	G3, G12, G24, T8
20	80	35	NP	800	NP	NP	HA-1	G5, W12
21	80	35	1200	800	1200	650	HA-1	G5, G12, H1, T7
22	80	35	1200	NP	1200	650	HA-1	G12, H1, T8
23	80	35	NP	800	1200	650	HA-1	G5, T7, W12, W14
24	80	35	1200	NP	NP	NP	HA-1	G12, T8
25	80	35	1200	800	NP	NP	HA-1	G5, G12, T7
26	80	35	NP	800	NP	NP	HA-1	G5, W12
27	80	35	NP	NP	1200	650	HA-1	G5, G12, G24, T7
28	80	35	NP	NP	1200	650	HA-1	G12, G24, T8
29	80	35	NP	800	NP	NP	HA-1	G5, W12
30	80	35	NP	800	NP	NP	HA-1	G5, W12
31	80	35	NP	800	1200	650	HA-1	G5, G12, T7
32	80	35	NP	NP	1200	650	HA-1	G12, T8
33	95	50	NP	800	NP	NP	HA-6	...
34	65	25	NP	NP	1500	NP	HA-2	G5, H2, T9
35	65	25	NP	NP	1500	NP	HA-2	H2, T9
36	70	30	NP	800	NP	NP	HA-2	G5, G16, G17, G32
37	70	30	NP	NP	1500	650	HA-2	G1, G5, G12, G32, T7
38	70	30	NP	NP	1500	650	HA-2	G1, G12, G32, T7
39	70	30	NP	800	NP	NP	HA-2	G5, G16, G17, G32
40	70	30	1500	800	1500	650	HA-2	G5, G12, T7
41	70	30	1500	800	1500	650	HA-2	G5, G12, H1, T7
42	70	30	1500	NP	1500	650	HA-2	G12, H1, T7

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
2	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
3	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
4	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
5	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
6	22.9	...	22.9	...	21.7	20.3	18.9	17.9	17.5	17.2	16.9	16.6	...	...
7	22.9	...	22.9	...	21.7	20.3	18.9	17.9	17.5	17.2	16.9	16.6	16.3	16.0
8	22.9	...	19.1	...	16.7	15.1	14.0	13.3	13.0	12.8	12.5	12.3	12.1	11.8
9	22.9	...	22.9	...	21.7	20.3	18.9	17.9	17.5	17.2	16.9	16.6	16.3	16.0
10	22.9	...	19.1	...	16.7	15.1	14.0	13.3	13.0	12.8	12.5	12.3	12.1	11.8
11	22.9	...	22.9	...	21.7	20.3	18.9	17.9	17.5	17.2	16.9	16.6	16.3	16.0
12	22.9	...	19.1	...	16.7	15.1	14.0	13.3	13.0	12.8	12.5	12.3	12.1	11.8
13	19.4	...	19.4	...	18.5	17.3	16.0	15.2	14.9	14.6	14.4	14.1	13.8	13.6
14	19.4	...	16.2	...	14.2	12.8	11.9	11.3	11.0	10.8	10.6	10.5	10.3	10.0
15	19.4	...	19.4	...	18.5	17.3	16.0	15.2	14.9	14.6	14.4	14.1	13.8	13.6
16	22.9	...	22.9	...	21.7	20.3	18.9	17.9	17.5	17.2	16.9	16.6	16.3	16.0
17	22.9	...	19.1	...	16.7	15.1	14.0	13.3	13.0	12.8	12.5	12.3	12.1	11.8
18	19.4	...	19.4	...	18.5	17.3	16.0	15.2	14.9	14.6	14.4	14.1	13.8	13.6
19	19.4	...	16.2	...	14.2	12.8	11.9	11.3	11.0	10.8	10.6	10.5	10.3	10.0
20	22.9	...	22.9	...	21.7	20.3	18.9	17.9	17.5	17.2	16.9	16.6	...	...
21	22.9	...	22.9	...	21.7	20.3	18.9	17.9	17.5	17.2	16.9	16.6	16.3	16.0
22	22.9	...	19.1	...	16.7	15.1	14.0	13.3	13.0	12.8	12.5	12.3	12.1	11.8
23	22.9	...	22.9	...	21.7	20.3	18.9	17.9	17.5	17.2	16.9	16.6	16.3	16.0
24	22.9	...	19.1	...	16.7	15.1	14.0	13.3	13.0	12.8	12.5	12.3	12.1	11.8
25	22.9	...	22.9	...	21.7	20.3	18.9	17.9	17.5	17.2	16.9	16.6	16.3	16.0
26	22.9	...	22.9	...	21.7	20.3	18.9	17.9	17.5	17.2	16.9	16.6	...	...
27	19.4	...	19.4	...	18.5	17.3	16.0	15.2	14.9	14.6	14.4	14.1	13.8	13.6
28	19.4	...	16.2	...	14.2	12.8	11.9	11.3	11.0	10.8	10.6	10.5	10.3	10.0
29	22.9	...	22.9	...	21.7	20.3	18.9	17.9	17.5	17.2	16.9	16.6	...	...
30	22.9	...	22.9	...	21.7	20.3	18.9	17.9	17.5	17.2	16.9	16.6	...	...
31	22.9	...	22.9	...	21.7	20.3	18.9	17.9	17.5	17.2	16.9	16.6	16.3	16.0
32	22.9	...	19.1	...	16.7	15.1	14.0	13.3	13.0	12.8	12.5	12.3	12.1	11.8
33	27.1	...	25.9	...	22.1	19.8	18.4	17.6	17.3	17.1	16.9	16.8	...	...
34	16.7	...	16.7	...	16.3	15.4	14.9	14.6	14.6	14.6	14.6	14.6	14.5	14.5
35	16.7	...	15.3	...	14.3	13.3	12.5	11.9	11.7	11.5	11.4	11.3	11.2	11.2
36	20.0	...	19.1	...	17.6	16.6	16.0	15.7	15.7	15.7	15.7	15.7	...	...
37	20.0	...	19.1	...	17.6	16.6	16.0	15.8	15.7	15.7	15.7	15.7	15.7	15.6
38	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
39	20.0	...	19.1	...	17.6	16.6	16.0	15.7	15.7	15.7	15.7	15.7	...	...
40	20.0	...	19.1	...	17.6	16.6	16.0	15.8	15.7	15.7	15.7	15.7	15.7	15.6
41	20.0	...	19.1	...	17.6	16.6	16.0	15.8	15.7	15.7	15.7	15.7	15.7	15.6
42	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	15.6	15.2	12.4	9.8	7.7	6.1	...	...	...	...	...	...	...	...	...
8	11.6	11.3	11.0	9.8	7.7	6.1	...	...	...	...	...	...	...	...	...
9	15.6	15.2	12.4	9.8	7.7	6.1	...	...	...	...	...	...	...	...	...
10	11.6	11.3	11.0	9.8	7.7	6.1	...	...	...	...	...	...	...	...	...
11	15.6	15.2	12.4	9.8	7.7	6.1	...	...	...	...	...	...	...	...	...
12	11.6	11.3	11.0	9.8	7.7	6.1	...	...	...	...	...	...	...	...	...
13	13.3	13.0	10.5	8.3	6.6	5.2	...	...	...	...	...	...	...	...	...
14	9.8	9.6	9.4	8.3	6.6	5.2	...	...	...	...	...	...	...	...	...
15	13.3	13.0	10.5	8.3	6.6	5.2	...	...	...	...	...	...	...	...	...
16	15.6	15.2	12.4	9.8	7.7	6.1	...	...	...	...	...	...	...	...	...
17	11.6	11.3	11.0	9.8	7.7	6.1	...	...	...	...	...	...	...	...	...
18	13.3	13.0	10.5	8.3	6.6	5.2	...	...	...	...	...	...	...	...	...
19	9.8	9.6	9.4	8.3	6.6	5.2	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	15.6	15.2	12.4	9.8	7.7	6.1	...	...	...	...	...	...	...	...	...
22	11.6	11.3	11.0	9.8	7.7	6.1	...	...	...	...	...	...	...	...	...
23	15.6	15.2	12.4	9.8	7.7	6.1	...	...	...	...	...	...	...	...	...
24	11.6	11.3	11.0	9.8	7.7	6.1	...	...	...	...	...	...	...	...	...
25	15.6	15.2	12.4	9.8	7.7	6.1	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	13.3	13.0	10.5	8.3	6.6	5.2	...	...	...	...	...	...	...	...	...
28	9.8	9.6	9.4	8.3	6.6	5.2	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	15.6	15.2	12.4	9.8	7.7	6.1	...	...	...	...	...	...	...	...	...
32	11.6	11.3	11.0	9.8	7.7	6.1	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	14.4	14.2	14.0	13.7	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
35	11.2	11.2	11.1	11.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	15.5	15.3	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
38	13.4	13.4	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	15.5	15.3	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
41	15.5	15.3	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
42	13.4	13.4	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	18Cr-10Ni-Cb	Forgings	SA-182	F347H	S34709	...	> 5	8	1
2	18Cr-10Ni-Cb	Forgings	SA-182	F347H	S34709	...	> 5	8	1
3	18Cr-10Ni-Cb	Forgings	SA-965	F347H	S34709	...	...	8	1
4	18Cr-10Ni-Cb	Forgings	SA-965	F347H	S34709	...	...	8	1
5	18Cr-10Ni-Cb	Forgings	SA-182	F348	S34800	...	> 5	8	1
6	18Cr-10Ni-Cb	Forgings	SA-182	F348	S34800	...	> 5	8	1
7	18Cr-10Ni-Cb	Forgings	SA-965	F348	S34800	...	...	8	1
8	18Cr-10Ni-Cb	Forgings	SA-965	F348	S34800	...	...	8	1
9	18Cr-10Ni-Cb	Forgings	SA-182	F348H	S34809	...	> 5	8	1
10	18Cr-10Ni-Cb	Forgings	SA-182	F348H	S34809	...	> 5	8	1
11	18Cr-10Ni-Cb	Forgings	SA-182	F347	S34700	...	≤ 5	8	1
12	18Cr-10Ni-Cb	Forgings	SA-182	F347	S34700	...	≤ 5	8	1
13	18Cr-10Ni-Cb	Smls. tube	SA-213	TP347	S34700	...	...	8	1
14	18Cr-10Ni-Cb	Smls. tube	SA-213	TP347	S34700	...	...	8	1
15	18Cr-10Ni-Cb	Plate	SA-240	347	S34700	...	...	8	1
16	18Cr-10Ni-Cb	Plate	SA-240	347	S34700	...	...	8	1
17	18Cr-10Ni-Cb	Wld. tube	SA-249	TP347	S34700	...	...	8	1
18	18Cr-10Ni-Cb	Wld. tube	SA-249	TP347	S34700	...	...	8	1
19	18Cr-10Ni-Cb	Wld. tube	SA-249	TP347	S34700	...	...	8	1
20	18Cr-10Ni-Cb	Wld. tube	SA-249	TP347	S34700	...	...	8	1
21	18Cr-10Ni-Cb	Smls. & wld. pipe	SA-312	TP347	S34700	...	...	8	1
22	18Cr-10Ni-Cb	Smls. & wld. pipe	SA-312	TP347	S34700	...	...	8	1
23	18Cr-10Ni-Cb	Wld. pipe	SA-312	TP347	S34700	...	...	8	1
24	18Cr-10Ni-Cb	Wld. pipe	SA-312	TP347	S34700	...	...	8	1
25	18Cr-10Ni-Cb	Wld. pipe	SA-358	347	S34700	1	...	8	1
26	18Cr-10Ni-Cb	Smls. pipe	SA-376	TP347	S34700	...	...	8	1
27	18Cr-10Ni-Cb	Smls. pipe	SA-376	TP347	S34700	...	...	8	1
28	18Cr-10Ni-Cb	Smls. & wld. fittings	SA-403	347	S34700	...	...	8	1
29	18Cr-10Ni-Cb	Wld. pipe	SA-409	TP347	S34700	...	...	8	1
30	18Cr-10Ni-Cb	Bar	SA-479	347	S34700	...	...	8	1
31	18Cr-10Ni-Cb	Bar	SA-479	347	S34700	...	...	8	1
32	18Cr-10Ni-Cb	Wld. pipe	SA-813	TP347	S34700	...	...	8	1
33	18Cr-10Ni-Cb	Bar	SA/JIS G4303	SUS347	...	...	...	8	1
34	18Cr-10Ni-Cb	Forgings	SA-182	F347H	S34709	...	≤ 5	8	1
35	18Cr-10Ni-Cb	Forgings	SA-182	F347H	S34709	...	≤ 5	8	1
36	18Cr-10Ni-Cb	Smls. tube	SA-213	TP347H	S34709	...	...	8	1
37	18Cr-10Ni-Cb	Smls. tube	SA-213	TP347H	S34709	...	...	8	1
38	18Cr-10Ni-Cb	Plate	SA-240	347H	S34709	...	...	8	1
39	18Cr-10Ni-Cb	Plate	SA-240	347H	S34709	...	...	8	1
40	18Cr-10Ni-Cb	Wld. tube	SA-249	TP347H	S34709	...	...	8	1
41	18Cr-10Ni-Cb	Wld. tube	SA-249	TP347H	S34709	...	...	8	1
42	18Cr-10Ni-Cb	Wld. tube	SA-249	TP347H	S34709	...	...	8	1
43	18Cr-10Ni-Cb	Wld. tube	SA-249	TP347H	S34709	...	...	8	1

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	70	30	1500	NP	NP	NP	HA-2	H2, T9
2	70	30	1500	800	1500	NP	HA-2	G5, H2, T8
3	70	30	NP	NP	1500	NP	HA-2	H2, T9
4	70	30	NP	800	1500	NP	HA-2	G5, H2, T8
5	70	30	1500	NP	NP	NP	HA-2	T7
6	70	30	1500	800	1500	650	HA-2	G5, G12, T7
7	70	30	NP	NP	1500	650	HA-2	G5, G12, H1, T7
8	70	30	NP	NP	1500	650	HA-2	G12, H1, T7
9	70	30	1500	NP	NP	NP	HA-2	T9
10	70	30	1500	800	1500	NP	HA-2	G5, T8
11	75	30	1500	800	1500	NP	HA-2	G5, G12, H1, T6
12	75	30	1500	NP	1500	NP	HA-2	G12, H1, T7
13	75	30	1500	800	1500	NP	HA-2	G5, G12, H1, T6
14	75	30	1500	NP	1500	NP	HA-2	G12, H1, T7
15	75	30	1500	800	1500	650	HA-2	G5, G12, T6
16	75	30	1500	NP	1500	650	HA-2	G12, T7
17	75	30	1500	NP	NP	NP	HA-2	G12, T7, W13
18	75	30	1500	800	NP	NP	HA-2	G5, G12, T6, W12, W13
19	75	30	1500	NP	1500	650	HA-2	G3, G5, G12, G24, T6
20	75	30	1500	NP	1500	650	HA-2	G3, G12, G24, T7
21	75	30	1500	800	1500	650	HA-2	G5, G12, T6, W12, W13, W14
22	75	30	1500	NP	1500	650	HA-2	G12, T7, W13, W14
23	75	30	1500	NP	1500	650	HA-2	G3, G5, G12, G24, T6
24	75	30	1500	NP	1500	650	HA-2	G3, G12, G24, T7
25	75	30	NP	800	NP	NP	HA-2	G5, H1, W12
26	75	30	1500	800	1500	650	HA-2	G5, G12, H1, T6
27	75	30	1500	NP	1500	650	HA-2	G12, H1, T7
28	75	30	NP	800	1500	650	HA-2	G5, G12, T6, W12, W14
29	75	30	NP	800	NP	NP	HA-2	G5, H1, W12
30	75	30	1500	800	1500	650	HA-2	G5, G12, G22, T6
31	75	30	1500	NP	1500	650	HA-2	G12, G22, T7
32	75	30	NP	800	NP	NP	HA-2	G5, H1, W12
33	75	30	1500	800	1500	NP	HA-2	G5, G12, G22, T6
34	75	30	1500	800	1500	NP	HA-2	G5, H2, T8
35	75	30	1500	NP	1500	NP	HA-2	H2, T9
36	75	30	1500	800	1500	NP	HA-2	G5, H2, T8
37	75	30	1500	NP	1500	NP	HA-2	H2, T9
38	75	30	1500	800	1500	NP	HA-2	G5, H2, T8
39	75	30	1500	NP	1500	NP	HA-2	H2, T9
40	75	30	1500	800	NP	NP	HA-2	G5, T8, W12, W13
41	75	30	1500	NP	NP	NP	HA-2	T9, W13
42	75	30	1500	NP	1500	NP	HA-2	G3, G5, G24, T8
43	75	30	1500	NP	1500	NP	HA-2	G3, G24, T9

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
2	20.0	...	19.1	...	17.6	16.6	16.0	15.7	15.7	15.7	15.7	15.7	15.7	15.6
3	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
4	20.0	...	19.1	...	17.6	16.6	16.0	15.7	15.7	15.7	15.7	15.7	15.7	15.6
5	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
6	20.0	...	19.1	...	17.6	16.6	16.0	15.8	15.7	15.7	15.7	15.7	15.7	15.6
7	20.0	...	19.1	...	17.6	16.6	16.0	15.8	15.7	15.7	15.7	15.7	15.7	15.6
8	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
9	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
10	20.0	...	19.1	...	17.6	16.6	16.0	15.7	15.7	15.7	15.7	15.7	15.7	15.6
11	20.0	...	20.0	...	18.8	17.8	17.2	16.9	16.8	16.8	16.8	16.8	16.8	16.7
12	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
13	20.0	...	20.0	...	18.8	17.8	17.2	16.9	16.8	16.8	16.8	16.8	16.8	16.7
14	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
15	20.0	...	20.0	...	18.8	17.8	17.2	16.9	16.8	16.8	16.8	16.8	16.8	16.7
16	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
17	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
18	20.0	...	20.0	...	18.8	17.8	17.2	16.9	16.8	16.8	16.8	16.8	16.8	16.7
19	17.0	...	17.0	...	16.0	15.1	14.6	14.3	14.3	14.3	14.3	14.3	14.3	14.2
20	17.0	...	15.6	...	14.6	13.6	12.8	12.2	11.9	11.8	11.6	11.5	11.5	11.4
21	20.0	...	20.0	...	18.8	17.8	17.2	16.9	16.8	16.8	16.8	16.8	16.8	16.7
22	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
23	17.0	...	17.0	...	16.0	15.1	14.6	14.3	14.3	14.3	14.3	14.3	14.3	14.2
24	17.0	...	15.6	...	14.6	13.6	12.8	12.2	11.9	11.8	11.6	11.5	11.5	11.4
25	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	...	...
26	20.0	...	20.0	...	18.8	17.8	17.2	16.9	16.8	16.8	16.8	16.8	16.8	16.7
27	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
28	20.0	...	20.0	...	18.8	17.8	17.2	16.9	16.8	16.8	16.8	16.8	16.8	16.7
29	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	...	...
30	20.0	...	20.0	...	18.8	17.8	17.2	16.9	16.8	16.8	16.8	16.8	16.8	16.7
31	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
32	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	...	...
33	20.0	...	20.0	...	18.8	17.8	17.2	16.9	16.8	16.8	16.8	16.8	16.8	16.7
34	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	16.8	16.7
35	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
36	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	16.8	16.7
37	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
38	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	16.8	16.7
39	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
40	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	16.8	16.7
41	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
42	17.0	...	17.0	...	16.0	15.1	14.6	14.3	14.3	14.3	14.3	14.3	14.3	14.2
43	17.0	...	15.6	...	14.6	13.6	12.8	12.2	11.9	11.8	11.6	11.5	11.5	11.4

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	13.4	13.4	13.4	13.3	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
2	15.5	15.3	15.1	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
3	13.4	13.4	13.4	13.3	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
4	15.5	15.3	15.1	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
5	13.4	13.4	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
6	15.5	15.3	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
7	15.5	15.3	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
8	13.4	13.4	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
9	13.4	13.4	13.4	13.3	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
10	15.5	15.3	15.1	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
11	16.6	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
12	13.4	13.4	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
13	16.6	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
14	13.4	13.4	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
15	16.6	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
16	13.4	13.4	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
17	13.4	13.4	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
18	16.6	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
19	14.1	13.6	10.3	7.8	5.2	3.8	2.8	1.9	1.3	1.0	0.77	0.68	...	...	...
20	11.4	11.4	10.3	7.8	5.2	3.8	2.8	1.9	1.3	1.0	0.77	0.68	...	...	...
21	16.6	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
22	13.4	13.4	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
23	14.1	13.6	10.3	7.8	5.2	3.8	2.8	1.9	1.3	1.0	0.77	0.68	...	...	...
24	11.4	11.4	10.3	7.8	5.2	3.8	2.8	1.9	1.3	1.0	0.77	0.68	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	16.6	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
27	13.4	13.4	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
28	16.6	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	16.6	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
31	13.4	13.4	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	16.6	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
34	16.6	16.4	16.2	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
35	13.4	13.4	13.4	13.3	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
36	16.6	16.4	16.2	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
37	13.4	13.4	13.4	13.3	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
38	16.6	16.4	16.2	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
39	13.4	13.4	13.4	13.3	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
40	16.6	16.4	16.2	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
41	13.4	13.4	13.4	13.3	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
42	14.1	14.0	13.7	12.0	8.9	6.7	5.0	3.7	2.7	2.1	1.6	1.1	...	...	...
43	11.4	11.4	11.4	11.3	8.9	6.7	5.0	3.7	2.7	2.1	1.6	1.1	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	18Cr-10Ni-Cb	Smls. & wld. pipe	SA-312	TP347H	S34709	...	...	8	1
2	18Cr-10Ni-Cb	Smls. & wld. pipe	SA-312	TP347H	S34709	...	...	8	1
3	18Cr-10Ni-Cb	Wld. pipe	SA-312	TP347H	S34709	...	...	8	1
4	18Cr-10Ni-Cb	Wld. pipe	SA-312	TP347H	S34709	...	...	8	1
5	18Cr-10Ni-Cb	Smls. pipe	SA-376	TP347H	S34709	...	...	8	1
6	18Cr-10Ni-Cb	Smls. pipe	SA-376	TP347H	S34709	...	...	8	1
7	18Cr-10Ni-Cb	Smls. & wld. fittings	SA-403	347H	S34709	...	...	8	1
8	18Cr-10Ni-Cb	Bar	SA-479	347H	S34709	...	...	8	1
9	18Cr-10Ni-Cb	Bar	SA-479	347H	S34709	...	...	8	1
10	18Cr-10Ni-Cb	Wld. pipe	SA-813	TP347H	S34709	...	...	8	1
11	18Cr-10Ni-Cb	Wld. pipe	SA-814	TP347H	S34709	...	...	8	1
(a) 12	18Cr-10Ni-Cb	Smls. tube	SA-213	TP347LN	S34751	...	...	8	1
(a) 13	18Cr-10Ni-Cb	Smls. tube	SA-213	TP347LN	S34751	...	...	8	1
(a) 14	18Cr-10Ni-Cb	Smls. pipe	SA-312	TP347LN	S34751	...	...	8	1
(a) 15	18Cr-10Ni-Cb	Smls. pipe	SA-312	TP347LN	S34751	...	...	8	1
16	18Cr-10Ni-Cb	Forgings	SA-182	F348	S34800	...	≤ 5	8	1
17	18Cr-10Ni-Cb	Forgings	SA-182	F348	S34800	...	≤ 5	8	1
18	18Cr-10Ni-Cb	Smls. tube	SA-213	TP348	S34800	...	...	8	1
19	18Cr-10Ni-Cb	Smls. tube	SA-213	TP348	S34800	...	...	8	1
20	18Cr-10Ni-Cb	Plate	SA-240	348	S34800	...	...	8	1
21	18Cr-10Ni-Cb	Plate	SA-240	348	S34800	...	...	8	1
22	18Cr-10Ni-Cb	Wld. tube	SA-249	TP348	S34800	...	...	8	1
23	18Cr-10Ni-Cb	Wld. tube	SA-249	TP348	S34800	...	...	8	1
24	18Cr-10Ni-Cb	Wld. tube	SA-249	TP348	S34800	...	...	8	1
25	18Cr-10Ni-Cb	Wld. tube	SA-249	TP348	S34800	...	...	8	1
26	18Cr-10Ni-Cb	Smls. & wld. pipe	SA-312	TP348	S34800	...	...	8	1
27	18Cr-10Ni-Cb	Smls. pipe	SA-312	TP348	S34800	...	...	8	1
28	18Cr-10Ni-Cb	Wld. pipe	SA-312	TP348	S34800	...	...	8	1
29	18Cr-10Ni-Cb	Wld. pipe	SA-312	TP348	S34800	...	...	8	1
30	18Cr-10Ni-Cb	Wld. pipe	SA-358	348	S34800	1	...	8	1
31	18Cr-10Ni-Cb	Smls. pipe	SA-376	TP348	S34800	...	...	8	1
32	18Cr-10Ni-Cb	Smls. pipe	SA-376	TP348	S34800	...	...	8	1
33	18Cr-10Ni-Cb	Smls. & wld. fittings	SA-403	348	S34800	...	...	8	1
34	18Cr-10Ni-Cb	Wld. pipe	SA-409	TP348	S34800	...	...	8	1
35	18Cr-10Ni-Cb	Bar	SA-479	348	S34800	...	...	8	1
36	18Cr-10Ni-Cb	Bar	SA-479	348	S34800	...	...	8	1
37	18Cr-10Ni-Cb	Wld. pipe	SA-813	TP348	S34800	...	...	8	1
38	18Cr-10Ni-Cb	Wld. pipe	SA-814	TP348	S34800	...	...	8	1
39	18Cr-10Ni-Cb	Forgings	SA-182	F348H	S34809	...	≤ 5	8	1
40	18Cr-10Ni-Cb	Forgings	SA-182	F348H	S34809	...	≤ 5	8	1
41	18Cr-10Ni-Cb	Smls. tube	SA-213	TP348H	S34809	...	...	8	1
42	18Cr-10Ni-Cb	Smls. tube	SA-213	TP348H	S34809	...	...	8	1
43	18Cr-10Ni-Cb	Plate	SA-240	348H	S34809	...	...	8	1

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes	
			I	III	VIII-1	XII			
1	75	30	1500	800	1500	NP	HA-2	G5, H2, T8, W12, W13, W14	
2	75	30	1500	NP	1500	NP	HA-2	H2, T9, W13, W14	
3	75	30	1500	NP	1500	NP	HA-2	G3, G5, G24, H2, T8	
4	75	30	1500	NP	1500	NP	HA-2	G3, G24, H2, T9	
5	75	30	1500	800	1500	NP	HA-2	G5, H2, T8	
6	75	30	1500	NP	1500	NP	HA-2	H2, T9	
7	75	30	NP	800	1500	NP	HA-2	G5, H2, T8, W12, W14	
8	75	30	1500	800	NP	NP	HA-2	G5, H2, T8	
9	75	30	1500	NP	NP	NP	HA-2	H2, T9	
10	75	30	NP	800	NP	NP	HA-2	G5, H2, W12	
11	75	30	NP	800	NP	NP	HA-2	G5, W12	
12	75	30	NP	NP	1100	NP	HA-2	G5, T8	(a)
13	75	30	NP	NP	1100	NP	HA-2	...	(a)
14	75	30	NP	NP	1100	NP	HA-2	G5, T8	(a)
15	75	30	NP	NP	1100	NP	HA-2	...	(a)
16	75	30	1500	800	1500	NP	HA-2	G5, G12, T6	
17	75	30	1500	NP	1500	NP	HA-2	G12, T7	
18	75	30	1500	800	1500	NP	HA-2	G5, G12, T6	
19	75	30	1500	NP	1500	NP	HA-2	G12, T7	
20	75	30	NP	800	1500	650	HA-2	G5, G12, T6	
21	75	30	NP	NP	1500	650	HA-2	G12, T7	
22	75	30	1500	NP	NP	NP	HA-2	G12, T7, W13	
23	75	30	1500	800	NP	NP	HA-2	G5, G12, T6, W12, W13	
24	75	30	1500	NP	1500	650	HA-2	G3, G5, G12, G24, T6	
25	75	30	1500	NP	1500	650	HA-2	G3, G12, G24, T7	
26	75	30	1500	800	1500	650	HA-2	G5, G12, T6, W12, W14	
27	75	30	1500	NP	1500	650	HA-2	G12, T7	
28	75	30	NP	NP	1500	650	HA-2	G5, G12, G24, T6	
29	75	30	NP	NP	1500	650	HA-2	G12, G24, T7	
30	75	30	NP	800	NP	NP	HA-2	G5, W12	
31	75	30	1500	800	1500	650	HA-2	G5, G12, H1, T6	
32	75	30	1500	NP	1500	650	HA-2	G12, H1, T7	
33	75	30	NP	800	1500	650	HA-2	G5, G12, H2, T6, W12, W14	
34	75	30	NP	800	NP	NP	HA-2	G5, W12	
35	75	30	1500	800	1500	650	HA-2	G5, G12, G22, H1, T6	
36	75	30	1500	NP	1500	650	HA-2	G12, G22, H1, T7	
37	75	30	NP	800	NP	NP	HA-2	G5, H1, W12	
38	75	30	NP	800	NP	NP	HA-2	G5, W12	
39	75	30	1500	800	1500	NP	HA-2	G5, T8	
40	75	30	1500	NP	1500	NP	HA-2	T9	
41	75	30	1500	800	1500	NP	HA-2	G5, H2, T8	
42	75	30	1500	NP	1500	NP	HA-2	H2, T9	
43	75	30	NP	800	NP	NP	HA-2	G5, H2	

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	16.8	16.7
2	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
3	17.0	...	17.0	...	16.0	15.1	14.6	14.3	14.3	14.3	14.3	14.3	14.3	14.2
4	17.0	...	15.6	...	14.6	13.6	12.8	12.2	11.9	11.8	11.6	11.5	11.5	11.4
5	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	16.8	16.7
6	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
7	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	16.8	16.7
8	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	16.8	16.7
9	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
10	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	...	...
11	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	...	...
(a) 12	20.0	...	20.0	...	19.1	17.8	16.9	16.5	16.4	16.3	16.3	16.3	16.3	16.2
(a) 13	20.0	...	17.7	...	16.0	14.6	13.6	12.9	12.7	12.6	12.5	12.4	12.4	12.4
(a) 14	20.0	...	20.0	...	19.1	17.8	16.9	16.5	16.4	16.3	16.3	16.3	16.3	16.2
(a) 15	20.0	...	17.7	...	16.0	14.6	13.6	12.9	12.7	12.6	12.5	12.4	12.4	12.4
16	20.0	...	20.0	...	18.8	17.8	17.2	16.9	16.8	16.8	16.8	16.8	16.8	16.7
17	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
18	20.0	...	20.0	...	18.8	17.8	17.2	16.9	16.8	16.8	16.8	16.8	16.8	16.7
19	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
20	20.0	...	20.0	...	18.8	17.8	17.2	16.9	16.8	16.8	16.8	16.8	16.8	16.7
21	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
22	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
23	20.0	...	20.0	...	18.8	17.8	17.2	16.9	16.8	16.8	16.8	16.8	16.8	16.7
24	17.0	...	17.0	...	16.0	15.1	14.6	14.3	14.3	14.3	14.3	14.3	14.3	14.2
25	17.0	...	15.6	...	14.6	13.6	12.8	12.2	11.9	11.8	11.6	11.5	11.5	11.4
26	20.0	...	20.0	...	18.8	17.8	17.2	16.9	16.8	16.8	16.8	16.8	16.8	16.7
27	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
28	17.0	...	17.0	...	16.0	15.1	14.6	14.3	14.3	14.3	14.3	14.3	14.3	14.2
29	17.0	...	15.6	...	14.6	13.6	12.8	12.2	11.9	11.8	11.6	11.5	11.5	11.4
30	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	...	...
31	20.0	...	20.0	...	18.8	17.8	17.2	16.9	16.8	16.8	16.8	16.8	16.8	16.7
32	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
33	20.0	...	20.0	...	18.8	17.8	17.2	16.9	16.8	16.8	16.8	16.8	16.8	16.7
34	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	...	...
35	20.0	...	20.0	...	18.8	17.8	17.2	16.9	16.8	16.8	16.8	16.8	16.8	16.7
36	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
37	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	...	...
38	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	...	...
39	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	16.8	16.7
40	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
41	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	16.8	16.7
42	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
43	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	...	...

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	16.6	16.4	16.2	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
2	13.4	13.4	13.4	13.3	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
3	14.1	14.0	13.7	12.0	8.9	6.7	5.0	3.7	2.7	2.1	1.6	1.1	...	...	...
4	11.4	11.4	11.4	11.3	8.9	6.7	5.0	3.7	2.7	2.1	1.6	1.1	...	...	...
5	16.6	16.4	16.2	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
6	13.4	13.4	13.4	13.3	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
7	16.6	16.4	16.2	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
8	16.6	16.4	16.2	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
9	13.4	13.4	13.4	13.3	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	16.1	15.8	15.6	13.2	...	...	...	...	...	...	...	...	...	...	(a)
13	12.4	12.4	12.3	12.2	...	...	...	...	...	...	...	...	...	...	(a)
14	16.1	15.8	15.6	13.2	...	...	...	...	...	...	...	...	...	...	(a)
15	12.4	12.4	12.3	12.2	...	...	...	...	...	...	...	...	...	...	(a)
16	16.6	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
17	13.4	13.4	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
18	16.6	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
19	13.4	13.4	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
20	16.6	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
21	13.4	13.4	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
22	13.4	13.4	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
23	16.6	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
24	14.1	13.6	10.3	7.8	5.2	3.8	2.8	1.9	1.3	1.0	0.77	0.68	...	...	...
25	11.4	11.4	10.3	7.8	5.2	3.8	2.8	1.9	1.3	1.0	0.77	0.68	...	...	...
26	16.6	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
27	13.4	13.4	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
28	14.1	13.6	10.3	7.8	5.2	3.8	2.8	1.9	1.3	1.0	0.77	0.68	...	...	...
29	11.4	11.4	10.3	7.8	5.2	3.8	2.8	1.9	1.3	1.0	0.77	0.68	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	16.6	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
32	13.4	13.4	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
33	16.6	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	16.6	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
36	13.4	13.4	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	16.6	16.4	16.2	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
40	13.4	13.4	13.4	13.3	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
41	16.6	16.4	16.2	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3
42	13.4	13.4	13.4	13.3	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	18Cr-10Ni-Cb	Wld. tube	SA-249	TP348H	S34809	...	...	8	1
2	18Cr-10Ni-Cb	Wld. tube	SA-249	TP348H	S34809	...	...	8	1
3	18Cr-10Ni-Cb	Wld. tube	SA-249	TP348H	S34809	...	...	8	1
4	18Cr-10Ni-Cb	Wld. tube	SA-249	TP348H	S34809	...	...	8	1
5	18Cr-10Ni-Cb	Smls. & wld. pipe	SA-312	TP348H	S34809	...	...	8	1
6	18Cr-10Ni-Cb	Smls. pipe	SA-312	TP348H	S34809	...	...	8	1
7	18Cr-10Ni-Cb	Wld. pipe	SA-312	TP348H	S34809	...	...	8	1
8	18Cr-10Ni-Cb	Wld. pipe	SA-312	TP348H	S34809	...	...	8	1
9	18Cr-10Ni-Cb	Smls. & wld. fittings	SA-403	348H	S34809	...	...	8	1
10	18Cr-10Ni-Cb	Bar	SA-479	348H	S34809	...	...	8	1
11	18Cr-10Ni-Cb	Bar	SA-479	348H	S34809	...	...	8	1
12	18Cr-10Ni-Cb	Wld. pipe	SA-813	TP348H	S34809	...	...	8	1
13	18Cr-10Ni-Cb	Wld. pipe	SA-814	TP348H	S34809	...	...	8	1
14	18Cr-10Ni-Cb	Smls. tube	SA-213	TP347HFG	S34710	...	...	8	1
15	18Cr-10Ni-Cb	Smls. tube	SA-213	TP347HFG	S34710	...	...	8	1
16	18Cr-10Ni-Ti	Smls. pipe	SA-312	TP321	S32100	...	$> \frac{3}{8}$	8	1
17	18Cr-10Ni-Ti	Smls. pipe	SA-312	TP321	S32100	...	$> \frac{3}{8}$	8	1
18	18Cr-10Ni-Ti	Wld. pipe	SA-312	TP321	S32100	...	$> \frac{3}{8}$	8	1
19	18Cr-10Ni-Ti	Wld. pipe	SA-312	TP321	S32100	...	$> \frac{3}{8}$	8	1
20	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321	S32100	...	$> \frac{3}{8}$	8	1
21	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321	S32100	...	$> \frac{3}{8}$	8	1
22	18Cr-10Ni-Ti	Smls. pipe	SA-312	TP321H	S32109	...	$> \frac{3}{16}$	8	1
23	18Cr-10Ni-Ti	Smls. pipe	SA-312	TP321H	S32109	...	$> \frac{3}{16}$	8	1
24	18Cr-10Ni-Ti	Wld. pipe	SA-312	TP321H	S32109	...	$> \frac{3}{16}$	8	1
25	18Cr-10Ni-Ti	Wld. pipe	SA-312	TP321H	S32109	...	$> \frac{3}{16}$	8	1
26	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321H	S32109	...	$> \frac{3}{8}$	8	1
27	18Cr-10Ni-Ti	Forgings	SA-182	F321	S32100	...	> 5	8	1
28	18Cr-10Ni-Ti	Forgings	SA-182	F321	S32100	...	> 5	8	1
29	18Cr-10Ni-Ti	Forgings	SA-965	F321	S32100	...	...	8	1
30	18Cr-10Ni-Ti	Forgings	SA-965	F321	S32100	...	...	8	1
31	18Cr-10Ni-Ti	Forgings	SA-182	F321H	S32109	...	> 5	8	1
32	18Cr-10Ni-Ti	Forgings	SA-182	F321H	S32109	...	> 5	8	1
33	18Cr-10Ni-Ti	Forgings	SA-965	F321H	S32109	...	...	8	1
34	18Cr-10Ni-Ti	Forgings	SA-965	F321H	S32109	...	...	8	1
35	18Cr-10Ni-Ti	Forgings	SA-182	F321	S32100	...	≤ 5	8	1
36	18Cr-10Ni-Ti	Forgings	SA-182	F321	S32100	...	≤ 5	8	1
37	18Cr-10Ni-Ti	Forgings	SA-182	F321	S32100	...	≤ 5	8	1
38	18Cr-10Ni-Ti	Smls. tube	SA-213	TP321	S32100	...	...	8	1
39	18Cr-10Ni-Ti	Smls. tube	SA-213	TP321	S32100	...	...	8	1
40	18Cr-10Ni-Ti	Smls. tube	SA-213	TP321	S32100	...	...	8	1
41	18Cr-10Ni-Ti	Plate	SA-240	321	S32100	...	...	8	1
42	18Cr-10Ni-Ti	Plate	SA-240	321	S32100	...	...	8	1
43	18Cr-10Ni-Ti	Plate	SA-240	321	S32100	...	...	8	1

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	75	30	1500	800	NP	NP	HA-2	G5, T8, W12, W13
2	75	30	1500	NP	NP	NP	HA-2	T9, W13
3	75	30	1500	NP	1500	NP	HA-2	G3, G5, G24, T8
4	75	30	1500	NP	1500	NP	HA-2	G3, G24, T9
5	75	30	1500	800	1500	NP	HA-2	G5, H2, T8, W12, W14
6	75	30	1500	NP	1500	NP	HA-2	H2, T9
7	75	30	NP	NP	1500	NP	HA-2	G5, G24, H2, T8
8	75	30	NP	NP	1500	NP	HA-2	G24, H2, T9
9	75	30	NP	800	1500	NP	HA-2	G5, H2, T8, W12, W14
10	75	30	1500	800	NP	NP	HA-2	G5, H2, T8
11	75	30	1500	NP	NP	NP	HA-2	H2, T9
12	75	30	NP	800	NP	NP	HA-2	G5, H2, W12
13	75	30	NP	800	NP	NP	HA-2	G5, W12
14	80	30	1350	NP	NP	NP	HA-2	G5, T9
15	80	30	1350	NP	NP	NP	HA-2	T9
16	70	25	1500	800	1500	NP	HA-2	G5, G12, T7
17	70	25	1500	NP	1500	NP	HA-2	G12, T7
18	70	25	1500	800	1500	NP	HA-2	G5, G12, T7, W12, W13, W14
19	70	25	1500	NP	1500	NP	HA-2	G12, T7, W13, W14
20	70	25	NP	800	1500	650	HA-2	G5, G12, H1, T7
21	70	25	NP	NP	1500	650	HA-2	G12, H1, T7
22	70	25	1500	800	1500	NP	HA-2	G5, T8
23	70	25	1500	NP	1500	NP	HA-2	T8
24	70	25	1500	800	1500	NP	HA-2	G5, T8, W12, W13, W14
25	70	25	1500	NP	1500	NP	HA-2	T8, W13, W14
26	70	25	NP	800	1500	NP	HA-2	G5, H2, T8
27	70	30	1500	800	1500	NP	HA-2	G5, G12, T6
28	70	30	1500	NP	1500	NP	HA-2	G12, T7
29	70	30	1500	800	1500	650	HA-2	G5, G12, H1, T6
30	70	30	1500	NP	1500	650	HA-2	G12, H1, T7
31	70	30	1500	800	1500	NP	HA-2	G5, H2, T8
32	70	30	1500	NP	1500	NP	HA-2	H2, T8
33	70	30	NP	800	1500	NP	HA-2	G5, H2, T8
34	70	30	NP	NP	1500	NP	HA-2	H2, T8
35	75	30	1500	NP	NP	NP	HA-2	G5, G12, T7
36	75	30	1500	NP	1500	650	HA-2	G12, T7
37	75	30	NP	800	1500	650	HA-2	G5, G12, T6
38	75	30	1500	NP	NP	NP	HA-2	G5, G12, T7
39	75	30	1500	NP	1500	NP	HA-2	G12, T7
40	75	30	NP	800	1500	NP	HA-2	G5, G12, T6
41	75	30	1500	NP	NP	NP	HA-2	G5, G12, T7
42	75	30	1500	NP	1500	650	HA-2	G12, T7
43	75	30	NP	800	1500	650	HA-2	G5, G12, T6

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	16.8	16.7
2	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
3	17.0	...	17.0	...	16.0	15.1	14.6	14.3	14.3	14.3	14.3	14.3	14.3	14.2
4	17.0	...	15.6	...	14.6	13.6	12.8	12.2	11.9	11.8	11.6	11.5	11.5	11.4
5	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	16.8	16.7
6	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
7	17.0	...	17.0	...	16.0	15.1	14.6	14.3	14.3	14.3	14.3	14.3	14.3	14.2
8	17.0	...	15.6	...	14.6	13.6	12.8	12.2	11.9	11.8	11.6	11.5	11.5	11.4
9	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	16.8	16.7
10	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	16.8	16.7
11	20.0	...	18.4	...	17.1	16.0	15.0	14.3	14.0	13.8	13.7	13.6	13.5	13.4
12	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	...	...
13	20.0	...	20.0	...	18.8	17.8	17.1	16.9	16.8	16.8	16.8	16.8	...	...
14	20.0	...	20.0	...	20.0	19.9	19.3	19.1	19.0	18.9	18.8	18.6	18.3	18.1
15	20.0	...	18.1	...	16.9	15.9	15.2	14.6	14.4	14.1	13.9	13.8	13.6	13.4
16	16.7	16.7	16.7	16.7	16.7	16.7	16.1	15.2	14.9	14.6	14.3	14.1	13.9	13.8
17	16.7	15.6	15.0	14.4	13.8	12.8	11.9	11.3	11.0	10.8	10.6	10.5	10.3	10.2
18	16.7	16.7	16.7	16.7	16.7	16.7	16.1	15.2	14.9	14.6	14.3	14.1	13.9	13.8
19	16.7	15.6	15.0	14.4	13.8	12.8	11.9	11.3	11.0	10.8	10.6	10.5	10.3	10.2
20	16.7	...	16.7	...	16.7	16.7	16.1	15.2	14.9	14.6	14.3	14.1	13.9	13.8
21	16.7	...	15.0	...	13.8	12.8	11.9	11.3	11.0	10.8	10.6	10.5	10.3	10.2
22	16.7	16.7	16.7	16.7	16.7	16.7	16.1	15.2	14.9	14.6	14.3	14.1	13.9	13.8
23	16.7	15.6	15.0	14.4	13.8	12.8	11.9	11.3	11.0	10.8	10.6	10.5	10.3	10.2
24	16.7	16.7	16.7	16.7	16.7	16.7	16.1	15.2	14.9	14.6	14.3	14.1	13.9	13.8
25	16.7	15.6	15.0	14.4	13.8	12.8	11.9	11.3	11.0	10.8	10.6	10.5	10.3	10.2
26	16.7	...	16.7	...	16.7	16.7	16.1	15.2	14.9	14.6	14.3	14.1	13.9	13.8
27	20.0	...	19.0	...	17.8	17.5	17.5	17.5	17.5	17.5	17.2	16.9	16.7	16.5
28	20.0	...	18.0	...	16.5	15.3	14.3	13.5	13.2	13.0	12.7	12.6	12.4	12.3
29	20.0	...	19.0	...	17.8	17.5	17.5	17.5	17.5	17.5	17.2	16.9	16.7	16.5
30	20.0	...	18.0	...	16.5	15.3	14.3	13.5	13.2	13.0	12.7	12.6	12.4	12.3
31	20.0	...	19.0	...	17.8	17.5	17.5	17.5	17.5	17.5	17.2	16.9	16.7	16.5
32	20.0	...	18.0	...	16.5	15.3	14.3	13.5	13.2	13.0	12.7	12.6	12.4	12.3
33	20.0	...	19.0	...	17.8	17.5	17.5	17.5	17.5	17.5	17.2	16.9	16.7	16.5
34	20.0	...	18.0	...	16.5	15.3	14.3	13.5	13.2	13.0	12.7	12.6	12.4	12.3
35	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
36	20.0	...	18.0	...	16.5	15.3	14.3	13.5	13.2	13.0	12.7	12.6	12.4	12.3
37	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
38	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
39	20.0	...	18.0	...	16.5	15.3	14.3	13.5	13.2	13.0	12.7	12.6	12.4	12.3
40	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
41	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
42	20.0	...	18.0	...	16.5	15.3	14.3	13.5	13.2	13.0	12.7	12.6	12.4	12.3
43	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	16.6	16.4	16.2	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
2	13.4	13.4	13.4	13.3	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
3	14.1	14.0	13.7	12.0	8.9	6.7	5.0	3.7	2.7	2.1	1.6	1.1	...	...	...
4	11.4	11.4	11.4	11.3	8.9	6.7	5.0	3.7	2.7	2.1	1.6	1.1	...	...	...
5	16.6	16.4	16.2	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
6	13.4	13.4	13.4	13.3	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
7	14.1	14.0	13.7	12.0	8.9	6.7	5.0	3.7	2.7	2.1	1.6	1.1	...	...	...
8	11.4	11.4	11.4	11.3	8.9	6.7	5.0	3.7	2.7	2.1	1.6	1.1	...	...	...
9	16.6	16.4	16.2	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
10	16.6	16.4	16.2	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
11	13.4	13.4	13.4	13.3	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	17.9	17.7	17.5	16.6	12.8	9.7	7.3	5.4	4.0	...	...	...	...	...	...
15	13.3	13.1	13.0	12.8	12.8	9.7	7.3	5.4	4.0	...	...	...	...	...	...
16	13.6	13.5	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
17	10.1	10.0	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
18	13.6	13.5	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
19	10.1	10.0	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
20	13.6	13.5	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
21	10.1	10.0	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
22	13.6	13.5	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
23	10.1	10.0	9.9	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
24	13.6	13.5	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
25	10.1	10.0	9.9	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
26	13.6	13.5	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
27	16.4	14.9	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
28	12.1	12.0	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
29	16.4	14.9	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
30	12.1	12.0	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
31	16.4	16.2	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
32	12.1	12.0	11.9	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
33	16.4	16.2	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
34	12.1	12.0	11.9	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
35	16.4	16.2	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
36	12.1	12.0	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
37	16.4	14.9	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
38	16.4	16.2	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
39	12.1	12.0	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
40	16.4	14.9	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
41	16.4	16.2	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
42	12.1	12.0	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
43	16.4	14.9	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	18Cr-10Ni-Ti	Wld. tube	SA-249	TP321	S32100	...	...	8	1
2	18Cr-10Ni-Ti	Wld. tube	SA-249	TP321	S32100	...	...	8	1
3	18Cr-10Ni-Ti	Wld. tube	SA-249	TP321	S32100	...	...	8	1
4	18Cr-10Ni-Ti	Wld. tube	SA-249	TP321	S32100	...	...	8	1
5	18Cr-10Ni-Ti	Smls. pipe	SA-312	TP321	S32100	...	$\leq \frac{3}{8}$	8	1
6	18Cr-10Ni-Ti	Smls. pipe	SA-312	TP321	S32100	...	$\leq \frac{3}{8}$	8	1
7	18Cr-10Ni-Ti	Wld. pipe	SA-312	TP321	S32100	...	$\leq \frac{3}{8}$	8	1
8	18Cr-10Ni-Ti	Wld. pipe	SA-312	TP321	S32100	...	$\leq \frac{3}{8}$	8	1
9	18Cr-10Ni-Ti	Wld. pipe	SA-358	321	S32100	1	...	8	1
10	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321	S32100	...	$\leq \frac{3}{8}$	8	1
11	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321	S32100	...	$\leq \frac{3}{8}$	8	1
12	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321	S32100	...	$\leq \frac{3}{8}$	8	1
13	18Cr-10Ni-Ti	Smls. & wld. fittings	SA-403	321	S32100	...	...	8	1
14	18Cr-10Ni-Ti	Wld. pipe	SA-409	TP321	S32100	...	...	8	1
15	18Cr-10Ni-Ti	Bar	SA-479	321	S32100	...	...	8	1
16	18Cr-10Ni-Ti	Bar	SA-479	321	S32100	...	...	8	1
17	18Cr-10Ni-Ti	Bar	SA-479	321	S32100	...	...	8	1
18	18Cr-10Ni-Ti	Wld. pipe	SA-813	TP321	S32100	...	...	8	1
19	18Cr-10Ni-Ti	Wld. pipe	SA-814	TP321	S32100	...	...	8	1
20	18Cr-10Ni-Ti	Bar	SA/JIS G4303	SUS321	...	...	...	8	1
21	18Cr-10Ni-Ti	Forgings	SA-182	F321H	S32109	...	≤ 5	8	1
22	18Cr-10Ni-Ti	Forgings	SA-182	F321H	S32109	...	≤ 5	8	1
23	18Cr-10Ni-Ti	Smls. tube	SA-213	TP321H	S32109	...	...	8	1
24	18Cr-10Ni-Ti	Smls. tube	SA-213	TP321H	S32109	...	...	8	1
25	18Cr-10Ni-Ti	Plate	SA-240	321H	S32109	...	...	8	1
26	18Cr-10Ni-Ti	Plate	SA-240	321H	S32109	...	...	8	1
27	18Cr-10Ni-Ti	Wld. tube	SA-249	TP321H	S32109	...	...	8	1
28	18Cr-10Ni-Ti	Wld. tube	SA-249	TP321H	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	Smls. pipe	SA-312	TP321H	S32109	...	$\leq \frac{3}{16}$	8	1
32	18Cr-10Ni-Ti	Smls. pipe	SA-312	TP321H	S32109	...	$\leq \frac{3}{16}$	8	1
33	18Cr-10Ni-Ti	Wld. pipe	SA-312	TP321H	S32109	...	$\leq \frac{3}{16}$	8	1
34	18Cr-10Ni-Ti	Wld. pipe	SA-312	TP321H	S32109	...	$\leq \frac{3}{16}$	8	1
35	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321H	S32109	...	$\leq \frac{3}{8}$	8	1
36	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321H	S32109	...	$\leq \frac{3}{8}$	8	1
37	18Cr-10Ni-Ti	Smls. & wld. fittings	SA-403	321H	S32109	...	...	8	1
38	18Cr-10Ni-Ti	Bar	SA-479	321H	S32109	...	...	8	1
39	18Cr-10Ni-Ti	Bar	SA-479	321H	S32109	...	...	8	1
40	18Cr-10Ni-Ti	Wld. pipe	SA-813	TP321H	S32109	...	...	8	1
41	18Cr-10Ni-Ti	Wld. pipe	SA-814	TP321H	S32109	...	...	8	1
42	18Cr-11Ni	Plate	SA-240	305	S30500	...	...	8	1

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	75	30	1500	NP	NP	NP	HA-2	G12, T7, W13
2	75	30	1500	800	NP	NP	HA-2	G5, G12, T7, W12, W13
3	75	30	1500	NP	1500	650	HA-2	G3, G5, G12, G24, T7
4	75	30	1500	NP	1500	650	HA-2	G3, G12, G24, T7
5	75	30	1500	800	1500	650	HA-2	G5, G12, T7
6	75	30	1500	NP	1500	650	HA-2	G12, T7
7	75	30	1500	800	1500	650	HA-2	G5, G12, T7, W12, W13, W14
8	75	30	1500	NP	1500	650	HA-2	T7, W13, W14
9	75	30	NP	800	NP	NP	HA-2	G5, H1, W12
10	75	30	1500	NP	NP	NP	HA-2	G5, G12, H1, T7
11	75	30	1500	NP	1500	NP	HA-2	G12, H1, T7
12	75	30	NP	800	1500	NP	HA-2	G5, G12, T6
13	75	30	NP	800	1500	650	HA-2	G5, G12, T6, W12, W14
14	75	30	NP	800	NP	NP	HA-2	G5, W12
15	75	30	1500	NP	NP	NP	HA-2	G5, G12, H1, T7
16	75	30	1500	NP	1500	650	HA-2	G12, G22, H1, T7
17	75	30	NP	800	1500	650	HA-2	G5, G12, G22, H1, T6
18	75	30	NP	800	NP	NP	HA-2	G5, H1, W12
19	75	30	NP	800	NP	NP	HA-2	G5, W12
20	75	30	NP	800	1500	NP	HA-2	G5, G12, G22, H1, T6
21	75	30	1500	800	1500	NP	HA-2	G5, H2, T8
22	75	30	1500	NP	1500	NP	HA-2	H2, T8
23	75	30	1500	800	1500	NP	HA-2	G5, H2, T8
24	75	30	1500	NP	1500	NP	HA-2	H2, T8
25	75	30	1500	800	1500	NP	HA-2	G5, H2, T8
26	75	30	1500	NP	1500	NP	HA-2	H2, T8
27	75	30	1500	NP	NP	NP	HA-2	T8, W13
28	75	30	1500	800	NP	NP	HA-2	G5, T8, W12, W13
29	75	30	1500	NP	1500	NP	HA-2	G3, G5, G24, T8
30	75	30	1500	NP	1500	NP	HA-2	G3, G24, T8
31	75	30	1500	800	1500	NP	HA-2	G5, T8
32	75	30	1500	NP	1500	NP	HA-2	T8
33	75	30	1500	800	1500	NP	HA-2	G5, T8, W12, W13, W14
34	75	30	1500	NP	1500	NP	HA-2	T8, W13, W14
35	75	30	1500	800	1500	NP	HA-2	G5, H2, T8
36	75	30	1500	NP	1500	NP	HA-2	H2, T8
37	75	30	NP	800	1500	NP	HA-2	G5, H2, T8, W12, W14
38	75	30	1500	NP	1500	NP	HA-2	H2, T8
39	75	30	1500	800	1500	NP	HA-2	G5, H2, T8
40	75	30	NP	800	NP	NP	HA-2	G5, H2, W12
41	75	30	NP	800	NP	NP	HA-2	G5, W12
42	75	30	NP	800	NP	NP	HA-1	G5

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	20.0	...	18.0	...	16.5	15.3	14.3	13.5	13.2	13.0	12.7	12.6	12.4	12.3
2	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
3	17.0	...	17.0	...	16.2	15.9	15.9	15.5	15.2	14.9	14.6	14.4	14.2	14.1
4	17.0	...	15.3	...	14.1	13.0	12.2	11.5	11.2	11.0	10.8	10.7	10.5	10.4
5	20.0	20.0	20.0	19.6	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
6	20.0	18.7	18.0	17.2	16.5	15.3	14.3	13.5	13.2	13.0	12.7	12.6	12.4	12.3
7	20.0	20.0	20.0	19.6	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
8	20.0	18.7	18.0	17.2	16.5	15.3	14.3	13.5	13.2	13.0	12.7	12.6	12.4	12.3
9	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	...	...
10	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
11	20.0	...	18.0	...	16.5	15.3	14.3	13.5	13.2	13.0	12.7	12.6	12.4	12.3
12	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
13	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
14	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	...	...
15	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
16	20.0	...	18.0	...	16.5	15.3	14.3	13.5	13.2	13.0	12.7	12.6	12.4	12.3
17	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
18	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	...	...
19	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	...	...
20	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
21	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
22	20.0	...	18.0	...	16.5	15.3	14.3	13.5	13.2	13.0	12.7	12.6	12.4	12.3
23	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
24	20.0	...	18.0	...	16.5	15.3	14.3	13.5	13.2	13.0	12.7	12.6	12.4	12.3
25	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
26	20.0	...	18.0	...	16.5	15.3	14.3	13.5	13.2	13.0	12.7	12.6	12.4	12.3
27	20.0	...	18.0	...	16.5	15.3	14.3	13.5	13.2	13.0	12.7	12.6	12.4	12.3
28	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
29	17.0	...	17.0	...	16.2	15.9	15.9	15.5	15.2	14.9	14.6	14.4	14.2	14.1
30	17.0	...	15.3	...	14.1	13.0	12.2	11.5	11.2	11.0	10.8	10.7	10.5	10.4
31	20.0	20.0	20.0	19.6	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
32	20.0	18.7	18.0	17.2	16.5	15.3	14.3	13.5	13.2	13.0	12.7	12.6	12.4	12.3
33	20.0	20.0	20.0	19.6	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
34	20.0	18.7	18.0	17.2	16.5	15.3	14.3	13.5	13.2	13.0	12.7	12.6	12.4	12.3
35	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
36	20.0	...	18.0	...	16.5	15.3	14.3	13.5	13.2	13.0	12.7	12.6	12.4	12.3
37	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
38	20.0	...	18.0	...	16.5	15.3	14.3	13.5	13.2	13.0	12.7	12.6	12.4	12.3
39	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	16.7	16.5
40	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	...	...
41	20.0	...	20.0	...	19.1	18.7	18.7	18.3	17.9	17.5	17.2	16.9	...	...
42	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	12.1	12.0	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
2	16.4	16.2	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
3	13.9	13.8	8.2	5.9	4.3	3.1	2.2	1.4	0.9	0.68	0.43	0.26	...	...	...
4	10.3	10.2	8.2	5.9	4.3	3.1	2.2	1.4	0.9	0.68	0.43	0.26	...	...	...
5	16.4	16.2	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
6	12.1	12.0	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
7	16.4	16.2	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
8	12.1	12.0	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	16.4	16.2	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
11	12.1	12.0	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
12	16.4	14.9	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
13	16.4	14.9	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	16.4	16.2	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
16	12.1	12.0	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
17	16.4	14.9	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	16.4	14.9	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30	...	...	...
21	16.4	16.2	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
22	12.1	12.0	11.9	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
23	16.4	16.2	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
24	12.1	12.0	11.9	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
25	16.4	16.2	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
26	12.1	12.0	11.9	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
27	12.1	12.0	11.9	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
28	16.4	16.2	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
29	13.9	13.8	10.5	7.7	5.9	4.6	3.5	2.7	2.1	1.6	1.3	0.94	...	...	...
30	10.3	10.2	10.1	7.7	5.9	4.6	3.5	2.7	2.1	1.6	1.3	0.94	...	...	...
31	16.4	16.2	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
32	12.1	12.0	11.9	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
33	16.4	16.2	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
34	12.1	12.0	11.9	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
35	16.4	16.2	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
36	12.1	12.0	11.9	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
37	16.4	16.2	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
38	12.1	12.0	11.9	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
39	16.4	16.2	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	18Cr-13Ni-3Mo	Forgings	SA-182	F317L	S31703	...	> 5	8	1
2	18Cr-13Ni-3Mo	Forgings	SA-182	F317L	S31703	...	> 5	8	1
3	18Cr-13Ni-3Mo	Forgings	SA-182	F317L	S31703	...	≤ 5	8	1
4	18Cr-13Ni-3Mo	Forgings	SA-182	F317L	S31703	...	≤ 5	8	1
5	18Cr-13Ni-3Mo	Forgings	SA-182	F317	S31700	...	≤ 5	8	1
6	18Cr-13Ni-3Mo	Forgings	SA-182	F317	S31700	...	≤ 5	8	1
7	18Cr-13Ni-3Mo	Plate	SA-240	317	S31700	...	...	8	1
8	18Cr-13Ni-3Mo	Plate	SA-240	317	S31700	...	...	8	1
9	18Cr-13Ni-3Mo	Plate	SA-240	317L	S31703	...	...	8	1
10	18Cr-13Ni-3Mo	Plate	SA-240	317L	S31703	...	...	8	1
11	18Cr-13Ni-3Mo	Wld. tube	SA-249	TP317	S31700	...	...	8	1
12	18Cr-13Ni-3Mo	Wld. tube	SA-249	TP317	S31700	...	...	8	1
13	18Cr-13Ni-3Mo	Wld. tube	SA-249	TP317	S31700	...	...	8	1
14	18Cr-13Ni-3Mo	Wld. tube	SA-249	TP317L	S31703	...	...	8	1
15	18Cr-13Ni-3Mo	Wld. tube	SA-249	TP317L	S31703	...	...	8	1
16	18Cr-13Ni-3Mo	Smls. & wld. pipe	SA-312	TP317	S31700	...	...	8	1
17	18Cr-13Ni-3Mo	Smls. pipe	SA-312	TP317	S31700	...	...	8	1
18	18Cr-13Ni-3Mo	Wld. pipe	SA-312	TP317	S31700	...	...	8	1
19	18Cr-13Ni-3Mo	Wld. pipe	SA-312	TP317	S31700	...	...	8	1
20	18Cr-13Ni-3Mo	Smls. pipe	SA-312	TP317L	S31703	...	...	8	1
21	18Cr-13Ni-3Mo	Smls. pipe	SA-312	TP317L	S31703	...	...	8	1
22	18Cr-13Ni-3Mo	Wld. pipe	SA-312	TP317L	S31703	...	...	8	1
23	18Cr-13Ni-3Mo	Wld. pipe	SA-312	TP317L	S31703	...	...	8	1
24	18Cr-13Ni-3Mo	Smls. & wld. fittings	SA-403	317	S31700	...	...	8	1
25	18Cr-13Ni-3Mo	Fittings	SA-403	317L	S31703	CR	...	8	1
26	18Cr-13Ni-3Mo	Fittings	SA-403	317L	S31703	CR	...	8	1
27	18Cr-13Ni-3Mo	Fittings	SA-403	317L	S31703	WP-S	...	8	1
28	18Cr-13Ni-3Mo	Fittings	SA-403	317L	S31703	WP-S	...	8	1
29	18Cr-13Ni-3Mo	Fittings	SA-403	317L	S31703	WP-W	...	8	1
30	18Cr-13Ni-3Mo	Fittings	SA-403	317L	S31703	WP-W	...	8	1
31	18Cr-13Ni-3Mo	Fittings	SA-403	317L	S31703	WP-WU	...	8	1
32	18Cr-13Ni-3Mo	Fittings	SA-403	317L	S31703	WP-WU	...	8	1
33	18Cr-13Ni-3Mo	Fittings	SA-403	317L	S31703	WP-WX	...	8	1
34	18Cr-13Ni-3Mo	Fittings	SA-403	317L	S31703	WP-WX	...	8	1
35	18Cr-15Ni-4Si	Forgings	SA-182	...	S30600	Sol. ann.	...	8	1
36	18Cr-15Ni-4Si	Forgings	SA-182	...	S30600	Sol. ann.	...	8	1
37	18Cr-15Ni-4Si	Plate	SA-240	...	S30600	Sol. ann.	≤ 2	8	1
38	18Cr-15Ni-4Si	Plate	SA-240	...	S30600	Sol. ann.	≤ 2	8	1
39	18Cr-15Ni-4Si	Smls. & wld. pipe	SA-312	...	S30600	Sol. ann.	...	8	1
40	18Cr-15Ni-4Si	Smls. & wld. pipe	SA-312	...	S30600	Sol. ann.	...	8	1
41	18Cr-15Ni-4Si	Wld. pipe	SA-312	...	S30600	Sol. ann.	...	8	1
42	18Cr-15Ni-4Si	Wld. pipe	SA-312	...	S30600	Sol. ann.	...	8	1
43	18Cr-15Ni-4Si	Bar	SA-479	...	S30600	Sol. ann.	≤ 4	8	1
44	18Cr-15Ni-4Si	Bar	SA-479	...	S30600	Sol. ann.	≤ 4	8	1

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	65	25	NP	NP	850	650	HA-4	G5
2	65	25	NP	NP	850	650	HA-4	...
3	70	25	NP	NP	850	650	HA-4	G5
4	70	25	NP	NP	850	650	HA-4	...
5	75	30	NP	NP	1500	650	HA-2	G5, G12, T8
6	75	30	NP	NP	1500	650	HA-2	G12, T9
7	75	30	NP	NP	1500	650	HA-2	G5, G12, T8
8	75	30	NP	NP	1500	650	HA-2	G12, T9
9	75	30	NP	NP	850	650	HA-4	G5
10	75	30	NP	NP	850	650	HA-4	...
11	75	30	NP	800	NP	NP	HA-2	G5, W12
12	75	30	NP	NP	1500	650	HA-2	G5, G12, G24, T8
13	75	30	NP	NP	1500	650	HA-2	G12, G24, T9
14	75	30	NP	NP	850	650	HA-4	G5, G24
15	75	30	NP	NP	850	650	HA-4	G24
16	75	30	NP	800	1500	650	HA-2	G5, G12, T8, W12, W14
17	75	30	NP	NP	1500	650	HA-2	G12, T9
18	75	30	NP	NP	1500	650	HA-2	G5, G12, G24, T8
19	75	30	NP	NP	1500	650	HA-2	G12, G24, T9
20	75	30	NP	NP	850	650	HA-4	G5
21	75	30	NP	NP	850	650	HA-4	...
22	75	30	NP	NP	850	650	HA-4	G5, G24
23	75	30	NP	NP	850	650	HA-4	G24
24	75	30	NP	NP	1500	650	HA-2	G5, G12, T8, W14
25	75	30	NP	NP	850	650	HA-4	G5, G24
26	75	30	NP	NP	850	650	HA-4	G24
27	75	30	NP	NP	850	650	HA-4	G5
28	75	30	NP	NP	850	650	HA-4	...
29	75	30	NP	NP	850	650	HA-4	G5, G24
30	75	30	NP	NP	850	650	HA-4	G24
31	75	30	NP	NP	850	650	HA-4	G5, G24
32	75	30	NP	NP	850	650	HA-4	G24
33	75	30	NP	NP	850	650	HA-4	G5, G24
34	75	30	NP	NP	850	650	HA-4	G24
35	78	35	NP	NP	300	NP	HA-2	G5, H6
36	78	35	NP	NP	300	NP	HA-2	H6
37	78	35	NP	NP	300	NP	HA-2	G5, H6
38	78	35	NP	NP	300	NP	HA-2	H6
39	78	35	NP	NP	300	NP	HA-2	G5, H6
40	78	35	NP	NP	300	NP	HA-2	H6
41	78	35	NP	NP	300	NP	HA-2	G5, G24, H6
42	78	35	NP	NP	300	NP	HA-2	G24, H6
43	78	35	NP	NP	300	NP	HA-2	G5, H6
44	78	35	NP	NP	300	NP	HA-2	H6

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	12.7	...
2	16.7	...	14.2	...	12.7	11.7	10.9	10.4	10.2	10.0	9.8	9.6	9.4	...
3	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	12.7	...
4	16.7	...	14.2	...	12.7	11.7	10.9	10.4	10.2	10.0	9.8	9.6	9.4	...
5	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
6	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
7	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
8	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
9	20.0	...	20.0	...	19.6	18.9	17.7	16.9	16.5	16.2	15.8	15.5	15.2	...
10	20.0	...	17.0	...	15.2	14.0	13.1	12.5	12.2	12.0	11.7	11.5	11.3	...
11	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
12	17.0	...	17.0	...	17.0	16.4	15.3	14.5	14.1	13.9	13.7	13.5	13.4	13.2
13	17.0	...	14.7	...	13.2	12.1	11.3	10.7	10.5	10.3	10.1	10.0	9.9	9.8
14	17.0	...	17.0	...	16.7	16.0	15.1	14.3	14.0	13.7	13.5	13.2	12.9	...
15	17.0	...	14.5	...	12.9	11.9	11.2	10.6	10.4	10.2	10.0	9.8	9.6	...
16	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
17	20.0	...	17.3	...	15.6	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
18	17.0	...	17.0	...	17.0	16.4	15.3	14.5	14.1	13.9	13.7	13.5	13.4	13.2
19	17.0	...	14.7	...	13.2	12.1	11.3	10.7	10.5	10.3	10.1	10.0	9.9	9.8
20	20.0	20.0	20.0	20.0	19.6	18.9	17.7	16.9	16.5	16.2	15.8	15.5	15.2	...
21	20.0	18.2	17.0	16.0	15.2	14.0	13.1	12.5	12.2	12.0	11.7	11.5	11.3	...
22	17.0	17.0	17.0	17.0	16.7	16.0	15.1	14.3	14.0	13.7	13.5	13.2	12.9	...
23	17.0	15.5	14.5	13.6	12.9	11.9	11.2	10.6	10.4	10.2	10.0	9.8	9.6	...
24	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	15.7	15.6
25	17.0	...	17.0	...	16.7	16.0	15.1	14.3	14.0	13.7	13.5	13.2	12.9	...
26	17.0	...	14.5	...	12.9	11.9	11.2	10.6	10.4	10.2	10.0	9.8	9.6	...
27	20.0	...	20.0	...	19.6	18.9	17.7	16.9	16.5	16.2	15.8	15.5	15.2	...
28	20.0	...	17.0	...	15.2	14.0	13.1	12.5	12.2	12.0	11.7	11.5	11.3	...
29	17.0	...	17.0	...	16.7	16.0	15.1	14.3	14.0	13.7	13.5	13.2	12.9	...
30	17.0	...	14.5	...	12.9	11.9	11.2	10.6	10.4	10.2	10.0	9.8	9.6	...
31	17.0	...	17.0	...	16.7	16.0	15.1	14.3	14.0	13.7	13.5	13.2	12.9	...
32	17.0	...	14.5	...	12.9	11.9	11.2	10.6	10.4	10.2	10.0	9.8	9.6	...
33	17.0	...	17.0	...	16.7	16.0	15.1	14.3	14.0	13.7	13.5	13.2	12.9	...
34	17.0	...	14.5	...	12.9	11.9	11.2	10.6	10.4	10.2	10.0	9.8	9.6	...
35	22.3	...	21.3	...	19.6	...	...	...	...	...	...	...	...	...
36	22.3	...	17.9	...	16.1	...	...	...	...	...	...	...	...	...
37	22.3	...	21.3	...	19.6	...	...	...	...	...	...	...	...	...
38	22.3	...	17.9	...	16.1	...	...	...	...	...	...	...	...	...
39	22.3	...	21.3	...	19.6	...	...	...	...	...	...	...	...	...
40	22.3	...	17.9	...	16.1	...	...	...	...	...	...	...	...	...
41	19.0	...	18.1	...	16.7	...	...	...	...	...	...	...	...	...
42	19.0	...	15.2	...	13.7	...	...	...	...	...	...	...	...	...
43	22.3	...	21.3	...	19.6	...	...	...	...	...	...	...	...	...
44	22.3	...	17.9	...	16.1	...	...	...	...	...	...	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
6	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
7	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
8	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	13.1	13.0	12.9	10.5	8.3	6.3	4.7	3.5	2.6	1.9	1.5	1.1	...	...	...
13	9.7	9.6	9.5	9.4	8.3	6.3	4.7	3.5	2.6	1.9	1.5	1.1	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
17	11.4	11.3	11.2	11.1	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
18	13.1	13.0	12.9	10.5	8.3	6.3	4.7	3.5	2.6	1.9	1.5	1.1	...	...	...
19	9.7	9.6	9.5	9.4	8.3	6.3	4.7	3.5	2.6	1.9	1.5	1.1
20
21
22
23
24	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3
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TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	18Cr-18Ni-2Si	Smls. tube	SA-213	XM-15	S38100	...	...	8	1
2	18Cr-18Ni-2Si	Smls. tube	SA-213	XM-15	S38100	...	...	8	1
3	18Cr-18Ni-2Si	Plate	SA-240	XM-15	S38100	...	...	8	1
4	18Cr-18Ni-2Si	Plate	SA-240	XM-15	S38100	...	...	8	1
5	18Cr-18Ni-2Si	Wld. tube	SA-249	TPXM-15	S38100	...	...	8	1
6	18Cr-18Ni-2Si	Wld. tube	SA-249	TPXM-15	S38100	...	...	8	1
7	18Cr-18Ni-2Si	Wld. pipe	SA-312	TPXM-15	S38100	...	...	8	1
8	18Cr-18Ni-2Si	Wld. pipe	SA-312	TPXM-15	S38100	...	...	8	1
9	18Cr-20Ni-5.5Si	Smls. tube	SA-213	...	S32615	Sol. ann.	...	8	1
10	18Cr-20Ni-5.5Si	Smls. tube	SA-213	...	S32615	Sol. ann.	...	8	1
11	18Cr-20Ni-5.5Si	Plate	SA-240	...	S32615	Sol. ann.	...	8	1
12	18Cr-20Ni-5.5Si	Plate	SA-240	...	S32615	Sol. ann.	...	8	1
13	18Cr-20Ni-5.5Si	Smls. & wld. pipe	SA-312	...	S32615	Sol. ann.	...	8	1
14	18Cr-20Ni-5.5Si	Smls. & wld. pipe	SA-312	...	S32615	Sol. ann.	...	8	1
15	18Cr-20Ni-5.5Si	Wld. pipe	SA-312	...	S32615	Sol. ann.	...	8	1
16	18Cr-20Ni-5.5Si	Wld. pipe	SA-312	...	S32615	Sol. ann.	...	8	1
17	18Cr-20Ni-5.5Si	Bar	SA-479	...	S32615	Sol. ann.	...	8	1
18	18Cr-20Ni-5.5Si	Bar	SA-479	...	S32615	Sol. ann.	...	8	1
19	19Cr-9Ni- $\frac{1}{2}$ Mo	Castings	SA-351	CF10	J92590	...	...	8	1
20	19Cr-9Ni- $\frac{1}{2}$ Mo	Castings	SA-351	CF10	J92590	...	...	8	1
21	19Cr-9Ni-2Mo	Castings	SA-351	CF10M	...	...	...	8	1
22	19Cr-9Ni-2Mo	Castings	SA-351	CF10M	...	...	...	8	1
23	19Cr-10Ni-3Mo	Castings	SA-351	CG8M	J93000	...	...	8	1
24	19Cr-10Ni-3Mo	Castings	SA-351	CG8M	J93000	...	...	8	1
25	19Cr-15Ni-4Mo	Smls. tube	SA-213	...	S31725	...	...	8	4
26	19Cr-15Ni-4Mo	Smls. tube	SA-213	...	S31725	...	...	8	4
27	19Cr-15Ni-4Mo	Plate	SA-240	...	S31725	...	...	8	4
28	19Cr-15Ni-4Mo	Plate	SA-240	...	S31725	...	...	8	4
29	19Cr-15Ni-4Mo	Wld. tube	SA-249	...	S31725	...	...	8	4
30	19Cr-15Ni-4Mo	Wld. tube	SA-249	...	S31725	...	...	8	4
31	19Cr-15Ni-4Mo	Smls. pipe	SA-312	...	S31725	...	...	8	4
32	19Cr-15Ni-4Mo	Smls. pipe	SA-312	...	S31725	...	...	8	4
33	19Cr-15Ni-4Mo	Wld. pipe	SA-312	...	S31725	...	...	8	4
34	19Cr-15Ni-4Mo	Wld. pipe	SA-312	...	S31725	...	...	8	4
35	19Cr-15Ni-4Mo	Wld. pipe	SA-358	...	S31725	...	...	8	4
36	19Cr-15Ni-4Mo	Wld. pipe	SA-358	...	S31725	...	...	8	4
37	19Cr-15Ni-4Mo	Smls. pipe	SA-376	...	S31725	...	...	8	4
38	19Cr-15Ni-4Mo	Smls. pipe	SA-376	...	S31725	...	...	8	4
39	19Cr-15Ni-4Mo	Fittings	SA-403	...	S31725	...	...	8	4
40	19Cr-15Ni-4Mo	Wld. pipe	SA-409	...	S31725	...	...	8	4
41	19Cr-15Ni-4Mo	Wld. pipe	SA-409	...	S31725	...	...	8	4
42	19Cr-15Ni-4Mo	Bar	SA-479	...	S31725	...	...	8	4
43	19Cr-15Ni-4Mo	Bar	SA-479	...	S31725	...	...	8	4

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	75	30	NP	NP	1000	650	HA-2	G5
2	75	30	NP	NP	1000	650	HA-2	...
3	75	30	NP	NP	1000	650	HA-2	G5
4	75	30	NP	NP	1000	650	HA-2	...
5	75	30	NP	NP	1000	650	HA-2	G5, G24
6	75	30	NP	NP	1000	650	HA-2	G24
7	75	30	NP	NP	950	650	HA-2	G5, G24
8	75	30	NP	NP	1000	650	HA-2	G24
9	80	32	NP	NP	400	NP	HA-2	G5, H6
10	80	32	NP	NP	400	NP	HA-2	H6
11	80	32	NP	NP	400	NP	HA-2	G5, H6
12	80	32	NP	NP	400	NP	HA-2	H6
13	80	32	NP	NP	400	NP	HA-2	G5, H6
14	80	32	NP	NP	400	NP	HA-2	H6
15	80	32	NP	NP	400	NP	HA-2	G5, G24, H6
16	80	32	NP	NP	400	NP	HA-2	G24, H6
17	80	32	NP	NP	400	NP	HA-2	G5, H6
18	80	32	NP	NP	400	NP	HA-2	H6
19	70	30	NP	NP	1500	650	HA-1	G1, G5, G32, T6
20	70	30	NP	NP	1500	650	HA-1	G1, G32, T7
21	70	30	NP	NP	1500	NP	HA-2	G1, G5, G32, T6
22	70	30	NP	NP	1500	NP	HA-2	G1, G32, T8
23	75	35	NP	NP	1000	650	HA-2	G1, G5, G32
24	75	35	NP	NP	1000	650	HA-2	G1, G32
25	75	30	NP	NP	400	400	HA-4	G5
26	75	30	NP	NP	400	400	HA-4	...
27	75	30	NP	NP	400	400	HA-4	G5
28	75	30	NP	NP	400	400	HA-4	...
29	75	30	NP	NP	400	400	HA-4	G5, G24
30	75	30	NP	NP	400	400	HA-4	G24
31	75	30	NP	NP	400	NP	HA-4	G5
32	75	30	NP	NP	400	NP	HA-4	...
33	75	30	NP	NP	400	NP	HA-4	G5, G24
34	75	30	NP	NP	400	NP	HA-4	G24
35	75	30	NP	NP	400	400	HA-4	G5, G24
36	75	30	NP	NP	400	400	HA-4	G24
37	75	30	NP	NP	400	400	HA-4	G5
38	75	30	NP	NP	400	400	HA-4	...
39	75	30	NP	NP	400	400	HA-4	G5, W14
40	75	30	NP	NP	400	400	HA-4	G5, G24
41	75	30	NP	NP	400	400	HA-4	G24
42	75	30	NP	NP	400	400	HA-4	G5
43	75	30	NP	NP	400	400	HA-4	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	14.9	14.6
2	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
3	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	14.9	14.6
4	20.0	...	16.7	...	15.0	13.8	12.9	12.3	12.0	11.7	11.5	11.2	11.0	10.8
5	17.0	...	17.0	...	16.1	15.5	14.8	14.1	13.8	13.5	13.2	12.9	12.6	12.4
6	17.0	...	14.2	...	12.7	11.7	11.0	10.4	10.2	10.0	9.8	9.6	9.4	9.2
7	17.0	...	17.0	...	16.1	15.5	14.8	14.1	13.8	13.5	13.2	12.9	12.6	12.4
8	17.0	...	14.2	...	12.7	11.7	11.0	10.4	10.2	10.0	9.8	9.6	9.4	9.2
9	21.3	...	21.3	...	21.3	21.0	...	...	...	...	...	...	...	...
10	21.3	...	17.6	...	16.5	15.4	...	...	...	...	...	...	...	...
11	21.3	...	21.3	...	21.3	21.0	...	...	...	...	...	...	...	...
12	21.3	...	17.6	...	16.5	15.4	...	...	...	...	...	...	...	...
13	21.3	...	21.3	...	21.3	21.0	...	...	...	...	...	...	...	...
14	21.3	...	17.6	...	16.5	15.4	...	...	...	...	...	...	...	...
15	18.1	...	18.1	...	18.1	17.9	...	...	...	...	...	...	...	...
16	18.1	...	15.0	...	14.0	13.1	...	...	...	...	...	...	...	...
17	21.3	...	21.3	...	21.3	21.0	...	...	...	...	...	...	...	...
18	21.3	...	17.6	...	16.5	15.4	...	...	...	...	...	...	...	...
19	20.0	...	19.0	...	17.7	17.2	17.0	16.5	16.2	15.8	15.5	15.2	14.9	14.6
20	20.0	...	16.7	...	15.0	13.8	12.9	12.2	12.0	11.7	11.5	11.3	11.1	10.8
21	20.0	...	20.0	...	19.5	19.3	17.9	17.0	16.6	16.3	16.1	15.9	15.7	15.5
22	20.0	...	17.5	...	15.7	14.3	13.3	12.6	12.3	12.1	11.9	11.8	11.6	11.5
23	21.4	...	20.8	...	19.6	19.1	18.4	17.5	17.1	16.8	16.6	16.4	16.2	16.0
24	21.4	...	18.8	...	16.4	14.7	13.6	12.9	12.7	12.5	12.3	12.1	12.0	11.8
25	20.0	...	20.0	...	19.6	18.9	...	...	...	...	...	...	...	...
26	20.0	...	16.9	...	15.2	14.0	...	...	...	...	...	...	...	...
27	20.0	...	20.0	...	19.6	18.9	...	...	...	...	...	...	...	...
28	20.0	...	16.9	...	15.2	14.0	...	...	...	...	...	...	...	...
29	17.0	...	17.0	...	16.6	16.1	...	...	...	...	...	...	...	...
30	17.0	...	14.4	...	12.9	11.9	...	...	...	...	...	...	...	...
31	20.0	...	20.0	...	19.6	18.9	...	...	...	...	...	...	...	...
32	20.0	...	16.9	...	15.2	14.0	...	...	...	...	...	...	...	...
33	17.0	...	17.0	...	16.6	16.1	...	...	...	...	...	...	...	...
34	17.0	...	14.4	...	12.9	11.9	...	...	...	...	...	...	...	...
35	17.0	...	17.0	...	16.6	16.1	...	...	...	...	...	...	...	...
36	17.0	...	14.4	...	12.9	11.9	...	...	...	...	...	...	...	...
37	20.0	...	20.0	...	19.6	18.9	...	...	...	...	...	...	...	...
38	20.0	...	16.9	...	15.2	14.0	...	...	...	...	...	...	...	...
39	20.0	...	20.0	...	19.6	18.9	...	...	...	...	...	...	...	...
40	17.0	...	17.0	...	16.6	16.1	...	...	...	...	...	...	...	...
41	17.0	...	14.4	...	12.9	11.9	...	...	...	...	...	...	...	...
42	20.0	...	20.0	...	19.6	18.9	...	...	...	...	...	...	...	...
43	20.0	...	16.9	...	15.2	14.0	...	...	...	...	...	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	14.3	14.0	...	...	...	...	...	...	...	...	...	...	...	...	...
2	10.6	10.4	...	...	...	...	...	...	...	...	...	...	...	...	...
3	14.3	14.0	...	...	...	...	...	...	...	...	...	...	...	...	...
4	10.6	10.4	...	...	...	...	...	...	...	...	...	...	...	...	...
5	12.1	11.9	...	...	...	...	...	...	...	...	...	...	...	...	...
6	9.0	8.8	...	...	...	...	...	...	...	...	...	...	...	...	...
7	12.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	9.0	8.8	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	14.4	12.2	9.5	7.5	6.0	4.8	3.9	3.3	2.7	2.3	2.0	1.7	...	...	...
20	10.6	10.4	9.5	7.5	6.0	4.8	3.9	3.3	2.7	2.3	2.0	1.7	...	...	...
21	15.3	14.9	11.5	8.9	6.9	5.4	4.3	3.4	2.8	2.3	1.9	1.6
22	11.4	11.3	11.2	8.9	6.9	5.4	4.3	3.4	2.8	2.3	1.9	1.6
23	15.7	12.2
24	11.6	11.3
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	20Cr-10Ni	Bar	SA-479	ER308	S30880	...	...	...	...
2	20Cr-18Ni-6Mo	Castings	SA-351	CK3MCuN	J93254	...	...	8	4
3	20Cr-18Ni-6Mo	Castings	SA-351	CK3MCuN	J93254	...	...	8	4
4	20Cr-18Ni-6Mo	Forgings	SA-182	F44	S31254	...	...	8	4
5	20Cr-18Ni-6Mo	Forgings	SA-182	F44	S31254	...	...	8	4
6	20Cr-18Ni-6Mo	Wld. tube	SA-249	...	S31254	...	...	8	4
7	20Cr-18Ni-6Mo	Wld. tube	SA-249	...	S31254	...	...	8	4
8	20Cr-18Ni-6Mo	Smls. pipe	SA-312	...	S31254	...	...	8	4
9	20Cr-18Ni-6Mo	Smls. pipe	SA-312	...	S31254	...	...	8	4
10	20Cr-18Ni-6Mo	Wld. pipe	SA-312	...	S31254	...	...	8	4
11	20Cr-18Ni-6Mo	Wld. pipe	SA-312	...	S31254	...	...	8	4
12	20Cr-18Ni-6Mo	Wld. pipe	SA-358	...	S31254	...	...	8	4
13	20Cr-18Ni-6Mo	Wld. pipe	SA-358	...	S31254	...	...	8	4
14	20Cr-18Ni-6Mo	Fittings	SA-403	...	S31254	...	...	8	4
15	20Cr-18Ni-6Mo	Plate	SA-240	...	S31254	...	$> \frac{3}{16}$	8	4
16	20Cr-18Ni-6Mo	Plate	SA-240	...	S31254	...	$> \frac{3}{16}$	8	4
17	20Cr-18Ni-6Mo	Plate	SA-240	...	S31254	...	$\leq \frac{3}{16}$	8	4
18	20Cr-18Ni-6Mo	Plate	SA-240	...	S31254	...	$\leq \frac{3}{16}$	8	4
19	21Cr-6Ni-9Mn	Forgings	SA-182	FXM-11	S21904	...	...	8	3
20	21Cr-6Ni-9Mn	Smls. pipe	SA-312	TPXM-11	S21904	...	...	8	3
21	21Cr-6Ni-9Mn	Smls. pipe	SA-312	TPXM-11	S21904	...	...	8	3
22	21Cr-6Ni-9Mn	Wld. 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	Plate	SA-666	XM-11	S21904	...	...	8	3
26	21Cr-6Ni-9Mn	Forgings	SA-965	FXM-11	S21904	...	...	8	3
27	21Cr-6Ni-9Mn	Forgings	SA-965	FXM-11	S21904	...	...	8	3
28	21Cr-11Ni-N	Forgings	SA-182	F45	S30815	...	...	8	2
29	21Cr-11Ni-N	Forgings	SA-182	F45	S30815	...	...	8	2
30	21Cr-11Ni-N	Smls. tube	SA-213	...	S30815	...	...	8	2
31	21Cr-11Ni-N	Smls. tube	SA-213	...	S30815	...	...	8	2
32	21Cr-11Ni-N	Plate	SA-240	...	S30815	...	...	8	2
33	21Cr-11Ni-N	Plate	SA-240	...	S30815	...	...	8	2
34	21Cr-11Ni-N	Wld. tube	SA-249	...	S30815	...	...	8	2
35	21Cr-11Ni-N	Wld. tube	SA-249	...	S30815	...	...	8	2
36	21Cr-11Ni-N	Smls. pipe	SA-312	...	S30815	...	...	8	2
37	21Cr-11Ni-N	Smls. pipe	SA-312	...	S30815	...	...	8	2
38	21Cr-11Ni-N	Wld. pipe	SA-312	...	S30815	...	...	8	2
39	21Cr-11Ni-N	Wld. pipe	SA-312	...	S30815	...	...	8	2
40	21Cr-11Ni-N	Bar	SA-479	...	S30815	...	...	8	2
41	21Cr-11Ni-N	Bar	SA-479	...	S30815	...	...	8	2

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	75	30	NP	800	NP	NP	HA-2	G5
2	80	38	NP	750	750	650	HA-2	G1, G5
3	80	38	NP	NP	750	650	HA-2	G1
4	94	44	NP	750	750	650	HA-2	G5
5	94	44	NP	NP	750	650	HA-2	...
6	94	44	NP	750	750	650	HA-2	G5, G24
7	94	44	NP	NP	750	650	HA-2	G24
8	94	44	NP	750	750	NP	HA-2	G5
9	94	44	NP	NP	750	NP	HA-2	...
10	94	44	NP	750	750	NP	HA-2	G5, G24
11	94	44	NP	NP	750	NP	HA-2	G24
12	94	44	NP	750	750	650	HA-2	G5, G24
13	94	44	NP	NP	750	650	HA-2	G24
14	94	44	NP	750	NP	NP	HA-2	G5, W12
15	95	45	NP	750	750	650	HA-2	G5
16	95	45	NP	NP	750	650	HA-2	...
17	100	45	NP	750	750	650	HA-2	G5
18	100	45	NP	NP	750	650	HA-2	...
19	90	50	NP	NP	600	600	HA-6	...
20	90	50	NP	NP	600	600	HA-6	G5
21	90	50	NP	NP	600	600	HA-6	...
22	90	50	NP	NP	600	600	HA-6	G5, G24
23	90	50	NP	NP	600	600	HA-6	G24
24	90	50	NP	NP	600	600	HA-6	G5
25	90	50	NP	NP	600	600	HA-6	...
26	90	50	NP	NP	600	600	HA-6	G5
27	90	50	NP	NP	600	600	HA-6	...
28	87	45	1650	NP	1650	650	HA-6	G5, G6, T5
29	87	45	1650	NP	1650	650	HA-6	G6, T6
30	87	45	1650	NP	1650	650	HA-6	G5, G6, T5
31	87	45	1650	NP	1650	650	HA-6	G6, T6
32	87	45	1650	NP	1650	650	HA-6	G5, G6, T5
33	87	45	1650	NP	1650	650	HA-6	G6, T6
34	87	45	1650	NP	1650	650	HA-6	G5, G6, G24, T5
35	87	45	1650	NP	1650	650	HA-6	G6, G24, T6
36	87	45	1650	NP	1650	650	HA-6	G5, G6, T5
37	87	45	1650	NP	1650	650	HA-6	G6, T6
38	87	45	1650	NP	1650	650	HA-6	G5, G6, G24, T5
39	87	45	1650	NP	1650	650	HA-6	G6, G24, T6
40	87	45	1650	NP	1650	650	HA-6	G5, G6, T5
41	87	45	1650	NP	1650	650	HA-6	G6, T6

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	20.0	...	20.0	...	18.9	18.3	17.5	16.6	16.2	15.8	15.5	15.2	...	...
2	22.9	...	22.9	...	21.7	20.7	20.0	19.6	19.4	19.3	19.2	...	...	...
3	22.9	...	20.7	...	18.5	17.1	16.1	15.4	15.2	15.1	15.0	...	...	...
4	26.9	...	26.9	...	25.5	24.3	23.5	23.0	22.8	22.7	22.6	...	...	...
5	26.9	...	23.9	...	21.4	19.8	18.6	17.9	17.6	17.4	17.3	...	...	...
6	22.8	...	22.8	...	21.7	20.7	20.0	19.5	19.4	19.3	19.2	...	...	...
7	22.8	...	20.3	...	18.2	16.8	15.8	15.2	15.0	14.8	14.7	...	...	...
8	26.9	...	26.9	...	25.5	24.3	23.5	23.0	22.8	22.7	22.6	...	...	...
9	26.9	...	23.9	...	21.4	19.8	18.6	17.9	17.6	17.4	17.3	...	...	...
10	22.8	...	22.8	...	21.7	20.7	20.0	19.5	19.4	19.3	19.2	...	...	...
11	22.8	...	20.3	...	18.2	16.8	15.8	15.2	15.0	14.8	14.7	...	...	...
12	22.8	...	22.8	...	21.7	20.7	20.0	19.5	19.4	19.3	19.2	...	...	...
13	22.8	...	20.3	...	18.2	16.8	15.8	15.2	15.0	14.8	14.7	...	...	...
14	26.9	...	26.9	...	25.5	24.3	23.5	23.0	22.8	22.7	22.6	...	...	...
15	27.1	...	27.1	...	25.8	24.6	23.7	23.2	23.1	23.0	22.9	...	...	...
16	27.1	...	24.5	...	21.9	20.2	19.1	18.3	18.0	17.8	17.7	...	...	...
17	28.6	...	28.6	...	27.2	25.9	25.0	24.4	24.3	24.1	23.9	...	...	...
18	28.6	...	24.5	...	21.9	20.2	19.1	18.3	18.0	17.8	17.7	...	...	...
19	25.7	...	25.7	...	22.0	19.6	18.1	17.1	...	...	...	...	...	...
20	25.7	...	25.7	...	24.0	22.8	22.0	21.5	...	...	...	...	...	...
21	25.7	...	25.7	...	22.0	19.6	18.1	17.1	...	...	...	...	...	...
22	21.9	...	21.9	...	20.4	19.4	18.7	18.3	...	...	...	...	...	...
23	21.9	...	21.9	...	18.7	16.6	15.3	14.6	...	...	...	...	...	...
24	25.7	...	25.7	...	24.0	22.8	22.0	21.5	...	...	...	...	...	...
25	25.7	...	25.7	...	22.0	19.6	18.1	17.1	...	...	...	...	...	...
26	25.7	...	25.7	...	24.0	22.8	22.0	21.5	...	...	...	...	...	...
27	25.7	...	25.7	...	22.0	19.6	18.1	17.1	...	...	...	...	...	...
28	24.9	...	24.7	...	23.3	22.4	21.8	21.4	21.2	21.0	20.8	20.6	20.3	20.0
29	24.9	...	24.7	...	22.0	19.9	18.5	17.7	17.4	17.2	17.0	16.8	16.6	16.4
30	24.9	...	24.7	...	23.3	22.4	21.8	21.4	21.2	21.0	20.8	20.6	20.3	20.0
31	24.9	...	24.7	...	22.0	19.9	18.5	17.7	17.4	17.2	17.0	16.8	16.6	16.4
32	24.9	...	24.7	...	23.3	22.4	21.8	21.4	21.2	21.0	20.8	20.6	20.3	20.0
33	24.9	...	24.7	...	22.0	19.9	18.5	17.7	17.4	17.2	17.0	16.8	16.6	16.4
34	21.1	...	21.0	...	19.8	19.1	18.5	18.2	18.0	17.8	17.7	17.5	17.3	17.0
35	21.1	...	21.0	...	18.7	16.9	15.8	15.0	14.8	14.6	14.5	14.3	14.2	14.0
36	24.9	...	24.7	...	23.3	22.4	21.8	21.4	21.2	21.0	20.8	20.6	20.3	20.0
37	24.9	...	24.7	...	22.0	19.9	18.5	17.7	17.4	17.2	17.0	16.8	16.6	16.4
38	21.1	...	21.0	...	19.8	19.1	18.5	18.2	18.0	17.8	17.7	17.5	17.3	17.0
39	21.1	...	21.0	...	18.7	16.9	15.8	15.0	14.8	14.6	14.5	14.3	14.2	14.0
40	24.9	...	24.7	...	23.3	22.4	21.8	21.4	21.2	21.0	20.8	20.6	20.3	20.0
41	24.9	...	24.7	...	22.0	19.9	18.5	17.7	17.4	17.2	17.0	16.8	16.6	16.4

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1
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28	19.1	14.9	11.6	9.0	6.9	5.2	4.0	3.1	2.4	1.9	1.6	1.3	1.0	0.86	0.71
29	16.2	14.9	11.6	9.0	6.9	5.2	4.0	3.1	2.4	1.9	1.6	1.3	1.0	0.86	0.71
30	19.1	14.9	11.6	9.0	6.9	5.2	4.0	3.1	2.4	1.9	1.6	1.3	1.0	0.86	0.71
31	16.2	14.9	11.6	9.0	6.9	5.2	4.0	3.1	2.4	1.9	1.6	1.3	1.0	0.86	0.71
32	19.1	14.9	11.6	9.0	6.9	5.2	4.0	3.1	2.4	1.9	1.6	1.3	1.0	0.86	0.71
33	16.2	14.9	11.6	9.0	6.9	5.2	4.0	3.1	2.4	1.9	1.6	1.3	1.0	0.86	0.71
34	16.3	12.7	9.9	7.7	5.9	4.4	3.4	2.6	2.0	1.6	1.4	1.1	0.85	0.73	0.60
35	13.8	12.7	9.9	7.7	5.9	4.4	3.4	2.6	2.0	1.6	1.4	1.1	0.85	0.73	0.60
36	19.1	14.9	11.6	9.0	6.9	5.2	4.0	3.1	2.4	1.9	1.6	1.3	1.0	0.86	0.71
37	16.2	14.9	11.6	9.0	6.9	5.2	4.0	3.1	2.4	1.9	1.6	1.3	1.0	0.86	0.71
38	16.3	12.7	9.9	7.7	5.9	4.4	3.4	2.6	2.0	1.6	1.4	1.1	0.85	0.73	0.60
39	13.8	12.7	9.9	7.7	5.9	4.4	3.4	2.6	2.0	1.6	1.4	1.1	0.85	0.73	0.60
40	19.1	14.9	11.6	9.0	6.9	5.2	4.0	3.1	2.4	1.9	1.6	1.3	1.0	0.86	0.71
41	16.2	14.9	11.6	9.0	6.9	5.2	4.0	3.1	2.4	1.9	1.6	1.3	1.0	0.86	0.71

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	22Cr-5Ni-3Mo-N	Forgings	SA-182	F51	S31803	...	...	10H	1
2	22Cr-5Ni-3Mo-N	Plate	SA-240	...	S31803	...	...	10H	1
3	22Cr-5Ni-3Mo-N	Bar	SA-479	...	S31803	...	...	10H	1
4	22Cr-5Ni-3Mo-N	Smls. tube	SA-789	...	S31803	...	...	10H	1
5	22Cr-5Ni-3Mo-N	Wld. tube	SA-789	...	S31803	...	...	10H	1
6	22Cr-5Ni-3Mo-N	Smls. pipe	SA-790	...	S31803	...	...	10H	1
7	22Cr-5Ni-3Mo-N	Wld. pipe	SA-790	...	S31803	...	...	10H	1
8	22Cr-5Ni-3Mo-N	Smls. fittings	SA-815	...	S31803	...	...	10H	1
9	22Cr-5Ni-3Mo-N	Wld. fittings	SA-815	...	S31803	...	...	10H	1
10	22Cr-5Ni-3Mo-N	Smls. & wld. fittings	SA-815	...	S31803	...	...	10H	1
11	22Cr-13Ni-5Mn	Castings	SA-351	CG6MMN	J93790	...	...	8	3
12	22Cr-13Ni-5Mn	Forgings	SA-182	FXM-19	S20910	...	...	8	3
13	22Cr-13Ni-5Mn	Smls. tube	SA-213	XM-19	S20910	...	...	8	3
14	22Cr-13Ni-5Mn	Plate	SA-240	XM-19	S20910	...	...	8	3
15	22Cr-13Ni-5Mn	Wld. tube	SA-249	TPXM-19	S20910	...	...	8	3
16	22Cr-13Ni-5Mn	Wld. tube	SA-249	TPXM-19	S20910	...	...	8	3
17	22Cr-13Ni-5Mn	Smls. & wld. pipe	SA-312	TPXM-19	S20910	...	...	8	3
18	22Cr-13Ni-5Mn	Smls. pipe	SA-312	TPXM-19	S20910	...	...	8	3
19	22Cr-13Ni-5Mn	Wld. pipe	SA-312	TPXM-19	S20910	...	...	8	3
20	22Cr-13Ni-5Mn	Wld. pipe	SA-358	XM-19	S20910	1	...	8	3
21	22Cr-13Ni-5Mn	Smls. & wld. fittings	SA-403	XM-19	S20910	...	...	8	3
22	22Cr-13Ni-5Mn	Bar	SA-479	XM-19	S20910	...	...	8	3
23	22Cr-13Ni-5Mn	Wld. pipe	SA-813	TPXM-19	S20910	...	...	8	3
24	22Cr-13Ni-5Mn	Wld. pipe	SA-814	TPXM-19	S20910	...	...	8	3
(10) 25	23Cr-4Ni-Mo-Cu-N	Plate	SA-240	...	S32304	...	...	10H	1
26	23Cr-4Ni-Mo-Cu-N	Smls. tube	SA-789	...	S32304	...	> 1	10H	1
27	23Cr-4Ni-Mo-Cu-N	Wld. tube	SA-789	...	S32304	...	> 1	10H	1
28	23Cr-4Ni-Mo-Cu-N	Smls. pipe	SA-790	...	S32304	...	...	10H	1
29	23Cr-4Ni-Mo-Cu-N	Wld. pipe	SA-790	...	S32304	...	...	10H	1
30	23Cr-4Ni-Mo-Cu-N	Smls. tube	SA-789	...	S32304	...	≤ 1	10H	1
31	23Cr-4Ni-Mo-Cu-N	Wld. tube	SA-789	...	S32304	...	≤ 1	10H	1
32	23Cr-12Ni	Smls. & wld. fittings	SA-403	309	S30900	...	...	8	2
33	23Cr-12Ni	Smls. tube	SA-213	TP309S	S30908	...	...	8	2
34	23Cr-12Ni	Smls. tube	SA-213	TP309S	S30908	...	...	8	2
35	23Cr-12Ni	Plate	SA-240	309S	S30908	...	...	8	2
36	23Cr-12Ni	Plate	SA-240	309S	S30908	...	...	8	2
37	23Cr-12Ni	Wld. tube	SA-249	TP309S	S30908	...	...	8	2
38	23Cr-12Ni	Wld. tube	SA-249	TP309S	S30908	...	...	8	2
39	23Cr-12Ni	Smls. & wld. pipe	SA-312	TP309S	S30908	...	...	8	2
40	23Cr-12Ni	Smls. pipe	SA-312	TP309S	S30908	...	...	8	2
41	23Cr-12Ni	Wld. pipe	SA-312	TP309S	S30908	...	...	8	2
42	23Cr-12Ni	Wld. pipe	SA-312	TP309S	S30908	...	...	8	2
43	23Cr-12Ni	Wld. pipe	SA-312	TP309S	S30908	...	...	8	2
44	23Cr-12Ni	Wld. pipe	SA-312	TP309S	S30908	...	...	8	2

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	90	65	600	NP	600	600	HA-5	G32
2	90	65	600	NP	600	600	HA-5	G32
3	90	65	600	NP	600	NP	HA-5	G32
4	90	65	600	NP	600	600	HA-5	G32
5	90	65	600	NP	600	600	HA-5	G24, G32
6	90	65	600	NP	600	600	HA-5	G32
7	90	65	600	NP	600	600	HA-5	G24, G32
8	90	65	600	NP	NP	NP	HA-5	G32
9	90	65	600	NP	NP	NP	HA-5	G24, G32
10	90	65	NP	NP	600	600	HA-5	G32, W14
11	85	42.5	NP	NP	1050	650	HA-2	G1
12	100	55	NP	800	1200	650	HA-6	G5, T8
13	100	55	NP	NP	1200	NP	HA-6	T8
14	100	55	NP	800	1200	650	HA-6	G5, T8
15	100	55	NP	800	NP	NP	HA-6	G5, W12
16	100	55	NP	NP	1200	650	HA-6	G24, T8
17	100	55	NP	800	NP	NP	HA-6	G5, W12
18	100	55	NP	NP	1200	650	HA-6	T8
19	100	55	NP	NP	1200	650	HA-6	G24, T8
20	100	55	NP	800	NP	NP	HA-6	G5, W12
21	100	55	NP	800	1200	650	HA-6	G5, T8, W12, W14
22	100	55	NP	800	1200	650	HA-6	G5, G22, T8
23	100	55	NP	800	NP	NP	HA-6	G5, W12
24	100	55	NP	800	NP	NP	HA-6	G5, W12
25	87	58	NP	NP	600	600	HA-6	G32
26	87	58	NP	NP	600	600	HA-6	G32
27	87	58	NP	NP	600	600	HA-6	G24, G32
28	87	58	NP	NP	600	600	HA-6	G32
29	87	58	NP	NP	600	600	HA-6	G24, G32
30	100	65	NP	NP	600	600	HA-5	G32
31	100	65	NP	NP	600	600	HA-5	G24, G32
32	75	30	NP	800	1500	650	HA-2	G5, G12, T5, W12, W14
33	75	30	1500	NP	1500	650	HA-2	G5, G12, T5
34	75	30	1500	NP	1500	650	HA-2	G12, T6
35	75	30	1500	800	1500	650	HA-2	G5, G12, T5
36	75	30	1500	NP	1500	650	HA-2	G12, T6
37	75	30	NP	NP	1500	650	HA-2	G5, G12, G24, T5
38	75	30	NP	NP	1500	650	HA-2	G12, G24, T6
39	75	30	1500	800	1500	650	HA-2	G5, G12, T5, W12, W14
40	75	30	1500	NP	1500	650	HA-2	G12, T6
41	75	30	1500	NP	NP	NP	HA-2	G5, G12, T5, W13
42	75	30	1500	NP	NP	NP	HA-2	G12, T6, W13
43	75	30	1500	NP	1500	650	HA-2	G3, G5, G12, G24, T5
44	75	30	1500	NP	1500	650	HA-2	G3, G12, G24, T6

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TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	25.7	...	25.7	...	24.8	23.9	23.3	23.1	...	...	...	...	...	...
2	25.7	...	25.7	...	24.8	23.9	23.3	23.1	...	...	...	...	...	...
3	25.7	...	25.7	...	24.8	23.9	23.3	23.1	...	...	...	...	...	...
4	25.7	...	25.7	...	24.8	23.9	23.3	23.1	...	...	...	...	...	...
5	21.9	...	21.9	...	21.1	20.3	19.8	19.6	...	...	...	...	...	...
6	25.7	...	25.7	...	24.8	23.9	23.3	23.1	...	...	...	...	...	...
7	21.9	...	21.9	...	21.1	20.3	19.8	19.6	...	...	...	...	...	...
8	25.7	...	25.7	...	24.8	23.9	23.3	23.1	...	...	...	...	...	...
9	21.9	...	21.9	...	21.1	20.3	19.8	19.6	...	...	...	...	...	...
10	25.7	...	25.7	...	24.8	23.9	23.3	23.1	...	...	...	...	...	...
11	19.4	...	19.3	...	17.8	16.8	16.0	15.4	15.2	14.9	14.7	14.6	14.4	14.2
12	28.6	...	28.4	...	26.9	26.0	25.5	25.1	24.9	24.7	24.5	24.2	23.9	23.6
13	28.6	...	28.4	...	26.9	26.0	25.5	25.0	24.6	24.2	23.9	23.5	23.3	23.0
14	28.6	...	28.4	...	26.9	26.0	25.5	25.1	24.9	24.7	24.5	24.2	23.9	23.6
15	28.6	...	28.4	...	26.9	26.0	25.5	25.1	24.9	24.7	24.5	24.2	...	...
16	24.3	...	24.1	...	22.9	22.1	21.6	21.2	20.9	20.6	20.3	20.0	19.8	19.5
17	28.6	...	28.4	...	26.9	26.0	25.5	25.1	24.9	24.7	24.5	24.2	...	...
18	28.6	...	28.4	...	26.9	26.0	25.5	25.0	24.6	24.2	23.9	23.5	23.3	23.0
19	24.3	...	24.1	...	22.9	22.1	21.6	21.2	20.9	20.6	20.3	20.0	19.8	19.5
20	28.6	...	28.4	...	26.9	26.0	25.5	25.1	24.9	24.7	24.5	24.2	...	...
21	28.6	...	28.4	...	26.9	26.0	25.5	25.1	24.9	24.7	24.5	24.2	23.9	23.6
22	28.6	...	28.4	...	26.9	26.0	25.5	25.1	24.9	24.7	24.5	24.2	23.9	23.6
23	28.6	...	28.4	...	26.9	26.0	25.5	25.1	24.9	24.7	24.5	24.2	...	...
24	28.6	...	28.4	...	26.9	26.0	25.5	25.1	24.9	24.7	24.5	24.2	...	...
(10) 25	24.9	...	24.0	...	22.5	21.7	21.3	21.0	...	...	...	...	...	...
26	24.9	...	24.0	...	22.5	21.7	21.3	21.0	...	...	...	...	...	...
27	21.1	...	20.4	...	19.1	18.5	18.1	17.9	...	...	...	...	...	...
28	24.9	...	24.0	...	22.5	21.7	21.3	21.0	...	...	...	...	...	...
29	21.1	...	20.4	...	19.1	18.5	18.1	17.9	...	...	...	...	...	...
30	28.6	...	27.6	...	25.9	25.0	24.6	24.3	...	...	...	...	...	...
31	24.3	...	23.4	...	22.0	21.3	20.9	20.6	...	...	...	...	...	...
32	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	17.5	17.2
33	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	17.5	17.2
34	20.0	...	17.5	...	16.1	15.1	14.4	13.9	13.7	13.5	13.3	13.1	12.9	12.7
35	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	17.5	17.2
36	20.0	...	17.5	...	16.1	15.1	14.4	13.9	13.7	13.5	13.3	13.1	12.9	12.7
37	17.0	...	17.0	...	17.0	17.0	16.5	15.9	15.7	15.5	15.3	15.1	14.8	14.6
38	17.0	...	14.9	...	13.7	12.8	12.2	11.8	11.6	11.5	11.3	11.2	11.0	10.8
39	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	17.5	17.2
40	20.0	...	17.5	...	16.1	15.1	14.4	13.9	13.7	13.5	13.3	13.1	12.9	12.7
41	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	17.5	17.2
42	20.0	...	17.5	...	16.1	15.1	14.4	13.9	13.7	13.5	13.3	13.1	12.9	12.7
43	17.0	...	17.0	...	17.0	17.0	16.5	15.9	15.7	15.5	15.3	15.1	14.8	14.6
44	17.0	...	14.9	...	13.7	12.8	12.2	11.8	11.6	11.5	11.3	11.2	11.0	10.8

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	14.1	13.9	13.6	...	...	...	...	...	...	...	...	...	...	...	...
12	23.2	22.8	22.3	20.4	13.0	8.3	...	...	...	...	...	...	...	...	...
13	22.7	22.5	22.2	20.4	13.0	8.3	...	...	...	...	...	...	...	...	...
14	23.2	22.8	22.3	20.4	13.0	8.3	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	19.3	19.1	18.9	17.3	11.1	7.1	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	22.7	22.5	22.2	20.4	13.0	8.3	...	...	...	...	...	...	...	...	...
19	19.3	19.1	18.9	17.3	11.1	7.1	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	23.2	22.8	22.3	20.4	13.0	8.3	...	...	...	...	...	...	...	...	...
22	23.2	22.8	22.3	20.4	13.0	8.3	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
33	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
34	12.5	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
35	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
36	12.5	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
37	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
38	10.6	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
39	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
40	12.5	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
41	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
42	12.5	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
43	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17
44	10.6	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17

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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	23Cr–12Ni	Wld. pipe	SA-358	309S	S30908	1	...	8	2
2	23Cr–12Ni	Bar	SA-479	309S	S30908	...	...	8	2
3	23Cr–12Ni	Bar	SA-479	309S	S30908	...	...	8	2
4	23Cr–12Ni	Wld. pipe	SA-813	TP309S	S30908	...	...	8	2
5	23Cr–12Ni	Wld. pipe	SA-813	TP309S	S30908	...	...	8	2
6	23Cr–12Ni	Wld. pipe	SA-814	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	Smls. tube	SA-213	TP309H	S30909	...	...	8	2
10	23Cr–12Ni	Plate	SA-240	309H	S30909	...	...	8	2
11	23Cr–12Ni	Plate	SA-240	309H	S30909	...	...	8	2
12	23Cr–12Ni	Wld. tube	SA-249	TP309H	S30909	...	...	8	2
13	23Cr–12Ni	Wld. tube	SA-249	TP309H	S30909	...	...	8	2
14	23Cr–12Ni	Wld. tube	SA-249	TP309H	S30909	...	...	8	2
15	23Cr–12Ni	Smls. pipe	SA-312	TP309H	S30909	...	...	8	2
16	23Cr–12Ni	Smls. pipe	SA-312	TP309H	S30909	...	...	8	2
17	23Cr–12Ni	Wld. pipe	SA-312	TP309H	S30909	...	...	8	2
18	23Cr–12Ni	Wld. pipe	SA-312	TP309H	S30909	...	...	8	2
19	23Cr–12Ni	Bar	SA-479	309H	S30909	...	...	8	2
20	23Cr–12Ni	Bar	SA-479	309H	S30909	...	...	8	2
21	23Cr–12Ni–Cb	Smls. tube	SA-213	TP309Cb	S30940	...	...	8	2
22	23Cr–12Ni–Cb	Smls. tube	SA-213	TP309Cb	S30940	...	...	8	2
23	23Cr–12Ni–Cb	Plate	SA-240	309Cb	S30940	...	...	8	2
24	23Cr–12Ni–Cb	Plate	SA-240	309Cb	S30940	...	...	8	2
25	23Cr–12Ni–Cb	Wld. tube	SA-249	TP309Cb	S30940	...	...	8	2
26	23Cr–12Ni–Cb	Wld. tube	SA-249	TP309Cb	S30940	...	...	8	2
27	23Cr–12Ni–Cb	Smls. & wld. pipe	SA-312	TP309Cb	S30940	...	...	8	2
28	23Cr–12Ni–Cb	Smls. pipe	SA-312	TP309Cb	S30940	...	...	8	2
29	23Cr–12Ni–Cb	Wld. pipe	SA-312	TP309Cb	S30940	...	...	8	2
30	23Cr–12Ni–Cb	Wld. pipe	SA-312	TP309Cb	S30940	...	...	8	2
31	23Cr–12Ni–Cb	Bar	SA-479	309Cb	S30940	...	...	8	2
32	23Cr–12Ni–Cb	Bar	SA-479	309Cb	S30940	...	...	8	2
33	23Cr–12Ni–Cb	Wld. pipe	SA-813	TP309Cb	S30940	...	...	8	2
34	23Cr–12Ni–Cb	Wld. pipe	SA-813	TP309Cb	S30940	...	...	8	2
35	23Cr–12Ni–Cb	Wld. pipe	SA-814	TP309Cb	S30940	...	...	8	2
36	23Cr–12Ni–Cb	Wld. pipe	SA-814	TP309Cb	S30940	...	...	8	2
37	24Cr–10Ni–4Mo–N	Castings	SA-995	2A	J93345	...	...	10H	1
38	25Cr–4Ni–4Mo–Ti	Plate	SA-240	...	S44635	...	...	10I	1
39	25Cr–4Ni–4Mo–Ti	Wld. tube	SA-268	...	S44635	...	...	10I	1
(10) 40	25Cr–5Ni–3Mo–2Cu	Castings	SA-995	1B	J93372	...	...	10H	1
41	25Cr–5Ni–3Mo–2Cu	Plate	SA-240	...	S32550	...	...	10H	1
42	25Cr–5Ni–3Mo–2Cu	Bar	SA-479	...	S32550	...	...	10H	1

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	75	30	NP	800	NP	NP	HA-2	G5, W12
2	75	30	1000	NP	1000	650	HA-2	G5, G12, G22, T5
3	75	30	1000	NP	1000	650	HA-2	G12, G22, T6
4	75	30	NP	NP	1500	650	HA-2	G5, G12, G24, T5
5	75	30	NP	NP	1500	650	HA-2	G12, G24, T6
6	75	30	NP	NP	1500	650	HA-2	G5, G12, G24, T5
7	75	30	NP	NP	1500	650	HA-2	G12, G24, T6
8	75	30	1500	NP	1500	NP	HA-2	G5, T6
9	75	30	1500	NP	1500	NP	HA-2	T7
10	75	30	1500	NP	1500	NP	HA-2	G5, H1, T6
11	75	30	1500	NP	1500	NP	HA-2	H1, T7
12	75	30	NP	800	NP	NP	HA-2	G5, W12
13	75	30	NP	NP	1500	NP	HA-2	G5, G24, T6
14	75	30	NP	NP	1500	NP	HA-2	G24, T7
15	75	30	1500	NP	1500	NP	HA-2	G5, T6
16	75	30	1500	NP	1500	NP	HA-2	T7
17	75	30	1500	NP	1500	NP	HA-2	G3, G5, G24, T6
18	75	30	1500	NP	1500	NP	HA-2	G3, G24, T7
19	75	30	1500	NP	1500	NP	HA-2	G5, T6
20	75	30	1500	NP	1500	NP	HA-2	T7
21	75	30	NP	NP	1500	650	HA-2	G5, G12, T5
22	75	30	NP	NP	1500	650	HA-2	G12, T6
23	75	30	NP	NP	1500	650	HA-2	G5, G12, T5
24	75	30	NP	NP	1500	650	HA-2	G12, T6
25	75	30	NP	NP	1500	650	HA-2	G5, G12, G24, T5
26	75	30	NP	NP	1500	650	HA-2	G12, G24, T6
27	75	30	NP	800	1500	650	HA-2	G5, G12, T5, W12
28	75	30	NP	NP	1500	650	HA-2	G12, T6
29	75	30	NP	NP	1500	650	HA-2	G5, G12, G24, T5
30	75	30	NP	NP	1500	650	HA-2	G12, G24, T6
31	75	30	NP	NP	1000	650	HA-2	G5, G12, G22
32	75	30	NP	NP	1000	650	HA-2	G12, G22
33	75	30	NP	NP	1500	650	HA-2	G5, G12, G24, T5
34	75	30	NP	NP	1500	650	HA-2	G12, G24, T6
35	75	30	NP	NP	1500	650	HA-2	G5, G12, G13, G24, T5
36	75	30	NP	NP	1500	650	HA-2	G12, G24, T6
37	95	65	NP	NP	600	600	HA-5	G1, G32
38	90	75	NP	NP	500	500	HA-5	G32
39	90	75	NP	NP	500	500	HA-5	G24, G32
40	100	70	NP	600	NP	NP	HA-5	G29, G32
41	110	80	NP	NP	500	500	HA-5	G32
42	110	80	NP	NP	500	500	HA-5	G32

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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	...	...
2	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	17.5	17.2
3	20.0	...	17.5	...	16.1	15.1	14.4	13.9	13.7	13.5	13.3	13.1	12.9	12.7
4	17.0	...	17.0	...	17.0	17.0	16.5	15.9	15.7	15.5	15.3	15.1	14.8	14.6
5	17.0	...	14.9	...	13.7	12.8	12.2	11.8	11.6	11.5	11.3	11.2	11.0	10.8
6	17.0	...	17.0	...	17.0	17.0	16.5	15.9	15.7	15.5	15.3	15.1	14.8	14.6
7	17.0	...	14.9	...	13.7	12.8	12.2	11.8	11.6	11.5	11.3	11.2	11.0	10.8
8	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	17.5	17.2
9	20.0	...	17.5	...	16.1	15.1	14.4	13.9	13.7	13.5	13.3	13.1	12.9	12.7
10	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	17.5	17.2
11	20.0	...	17.5	...	16.1	15.1	14.4	13.9	13.7	13.5	13.3	13.1	12.9	12.7
12	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	...	...
13	17.0	...	17.0	...	17.0	17.0	16.5	15.9	15.7	15.5	15.3	15.1	14.8	14.6
14	17.0	...	14.9	...	13.7	12.8	12.2	11.8	11.6	11.5	11.3	11.2	11.0	10.8
15	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	17.5	17.2
16	20.0	...	17.5	...	16.1	15.1	14.4	13.9	13.7	13.5	13.3	13.1	12.9	12.7
17	17.0	...	17.0	...	17.0	17.0	16.5	15.9	15.7	15.5	15.3	15.1	14.8	14.6
18	17.0	...	14.9	...	13.7	12.8	12.2	11.8	11.6	11.5	11.3	11.2	11.0	10.8
19	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	17.5	17.2
20	20.0	...	17.5	...	16.1	15.1	14.4	13.9	13.7	13.5	13.3	13.1	12.9	12.7
21	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	17.5	17.2
22	20.0	...	17.5	...	16.1	15.1	14.4	13.9	13.7	13.5	13.3	13.1	12.9	12.7
23	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	17.5	17.2
24	20.0	...	17.5	...	16.1	15.1	14.4	13.9	13.7	13.5	13.3	13.1	12.9	12.7
25	17.0	...	17.0	...	17.0	17.0	16.5	15.9	15.7	15.5	15.3	15.1	14.8	14.6
26	17.0	...	14.9	...	13.7	12.8	12.2	11.8	11.6	11.5	11.3	11.2	11.0	10.8
27	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	17.5	17.2
28	20.0	...	17.5	...	16.1	15.1	14.4	13.9	13.7	13.5	13.3	13.1	12.9	12.7
29	17.0	...	17.0	...	17.0	17.0	16.5	15.9	15.7	15.5	15.3	15.1	14.8	14.6
30	17.0	...	14.9	...	13.7	12.8	12.2	11.8	11.6	11.5	11.3	11.2	11.0	10.8
31	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	17.5	17.2
32	20.0	...	17.5	...	16.1	15.1	14.4	13.9	13.7	13.5	13.3	13.1	12.9	12.7
33	17.0	...	17.0	...	17.0	17.0	16.5	15.9	15.7	15.5	15.3	15.1	14.8	14.6
34	17.0	...	14.9	...	13.7	12.8	12.2	11.8	11.6	11.5	11.3	11.2	11.0	10.8
35	17.0	...	17.0	...	17.0	17.0	16.5	15.9	15.7	15.5	15.3	15.1	14.8	14.6
36	17.0	...	14.9	...	13.7	12.8	12.2	11.8	11.6	11.5	11.3	11.2	11.0	10.8
37	27.1	...	27.1	...	25.1	24.2	24.2	24.2	...	...	...	...	...	...
38	25.7	...	24.9	...	23.5	22.5	22.0	...	...	...	...	...	...	...
39	21.9	...	21.2	...	19.9	19.1	18.7	...	...	...	...	...	...	...
(10) 40	28.6	...	28.6	...	27.9	27.5	27.5	27.4	...	...	...	...	...	...
41	31.4	...	31.3	...	29.5	28.6	28.2	...	...	...	...	...	...	...
42	31.4	...	31.3	...	29.5	28.6	28.2	...	...	...	...	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	15.9	9.9	...	...	...	...	...	...	...	...	...	...	...	...	...
3	12.5	9.9	...	...	...	...	...	...	...	...	...	...	...	...	...
4	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
5	10.6	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
6	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
7	10.6	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
8	16.9	13.8	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	1.0	0.75	...	...	...
9	12.5	12.3	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	1.0	0.75	...	...	...
10	16.9	13.8	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	1.0	0.75	...	...	...
11	12.5	12.3	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	1.0	0.75	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	14.4	11.7	8.8	6.5	4.7	3.4	2.6	1.9	1.4	1.1	0.82	0.64	...	...	...
14	10.6	10.4	8.8	6.5	4.7	3.4	2.6	1.9	1.4	1.1	0.82	0.64	...	...	...
15	16.9	13.8	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	1.0	0.75	...	...	...
16	12.5	12.3	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	1.0	0.75	...	...	...
17	14.4	11.7	8.8	6.5	4.7	3.4	2.6	1.9	1.4	1.1	0.82	0.64	...	...	...
18	10.6	10.4	8.8	6.5	4.7	3.4	2.6	1.9	1.4	1.1	0.82	0.64	...	...	...
19	16.9	13.8	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	1.0	0.75	...	...	...
20	12.5	12.3	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	1.0	0.75	...	...	...
21	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
22	12.5	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
23	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
24	12.5	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
25	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
26	10.6	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
27	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
28	12.5	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
29	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
30	10.6	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
31	15.9	9.9	...	...	...	...	...	...	...	...	...	...	...	...	...
32	12.5	9.9	...	...	...	...	...	...	...	...	...	...	...	...	...
33	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
34	10.6	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
35	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
36	10.6	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

(10)

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	25Cr-5Ni-3Mo-2Cu	Smls. tube	SA-789	...	S32550	...	...	10H	1
2	25Cr-5Ni-3Mo-2Cu	Wld. tube	SA-789	...	S32550	...	...	10H	1
3	25Cr-5Ni-3Mo-2Cu	Smls. pipe	SA-790	...	S32550	...	...	10H	1
4	25Cr-5Ni-3Mo-2Cu	Wld. pipe	SA-790	...	S32550	...	...	10H	1
5	25Cr-6Ni-Mo-N	Plate	SA-240	...	S31200	...	...	10H	1
6	25Cr-6.5Ni-3Mo-N	Smls. tube	SA-789	...	S31260	...	...	10H	1
7	25Cr-6.5Ni-3Mo-N	Wld. tube	SA-789	...	S31260	...	...	10H	1
8	25Cr-6.5Ni-3Mo-N	Smls. pipe	SA-790	...	S31260	...	...	10H	1
9	25Cr-6.5Ni-3Mo-N	Wld. pipe	SA-790	...	S31260	...	...	10H	1
10	25Cr-6.5Ni-3Mo-N	Plate	SA-240	...	S31260	...	...	10H	1
11	25Cr-7Ni-3Mo-W-Cu-N	Forgings	SA-182	F54	S39274	...	...	10H	1
12	25Cr-7Ni-3Mo-W-Cu-N	Smls. tube	SA-789	...	S39274	...	...	10H	1
13	25Cr-7Ni-3Mo-W-Cu-N	Wld. tube	SA-789	...	S39274	...	...	10H	1
14	25Cr-7Ni-3Mo-W-Cu-N	Smls. pipe	SA-790	...	S39274	...	...	10H	1
15	25Cr-7Ni-3Mo-W-Cu-N	Wld. pipe	SA-790	...	S39274	...	...	10H	1
16	25Cr-7Ni-4Mo-N	Forgings	SA-182	F53	S32750	...	...	10H	1
17	25Cr-7Ni-4Mo-N	Plate, sheet	SA-240	...	S32750	...	...	10H	1
18	25Cr-7Ni-4Mo-N	Smls. tube	SA-789	...	S32750	...	≤ 1	10H	1
19	25Cr-7Ni-4Mo-N	Wld. tube	SA-789	...	S32750	...	≤ 1	10H	1
20	25Cr-7Ni-4Mo-N	Smls. pipe	SA-790	...	S32750	...	≤ 1	10H	1
21	25Cr-7Ni-4Mo-N	Wld. pipe	SA-790	...	S32750	...	≤ 1	10H	1
22	25Cr-12Ni	Castings	SA-351	CH8	J93400	...	...	8	2
23	25Cr-12Ni	Castings	SA-351	CH8	J93400	...	...	8	2
24	25Cr-12Ni	Cast pipe	SA-451	CPH8	J93400	...	...	8	2
25	25Cr-12Ni	Castings	SA-351	CH20	J93402	...	...	8	2
26	25Cr-12Ni	Castings	SA-351	CH20	J93402	...	...	8	2
27	25Cr-12Ni	Cast pipe	SA-451	CPH20	J93402	...	...	8	2
28	25Cr-20Ni	Castings	SA-351	CK20	J94202	...	...	8	2
29	25Cr-20Ni	Castings	SA-351	CK20	J94202	...	...	8	2
30	25Cr-20Ni	Cast pipe	SA-451	CPK20	J94202	...	...	8	2
31	25Cr-20Ni	Forgings	SA-182	F310	S31000	...	> 5	8	2
32	25Cr-20Ni	Forgings	SA-182	F310	S31000	...	≤ 5	8	2
33	25Cr-20Ni	Forgings	SA-965	F310	S31000	...	...	8	2
34	25Cr-20Ni	Smls. tube	SA-213	TP310S	S31008	...	...	8	2
35	25Cr-20Ni	Smls. tube	SA-213	TP310S	S31008	...	...	8	2
36	25Cr-20Ni	Plate	SA-240	310S	S31008	...	...	8	2
37	25Cr-20Ni	Plate	SA-240	310S	S31008	...	...	8	2
38	25Cr-20Ni	Wld. tube	SA-249	TP310S	S31008	...	...	8	2
39	25Cr-20Ni	Wld. tube	SA-249	TP310S	S31008	...	...	8	2
40	25Cr-20Ni	Smls. & wld. pipe	SA-312	TP310S	S31008	...	...	8	2
41	25Cr-20Ni	Smls. pipe	SA-312	TP310S	S31008	...	...	8	2
42	25Cr-20Ni	Wld. pipe	SA-312	TP310S	S31008	...	...	8	2
43	25Cr-20Ni	Wld. pipe	SA-312	TP310S	S31008	...	...	8	2

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	110	80	NP	NP	500	500	HA-5	G32
2	110	80	NP	NP	500	500	HA-5	G24, G32
3	110	80	NP	NP	500	500	HA-5	G32
4	110	80	NP	NP	500	500	HA-5	G24, G32
5	100	65	NP	NP	600	600	HA-5	G32
6	100	65	NP	NP	650	650	HA-5	G32
7	100	65	NP	NP	650	650	HA-5	G24, G32
8	100	65	NP	NP	650	650	HA-5	G32
9	100	65	NP	NP	650	650	HA-5	G24, G32
10	100	70	NP	NP	650	650	HA-5	G32
11	116	80	NP	NP	650	650	HA-8	G32
12	116	80	NP	NP	650	650	HA-8	G32
13	116	80	NP	NP	650	650	HA-8	G24, G32
14	116	80	NP	NP	650	650	HA-8	G32
15	116	80	NP	NP	650	650	HA-8	G24, G32
16	116	80	NP	NP	600	NP	HA-5	G32
17	116	80	NP	NP	600	NP	HA-5	G32
18	116	80	NP	NP	600	600	HA-5	G32
19	116	80	NP	NP	600	600	HA-5	G24, G32
20	116	80	NP	NP	600	600	HA-5	G32
21	116	80	NP	NP	600	600	HA-5	G24, G32
22	65	28	NP	800	1500	650	HA-3	G1, G5, G12, G16, G17, G32, T6
23	65	28	NP	NP	1500	650	HA-3	G1, G12, G32, T7
24	65	28	NP	800	NP	NP	HA-3	G5, G16, G17, G32
25	70	30	NP	800	1500	650	HA-2	G1, G5, G12, G16, G17, T6
26	70	30	NP	NP	1500	650	HA-2	G1, G12, T7
27	70	30	NP	800	NP	NP	HA-2	G5, G16, G17
28	65	28	NP	800	1500	650	HA-3	G1, G5, G12, G16, G17, T6
29	65	28	NP	NP	1500	650	HA-3	G1, G12, T8
30	65	28	NP	800	NP	NP	HA-3	G5, G16, G17
31	70	30	NP	800	NP	NP	HA-2	G5
32	75	30	NP	800	1500	650	HA-2	G5, G12, G14, T5
33	75	30	NP	800	1500	650	HA-2	G5, G12, T5
34	75	30	1500	NP	1500	650	HA-2	G5, G12, T5
35	75	30	1500	NP	1500	650	HA-2	G12, T6
36	75	30	1500	800	1500	650	HA-2	G5, G12, T5
37	75	30	1500	NP	1500	650	HA-2	G12, T6
38	75	30	NP	NP	1500	650	HA-2	G5, G12, G24, T5
39	75	30	NP	NP	1500	650	HA-2	G12, G24, T6
40	75	30	1500	800	1500	650	HA-2	G5, G12, T5, W12, W14
41	75	30	1500	NP	1500	650	HA-2	G12, T6
42	75	30	1500	NP	1500	650	HA-2	G3, G5, G12, G14, G24, T5
43	75	30	1500	NP	1500	650	HA-2	G3, G12, G14, G24, T6

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	31.4	...	31.3	...	29.5	28.6	28.2	...	...	...	...	...	...	...
2	26.7	...	26.6	...	25.1	24.3	24.0	...	...	...	...	...	...	...
3	31.4	...	31.3	...	29.5	28.6	28.2	...	...	...	...	...	...	...
4	26.7	...	26.6	...	25.1	24.3	24.0	...	...	...	...	...	...	...
5	28.6	...	28.6	...	27.1	26.3	26.1	26.1	...	...	...	...	...	...
6	28.6	...	28.5	...	27.1	26.4	26.3	26.3	26.3	...	...	...	...	...
7	24.3	...	24.3	...	23.0	22.5	22.4	22.4	22.4	...	...	...	...	...
8	28.6	...	28.5	...	27.1	26.4	26.3	26.3	26.3	...	...	...	...	...
9	24.3	...	24.3	...	23.0	22.5	22.4	22.4	22.4	...	...	...	...	...
10	28.6	...	28.5	...	27.1	26.4	26.3	26.3	26.3	...	...	...	...	...
11	33.1	...	33.1	...	31.6	31.4	31.4	31.4	31.4	...	...	...	...	...
12	33.1	...	33.1	...	31.6	31.4	31.4	31.4	31.4	...	...	...	...	...
13	28.2	...	28.2	...	26.8	26.7	26.7	26.7	26.7	...	...	...	...	...
14	33.1	...	33.1	...	31.6	31.4	31.4	31.4	31.4	...	...	...	...	...
15	28.2	...	28.2	...	26.8	26.7	26.7	26.7	26.7	...	...	...	...	...
16	33.1	...	33.0	...	31.2	30.1	29.6	29.4	...	...	...	...	...	...
17	33.1	...	33.0	...	31.2	30.1	29.6	29.4	...	...	...	...	...	...
18	33.1	...	33.0	...	31.2	30.1	29.6	29.4	...	...	...	...	...	...
19	28.2	...	28.0	...	26.5	25.6	25.2	25.0	...	...	...	...	...	...
20	33.1	...	33.0	...	31.2	30.1	29.6	29.4	...	...	...	...	...	...
21	28.2	...	28.0	...	26.5	25.6	25.2	25.0	...	...	...	...	...	...
22	18.6	...	17.0	...	15.8	15.4	15.4	15.4	15.3	15.2	15.0	14.8	14.4	13.9
23	18.6	...	15.3	...	14.1	13.5	13.1	12.7	12.4	12.1	11.8	11.4	11.0	10.7
24	18.6	...	17.0	...	15.8	15.4	15.4	15.4	15.3	15.2	15.0	14.8	...	...
25	20.0	...	18.3	...	17.0	16.6	16.6	16.6	16.5	16.4	16.2	15.9	15.5	14.9
26	20.0	...	16.3	...	15.1	14.5	14.0	13.6	13.3	12.9	12.6	12.2	11.8	11.4
27	20.0	...	18.3	...	17.0	16.6	16.6	16.6	16.5	16.4	16.2	15.9	...	...
28	18.6	...	17.0	...	15.8	15.4	15.4	15.4	15.3	15.2	15.0	14.8	14.4	13.9
29	18.6	...	15.3	...	14.1	13.5	13.1	12.7	12.4	12.1	11.8	11.4	11.0	10.7
30	18.6	...	17.0	...	15.8	15.4	15.4	15.4	15.3	15.2	15.0	14.8	...	...
31	20.0	...	19.8	...	18.9	18.6	18.5	18.5	18.2	17.9	17.7	17.4	...	...
32	20.0	...	20.0	...	20.0	19.9	19.3	18.5	18.2	17.9	17.7	17.4	17.2	16.9
33	20.0	...	20.0	...	20.0	19.9	19.3	18.5	18.2	17.9	17.7	17.4	17.2	16.9
34	20.0	...	20.0	...	20.0	19.9	19.3	18.5	18.2	17.9	17.7	17.4	17.2	16.9
35	20.0	...	17.6	...	16.1	15.1	14.3	13.7	13.5	13.3	13.1	12.9	12.7	12.5
36	20.0	...	20.0	...	20.0	19.9	19.3	18.5	18.2	17.9	17.7	17.4	17.2	16.9
37	20.0	...	17.6	...	16.1	15.1	14.3	13.7	13.5	13.3	13.1	12.9	12.7	12.5
38	17.0	...	17.0	...	17.0	16.9	16.4	15.7	15.5	15.2	15.0	14.8	14.6	14.4
39	17.0	...	15.0	...	13.7	12.8	12.1	11.7	11.5	11.3	11.1	11.0	10.8	10.7
40	20.0	...	20.0	...	20.0	19.9	19.3	18.5	18.2	17.9	17.7	17.4	17.2	16.9
41	20.0	...	17.6	...	16.1	15.1	14.3	13.7	13.5	13.3	13.1	12.9	12.7	12.5
42	17.0	...	17.0	...	17.0	16.9	16.4	15.7	15.5	15.2	15.0	14.8	14.6	14.4
43	17.0	...	15.0	...	13.7	12.8	12.1	11.7	11.5	11.3	11.1	11.0	10.8	10.7

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	13.2	11.1	8.5	6.5	5.0	3.8	2.9	2.3	1.8	1.3	0.90	0.80	...	...	...
23	10.3	9.9	8.5	6.5	5.0	3.8	2.9	2.3	1.8	1.3	0.90	0.80	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	14.3	11.1	8.5	6.5	5.0	3.8	2.9	2.3	1.8	1.3	0.90	0.80	...	...	...
26	11.0	10.6	8.5	6.5	5.0	3.8	2.9	2.3	1.8	1.3	0.90	0.80	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	13.2	11.3	9.8	8.5	7.3	6.0	4.8	3.5	2.4	1.6	1.1	0.80	...	...	...
29	10.3	9.9	9.5	8.5	7.3	6.0	4.8	3.5	2.4	1.6	1.1	0.80	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
33	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
34	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
35	12.3	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
36	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
37	12.3	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
38	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
39	10.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
40	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
41	12.3	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
42	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
43	10.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	25Cr–20Ni	Wld. pipe	SA-358	310S	S31008	1	...	8	2
2	25Cr–20Ni	Smls. & wld. fittings	SA-403	310S	S31008	...	...	8	2
3	25Cr–20Ni	Bar	SA-479	310S	S31008	...	...	8	2
4	25Cr–20Ni	Bar	SA-479	310S	S31008	...	...	8	2
5	25Cr–20Ni	Wld. pipe	SA-813	TP310S	S31008	...	...	8	2
6	25Cr–20Ni	Wld. pipe	SA-813	TP310S	S31008	...	...	8	2
7	25Cr–20Ni	Wld. pipe	SA-814	TP310S	S31008	...	...	8	2
8	25Cr–20Ni	Wld. pipe	SA-814	TP310S	S31008	...	...	8	2
9	25Cr–20Ni	Bar	SA/JIS G4303	SUS310S	...	...	...	8	2
10	25Cr–20Ni	Smls. tube	SA-213	TP310H	S31009	...	...	8	2
11	25Cr–20Ni	Plate	SA-240	310H	S31009	...	...	8	2
12	25Cr–20Ni	Plate	SA-240	310H	S31009	...	...	8	2
13	25Cr–20Ni	Wld. tube	SA-249	TP310H	S31009	...	...	8	2
14	25Cr–20Ni	Wld. tube	SA-249	TP310H	S31009	...	...	8	2
15	25Cr–20Ni	Wld. tube	SA-249	TP310H	S31009	...	...	8	2
16	25Cr–20Ni	Smls. pipe	SA-312	TP310H	S31009	...	...	8	2
17	25Cr–20Ni	Smls. pipe	SA-312	TP310H	S31009	...	...	8	2
18	25Cr–20Ni	Wld. pipe	SA-312	TP310H	S31009	...	...	8	2
19	25Cr–20Ni	Wld. pipe	SA-312	TP310H	S31009	...	...	8	2
20	25Cr–20Ni	Bar	SA-479	310H	S31009	...	...	8	2
21	25Cr–20Ni	Bar	SA-479	310H	S31009	...	...	8	2
22	25Cr–20Ni–Cb	Smls. tube	SA-213	TP310Cb	S31040	...	...	8	2
23	25Cr–20Ni–Cb	Smls. tube	SA-213	TP310Cb	S31040	...	...	8	2
24	25Cr–20Ni–Cb	Plate	SA-240	310Cb	S31040	...	...	8	2
25	25Cr–20Ni–Cb	Plate	SA-240	310Cb	S31040	...	...	8	2
26	25Cr–20Ni–Cb	Wld. tube	SA-249	TP310Cb	S31040	...	...	8	2
27	25Cr–20Ni–Cb	Wld. tube	SA-249	TP310Cb	S31040	...	...	8	2
28	25Cr–20Ni–Cb	Smls. & wld. pipe	SA-312	TP310Cb	S31040	...	...	8	2
29	25Cr–20Ni–Cb	Smls. pipe	SA-312	TP310Cb	S31040	...	...	8	2
30	25Cr–20Ni–Cb	Wld. pipe	SA-312	TP310Cb	S31040	...	...	8	2
31	25Cr–20Ni–Cb	Wld. pipe	SA-312	TP310Cb	S31040	...	...	8	2
32	25Cr–20Ni–Cb	Bar	SA-479	310Cb	S31040	...	...	8	2
33	25Cr–20Ni–Cb	Bar	SA-479	310Cb	S31040	...	...	8	2
34	25Cr–20Ni–Cb	Wld. pipe	SA-813	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
37	25Cr–20Ni–Cb	Wld. pipe	SA-814	TP310Cb	S31040	...	...	8	2
(10) 38	25Cr–20Ni–Cb–N	Smls. tube	SA-213	TP310HCbN	S31042	...	...	8	3
(10) 39	25Cr–20Ni–Cb–N	Smls. tube	SA-213	TP310HCbN	S31042	...	...	8	3
40	25Cr–22Ni–2Mo–N	Forgings	SA-182	F310MoLN	S31050	...	...	8	2
41	25Cr–22Ni–2Mo–N	Forgings	SA-182	F310MoLN	S31050	...	...	8	2
42	25Cr–22Ni–2Mo–N	Smls. tube	SA-213	TP310MoLN	S31050	...	0.250 < <i>t</i> ≤ 1.250	8	2
43	25Cr–22Ni–2Mo–N	Smls. tube	SA-213	TP310MoLN	S31050	...	0.250 < <i>t</i> ≤ 1.250	8	2
44	25Cr–22Ni–2Mo–N	Wld. tube	SA-249	TP310MoLN	S31050	...	0.250 < <i>t</i> ≤ 1.250	8	2
45	25Cr–22Ni–2Mo–N	Wld. tube	SA-249	TP310MoLN	S31050	...	0.250 < <i>t</i> ≤ 1.250	8	2

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
			I	III	VIII-1	XII		
1	75	30	NP	800	NP	NP	HA-2	G5, W12
2	75	30	NP	800	1500	650	HA-2	G5, G12, T5, W12, W14
3	75	30	1000	NP	1000	650	HA-2	G12, G22, T6
4	75	30	1000	800	1000	650	HA-2	G5, G12, G22, T5
5	75	30	NP	NP	1500	650	HA-2	G5, G12, G24, T5
6	75	30	NP	NP	1500	650	HA-2	G12, G24, T6
7	75	30	NP	NP	1500	650	HA-2	G5, G12, G24, T5
8	75	30	NP	NP	1500	650	HA-2	G12, G24, T6
9	75	30	1000	800	1000	NP	HA-2	G5, G12, G22, T5
10	75	30	1500	800	1500	NP	HA-2	G5, T6
11	75	30	1500	NP	1500	NP	HA-2	G5, T6
12	75	30	1500	NP	1500	NP	HA-2	T7
13	75	30	NP	800	NP	NP	HA-2	G5, W12
14	75	30	NP	NP	1500	NP	HA-2	G5, G12, G24, T6
15	75	30	NP	NP	1500	NP	HA-2	G12, G24, T7
16	75	30	1500	NP	1500	NP	HA-2	G5, T6
17	75	30	1500	NP	1500	NP	HA-2	T7
18	75	30	1500	NP	1500	NP	HA-2	G3, G5, G24, T6
19	75	30	1500	NP	1500	NP	HA-2	G3, G24, T7
20	75	30	1500	NP	1500	NP	HA-2	G5, T6
21	75	30	1500	NP	1500	NP	HA-2	T7
22	75	30	NP	NP	1500	650	HA-2	G5, G12, T5
23	75	30	NP	NP	1500	650	HA-2	G12, T6
24	75	30	NP	NP	1500	650	HA-2	G5, G12, T5
25	75	30	NP	NP	1500	650	HA-2	G12, T6
26	75	30	NP	NP	1500	650	HA-2	G5, G12, G24, T5
27	75	30	NP	NP	1500	650	HA-2	G12, G24, T6
28	75	30	NP	800	1500	650	HA-2	G5, G12, T5, W12, W14
29	75	30	NP	NP	1500	650	HA-2	G12, T6
30	75	30	NP	NP	1500	650	HA-2	G5, G12, G24, T5
31	75	30	NP	NP	1500	650	HA-2	G12, G14, G24, T6
32	75	30	NP	NP	1000	650	HA-2	G5, G12, G22, T5
33	75	30	NP	NP	1000	650	HA-2	G12, G22, T6
34	75	30	NP	NP	1500	650	HA-2	G5, G12, G24, T5
35	75	30	NP	NP	1500	650	HA-2	G12, G24, T6
36	75	30	NP	NP	1500	650	HA-2	G5, G12, G24, T5
37	75	30	NP	NP	1500	650	HA-2	G12, G24, T6
38	95	43	1350	NP	NP	NP	HA-2	G5, G12, S4, T8
39	95	43	1350	NP	NP	NP	HA-2	G12, S4, T9
40	78	37	NP	NP	600	600	HA-2	G5
41	78	37	NP	NP	600	600	HA-2	...
42	78	37	NP	NP	900	650	HA-2	G5
43	78	37	NP	NP	900	650	HA-2	...
44	78	37	NP	NP	900	650	HA-2	G5, G24
45	78	37	NP	NP	900	650	HA-2	G24

(10)
(10)

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	20.0	...	20.0	...	20.0	19.9	19.3	18.5	18.2	17.9	17.7	17.4	...	...
2	20.0	...	20.0	...	20.0	19.9	19.3	18.5	18.2	17.9	17.7	17.4	17.2	16.9
3	20.0	...	17.6	...	16.1	15.1	14.3	13.7	13.5	13.3	13.1	12.9	12.7	12.5
4	20.0	...	20.0	...	20.0	19.9	19.3	18.5	18.2	17.9	17.7	17.4	17.2	16.9
5	17.0	...	17.0	...	17.0	16.9	16.4	15.7	15.5	15.2	15.0	14.8	14.6	14.4
6	17.0	...	15.0	...	13.7	12.8	12.1	11.7	11.5	11.3	11.1	11.0	10.8	10.7
7	17.0	...	17.0	...	17.0	16.9	16.4	15.7	15.5	15.2	15.0	14.8	14.6	14.4
8	17.0	...	15.0	...	13.7	12.8	12.1	11.7	11.5	11.3	11.1	11.0	10.8	10.7
9	20.0	...	20.0	...	20.0	19.9	19.3	18.5	18.2	17.9	17.7	17.4	17.2	16.9
10	20.0	...	20.0	...	20.0	19.9	19.3	18.5	18.2	17.9	17.7	17.4	17.2	16.9
11	20.0	...	20.0	...	20.0	19.9	19.3	18.5	18.2	17.9	17.7	17.4	17.2	16.9
12	20.0	...	17.6	...	16.1	15.1	14.3	13.7	13.5	13.3	13.1	12.9	12.7	12.5
13	20.0	...	20.0	...	20.0	19.9	19.3	18.5	18.2	17.9	17.7	17.4	...	...
14	17.0	...	17.0	...	17.0	16.9	16.4	15.7	15.5	15.2	15.0	14.8	14.6	14.4
15	17.0	...	15.0	...	13.7	12.8	12.1	11.7	11.5	11.3	11.1	11.0	10.8	10.7
16	20.0	...	20.0	...	20.0	19.9	19.3	18.5	18.2	17.9	17.7	17.4	17.2	16.9
17	20.0	...	17.6	...	16.1	15.1	14.3	13.7	13.5	13.3	13.1	12.9	12.7	12.5
18	17.0	...	17.0	...	17.0	16.9	16.4	15.7	15.5	15.2	15.0	14.8	14.6	14.4
19	17.0	...	15.0	...	13.7	12.8	12.1	11.7	11.5	11.3	11.1	11.0	10.8	10.7
20	20.0	...	20.0	...	20.0	19.9	19.3	18.5	18.2	17.9	17.7	17.4	17.2	16.9
21	20.0	...	17.6	...	16.1	15.1	14.3	13.7	13.5	13.3	13.1	12.9	12.7	12.5
22	20.0	...	20.0	...	20.0	19.9	19.3	18.5	18.2	17.9	17.7	17.4	17.2	16.9
23	20.0	...	17.6	...	16.1	15.1	14.3	13.7	13.5	13.3	13.1	12.9	12.7	12.5
24	20.0	...	20.0	...	20.0	19.9	19.3	18.5	18.2	17.9	17.7	17.4	17.2	16.9
25	20.0	...	17.6	...	16.1	15.1	14.3	13.7	13.5	13.3	13.1	12.9	12.7	12.5
26	17.0	...	17.0	...	17.0	16.9	16.4	15.7	15.5	15.2	15.0	14.8	14.6	14.4
27	17.0	...	15.0	...	13.7	12.8	12.1	11.7	11.5	11.3	11.1	11.0	10.8	10.7
28	20.0	...	20.0	...	20.0	19.9	19.3	18.5	18.2	17.9	17.7	17.4	17.2	16.9
29	20.0	...	17.6	...	16.1	15.1	14.3	13.7	13.5	13.3	13.1	12.9	12.7	12.5
30	17.0	...	17.0	...	17.0	16.9	16.4	15.7	15.5	15.2	15.0	14.8	14.6	14.4
31	17.0	...	15.0	...	13.7	12.8	12.1	11.7	11.5	11.3	11.1	11.0	10.8	10.7
32	20.0	...	20.0	...	20.0	19.9	19.3	18.5	18.2	17.9	17.7	17.4	17.2	16.9
33	20.0	...	17.6	...	16.1	15.1	14.3	13.7	13.5	13.3	13.1	12.9	12.7	12.5
34	17.0	...	17.0	...	17.0	16.9	16.4	15.7	15.5	15.2	15.0	14.8	14.6	14.4
35	17.0	...	15.0	...	13.7	12.8	12.1	11.7	11.5	11.3	11.1	11.0	10.8	10.7
36	17.0	...	17.0	...	17.0	16.9	16.4	15.7	15.5	15.2	15.0	14.8	14.6	14.4
37	17.0	...	15.0	...	13.7	12.8	12.1	11.7	11.5	11.3	11.1	11.0	10.8	10.7
(10) 38	27.1	...	26.9	...	25.4	24.6	24.2	24.0	23.9	23.8	23.7	23.6	23.4	23.1
(10) 39	27.1	...	24.0	...	21.7	20.2	19.2	18.5	18.3	18.1	17.8	17.6	17.4	17.1
40	22.3	...	22.0	...	20.8	20.0	19.5	19.0	...	...	...	...	...	...
41	22.3	...	21.0	...	19.1	17.8	16.8	15.9	...	...	...	...	...	...
42	22.3	...	22.0	...	20.8	20.0	19.5	19.0	18.8	18.7	18.5	18.4	18.2	17.9
43	22.3	...	21.0	...	19.1	17.8	16.8	15.9	15.5	15.1	14.8	14.4	14.0	13.7
44	18.9	...	18.7	...	17.7	17.0	16.5	16.2	16.0	15.9	15.8	15.6	15.5	15.2
45	18.9	...	17.8	...	16.2	15.1	14.3	13.5	13.2	12.9	12.5	12.2	11.9	11.7

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
3	12.3	9.9	...	...	...	...	...	...	...	...	...	...	...	...	...
4	15.9	9.9	...	...	...	...	...	...	...	...	...	...	...	...	...
5	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
6	10.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
7	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
8	10.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
9	15.9	9.9	...	...	...	...	...	...	...	...	...	...	...	...	...
10	16.7	13.8	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	0.97	0.75	...	...	...
11	16.7	13.8	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	0.97	0.75	...	...	...
12	12.3	12.1	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	0.97	0.75	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	14.2	11.7	8.8	6.5	4.7	3.4	2.6	1.9	1.4	1.1	0.82	0.64	...	...	...
15	10.5	10.3	8.8	6.5	4.7	3.4	2.6	1.9	1.4	1.1	0.82	0.64	...	...	...
16	16.7	13.8	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	0.97	0.75	...	...	...
17	12.3	12.1	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	0.97	0.75	...	...	...
18	14.2	11.7	8.8	6.5	4.7	3.4	2.6	1.9	1.4	1.1	0.82	0.64	...	...	...
19	10.5	10.3	8.8	6.5	4.7	3.4	2.6	1.9	1.4	1.1	0.82	0.64	...	...	...
20	16.7	13.8	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	0.97	0.75	...	...	...
21	12.3	12.1	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	0.97	0.75	...	...	...
22	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
23	12.3	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
24	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
25	12.3	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
26	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
27	10.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
28	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
29	12.3	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	...	...	...
30	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
31	10.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
32	15.9	9.9	...	...	...	...	...	...	...	...	...	...	...	...	...
33	12.3	9.9	...	...	...	...	...	...	...	...	...	...	...	...	...
34	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
35	10.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
36	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	...	...	...
37	10.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17
38	22.8	22.4	22.0	18.4	13.6	10.1	7.6	5.7	4.3	(10)
39	16.9	16.6	16.3	16.1	13.6	10.1	7.6	5.7	4.3	(10)
40
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	25Cr-22Ni-2Mo-N	Wld. pipe	SA-312	TP310MoLN	S31050	...	$0.250 < t \leq 1.250$	8	2
2	25Cr-22Ni-2Mo-N	Wld. pipe	SA-312	TP310MoLN	S31050	...	$0.250 < t \leq 1.250$	8	2
3	25Cr-22Ni-2Mo-N	Plate	SA-240	310MoLN	S31050	...	...	8	2
4	25Cr-22Ni-2Mo-N	Plate	SA-240	310MoLN	S31050	...	...	8	2
5	25Cr-22Ni-2Mo-N	Smls. tube	SA-213	TP310MoLN	S31050	...	≤ 0.250 , wall	8	2
6	25Cr-22Ni-2Mo-N	Smls. tube	SA-213	TP310MoLN	S31050	...	≤ 0.250 , wall	8	2
7	25Cr-22Ni-2Mo-N	Wld. tube	SA-249	TP310MoLN	S31050	...	≤ 0.250 , wall	8	2
8	25Cr-22Ni-2Mo-N	Wld. tube	SA-249	TP310MoLN	S31050	...	≤ 0.250 , wall	8	2
9	25Cr-22Ni-2Mo-N	Wld. pipe	SA-312	TP310MoLN	S31050	...	≤ 0.250 , wall	8	2
10	25Cr-22Ni-2Mo-N	Wld. pipe	SA-312	TP310MoLN	S31050	...	≤ 0.250 , wall	8	2
(10) 11	26Cr-4Ni-Mo	Plate	SA-240	329	S32900	...	...	10H	1
(10) 12	26Cr-4Ni-Mo	Wld. tube	SA-789	...	S32900	...	...	10H	1
(10) 13	26Cr-4Ni-Mo	Smls. tube	SA-789	...	S32900	...	...	10H	1
(10) 14	26Cr-4Ni-Mo	Wld. pipe	SA-790	...	S32900	...	...	10H	1
(10) 15	26Cr-4Ni-Mo	Smls. pipe	SA-790	...	S32900	...	...	10H	1
(10) 16	26Cr-4Ni-Mo-N	Plate	SA-240	...	S32950	...	...	10H	1
(10) 17	26Cr-4Ni-Mo-N	Wld. tube	SA-789	...	S32950	...	...	10H	1
(10) 18	26Cr-4Ni-Mo-N	Smls. tube	SA-789	...	S32950	...	...	10H	1
(10) 19	26Cr-4Ni-Mo-N	Wld. pipe	SA-790	...	S32950	...	...	10H	1
(10) 20	26Cr-4Ni-Mo-N	Smls. pipe	SA-790	...	S32950	...	...	10H	1
21	29Cr-6.5Ni-2Mo-N	Plate, sheet, strip	SA-240	...	S32906	...	≥ 0.40	10H	1
22	29Cr-6.5Ni-2Mo-N	Bar	SA-479	...	S32906	...	...	10H	1
23	29Cr-6.5Ni-2Mo-N	Smls. tube	SA-789	...	S32906	...	≥ 0.40	10H	1
24	29Cr-6.5Ni-2Mo-N	Smls. pipe	SA-790	...	S32906	...	≥ 0.40	10H	1
25	29Cr-6.5Ni-2Mo-N	Plate, sheet, strip	SA-240	...	S32906	...	< 0.40	10H	1
26	29Cr-6.5Ni-2Mo-N	Smls. tube	SA-789	...	S32906	...	< 0.40	10H	1
27	29Cr-6.5Ni-2Mo-N	Smls. pipe	SA-790	...	S32906	...	< 0.40	10H	1

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes	
			I	III	VIII-1	XII			
1	78	37	NP	NP	900	650	HA-2	G5, G24	
2	78	37	NP	NP	900	650	HA-2	G24	
3	80	35	NP	NP	600	600	HA-2	G5	
4	80	35	NP	NP	600	600	HA-2	...	
5	84	39	NP	NP	900	650	HA-2	G5	
6	84	39	NP	NP	900	650	HA-2	...	
7	84	39	NP	NP	900	650	HA-2	G5, G24	
8	84	39	NP	NP	900	650	HA-2	G24	
9	84	39	NP	NP	900	650	HA-2	G5, G24	
10	84	39	NP	NP	900	650	HA-2	G24	
11	90	70	NP	NP	500	500	HA-5	G32	(10)
12	90	70	NP	NP	500	500	HA-5	G24, G32	(10)
13	90	70	NP	NP	500	500	HA-5	G32	(10)
14	90	70	NP	NP	500	500	HA-5	G24, G32	(10)
15	90	70	NP	NP	500	500	HA-5	G32	(10)
16	100	70	NP	NP	600	600	HA-5	G32	(10)
17	100	70	NP	NP	600	600	HA-5	G24, G32	(10)
18	100	70	NP	NP	600	600	HA-5	G32	(10)
19	100	70	NP	NP	600	600	HA-5	G24, G32	(10)
20	100	70	NP	NP	600	600	HA-5	G32	(10)
21	109	80	NP	NP	600	600	HA-5	G32	
22	109	80	NP	NP	600	600	HA-5	G32	
23	109	80	NP	NP	600	600	HA-5	G32	
24	109	80	NP	NP	600	600	HA-5	G32	
25	116	94	NP	NP	600	600	HA-5	G32	
26	116	94	NP	NP	600	600	HA-5	G32	
27	116	94	NP	NP	600	600	HA-5	G32	

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	18.9	...	18.7	...	17.7	17.0	16.5	16.2	16.0	15.9	15.8	15.6	15.5	15.2
2	18.9	...	17.8	...	16.2	15.1	14.3	13.5	13.2	12.9	12.5	12.2	11.9	11.7
3	22.9	...	22.6	...	21.4	20.5	20.0	19.5	...	...	...	...	...	...
4	22.9	...	19.9	...	18.1	16.8	15.9	15.1	...	...	...	...	...	...
5	24.0	...	23.7	...	22.4	21.6	21.0	20.5	20.3	20.1	20.0	19.8	19.6	19.3
6	24.0	...	22.1	...	20.1	18.7	17.7	16.8	16.4	16.0	15.6	15.2	14.8	14.5
7	20.4	...	20.2	...	19.1	18.3	17.8	17.4	17.3	17.1	17.0	16.8	16.6	16.4
8	20.4	...	18.8	...	17.1	15.9	15.0	14.3	13.9	13.6	13.2	12.9	12.6	12.3
9	20.4	...	20.2	...	19.1	18.3	17.8	17.4	17.3	17.1	17.0	16.8	16.6	16.4
10	20.4	...	18.8	...	17.1	15.9	15.0	14.3	13.9	13.6	13.2	12.9	12.6	12.3
(10) 11	25.7	...	25.7	...	24.8	24.3	24.3	...	...	...	...	...	...	...
(10) 12	21.9	...	21.9	...	21.0	20.6	20.6	...	...	...	...	...	...	...
(10) 13	25.7	...	25.7	...	24.8	24.3	24.3	...	...	...	...	...	...	...
(10) 14	21.9	...	21.9	...	21.0	20.6	20.6	...	...	...	...	...	...	...
(10) 15	25.7	...	25.7	...	24.8	24.3	24.3	...	...	...	...	...	...	...
(10) 16	28.6	...	28.5	...	27.0	26.4	26.4	26.4	...	...	...	...	...	...
(10) 17	24.3	...	24.2	...	23.0	22.5	22.5	22.5	...	...	...	...	...	...
(10) 18	28.6	...	28.5	...	27.0	26.4	26.4	26.4	...	...	...	...	...	...
(10) 19	24.3	...	24.2	...	23.0	22.5	22.5	22.5	...	...	...	...	...	...
(10) 20	28.6	...	28.5	...	27.0	26.4	26.4	26.4	...	...	...	...	...	...
21	31.1	...	31.1	...	29.6	28.7	28.3	28.3	...	...	...	...	...	...
22	31.1	...	31.1	...	29.6	28.7	28.3	28.3	...	...	...	...	...	...
23	31.1	...	31.1	...	29.6	28.7	28.3	28.3	...	...	...	...	...	...
24	31.1	...	31.1	...	29.6	28.7	28.3	28.3	...	...	...	...	...	...
25	33.1	...	33.1	...	31.5	30.6	30.1	30.1	...	...	...	...	...	...
26	33.1	...	33.1	...	31.5	30.6	30.1	30.1	...	...	...	...	...	...
27	33.1	...	33.1	...	31.5	30.6	30.1	30.1	...	...	...	...	...	...

TABLE 1A (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1
2
3
4
5
6
7
8
9
10
11	(10)
12	(10)
13	(10)
14	(10)
15	(10)
16	(10)
17	(10)
18	(10)
19	(10)
20	(10)
21
22
23
24
25
26
27

NOTES TO TABLE 1A

GENERAL NOTES

- (a) The following abbreviations are used: Norm. rld., Normalized rolled; Smls., Seamless; Sol. ann., Solution annealed; 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) For Section VIII and XII applications, stress values in restricted shear such as dowel bolts or similar construction in which the shearing member is so restricted that the section under consideration would fail without reduction of area shall be 0.80 times the values in the above Table.
- (d) For Section VIII and XII applications, stress values in bearing shall be 1.60 times the values in the above Table.
- (e) Stress values for -20°F to 100°F 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 T10).
- (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.
- (10) (h) 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.

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 850°F .
- 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 1500°F and shall be considered in the design.
- (10) G7 DELETED.
- (10) G8 DELETED.
- 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 800°F , the carbide phase of carbon steel may be converted to graphite. See Appendix A, A-240.
- G11 Upon prolonged exposure to temperatures above 875°F , the carbide phase of carbon-molybdenum steel may be converted to graphite. See Appendix A, A-240.
- G12 At temperatures above 1000°F , these stress values apply only when the carbon is 0.04% or higher on heat analysis.
- G13 These stress values at 1050°F 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 2 in. nominal pipe size 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.
- (a) G19 DELETED.
- (a) G20 DELETED.
- (a) G21 DELETED.
- 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, Fig. 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.

NOTES TO TABLE 1A (CONT'D)

NOTES — GENERAL REQUIREMENTS (CONT'D)

- 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 125,000 psi.
- 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 For Section VIII applications, these stress values are based on expected minimum values of 45,000 psi tensile strength and yield strength of 20,000 psi resulting from loss of strength due to thermal treatment required for the glass coating operation. UG-85 does not apply.
- G31 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.
- G32 This steel may be expected to develop embrittlement after service at moderately elevated temperature; see Appendix A, A-340 and A-360.
- G33 These stresses are based on weld metal properties.
- G34 For Section I, use is limited to PEB-5.3. See PG-5.5 for cautionary note.
- (10) G35 DELETED.

NOTES — HEAT TREATMENT REQUIREMENTS

- H1 For temperatures above 1000°F, 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 1900°F, and quenching in water or rapidly cooling by other means.
- (10) H2 For temperatures above 1000°F, these stress values may be used only if the material is heat treated by heating to a minimum temperature of 2000°F, and quenching in water or rapidly cooling by other means.
- (10) H3 DELETED.
- H4 DELETED.
- H5 For Section III applications, if heat treatment is performed after forming or fabrication, it shall be performed at 1500°F to 1850°F for a period of time not to exceed 10 min at temperature, followed by rapid cooling.
- H6 Material shall be solution annealed at 2010°F to 2140°F, followed by a rapid cooling in water or air.

NOTES — SIZE REQUIREMENTS

- S1 For Section I applications, stress values at temperatures of 850°F and above are permissible but, except for tubular products 3 in. 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 900°F and above are permissible but, except for tubular products 3 in. 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 1000°F and above are permissible but, except for tubular products 3 in. 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 1150°F and above are permissible but, except for tubular products 3 in. 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 $\frac{3}{4}$ in.
- S6 Material that conforms to Class 10, 11, or 12 is not permitted when the nominal thickness of the material exceeds $1\frac{1}{4}$ in.
- S7 The maximum thickness of unheat-treated forgings shall not exceed $3\frac{3}{4}$ in. The maximum thickness as-heat-treated may be 4 in.
- S8 The maximum section thickness shall not exceed 3 in. for double-normalized-and-tempered forgings, or 5 in. for quenched-and-tempered forgings.
- S9 Both NPS 8 and larger, and schedule 140 and heavier.
- (10) S10 The maximum pipe size shall be NPS 4 (DN 100) and the maximum thickness in any pipe size shall be Schedule 80.

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

- T1 Allowable stresses for temperatures of 700°F and above are values obtained from time-dependent properties.
- T2 Allowable stresses for temperatures of 750°F and above are values obtained from time-dependent properties.
- T3 Allowable stresses for temperatures of 850°F and above are values obtained from time-dependent properties.
- T4 Allowable stresses for temperatures of 900°F and above are values obtained from time-dependent properties.
- T5 Allowable stresses for temperatures of 950°F and above are values obtained from time-dependent properties.
- T6 Allowable stresses for temperatures of 1000°F and above are values obtained from time-dependent properties.
- T7 Allowable stresses for temperatures of 1050°F and above are values obtained from time-dependent properties.
- T8 Allowable stresses for temperatures of 1100°F and above are values obtained from time-dependent properties.
- T9 Allowable stresses for temperatures of 1150°F and above are values obtained from time-dependent properties.
- T10 Allowable stresses for temperatures of 800°F and above are values obtained from time-dependent properties.

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 100 ksi.
- W5 Welded, with the tensile strength of the Section IX reduced tension test less than 100 ksi but not less than 95 ksi.
- W6 This material may be welded by the resistance technique.
- W7 In welded construction for temperatures above 850°F, 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.

NOTES TO TABLE 1A (CONT'D)

NOTES — WELDING REQUIREMENTS (CONT'D)

- 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 3 $\frac{1}{2}$ in. in outside diameter, when the design metal temperatures exceed 850°F, 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 3 $\frac{1}{2}$ in.
 - (c) The weld seam of each tube shall be subjected to an angle beam ultrasonic inspection per SA-450.
 - (d) A complete volumetric inspection of the entire length of each tube shall be performed in accordance with SA-450.
 - (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 certification.

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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	...	Plate, sheet	SB-209	...	Alclad 3003	0
2	...	Plate, sheet	SB-209	...	Alclad 3003	0
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	0
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	0
17	...	Smls. extr. tube	SB-241	...	Alclad 3003	H112
18	...	Plate, sheet	SB-209	...	Alclad 3004	0
19	...	Plate, sheet	SB-209	...	Alclad 3004	0
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-26	...	A24430	F

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	0.006–0.499	21	13	4.5	NP	250 (Cl. 3 only)	400	400	NFA-7	G16
2	0.500–3.000	21	14	5	NP	250 (Cl. 3 only)	400	400	NFA-7	G25
3	0.250–0.499	21	16	9	NP	300 (Cl. 3 only)	400	400	NFA-7	G16, W3
4	0.500–2.000	21	15	6	NP	200 (Cl. 3 only)	400	400	NFA-7	G26, W3
5	2.001–3.000	21	14.5	6	NP	200 (Cl. 3 only)	400	400	NFA-7	G26, W3
6	0.017–0.499	21	16	11	NP	300 (Cl. 3 only)	400	400	NFA-7	G16, W3
7	0.500–2.000	21	17	12	NP	300 (Cl. 3 only)	400	400	NFA-7	G25, W3
8	0.009–0.499	21	19	16	NP	250 (Cl. 3 only)	400	400	NFA-7	G16, W3
9	0.500–1.000	21	20	17	NP	250 (Cl. 3 only)	400	400	NFA-7	G25, W3
10	0.010–0.500	21	13	4.5	NP	250 (Cl. 3 only)	400	400	NFA-7	G16
11	0.050–0.500	21	13	4.5	NP	250 (Cl. 3 only)	400	400	NFA-7	G16, W3
12	0.010–0.500	21	19	16	NP	250 (Cl. 3 only)	400	400	NFA-1	G16, W3
13	0.010–0.500	21	26	23	NP	250 (Cl. 3 only)	400	400	NFA-1	G16, W3
14	0.010–0.200	21	19	16	NP	250 (Cl. 3 only)	400	400	NFA-1	G16, W4
15	0.010–0.200	21	21	18	NP	250 (Cl. 3 only)	400	400	NFA-1	G16, W4
16	...	21	13	4.5	NP	250 (Cl. 3 only)	400	400	NFA-7	G16
17	...	21	13	4.5	NP	250 (Cl. 3 only)	400	400	NFA-7	G16, W3
18	0.051–0.499	22	21	8	NP	300 (Cl. 3 only)	400	400	NFA-7	G16
19	0.500–3.000	22	22	8.5	NP	300 (Cl. 3 only)	400	400	NFA-7	G25
20	0.250–0.499	22	22	8.5	NP	300 (Cl. 3 only)	400	400	NFA-7	G16, W3
21	0.500–3.000	22	23	9	NP	300 (Cl. 3 only)	400	400	NFA-7	G25, W3
22	0.051–0.499	22	27	20	NP	250 (Cl. 3 only)	400	400	NFA-7	G16, W3
23	0.500–2.000	22	28	21	NP	250 (Cl. 3 only)	400	400	NFA-7	G25, W3
24	0.051–0.499	22	31	24	NP	250 (Cl. 3 only)	400	400	NFA-7	G16, W3
25	0.500–1.000	22	32	25	NP	250 (Cl. 3 only)	400	400	NFA-7	G25, W3
26	0.051–0.249	23	27	14	NP	400 (Cl. 3 only)	400	400	NFA-12	G16, G24, W4
27	0.250–0.499	23	27	14	NP	400 (Cl. 3 only)	400	400	NFA-12	G16, G24, W4
28	0.500–3.000	23	30	16	NP	400 (Cl. 3 only)	400	400	NFA-12	G24, G25, W4
29	0.051–0.249	23	24	...	NP	400 (Cl. 3 only)	400	400	NFA-12	G24, W7
30	0.250–3.000	23	24	...	NP	400 (Cl. 3 only)	400	400	NFA-12	G24, W7
31	0.051–0.249	23	38	32	NP	400 (Cl. 3 only)	400	400	NFA-12	G16, G24, W4
32	0.250–0.499	23	38	32	NP	400 (Cl. 3 only)	400	400	NFA-12	G16, G24, W4
33	0.500–4.000	23	42	35	NP	400 (Cl. 3 only)	400	400	NFA-12	G24, G25, W4
34	4.001–5.000	23	40	35	NP	400 (Cl. 3 only)	400	400	NFA-12	G24, G26, W4
35	0.051–0.249	23	24	...	NP	400 (Cl. 3 only)	400	400	NFA-12	G24, W7
36	0.250–5.000	23	24	...	NP	400 (Cl. 3 only)	400	400	NFA-12	G24, W7
37	≤ 2.000	...	45	28	NP	NP	150	150	NFA-12	G15, W4
38	≤ 2.000	...	48	29	NP	NP	150	150	NFA-12	G15, W4
39	...	...	25	18	NP	350 (Cl. 3 only)	400	400	NFA-1	G15, W4
40	...	...	30	20	NP	250 (Cl. 3 only)	250	250	NFA-12	G15, W4
41	...	...	33	22	NP	NP	250	250	NFA-12	G15, W4
42	...	...	17	6	NP	400 (Cl. 3 only)	400	400	NFA-1	G15, W4

TABLE 1B
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	3.0	3.0	3.0	2.7	2.2	1.6	1.3	...	...	...	...	...	...	...	...	...	...	...
2	3.0	3.0	3.0	2.7	2.2	1.6	1.3	...	...	...	...	...	...	...	...	...	...	...
3	4.3	4.3	4.3	3.8	3.3	2.7	2.1	...	...	...	...	...	...	...	...	...	...	...
4	3.9	3.9	3.9	3.0	2.2	1.6	1.3	...	...	...	...	...	...	...	...	...	...	...
5	3.8	3.8	3.7	2.9	2.2	1.6	1.3	...	...	...	...	...	...	...	...	...	...	...
6	4.3	4.3	4.3	3.8	3.3	2.7	2.1	...	...	...	...	...	...	...	...	...	...	...
7	4.3	4.3	4.3	3.8	3.3	2.7	2.1	...	...	...	...	...	...	...	...	...	...	...
8	5.1	5.1	5.1	4.5	3.9	2.7	2.1	...	...	...	...	...	...	...	...	...	...	...
9	5.1	5.1	5.1	4.5	3.9	2.7	2.1	...	...	...	...	...	...	...	...	...	...	...
10	3.0	3.0	3.0	2.7	2.2	1.6	1.3	...	...	...	...	...	...	...	...	...	...	...
11	3.0	3.0	3.0	2.7	2.2	1.6	1.3	...	...	...	...	...	...	...	...	...	...	...
12	5.1	5.1	5.1	4.5	3.9	2.7	2.1	...	...	...	...	...	...	...	...	...	...	...
13	7.0	7.0	6.9	5.8	4.8	3.2	2.3	...	...	...	...	...	...	...	...	...	...	...
14	5.1	5.1	5.1	4.5	3.9	2.7	2.1	...	...	...	...	...	...	...	...	...	...	...
15	5.7	5.7	5.7	4.8	3.9	2.7	2.1	...	...	...	...	...	...	...	...	...	...	...
16	3.0	3.0	3.0	2.7	2.2	1.6	1.2	...	...	...	...	...	...	...	...	...	...	...
17	3.0	3.0	3.0	2.7	2.2	1.6	1.2	...	...	...	...	...	...	...	...	...	...	...
18	5.0	5.0	5.0	5.0	4.5	3.4	2.1	...	...	...	...	...	...	...	...	...	...	...
19	5.0	5.0	5.0	5.0	4.5	3.4	2.1	...	...	...	...	...	...	...	...	...	...	...
20	5.2	5.2	5.2	5.2	4.6	3.4	2.1	...	...	...	...	...	...	...	...	...	...	...
21	5.9	5.9	5.9	5.3	4.6	3.4	2.1	...	...	...	...	...	...	...	...	...	...	...
22	7.2	7.2	7.2	6.2	5.2	3.4	2.1	...	...	...	...	...	...	...	...	...	...	...
23	7.2	7.2	7.2	6.2	5.2	3.4	2.1	...	...	...	...	...	...	...	...	...	...	...
24	8.2	8.2	8.2	6.7	5.2	3.4	2.1	...	...	...	...	...	...	...	...	...	...	...
25	8.2	8.2	8.2	6.7	5.2	3.4	2.1	...	...	...	...	...	...	...	...	...	...	...
26	7.8	7.8	7.8	7.0	6.2	5.7	4.0	...	...	...	...	...	...	...	...	...	...	...
27	7.8	7.8	7.8	7.0	6.2	5.7	4.0	...	...	...	...	...	...	...	...	...	...	...
28	7.8	7.8	7.8	7.0	6.2	5.7	4.0	...	...	...	...	...	...	...	...	...	...	...
29	6.0	6.0	6.0	5.9	5.5	4.6	3.5	...	...	...	...	...	...	...	...	...	...	...
30	6.0	6.0	6.0	5.9	5.5	4.6	3.5	...	...	...	...	...	...	...	...	...	...	...
31	10.9	10.9	10.9	9.2	7.6	5.7	4.0	...	...	...	...	...	...	...	...	...	...	...
32	10.9	10.9	10.9	9.2	7.6	5.7	4.0	...	...	...	...	...	...	...	...	...	...	...
33	10.9	10.9	10.9	9.2	7.6	5.7	4.0	...	...	...	...	...	...	...	...	...	...	...
34	10.3	10.3	10.3	8.6	7.4	5.7	4.0	...	...	...	...	...	...	...	...	...	...	...
35	6.0	6.0	6.0	5.9	5.5	4.6	3.5	...	...	...	...	...	...	...	...	...	...	...
36	6.0	6.0	6.0	5.9	5.5	4.6	3.5	...	...	...	...	...	...	...	...	...	...	...
37	8.4	7.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	10.3	8.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	7.2	7.2	7.2	6.3	5.4	4.1	2.4	...	...	...	...	...	...	...	...	...	...	...
40	8.6	8.6	8.6	6.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	9.5	9.3	8.5	6.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	4.0	4.0	4.0	3.8	3.5	3.1	2.8	...	...	...	...	...	...	...	...	...	...	...

TABLE 1B
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1
2
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	...	Plate, sheet	SB-209	...	A91060	0
2	...	Plate, sheet	SB-209	...	A91060	H112
3	...	Plate, sheet	SB-209	...	A91060	H112
4	...	Plate, sheet	SB-209	...	A91060	H112
5	...	Plate, sheet	SB-209	...	A91060	H12
6	...	Plate, sheet	SB-209	...	A91060	H14
7	...	Drawn smls. tube	SB-210	...	A91060	0
8	...	Drawn smls. tube	SB-210	...	A91060	H14
9	...	Drawn smls. tube	SB-210	...	A91060	H113
10	...	Bar, rod, shapes	SB-221	...	A91060	0
11	...	Bar, rod, shapes	SB-221	...	A91060	H112
12	...	Cond. & heat exch. tubes	SB-234	...	A91060	H14
13	...	Smls. extr. tube	SB-241	...	A91060	0
14	...	Smls. extr. tube	SB-241	...	A91060	H112
15	...	Plate, sheet	SB-209	...	A91100	0
16	...	Plate, sheet	SB-209	...	A91100	H112
17	...	Plate, sheet	SB-209	...	A91100	H112
18	...	Plate, sheet	SB-209	...	A91100	H112
19	...	Plate, sheet	SB-209	...	A91100	H12
20	...	Plate, sheet	SB-209	...	A91100	H14
21	...	Bar, rod, shapes	SB-221	...	A91100	0
22	...	Bar, rod, shapes	SB-221	...	A91100	H112
23	...	Smls. extr. tube	SB-241	...	A91100	0
24	...	Smls. extr. tube	SB-241	...	A91100	H112
25	...	Die forgings	SB-247	...	A92014	T4
26	...	Die forgings	SB-247	...	A92014	T6
27	...	Die forgings	SB-247	...	A92014	T6
28	...	Bar, rod, wire	SB-211	...	A92024	T4
29	...	Bar, rod, wire	SB-211	...	A92024	T4
30	...	Bar, rod, wire	SB-211	...	A92024	T4
31	...	Bar, rod, wire	SB-211	...	A92024	T4
32	...	Bar, rod, shapes	SB-221	...	A92024	T3
33	...	Bar, rod, shapes	SB-221	...	A92024	T3
34	...	Bar, rod, shapes	SB-221	...	A92024	T3
35	...	Bar, rod, shapes	SB-221	...	A92024	T3
36	...	Plate, sheet	SB-209	...	A93003	0
37	...	Plate, sheet	SB-209	...	A93003	H112
38	...	Plate, sheet	SB-209	...	A93003	H112
39	...	Plate, sheet	SB-209	...	A93003	H112
40	...	Plate, sheet	SB-209	...	A93003	H12
41	...	Plate, sheet	SB-209	...	A93003	H14

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	0.051–3.000	21	8	2.5	NP	300 (Cl. 3 only)	400	400	NFA-7	T3
2	0.250–0.499	21	11	7	NP	300 (Cl. 3 only)	400	400	NFA-7	T3, W3
3	0.500–1.000	21	10	5	NP	300 (Cl. 3 only)	400	400	NFA-7	T4, W3
4	1.001–3.000	21	9	4	NP	250 (Cl. 3 only)	400	400	NFA-7	T3, W3
5	0.051–2.000	21	11	9	NP	300 (Cl. 3 only)	400	400	NFA-7	T3, W3
6	0.051–1.000	21	12	10	NP	300 (Cl. 3 only)	400	400	NFA-7	T3, W3
7	0.018–0.500	21	8.5	2.5	NP	300 (Cl. 3 only)	400	400	NFA-7	T3
8	0.018–0.500	...	12	10	NP	300 (Cl. 3 only)	400	400	NFA-7	T3, W3
9	0.018–0.500	21	8.5	2.5	NP	300 (Cl. 3 only)	400	400	NFA-7	T3, W3
10	...	21	8.5	2.5	NP	300 (Cl. 3 only)	400	400	NFA-7	G13, T3
11	...	21	8.5	2.5	NP	300 (Cl. 3 only)	400	400	NFA-7	G13, T3, W3
12	0.010–0.200	21	12	10	NP	300 (Cl. 3 only)	400	400	NFA-7	T3, W4
13	...	21	8.5	2.5	NP	300 (Cl. 3 only)	400	400	NFA-7	T3
14	...	21	8.5	2.5	NP	300 (Cl. 3 only)	400	400	NFA-7	T3, W3
15	0.006–3.000	21	11	3.5	NP	250 (Cl. 3 only)	400	400	NFA-7	T4
16	0.250–0.499	21	13	7	NP	250 (Cl. 3 only)	400	400	NFA-7	T4, W3
17	0.500–2.000	21	12	5	NP	250 (Cl. 3 only)	400	400	NFA-7	T4, W3
18	2.001–3.000	21	11.5	4	NP	250 (Cl. 3 only)	400	400	NFA-7	T4, W3
19	0.051–2.000	21	14	11	NP	250 (Cl. 3 only)	400	400	NFA-7	T4, W3
20	0.009–1.000	21	16	14	NP	250 (Cl. 3 only)	400	400	NFA-7	T4, W3
21	...	21	11	3	NP	250 (Cl. 3 only)	400	400	NFA-7	T4
22	...	21	11	3	NP	250 (Cl. 3 only)	400	400	NFA-7	T4, W3
23	...	21	11	3	NP	250 (Cl. 3 only)	400	400	NFA-7	T4
24	...	21	11	3	NP	250 (Cl. 3 only)	400	400	NFA-7	T4, W3
25	≤ 4.000	...	55	30	NP	400 (Cl. 3 only)	400	400	NFA-6	T3, W4
26	≤ 2.000	...	65	56	NP	400 (Cl. 3 only)	400	400	NFA-6	T2, W4
27	2.001–4.000	...	63	54	NP	400 (Cl. 3 only)	400	400	NFA-6	T2, W4
28	0.125–0.499	...	62	45	NP	400 (Cl. 3 only)	400	400	NFA-6	T2, W4
29	0.500–4.500	...	62	42	NP	400 (Cl. 3 only)	400	400	NFA-6	T2, W4
30	4.501–6.500	...	62	40	NP	400 (Cl. 3 only)	400	400	NFA-6	T2, W4
31	6.501–8.000	...	58	38	NP	400 (Cl. 3 only)	400	400	NFA-6	T2, W4
32	≤ 0.249	...	57	42	NP	400 (Cl. 3 only)	400	400	NFA-6	G24, T2, W4
33	0.250–0.749	...	60	44	NP	400 (Cl. 3 only)	400	400	NFA-6	G24, T2, W4
34	0.750–1.499	...	65	46	NP	400 (Cl. 3 only)	400	400	NFA-6	G24, T2, W4
35	≥ 1.500	...	68	48	NP	400 (Cl. 3 only)	400	400	NFA-6	G24, T2, W4
36	0.006–3.000	21	14	5	NP	250 (Cl. 3 only)	400	400	NFA-1	T3
37	0.250–0.499	21	17	10	NP	300 (Cl. 3 only)	400	400	NFA-1	T4, W3
38	0.500–2.000	21	15	6	NP	200 (Cl. 3 only)	400	400	NFA-1	T3, W3
39	2.001–3.000	21	14.5	6	NP	200 (Cl. 3 only)	400	400	NFA-1	T3, W3
40	0.017–2.000	21	17	12	NP	300 (Cl. 3 only)	400	400	NFA-1	T4, W3
41	0.009–1.000	21	20	17	NP	250 (Cl. 3 only)	400	400	NFA-2	T4, W3

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	1.7	1.7	1.6	1.5	1.3	1.1	0.80	...	...	...	...	...	...	...	...	...	...	...
2	3.2	3.0	2.4	2.1	1.8	1.6	1.0	...	...	...	...	...	...	...	...	...	...	...
3	2.9	2.7	2.2	1.9	1.7	1.4	1.0	...	...	...	...	...	...	...	...	...	...	...
4	2.6	2.4	1.9	1.7	1.5	1.1	0.80	...	...	...	...	...	...	...	...	...	...	...
5	3.2	3.2	2.6	2.3	2.1	1.8	1.1	...	...	...	...	...	...	...	...	...	...	...
6	3.4	3.4	3.4	3.0	2.6	1.8	1.2	...	...	...	...	...	...	...	...	...	...	...
7	1.7	1.7	1.6	1.5	1.3	1.1	0.80	...	...	...	...	...	...	...	...	...	...	...
8	3.4	3.4	3.4	3.0	2.6	1.8	1.2	...	...	...	...	...	...	...	...	...	...	...
9	1.7	1.7	1.6	1.5	1.3	1.1	0.80	...	...	...	...	...	...	...	...	...	...	...
10	1.7	1.7	1.6	1.5	1.3	1.1	0.80	...	...	...	...	...	...	...	...	...	...	...
11	1.7	1.7	1.6	1.5	1.3	1.1	0.80	...	...	...	...	...	...	...	...	...	...	...
12	3.4	3.4	3.4	3.0	2.6	1.8	1.2	...	...	...	...	...	...	...	...	...	...	...
13	1.7	1.7	1.6	1.5	1.3	1.1	0.80	...	...	...	...	...	...	...	...	...	...	...
14	1.7	1.7	1.6	1.4	1.2	1.0	0.80	...	...	...	...	...	...	...	...	...	...	...
15	2.3	2.3	2.3	2.3	1.8	1.4	1.0	...	...	...	...	...	...	...	...	...	...	...
16	3.7	3.7	3.7	2.7	2.4	1.7	1.0	...	...	...	...	...	...	...	...	...	...	...
17	3.3	3.3	3.3	2.5	2.2	1.7	1.0	...	...	...	...	...	...	...	...	...	...	...
18	2.7	2.7	2.7	2.4	1.8	1.4	1.0	...	...	...	...	...	...	...	...	...	...	...
19	4.0	4.0	4.0	3.2	2.8	2.0	1.2	...	...	...	...	...	...	...	...	...	...	...
20	4.6	4.6	4.6	3.7	2.8	2.0	1.2	...	...	...	...	...	...	...	...	...	...	...
21	2.0	2.0	2.0	2.0	1.8	1.4	1.0	...	...	...	...	...	...	...	...	...	...	...
22	2.0	2.0	2.0	2.0	1.8	1.4	1.0	...	...	...	...	...	...	...	...	...	...	...
23	2.0	2.0	2.0	2.0	1.8	1.4	1.0	...	...	...	...	...	...	...	...	...	...	...
24	2.0	2.0	2.0	2.0	1.8	1.4	1.0	...	...	...	...	...	...	...	...	...	...	...
25	15.7	15.7	13.3	12.5	11.5	6.8	3.9	...	...	...	...	...	...	...	...	...	...	...
26	18.6	18.6	18.6	14.8	11.5	6.8	3.9	...	...	...	...	...	...	...	...	...	...	...
27	18.0	18.0	18.0	14.8	11.5	6.8	3.9	...	...	...	...	...	...	...	...	...	...	...
28	17.7	17.7	17.7	13.7	10.4	6.5	4.5	...	...	...	...	...	...	...	...	...	...	...
29	17.7	17.7	17.7	13.7	10.4	6.5	4.5	...	...	...	...	...	...	...	...	...	...	...
30	17.7	17.7	17.7	13.7	10.4	6.5	4.5	...	...	...	...	...	...	...	...	...	...	...
31	16.6	16.6	16.6	12.8	9.7	6.1	4.2	...	...	...	...	...	...	...	...	...	...	...
32	16.3	16.3	16.3	12.6	9.5	6.0	4.2	...	...	...	...	...	...	...	...	...	...	...
33	17.1	17.1	17.1	13.2	10.0	6.3	4.4	...	...	...	...	...	...	...	...	...	...	...
34	18.6	18.6	18.6	14.3	10.8	6.8	4.7	...	...	...	...	...	...	...	...	...	...	...
35	19.4	19.4	19.4	15.0	11.3	7.1	5.0	...	...	...	...	...	...	...	...	...	...	...
36	3.4	3.4	3.4	3.0	2.4	1.8	1.4	...	...	...	...	...	...	...	...	...	...	...
37	4.9	4.9	4.9	4.0	3.6	3.0	2.4	...	...	...	...	...	...	...	...	...	...	...
38	3.8	3.8	3.7	3.2	2.4	1.8	1.4	...	...	...	...	...	...	...	...	...	...	...
39	3.6	3.6	3.5	3.2	2.4	1.8	1.4	...	...	...	...	...	...	...	...	...	...	...
40	4.9	4.9	4.9	4.0	3.6	3.0	2.4	...	...	...	...	...	...	...	...	...	...	...
41	5.7	5.7	5.7	4.9	4.3	3.0	2.4	...	...	...	...	...	...	...	...	...	...	...

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1
2
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	...	Drawn smls. tube	SB-210	...	A93003	0
2	...	Drawn smls. tube	SB-210	...	A93003	H113
3	...	Drawn smls. tube	SB-210	...	A93003	H12
4	...	Drawn smls. tube	SB-210	...	A93003	H14
5	...	Drawn smls. tube	SB-210	...	A93003	H18
6	...	Bar, rod, shapes	SB-221	...	A93003	0
7	...	Bar, rod, shapes	SB-221	...	A93003	H112
8	...	Cond. & heat exch. tubes	SB-234	...	A93003	H14
9	...	Cond. & heat exch. tubes	SB-234	...	A93003	H25
10	...	Smls. extr. tube	SB-241	...	A93003	0
11	...	Smls. extr. tube	SB-241	...	A93003	H112
12	...	Smls. pipe	SB-241	...	A93003	H112
13	...	Smls. pipe	SB-241	...	A93003	H18
14	...	Die forgings	SB-247	...	A93003	H112
15	...	Die forgings	SB-247	...	A93003	H112 wld.
16	...	Plate, sheet	SB-209	...	A93004	0
17	...	Plate, sheet	SB-209	...	A93004	H112
18	...	Plate, sheet	SB-209	...	A93004	H32
19	...	Plate, sheet	SB-209	...	A93004	H34
20	...	Plate, sheet	SB-209	...	A95052	0
21	...	Plate, sheet	SB-209	...	A95052	H112
22	...	Plate, sheet	SB-209	...	A95052	H112
23	...	Plate, sheet	SB-209	...	A95052	H32
24	...	Plate, sheet	SB-209	...	A95052	H34
25	...	Drawn smls. tube	SB-210	...	A95052	0
26	...	Drawn smls. tube	SB-210	...	A95052	H32
27	...	Drawn smls. tube	SB-210	...	A95052	H34
28	...	Cond. & heat exch. tubes	SB-234	...	A95052	H32
29	...	Cond. & heat exch. tubes	SB-234	...	A95052	H34
30	...	Smls. extr. tube	SB-241	...	A95052	0
31	...	Plate, sheet	SB-209	...	A95083	0
32	...	Plate, sheet	SB-209	...	A95083	0
33	...	Plate, sheet	SB-209	...	A95083	0
34	...	Plate, sheet	SB-209	...	A95083	0
35	...	Plate, sheet	SB-209	...	A95083	0
36	...	Plate, sheet	SB-209	...	A95083	H112
37	...	Plate, sheet	SB-209	...	A95083	H112
38	...	Plate, sheet	SB-209	...	A95083	H32
39	...	Plate, sheet	SB-209	...	A95083	H32
40	...	Plate, sheet	SB-209	...	A95083	H32
41	...	Bar, rod, shapes	SB-221	...	A95083	0
42	...	Bar, rod, shapes	SB-221	...	A95083	H111
43	...	Bar, rod, shapes	SB-221	...	A95083	H112

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	0.010–0.500	21	14	5	NP	250 (Cl. 3 only)	400	400	NFA-1	T3
2	0.010–0.500	21	14	5	NP	250 (Cl. 3 only)	400	400	NFA-1	T3, W3
3	0.010–0.500	21	17	12	NP	300 (Cl. 3 only)	400	400	NFA-1	T4, W3
4	0.010–0.500	21	20	17	NP	250 (Cl. 3 only)	400	400	NFA-2	T4, W3
5	0.010–0.500	21	27	24	NP	250 (Cl. 3 only)	400	400	NFA-2	T4, W3
6	...	21	14	5	NP	250 (Cl. 3 only)	400	400	NFA-1	T3
7	...	21	14	5	NP	250 (Cl. 3 only)	400	400	NFA-1	T3, W3
8	0.010–0.200	21	20	17	NP	250 (Cl. 3 only)	400	400	NFA-2	T4, W4
9	0.010–0.200	21	22	19	NP	250 (Cl. 3 only)	400	400	NFA-2	T4, W4
10	...	21	14	5	NP	250 (Cl. 3 only)	400	400	NFA-1	T3
11	...	21	14	5	NP	250 (Cl. 3 only)	400	400	NFA-1	T3, W3
12	≥ 1.000	21	14	5	NP	250 (Cl. 3 only)	400	400	NFA-1	T3, W4
13	< 1.000	21	27	24	NP	250 (Cl. 3 only)	400	400	NFA-1	T4, W4
14	≤ 4.000	21	14	5	NP	250 (Cl. 3 only)	400	400	NFA-1	T3
15	≤ 4.000	21	14	...	NP	250 (Cl. 3 only)	400	400	NFA-1	T3, W7
16	0.006–3.000	22	22	8.5	NP	300 (Cl. 3 only)	400	400	NFA-3	...
17	0.250–3.000	22	23	9	NP	300 (Cl. 3 only)	400	400	NFA-3	W3
18	0.051–2.000	22	28	21	NP	250 (Cl. 3 only)	400	400	NFA-3	W3
19	0.051–1.000	22	32	25	NP	250 (Cl. 3 only)	400	400	NFA-4	W3
20	0.051–3.000	22	25	9.5	NP	250 (Cl. 3 only)	400	400	NFA-8	...
21	0.250–0.499	22	28	16	NP	250 (Cl. 3 only)	400	400	NFA-8	W3
22	0.500–3.000	22	25	9.5	NP	250 (Cl. 3 only)	400	400	NFA-8	W3
23	0.051–2.000	22	31	23	NP	200 (Cl. 3 only)	400	400	NFA-3	W3
24	0.051–1.000	22	34	26	NP	200 (Cl. 3 only)	400	400	NFA-4	W3
25	0.018–0.450	22	25	10	NP	300 (Cl. 3 only)	400	400	NFA-8	...
26	0.018–0.450	22	31	23	NP	200 (Cl. 3 only)	400	400	NFA-8	W4
27	0.018–0.450	22	34	26	NP	200 (Cl. 3 only)	400	400	NFA-8	W4
28	0.010–0.200	22	31	23	NP	200 (Cl. 3 only)	400	400	NFA-8	W4
29	0.010–0.200	22	34	26	NP	200 (Cl. 3 only)	400	400	NFA-8	W4
30	...	22	25	10	NP	250 (Cl. 3 only)	400	400	NFA-8	...
31	0.051–1.500	25	40	18	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19
32	1.501–3.000	25	39	17	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19
33	3.001–5.000	25	38	16	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19
34	5.001–7.000	25	37	15	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19
35	7.001–8.000	25	36	14	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19
36	0.250–1.500	25	40	18	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W3
37	1.501–3.000	25	39	17	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W3
38	0.125–0.187	25	44	31	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W3
39	0.188–1.500	25	44	31	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W3
40	1.501–3.000	25	41	29	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W3
41	≤ 5.000	25	39	16	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19
42	≤ 5.000	25	40	24	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W3
43	≤ 5.000	25	39	16	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W3

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	3.4	3.4	3.4	3.0	2.4	1.8	1.4	...	...	...	...	...	...	...	...	...	...	...
2	3.4	3.4	3.4	3.0	2.4	1.8	1.4	...	...	...	...	...	...	...	...	...	...	...
3	4.9	4.9	4.9	4.0	3.6	3.0	2.4	...	...	...	...	...	...	...	...	...	...	...
4	5.7	5.7	5.7	4.9	4.3	3.0	2.4	...	...	...	...	...	...	...	...	...	...	...
5	7.8	7.8	7.7	6.3	5.4	3.5	2.5	...	...	...	...	...	...	...	...	...	...	...
6	3.4	3.4	3.4	3.0	2.4	1.8	1.4	...	...	...	...	...	...	...	...	...	...	...
7	3.4	3.4	3.4	3.0	2.4	1.8	1.4	...	...	...	...	...	...	...	...	...	...	...
8	5.7	5.7	5.7	4.9	4.3	3.0	2.4	...	...	...	...	...	...	...	...	...	...	...
9	6.3	6.3	6.3	5.3	4.3	3.0	2.4	...	...	...	...	...	...	...	...	...	...	...
10	3.4	3.4	3.4	3.0	2.4	1.8	1.4	...	...	...	...	...	...	...	...	...	...	...
11	3.4	3.4	3.4	3.0	2.4	1.8	1.4	...	...	...	...	...	...	...	...	...	...	...
12	3.4	3.4	3.4	3.0	2.4	1.8	1.4	...	...	...	...	...	...	...	...	...	...	...
13	7.8	7.8	7.7	6.3	5.4	3.5	2.5	...	...	...	...	...	...	...	...	...	...	...
14	3.4	3.4	3.4	3.0	2.4	1.8	1.4	...	...	...	...	...	...	...	...	...	...	...
15	3.4	3.4	3.4	3.0	2.4	1.8	1.4	...	...	...	...	...	...	...	...	...	...	...
16	5.7	5.7	5.7	5.5	5.0	3.8	2.4	...	...	...	...	...	...	...	...	...	...	...
17	6.0	6.0	6.0	5.8	5.1	3.8	2.4	...	...	...	...	...	...	...	...	...	...	...
18	8.0	8.0	8.0	7.0	5.8	3.8	2.4	...	...	...	...	...	...	...	...	...	...	...
19	9.1	9.1	9.1	8.0	5.8	3.8	2.4	...	...	...	...	...	...	...	...	...	...	...
20	6.3	6.3	6.3	6.3	5.6	4.1	2.4	...	...	...	...	...	...	...	...	...	...	...
21	8.0	8.0	8.0	7.0	6.2	4.1	2.4	...	...	...	...	...	...	...	...	...	...	...
22	6.3	6.3	6.3	6.3	6.0	4.1	2.4	...	...	...	...	...	...	...	...	...	...	...
23	8.9	8.9	8.9	7.5	6.2	4.1	2.4	...	...	...	...	...	...	...	...	...	...	...
24	9.7	9.7	9.7	8.5	6.2	4.1	2.4	...	...	...	...	...	...	...	...	...	...	...
25	6.7	6.7	6.7	6.2	5.6	4.1	2.3	...	...	...	...	...	...	...	...	...	...	...
26	8.9	8.9	8.9	7.5	6.1	4.1	2.3	...	...	...	...	...	...	...	...	...	...	...
27	9.7	9.7	9.7	8.4	6.1	4.1	2.3	...	...	...	...	...	...	...	...	...	...	...
28	8.9	8.9	8.9	7.5	6.2	4.1	2.4	...	...	...	...	...	...	...	...	...	...	...
29	9.7	9.7	9.7	8.5	6.2	4.1	2.4	...	...	...	...	...	...	...	...	...	...	...
30	6.7	6.7	6.7	6.3	5.6	4.1	2.3	...	...	...	...	...	...	...	...	...	...	...
31	11.4	11.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	11.1	11.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	10.7	10.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	10.0	10.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	9.3	9.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	11.4	11.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	11.1	11.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	12.6	12.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	12.6	12.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	11.7	11.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	10.7	10.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	11.4	11.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	10.7	10.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	...	Smls. extr. tube	SB-241	...	A95083	0
2	...	Smls. extr. tube	SB-241	...	A95083	H111
3	...	Smls. extr. tube	SB-241	...	A95083	H112
4	...	Die & hand forgings	SB-247	...	A95083	H111
5	...	Die & hand forgings	SB-247	...	A95083	H112
6	...	Die & hand forgings	SB-247	...	A95083	H111 wld.
7	...	Die & hand forgings	SB-247	...	A95083	H112 wld.
8	...	Plate, sheet	SB-928	...	A95083	H321
9	...	Plate, sheet	SB-928	...	A95083	H321
10	...	Plate, sheet	SB-209	...	A95086	0
11	...	Plate, sheet	SB-209	...	A95086	H112
12	...	Plate, sheet	SB-209	...	A95086	H112
13	...	Plate, sheet	SB-209	...	A95086	H112
14	...	Plate, sheet	SB-209	...	A95086	H112
15	...	Plate, sheet	SB-928	...	A95086	H116
16	...	Plate, sheet	SB-209	...	A95086	H32
17	...	Plate, sheet	SB-209	...	A95086	H34
18	...	Bar, rod, shapes	SB-221	...	A95086	H112
19	...	Smls. extr. tube	SB-241	...	A95086	0
20	...	Smls. extr. tube	SB-241	...	A95086	H111
21	...	Smls. extr. tube	SB-241	...	A95086	H112
22	...	Plate, sheet	SB-209	...	A95154	0
23	...	Plate, sheet	SB-209	...	A95154	H112
24	...	Plate, sheet	SB-209	...	A95154	H112
25	...	Plate, sheet	SB-209	...	A95154	H32
26	...	Plate, sheet	SB-209	...	A95154	H34
27	...	Drawn smls. tube	SB-210	...	A95154	0
28	...	Drawn smls. tube	SB-210	...	A95154	H34
29	...	Bar, rod, shapes	SB-221	...	A95154	0
30	...	Bar, rod, shapes	SB-221	...	A95154	H112
31	...	Plate, sheet	SB-209	...	A95254	0
32	...	Plate, sheet	SB-209	...	A95254	H112
33	...	Plate, sheet	SB-209	...	A95254	H112
34	...	Plate, sheet	SB-209	...	A95254	H32
35	...	Plate, sheet	SB-209	...	A95254	H34
36	...	Plate, sheet	SB-209	...	A95454	0
37	...	Plate, sheet	SB-209	...	A95454	H112
38	...	Plate, sheet	SB-209	...	A95454	H112
39	...	Plate, sheet	SB-209	...	A95454	H32
40	...	Plate, sheet	SB-209	...	A95454	H34
41	...	Bar, rod, shapes	SB-221	...	A95454	0
42	...	Bar, rod, shapes	SB-221	...	A95454	H111
43	...	Bar, rod, shapes	SB-221	...	A95454	H112

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	25	39	16	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19
2	...	25	40	24	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W3
3	...	25	39	16	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W3
4	≤ 4.000	25	39	20	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W4
5	≤ 4.000	25	39	16	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W4
6	≤ 4.000	25	38	...	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W7
7	≤ 4.000	25	38	...	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W7
8	0.125–1.500	25	44	31	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W3
9	1.501–3.000	25	41	29	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W3
10	0.051–2.000	25	35	14	NP	150 (Cl. 3 only)	150	150	NFA-9	G18, G19
11	0.188–0.499	25	36	18	NP	150 (Cl. 3 only)	150	150	NFA-9	G18, G19, W3
12	0.500–1.000	25	35	16	NP	150 (Cl. 3 only)	150	150	NFA-9	G18, G19, W3
13	1.001–2.000	25	35	14	NP	150 (Cl. 3 only)	150	150	NFA-9	G18, G19, W3
14	2.001–3.000	25	34	14	NP	150 (Cl. 3 only)	150	150	NFA-9	G18, G19
15	0.063–2.000	25	40	28	NP	NP	150	150	NFA-11	G18, G19, W3
16	0.051–2.000	25	40	28	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W3
17	0.051–1.000	25	44	34	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W3
18	≤ 5.000	25	35	14	NP	150 (Cl. 3 only)	150	150	NFA-9	G18, G19, W4
19	≤ 5.000	25	35	14	NP	150 (Cl. 3 only)	150	150	NFA-9	G18, G19
20	≤ 5.000	25	36	21	NP	150 (Cl. 3 only)	150	150	NFA-9	G18, G19, W3
21	≤ 5.000	25	35	14	NP	150 (Cl. 3 only)	150	150	NFA-9	...
22	0.051–3.000	22	30	11	NP	150 (Cl. 3 only)	150	150	NFA-5	G18, G19
23	0.250–0.499	22	32	18	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W3
24	0.500–3.000	22	30	11	NP	150 (Cl. 3 only)	150	150	NFA-5	G18, G19, W3
25	0.051–2.000	22	36	26	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W3
26	0.051–1.000	22	39	29	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W3
27	0.010–0.450	22	30	11	NP	150 (Cl. 3 only)	150	150	NFA-5	G18, G19
28	0.010–0.450	22	39	29	NP	150 (Cl. 3 only)	150	150	NFA-5	G18, G19, W3
29	...	22	30	11	NP	150 (Cl. 3 only)	150	150	NFA-5	G18, G19
30	...	22	30	11	NP	150 (Cl. 3 only)	150	150	NFA-5	G18, G19, W3
31	0.051–3.000	22	30	11	NP	150 (Cl. 3 only)	150	150	NFA-5	G18, G19
32	0.250–0.499	22	32	18	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W3
33	0.500–3.000	22	30	11	NP	150 (Cl. 3 only)	150	150	NFA-5	G18, G19, W3
34	0.051–2.000	22	36	26	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W3
35	0.051–1.000	22	39	29	NP	150 (Cl. 3 only)	150	150	NFA-11	G18, G19, W3
36	0.051–3.000	22	31	12	NP	250 (Cl. 3 only)	400	400	NFA-6	T1
37	0.250–0.499	22	32	18	NP	250 (Cl. 3 only)	400	400	NFA-6	T1, W3
38	0.500–3.000	22	31	12	NP	250 (Cl. 3 only)	400	400	NFA-6	T1, W3
39	0.051–2.000	22	36	26	NP	250 (Cl. 3 only)	400	400	NFA-6	T1, W3
40	0.051–1.000	22	39	29	NP	250 (Cl. 3 only)	400	400	NFA-6	T1, W3
41	≤ 5.000	22	31	12	NP	250 (Cl. 3 only)	400	400	NFA-6	T1
42	≤ 5.000	22	33	19	NP	250 (Cl. 3 only)	400	400	NFA-6	T1, W3
43	≤ 5.000	22	31	12	NP	250 (Cl. 3 only)	400	400	NFA-6	T1, W3

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	10.7	10.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	11.4	11.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	10.7	10.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	11.1	11.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	10.7	10.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	10.9	10.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	10.9	10.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	12.6	12.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	11.7	11.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	9.3	9.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	10.3	10.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	10.0	10.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	9.3	9.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	9.3	9.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	11.4	11.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	11.4	11.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	12.6	12.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	9.3	9.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	9.3	9.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	10.3	10.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	9.3	9.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	7.3	7.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	9.1	9.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	7.3	7.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	10.3	10.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	11.1	11.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	7.3	7.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	11.1	11.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	7.3	7.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	7.3	7.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	7.3	7.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	9.1	9.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	7.3	7.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	10.3	10.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	11.1	11.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	8.0	8.0	8.0	7.5	5.5	4.1	3.0	...	...	...	...	...	...	...	...	...	...	...
37	9.1	9.1	9.1	7.5	5.5	4.1	3.0	...	...	...	...	...	...	...	...	...	...	...
38	8.0	8.0	8.0	7.5	5.5	4.1	3.0	...	...	...	...	...	...	...	...	...	...	...
39	10.3	10.3	10.3	7.5	5.5	4.1	3.0	...	...	...	...	...	...	...	...	...	...	...
40	11.1	11.1	11.1	7.5	5.5	4.1	3.0	...	...	...	...	...	...	...	...	...	...	...
41	8.0	8.0	8.0	7.5	5.5	4.1	3.0	...	...	...	...	...	...	...	...	...	...	...
42	9.4	9.4	9.4	7.5	5.5	4.1	3.0	...	...	...	...	...	...	...	...	...	...	...
43	8.0	8.0	8.0	7.5	5.5	4.1	3.0	...	...	...	...	...	...	...	...	...	...	...

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	...	Cond. & heat exch. tubes	SB-234	...	A95454	H32
2	...	Cond. & heat exch. tubes	SB-234	...	A95454	H34
3	...	Smls. extr. tube	SB-241	...	A95454	0
4	...	Smls. extr. tube	SB-241	...	A95454	H111
5	...	Smls. extr. tube	SB-241	...	A95454	H112
6	...	Plate, sheet	SB-209	...	A95456	0
7	...	Plate, sheet	SB-209	...	A95456	0
8	...	Plate, sheet	SB-209	...	A95456	0
9	...	Plate, sheet	SB-209	...	A95456	0
10	...	Plate, sheet	SB-209	...	A95456	0
11	...	Plate, sheet	SB-209	...	A95456	H112
12	...	Plate, sheet	SB-209	...	A95456	H112
13	...	Plate, sheet	SB-209	...	A95456	H32
14	...	Plate, sheet	SB-209	...	A95456	H32
15	...	Plate, sheet	SB-209	...	A95456	H32
16	...	Bar, rod, shapes	SB-221	...	A95456	0
17	...	Bar, rod, shapes	SB-221	...	A95456	H111
18	...	Bar, rod, shapes	SB-221	...	A95456	H112
19	...	Smls. extr. tube	SB-241	...	A95456	0
20	...	Smls. extr. tube	SB-241	...	A95456	H111
21	...	Smls. extr. tube	SB-241	...	A95456	H112
22	...	Plate, sheet	SB-928	...	A95456	H321
23	...	Plate, sheet	SB-928	...	A95456	H321
24	...	Plate, sheet	SB-928	...	A95456	H321
25	...	Plate, sheet	SB-209	...	A95652	0
26	...	Plate, sheet	SB-209	...	A95652	H112
27	...	Plate, sheet	SB-209	...	A95652	H112
28	...	Plate, sheet	SB-209	...	A95652	H32
29	...	Plate, sheet	SB-209	...	A95652	H34
30	...	Plate, sheet	SB-209	...	A96061	T4
31	...	Plate, sheet	SB-209	...	A96061	T451
32	...	Plate, sheet	SB-209	...	A96061	T6
(10) 33	...	Plate, sheet	SB-209	...	A96061	T651
(10) 34	...	Plate, sheet	SB-209	...	A96061	T651
35	...	Plate, sheet	SB-209	...	A96061	T4 wld.
36	...	Plate, sheet	SB-209	...	A96061	T451 wld.
37	...	Plate, sheet	SB-209	...	A96061	T6 wld.
(10) 38	...	Plate, sheet	SB-209	...	A96061	T651 wld.
39	...	Drawn smls. tube	SB-210	...	A96061	T4
(10) 40	...	Drawn smls. tube	SB-210	...	A96061	T6
41	...	Drawn smls. tube	SB-210	...	A96061	T4 wld.
(10) 42	...	Drawn smls. tube	SB-210	...	A96061	T6 wld.

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	0.010–0.250	22	36	26	NP	250 (Cl. 3 only)	400	400	NFA-6	T1, W4
2	0.010–0.250	22	39	29	NP	250 (Cl. 3 only)	400	400	NFA-6	T1, W4
3	≤ 5.000	22	31	12	NP	250 (Cl. 3 only)	400	400	NFA-6	T1
4	≤ 5.000	22	33	19	NP	250 (Cl. 3 only)	400	400	NFA-6	T1, W3
5	≤ 5.000	22	31	12	NP	250 (Cl. 3 only)	400	400	NFA-6	T1, W3
6	0.051–1.500	25	42	19	NP	150 (Cl. 3 only)	150	150	NFA-10	G18, G19
7	1.501–3.000	25	41	18	NP	150 (Cl. 3 only)	150	150	NFA-10	G18, G19
8	3.001–5.000	25	40	17	NP	150 (Cl. 3 only)	150	150	NFA-10	G18, G19
9	5.001–7.000	25	39	16	NP	150 (Cl. 3 only)	150	150	NFA-10	G18, G19
10	7.001–8.000	25	38	15	NP	150 (Cl. 3 only)	150	150	NFA-10	G18, G19
11	0.250–1.500	25	42	19	NP	150 (Cl. 3 only)	150	150	NFA-10	G18, G19, W3
12	1.501–3.000	25	41	18	NP	150 (Cl. 3 only)	150	150	NFA-10	G18, G19, W3
13	0.188–0.499	25	46	33	NP	150 (Cl. 3 only)	150	150	NFA-10	G18, G19, W3
14	0.500–1.500	25	44	31	NP	150 (Cl. 3 only)	150	150	NFA-10	G18, G19, W3
15	1.501–3.000	25	41	29	NP	150 (Cl. 3 only)	150	150	NFA-10	G18, G19, W3
16	≤ 5.000	25	41	19	NP	150 (Cl. 3 only)	150	150	NFA-10	G18, G19
17	≤ 5.000	25	42	26	NP	150 (Cl. 3 only)	150	150	NFA-10	G18, G19, W3
18	≤ 5.000	25	41	19	NP	150 (Cl. 3 only)	150	150	NFA-10	G18, G19, W3
19	≤ 5.000	25	41	19	NP	150 (Cl. 3 only)	150	150	NFA-10	G18, G19
20	≤ 5.000	25	42	26	NP	150 (Cl. 3 only)	150	150	NFA-10	G18, G19, W3
21	≤ 5.000	25	41	19	NP	150 (Cl. 3 only)	150	150	NFA-10	G18, G19, W3
22	0.188–0.499	25	46	33	NP	150 (Cl. 3 only)	150	150	NFA-10	G18, G19, W3
23	0.500–1.500	25	44	31	NP	150 (Cl. 3 only)	150	150	NFA-10	G18, G19, W3
24	1.501–3.000	25	41	29	NP	150 (Cl. 3 only)	150	150	NFA-10	G18, G19, W3
25	0.051–3.000	22	25	9.5	NP	250 (Cl. 3 only)	400	400	NFA-8	T2
26	0.250–0.499	22	28	16	NP	250 (Cl. 3 only)	400	400	NFA-8	T1, W3
27	0.500–3.000	22	25	9.5	NP	250 (Cl. 3 only)	400	400	NFA-8	T2, W3
28	0.051–2.000	22	31	23	NP	200 (Cl. 3 only)	400	400	NFA-3	T1, W3
29	0.051–1.000	22	34	26	NP	200 (Cl. 3 only)	400	400	NFA-4	T1, W3
30	0.051–0.249	23	30	16	NP	400 (Cl. 3 only)	400	400	NFA-13	G24, T3, W4
31	0.250–3.000	23	30	16	NP	400 (Cl. 3 only)	400	400	NFA-13	G24, T3, W4
32	0.051–0.249	23	42	35	NP	400 (Cl. 3 only)	400	400	NFA-12	G24, T3, W4
33	0.250–4.000	23	42	35	NP	400 (Cl. 3 only)	400	400	NFA-12,13	G24, T3, W4, W16
34	4.001–6.000	23	40	35	NP	400 (Cl. 3 only)	400	400	NFA-12,13	G24, T3, W4, W16
35	0.051–0.249	23	24	...	NP	400 (Cl. 3 only)	400	400	NFA-13	G24, T3, W7
36	0.250–3.000	23	24	...	NP	NP	400	400	NFA-13	G24, T3, W7
37	0.051–0.249	23	24	...	NP	400 (Cl. 3 only)	400	400	NFA-12	G24, T3, W7
38	0.250–6.000	23	24	...	NP	NP	400	400	NFA-12,13	G24, T3, W7, W16
39	0.025–0.500	23	30	16	NP	400 (Cl. 3 only)	400	400	NFA-13	T3, W4
40	0.025–0.500	23	42	35	NP	400 (Cl. 3 only)	400	400	NFA-12,13	T3, W4, W16
41	0.025–0.500	23	24	...	NP	400 (Cl. 3 only)	400	400	NFA-13	T3, W7
42	0.025–0.500	23	24	...	NP	400 (Cl. 3 only)	400	400	NFA-12,13	T3, W7, W16

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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	10.3	10.3	10.3	7.5	5.5	4.1	3.0	...	...	...	...	...	...	...	...	...	...	...
2	11.1	11.1	11.1	7.5	5.5	4.1	3.0	...	...	...	...	...	...	...	...	...	...	...
3	8.0	8.0	8.0	7.5	5.5	4.1	3.0	...	...	...	...	...	...	...	...	...	...	...
4	9.4	9.4	9.4	7.5	5.5	4.1	3.0	...	...	...	...	...	...	...	...	...	...	...
5	8.0	8.0	8.0	7.5	5.5	4.1	3.0	...	...	...	...	...	...	...	...	...	...	...
6	12.0	12.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	11.7	11.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	11.3	11.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	10.7	10.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	10.0	10.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	12.0	12.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	11.7	11.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	13.1	13.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	12.6	12.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	11.7	11.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	11.7	11.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	12.0	12.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	11.7	11.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	11.7	11.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	12.0	12.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	11.7	11.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	13.1	13.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	12.6	12.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	11.7	11.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	6.3	6.3	6.3	6.3	6.1	4.1	2.4	...	...	...	...	...	...	...	...	...	...	...
26	8.0	8.0	8.0	7.5	6.1	4.1	2.4	...	...	...	...	...	...	...	...	...	...	...
27	6.3	6.3	6.3	6.3	6.1	4.1	2.4	...	...	...	...	...	...	...	...	...	...	...
28	8.9	8.9	8.9	7.5	6.1	4.1	2.4	...	...	...	...	...	...	...	...	...	...	...
29	9.7	9.7	9.7	7.5	6.1	4.1	2.4	...	...	...	...	...	...	...	...	...	...	...
30	8.6	8.6	8.6	7.4	6.9	6.3	4.5	...	...	...	...	...	...	...	...	...	...	...
31	8.6	8.6	8.6	7.4	6.9	6.3	4.5	...	...	...	...	...	...	...	...	...	...	...
32	12.0	12.0	12.0	9.9	8.4	6.3	4.5	...	...	...	...	...	...	...	...	...	...	...
(10) 33	12.0	12.0	12.0	9.9	8.4	6.3	4.5	...	...	...	...	...	...	...	...	...	...	...
(10) 34	11.4	11.4	11.4	9.6	8.2	6.3	4.4	...	...	...	...	...	...	...	...	...	...	...
35	6.0	6.0	6.0	5.9	5.5	4.6	3.5	...	...	...	...	...	...	...	...	...	...	...
36	6.0	6.0	6.0	5.9	5.5	4.6	3.5	...	...	...	...	...	...	...	...	...	...	...
37	6.0	6.0	6.0	5.9	5.5	4.6	3.5	...	...	...	...	...	...	...	...	...	...	...
(10) 38	6.0	6.0	6.0	5.9	5.5	4.6	3.5	...	...	...	...	...	...	...	...	...	...	...
39	8.6	8.6	8.6	7.4	6.9	6.3	4.5	...	...	...	...	...	...	...	...	...	...	...
(10) 40	12.0	12.0	12.0	9.9	8.4	6.3	4.5	...	...	...	...	...	...	...	...	...	...	...
41	6.0	6.0	6.0	5.9	5.5	4.6	3.5	...	...	...	...	...	...	...	...	...	...	...
(10) 42	6.0	6.0	6.0	5.9	5.5	4.6	3.5	...	...	...	...	...	...	...	...	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1
2
3
4
5
6
7
8
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27
28
29
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31
32
33	(10)
34	(10)
35
36
37
38	(10)
39
40	(10)
41
42	(10)

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
(10) 1	...	Bar, rod, wire	SB-211	...	A96061	T6
(10) 2	...	Bar, rod, wire	SB-211	...	A96061	T651
(10) 3	...	Bar, rod, wire	SB-211	...	A96061	T6 wld.
(10) 4	...	Bar, rod, wire	SB-211	...	A96061	T651 wld.
(10) 5	...	Bar, rod, shapes	SB-221	...	A96061	T4
(10) 6	...	Bar, rod, shapes	SB-221	...	A96061	T6
(10) 7	...	Bar, rod, shapes	SB-221	...	A96061	T4 wld.
(10) 8	...	Bar, rod, shapes	SB-221	...	A96061	T6 wld.
9	...	Cond. & heat exch. tubes	SB-234	...	A96061	T4
10	...	Cond. & heat exch. tubes	SB-234	...	A96061	T6
11	...	Cond. & heat exch. tubes	SB-234	...	A96061	T4 wld.
12	...	Cond. & heat exch. tubes	SB-234	...	A96061	T6 wld.
(10) 13	...	Smls. extr. tube	SB-241	...	A96061	T4
(10) 14	...	Smls. extr. tube	SB-241	...	A96061	T6
(10) 15	...	Smls. extr. tube	SB-241	...	A96061	T4 wld.
(10) 16	...	Smls. extr. tube	SB-241	...	A96061	T6 wld.
(10) 17	...	Smls. pipe	SB-241	...	A96061	T6
(10) 18	...	Smls. pipe	SB-241	...	A96061	T6
(10) 19	...	Smls. pipe	SB-241	...	A96061	T6 wld.
(10) 20	...	Die forgings	SB-247	...	A96061	T6
(10) 21	...	Hand forgings	SB-247	...	A96061	T6
(10) 22	...	Hand forgings	SB-247	...	A96061	T6
(10) 23	...	Die & hand forgings	SB-247	...	A96061	T6 wld.
(10) 24	...	Shapes	SB-308	...	A96061	T6
(10) 25	...	Shapes	SB-308	...	A96061	T6 wld.
26	...	Drawn smls. tube	SB-210	...	A96063	T6
27	...	Drawn smls. tube	SB-210	...	A96063	T6 wld.
28	...	Bar, rod, shapes	SB-221	...	A96063	T1
29	...	Bar, rod, shapes	SB-221	...	A96063	T1
30	...	Bar, rod, shapes	SB-221	...	A96063	T5
31	...	Bar, rod, shapes	SB-221	...	A96063	T5
32	...	Bar, rod, shapes	SB-221	...	A96063	T6
33	...	Bar, rod, shapes	SB-221	...	A96063	T5 wld.
34	...	Bar, rod, shapes	SB-221	...	A96063	T6 wld.
35	...	Smls. extr. tube	SB-241	...	A96063	T1
36	...	Smls. extr. tube	SB-241	...	A96063	T1
37	...	Smls. extr. tube	SB-241	...	A96063	T5
38	...	Smls. extr. tube	SB-241	...	A96063	T5
39	...	Smls. extr. tube	SB-241	...	A96063	T6
40	...	Smls. extr. tube	SB-241	...	A96063	T5 wld.
41	...	Smls. extr. tube	SB-241	...	A96063	T6 wld.
42	...	Smls. pipe	SB-241	...	A96063	T6
43	...	Smls. pipe	SB-241	...	A96063	T6 wld.

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes	
					I	III	VIII-1	XII			
1	0.125–0.249	23	42	35	NP	400 (Cl. 3 only)	400	400	NFA-12	G24, T3, W4	
2	0.250–8.000	23	42	35	NP	400 (Cl. 3 only)	400	400	NFA-12,13	G24, T3, W4, W16	(10)
3	0.125–0.249	23	24	...	NP	400 (Cl. 3 only)	400	400	NFA-12	G13, G24, T3, W7	
4	0.250–8.000	23	24	...	NP	400 (Cl. 3 only)	400	400	NFA-12,13	G13, G24, T3, W7, W16	(10)
5	...	23	26	16	NP	400 (Cl. 3 only)	400	400	NFA-13	G24, T3, W4	
6	...	23	38	35	NP	400 (Cl. 3 only)	400	400	NFA-12,13	G24, T3, W4, W16	(10)
7	...	23	24	...	NP	400 (Cl. 3 only)	400	400	NFA-13	G24, T3, W7	
8	...	23	24	...	NP	400 (Cl. 3 only)	400	400	NFA-12,13	G13, G24, T3, W7, W16	(10)
9	0.025–0.200	23	30	16	NP	400 (Cl. 3 only)	400	400	NFA-13	T3, W4	
10	0.025–0.200	23	42	35	NP	400 (Cl. 3 only)	400	400	NFA-12	T3, W4	
11	0.025–0.200	23	24	...	NP	400 (Cl. 3 only)	400	400	NFA-13	T3, W7	
12	0.025–0.200	23	24	...	NP	400 (Cl. 3 only)	400	400	NFA-12	T3, W7	
13	...	23	26	16	NP	400 (Cl. 3 only)	400	400	NFA-13	G24, T3, W4	
14	...	23	38	35	NP	400 (Cl. 3 only)	400	400	NFA-12,13	G24, T3, W4, W16	(10)
15	...	23	24	...	NP	400 (Cl. 3 only)	400	400	NFA-13	G24, T3, W7	
16	...	23	24	...	NP	400 (Cl. 3 only)	400	400	NFA-12,13	G24, T3, W7, W16	(10)
17	< 1.000	23	42	35	NP	400 (Cl. 3 only)	400	400	NFA-12,13	T3, W4, W16	(10)
18	≥ 1.000	23	38	35	NP	400 (Cl. 3 only)	400	400	NFA-12,13	T3, W4, W16	(10)
19	...	23	24	...	NP	400 (Cl. 3 only)	400	400	NFA-12,13	T3, W7, W16	(10)
20	≤ 4.000	23	38	35	NP	400 (Cl. 3 only)	400	400	NFA-12,13	T3, W4, W16	(10)
21	≤ 4.000	23	37	33	NP	400 (Cl. 3 only)	400	400	NFA-12,13	T3, W4, W16	(10)
22	4.001–8.000	23	35	32	NP	400 (Cl. 3 only)	400	400	NFA-12,13	T3, W4, W16	(10)
23	≤ 8.000	23	24	...	NP	400 (Cl. 3 only)	400	400	NFA-12,13	T3, W7, W16	(10)
24	...	23	38	35	NP	400 (Cl. 3 only)	400	400	NFA-12,13	T3, W4, W16	(10)
25	...	23	24	...	NP	400 (Cl. 3 only)	400	400	NFA-12,13	G13, T3, W7, W16	(10)
26	0.025–0.500	23	33	28	NP	400 (Cl. 3 only)	400	400	NFA-1	T3, W4	
27	0.025–0.500	23	17	...	NP	400 (Cl. 3 only)	400	400	NFA-1	T3, W7	
28	≤ 0.500	23	17	9	NP	350 (Cl. 3 only)	400	400	NFA-1	T3, W4	
29	0.501–1.000	23	16	8	NP	350 (Cl. 3 only)	400	400	NFA-1	T3, W4	
30	≤ 0.500	23	22	16	NP	400 (Cl. 3 only)	400	400	NFA-1	T3, W4	
31	0.501–1.000	23	21	15	NP	400 (Cl. 3 only)	400	400	NFA-1	T3, W4	
32	≤ 1.000	23	30	25	NP	400 (Cl. 3 only)	400	400	NFA-1	T3, W4	
33	≤ 1.000	23	17	...	NP	400 (Cl. 3 only)	400	400	NFA-1	T3, W7	
34	≤ 1.000	23	17	...	NP	400 (Cl. 3 only)	400	400	NFA-1	T3, W7	
35	≤ 0.500	23	17	9	NP	350 (Cl. 3 only)	NP	NP	NFA-1	T3, W4	
36	0.501–1.000	23	16	8	NP	350 (Cl. 3 only)	NP	NP	NFA-1	T3, W4	
37	≤ 0.500	23	22	16	NP	350 (Cl. 3 only)	400	400	NFA-1	T3, W4	
38	0.501–1.000	23	21	15	NP	350 (Cl. 3 only)	400	400	NFA-1	T3, W4	
39	≤ 1.000	23	30	25	NP	350 (Cl. 3 only)	400	400	NFA-1	T3, W4	
40	≤ 1.000	23	17	...	NP	350 (Cl. 3 only)	400	400	NFA-1	T3, W7	
41	≤ 1.000	23	17	...	NP	350 (Cl. 3 only)	400	400	NFA-1	T3, W7	
42	...	23	30	25	NP	400 (Cl. 3 only)	400	400	NFA-1	T3, W4	
43	...	23	17	...	NP	400 (Cl. 3 only)	400	400	NFA-1	T3, W7	

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
(10) 1	12.0	12.0	12.0	9.9	8.4	6.3	4.5	...	...	...	...	...	...	...	...	...	...	...
(10) 2	12.0	12.0	12.0	9.9	8.4	6.4	4.5	...	...	...	...	...	...	...	...	...	...	...
3	6.0	6.0	6.0	5.9	5.5	4.6	3.5	...	...	...	...	...	...	...	...	...	...	...
(10) 4	6.0	6.0	6.0	5.9	5.5	4.6	3.5	...	...	...	...	...	...	...	...	...	...	...
5	7.4	7.4	7.4	6.4	6.0	5.8	4.5	...	...	...	...	...	...	...	...	...	...	...
(10) 6	10.9	10.9	10.9	9.1	7.9	6.3	4.5	...	...	...	...	...	...	...	...	...	...	...
7	6.0	6.0	6.0	5.9	5.5	4.6	3.5	...	...	...	...	...	...	...	...	...	...	...
(10) 8	6.0	6.0	6.0	5.9	5.5	4.6	3.5	...	...	...	...	...	...	...	...	...	...	...
9	8.6	8.6	8.6	7.4	6.9	6.3	4.5	...	...	...	...	...	...	...	...	...	...	...
10	12.0	12.0	12.0	9.9	8.4	6.3	4.5	...	...	...	...	...	...	...	...	...	...	...
11	6.0	6.0	6.0	5.9	5.5	4.6	3.5	...	...	...	...	...	...	...	...	...	...	...
12	6.0	6.0	6.0	5.9	5.5	4.6	3.5	...	...	...	...	...	...	...	...	...	...	...
13	7.4	7.4	7.4	6.4	6.0	5.8	4.5	...	...	...	...	...	...	...	...	...	...	...
(10) 14	10.9	10.9	10.9	9.1	7.9	6.3	4.5	...	...	...	...	...	...	...	...	...	...	...
15	6.0	6.0	6.0	5.9	5.5	4.6	3.5	...	...	...	...	...	...	...	...	...	...	...
(10) 16	6.0	6.0	6.0	5.9	5.5	4.6	3.5	...	...	...	...	...	...	...	...	...	...	...
(10) 17	12.0	12.0	12.0	9.9	8.4	6.3	4.5	...	...	...	...	...	...	...	...	...	...	...
(10) 18	10.9	10.9	10.9	9.1	7.9	6.3	4.5	...	...	...	...	...	...	...	...	...	...	...
(10) 19	6.0	6.0	6.0	5.9	5.5	4.6	3.5	...	...	...	...	...	...	...	...	...	...	...
(10) 20	10.9	10.9	10.9	9.1	7.9	6.3	4.5	...	...	...	...	...	...	...	...	...	...	...
(10) 21	10.6	10.6	10.6	8.8	7.7	6.3	4.5	...	...	...	...	...	...	...	...	...	...	...
(10) 22	10.0	10.0	10.0	8.4	7.4	6.1	4.5	...	...	...	...	...	...	...	...	...	...	...
(10) 23	6.0	6.0	6.0	5.9	5.5	4.6	3.5	...	...	...	...	...	...	...	...	...	...	...
(10) 24	10.9	10.9	10.9	8.5	7.2	5.6	4.0	...	...	...	...	...	...	...	...	...	...	...
(10) 25	6.0	5.9	5.7	5.4	5.0	4.2	3.2	...	...	...	...	...	...	...	...	...	...	...
26	9.4	9.4	9.4	7.4	5.5	3.4	2.0	...	...	...	...	...	...	...	...	...	...	...
27	4.3	4.3	4.3	4.2	3.9	3.0	2.0	...	...	...	...	...	...	...	...	...	...	...
28	4.9	4.9	4.9	4.2	4.2	3.4	2.0	...	...	...	...	...	...	...	...	...	...	...
29	4.6	4.6	4.6	4.0	4.0	3.4	2.0	...	...	...	...	...	...	...	...	...	...	...
30	6.3	6.3	6.3	5.1	4.6	3.4	2.0	...	...	...	...	...	...	...	...	...	...	...
31	6.0	6.0	6.0	4.9	4.3	3.4	2.0	...	...	...	...	...	...	...	...	...	...	...
32	8.6	8.6	8.6	6.8	5.0	3.4	2.0	...	...	...	...	...	...	...	...	...	...	...
33	4.3	4.3	4.3	4.2	3.9	3.0	2.0	...	...	...	...	...	...	...	...	...	...	...
34	4.3	4.3	4.3	4.2	3.9	3.0	2.0	...	...	...	...	...	...	...	...	...	...	...
35	4.9	4.9	4.9	4.2	4.2	3.4	...	...	...	...	...	...	...	...	...	...	...	...
36	4.6	4.6	4.6	4.0	4.0	3.4	...	...	...	...	...	...	...	...	...	...	...	...
37	6.3	6.3	6.3	5.1	4.6	3.4	2.0	...	...	...	...	...	...	...	...	...	...	...
38	6.0	6.0	6.0	4.9	4.4	3.4	2.0	...	...	...	...	...	...	...	...	...	...	...
39	8.6	8.6	8.6	6.8	5.0	3.4	2.0	...	...	...	...	...	...	...	...	...	...	...
40	4.3	4.3	4.3	4.2	3.9	3.0	2.0	...	...	...	...	...	...	...	...	...	...	...
41	4.3	4.3	4.3	4.2	3.9	3.0	2.0	...	...	...	...	...	...	...	...	...	...	...
42	8.6	8.6	8.6	6.8	5.0	3.4	2.0	...	...	...	...	...	...	...	...	...	...	...
43	4.3	4.3	4.3	4.2	3.9	3.0	2.0	...	...	...	...	...	...	...	...	...	...	...

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1
2
3
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	...	Rod	SB-187	...	C10200	060
2	...	Smls. tube	SB-75	...	C10200	060
3	...	Smls. pipe	SB-42	...	C10200	061
(10) 4	...	Plate, sheet, strip	SB-152	...	C10200	H00
(10) 5	...	Plate, sheet, strip	SB-152	...	C10200	H01
(10) 6	...	Plate, sheet, strip	SB-152	...	C10200	H02
(10) 7	...	Plate, sheet, strip	SB-152	...	C10200	H03
(10) 8	...	Plate, sheet, strip	SB-152	...	C10200	H04
9	...	Plate, sheet, strip	SB-152	...	C10200	025
10	...	Smls. pipe	SB-42	...	C10200	H55
11	...	Smls. tube	SB-75	...	C10200	H55
12	...	Smls. cond. tube	SB-111	...	C10200	H55
13	...	Smls. U-bend tube	SB-395	...	C10200	H55
14	...	Smls. pipe	SB-42	...	C10200	H80
15	...	Smls. tube	SB-75	...	C10200	H80
16	...	Smls. cond. tube	SB-111	...	C10200	H80
17	...	Plate, sheet, strip	SB-152	...	C10400	H00
18	...	Plate, sheet, strip	SB-152	...	C10400	H01
19	...	Plate, sheet, strip	SB-152	...	C10400	H02
20	...	Plate, sheet, strip	SB-152	...	C10400	H03
(10) 21	...	Plate, sheet, strip	SB-152	...	C10400	H04
22	...	Plate, sheet, strip	SB-152	...	C10400	025
23	...	Plate, sheet, strip	SB-152	...	C10500	H00
24	...	Plate, sheet, strip	SB-152	...	C10500	H01
25	...	Plate, sheet, strip	SB-152	...	C10500	H02
26	...	Plate, sheet, strip	SB-152	...	C10500	H03
27	...	Plate, sheet, strip	SB-152	...	C10500	H04
28	...	Plate, sheet, strip	SB-152	...	C10500	025
29	...	Plate, sheet, strip	SB-152	...	C10700	H00
30	...	Plate, sheet, strip	SB-152	...	C10700	H01
31	...	Plate, sheet, strip	SB-152	...	C10700	H02
32	...	Plate, sheet, strip	SB-152	...	C10700	H03
33	...	Plate, sheet, strip	SB-152	...	C10700	H04
34	...	Plate, sheet, strip	SB-152	...	C10700	025
35	...	Bar, rod	SB-187	...	C11000	H04
36	...	Bar, rod	SB-187	...	C11000	060
37	...	Plate, sheet, strip, bar	SB-152	...	C11000	H00
38	...	Plate, sheet, strip, bar	SB-152	...	C11000	H01
39	...	Plate, sheet, strip, bar	SB-152	...	C11000	H02
40	...	Plate, sheet, strip, bar	SB-152	...	C11000	H03
41	...	Plate, sheet, strip, bar	SB-152	...	C11000	H04
42	...	Plate, sheet, strip, bar	SB-152	...	C11000	025
43	...	Smls. tube	SB-75	...	C12000	050
44	...	Smls. tube	SB-75	...	C12000	060
45	...	Smls. pipe	SB-42	...	C12000	061

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes	
					I	III	VIII-1	XII			
1	...	31	28	...	NP	300	400	400	NFC-1	T3	
2	...	31	30	9	400	300 (Cl. 3 only)	400	400	NFC-1	G1, T3, W10	
3	...	31	30	9	400	300	400	400	NFC-1	G1, T3, W10	
4	...	31	30	10	NP	300 (Cl. 3 only)	400	400	NFC-1	T2	(10)
5	...	31	30	10	NP	300 (Cl. 3 only)	400	400	NFC-1	T2	(10)
6	...	31	30	10	NP	300 (Cl. 3 only)	400	400	NFC-1	T2	(10)
7	...	31	30	10	NP	300 (Cl. 3 only)	400	400	NFC-1	T2	(10)
8	...	31	30	10	NP	300 (Cl. 3 only)	400	400	NFC-1	T2	(10)
9	...	31	30	10	NP	300 (Cl. 3 only)	400	400	NFC-1	T2	
10	2 < NPS ≤ 12	31	36	30	400	400	400	400	NFC-6	G1, W9, W10	
11	...	31	36	30	400	400 (Cl. 3 only)	400	400	NFC-6	G1, G9, W9, W10	
12	< 3	31	36	30	NP	400	400	400	NFC-6	G9, W9	
13	...	31	36	30	NP	400 (Cl. 3 only)	400	400	NFC-6	W9	
14	1/8 < NPS ≤ 2	31	45	40	400	300	400	400	NFC-6	G1, G5, G6, T4, W9, W10	
15	< 4	31	45	40	400	350	400	400	NFC-6	G1, G9, T4, W9, W10	
16	< 3	31	45	40	NP	300	400	400	NFC-6	G9, T4, W9	
17	...	31	30	10	NP	300	400	400	NFC-1	T2	
18	...	31	30	10	NP	300	400	400	NFC-1	T2	
19	...	31	30	10	NP	300	400	400	NFC-1	T2	
20	...	31	30	10	NP	300	400	400	NFC-1	T2	
21	...	31	30	10	NP	300	400	400	NFC-1	T2	(10)
22	...	31	30	10	NP	300	400	400	NFC-1	T2	
23	...	31	30	10	NP	300	400	400	NFC-1	T2	
24	...	31	30	10	NP	300	400	400	NFC-1	T2	
25	...	31	30	10	NP	300	400	400	NFC-1	T2	
26	...	31	30	10	NP	300	400	400	NFC-1	T2	
27	...	31	30	10	NP	300	400	400	NFC-1	T2	
28	...	31	30	10	NP	300	400	400	NFC-1	T2	
29	...	31	30	10	NP	300	400	400	NFC-1	T2	
30	...	31	30	10	NP	300	400	400	NFC-1	T2	
31	...	31	30	10	NP	300	400	400	NFC-1	T2	
32	...	31	30	10	NP	300	400	400	NFC-1	T2	
33	...	31	30	10	NP	300	400	400	NFC-1	T2	
34	...	31	30	10	NP	300	400	400	NFC-1	T2	
35	...	31	28	...	NP	300	400	400	NFC-1	T3	
36	...	31	28	...	NP	300	400	400	NFC-1	T3	
37	≤ 2	31	30	10	NP	NP	400	400	NFC-1	T2	
38	≤ 2	31	30	10	NP	NP	400	400	NFC-1	T2	
39	≤ 2	31	30	10	NP	NP	400	400	NFC-1	T2	
40	≤ 2	31	30	10	NP	NP	400	400	NFC-1	T2	
41	≤ 2	31	30	10	NP	NP	400	400	NFC-1	T2	
42	≤ 2	31	30	10	NP	NP	400	400	NFC-1	T2	
43	...	31	30	9	NP	300 (Cl. 3 only)	NP	NP	NFC-1	...	
44	...	31	30	9	400	300 (Cl. 3 only)	400	400	NFC-1	G1, T3, W10	
45	...	31	30	9	400	300	400	400	NFC-1	G1, T3, W10	

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	5.3	4.5	4.3	4.2	4.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
2	6.0	5.1	4.9	4.8	4.7	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
3	6.0	5.1	4.9	4.8	4.7	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
(10) 4	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
(10) 5	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
(10) 6	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
(10) 7	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
(10) 8	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
9	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
10	10.3	10.3	10.3	10.3	10.0	9.7	9.4	...	...	...	...	...	...	...	...	...	...	...
11	10.3	10.3	10.3	10.3	10.0	9.7	9.4	...	...	...	...	...	...	...	...	...	...	...
12	10.3	10.3	10.3	10.3	10.0	9.7	9.4	...	...	...	...	...	...	...	...	...	...	...
13	10.3	10.3	10.3	10.3	10.0	9.7	9.4	...	...	...	...	...	...	...	...	...	...	...
14	12.9	12.9	12.9	12.9	12.5	11.8	4.3	...	...	...	...	...	...	...	...	...	...	...
15	12.9	12.9	12.9	12.9	12.5	11.8	4.3	...	...	...	...	...	...	...	...	...	...	...
16	12.9	12.9	12.9	12.9	12.5	11.8	4.3	...	...	...	...	...	...	...	...	...	...	...
17	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
18	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
19	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
20	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
(10) 21	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
22	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
23	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
24	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
25	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
26	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
27	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
28	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
29	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
30	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
31	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
32	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
33	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
34	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
35	5.3	4.5	4.3	4.2	4.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
36	5.3	4.5	4.3	4.2	4.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
37	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
38	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
39	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
40	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
41	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
42	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
43	6.0	5.1	4.9	4.8	4.7	...	...	...	...	...	...	...	...	...	...	...	...	...
44	6.0	5.1	4.9	4.8	4.7	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
45	6.0	5.1	4.9	4.8	4.7	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1
2
3
4
5
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	...	Smls. pipe	SB-42	...	C12000	H55
2	...	Smls. tube	SB-75	...	C12000	H55
3	...	Smls. cond. tube	SB-111	...	C12000	H55
4	...	Smls. U-bend tube	SB-395	...	C12000	H55
5	...	Smls. pipe	SB-42	...	C12000	H80
6	...	Smls. tube	SB-75	...	C12000	H80
7	...	Smls. cond. tube	SB-111	...	C12000	H80
8	...	Smls. tube	SB-75	...	C12200	050
9	...	Smls. tube	SB-75	...	C12200	060
10	...	Smls. pipe	SB-42	...	C12200	061
11	...	Finned tube	SB-359	...	C12200	061
12	...	Wld. cond. tube	SB-543	...	C12200	W061
13	...	Plate, sheet, strip	SB-152	...	C12200	H00
14	...	Plate, sheet, strip	SB-152	...	C12200	H01
15	...	Plate, sheet, strip	SB-152	...	C12200	H02
16	...	Plate, sheet, strip	SB-152	...	C12200	H03
17	...	Plate, sheet, strip	SB-152	...	C12200	H04
18	...	Plate, sheet, strip	SB-152	...	C12200	025
19	...	Wld. cond. tube	SB-543	...	C12200	WC55
20	...	Smls. pipe	SB-42	...	C12200	H55
21	...	Smls. tube	SB-75	...	C12200	H55
22	...	Smls. cond. tube	SB-111	...	C12200	H55
(a) 23	...	Finned tube	SB-359	...	C12200	H55
24	...	Smls. U-bend tube	SB-395	...	C12200	H55
25	...	Smls. pipe	SB-42	...	C12200	H80
26	...	Smls. cond. tube	SB-75	...	C12200	H80
27	...	Smls. tube	SB-111	...	C12200	H80
28	...	Plate, sheet, strip, bar	SB-152	...	C12300	H00
29	...	Plate, sheet, strip, bar	SB-152	...	C12300	H01
30	...	Plate, sheet, strip, bar	SB-152	...	C12300	H02
31	...	Plate, sheet, strip, bar	SB-152	...	C12300	H03
32	...	Plate, sheet, strip, bar	SB-152	...	C12300	H04
33	...	Plate, sheet, strip, bar	SB-152	...	C12300	025
34	...	Plate, sheet, strip	SB-152	...	C14200	025
35	...	Smls. cond. tube	SB-111	...	C14200	H55
36	...	Smls. U-bend tube	SB-395	...	C14200	H55
37	...	Smls. cond. tube	SB-111	...	C14200	H80
38	...	Smls. cond. tube	SB-111	...	C19200	061
39	...	Smls. U-bend tube	SB-395	...	C19200	061
40	...	Wld. cond. tube	SB-543	...	C19400	W061
41	...	Wld. cond. tube	SB-543	...	C19400	WC55
(a) 42	...	Smls. pipe	SB-43	...	C23000	H58
43	...	Smls. tube	SB-135	...	C23000	050
(a) 44	...	Smls. red brass tube	SB-135	...	C23000	060

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	2 < NPS ≤ 12	31	36	30	400	400	400	400	NFC-6	G1, W9, W10
2	...	31	36	30	400	400 (Cl. 3 only)	400	400	NFC-6	G1, G9, W9, W10
3	< 3	31	36	30	NP	400	400	400	NFC-6	G9, W9
4	< 2	31	36	30	NP	400 (Cl. 3 only)	400	400	NFC-6	W9
5	1/8 < NPS ≤ 2	31	45	40	400	300	400	400	NFC-6	G1, G6, T4, W9, W10
6	...	31	45	40	400	350 (Cl. 3 only)	400	400	NFC-6	G1, G9, T4, W9, W10
7	< 3	31	45	40	NP	300	400	400	NFC-6	G9, T4, W9
8	...	31	30	9	NP	300	400	400	NFC-7	T3
9	...	31	30	9	400	300	NP	NP	NFC-1	G1, T3, W10
10	...	31	30	9	400	300	400	400	NFC-1	G1, T3, W10
11	...	31	30	9	NP	300 (Cl. 3 only)	400	NP	NFC-1	G1, T3, W10
12	...	31	30	9	NP	300 (Cl. 3 only)	400	400	NFC-1	G14, T3, W11
13	...	31	30	10	NP	300	400	400	NFC-1	T2
14	...	31	30	10	NP	300	400	400	NFC-1	T2
15	...	31	30	10	NP	300	400	400	NFC-1	T2
16	...	31	30	10	NP	300	400	400	NFC-1	T2
17	...	31	30	10	NP	300	400	400	NFC-1	T2
18	...	31	30	10	NP	300	400	400	NFC-1	T2
19	...	31	32	15	NP	300 (Cl. 3 only)	400	400	NFC-1	G14, T4, W3
20	2 < NPS ≤ 12	31	36	30	400	400	400	400	NFC-6	G1, W9, W10
21	...	31	36	30	400	400 (Cl. 3 only)	400	400	NFC-6	G1, G9, W9, W10
22	< 3	31	36	30	NP	400	400	400	NFC-6	G9, W9
23	...	31	36	30	NP	300 (Cl. 3 only)	400	NP	NFC-6	G1, G9, W9, W10
24	< 2	31	36	30	NP	400 (Cl. 3 only)	400	400	NFC-6	W9
25	1/8 < NPS ≤ 3	31	45	40	400	300	400	400	NFC-6	G1, G6, T4, W9, W10
26	< 4	31	45	40	400	350 (Cl. 3 only)	400	400	NFC-6	G1, G9, T4, W9, W10
27	< 3	31	45	40	NP	300	400	400	NFC-6	G9, T4, W9
28	...	31	30	10	NP	300	400	400	NFC-1	T2
29	...	31	30	10	NP	300	400	400	NFC-1	T2
30	...	31	30	10	NP	300	400	400	NFC-1	T2
31	...	31	30	10	NP	300	400	400	NFC-1	T2
32	...	31	30	10	NP	300	400	400	NFC-1	T2
33	...	31	30	10	NP	300	400	400	NFC-1	T2
34	...	31	30	10	NP	300 (Cl. 3 only)	NP	NP	NFC-1	T2
35	< 3	31	36	30	NP	400	400	400	NFC-6	G9, W9
36	...	31	36	30	NP	400 (Cl. 3 only)	400	400	NFC-6	W9
37	< 3	31	45	40	NP	300	400	400	NFC-6	G9, T4, W9
38	< 3	31	38	12	NP	NP	300	300	NFC-1	...
39	...	31	38	12	NP	NP	300	300	NFC-1	...
40	...	31	45	15	NP	NP	400	400	NFC-5	G14, G15
41	...	31	45	22	NP	300 (Cl. 3 only)	400	400	NFC-5	G14, G15
42	...	32	40	12	450	300 (Cl. 3 only)	450	450	NFC-1	G1, T3, W10
43	...	32	40	12	NP	300 (Cl. 3 only)	NP	NP	NFC-1	...
44	...	32	40	12	NP	300 (Cl. 3 only)	450	450	NFC-1	T3

(a)

(a)

(a)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	10.3	10.3	10.3	10.3	10.0	9.7	9.4	...	...	...	...	...	...	...	...	...	...	...
2	10.3	10.3	10.3	10.3	10.0	9.7	9.4	...	...	...	...	...	...	...	...	...	...	...
3	10.3	10.3	10.3	10.3	10.0	9.7	9.4	...	...	...	...	...	...	...	...	...	...	...
4	10.3	10.3	10.3	10.3	10.0	9.7	9.4	...	...	...	...	...	...	...	...	...	...	...
5	12.9	12.9	12.9	12.9	12.5	11.8	4.3	...	...	...	...	...	...	...	...	...	...	...
6	12.9	12.9	12.9	12.9	12.5	11.8	4.3	...	...	...	...	...	...	...	...	...	...	...
7	12.9	12.9	12.9	12.9	12.5	11.8	4.3	...	...	...	...	...	...	...	...	...	...	...
8	6.0	5.1	4.9	4.8	4.7	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
9	6.0	5.1	4.9	4.8	4.7	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
10	6.0	5.1	4.9	4.8	4.7	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
11	6.0	5.1	4.9	4.8	4.7	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
12	5.1	4.3	4.1	4.1	4.0	3.4	2.6	...	...	...	...	...	...	...	...	...	...	...
13	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
14	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
15	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
16	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
17	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
18	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
19	7.8	7.8	7.8	7.8	7.5	7.3	2.6	...	...	...	...	...	...	...	...	...	...	...
20	10.3	10.3	10.3	10.3	10.0	9.7	9.4	...	...	...	...	...	...	...	...	...	...	...
21	10.3	10.3	10.3	10.3	10.0	9.7	9.4	...	...	...	...	...	...	...	...	...	...	...
22	10.3	10.3	10.3	10.3	10.0	9.7	9.4	...	...	...	...	...	...	...	...	...	...	...
(a) 23	10.3	10.3	10.3	10.3	10.0	9.7	9.4	...	...	...	...	...	...	...	...	...	...	...
24	10.3	10.3	10.3	10.3	10.0	9.7	9.4	...	...	...	...	...	...	...	...	...	...	...
25	12.9	12.9	12.9	12.9	12.5	11.8	4.3	...	...	...	...	...	...	...	...	...	...	...
26	12.9	12.9	12.9	12.9	12.5	11.8	4.3	...	...	...	...	...	...	...	...	...	...	...
27	12.9	12.9	12.9	12.9	12.5	11.8	4.3	...	...	...	...	...	...	...	...	...	...	...
28	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
29	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
30	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
31	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
32	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
33	6.7	5.6	5.4	5.3	5.0	4.0	3.0	...	...	...	...	...	...	...	...	...	...	...
34	6.7	5.6	5.4	5.3	5.0	...	...	...	...	...	...	...	...	...	...	...	...	...
35	10.3	10.3	10.3	10.3	10.0	9.7	9.4	...	...	...	...	...	...	...	...	...	...	...
36	10.3	10.3	10.3	10.3	10.0	9.7	9.4	...	...	...	...	...	...	...	...	...	...	...
37	12.9	12.9	12.9	12.9	12.5	11.8	4.3	...	...	...	...	...	...	...	...	...	...	...
38	8.0	7.1	6.7	6.4	6.2	...	...	...	...	...	...	...	...	...	...	...	...	...
39	8.0	7.1	6.7	6.4	6.2	...	...	...	...	...	...	...	...	...	...	...	...	...
40	8.5	8.4	8.3	8.1	7.8	7.6	6.0	...	...	...	...	...	...	...	...	...	...	...
41	10.9	10.9	10.9	10.6	10.1	7.7	6.0	...	...	...	...	...	...	...	...	...	...	...
(a) 42	8.0	8.0	8.0	8.0	8.0	7.0	5.0	2.0	...	...	...	...	...	...	...	...	...	...
43	8.0	8.0	8.0	8.0	8.0	...	...	...	...	...	...	...	...	...	...	...	...	...
(a) 44	8.0	8.0	8.0	8.0	8.0	7.0	5.0	2.0	...	...	...	...	...	...	...	...	...	...

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1
2
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
(a) 1	...	Smls. pipe	SB-43	...	C23000	061
(a) 2	...	Smls. cond. tube	SB-111	...	C23000	061
(a) 3	...	Smls. tube	SB-395	...	C23000	061
4	...	Wld. cond. tube	SB-543	...	C23000	W061
5	...	Wld. cond. tube	SB-543	...	C23000	WC55
6	...	Smls. tube	SB-111	...	C28000	061
7	...	Plate	SB-171	...	C36500	M20
8	...	Plate	SB-171	...	C36500	025
9	...	Plate	SB-171	...	C36500	M20
10	...	Plate	SB-171	...	C36500	025
11	...	Plate	SB-171	...	C36500	M20
12	...	Plate	SB-171	...	C36500	025
13	...	Forgings, brass	SB-283	...	C37700	M10
14	...	Forgings, brass	SB-283	...	C37700	M11
15	...	Forgings, brass	SB-283	...	C37700	020
16	...	Forgings, brass	SB-283	...	C37700	TQ50
17	...	Forgings, brass	SB-283	...	C37700	M10
18	...	Forgings, brass	SB-283	...	C37700	M11
19	...	Forgings, brass	SB-283	...	C37700	020
20	...	Forgings, brass	SB-283	...	C37700	TQ50
21	...	Plate	SB-171	...	C44300	M20
22	...	Plate	SB-171	...	C44300	025
23	...	Smls. cond. tube	SB-111	...	C44300	061
24	...	Finned tube	SB-359	...	C44300	061
25	...	Smls. U-bend tube	SB-395	...	C44300	061
26	...	Wld. cond. tube	SB-543	...	C44300	W061
27	...	Plate	SB-171	...	C44400	M20
28	...	Plate	SB-171	...	C44400	025
29	...	Smls. cond. tube	SB-111	...	C44400	061
30	...	Finned tube	SB-359	...	C44400	061
31	...	Smls. U-bend tube	SB-395	...	C44400	061
32	...	Wld. cond. tube	SB-543	...	C44400	W061
33	...	Plate	SB-171	...	C44500	M20
34	...	Plate	SB-171	...	C44500	025
35	...	Smls. cond. tube	SB-111	...	C44500	061
36	...	Finned tube	SB-359	...	C44500	061
37	...	Smls. U-bend tube	SB-395	...	C44500	061
38	...	Wld. cond. tube	SB-543	...	C44500	W061
39	...	Plate	SB-171	...	C46400	M20
40	...	Plate	SB-171	...	C46400	025
41	...	Plate	SB-171	...	C46400	M20
42	...	Plate	SB-171	...	C46400	025

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	32	40	12	450	300 (Cl. 3 only)	450	450	NFC-1	G1, T3, W10
2	< 3	32	40	12	NP	300 (Cl. 3 only)	450	450	NFC-1	T3
3	...	32	40	12	NP	300 (Cl. 3 only)	450	450	NFC-1	T3
4	...	32	40	12	NP	300 (Cl. 3 only)	450	450	NFC-1	G14, G15, T3
5	...	32	42	20	NP	300 (Cl. 3 only)	450	450	NFC-2	G14, G15, T3
6	...	32	50	20	400	350 (Cl. 3 only)	400	400	NFC-3	G1, G6, T3, W10
7	$3.5 < t \leq 5$	32	40	12	NP	350 (Cl. 3 only)	400	400	NFC-2	G7, T4
8	$3.5 < t \leq 5$	32	40	12	NP	350 (Cl. 3 only)	400	400	NFC-2	G7, T4
9	$2 < t \leq 3.5$	32	45	15	NP	350 (Cl. 3 only)	400	400	NFC-2	T4
10	$2 < t \leq 3.5$	32	45	15	NP	350 (Cl. 3 only)	400	400	NFC-2	T4
11	≤ 2	32	50	20	NP	350 (Cl. 3 only)	400	400	NFC-2	T3
12	≤ 2	32	50	20	NP	350 (Cl. 3 only)	400	400	NFC-2	T3
13	$> 1\frac{1}{2}$	...	46	15	NP	NP	200	200	NFC-2	W14
14	$> 1\frac{1}{2}$	...	46	15	NP	NP	200	200	NFC-2	W14
15	$> 1\frac{1}{2}$	...	46	15	NP	NP	200	200	NFC-2	W14
16	$> 1\frac{1}{2}$	...	46	15	NP	NP	200	200	NFC-2	W14
17	$\leq 1\frac{1}{2}$	...	50	18	NP	NP	200	200	NFC-2	W14
18	$\leq 1\frac{1}{2}$	...	50	18	NP	NP	200	200	NFC-2	W14
19	$\leq 1\frac{1}{2}$	...	50	18	NP	NP	200	200	NFC-2	W14
20	$\leq 1\frac{1}{2}$	...	50	18	NP	NP	200	200	NFC-2	W14
21	≤ 4	32	45	15	NP	350 (Cl. 3 only)	450	450	NFC-2	T3
22	≤ 4	32	45	15	NP	350 (Cl. 3 only)	450	450	NFC-2	T3
23	< 3	32	45	15	450	350 (Cl. 3 only)	450	450	NFC-2	G1, G6, T3, W10
24	...	32	45	15	NP	350 (Cl. 3 only)	450	NP	NFC-2	G1, G6, T3, W10
25	...	32	45	15	NP	350 (Cl. 3 only)	450	450	NFC-2	T3
26	...	32	45	15	NP	NP	450	450	NFC-2	G7, G14, G15, T3
27	≤ 4	32	45	15	NP	350 (Cl. 3 only)	450	450	NFC-2	T3
28	≤ 4	32	45	15	NP	350 (Cl. 3 only)	450	450	NFC-2	T3
29	< 3	32	45	15	450	350 (Cl. 3 only)	450	450	NFC-2	G1, G6, T3, W10
30	...	32	45	15	NP	350 (Cl. 3 only)	450	NP	NFC-2	G1, G6, T3, W10
31	...	32	45	15	NP	350 (Cl. 3 only)	450	450	NFC-2	T3
32	...	32	45	15	NP	NP	450	450	NFC-2	G7, G14, G15, T3
33	≤ 4	32	45	15	NP	350 (Cl. 3 only)	450	450	NFC-2	T3
34	≤ 4	32	45	15	NP	350 (Cl. 3 only)	450	450	NFC-2	T3
35	< 3	32	45	15	450	350 (Cl. 3 only)	450	450	NFC-2	G1, G6, T3, W10
36	...	32	45	15	NP	350 (Cl. 3 only)	450	NP	NFC-2	G1, G6, T3, W10
37	...	32	45	15	NP	350 (Cl. 3 only)	450	450	NFC-2	T3
38	...	32	45	15	NP	NP	450	450	NFC-2	G7, G14, G15, T3
39	$3 < t \leq 5$	32	50	18	NP	300 (Cl. 3 only)	400	400	NFC-2	T3
40	$3 < t \leq 5$	32	50	18	NP	300 (Cl. 3 only)	400	400	NFC-2	T3
41	≤ 3	32	50	20	NP	300 (Cl. 3 only)	400	400	NFC-2	T3
42	≤ 3	32	50	20	NP	300 (Cl. 3 only)	400	400	NFC-2	T3

(a)
(a)
(a)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
(a) 1	8.0	8.0	8.0	8.0	8.0	7.0	5.0	2.0	...	...	...	...	...	...	...	...	...	...
(a) 2	8.0	8.0	8.0	8.0	8.0	7.0	5.0	2.0	...	...	...	...	...	...	...	...	...	...
(a) 3	8.0	8.0	8.0	8.0	8.0	7.0	5.0	2.0	...	...	...	...	...	...	...	...	...	...
4	6.8	6.8	6.8	6.8	6.8	6.0	4.3	1.7	...	...	...	...	...	...	...	...	...	...
5	6.8	6.8	6.8	6.8	6.8	6.0	4.3	1.7	...	...	...	...	...	...	...	...	...	...
6	13.3	13.3	13.3	13.3	13.3	10.8	5.3	...	...	...	...	...	...	...	...	...	...	...
7	8.0	8.0	8.0	8.0	8.0	8.0	5.3	...	...	...	...	...	...	...	...	...	...	...
8	8.0	8.0	8.0	8.0	8.0	8.0	5.3	...	...	...	...	...	...	...	...	...	...	...
9	10.0	10.0	10.0	10.0	10.0	10.0	5.3	...	...	...	...	...	...	...	...	...	...	...
10	10.0	10.0	10.0	10.0	10.0	10.0	5.3	...	...	...	...	...	...	...	...	...	...	...
11	13.3	13.3	13.3	13.3	13.3	10.8	5.3	...	...	...	...	...	...	...	...	...	...	...
12	13.3	13.3	13.3	13.3	13.3	10.8	5.3	...	...	...	...	...	...	...	...	...	...	...
13	10.0	9.4	9.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	10.0	9.4	9.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	10.0	9.4	9.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	10.0	9.4	9.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	12.0	11.3	10.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	12.0	11.3	10.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	12.0	11.3	10.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	12.0	11.3	10.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	10.0	10.0	10.0	10.0	10.0	9.8	3.5	2.0	...	...	...	...	...	...	...	...	...	...
22	10.0	10.0	10.0	10.0	10.0	9.8	3.5	2.0	...	...	...	...	...	...	...	...	...	...
23	10.0	10.0	10.0	10.0	10.0	9.8	3.5	2.0	...	...	...	...	...	...	...	...	...	...
24	10.0	10.0	10.0	10.0	10.0	9.8	3.5	2.0	...	...	...	...	...	...	...	...	...	...
25	10.0	10.0	10.0	10.0	10.0	9.8	3.5	2.0	...	...	...	...	...	...	...	...	...	...
26	8.5	8.5	8.5	8.5	8.5	8.3	3.0	1.7	...	...	...	...	...	...	...	...	...	...
27	10.0	10.0	10.0	10.0	10.0	9.8	3.5	2.0	...	...	...	...	...	...	...	...	...	...
28	10.0	10.0	10.0	10.0	10.0	9.8	3.5	2.0	...	...	...	...	...	...	...	...	...	...
29	10.0	10.0	10.0	10.0	10.0	9.8	3.5	2.0	...	...	...	...	...	...	...	...	...	...
30	10.0	10.0	10.0	10.0	10.0	9.8	3.5	2.0	...	...	...	...	...	...	...	...	...	...
31	10.0	10.0	10.0	10.0	10.0	9.8	3.5	2.0	...	...	...	...	...	...	...	...	...	...
32	8.5	8.5	8.5	8.5	8.5	8.3	3.0	1.7	...	...	...	...	...	...	...	...	...	...
33	10.0	10.0	10.0	10.0	10.0	9.8	3.5	2.0	...	...	...	...	...	...	...	...	...	...
34	10.0	10.0	10.0	10.0	10.0	9.8	3.5	2.0	...	...	...	...	...	...	...	...	...	...
35	10.0	10.0	10.0	10.0	10.0	9.8	3.5	2.0	...	...	...	...	...	...	...	...	...	...
36	10.0	10.0	10.0	10.0	10.0	9.8	3.5	2.0	...	...	...	...	...	...	...	...	...	...
37	10.0	10.0	10.0	10.0	10.0	9.8	3.5	2.0	...	...	...	...	...	...	...	...	...	...
38	8.5	8.5	8.5	8.5	8.5	8.3	3.0	1.7	...	...	...	...	...	...	...	...	...	...
39	12.0	12.0	12.0	12.0	12.0	6.3	2.5	...	...	...	...	...	...	...	...	...	...	...
40	12.0	12.0	12.0	12.0	12.0	6.3	2.5	...	...	...	...	...	...	...	...	...	...	...
41	13.3	13.3	13.3	13.3	13.3	6.3	2.5	...	...	...	...	...	...	...	...	...	...	...
42	13.3	13.3	13.3	13.3	13.3	6.3	2.5	...	...	...	...	...	...	...	...	...	...	...

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800	
1	(a)
2	(a)
3	(a)
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	...	Plate	SB-171	...	C46500	M20
2	...	Plate	SB-171	...	C46500	025
3	...	Plate	SB-171	...	C46500	M20
4	...	Plate	SB-171	...	C46500	025
5	...	Smls. cond. tube	SB-111	...	C60800	061
6	...	Smls. U-bend tube	SB-395	...	C60800	061
7	...	Plate	SB-171	...	C61400	M20
8	...	Plate	SB-171	...	C61400	025
9	...	Plate, sheet	SB-169	...	C61400	025 or 060
10	...	Plate	SB-171	...	C61400	M20
11	...	Plate	SB-171	...	C61400	025
12	...	Plate, sheet	SB-169	...	C61400	025 or 060
13	...	Plate, sheet	SB-169	...	C61400	025 or 060
14	...	Plate	SB-171	...	C63000	M20
15	...	Plate	SB-171	...	C63000	025
16	...	Plate	SB-171	...	C63000	M20
17	...	Plate	SB-171	...	C63000	025
18	...	Plate	SB-171	...	C63000	M20
19	...	Plate	SB-171	...	C63000	025
20	...	Forgings	SB-283	...	C64200	M10
21	...	Forgings	SB-283	...	C64200	M11
22	...	Forgings	SB-283	...	C64200	020
23	...	Forgings	SB-283	...	C64200	TQ50
24	...	Forgings	SB-283	...	C64200	M10
25	...	Forgings	SB-283	...	C64200	M11
26	...	Forgings	SB-283	...	C64200	020
27	...	Forgings	SB-283	...	C64200	TQ50
28	...	Bar, rod	SB-98	...	C65100	060
29	...	Bar, rod	SB-98	...	C65100	H02
30	...	Smls. pipe & tube	SB-315	...	C65500	061
31	...	Plate, sheet	SB-96	...	C65500	061
32	...	Bar, rod	SB-98	...	C65500	060
33	...	Bar, rod	SB-98	...	C65500	H02
34	...	Bar, rod	SB-98	...	C66100	060
35	...	Bar, rod	SB-98	...	C66100	H02
36	...	Smls. cond. tube	SB-111	...	C68700	061
37	...	Smls. U-bend tube	SB-395	...	C68700	061
38	...	Wld. cond. tube	SB-543	...	C68700	W061
39	...	Smls. cond. tube	SB-111	...	C70400	061
40	...	Wld. tube	SB-543	...	C70400	W061
41	...	Smls. cond. tube	SB-111	...	C70400	H55
42	...	Smls. pipe & tube	SB-466	...	C70600	060
43	...	Wld. pipe	SB-467	...	C70600	W061
44	...	Bar, rod	SB-151	...	C70600	060

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	$3 < t \leq 5$	32	50	18	NP	300 (Cl. 3 only)	400	400	NFC-2	T3
2	$3 < t \leq 5$	32	50	18	NP	300 (Cl. 3 only)	400	400	NFC-2	T3
3	≤ 3	32	50	20	NP	300 (Cl. 3 only)	400	400	NFC-2	T3
4	≤ 3	32	50	20	NP	300 (Cl. 3 only)	400	400	NFC-2	T3
5	...	35	50	19	NP	300 (Cl. 3 only)	500	500	NFC-3	G6, T4
6	...	35	50	19	NP	300 (Cl. 3 only)	500	500	NFC-2	T4
7	$2 < t \leq 5$	35	65	28	NP	500 (Cl. 3 only)	500	500	NFC-8	...
8	$2 < t \leq 5$	35	65	28	NP	500 (Cl. 3 only)	500	500	NFC-8	...
9	$2 < t \leq 5$	35	65	28	NP	500 (Cl. 3 only)	500	500	NFC-8	...
10	≤ 2	35	70	30	NP	500 (Cl. 3 only)	500	500	NFC-8	...
11	≤ 2	35	70	30	NP	500 (Cl. 3 only)	500	500	NFC-8	...
12	$\frac{1}{2} < t \leq 2$	35	70	30	NP	500 (Cl. 3 only)	500	500	NFC-8	...
13	$\leq \frac{1}{2}$	35	72	32	NP	450 (Cl. 3 only)	500	500	NFC-8	...
14	$3.5 < t \leq 5$	35	80	30	NP	500 (Cl. 3 only)	700	650	NFC-8	T6
15	$3.5 < t \leq 5$	35	80	30	NP	500 (Cl. 3 only)	700	650	NFC-8	T6
16	$2 < t \leq 3.5$	35	85	33	NP	500 (Cl. 3 only)	700	650	NFC-8	T6
17	$2 < t \leq 3.5$	35	85	33	NP	500 (Cl. 3 only)	700	650	NFC-8	T6
18	≤ 2	35	90	36	NP	500 (Cl. 3 only)	700	650	NFC-8	T6
19	≤ 2	35	90	36	NP	500 (Cl. 3 only)	700	650	NFC-8	T6
20	$> 1\frac{1}{2}$	...	68	23	NP	NP	500	500	NFC-3	G10, T19, W14
21	$> 1\frac{1}{2}$	...	68	23	NP	NP	500	500	NFC-3	G10, T19, W14
22	$> 1\frac{1}{2}$	...	68	23	NP	NP	500	500	NFC-3	G10, T19, W14
23	$> 1\frac{1}{2}$	...	68	23	NP	NP	500	500	NFC-3	G10, T19, W14
24	$\leq 1\frac{1}{2}$	...	70	25	NP	NP	500	500	NFC-3	T19, W14
25	$\leq 1\frac{1}{2}$	...	70	25	NP	NP	500	500	NFC-3	T19, W14
26	$\leq 1\frac{1}{2}$	...	70	25	NP	NP	500	500	NFC-3	T19, W14
27	$\leq 1\frac{1}{2}$	...	70	25	NP	NP	500	500	NFC-3	T19, W14
28	...	33	40	12	NP	300	350	350	NFC-1	G17, T3
29	...	33	55	20	NP	300	350	350	NFC-2	G17, W9
30	...	33	50	15	NP	300 (Cl. 3 only)	400	400	NFC-2	G17, T3
31	≤ 2	33	50	18	NP	300 (Cl. 3 only)	350	350	NFC-2	G17, T3
32	...	33	52	15	NP	300	350	350	NFC-2	G17, T3
33	...	33	70	38	NP	300	350	350	NFC-2	G17, T3
34	...	33	52	15	NP	300	350	350	NFC-2	G17
35	...	33	70	38	NP	300	350	350	NFC-2	G17, W9
36	< 3	32	50	18	NP	300 (Cl. 3 only)	450	450	NFC-2	...
37	...	32	50	18	NP	300 (Cl. 3 only)	450	450	NFC-2	...
38	...	32	50	18	NP	NP	450	450	NFC-2	G14, G15
39	< 3	34	38	12	NP	150 (Cl. 3 only)	150	150	NFC-2	...
40	...	34	38	12	NP	NP	150	150	NFC-2	G14, G15
41	< 3	34	40	30	NP	150 (Cl. 3 only)	150	150	NFC-2	G7, W9
42	...	34	38	13	NP	400	600	600	NFC-3	T6
43	$> 4\frac{1}{2}$	34	38	13	NP	450 (Cl. 3 only)	600	600	NFC-3	G14, G15, T6
44	...	34	38	15	NP	200	NP	NP	NFC-3	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	12.0	12.0	12.0	12.0	12.0	6.3	2.5	...	...	...	...	...	...	...	...	...	...	...
2	12.0	12.0	12.0	12.0	12.0	6.3	2.5	...	...	...	...	...	...	...	...	...	...	...
3	13.3	13.3	13.3	13.3	13.3	6.3	2.5	...	...	...	...	...	...	...	...	...	...	...
4	13.3	13.3	13.3	13.3	13.3	6.3	2.5	...	...	...	...	...	...	...	...	...	...	...
5	12.7	12.2	12.2	12.2	12.0	10.0	6.0	4.0	2.0	...	...	...	...	...	...	...	...	...
6	12.7	12.2	12.2	12.2	12.0	10.0	6.0	4.0	2.0	...	...	...	...	...	...	...	...	...
7	18.6	18.6	18.5	18.3	18.2	18.1	17.9	17.5	17.0	...	...	...	...	...	...	...	...	...
8	18.6	18.6	18.5	18.3	18.2	18.1	17.9	17.5	17.0	...	...	...	...	...	...	...	...	...
9	18.6	18.6	18.5	18.3	18.2	18.1	17.9	17.5	17.0	...	...	...	...	...	...	...	...	...
10	20.0	19.9	19.8	19.7	19.5	19.4	19.2	18.9	18.3	...	...	...	...	...	...	...	...	...
11	20.0	19.9	19.8	19.7	19.5	19.4	19.2	18.9	18.3	...	...	...	...	...	...	...	...	...
12	20.0	19.9	19.8	19.7	19.5	19.4	19.2	18.9	18.3	...	...	...	...	...	...	...	...	...
13	20.6	20.6	20.6	20.6	20.6	20.6	20.2	19.4	18.8	...	...	...	...	...	...	...	...	...
14	20.0	19.8	19.6	19.3	19.1	19.0	18.8	18.4	17.6	16.0	12.0	8.6	6.0	...	...	...	...	...
15	20.0	19.8	19.6	19.3	19.1	19.0	18.8	18.4	17.6	16.0	12.0	8.6	6.0	...	...	...	...	...
16	22.0	21.8	21.5	21.2	21.0	20.9	20.7	20.2	19.4	16.0	12.0	8.6	6.0	...	...	...	...	...
17	22.0	21.8	21.5	21.2	21.0	20.9	20.7	20.2	19.4	16.0	12.0	8.6	6.0	...	...	...	...	...
18	24.0	23.8	23.5	23.2	22.9	22.8	22.5	22.1	21.1	16.0	12.0	8.6	6.0	...	...	...	...	...
19	24.0	23.8	23.5	23.2	22.9	22.8	22.5	22.1	21.1	16.0	12.0	8.6	6.0	...	...	...	...	...
20	15.3	13.5	13.0	12.5	12.5	12.0	11.0	7.5	5.2	...	...	...	...	...	...	...	...	...
21	15.3	13.5	13.0	12.5	12.5	12.0	11.0	7.5	5.2	...	...	...	...	...	...	...	...	...
22	15.3	13.5	13.0	12.5	12.5	12.0	11.0	7.5	5.2	...	...	...	...	...	...	...	...	...
23	15.3	13.5	13.0	12.5	12.5	12.0	11.0	7.5	5.2	...	...	...	...	...	...	...	...	...
24	16.7	14.5	14.0	13.5	13.5	13.0	11.0	7.5	5.2	...	...	...	...	...	...	...	...	...
25	16.7	14.5	14.0	13.5	13.5	13.0	11.0	7.5	5.2	...	...	...	...	...	...	...	...	...
26	16.7	14.5	14.0	13.5	13.5	13.0	11.0	7.5	5.2	...	...	...	...	...	...	...	...	...
27	16.7	14.5	14.0	13.5	13.5	13.0	11.0	7.5	5.2	...	...	...	...	...	...	...	...	...
28	8.0	8.0	8.0	8.0	7.0	5.0	...	...	...	...	...	...	...	...	...	...	...	...
29	13.3	13.3	13.3	12.8	10.0	8.0	...	...	...	...	...	...	...	...	...	...	...	...
30	10.0	10.0	10.0	10.0	9.9	5.0	5.0	...	...	...	...	...	...	...	...	...	...	...
31	12.0	11.9	11.7	11.7	10.0	5.0	...	...	...	...	...	...	...	...	...	...	...	...
32	10.0	10.0	10.0	...	9.9	5.0	...	...	...	...	...	...	...	...	...	...	...	...
33	20.0	20.0	20.0	20.0	20.0	10.0	...	...	...	...	...	...	...	...	...	...	...	...
34	10.0	10.0	10.0	10.0	10.0	5.0	...	...	...	...	...	...	...	...	...	...	...	...
35	20.0	20.0	20.0	20.0	20.0	10.0	...	...	...	...	...	...	...	...	...	...	...	...
36	12.0	11.9	11.8	11.7	11.7	6.5	3.3	1.8	...	...	...	...	...	...	...	...	...	...
37	12.0	11.9	11.8	11.7	11.7	6.5	3.3	1.8	...	...	...	...	...	...	...	...	...	...
38	10.2	10.1	10.0	9.9	9.9	5.5	2.7	1.4	...	...	...	...	...	...	...	...	...	...
39	8.0	8.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	6.8	6.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	11.4	11.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	8.7	8.4	8.2	8.0	7.8	7.7	7.5	7.4	7.3	7.0	6.0	...	...	...	...	...	...	...
43	7.4	7.2	7.0	6.8	6.7	6.5	6.4	6.3	6.2	5.7	4.3	...	...	...	...	...	...	...
44	10.0	9.7	9.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	...	Plate	SB-171	...	C70600	M20
2	...	Plate, sheet	SB-171	...	C70600	M20
3	...	Plate	SB-171	...	C70600	M20
4	...	Plate	SB-171	...	C70600	025
5	...	Plate, sheet	SB-171	...	C70600	025
6	...	Plate	SB-171	...	C70600	025
7	...	Smls. cond. tube	SB-111	...	C70600	061
8	...	Smls. cond. tube	SB-111	...	C70600	061
9	...	Finned tube	SB-359	...	C70600	061
10	...	Smls. U-bend tube	SB-395	...	C70600	061
11	...	Wld. pipe	SB-467	...	C70600	W061
12	...	Wld. tube	SB-543	...	C70600	W061
13	...	Finned wld. tube	SB-956	...	C70600	W061
14	...	Wld. pipe	SB-467	...	C70600	WM50
15	...	Smls. tube	SB-111	...	C70600	H55
16	...	Wld. tube	SB-543	...	C70600	WC55
17	...	Finned wld. tube	SB-956	...	C70600	WC55
18	...	Wld. pipe	SB-467	...	C70600	Wld. fr. cold rld. strip
19	...	Smls. tube	SB-466	...	C71000	060
20	...	Smls. cond. tube	SB-111	...	C71000	061
21	...	Finned tube	SB-359	...	C71000	061
22	...	Smls. tube	SB-395	...	C71000	061
23	...	Wld. pipe	SB-467	...	C71500	W061
24	...	Plate, sheet	SB-171	...	C71500	M20
25	...	Plate, sheet	SB-171	...	C71500	025
26	...	Plate, sheet	SB-171	...	C71500	M20
27	...	Plate, sheet	SB-171	...	C71500	025
28	...	Wld. pipe	SB-467	...	C71500	W061
(10) 29	...	Smls. pipe & tube	SB-466	...	C71500	060
30	...	Smls. cond. tube	SB-111	...	C71500	061
31	...	Finned tube	SB-359	...	C71500	061
32	...	Smls. U-bend tube	SB-395	...	C71500	061
33	...	Wld. cond. tube	SB-543	...	C71500	W061
34	...	Finned wld. cond. tube	SB-956	...	C71500	W061
35	...	Smls. cond. tube	SB-111	...	C71500	HR50
36	...	Smls. U-bend tube	SB-395	...	C71500	HR58
37	...	Smls. cond. tube	SB-111	...	C72200	061
38	...	Castings	SB-62	...	C83600	M01
39	...	Castings	SB-61	...	C92200	M01
40	...	Castings	SB-584	...	C92200	M01

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	≤ 5	34	40	15	NP	400	NP	NP	NFC-3	...
2	≤ 5	34	40	15	NP	450 (Cl. 3 only)	NP	NP	NFC-3	...
3	≤ 5	34	40	15	NP	NP	600	600	NFC-3	T5
4	≤ 5	34	40	15	NP	400	NP	NP	NFC-3	...
5	≤ 5	34	40	15	NP	450 (Cl. 3 only)	NP	NP	NFC-3	...
6	≤ 5	34	40	15	NP	NP	600	600	NFC-3	T5
7	...	34	40	15	600	400	NP	NP	NFC-3	G1, T5, W10
8	...	34	40	15	NP	450 (Cl. 3 only)	600	600	NFC-3	T5
9	...	34	40	15	NP	450 (Cl. 3 only)	600	NP	NFC-3	G1, T5, W10
10	...	34	40	15	NP	450 (Cl. 3 only)	600	600	NFC-3	T5
11	≤ 4½	34	40	15	NP	450 (Cl. 3 only)	600	600	NFC-3	G14, G15
12	...	34	40	15	NP	450 (Cl. 3 only)	600	600	NFC-3	G14, G15
13	...	34	40	15	NP	NP	600	NP	NFC-3	G14
14	≤ 4½	34	45	30	NP	NP	600	600	NFC-3	G14
15	...	34	45	35	NP	450 (Cl. 3 only)	600	600	NFC-3	T5
16	...	34	45	35	NP	450 (Cl. 3 only)	600	600	NFC-3	G14, G15
17	...	34	45	35	NP	NP	600	NP	NFC-3	G14
18	≤ 4½	34	54	45	NP	NP	600	600	NFC-3	G14
19	...	34	45	16	NP	700 (Cl. 3 only)	700	650	NFC-3	T7
20	...	34	45	16	700	700 (Cl. 3 only)	700	650	NFC-3	G1, T7, W10
21	...	34	45	16	NP	700 (Cl. 3 only)	700	NP	NFC-3	G1, T7, W10
22	...	34	45	16	NP	700 (Cl. 3 only)	700	650	NFC-3	T7
23	> 4½	34	45	15	NP	600 (Cl. 3 only)	NP	NP	NFC-3	G14
24	2.5 < <i>t</i> ≤ 5	34	45	18	NP	700	700	650	NFC-4	...
25	2.5 < <i>t</i> ≤ 5	34	45	18	NP	700	700	650	NFC-4	...
26	≤ 2.5	34	50	20	NP	700	700	650	NFC-4	...
27	≤ 2.5	34	50	20	NP	700	700	650	NFC-4	...
28	≤ 4½	34	50	20	NP	600 (Cl. 3 only)	NP	NP	NFC-4	G14
29	...	34	52	18	NP	700	700	650	NFC-4	...
30	...	34	52	18	700	700	700	650	NFC-4	G1, W10
31	...	34	52	18	NP	700 (Cl. 3 only)	700	NP	NFC-4	G1, W10
32	...	34	52	18	NP	700 (Cl. 3 only)	700	650	NFC-4	...
33	...	34	52	18	NP	600 (Cl. 3 only)	600	600	NFC-4	G14, G15
34	...	34	52	18	NP	NP	600	NP	NFC-4	G14
35	≤ 3⅛	34	72	50	NP	700	800	650	NFC-4	T9, W9
36	...	34	72	50	NP	700	800	650	NFC-8	T9, W9
37	≤ 2	34	45	16	NP	NP	150	150	NFC-3	...
38	...	...	30	14	450	450 (Cl. 3 only)	450	450	NFC-1	G1, G3, G15, W10, W14
39	34	16	550	500 (Cl. 3 only)	550	550	NFN-1	G1, G3, G15, T6, W10, W14
40	34	16	NP	500 (Cl. 3 only)	550	550	NFN-1	G15, T6

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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	10.0	9.7	9.5	9.3	9.0	8.8	8.7	...	...	...	...	...	...	...	...	...	...	...
2	10.0	9.7	9.5	9.3	9.0	8.8	8.7	8.5	...	...	...	...	...	...	...	...	...	...
3	10.0	9.7	9.5	9.3	9.0	8.8	8.7	8.5	8.0	7.0	6.0	...	...	...	...	...	...	...
4	10.0	9.7	9.5	9.3	9.0	8.8	8.7	...	...	...	...	...	...	...	...	...	...	...
5	10.0	9.7	9.5	9.3	9.0	8.8	8.7	8.5	...	...	...	...	...	...	...	...	...	...
6	10.0	9.7	9.5	9.3	9.0	8.8	8.7	8.5	8.0	7.0	6.0	...	...	...	...	...	...	...
7	10.0	9.7	9.5	9.3	9.0	8.8	8.7	8.5	8.0	7.0	6.0	...	...	...	...	...	...	...
8	10.0	9.7	9.5	9.3	9.0	8.8	8.7	8.5	8.0	7.0	6.0	...	...	...	...	...	...	...
9	10.0	9.7	9.5	9.3	9.0	8.8	8.7	8.5	8.0	7.0	6.0	...	...	...	...	...	...	...
10	10.0	9.7	9.5	9.3	9.0	8.8	8.7	8.5	8.0	7.0	6.0	...	...	...	...	...	...	...
11	8.5	8.3	8.1	7.9	7.7	7.5	7.4	7.2	6.3	5.7	4.3	...	...	...	...	...	...	...
12	8.5	8.3	8.1	7.9	7.7	7.5	7.4	7.2	6.3	5.7	4.3	...	...	...	...	...	...	...
13	8.5	8.3	8.1	7.9	7.7	7.5	7.4	7.2	6.3	5.7	4.3	...	...	...	...	...	...	...
14	8.5	8.3	8.1	7.9	7.7	7.5	7.4	7.2	6.3	5.7	4.3	...	...	...	...	...	...	...
15	10.0	9.7	9.5	9.3	9.0	8.8	8.7	8.5	8.0	7.0	6.0	...	...	...	...	...	...	...
16	8.5	8.3	8.1	7.9	7.7	7.5	7.4	7.2	6.3	5.7	4.3	...	...	...	...	...	...	...
17	8.5	8.3	8.1	7.9	7.7	7.5	7.4	7.2	6.3	5.7	4.3	...	...	...	...	...	...	...
18	8.5	8.3	8.1	7.9	7.7	7.5	7.4	7.2	6.3	5.7	4.3	...	...	...	...	...	...	...
19	10.7	10.6	10.5	10.4	10.2	10.1	9.9	9.6	9.3	8.9	8.4	7.7	7.0	...	...	...	...	...
20	10.7	10.6	10.5	10.4	10.2	10.1	9.9	9.6	9.3	8.9	8.4	7.7	7.0	...	...	...	...	...
21	10.7	10.6	10.5	10.4	10.2	10.1	9.9	9.6	9.3	8.9	8.4	7.7	7.0	...	...	...	...	...
22	10.7	10.6	10.5	10.4	10.2	10.1	9.9	9.6	9.3	8.9	8.4	7.7	7.0	...	...	...	...	...
23	8.5	8.2	8.0	7.8	7.6	7.5	7.3	7.2	7.0	6.9	6.8	...	...	...	...	...	...	...
24	12.0	11.6	11.3	11.0	10.8	10.5	10.3	10.1	9.9	9.8	9.6	9.5	9.4	...	...	...	...	...
25	12.0	11.6	11.3	11.0	10.8	10.5	10.3	10.1	9.9	9.8	9.6	9.5	9.4	...	...	...	...	...
26	13.3	12.9	12.6	12.3	12.0	11.7	11.5	11.2	11.0	10.8	10.7	10.6	10.4	...	...	...	...	...
27	13.3	12.9	12.6	12.3	12.0	11.7	11.5	11.2	11.0	10.8	10.7	10.6	10.4	...	...	...	...	...
28	11.3	10.9	10.7	10.4	10.2	10.0	9.7	9.6	9.4	9.2	9.1	...	...	...	...	...	...	...
(10) 29	12.0	11.6	11.3	11.0	10.8	10.5	10.3	10.1	9.9	9.8	9.6	9.5	9.4	...	...	...	...	...
30	12.0	11.6	11.3	11.0	10.8	10.5	10.3	10.1	9.9	9.8	9.6	9.5	9.4	...	...	...	...	...
31	12.0	11.6	11.3	11.0	10.8	10.5	10.3	10.1	9.9	9.8	9.6	9.5	9.4	...	...	...	...	...
32	12.0	11.6	11.3	11.0	10.8	10.5	10.3	10.1	9.9	9.8	9.6	9.5	9.4	...	...	...	...	...
33	10.2	9.8	9.6	9.4	9.2	9.0	8.8	8.6	8.4	8.3	8.2	...	...	...	...	...	...	...
34	10.2	9.8	9.6	9.4	9.2	9.0	8.8	8.6	8.4	8.3	8.2	...	...	...	...	...	...	...
35	20.6	20.6	20.6	20.6	20.6	20.2	19.7	19.2	18.9	18.6	18.5	18.3	17.9	17.2	8.5	...	...	...
36	20.6	20.6	20.6	20.6	20.6	20.2	19.7	19.2	18.9	18.6	18.5	18.3	17.9	17.2	8.5	...	...	...
37	10.7	10.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	8.6	8.6	8.6	8.6	8.3	8.1	6.9	6.8	...	...	...	...	...	...	...	...	...	...
39	9.7	9.7	9.7	9.7	9.7	9.7	8.2	7.7	7.2	5.0	...	...	...	...	...	...	...	...
40	9.7	9.7	9.7	9.7	9.7	9.7	8.2	7.7	7.2	5.0	...	...	...	...	...	...	...	...

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1
2
3
4
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	...	Castings	SB-584	...	C93700	M01
2	...	Castings	SB-148	...	C95200	M01
3	...	Castings	SB-271	...	C95200	M02
4	...	Castings	SB-505	...	C95200	M07
5	...	Castings	SB-148	...	C95400	M01
6	...	Castings	SB-271	...	C95400	M02
7	...	Castings	SB-369	...	C96200	M01
8	...	Castings	SB-584	...	C97600	M01
9	99Ni	Smls. pipe & tube	SB-161	...	N02200	Annealed
10	99Ni	Smls. & wld. fittings	SB-366	...	N02200	Annealed
11	99Ni	Bar, rod	SB-160	...	N02200	Annealed
12	99Ni	Smls. pipe & tube	SB-161	...	N02200	Annealed
13	99Ni	Plate, sheet, strip	SB-162	...	N02200	Annealed
14	99Ni	Smls. tube	SB-163	...	N02200	Annealed
15	99Ni	Plate, sheet, strip	SB-162	...	N02200	As rolled
16	99Ni	Bar, rod	SB-160	...	N02200	Hot rolled
17	99Ni	Smls. pipe & tube	SB-161	...	N02200	Stress rel.
(10) 18	99Ni	Smls. tube	SB-163	...	N02200	Stress rel.
19	99Ni–Low C	Smls. pipe & tube	SB-161	...	N02201	Annealed
20	99Ni–Low C	Smls. & wld. fittings	SB-366	...	N02201	Annealed
21	99Ni–Low C	Bar, rod	SB-160	...	N02201	Hot rolled/ann.
22	99Ni–Low C	Smls. pipe & tube	SB-161	...	N02201	Annealed
23	99Ni–Low C	Smls. tube	SB-163	...	N02201	Annealed
24	99Ni–Low C	Plate, sheet, strip	SB-162	...	N02201	Hot rolled/ann.
25	99Ni–Low C	Smls. pipe & tube	SB-161	...	N02201	Stress rel.
26	99Ni–Low C	Smls. pipe & tube	SB-163	...	N02201	Stress rel.
27	67Ni–30Cu	Bar	SB-164	...	N04400	Annealed
28	67Ni–30Cu	Smls. pipe & tube	SB-165	...	N04400	Annealed
29	67Ni–30Cu	Forgings	SB-564	...	N04400	Annealed
30	67Ni–30Cu	Plate	SB-127	...	N04400	Annealed
31	67Ni–30Cu	Smls. tube	SB-163	...	N04400	Annealed
32	67Ni–30Cu	Smls. pipe & tube	SB-165	...	N04400	Annealed
33	67Ni–30Cu	Smls. & wld. fittings	SB-366	...	N04400	Annealed
34	67Ni–30Cu	Bar	SB-164	...	N04400	Hot worked
35	67Ni–30Cu	Plate	SB-127	...	N04400	As rolled
36	67Ni–30Cu	Bar, rod	SB-164	...	N04400	Hot worked
37	67Ni–30Cu	Bar, rod	SB-164	...	N04400	Hot worked
38	67Ni–30Cu	Smls. tube	SB-163	...	N04400	Stress rel.
39	67Ni–30Cu	Smls. pipe & tube	SB-165	...	N04400	Stress rel.
40	67Ni–30Cu–S	Bar	SB-164	...	N04405	Annealed
41	67Ni–30Cu–S	Bar	SB-164	...	N04405	Hot worked

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	30	12	NP	400 (SPT)	400	400	NFC-1	G15, W15
2	...	35	65	25	550	500 (Cl. 3 only)	600	600	NFC-4	G15, T6
3	...	35	65	25	NP	500 (Cl. 3 only)	600	600	NFC-4	G15, T6
4	...	35	68	26	NP	500 (Cl. 3 only)	NP	NP	NFC-4	G15
5	...	35	75	30	550	450 (Cl. 3 only)	600	600	NFC-4	G15, T5, W8
6	...	35	75	30	NP	450 (Cl. 3 only)	NP	NP	NFC-4	G15, W8
7	...	34	45	25	NP	200 (Cl. 3 only)	NP	NP	NFC-4	G15
8	40	17	NP	NP	300	300	NFC-1	G15, W15
9	> 5 O.D.	41	55	12	NP	600 (Cl. 3 only)	600	600	NFN-2	...
10	...	41	55	12	NP	NP	600	600	NFN-2	W12
11	...	41	55	15	NP	600 (Cl. 3 only)	600	600	NFN-2	...
12	≤ 5 O.D.	41	55	15	NP	600 (Cl. 3 only)	600	600	NFN-2	...
13	...	41	55	15	NP	600 (Cl. 3 only)	600	600	NFN-2	...
14	...	41	55	15	NP	600 (Cl. 3 only)	600	600	NFN-2	...
15	...	41	55	20	NP	600 (Cl. 3 only)	600	600	NFN-2	G20
16	...	41	60	15	NP	600 (Cl. 3 only)	600	600	NFN-2	...
17	...	41	65	40	NP	600 (Cl. 3 only)	600	600	NFN-25	...
18	...	41	65	40	NP	600 (Cl. 3 only)	600	600	NFN-25	...
19	> 5 O.D.	41	50	10	NP	800 (Cl. 3 only)	1200	650	NFN-1	T10
20	...	41	50	10	NP	NP	1150	650	NFN-1	T10, W12
21	...	41	50	10	NP	800 (Cl. 3 only)	1200	650	NFN-1	T10
22	≤ 5 O.D.	41	50	12	NP	800 (Cl. 3 only)	1200	650	NFN-1	T9
23	...	41	50	12	NP	800 (Cl. 3 only)	1200	650	NFN-1	T9
24	...	41	50	12	NP	800 (Cl. 3 only)	1200	650	NFN-1	T9
25	...	41	60	30	NP	600 (Cl. 3 only)	600	600	NFN-1	...
26	...	41	60	30	NP	800 (Cl. 3 only)	900	650	NFN-1	...
27	...	42	70	25	NP	800	900	650	NFN-3	T10
28	> 5 O.D.	42	70	25	NP	800	900	650	NFN-3	T10
29	...	42	70	25	NP	800	900	650	NFN-3	T10
30	...	42	70	28	NP	800	900	650	NFN-3	T10
31	≤ 3	42	70	28	NP	800	900	650	NFN-3	T10
32	≤ 5 O.D.	42	70	28	NP	800	900	650	NFN-3	T10
33	...	42	70	28	NP	NP	900	650	NFN-3	T10, W12
34	...	42	75	30	NP	800	900	650	NFN-3	T9
35	...	42	75	40	NP	800	900	650	NFN-3	G12, G20, T9
36	...	42	75	40	NP	NP	900	650	NFN-3	T9
37	...	42	80	40	NP	800 (Cl. 3 only)	900	650	NFN-3	T9
38	...	42	85	55	NP	800	800	650	NFN-3	G11, T8
39	...	42	85	55	NP	800	500	500	NFN-3	G5, G21, T8
40	...	42	70	25	NP	800	900	650	NFN-3	T10
41	...	42	75	35	NP	800	900	650	NFN-3	T10

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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	8.0	7.4	6.9	6.6	6.6	6.5	6.4	...	...	...	...	...	...	...	...	...	...	...
2	16.7	15.7	15.2	14.8	14.5	14.3	14.2	14.2	14.2	11.7	7.4	...	...	...	...	...	...	...
3	16.7	15.7	15.2	14.8	14.5	14.3	14.2	14.2	14.2	11.7	7.4	...	...	...	...	...	...	...
4	17.3	16.3	15.8	15.4	15.1	14.9	14.8	14.7	14.7	...	...	...	...	...	...	...	...	...
5	20.0	19.0	18.7	18.5	18.5	18.5	18.5	16.0	13.9	11.0	8.5	...	...	...	...	...	...	...
6	20.0	19.0	18.7	18.5	18.5	18.5	18.5	16.0	...	...	...	...	...	...	...	...	...	...
7	9.5	9.5	9.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	7.5	7.2	7.0	6.9	6.7	...	...	...	...	...	...	...	...	...	...	...	...	...
9	8.0	...	8.0	...	8.0	...	8.0	...	8.0	...	8.0	...	...	...	...	...	...	...
10	8.0	...	8.0	...	8.0	...	8.0	...	8.0	...	8.0	...	...	...	...	...	...	...
11	10.0	...	10.0	...	10.0	...	10.0	...	10.0	...	10.0	...	...	...	...	...	...	...
12	10.0	...	10.0	...	10.0	...	10.0	...	10.0	...	10.0	...	...	...	...	...	...	...
13	10.0	...	10.0	...	10.0	...	10.0	...	10.0	...	10.0	...	...	...	...	...	...	...
14	10.0	...	10.0	...	10.0	...	10.0	...	10.0	...	10.0	...	...	...	...	...	...	...
15	13.3	...	13.3	...	13.3	...	13.3	...	12.6	...	11.5	...	...	...	...	...	...	...
16	10.0	...	10.0	...	10.0	...	10.0	...	10.0	...	10.0	...	...	...	...	...	...	...
17	18.6	...	18.6	...	18.6	...	18.6	...	18.3	...	17.7	...	...	...	...	...	...	...
(10) 18	18.6	...	18.6	...	18.6	...	18.6	...	18.3	...	17.7	...	...	...	...	...	...	...
19	6.7	...	6.4	...	6.3	...	6.2	...	6.2	...	6.2	6.2	6.2	6.1	6.0	5.8	4.5	3.7
20	6.7	...	6.4	...	6.3	...	6.2	...	6.2	...	6.2	6.2	6.2	6.1	6.0	5.8	4.5	3.7
21	6.7	...	6.4	...	6.3	...	6.2	...	6.2	...	6.2	6.2	6.2	6.1	6.0	5.8	4.5	3.7
22	8.0	...	7.7	...	7.5	...	7.5	...	7.5	...	7.5	7.5	7.4	7.4	7.2	5.8	4.5	3.7
23	8.0	...	7.7	...	7.5	...	7.5	...	7.5	...	7.5	7.5	7.4	7.4	7.2	5.8	4.5	3.7
24	8.0	...	7.7	...	7.5	...	7.5	...	7.5	...	7.5	7.5	7.4	7.4	7.2	5.8	4.5	3.7
25	17.1	...	17.1	...	17.0	...	17.0	...	16.8	...	16.3	...	...	...	...	...	...	...
26	17.1	...	17.1	...	17.0	...	17.0	...	16.8	...	16.3	14.0	13.4	12.8	12.1	11.7	11.1	...
27	16.7	...	14.6	...	13.6	...	13.2	...	13.1	...	13.1	13.1	13.0	12.9	12.7	11.0	8.0	...
28	16.7	...	14.6	...	13.6	...	13.2	...	13.1	...	13.1	13.1	13.0	12.9	12.7	11.0	8.0	...
29	16.7	...	14.6	...	13.6	...	13.2	...	13.1	...	13.1	13.1	13.0	12.9	12.7	11.0	8.0	...
30	18.7	...	16.4	...	15.2	...	14.7	...	14.7	...	14.7	14.7	14.6	14.5	14.3	11.0	8.0	...
31	18.7	...	16.4	...	15.2	...	14.7	...	14.7	...	14.7	14.7	14.6	14.5	14.3	11.0	8.0	...
32	18.7	...	16.4	...	15.2	...	14.7	...	14.7	...	14.7	14.7	14.6	14.5	14.3	11.0	8.0	...
33	18.7	...	16.4	...	15.2	...	14.7	...	14.7	...	14.7	14.7	14.6	14.5	14.3	11.0	8.0	...
34	20.0	...	19.4	...	18.6	...	17.9	...	17.6	...	17.3	17.2	17.0	16.8	14.5	8.5	4.0	...
35	21.4	...	21.4	...	21.4	...	21.4	...	21.4	...	21.4	21.4	20.7	18.5	14.5	8.5	4.0	...
36	21.4	...	21.4	...	21.4	...	21.4	...	21.4	...	21.4	21.4	20.7	18.5	14.5	8.5	4.0	...
37	22.9	...	22.9	...	22.9	...	22.9	...	22.9	...	22.9	22.8	22.0	18.5	14.5	8.5	4.0	...
38	24.3	...	24.3	...	24.3	...	24.3	...	24.3	...	23.9	23.5	22.8	18.0	12.7	...	...	...
39	24.3	...	24.3	...	24.3	...	24.3	...	24.3	...	23.9	23.5	22.8	18.0	12.7	...	...	...
40	16.7	...	14.6	...	13.6	...	13.2	...	13.1	...	13.1	13.1	13.0	12.9	12.7	11.0	8.0	...
41	21.4	...	21.4	...	21.4	...	20.9	...	20.5	...	20.2	20.1	19.8	18.5	14.5	8.5	4.0	...

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19	3.0	2.4	2.0	1.5	1.2
20	3.0	2.4	2.0	1.5
21	3.0	2.4	2.0	1.5	1.2
22	3.0	2.4	2.0	1.5	1.2
23	3.0	2.4	2.0	1.5	1.2
24	3.0	2.4	2.0	1.5	1.2
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	47Ni-22Cr-9Mo-18Fe	Plate, sheet, strip	SB-435	...	N06002	Annealed
2	47Ni-22Cr-9Mo-18Fe	Plate, sheet, strip	SB-435	...	N06002	Annealed
3	47Ni-22Cr-9Mo-18Fe	Rod	SB-572	...	N06002	Annealed
4	47Ni-22Cr-9Mo-18Fe	Rod	SB-572	...	N06002	Annealed
5	47Ni-22Cr-9Mo-18Fe	Smls. & wld. fittings	SB-366	...	N06002	Annealed
6	47Ni-22Cr-9Mo-18Fe	Wld. pipe	SB-619	...	N06002	Solution ann.
7	47Ni-22Cr-9Mo-18Fe	Wld. pipe	SB-619	...	N06002	Solution ann.
8	47Ni-22Cr-9Mo-18Fe	Smls. pipe & tube	SB-622	...	N06002	Solution ann.
9	47Ni-22Cr-9Mo-18Fe	Smls. pipe & tube	SB-622	...	N06002	Solution ann.
10	47Ni-22Cr-9Mo-18Fe	Wld. tube	SB-626	...	N06002	Solution ann.
11	47Ni-22Cr-9Mo-18Fe	Wld. tube	SB-626	...	N06002	Solution ann.
12	47Ni-22Cr-19Fe-6Mo	Rod	SB-581	...	N06007	Solution ann.
13	47Ni-22Cr-19Fe-6Mo	Rod	SB-581	...	N06007	Solution ann.
14	47Ni-22Cr-19Fe-6Mo	Plate, sheet, strip	SB-582	...	N06007	Solution ann.
15	47Ni-22Cr-19Fe-6Mo	Plate, sheet, strip	SB-582	...	N06007	Solution ann.
16	47Ni-22Cr-19Fe-6Mo	Smls. & wld. fittings	SB-366	...	N06007	Annealed
17	47Ni-22Cr-19Fe-6Mo	Rod	SB-581	...	N06007	Solution ann.
18	47Ni-22Cr-19Fe-6Mo	Rod	SB-581	...	N06007	Solution ann.
19	47Ni-22Cr-19Fe-6Mo	Plate, sheet, strip	SB-582	...	N06007	Solution ann.
20	47Ni-22Cr-19Fe-6Mo	Plate, sheet, strip	SB-582	...	N06007	Solution ann.
21	47Ni-22Cr-19Fe-6Mo	Wld. pipe	SB-619	...	N06007	Solution ann.
22	47Ni-22Cr-19Fe-6Mo	Wld. pipe	SB-619	...	N06007	Solution ann.
23	47Ni-22Cr-19Fe-6Mo	Smls. pipe & tube	SB-622	...	N06007	Solution ann.
24	47Ni-22Cr-19Fe-6Mo	Smls. pipe & tube	SB-622	...	N06007	Solution ann.
25	47Ni-22Cr-19Fe-6Mo	Wld. tube	SB-626	...	N06007	Solution ann.
26	47Ni-22Cr-19Fe-6Mo	Wld. tube	SB-626	...	N06007	Solution ann.
27	55Ni-21Cr-13.5Mo	Smls. & wld. fittings	SB-366	...	N06022	Solution ann.
28	55Ni-21Cr-13.5Mo	Forgings	SB-462	...	N06022	Solution ann.
29	55Ni-21Cr-13.5Mo	Forgings	SB-462	...	N06022	Solution ann.
30	55Ni-21Cr-13.5Mo	Forgings	SB-564	...	N06022	Solution ann.
31	55Ni-21Cr-13.5Mo	Forgings	SB-564	...	N06022	Solution ann.
32	55Ni-21Cr-13.5Mo	Rod	SB-574	...	N06022	Solution ann.
33	55Ni-21Cr-13.5Mo	Rod	SB-574	...	N06022	Solution ann.
34	55Ni-21Cr-13.5Mo	Plate, sheet, strip	SB-575	...	N06022	Solution ann.
35	55Ni-21Cr-13.5Mo	Plate, sheet, strip	SB-575	...	N06022	Solution ann.
36	55Ni-21Cr-13.5Mo	Wld. pipe	SB-619	...	N06022	Solution ann.
37	55Ni-21Cr-13.5Mo	Wld. pipe	SB-619	...	N06022	Solution ann.
38	55Ni-21Cr-13.5Mo	Smls. pipe & tube	SB-622	...	N06022	Solution ann.
39	55Ni-21Cr-13.5Mo	Smls. pipe & tube	SB-622	...	N06022	Solution ann.
40	55Ni-21Cr-13.5Mo	Wld. tube	SB-626	...	N06022	Solution ann.
41	55Ni-21Cr-13.5Mo	Wld. tube	SB-626	...	N06022	Solution ann.
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.

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	43	95	35	NP	800	1650	650	NFN-15	G4, G5, T15
2	...	43	95	35	NP	NP	1650	650	NFN-15	G4, T16
3	...	43	95	35	NP	800	1650	650	NFN-15	G4, G5, G13, T15
4	...	43	95	35	NP	NP	1650	650	NFN-15	G4, G13, T16
5	...	43	100	40	NP	NP	1650	650	NFN-15	G4, G5, T15, W12
6	...	43	100	40	NP	800	1650	650	NFN-15	G4, G5, G14, T14, W5
7	...	43	100	40	NP	NP	1650	650	NFN-15	G4, G14, T16
8	...	43	100	40	NP	800	1650	650	NFN-15	G4, G5, T14
9	...	43	100	40	NP	NP	1650	650	NFN-15	G4, T16
10	...	43	100	40	NP	800	1650	650	NFN-15	G4, G5, G14, T14, W5
11	...	43	100	40	NP	NP	1650	650	NFN-15	G4, G14, T16
12	$> \frac{3}{4}$	45	85	30	NP	NP	1000	650	NFN-11	...
13	$> \frac{3}{4}$	45	85	30	NP	NP	1000	650	NFN-11	G5
14	$> \frac{3}{4}$	45	85	30	NP	NP	1000	650	NFN-11	...
15	$> \frac{3}{4}$	45	85	30	NP	NP	1000	650	NFN-11	G5
16	...	45	90	35	NP	NP	1000	650	NFN-11	G5, W12
17	$\leq \frac{3}{4}$	45	90	35	NP	NP	1000	650	NFN-11	...
18	$\leq \frac{3}{4}$	45	90	35	NP	NP	1000	650	NFN-11	G5
19	$\leq \frac{3}{4}$	45	90	35	NP	NP	1000	650	NFN-11	...
20	$\leq \frac{3}{4}$	45	90	35	NP	NP	1000	650	NFN-11	G5
21	...	45	90	35	NP	NP	1000	650	NFN-11	G14
22	...	45	90	35	NP	NP	1000	650	NFN-11	G5, G14
23	...	45	90	35	NP	NP	1000	650	NFN-11	...
24	...	45	90	35	NP	NP	1000	650	NFN-11	G5
25	...	45	90	35	NP	NP	1000	650	NFN-11	G14
26	...	45	90	35	NP	NP	1000	650	NFN-11	G5, G14
27	...	43	100	45	1250	NP	1250	650	NFN-10	G5, G27, G28, T15, W12
28	...	43	100	45	1250	NP	1250	NP	NFN-10	G5, G27, G28, T15
29	...	43	100	45	1250	NP	1250	NP	NFN-10	G27, G28, T15
30	...	43	100	45	1250	800	1250	650	NFN-10	G5, G27, G28, T15
31	...	43	100	45	1250	NP	1250	650	NFN-10	G27, G28, T15
32	...	43	100	45	1250	800	1250	650	NFN-10	G5, G27, G28, T15
33	...	43	100	45	1250	NP	1250	650	NFN-10	G27, G28, T15
34	...	43	100	45	1250	800	1250	650	NFN-10	G5, G27, G28, T15
35	...	43	100	45	1250	NP	1250	650	NFN-10	G27, G28, T15
36	...	43	100	45	1250	800	1250	650	NFN-10	G5, G14, G27, G28, T15, W6
37	...	43	100	45	1250	NP	1250	650	NFN-10	G14, G27, G28, T15
38	...	43	100	45	1250	800	1250	650	NFN-10	G5, G27, G28, T15
39	...	43	100	45	1250	NP	1250	650	NFN-10	G27, G28, T15
40	...	43	100	45	1250	800	1250	650	NFN-10	G5, G14, G27, G28, T15, W6
41	...	43	100	45	1250	NP	1250	650	NFN-10	G14, G27, G28, T15
42	...	45	85	35	NP	NP	800	650	NFN-19	G5, W12
43	...	45	85	35	NP	NP	800	NP	NFN-19	G5
44	...	45	85	35	NP	NP	800	NP	NFN-19	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	23.3	...	23.3	...	23.3	...	23.3	...	22.3	...	21.2	20.7	20.3	20.1	19.9	19.7	19.6	19.5
2	23.3	...	21.0	...	19.2	...	17.7	...	16.5	...	15.7	15.3	15.1	14.9	14.7	14.6	14.5	14.4
3	23.3	...	23.3	...	23.3	...	23.3	...	22.3	...	21.2	20.7	20.3	20.1	19.9	19.7	19.6	19.5
4	23.3	...	21.0	...	19.2	...	17.7	...	16.5	...	15.7	15.3	15.1	14.9	14.7	14.6	14.5	14.4
5	26.7	...	26.7	...	26.7	...	26.7	...	25.5	...	24.2	...	23.3	...	22.7	...	22.4	...
6	22.7	...	22.7	...	22.7	...	22.7	...	21.7	...	20.5	20.1	19.8	19.5	19.3	19.1	19.0	18.9
7	22.7	...	20.4	...	18.7	...	17.2	...	16.1	...	15.2	14.9	14.6	14.4	14.3	14.2	14.1	14.0
8	26.7	...	26.7	...	26.7	...	26.7	...	25.5	...	24.2	23.7	23.3	22.9	22.7	22.5	22.4	22.2
9	26.7	...	24.0	...	22.0	...	20.3	...	18.9	...	17.9	17.5	17.2	17.0	16.8	16.7	16.6	16.5
10	22.7	...	22.7	...	22.7	...	22.7	...	21.7	...	20.5	20.1	19.8	19.5	19.3	19.1	19.0	18.9
11	22.7	...	20.4	...	18.7	...	17.2	...	16.1	...	15.2	14.9	14.6	14.4	14.3	14.2	14.1	14.0
12	20.0	...	18.0	...	16.7	...	15.7	...	14.9	...	14.4	14.2	14.1	14.0	13.9	13.8	13.7	13.6
13	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	19.5	19.2	19.0	18.8	18.7	18.6	18.5	18.4
14	20.0	...	18.0	...	16.7	...	15.7	...	14.9	...	14.4	14.2	14.1	14.0	13.9	13.8	13.7	13.6
15	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	19.5	19.2	19.0	18.8	18.7	18.6	18.5	18.4
16	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	22.7	...	22.2	...	21.8	...	21.6	...
17	23.3	...	21.0	...	19.5	...	18.3	...	17.4	...	16.8	16.6	16.4	16.3	16.2	16.1	16.0	15.9
18	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	22.7	22.4	22.2	22.0	21.8	21.7	21.6	21.5
19	23.3	...	21.0	...	19.5	...	18.3	...	17.4	...	16.8	16.6	16.4	16.3	16.2	16.1	16.0	15.9
20	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	22.7	22.4	22.2	22.0	21.8	21.7	21.6	21.5
21	19.8	...	17.8	...	16.5	...	15.5	...	14.8	...	14.3	14.1	14.0	13.8	13.7	13.7	13.6	13.5
22	19.8	...	19.8	...	19.8	...	19.8	...	19.8	...	19.3	19.1	18.8	18.7	18.5	18.4	18.3	18.3
23	23.3	...	21.0	...	19.5	...	18.3	...	17.4	...	16.8	16.6	16.4	16.3	16.2	16.1	16.0	15.9
24	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	22.7	22.4	22.2	22.0	21.8	21.7	21.6	21.5
25	19.8	...	17.8	...	16.5	...	15.5	...	14.8	...	14.3	14.1	14.0	13.8	13.7	13.7	13.6	13.5
26	19.8	...	19.8	...	19.8	...	19.8	...	19.8	...	19.3	19.1	18.8	18.7	18.5	18.4	18.3	18.3
27	28.6	...	28.6	...	28.2	...	27.2	...	26.5	...	26.0	25.8	25.6	25.4	25.3	25.1	24.9	24.7
28	28.6	...	28.6	...	28.2	...	27.2	...	26.5	...	26.0	25.8	25.6	25.4	25.3	25.1	24.9	24.7
29	28.6	...	26.7	...	24.6	...	22.9	...	21.5	...	20.4	20.0	19.6	19.3	19.0	18.8	18.6	18.5
30	28.6	...	28.6	...	28.2	...	27.2	...	26.5	...	26.0	25.8	25.6	25.4	25.3	25.1	24.9	24.7
31	28.6	...	26.7	...	24.6	...	22.9	...	21.5	...	20.4	20.0	19.6	19.3	19.0	18.8	18.6	18.5
32	28.6	...	28.6	...	28.2	...	27.2	...	26.5	...	26.0	25.8	25.6	25.4	25.3	25.1	24.9	24.7
33	28.6	...	26.7	...	24.6	...	22.9	...	21.5	...	20.4	20.0	19.6	19.3	19.0	18.8	18.6	18.5
34	28.6	...	28.6	...	28.2	...	27.2	...	26.5	...	26.0	25.8	25.6	25.4	25.3	25.1	24.9	24.7
35	28.6	...	26.7	...	24.6	...	22.9	...	21.5	...	20.4	20.0	19.6	19.3	19.0	18.8	18.6	18.5
36	24.3	...	24.3	...	23.9	...	23.1	...	22.6	...	22.1	21.9	21.8	21.6	21.5	21.3	21.1	21.0
37	24.3	...	22.7	...	20.9	...	19.4	...	18.3	...	17.4	17.0	16.7	16.4	16.2	16.0	15.8	15.7
38	28.6	...	28.6	...	28.2	...	27.2	...	26.5	...	26.0	25.8	25.6	25.4	25.3	25.1	24.9	24.7
39	28.6	...	26.7	...	24.6	...	22.9	...	21.5	...	20.4	20.0	19.6	19.3	19.0	18.8	18.6	18.5
40	24.3	...	24.3	...	23.9	...	23.1	...	22.6	...	22.1	21.9	21.8	21.6	21.5	21.3	21.1	21.0
41	24.3	...	22.7	...	20.9	...	19.4	...	18.3	...	17.4	17.0	16.7	16.4	16.2	16.0	15.8	15.7
42	23.3	...	23.3	...	23.3	...	22.5	...	21.9	...	21.3	20.9	20.5	20.1	19.7	...	...	...
43	23.3	...	23.3	...	23.3	...	22.5	...	21.9	...	21.3	20.9	20.5	20.1	19.7	...	...	...
44	23.3	...	20.0	...	18.3	...	17.2	...	16.4	...	15.8	15.5	15.2	14.9	14.6	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1	19.4	19.3	17.5	14.1	11.3	9.3	7.7	6.1	4.8	3.8	3.0	2.3	1.7	1.2	...	...	...
2	14.3	14.3	14.2	14.1	11.3	9.3	7.7	6.1	4.8	3.8	3.0	2.3	1.7	1.2	...	...	...
3	19.4	19.3	17.5	14.1	11.3	9.3	7.7	6.1	4.8	3.8	3.0	2.3	1.7	1.2	...	...	...
4	14.3	14.3	14.2	14.1	11.3	9.3	7.7	6.1	4.8	3.8	3.0	2.3	1.7	1.2	...	...	...
5	22.1	...	17.5	...	11.3	...	7.7	...	4.8	...	3.0	...	1.7	1.2	...	...	...
6	18.8	18.5	14.9	12.0	9.6	7.9	6.5	5.2	4.1	3.2	2.6	2.0	1.4	1.0	...	...	...
7	13.9	13.9	13.8	12.0	9.6	7.9	6.5	5.2	4.1	3.2	2.6	2.0	1.4	1.0	...	...	...
8	22.1	21.7	17.5	14.1	11.3	9.3	7.7	6.1	4.8	3.8	3.0	2.3	1.7	1.2	...	...	...
9	16.4	16.3	16.2	14.1	11.3	9.3	7.7	6.1	4.8	3.8	3.0	2.3	1.7	1.2	...	...	...
10	18.8	18.5	14.9	12.0	9.6	7.9	6.5	5.2	4.1	3.2	2.6	2.0	1.4	1.0	...	...	...
11	13.9	13.9	13.8	12.0	9.6	7.9	6.5	5.2	4.1	3.2	2.6	2.0	1.4	1.0	...	...	...
12	13.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	18.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	13.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	18.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	21.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	15.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	21.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	15.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	21.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	13.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	18.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	15.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	21.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	13.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	18.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	24.4	23.0	17.5	12.7	9.6	7.6	...	...	...	...	...	...	...	...	...	...	...
28	24.4	23.0	17.5	12.7	9.6	7.6	...	...	...	...	...	...	...	...	...	...	...
29	18.3	18.2	17.5	12.7	9.6	7.6	...	...	...	...	...	...	...	...	...	...	...
30	24.4	23.0	17.5	12.7	9.6	7.6	...	...	...	...	...	...	...	...	...	...	...
31	18.3	18.2	17.5	12.7	9.6	7.6	...	...	...	...	...	...	...	...	...	...	...
32	24.4	23.0	17.5	12.7	9.6	7.6	...	...	...	...	...	...	...	...	...	...	...
33	18.3	18.2	17.5	12.7	9.6	7.6	...	...	...	...	...	...	...	...	...	...	...
34	24.4	23.0	17.5	12.7	9.6	7.6	...	...	...	...	...	...	...	...	...	...	...
35	18.3	18.2	17.5	12.7	9.6	7.6	...	...	...	...	...	...	...	...	...	...	...
36	20.7	19.6	14.9	10.8	8.2	6.5	...	...	...	...	...	...	...	...	...	...	...
37	15.6	15.5	14.9	10.8	8.2	6.5	...	...	...	...	...	...	...	...	...	...	...
38	24.4	23.0	17.5	12.7	9.6	7.6	...	...	...	...	...	...	...	...	...	...	...
39	18.3	18.2	17.5	12.7	9.6	7.6	...	...	...	...	...	...	...	...	...	...	...
40	20.7	19.6	14.9	10.8	8.2	6.5	...	...	...	...	...	...	...	...	...	...	...
41	15.6	15.5	14.9	10.8	8.2	6.5	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

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

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	45	85	35	NP	800	800	650	NFN-19	G5
2	...	45	85	35	NP	NP	800	650	NFN-19	...
3	...	45	85	35	NP	800	800	650	NFN-19	G5
4	...	45	85	35	NP	NP	800	650	NFN-19	...
5	...	45	85	35	NP	800	800	650	NFN-19	G5, G14, W6
6	...	45	85	35	NP	NP	800	650	NFN-19	G14
7	...	45	85	35	NP	800	800	650	NFN-19	G5
8	...	45	85	35	NP	NP	800	650	NFN-19	...
9	...	45	85	35	NP	800	800	650	NFN-19	G5, G14, W6
10	...	45	85	35	NP	NP	800	650	NFN-19	G14
11	...	43	85	35	NP	NP	800	NP	NFN-27	G5, W12
12	...	43	85	35	NP	NP	800	NP	NFN-27	G5
13	...	43	85	35	NP	NP	800	NP	NFN-27	...
14	...	43	85	35	NP	NP	800	NP	NFN-27	G5
15	...	43	85	35	NP	NP	800	NP	NFN-27	...
16	...	43	85	35	NP	NP	800	NP	NFN-27	G5
17	...	43	85	35	NP	NP	800	NP	NFN-27	...
18	...	43	85	35	NP	NP	800	NP	NFN-27	G5
19	...	43	85	35	NP	NP	800	NP	NFN-27	...
20	...	43	85	35	NP	NP	800	NP	NFN-27	G5, G14
21	...	43	85	35	NP	NP	800	NP	NFN-27	G14
22	...	43	85	35	NP	NP	800	NP	NFN-27	G5
23	...	43	85	35	NP	NP	800	NP	NFN-27	...
24	...	43	85	35	NP	NP	800	NP	NFN-27	G5, G14
25	...	43	85	35	NP	NP	800	NP	NFN-27	G14
26	...	46	90	35	1500	NP	1500	NP	NFN-8	G5, T11
27	...	46	90	35	1500	NP	1500	NP	NFN-8	T11
28	...	46	90	35	1500	NP	1500	NP	NFN-8	G5, T11
29	...	46	90	35	1500	NP	1500	NP	NFN-8	T11
30	...	46	90	35	1500	NP	1500	NP	NFN-8	G5, T11
31	...	46	90	35	1500	NP	1500	NP	NFN-8	T11
32	...	46	90	35	1500	NP	1500	NP	NFN-8	G5, T11, W12
33	...	46	90	35	1500	NP	1500	NP	NFN-8	G5, T11
34	...	46	90	35	1500	NP	1500	NP	NFN-8	T11
35	...	46	90	35	1500	NP	1500	NP	NFN-8	G5, G14, T11
36	...	46	90	35	1500	NP	1500	NP	NFN-8	G14, T11
37	...	46	90	35	1500	NP	1500	NP	NFN-8	G5, G14, T11
38	...	46	90	35	1500	NP	1500	NP	NFN-8	G14, T11
39	...	46	90	35	1500	NP	1500	NP	NFN-8	G5, T11
40	...	46	90	35	1500	NP	1500	NP	NFN-8	T11
41	...	43	100	45	NP	800	1400	650	NFN-14	G5, G14, G23, T16
42	...	43	100	45	NP	800	1400	650	NFN-14	G5, G23, T16
43	...	43	100	45	NP	800	1400	650	NFN-14	G5, G14, G23, T16
44	...	43	100	45	NP	800	1400	650	NFN-14	G5, G23, T16

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	23.3	...	23.3	...	23.3	...	22.5	...	21.9	...	21.3	20.9	20.5	20.1	19.7	...	...	...
2	23.3	...	20.0	...	18.3	...	17.2	...	16.4	...	15.8	15.5	15.2	14.9	14.6	...	...	...
3	23.3	...	23.3	...	23.3	...	22.5	...	21.9	...	21.3	20.9	20.5	20.1	19.7	...	...	...
4	23.3	...	20.0	...	18.3	...	17.2	...	16.4	...	15.8	15.5	15.2	14.9	14.6	...	...	...
5	19.8	...	19.8	...	19.8	...	19.1	...	18.6	...	18.1	17.7	17.4	17.1	16.8	...	...	...
6	19.8	...	17.0	...	15.6	...	14.6	...	13.9	...	13.4	13.1	12.9	12.7	12.4	...	...	...
7	23.3	...	23.3	...	23.3	...	22.5	...	21.9	...	21.3	20.9	20.5	20.1	19.7	...	...	...
8	23.3	...	20.0	...	18.3	...	17.2	...	16.4	...	15.8	15.5	15.2	14.9	14.6	...	...	...
9	19.8	...	19.8	...	19.8	...	19.1	...	18.6	...	18.1	17.7	17.4	17.1	16.8	...	...	...
10	19.8	...	17.0	...	15.6	...	14.6	...	13.9	...	13.4	13.1	12.9	12.7	12.4	...	...	...
11	23.3	...	23.3	...	23.3	...	22.2	...	20.5	...	19.7	19.4	19.2	19.0	18.8	...	...	...
12	23.3	...	23.3	...	23.3	...	22.2	...	20.5	...	19.7	19.4	19.2	19.0	18.8	...	...	...
13	23.3	...	20.4	...	18.2	...	16.5	...	15.3	...	14.6	14.4	14.2	14.1	13.9	...	...	...
14	23.3	...	23.3	...	23.3	...	22.2	...	20.5	...	19.7	19.4	19.2	19.0	18.8	...	...	...
15	23.3	...	20.4	...	18.2	...	16.5	...	15.3	...	14.6	14.4	14.2	14.1	13.9	...	...	...
16	23.3	...	23.3	...	23.3	...	22.2	...	20.5	...	19.7	19.4	19.2	19.0	18.8	...	...	...
17	23.3	...	20.4	...	18.2	...	16.5	...	15.3	...	14.6	14.4	14.2	14.1	13.9	...	...	...
18	23.3	...	23.3	...	23.3	...	22.2	...	20.5	...	19.7	19.4	19.2	19.0	18.8	...	...	...
19	23.3	...	20.4	...	18.2	...	16.5	...	15.3	...	14.6	14.4	14.2	14.1	13.9	...	...	...
20	19.8	...	19.8	...	19.8	...	18.9	...	17.4	...	16.7	16.5	16.3	16.2	16.0	...	...	...
21	19.8	...	17.3	...	15.5	...	14.0	...	13.0	...	12.4	12.2	12.1	12.0	11.8	...	...	...
22	23.3	...	23.3	...	23.3	...	22.2	...	20.5	...	19.7	19.4	19.2	19.0	18.8	...	...	...
23	23.3	...	20.4	...	18.2	...	16.5	...	15.3	...	14.6	14.4	14.2	14.1	13.9	...	...	...
24	19.8	...	19.8	...	19.8	...	18.9	...	17.4	...	16.7	16.5	16.3	16.2	16.0	...	...	...
25	19.8	...	17.3	...	15.5	...	14.0	...	13.0	...	12.4	12.2	12.1	12.0	11.8	...	...	...
26	23.3	...	23.3	...	23.3	...	23.3	...	22.6	...	22.1	21.9	21.7	21.6	21.4	21.1	16.0	12.9
27	23.3	...	20.9	...	19.3	...	18.1	...	17.4	...	17.0	16.8	16.8	16.7	16.6	16.5	16.0	12.9
28	23.3	...	23.3	...	23.3	...	23.3	...	22.6	...	22.1	21.9	21.7	21.6	21.4	21.1	16.0	12.9
29	23.3	...	20.9	...	19.3	...	18.1	...	17.4	...	17.0	16.8	16.8	16.7	16.6	16.5	16.0	12.9
30	23.3	...	23.3	...	23.3	...	23.3	...	22.6	...	22.1	21.9	21.7	21.6	21.4	21.1	16.0	12.9
31	23.3	...	20.9	...	19.3	...	18.1	...	17.4	...	17.0	16.8	16.8	16.7	16.6	16.5	16.0	12.9
32	23.3	...	23.3	...	23.3	...	23.3	...	22.6	...	22.1	21.9	21.7	21.6	21.4	21.1	16.0	12.9
33	23.3	...	23.3	...	23.3	...	23.3	...	22.6	...	22.1	21.9	21.7	21.6	21.4	21.1	16.0	12.9
34	23.3	...	20.9	...	19.3	...	18.1	...	17.4	...	17.0	16.8	16.8	16.7	16.6	16.5	16.0	12.9
35	19.8	...	19.8	...	19.8	...	19.8	...	19.2	...	18.8	18.6	18.4	18.4	18.2	17.9	13.6	11.0
36	19.8	...	17.8	...	16.4	...	15.4	...	14.8	...	14.5	14.3	14.3	14.2	14.1	14.0	13.6	11.0
37	19.8	...	19.8	...	19.8	...	19.8	...	19.2	...	18.8	18.6	18.4	18.4	18.2	17.9	13.6	11.0
38	19.8	...	17.8	...	16.4	...	15.4	...	14.8	...	14.5	14.3	14.3	14.2	14.1	14.0	13.6	11.0
39	23.3	...	23.3	...	23.3	...	23.3	...	22.6	...	22.1	21.9	21.7	21.6	21.4	21.1	16.0	12.9
40	23.3	...	20.9	...	19.3	...	18.1	...	17.4	...	17.0	16.8	16.8	16.7	16.6	16.5	16.0	12.9
41	24.3	...	24.3	...	24.3	...	23.8	...	23.0	...	22.1	21.8	21.4	21.2	20.9	20.7	20.6	20.1
42	28.6	...	28.6	...	28.6	...	28.0	...	27.0	...	26.0	25.6	25.2	24.9	24.6	24.4	24.2	23.7
43	24.3	...	24.3	...	24.3	...	23.8	...	23.0	...	22.1	21.8	21.4	21.2	20.9	20.7	20.6	20.1
44	28.6	...	28.6	...	28.6	...	28.0	...	27.0	...	26.0	25.6	25.2	24.9	24.6	24.4	24.2	23.7

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
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	9.4	7.1	5.6	4.4	3.5	2.8	2.2	1.8	1.4	1.1	0.85	...	...	...	...	...	...
27	9.4	7.1	5.6	4.4	3.5	2.8	2.2	1.8	1.4	1.1	0.85	...	...	...	...	...	...
28	9.4	7.1	5.6	4.4	3.5	2.8	2.2	1.8	1.4	1.1	0.85	...	...	...	...	...	...
29	9.4	7.1	5.6	4.4	3.5	2.8	2.2	1.8	1.4	1.1	0.85	...	...	...	...	...	...
30	9.4	7.1	5.6	4.4	3.5	2.8	2.2	1.8	1.4	1.1	0.85	...	...	...	...	...	...
31	9.4	7.1	5.6	4.4	3.5	2.8	2.2	1.8	1.4	1.1	0.85	...	...	...	...	...	...
32	9.4	7.1	5.6	4.4	3.5	2.8	2.2	1.8	1.4	1.1	0.85	...	...	...	...	...	...
33	9.4	7.1	5.6	4.4	3.5	2.8	2.2	1.8	1.4	1.1	0.85	...	...	...	...	...	...
34	9.4	7.1	5.6	4.4	3.5	2.8	2.2	1.8	1.4	1.1	0.85	...	...	...	...	...	...
35	8.0	6.0	4.8	3.7	3.0	2.4	1.9	1.5	1.2	0.90	0.70	...	...	...	...	...	...
36	8.0	6.0	4.8	3.7	3.0	2.4	1.9	1.5	1.2	0.90	0.70	...	...	...	...	...	...
37	8.0	6.0	4.8	3.7	3.0	2.4	1.9	1.5	1.2	0.90	0.70	...	...	...	...	...	...
38	8.0	6.0	4.8	3.7	3.0	2.4	1.9	1.5	1.2	0.90	0.70	...	...	...	...	...	...
39	9.4	7.1	5.6	4.4	3.5	2.8	2.2	1.8	1.4	1.1	0.85	...	...	...	...	...	...
40	9.4	7.1	5.6	4.4	3.5	2.8	2.2	1.8	1.4	1.1	0.85	...	...	...	...	...	...
41	19.6	19.2	16.0	12.4	9.9	8.0	6.3	5.0	4.1	...	...	...	...	...	...	...	...
42	23.1	22.6	18.8	14.6	11.6	9.4	7.4	5.9	4.8	...	...	...	...	...	...	...	...
43	19.6	19.2	16.0	12.4	9.9	8.0	6.3	5.0	4.1	...	...	...	...	...	...	...	...
44	23.1	22.6	18.8	14.6	11.6	9.4	7.4	5.9	4.8	...	...	...	...	...	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	59Ni-23Cr-16Mo	Forged fittings	SB-462	...	N06059	Solution ann.
2	59Ni-23Cr-16Mo	Forged fittings	SB-462	...	N06059	Solution ann.
3	59Ni-23Cr-16Mo	Forgings	SB-564	...	N06059	Solution ann.
4	59Ni-23Cr-16Mo	Forgings	SB-564	...	N06059	Solution ann.
5	59Ni-23Cr-16Mo	Rod	SB-574	...	N06059	Solution ann.
6	59Ni-23Cr-16Mo	Rod	SB-574	...	N06059	Solution ann.
7	59Ni-23Cr-16Mo	Plate, sheet, strip	SB-575	...	N06059	Solution ann.
8	59Ni-23Cr-16Mo	Plate, sheet, strip	SB-575	...	N06059	Solution ann.
9	59Ni-23Cr-16Mo	Wld. pipe	SB-619	...	N06059	Solution ann.
10	59Ni-23Cr-16Mo	Wld. pipe	SB-619	...	N06059	Solution ann.
11	59Ni-23Cr-16Mo	Smls. pipe & tube	SB-622	...	N06059	Solution ann.
12	59Ni-23Cr-16Mo	Smls. pipe & tube	SB-622	...	N06059	Solution ann.
13	59Ni-23Cr-16Mo	Wld. tube	SB-626	...	N06059	Solution ann.
14	59Ni-23Cr-16Mo	Wld. tube	SB-626	...	N06059	Solution ann.
15	59Ni-23Cr-16Mo-1.6Cu	Smls. & wld. fittings	SB-366	...	N06200	Solution ann.
16	59Ni-23Cr-16Mo-1.6Cu	Forgings	SB-462	...	N06200	Solution ann.
17	59Ni-23Cr-16Mo-1.6Cu	Forgings	SB-462	...	N06200	Solution ann.
18	59Ni-23Cr-16Mo-1.6Cu	Forgings	SB-564	...	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	Rod	SB-574	...	N06200	Solution ann.
22	59Ni-23Cr-16Mo-1.6Cu	Plate, sheet, strip	SB-575	...	N06200	Solution ann.
23	59Ni-23Cr-16Mo-1.6Cu	Plate, sheet, strip	SB-575	...	N06200	Solution ann.
24	59Ni-23Cr-16Mo-1.6Cu	Wld. pipe	SB-619	...	N06200	Solution ann.
25	59Ni-23Cr-16Mo-1.6Cu	Wld. pipe	SB-619	...	N06200	Solution ann.
26	59Ni-23Cr-16Mo-1.6Cu	Smls. pipe & tube	SB-622	...	N06200	Solution ann.
27	59Ni-23Cr-16Mo-1.6Cu	Smls. pipe & tube	SB-622	...	N06200	Solution ann.
28	59Ni-23Cr-16Mo-1.6Cu	Wld. tube	SB-626	...	N06200	Solution ann.
29	59Ni-23Cr-16Mo-1.6Cu	Wld. tube	SB-626	...	N06200	Solution ann.
30	60Ni-19Cr-19Mo-1.8Ta	Smls. & wld. fittings	SB-366	...	N06210	Solution ann.
31	60Ni-19Cr-19Mo-1.8Ta	Forgings	SB-564	...	N06210	Solution ann.
32	60Ni-19Cr-19Mo-1.8Ta	Forgings	SB-564	...	N06210	Solution ann.
33	60Ni-19Cr-19Mo-1.8Ta	Rod	SB-574	...	N06210	Solution ann.
34	60Ni-19Cr-19Mo-1.8Ta	Rod	SB-574	...	N06210	Solution ann.
35	60Ni-19Cr-19Mo-1.8Ta	Plate, sheet, strip	SB-575	...	N06210	Solution ann.
36	60Ni-19Cr-19Mo-1.8Ta	Plate, sheet, strip	SB-575	...	N06210	Solution ann.
37	60Ni-19Cr-19Mo-1.8Ta	Wld. pipe	SB-619	...	N06210	Solution ann.
38	60Ni-19Cr-19Mo-1.8Ta	Wld. pipe	SB-619	...	N06210	Solution ann.
39	60Ni-19Cr-19Mo-1.8Ta	Smls. pipe & tube	SB-622	...	N06210	Solution ann.
40	60Ni-19Cr-19Mo-1.8Ta	Smls. pipe & tube	SB-622	...	N06210	Solution ann.
41	60Ni-19Cr-19Mo-1.8Ta	Wld. tube	SB-626	...	N06210	Solution ann.
42	60Ni-19Cr-19Mo-1.8Ta	Wld. tube	SB-626	...	N06210	Solution ann.

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	43	100	45	NP	NP	1400	650	NFN-14	G23, T16
2	...	43	100	45	NP	NP	1400	650	NFN-14	G5, G23, T16
3	...	43	100	45	NP	800	1400	650	NFN-14	G23, T16
4	...	43	100	45	NP	800	1400	650	NFN-14	G5, G23, T16
5	...	43	100	45	NP	800	1400	650	NFN-14	G23, T16
6	...	43	100	45	NP	800	1400	650	NFN-14	G5, G23, T16
7	...	43	100	45	NP	800	1400	650	NFN-14	G23, T16
8	...	43	100	45	NP	800	1400	650	NFN-14	G5, G23, T16
9	...	43	100	45	NP	800	1400	650	NFN-14	G14, G23, T16
10	...	43	100	45	NP	800	1400	650	NFN-14	G5, G14, G23, T16
11	...	43	100	45	NP	800	1400	650	NFN-14	G23, T16
12	...	43	100	45	NP	800	1400	650	NFN-14	G5, G23, T16
13	...	43	100	45	NP	800	1400	650	NFN-14	G14, G23, T16
14	...	43	100	45	NP	800	1400	650	NFN-14	G5, G14, G23, T16
15	...	43	100	45	NP	NP	800	NP	NFN-10	G5, W12
16	...	43	100	45	NP	NP	800	NP	NFN-10	...
17	...	43	100	45	NP	NP	800	NP	NFN-10	G5
18	...	43	100	45	NP	NP	800	NP	NFN-10	...
19	...	43	100	45	NP	NP	800	NP	NFN-10	G5
20	...	43	100	45	NP	NP	800	NP	NFN-10	...
21	...	43	100	45	NP	NP	800	NP	NFN-10	G5
22	...	43	100	45	NP	NP	800	NP	NFN-10	...
23	...	43	100	45	NP	NP	800	NP	NFN-10	G5
24	...	43	100	45	NP	NP	800	NP	NFN-10	G14
25	...	43	100	45	NP	NP	800	NP	NFN-10	G5, G14
26	...	43	100	45	NP	NP	800	NP	NFN-10	...
27	...	43	100	45	NP	NP	800	NP	NFN-10	G5
28	...	43	100	45	NP	NP	800	NP	NFN-10	G14
29	...	43	100	45	NP	NP	800	NP	NFN-10	G5, G14
30	...	43	100	45	NP	NP	800	NP	NFN-14	G5, W12
31	...	43	100	45	NP	NP	800	NP	NFN-14	...
32	...	43	100	45	NP	NP	800	NP	NFN-14	G5
33	...	43	100	45	NP	NP	800	NP	NFN-14	...
34	...	43	100	45	NP	NP	800	NP	NFN-14	G5
35	...	43	100	45	NP	NP	800	NP	NFN-14	...
36	...	43	100	45	NP	NP	800	NP	NFN-14	G5
37	...	43	100	45	NP	NP	800	NP	NFN-14	...
38	...	43	100	45	NP	NP	800	NP	NFN-14	G5, G14
39	...	43	100	45	NP	NP	800	NP	NFN-14	...
40	...	43	100	45	NP	NP	800	NP	NFN-14	G5
41	...	43	100	45	NP	NP	800	NP	NFN-14	...
42	...	43	100	45	NP	NP	800	NP	NFN-14	G5, G14

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	28.6	...	26.9	...	25.2	...	23.8	...	22.6	...	21.4	20.8	20.2	19.6	19.1	18.5	18.0	17.5
2	28.6	...	28.6	...	28.6	...	28.0	...	27.0	...	26.0	25.6	25.2	24.9	24.6	24.4	24.2	23.7
3	28.6	...	26.9	...	25.2	...	23.8	...	22.6	...	21.4	20.8	20.2	19.6	19.1	18.5	18.0	17.5
4	28.6	...	28.6	...	28.6	...	28.0	...	27.0	...	26.0	25.6	25.2	24.9	24.6	24.4	24.2	23.7
5	28.6	...	26.9	...	25.2	...	23.8	...	22.6	...	21.4	20.8	20.2	19.6	19.1	18.5	18.0	17.5
6	28.6	...	28.6	...	28.6	...	28.0	...	27.0	...	26.0	25.6	25.2	24.9	24.6	24.4	24.2	23.7
7	28.6	...	26.9	...	25.2	...	23.8	...	22.6	...	21.4	20.8	20.2	19.6	19.1	18.5	18.0	17.5
8	28.6	...	28.6	...	28.6	...	28.0	...	27.0	...	26.0	25.6	25.2	24.9	24.6	24.4	24.2	23.7
9	24.3	...	22.9	...	21.4	...	20.2	...	19.2	...	18.2	17.7	17.2	16.7	16.2	15.7	15.3	14.9
10	24.3	...	24.3	...	24.3	...	23.8	...	23.0	...	22.1	21.8	21.4	21.2	20.9	20.7	20.6	20.1
11	28.6	...	26.9	...	25.2	...	23.8	...	22.6	...	21.4	20.8	20.2	19.6	19.1	18.5	18.0	17.5
12	28.6	...	28.6	...	28.6	...	28.0	...	27.0	...	26.0	25.6	25.2	24.9	24.6	24.4	24.2	23.7
13	24.3	...	22.9	...	21.4	...	20.2	...	19.2	...	18.2	17.7	17.2	16.7	16.2	15.7	15.3	14.9
14	24.3	...	24.3	...	24.3	...	23.8	...	23.0	...	22.1	21.8	21.4	21.2	20.9	20.7	20.6	20.1
15	28.6	...	28.6	...	28.6	...	27.6	...	26.8	...	26.2	26.0	25.7	25.4	25.2	...	...	...
16	28.6	...	26.9	...	24.8	...	22.9	...	21.2	...	19.9	19.4	19.1	18.8	18.7	...	...	...
17	28.6	...	28.6	...	28.6	...	27.6	...	26.8	...	26.2	26.0	25.7	25.4	25.2	...	...	...
18	28.6	...	26.9	...	24.8	...	22.9	...	21.2	...	19.9	19.4	19.1	18.8	18.7	...	...	...
19	28.6	...	28.6	...	28.6	...	27.6	...	26.8	...	26.2	26.0	25.7	25.4	25.2	...	...	...
20	28.6	...	26.9	...	24.8	...	22.9	...	21.2	...	19.9	19.4	19.1	18.8	18.7	...	...	...
21	28.6	...	28.6	...	28.6	...	27.6	...	26.8	...	26.2	26.0	25.7	25.4	25.2	...	...	...
22	28.6	...	26.9	...	24.8	...	22.9	...	21.2	...	19.9	19.4	19.1	18.8	18.7	...	...	...
23	28.6	...	28.6	...	28.6	...	27.6	...	26.8	...	26.2	26.0	25.7	25.4	25.2	...	...	...
24	24.3	...	22.9	...	21.1	...	19.4	...	18.0	...	16.9	16.5	16.2	16.0	15.9	...	...	...
25	24.3	...	24.3	...	24.3	...	23.5	...	22.8	...	22.3	22.1	21.9	21.6	21.4	...	...	...
26	28.6	...	26.9	...	24.8	...	22.9	...	21.2	...	19.9	19.4	19.1	18.8	18.7	...	...	...
27	28.6	...	28.6	...	28.6	...	27.6	...	26.8	...	26.2	26.0	25.7	25.4	25.2	...	...	...
28	24.3	...	22.9	...	21.1	...	19.4	...	18.0	...	16.9	16.5	16.2	16.0	15.9	...	...	...
29	24.3	...	24.3	...	24.3	...	23.5	...	22.8	...	22.3	22.1	21.9	21.6	21.4	...	...	...
30	28.6	...	28.6	...	28.5	...	27.6	...	26.9	...	26.3	25.5	24.8	24.1	23.6	...	...	...
31	28.6	...	26.6	...	24.5	...	22.6	...	21.0	...	19.5	18.9	18.4	17.9	17.5	...	...	...
32	28.6	...	28.6	...	28.5	...	27.6	...	26.9	...	26.3	25.5	24.8	24.1	23.6	...	...	...
33	28.6	...	26.6	...	24.5	...	22.6	...	21.0	...	19.5	18.9	18.4	17.9	17.5	...	...	...
34	28.6	...	28.6	...	28.5	...	27.6	...	26.9	...	26.3	25.5	24.8	24.1	23.6	...	...	...
35	28.6	...	26.6	...	24.5	...	22.6	...	21.0	...	19.5	18.9	18.4	17.9	17.5	...	...	...
36	28.6	...	28.6	...	28.5	...	27.6	...	26.9	...	26.3	25.5	24.8	24.1	23.6	...	...	...
37	24.3	...	22.6	...	20.8	...	19.2	...	17.8	...	16.6	16.1	15.6	15.2	14.8	...	...	...
38	24.3	...	24.3	...	24.2	...	23.5	...	22.9	...	22.4	21.7	21.1	20.5	20.0	...	...	...
39	28.6	...	26.6	...	24.5	...	22.6	...	21.0	...	19.5	18.9	18.4	17.9	17.5	...	...	...
40	28.6	...	28.6	...	28.5	...	27.6	...	26.9	...	26.3	25.5	24.8	24.1	23.6	...	...	...
41	24.3	...	22.6	...	20.8	...	19.2	...	17.8	...	16.6	16.1	15.6	15.2	14.8	...	...	...
42	24.3	...	24.3	...	24.2	...	23.5	...	22.9	...	22.4	21.7	21.1	20.5	20.0	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1	17.1	16.8	16.5	14.6	11.6	9.4	7.4	5.9	4.8	...	...	...	...	...	...	...	...
2	23.1	22.6	18.8	14.6	11.6	9.4	7.4	5.9	4.8	...	...	...	...	...	...	...	...
3	17.1	16.8	16.5	14.6	11.6	9.4	7.4	5.9	4.8	...	...	...	...	...	...	...	...
4	23.1	22.6	18.8	14.6	11.6	9.4	7.4	5.9	4.8	...	...	...	...	...	...	...	...
5	17.1	16.8	16.5	14.6	11.6	9.4	7.4	5.9	4.8	...	...	...	...	...	...	...	...
6	23.1	22.6	18.8	14.6	11.6	9.4	7.4	5.9	4.8	...	...	...	...	...	...	...	...
7	17.1	16.8	16.5	14.6	11.6	9.4	7.4	5.9	4.8	...	...	...	...	...	...	...	...
8	23.1	22.6	18.8	14.6	11.6	9.4	7.4	5.9	4.8	...	...	...	...	...	...	...	...
9	14.5	14.3	14.0	12.4	9.9	8.0	6.3	5.0	4.1	...	...	...	...	...	...	...	...
10	19.6	19.2	16.0	12.4	9.9	8.0	6.3	5.0	4.1	...	...	...	...	...	...	...	...
11	17.1	16.8	16.5	14.6	11.6	9.4	7.4	5.9	4.8	...	...	...	...	...	...	...	...
12	23.1	22.6	18.8	14.6	11.6	9.4	7.4	5.9	4.8
13	14.5	14.3	14.0	12.4	9.9	8.0	6.3	5.0	4.1
14	19.6	19.2	16.0	12.4	9.9	8.0	6.3	5.0	4.1
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	57Ni-22Cr-14W-2Mo-La	Smls. & wld. fittings	SB-366	...	N06230	Solution ann.
2	57Ni-22Cr-14W-2Mo-La	Plate, sheet, strip	SB-435	...	N06230	Solution ann.
3	57Ni-22Cr-14W-2Mo-La	Plate, sheet, strip	SB-435	...	N06230	Solution ann.
4	57Ni-22Cr-14W-2Mo-La	Forgings	SB-564	...	N06230	Solution ann.
5	57Ni-22Cr-14W-2Mo-La	Forgings	SB-564	...	N06230	Solution ann.
6	57Ni-22Cr-14W-2Mo-La	Bar	SB-572	...	N06230	Solution ann.
7	57Ni-22Cr-14W-2Mo-La	Bar	SB-572	...	N06230	Solution ann.
8	57Ni-22Cr-14W-2Mo-La	Wld. pipe	SB-619	...	N06230	Solution ann.
9	57Ni-22Cr-14W-2Mo-La	Wld. pipe	SB-619	...	N06230	Solution ann.
10	57Ni-22Cr-14W-2Mo-La	Smls. pipe & tube	SB-622	...	N06230	Solution ann.
11	57Ni-22Cr-14W-2Mo-La	Smls. pipe & tube	SB-622	...	N06230	Solution ann.
12	57Ni-22Cr-14W-2Mo-La	Wld. tube	SB-626	...	N06230	Solution ann.
13	57Ni-22Cr-14W-2Mo-La	Wld. tube	SB-626	...	N06230	Solution ann.
14	61Ni-16Mo-16Cr	Smls. & wld. fittings	SB-366	...	N06455	Annealed
15	61Ni-16Mo-16Cr	Rod	SB-574	...	N06455	Solution ann.
16	61Ni-16Mo-16Cr	Rod	SB-574	...	N06455	Solution ann.
17	61Ni-16Mo-16Cr	Plate, sheet, strip	SB-575	...	N06455	Solution ann.
18	61Ni-16Mo-16Cr	Plate, sheet, strip	SB-575	...	N06455	Solution ann.
19	61Ni-16Mo-16Cr	Wld. pipe	SB-619	...	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	Smls. pipe & tube	SB-622	...	N06455	Solution ann.
23	61Ni-16Mo-16Cr	Wld. tube	SB-626	...	N06455	Solution ann.
24	61Ni-16Mo-16Cr	Wld. tube	SB-626	...	N06455	Solution 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. & wld. fittings	SB-366	...	N06600	Annealed
28	72Ni-15Cr-8Fe	Smls. pipe & tube	SB-167	...	N06600	Cold drawn/ann.
29	72Ni-15Cr-8Fe	Smls. pipe & tube	SB-167	...	N06600	Cold drawn/ann.
30	72Ni-15Cr-8Fe	Smls. pipe & tube	SB-167	...	N06600	Hot fin./ann.
31	72Ni-15Cr-8Fe	Smls. pipe & tube	SB-167	...	N06600	Hot fin./ann.
32	72Ni-15Cr-8Fe	Smls. pipe & tube	SB-167	...	N06600	Hot fin./ann.
33	72Ni-15Cr-8Fe	Smls. tube	SB-163	...	N06600	Annealed
34	72Ni-15Cr-8Fe	Smls. tube	SB-163	...	N06600	Annealed
35	72Ni-15Cr-8Fe	Bar	SB-166	...	N06600	Annealed
36	72Ni-15Cr-8Fe	Bar	SB-166	...	N06600	Annealed
37	72Ni-15Cr-8Fe	Plate	SB-168	...	N06600	Annealed
38	72Ni-15Cr-8Fe	Plate, sheet, strip	SB-168	...	N06600	Annealed
39	72Ni-15Cr-8Fe	Wld. tube	SB-516	...	N06600	Annealed
40	72Ni-15Cr-8Fe	Wld. tube	SB-516	...	N06600	Annealed
41	72Ni-15Cr-8Fe	Forgings	SB-564	...	N06600	...
42	72Ni-15Cr-8Fe	Forgings	SB-564	...	N06600	Annealed

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	43	110	45	1650	NP	1800	650	NFN-24	G4, G5, T15, W12
2	...	43	110	45	1650	NP	1800	650	NFN-24	G4, T16
3	...	43	110	45	1650	NP	1800	650	NFN-24	G4, G5, T15
4	...	43	110	45	1650	NP	1800	650	NFN-24	G4, T16
5	...	43	110	45	1650	NP	1800	650	NFN-24	G4, G5, T15
6	...	43	110	45	1650	NP	1800	650	NFN-24	G4, T16
7	...	43	110	45	1650	NP	1800	650	NFN-24	G4, G5, T15
8	...	43	110	45	1650	NP	1800	650	NFN-24	G4, G14, T16
9	...	43	110	45	1650	NP	1800	650	NFN-24	G4, G5, G14, T15
10	...	43	110	45	1650	NP	1800	650	NFN-24	G4, T16
11	...	43	110	45	1650	NP	1800	650	NFN-24	G4, G5, T15
12	...	43	110	45	1650	NP	1800	650	NFN-24	G4, G14, T16
13	...	43	110	45	1650	NP	1800	650	NFN-24	G4, G5, G14, T15
14	...	43	100	40	NP	NP	800	650	NFN-14	G5, W12
15	...	43	100	40	NP	NP	800	650	NFN-14	...
16	...	43	100	40	NP	NP	800	650	NFN-14	G5
17	...	43	100	40	NP	NP	800	650	NFN-14	...
18	...	43	100	40	NP	NP	800	650	NFN-14	G5
19	...	43	100	40	NP	NP	800	650	NFN-14	G14
20	...	43	100	40	NP	NP	800	650	NFN-14	G5, G14
21	...	43	100	40	NP	NP	800	650	NFN-14	...
22	...	43	100	40	NP	NP	800	650	NFN-14	G5
23	...	43	100	40	NP	NP	800	650	NFN-14	G14
24	...	43	100	40	NP	NP	800	650	NFN-14	G5, G14
25	> 5	43	75	25	NP	800	1200	650	NFN-4	T12
26	> 5	43	75	25	NP	800	1200	650	NFN-4	G5, T11
27	...	43	80	30	NP	NP	1200	650	NFN-4	G5, T11, W12
28	> 5	43	80	30	NP	800 (Cl. 3 only)	1200	650	NFN-4	T12
29	> 5	43	80	30	NP	800 (Cl. 3 only)	1200	650	NFN-4	G5, T11
30	...	43	80	30	NP	800	NP	NP	NFN-4	G5
31	≤ 5	43	80	30	NP	800 (Cl. 3 only)	1200	650	NFN-4	G5, T11
32	≤ 5	43	80	30	NP	NP	1200	650	NFN-4	T12
33	≤ 3	43	80	35	1200	800	1200	650	NFN-4	G5, T11
34	≤ 3	43	80	35	1200	NP	1200	650	NFN-4	T11
35	...	43	80	35	1200	800	1200	650	NFN-4	G5, T11
36	...	43	80	35	1200	NP	1200	650	NFN-4	T11
37	...	43	80	35	1200	800	1200	650	NFN-4	G5, T11
38	...	43	80	35	1200	NP	1200	650	NFN-4	T11
39	...	43	80	35	NP	NP	1200	650	NFN-4	G14, T11
40	...	43	80	35	NP	NP	1200	650	NFN-4	G5, G14, T11
41	...	43	80	35	NP	800	NP	NP	NFN-4	G5
42	...	43	80	35	NP	NP	1200	650	NFN-4	T11

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	30.0	...	30.0	...	30.0	...	30.0	...	30.0	...	29.4	29.1	28.7	28.4	28.2	28.2	28.2	28.2
2	30.0	...	28.2	...	26.4	...	24.7	...	23.1	...	22.0	21.5	21.2	21.0	20.9	20.9	20.9	20.9
3	30.0	...	30.0	...	30.0	...	30.0	...	30.0	...	29.4	29.1	28.7	28.4	28.2	28.2	28.2	28.2
4	30.0	...	28.2	...	26.4	...	24.7	...	23.1	...	22.0	21.5	21.2	21.0	20.9	20.9	20.9	20.9
5	30.0	...	30.0	...	30.0	...	30.0	...	30.0	...	29.4	29.1	28.7	28.4	28.2	28.2	28.2	28.2
6	30.0	...	28.2	...	26.4	...	24.7	...	23.1	...	22.0	21.5	21.2	21.0	20.9	20.9	20.9	20.9
7	30.0	...	30.0	...	30.0	...	30.0	...	30.0	...	29.4	29.1	28.7	28.4	28.2	28.2	28.2	28.2
8	25.5	...	24.0	...	22.4	...	21.0	...	19.6	...	18.7	18.3	18.0	17.9	17.8	17.8	17.8	17.8
9	25.5	...	25.5	...	25.5	...	25.5	...	25.5	...	25.0	24.7	24.4	24.1	24.0	24.0	24.0	24.0
10	30.0	...	28.2	...	26.4	...	24.7	...	23.1	...	22.0	21.5	21.2	21.0	20.9	20.9	20.9	20.9
11	30.0	...	30.0	...	30.0	...	30.0	...	30.0	...	29.4	29.1	28.7	28.4	28.2	28.2	28.2	28.2
12	25.5	...	24.0	...	22.4	...	21.0	...	19.6	...	18.7	18.3	18.0	17.9	17.8	17.8	17.8	17.8
13	25.5	...	25.5	...	25.5	...	25.5	...	25.5	...	25.0	24.7	24.4	24.1	24.0	24.0	24.0	24.0
14	26.7	...	26.7	...	26.7	...	26.7	...	26.7	...	26.7	...	26.5	...	25.8	...	...	...
15	26.7	...	24.6	...	23.0	...	21.7	...	20.8	...	20.1	19.9	19.6	19.4	19.1	...	...	...
16	26.7	...	26.7	...	26.7	...	26.7	...	26.7	...	26.7	26.7	26.5	26.1	25.8	...	...	...
17	26.7	...	24.6	...	23.0	...	21.7	...	20.8	...	20.1	19.9	19.6	19.4	19.1	...	...	...
18	26.7	...	26.7	...	26.7	...	26.7	...	26.7	...	26.7	26.7	26.5	26.1	25.8	...	...	...
19	22.7	...	20.9	...	19.5	...	18.5	...	17.7	...	17.1	16.9	16.7	16.5	16.2	...	...	...
20	22.7	...	22.7	...	22.7	...	22.7	...	22.7	...	22.7	22.7	22.5	22.2	21.9	...	...	...
21	26.7	...	24.6	...	23.0	...	21.7	...	20.8	...	20.1	19.9	19.6	19.4	19.1	...	...	...
22	26.7	...	26.7	...	26.7	...	26.7	...	26.7	...	26.7	26.7	26.5	26.1	25.8	...	...	...
23	22.7	...	20.9	...	19.5	...	18.5	...	17.7	...	17.1	16.9	16.7	16.5	16.2	...	...	...
24	22.7	...	22.7	...	22.7	...	22.7	...	22.7	...	22.7	22.7	22.5	22.2	21.9	...	...	...
25	16.7	...	15.9	...	15.2	...	14.6	...	14.0	...	13.5	13.3	13.1	12.9	12.7	12.5	12.4	10.6
26	16.7	...	16.7	...	16.7	...	16.7	...	16.7	...	16.7	16.7	16.7	16.7	16.7	16.7	16.0	10.6
27	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	16.0	10.6
28	20.0	...	19.1	...	18.3	...	17.5	...	16.8	...	16.2	15.9	15.7	15.5	15.2	15.1	14.9	10.6
29	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	16.0	10.6
30	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	...	...	...
31	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	16.0	10.6
32	20.0	...	19.1	...	18.3	...	17.5	...	16.8	...	16.2	15.9	15.7	15.5	15.2	15.1	14.9	10.6
33	22.9	...	22.9	...	22.9	...	22.9	...	22.9	...	22.9	22.9	22.9	22.9	22.9	22.4	16.0	10.6
34	22.9	...	21.3	...	20.8	...	20.5	...	20.2	...	19.9	19.8	19.6	19.4	19.1	18.7	16.0	10.6
35	22.9	...	22.9	...	22.9	...	22.9	...	22.9	...	22.9	22.9	22.9	22.9	22.9	22.4	16.0	10.6
36	22.9	...	21.3	...	20.8	...	20.5	...	20.2	...	19.9	19.8	19.6	19.4	19.1	18.7	16.0	10.6
37	22.9	...	22.9	...	22.9	...	22.9	...	22.9	...	22.9	22.9	22.9	22.9	22.9	22.4	16.0	10.6
38	22.9	...	21.3	...	20.8	...	20.5	...	20.2	...	19.9	19.8	19.6	19.4	19.1	18.7	16.0	10.6
39	19.4	...	18.1	...	17.7	...	17.4	...	17.2	...	16.9	16.8	16.7	16.5	16.2	15.9	13.6	9.0
40	19.4	...	19.4	...	19.4	...	19.4	...	19.4	...	19.4	19.4	19.4	19.4	19.4	19.0	13.6	9.0
41	22.9	...	22.9	...	22.9	...	22.9	...	22.9	...	22.9	22.9	22.9	22.9	22.9	...	...	...
42	22.9	...	21.3	...	20.8	...	20.5	...	20.2	...	19.9	19.8	19.6	19.4	19.1	18.7	16.0	10.6

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1	28.2	28.2	23.2	19.0	15.6	12.9	10.6	8.5	6.7	5.3	4.1	2.9	2.1	1.5	1.1	0.70	0.45
2	20.9	20.9	20.9	19.0	15.6	12.9	10.6	8.5	6.7	5.3	4.1	2.9	2.1	1.5	1.1	0.70	0.45
3	28.2	28.2	23.2	19.0	15.6	12.9	10.6	8.5	6.7	5.3	4.1	2.9	2.1	1.5	1.1	0.70	0.45
4	20.9	20.9	20.9	19.0	15.6	12.9	10.6	8.5	6.7	5.3	4.1	2.9	2.1	1.5	1.1	0.70	0.45
5	28.2	28.2	23.2	19.0	15.6	12.9	10.6	8.5	6.7	5.3	4.1	2.9	2.1	1.5	1.1	0.70	0.45
6	20.9	20.9	20.9	19.0	15.6	12.9	10.6	8.5	6.7	5.3	4.1	2.9	2.1	1.5	1.1	0.70	0.45
7	28.2	28.2	23.2	19.0	15.6	12.9	10.6	8.5	6.7	5.3	4.1	2.9	2.1	1.5	1.1	0.70	0.45
8	17.8	17.8	17.8	16.2	13.3	11.0	9.0	7.2	5.7	4.5	3.5	2.5	1.8	1.3	0.94	0.60	0.38
9	24.0	24.0	19.7	16.2	13.3	11.0	9.0	7.2	5.7	4.5	3.5	2.5	1.8	1.3	0.94	0.60	0.38
10	20.9	20.9	20.9	19.0	15.6	12.9	10.6	8.5	6.7	5.3	4.1	2.9	2.1	1.5	1.1	0.70	0.45
11	28.2	28.2	23.2	19.0	15.6	12.9	10.6	8.5	6.7	5.3	4.1	2.9	2.1	1.5	1.1	0.70	0.45
12	17.8	17.8	17.8	16.2	13.3	11.0	9.0	7.2	5.7	4.5	3.5	2.5	1.8	1.3	0.94	0.60	0.38
13	24.0	24.0	19.7	16.2	13.3	11.0	9.0	7.2	5.7	4.5	3.5	2.5	1.8	1.3	0.94	0.60	0.38
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...	...	...	...
26	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...	...	...	...
27	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...	...	...	...
28	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...	...	...	...
29	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...	...	...	...
32	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...	...	...	...
33	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...	...	...	...
34	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...	...	...	...
35	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...	...	...	...
36	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...	...	...	...
37	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...	...	...	...
38	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...	...	...	...
39	6.0	3.8	2.6	1.9	1.7	...	...	...	...	...	...	...	...	...	...	...	...
40	6.0	3.8	2.6	1.9	1.7	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	72Ni-15Cr-8Fe	Smls. pipe & tube	SB-167	...	N06600	Cold drawn/ann.
2	72Ni-15Cr-8Fe	Smls. pipe & tube	SB-167	...	N06600	Cold drawn/ann.
3	72Ni-15Cr-8Fe	Wld. pipe	SB-517	...	N06600	Cold drawn/ann.
4	72Ni-15Cr-8Fe	Wld. pipe	SB-517	...	N06600	Cold drawn/ann.
5	72Ni-15Cr-8Fe	Bar, rod	SB-166	...	N06600	Hot fin.
6	72Ni-15Cr-8Fe	Bar, rod	SB-166	...	N06600	Hot fin.
7	72Ni-15Cr-8Fe	Plate, sheet, strip	SB-168	...	N06600	Hot rolled
8	72Ni-15Cr-8Fe	Plate, sheet, strip	SB-168	...	N06600	Hot rolled
9	60Ni-23Cr-Fe	Smls. tube	SB-163	...	N06601	Annealed
10	60Ni-23Cr-Fe	Smls. tube	SB-163	...	N06601	Annealed
11	60Ni-23Cr-Fe	Bar	SB-166	...	N06601	Annealed
12	60Ni-23Cr-Fe	Bar	SB-166	...	N06601	Annealed
13	60Ni-23Cr-Fe	Smls. pipe & tube	SB-167	...	N06601	Annealed
14	60Ni-23Cr-Fe	Smls. pipe & tube	SB-167	...	N06601	Annealed
15	60Ni-23Cr-Fe	Plate, sheet, strip	SB-168	...	N06601	Annealed
16	60Ni-23Cr-Fe	Plate, sheet, strip	SB-168	...	N06601	Annealed
(10) 17	52Ni-22Cr-13Co-9Mo	Bar, rod	SB-166	...	N06617	Annealed
(10) 18	52Ni-22Cr-13Co-9Mo	Bar, rod	SB-166	...	N06617	Annealed
(10) 19	52Ni-22Cr-13Co-9Mo	Smls. pipe & tube	SB-167	...	N06617	Annealed
(10) 20	52Ni-22Cr-13Co-9Mo	Smls. pipe & tube	SB-167	...	N06617	Annealed
(10) 21	52Ni-22Cr-13Co-9Mo	Plate, sheet, strip	SB-168	...	N06617	Annealed
(10) 22	52Ni-22Cr-13Co-9Mo	Plate, sheet, strip	SB-168	...	N06617	Annealed
(10) 23	52Ni-22Cr-13Co-9Mo	Forgings	SB-564	...	N06617	Annealed
(10) 24	52Ni-22Cr-13Co-9Mo	Forgings	SB-564	...	N06617	Annealed
25	60Ni-22Cr-9Mo-3.5Cb	Plate, sheet, strip	SB-443	2	N06625	Solution ann.
26	60Ni-22Cr-9Mo-3.5Cb	Plate, sheet, strip	SB-443	2	N06625	Solution ann.
27	60Ni-22Cr-9Mo-3.5Cb	Smls. pipe & tube	SB-444	2	N06625	Solution ann.
28	60Ni-22Cr-9Mo-3.5Cb	Smls. pipe & tube	SB-444	2	N06625	Solution ann.
29	60Ni-22Cr-9Mo-3.5Cb	Bar	SB-446	2	N06625	Solution ann.
30	60Ni-22Cr-9Mo-3.5Cb	Bar	SB-446	2	N06625	Solution ann.
31	60Ni-22Cr-9Mo-3.5Cb	Smls. & wld. fittings	SB-366	...	N06625	Annealed
32	60Ni-22Cr-9Mo-3.5Cb	Bar	SB-446	1	N06625	Annealed
33	60Ni-22Cr-9Mo-3.5Cb	Forgings	SB-564	...	N06625	Annealed
34	60Ni-22Cr-9Mo-3.5Cb	Plate, sheet, strip	SB-443	1	N06625	Annealed
35	60Ni-22Cr-9Mo-3.5Cb	Plate, sheet, strip	SB-443	1	N06625	Annealed
36	60Ni-22Cr-9Mo-3.5Cb	Smls. pipe	SB-444	1	N06625	Annealed
37	60Ni-22Cr-9Mo-3.5Cb	Bar	SB-446	1	N06625	Annealed
38	60Ni-22Cr-9Mo-3.5Cb	Forgings	SB-564	...	N06625	Annealed
39	60Ni-22Cr-9Mo-3.5Cb	Wld. tube	SB-704	...	N06625	Annealed
40	60Ni-22Cr-9Mo-3.5Cb	Wld. pipe	SB-705	1	N06625	Annealed

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	≤ 5	43	80	35	1200	800 (Cl. 3 only)	1200	650	NFN-4	T11
2	≤ 5	43	80	35	1200	800	1200	650	NFN-4	G5, T11
3	...	43	80	35	NP	NP	1200	650	NFN-4	G14, T11
4	...	43	80	35	NP	NP	1200	650	NFN-4	G5, G14, T11
5	...	43	85	35	1200	800 (Cl. 3 only)	1200	650	NFN-4	T13
6	...	43	85	35	1200	800 (Cl. 3 only)	1200	650	NFN-4	G5, T12
7	...	43	85	35	1200	800 (Cl. 3 only)	1200	650	NFN-4	G20, T13
8	...	43	85	35	1200	800 (Cl. 3 only)	1200	650	NFN-4	G5, G20, T12
9	≤ 3 O.D.	43	80	30	1650	NP	1650	NP	NFN-4	G4, T14
10	≤ 3 O.D.	43	80	30	1650	NP	1650	NP	NFN-4	G4, G5, T13
11	...	43	80	30	1650	NP	1650	NP	NFN-4	G4, T14
12	...	43	80	30	1650	NP	1650	NP	NFN-4	G4, G5, T13
13	...	43	80	30	1650	NP	1650	NP	NFN-4	G4, T14
14	...	43	80	30	1650	NP	1650	NP	NFN-4	G4, G5, T13
15	...	43	80	30	1650	NP	1650	NP	NFN-4	G4, T14
16	...	43	80	30	1650	NP	1650	NP	NFN-4	G4, G5, T13
17	...	43	95	35	1650	NP	1800	NP	NFN-4	G4, T18
18	...	43	95	35	1650	NP	1800	NP	NFN-4	G4, G5, T17
19	...	43	95	35	1650	NP	1800	NP	NFN-4	G4, T18
20	...	43	95	35	1650	NP	1800	NP	NFN-4	G4, G5, T17
21	...	43	95	35	1650	NP	1800	NP	NFN-4	G4, T18
22	...	43	95	35	1650	NP	1800	NP	NFN-4	G4, G5, T17
23	...	43	95	35	1650	NP	1800	NP	NFN-4	G4, T18
24	...	43	95	35	1650	NP	1800	NP	NFN-4	G4, G5, T17
25	...	43	100	40	1100	NP	1600	650	NFN-22	G4, G5, G23, T17, W13
26	...	43	100	40	1100	NP	1600	650	NFN-22	G4, G23, T18, W13
27	...	43	100	40	1100	NP	1600	650	NFN-22	G4, G5, G23, T17, W13
28	...	43	100	40	1100	NP	1600	650	NFN-22	G4, G23, T18, W13
29	...	43	100	40	1100	NP	1600	650	NFN-22	G4, G5, G23, T17, W13
30	...	43	100	40	1100	NP	1600	650	NFN-22	G4, G23, T18, W13
31	...	43	110	50	1100	NP	1200	650	NFN-17	G23, T16, W12
32	4 < t ≤ 10	43	110	50	1100	800	1200	650	NFN-17	G23, T16
33	4 < t ≤ 10	43	110	50	1100	800	1200	650	NFN-17	G23, T16
34	...	43	110	55	1100	800	1200	650	NFN-17	G23, T16
35	...	43	120	60	1100	NP	1200	650	NFN-17	G22, G23, T16
36	...	43	120	60	1100	800	1200	650	NFN-17	G23, T16
37	≤ 4	43	120	60	1100	800	1200	650	NFN-17	G22, G23, T16
38	≤ 4	43	120	60	1100	800	1200	650	NFN-17	G22, G23, T16
39	...	43	120	60	1100	800	1200	650	NFN-17	G14, G23, T16
40	...	43	120	60	1100	NP	1200	650	NFN-17	G14, G23, T16

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	22.9	...	21.3	...	20.8	...	20.5	...	20.2	...	19.9	19.8	19.6	19.4	19.1	18.7	16.0	10.6
2	22.9	...	22.9	...	22.9	...	22.9	...	22.9	...	22.9	22.9	22.9	22.9	22.9	22.4	16.0	10.6
3	19.4	...	18.1	...	17.7	...	17.4	...	17.2	...	16.9	16.8	16.7	16.5	16.2	15.9	13.6	9.0
4	19.4	...	19.4	...	19.4	...	19.4	...	19.4	...	19.4	19.4	19.4	19.4	19.4	19.0	13.6	9.0
5	23.3	...	22.1	...	21.5	...	21.3	...	21.3	...	21.2	21.1	21.0	20.8	20.5	20.1	19.7	19.3
6	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	23.3	23.3	23.3	23.3	23.3	23.3	23.3	20.4
7	23.3	...	22.1	...	21.5	...	21.3	...	21.3	...	21.2	21.1	21.0	20.8	20.5	20.1	19.7	19.3
8	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	23.3	23.3	23.3	23.3	23.3	23.3	23.3	20.4
9	20.0	...	17.8	...	16.6	...	15.5	...	14.7	...	14.2	14.0	13.9	13.8	13.8	13.8	13.8	13.7
10	20.0	...	20.0	...	20.0	...	20.0	...	19.9	...	19.2	19.0	18.8	18.7	18.6	18.6	18.6	18.6
11	20.0	...	17.8	...	16.6	...	15.5	...	14.7	...	14.2	14.0	13.9	13.8	13.8	13.8	13.8	13.7
12	20.0	...	20.0	...	20.0	...	20.0	...	19.9	...	19.2	19.0	18.8	18.7	18.6	18.6	18.6	18.6
13	20.0	...	17.8	...	16.6	...	15.5	...	14.7	...	14.2	14.0	13.9	13.8	13.8	13.8	13.8	13.7
14	20.0	...	20.0	...	20.0	...	20.0	...	19.9	...	19.2	19.0	18.8	18.7	18.6	18.6	18.6	18.6
15	20.0	...	17.8	...	16.6	...	15.5	...	14.7	...	14.2	14.0	13.9	13.8	13.8	13.8	13.8	13.7
16	20.0	...	20.0	...	20.0	...	20.0	...	19.9	...	19.2	19.0	18.8	18.7	18.6	18.6	18.6	18.6
(10) 17	23.3	...	20.8	...	19.2	...	18.1	...	17.2	...	16.6	16.4	16.2	16.0	15.9	15.8	15.7	15.6
(10) 18	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	22.5	22.1	21.9	21.7	21.5	21.3	21.2	21.0
(10) 19	23.3	...	20.8	...	19.2	...	18.1	...	17.2	...	16.6	16.4	16.2	16.0	15.9	15.8	15.7	15.6
(10) 20	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	22.5	22.1	21.9	21.7	21.5	21.3	21.2	21.0
(10) 21	23.3	...	20.8	...	19.2	...	18.1	...	17.2	...	16.6	16.4	16.2	16.0	15.9	15.8	15.7	15.6
(10) 22	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	22.5	22.1	21.9	21.7	21.5	21.3	21.2	21.0
(10) 23	23.3	...	20.8	...	19.2	...	18.1	...	17.2	...	16.6	16.4	16.2	16.0	15.9	15.8	15.7	15.6
(10) 24	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	22.5	22.1	21.9	21.7	21.5	21.3	21.2	21.0
25	26.7	...	26.7	...	26.7	...	26.7	...	26.7	...	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.6
26	26.7	...	24.6	...	23.4	...	22.4	...	21.7	...	21.0	20.8	20.5	20.3	20.1	20.0	19.8	19.7
27	26.7	...	26.7	...	26.7	...	26.7	...	26.7	...	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.6
28	26.7	...	24.6	...	23.4	...	22.4	...	21.7	...	21.0	20.8	20.5	20.3	20.1	20.0	19.8	19.7
29	26.7	...	26.7	...	26.7	...	26.7	...	26.7	...	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.6
30	26.7	...	24.6	...	23.4	...	22.4	...	21.7	...	21.0	20.8	20.5	20.3	20.1	20.0	19.8	19.7
31	31.4	...	31.4	...	31.4	...	30.8	...	30.2	...	29.7	29.4	29.1	28.9	28.6	28.3	28.0	27.7
32	31.4	...	31.4	...	31.4	...	30.8	...	30.2	...	29.7	29.4	29.1	28.9	28.6	28.3	28.0	27.7
33	31.4	...	31.4	...	31.4	...	30.8	...	30.2	...	29.7	29.4	29.1	28.9	28.6	28.3	28.0	27.7
34	31.4	...	31.4	...	31.4	...	30.8	...	30.2	...	29.7	29.4	29.1	28.9	28.6	28.3	28.0	27.7
35	34.3	...	34.3	...	34.3	...	33.6	...	32.9	...	32.4	32.1	31.8	31.5	31.2	30.9	30.6	30.3
36	34.3	...	34.3	...	34.3	...	33.6	...	32.9	...	32.4	32.1	31.8	31.5	31.2	30.9	30.6	30.3
37	34.3	...	34.3	...	34.3	...	33.6	...	32.9	...	32.4	32.1	31.8	31.5	31.2	30.9	30.6	30.3
38	34.3	...	34.3	...	34.3	...	33.6	...	32.9	...	32.4	32.1	31.8	31.5	31.2	30.9	30.6	30.3
39	29.1	...	29.1	...	29.1	...	28.5	...	28.0	...	27.5	27.3	27.0	26.8	26.5	26.3	26.0	25.7
40	29.1	...	29.1	...	29.1	...	28.5	...	28.0	...	27.5	27.3	27.0	26.8	26.5	26.3	26.0	25.7

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...	...	...	...
2	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...	...	...	...
3	6.0	3.8	2.6	1.9	1.7	...	...	...	...	...	...	...	...	...	...	...	...
4	6.0	3.8	2.6	1.9	1.7	...	...	...	...	...	...	...	...	...	...	...	...
5	14.5	10.3	7.2	5.8	5.5	...	...	...	...	...	...	...	...	...	...	...	...
6	14.5	10.3	7.2	5.8	5.5	...	...	...	...	...	...	...	...	...	...	...	...
7	14.5	10.3	7.2	5.8	5.5	...	...	...	...	...	...	...	...	...	...	...	...
8	14.5	10.3	7.2	5.8	5.5	...	...	...	...	...	...	...	...	...	...	...	...
9	13.7	13.6	10.4	8.0	6.1	4.6	3.6	2.8	2.1	1.7	1.3	1.1	0.87	0.71	...	...	...
10	17.6	13.6	10.4	8.0	6.1	4.6	3.6	2.8	2.1	1.7	1.3	1.1	0.87	0.71	...	...	...
11	13.7	13.6	10.4	8.0	6.1	4.6	3.6	2.8	2.1	1.7	1.3	1.1	0.87	0.71	...	...	...
12	17.6	13.6	10.4	8.0	6.1	4.6	3.6	2.8	2.1	1.7	1.3	1.1	0.87	0.71	...	...	...
13	13.7	13.6	10.4	8.0	6.1	4.6	3.6	2.8	2.1	1.7	1.3	1.1	0.87	0.71	...	...	...
14	17.6	13.6	10.4	8.0	6.1	4.6	3.6	2.8	2.1	1.7	1.3	1.1	0.87	0.71	...	...	...
15	13.7	13.6	10.4	8.0	6.1	4.6	3.6	2.8	2.1	1.7	1.3	1.1	0.87	0.71	...	...	...
16	17.6	13.6	10.4	8.0	6.1	4.6	3.6	2.8	2.1	1.7	1.3	1.1	0.87	0.71	...	...	...
17	15.5	15.4	15.4	15.3	15.3	14.5	11.2	8.7	6.6	5.1	3.9	3.0	2.3	1.8	1.4	1.1	0.73 (10)
18	20.9	20.9	20.8	20.7	18.1	14.5	11.2	8.7	6.6	5.1	3.9	3.0	2.3	1.8	1.4	1.1	0.73 (10)
19	15.5	15.4	15.4	15.3	15.3	14.5	11.2	8.7	6.6	5.1	3.9	3.0	2.3	1.8	1.4	1.1	0.73 (10)
20	20.9	20.9	20.8	20.7	18.1	14.5	11.2	8.7	6.6	5.1	3.9	3.0	2.3	1.8	1.4	1.1	0.73 (10)
21	15.5	15.4	15.4	15.3	15.3	14.5	11.2	8.7	6.6	5.1	3.9	3.0	2.3	1.8	1.4	1.1	0.73 (10)
22	20.9	20.9	20.8	20.7	18.1	14.5	11.2	8.7	6.6	5.1	3.9	3.0	2.3	1.8	1.4	1.1	0.73 (10)
23	15.5	15.4	15.4	15.3	15.3	14.5	11.2	8.7	6.6	5.1	3.9	3.0	2.3	1.8	1.4	1.1	0.73 (10)
24	20.9	20.9	20.8	20.7	18.1	14.5	11.2	8.7	6.6	5.1	3.9	3.0	2.3	1.8	1.4	1.1	0.73 (10)
25	26.4	26.3	26.2	26.1	20.0	15.0	11.6	8.5	6.7	4.9	3.8	2.6	1.9	...	...	...	...
26	19.6	19.5	19.4	19.3	19.3	15.0	11.6	8.5	6.7	4.9	3.8	2.6	1.9	...	...	...	...
27	26.4	26.3	26.2	26.1	20.0	15.0	11.6	8.5	6.7	4.9	3.8	2.6	1.9	...	...	...	...
28	19.6	19.5	19.4	19.3	19.3	15.0	11.6	8.5	6.7	4.9	3.8	2.6	1.9	...	...	...	...
29	26.4	26.3	26.2	26.1	20.0	15.0	11.6	8.5	6.7	4.9	3.8	2.6	1.9	...	...	...	...
30	19.6	19.5	19.4	19.3	19.3	15.0	11.6	8.5	6.7	4.9	3.8	2.6	1.9	...	...	...	...
31	27.4	27.0	26.6	21.0	13.2	...	...	...	...	...	...	...	...	...	...	...	...
32	27.4	27.0	26.6	21.0	13.2	...	...	...	...	...	...	...	...	...	...	...	...
33	27.4	27.0	26.6	21.0	13.2	...	...	...	...	...	...	...	...	...	...	...	...
34	27.4	27.0	26.6	21.0	13.2	...	...	...	...	...	...	...	...	...	...	...	...
35	29.9	29.5	29.0	21.0	13.2	...	...	...	...	...	...	...	...	...	...	...	...
36	29.9	29.5	29.0	21.0	13.2	...	...	...	...	...	...	...	...	...	...	...	...
37	29.9	29.5	29.0	21.0	13.2	...	...	...	...	...	...	...	...	...	...	...	...
38	29.9	29.5	29.0	21.0	13.2	...	...	...	...	...	...	...	...	...	...	...	...
39	25.4	25.1	24.7	17.9	11.2	...	...	...	...	...	...	...	...	...	...	...	...
40	25.4	25.1	24.7	17.9	11.2	...	...	...	...	...	...	...	...	...	...	...	...

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	Ni–Cr–Mo–W	Forged fittings	SB-462	...	N06686	Solution ann.
2	Ni–Cr–Mo–W	Forged fittings	SB-462	...	N06686	Solution ann.
3	Ni–Cr–Mo–W	Forgings	SB-564	...	N06686	Solution ann.
4	Ni–Cr–Mo–W	Forgings	SB-564	...	N06686	Solution ann.
5	Ni–Cr–Mo–W	Rod	SB-574	...	N06686	Solution ann.
6	Ni–Cr–Mo–W	Rod	SB-574	...	N06686	Solution ann.
7	Ni–Cr–Mo–W	Plate, sheet, strip	SB-575	...	N06686	Solution ann.
8	Ni–Cr–Mo–W	Plate, sheet, strip	SB-575	...	N06686	Solution ann.
9	Ni–Cr–Mo–W	Wld. pipe	SB-619	...	N06686	Solution ann.
10	Ni–Cr–Mo–W	Wld. pipe	SB-619	...	N06686	Solution ann.
11	Ni–Cr–Mo–W	Smls. pipe & tube	SB-622	...	N06686	Solution ann.
12	Ni–Cr–Mo–W	Smls. pipe & tube	SB-622	...	N06686	Solution ann.
13	Ni–Cr–Mo–W	Wld. tube	SB-626	...	N06686	Solution ann.
14	Ni–Cr–Mo–W	Wld. tube	SB-626	...	N06686	Solution ann.
15	58Ni–29Cr–9Fe	Bar, rod	SB-166	...	N06690	Annealed
16	58Ni–29Cr–9Fe	Bar, rod	SB-166	...	N06690	Annealed
17	58Ni–29Cr–9Fe	Plate, sheet, strip	SB-168	...	N06690	Annealed
18	58Ni–29Cr–9Fe	Plate, sheet, strip	SB-168	...	N06690	Annealed
19	58Ni–29Cr–9Fe	Smls. pipe & tube	SB-167	...	N06690	Cold drawn/ann.
20	58Ni–29Cr–9Fe	Smls. pipe & tube	SB-167	...	N06690	Cold drawn/ann.
21	49Ni–25Cr–18Fe–6Mo	Plate, sheet, strip	SB-582	...	N06975	Solution ann.
22	49Ni–25Cr–18Fe–6Mo	Plate, sheet, strip	SB-582	...	N06975	Solution ann.
23	49Ni–25Cr–18Fe–6Mo	Wld. pipe	SB-619	...	N06975	Solution ann.
24	49Ni–25Cr–18Fe–6Mo	Wld. pipe	SB-619	...	N06975	Solution ann.
25	49Ni–25Cr–18Fe–6Mo	Smls. pipe & tube	SB-622	...	N06975	Solution ann.
26	49Ni–25Cr–18Fe–6Mo	Smls. pipe & tube	SB-622	...	N06975	Solution ann.
27	49Ni–25Cr–18Fe–6Mo	Wld. tube	SB-626	...	N06975	Solution ann.
28	49Ni–25Cr–18Fe–6Mo	Wld. tube	SB-626	...	N06975	Solution ann.
29	47Ni–22Cr–20Fe–7Mo	Rod	SB-581	...	N06985	Annealed
30	47Ni–22Cr–20Fe–7Mo	Rod	SB-581	...	N06985	Annealed
31	47Ni–22Cr–20Fe–7Mo	Plate, sheet, strip	SB-582	...	N06985	Annealed
32	47Ni–22Cr–20Fe–7Mo	Plate, sheet, strip	SB-582	...	N06985	Annealed
33	47Ni–22Cr–20Fe–7Mo	Smls. & wld. fittings	SB-366	...	N06985	Annealed
34	47Ni–22Cr–20Fe–7Mo	Rod	SB-581	...	N06985	Annealed
35	47Ni–22Cr–20Fe–7Mo	Rod	SB-581	...	N06985	Annealed
36	47Ni–22Cr–20Fe–7Mo	Plate, sheet, strip	SB-582	...	N06985	Annealed
37	47Ni–22Cr–20Fe–7Mo	Plate, sheet, strip	SB-582	...	N06985	Annealed
38	47Ni–22Cr–20Fe–7Mo	Wld. pipe	SB-619	...	N06985	Annealed
39	47Ni–22Cr–20Fe–7Mo	Wld. pipe	SB-619	...	N06985	Annealed
40	47Ni–22Cr–20Fe–7Mo	Smls. pipe & tube	SB-622	...	N06985	Annealed
41	47Ni–22Cr–20Fe–7Mo	Smls. pipe & tube	SB-622	...	N06985	Annealed
42	47Ni–22Cr–20Fe–7Mo	Wld. tube	SB-626	...	N06985	Annealed
43	47Ni–22Cr–20Fe–7Mo	Wld. tube	SB-626	...	N06985	Annealed

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	$\leq 3\frac{1}{2}$	43	100	45	NP	NP	800	NP	NFN-10	G5
2	$\leq 3\frac{1}{2}$	43	100	45	NP	NP	800	NP	NFN-10	...
3	...	43	100	45	NP	NP	800	NP	NFN-10	G5
4	...	43	100	45	NP	NP	800	NP	NFN-10	...
5	$\leq 3\frac{1}{2}$	43	100	45	NP	NP	800	NP	NFN-10	G5
6	$\leq 3\frac{1}{2}$	43	100	45	NP	NP	800	NP	NFN-10	...
7	...	43	100	45	NP	NP	800	NP	NFN-10	G5
8	...	43	100	45	NP	NP	800	NP	NFN-10	...
9	≤ 8	43	100	45	NP	NP	800	NP	NFN-10	G5, G14
10	≤ 8	43	100	45	NP	NP	800	NP	NFN-10	G14
11	...	43	100	45	NP	NP	800	NP	NFN-10	G5
12	...	43	100	45	NP	NP	800	NP	NFN-10	...
13	$\leq 3\frac{1}{2}$	43	100	45	NP	NP	800	NP	NFN-10	G5, G14
14	$\leq 3\frac{1}{2}$	43	100	45	NP	NP	800	NP	NFN-10	G14
15	...	43	85	35	NP	NP	850	650	NFN-4	...
16	...	43	85	35	NP	NP	850	650	NFN-4	G5
17	...	43	85	35	NP	NP	850	650	NFN-4	...
18	...	43	85	35	NP	NP	850	650	NFN-4	G5
19	...	43	85	35	1200	NP	850	650	NFN-4	H3, T12
20	...	43	85	35	1200	NP	850	650	NFN-4	G5, H3, T12
21	...	45	85	32	NP	NP	800	650	NFN-11	...
22	...	45	85	32	NP	NP	800	650	NFN-11	G5
23	...	45	85	32	NP	NP	800	650	NFN-11	G14
24	...	45	85	32	NP	NP	800	650	NFN-11	G5, G14
25	...	45	85	32	NP	NP	800	650	NFN-11	...
26	...	45	85	32	NP	NP	800	650	NFN-11	G5
27	...	45	85	32	NP	NP	800	650	NFN-11	G14
28	...	45	85	32	NP	NP	800	650	NFN-11	G5, G14
29	$> \frac{3}{4}$	45	85	30	NP	NP	800	650	NFN-19	...
30	$> \frac{3}{4}$	45	85	30	NP	NP	800	650	NFN-19	G5
31	$> \frac{3}{4}$	45	85	30	NP	NP	800	650	NFN-19	...
32	$> \frac{3}{4}$	45	85	30	NP	NP	800	650	NFN-19	G5
33	...	45	90	35	NP	NP	800	650	NFN-18	G5, W12
34	$\leq \frac{3}{4}$	45	90	35	NP	NP	800	650	NFN-18	...
35	$\leq \frac{3}{4}$	45	90	35	NP	NP	800	650	NFN-18	G5
36	$\leq \frac{3}{4}$	45	90	35	NP	NP	800	650	NFN-18	...
37	$\leq \frac{3}{4}$	45	90	35	NP	NP	800	650	NFN-18	G5
38	...	45	90	35	NP	NP	800	650	NFN-18	G14
39	...	45	90	35	NP	NP	800	650	NFN-18	G5, G14
40	...	45	90	35	NP	NP	800	650	NFN-18	...
41	...	45	90	35	NP	NP	800	650	NFN-18	G5
42	...	45	90	35	NP	NP	800	650	NFN-18	G14
43	...	45	90	35	NP	NP	800	650	NFN-18	G5, G14

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	28.6	...	28.6	...	28.2	...	27.2	...	26.5	...	25.9	25.7	25.4	25.2	24.9	...	...	...
2	28.6	...	24.9	...	23.4	...	22.5	...	21.6	...	20.8	20.4	20.1	19.9	19.9	...	...	...
3	28.6	...	28.6	...	28.2	...	27.2	...	26.5	...	25.9	25.7	25.4	25.2	24.9	...	...	...
4	28.6	...	24.9	...	23.4	...	22.5	...	21.6	...	20.8	20.4	20.1	19.9	19.9	...	...	...
5	28.6	...	28.6	...	28.2	...	27.2	...	26.5	...	25.9	25.7	25.4	25.2	24.9	...	...	...
6	28.6	...	24.9	...	23.4	...	22.5	...	21.6	...	20.8	20.4	20.1	19.9	19.9	...	...	...
7	28.6	...	28.6	...	28.2	...	27.2	...	26.5	...	25.9	25.7	25.4	25.2	24.9	...	...	...
8	28.6	...	24.9	...	23.4	...	22.5	...	21.6	...	20.8	20.4	20.1	19.9	19.9	...	...	...
9	24.3	...	24.3	...	24.0	...	23.1	...	22.5	...	22.0	21.8	21.6	21.4	21.2	...	...	...
10	24.3	...	21.2	...	19.9	...	19.1	...	18.4	...	17.7	17.3	17.1	16.9	16.9	...	...	...
11	28.6	...	28.6	...	28.2	...	27.2	...	26.5	...	25.9	25.7	25.4	25.2	24.9	...	...	...
12	28.6	...	24.9	...	23.4	...	22.5	...	21.6	...	20.8	20.4	20.1	19.9	19.9	...	...	...
13	24.3	...	24.3	...	24.0	...	23.1	...	22.5	...	22.0	21.8	21.6	21.4	21.2	...	...	...
14	24.3	...	21.2	...	19.9	...	19.1	...	18.4	...	17.7	17.3	17.1	16.9	16.9	...	...	...
15	23.3	...	21.1	...	19.9	...	19.1	...	18.6	...	18.4	18.4	18.4	18.4	18.4	18.4	...	...
16	23.3	...	23.3	...	23.3	...	23.3	...	23.1	...	22.9	22.9	22.8	22.7	22.6	22.5	...	...
17	23.3	...	21.1	...	19.9	...	19.1	...	18.6	...	18.4	18.4	18.4	18.4	18.4	18.4	...	...
18	23.3	...	23.3	...	23.3	...	23.3	...	23.1	...	22.9	22.9	22.8	22.7	22.6	22.5	...	...
19	23.3	...	21.1	...	19.9	...	19.1	...	18.6	...	18.4	18.4	18.4	18.4	18.4	18.4	18.3	16.5
20	23.3	...	23.3	...	23.3	...	23.3	...	23.1	...	22.9	22.9	22.8	22.7	22.6	22.5	22.2	16.5
21	21.3	...	19.5	...	18.5	...	17.5	...	16.5	...	15.6	15.3	15.0	14.8	14.7	...	...	...
22	21.3	...	21.3	...	21.3	...	21.3	...	21.3	...	21.1	20.6	20.2	20.0	19.8	...	...	...
23	18.1	...	16.6	...	15.7	...	14.9	...	14.0	...	13.3	13.0	12.7	12.6	12.5	...	...	...
24	18.1	...	18.1	...	18.1	...	18.1	...	18.1	...	17.9	17.5	17.2	17.0	16.8	...	...	...
25	21.3	...	19.5	...	18.5	...	17.5	...	16.5	...	15.6	15.3	15.0	14.8	14.7	...	...	...
26	21.3	...	21.3	...	21.3	...	21.3	...	21.3	...	21.1	20.6	20.2	20.0	19.8	...	...	...
27	18.1	...	16.6	...	15.7	...	14.9	...	14.0	...	13.3	13.0	12.7	12.6	12.5	...	...	...
28	18.1	...	18.1	...	18.1	...	18.1	...	18.1	...	17.9	17.5	17.2	17.0	16.8	...	...	...
29	20.0	...	17.8	...	16.2	...	14.9	...	13.9	...	13.1	12.8	12.5	12.3	12.0	...	...	...
30	20.0	...	20.0	...	20.0	...	20.0	...	18.8	...	17.7	17.3	16.9	16.5	16.2	...	...	...
31	20.0	...	17.8	...	16.2	...	14.9	...	13.9	...	13.1	12.8	12.5	12.3	12.0	...	...	...
32	20.0	...	20.0	...	20.0	...	20.0	...	18.8	...	17.7	17.3	16.9	16.5	16.2	...	...	...
33	23.3	...	23.3	...	23.3	...	23.3	...	21.9	...	20.7	20.2	19.7	19.3	18.9	...	...	...
34	23.3	...	20.8	...	18.9	...	17.4	...	16.2	...	15.3	14.9	14.6	14.3	14.0	...	...	...
35	23.3	...	23.3	...	23.3	...	23.3	...	21.9	...	20.7	20.2	19.7	19.3	18.9	...	...	...
36	23.3	...	20.8	...	18.9	...	17.4	...	16.2	...	15.3	14.9	14.6	14.3	14.0	...	...	...
37	23.3	...	23.3	...	23.3	...	23.3	...	21.9	...	20.7	20.2	19.7	19.3	18.9	...	...	...
38	19.8	...	17.7	...	16.1	...	14.8	...	13.8	...	13.0	12.7	12.4	12.1	11.9	...	...	...
39	19.8	...	19.8	...	19.8	...	19.8	...	18.6	...	17.6	17.1	16.8	16.4	16.1	...	...	...
40	23.3	...	20.8	...	18.9	...	17.4	...	16.2	...	15.3	14.9	14.6	14.3	14.0	...	...	...
41	23.3	...	23.3	...	23.3	...	23.3	...	21.9	...	20.7	20.2	19.7	19.3	18.9	...	...	...
42	19.8	...	17.7	...	16.1	...	14.8	...	13.8	...	13.0	12.7	12.4	12.1	11.9	...	...	...
43	19.8	...	19.8	...	19.8	...	19.8	...	18.6	...	17.6	17.1	16.8	16.4	16.1	...	...	...

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1
2
3
4
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15
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19	11.6	9.0	6.5	4.5	3.0
20	11.6	9.0	6.5	4.5	3.0
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	35Ni-35Fe-20Cr-Cb	Forgings	SB-462	...	N08020	Annealed
2	35Ni-35Fe-20Cr-Cb	Forgings	SB-462	...	N08020	Annealed
3	35Ni-35Fe-20Cr-Cb	Plate	SB-463	...	N08020	Annealed
4	35Ni-35Fe-20Cr-Cb	Plate	SB-463	...	N08020	Annealed
5	35Ni-35Fe-20Cr-Cb	Bar	SB-473	...	N08020	Annealed
6	35Ni-35Fe-20Cr-Cb	Bar	SB-473	...	N08020	Annealed
7	35Ni-35Fe-20Cr-Cb	Smls. pipe & tube	SB-729	...	N08020	Annealed
8	35Ni-35Fe-20Cr-Cb	Smls. pipe & tube	SB-729	...	N08020	Annealed
9	35Ni-35Fe-20Cr-Cb	Wld. pipe	SB-464	...	N08020	Wld. ann.
10	35Ni-35Fe-20Cr-Cb	Wld. pipe	SB-464	...	N08020	Wld. ann.
11	35Ni-35Fe-20Cr-Cb	Wld. pipe	SB-464	...	N08020	Wld. ann.
12	35Ni-35Fe-20Cr-Cb	Wld. tube	SB-468	...	N08020	Wld. ann.
13	35Ni-35Fe-20Cr-Cb	Wld. tube	SB-468	...	N08020	Wld. ann.
14	35Ni-35Fe-20Cr-Cb	Wld. tube	SB-468	...	N08020	Wld. ann.
15	35Ni-35Fe-20Cr-Cb	Smls. & wld. fittings	SB-366	...	N08020	Annealed
16	37Ni-33Fe-23Cr-4Mo-Cu	Plate, sheet, strip	SB-463	...	N08024	Annealed
17	37Ni-33Fe-23Cr-4Mo-Cu	Plate, sheet, strip	SB-463	...	N08024	Annealed
18	37Ni-33Fe-23Cr-4Mo-Cu	Wld. pipe	SB-464	...	N08024	Wld. ann.
19	37Ni-33Fe-23Cr-4Mo-Cu	Wld. pipe	SB-464	...	N08024	Wld. ann.
20	37Ni-33Fe-23Cr-4Mo-Cu	Wld. tube	SB-468	...	N08024	Wld. ann.
21	37Ni-33Fe-23Cr-4Mo-Cu	Wld. tube	SB-468	...	N08024	Wld. ann.
22	35Ni-30Fe-24Cr-6Mo-Cu	Plate, sheet, strip	SB-463	...	N08026	Annealed
23	35Ni-30Fe-24Cr-6Mo-Cu	Plate, sheet, strip	SB-463	...	N08026	Annealed
24	35Ni-30Fe-24Cr-6Mo-Cu	Wld. pipe	SB-464	...	N08026	Wld. ann.
25	35Ni-30Fe-24Cr-6Mo-Cu	Wld. pipe	SB-464	...	N08026	Wld. ann.
26	35Ni-30Fe-24Cr-6Mo-Cu	Wld. tube	SB-468	...	N08026	Wld. ann.
27	35Ni-30Fe-24Cr-6Mo-Cu	Wld. tube	SB-468	...	N08026	Wld. ann.
28	31Ni-31Fe-29Cr-Mo	Smls. tube	SB-668	...	N08028	Annealed
29	31Ni-31Fe-29Cr-Mo	Smls. tube	SB-668	...	N08028	Annealed
30	31Ni-31Fe-29Cr-Mo	Plate, sheet, strip	SB-709	...	N08028	Annealed
31	31Ni-31Fe-29Cr-Mo	Plate, sheet, strip	SB-709	...	N08028	Annealed
32	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Smls. & wld. fittings	SB-366	...	N08031	Solution ann.
33	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Forged fittings	SB-462	...	N08031	Solution ann.
34	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Forged fittings	SB-462	...	N08031	Solution ann.
35	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Forgings	SB-564	...	N08031	Solution ann.
36	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Forgings	SB-564	...	N08031	Solution ann.
37	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Rod	SB-581	...	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	Wld. pipe	SB-619	...	N08031	Solution ann.
41	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Smls. pipe & tube	SB-622	...	N08031	Solution ann.
42	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Smls. pipe & tube	SB-622	...	N08031	Solution ann.

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	45	80	35	NP	800	800	650	NFN-12	G5
2	...	45	80	35	NP	NP	800	650	NFN-12	...
3	...	45	80	35	NP	NP	800	650	NFN-12	...
4	...	45	80	35	NP	800	800	650	NFN-12	G5
5	...	45	80	35	NP	800	800	650	NFN-12	G5
6	...	45	80	35	NP	NP	800	650	NFN-12	...
7	...	45	80	35	NP	NP	800	650	NFN-12	...
8	...	45	80	35	NP	NP	800	650	NFN-12	G5
9	...	45	80	35	NP	800	NP	NP	NFN-12	G5, W5
10	...	45	80	35	NP	NP	800	650	NFN-12	G14
11	...	45	80	35	NP	NP	800	650	NFN-12	G5, G14
12	...	45	80	35	NP	800	NP	NP	NFN-12	G5, W5
13	...	45	80	35	NP	NP	800	650	NFN-12	G14
14	...	45	80	35	NP	NP	800	650	NFN-12	G5, G14
15	...	45	85	40	NP	NP	800	650	NFN-12	G5, W12
16	...	45	80	35	NP	NP	800	650	NFN-13	...
17	...	45	80	35	NP	NP	800	650	NFN-13	G5
18	...	45	80	35	NP	NP	800	650	NFN-13	G14
19	...	45	80	35	NP	NP	800	650	NFN-13	G5, G14
20	...	45	80	35	NP	NP	800	650	NFN-13	G14
21	...	45	80	35	NP	NP	800	650	NFN-13	G5, G14
22	...	45	80	35	NP	NP	800	650	NFN-13	...
23	...	45	80	35	NP	NP	800	650	NFN-13	G5
24	...	45	80	35	NP	NP	800	650	NFN-13	G14
25	...	45	80	35	NP	NP	800	650	NFN-13	G5, G14
26	...	45	80	35	NP	NP	800	650	NFN-13	G14
27	...	45	80	35	NP	NP	800	650	NFN-13	G5, G14
28	...	45	73	31	NP	600	850	650	NFN-13	...
29	...	45	73	31	NP	600	850	650	NFN-13	G5
30	...	45	73	31	NP	NP	850	650	NFN-13	...
31	...	45	73	31	NP	NP	850	650	NFN-13	G5
32	...	45	94	40	NP	NP	800	NP	NFN-11	G5, W12
33	...	45	94	40	NP	NP	800	NP	NFN-11	...
34	...	45	94	40	NP	NP	800	NP	NFN-11	G5
35	...	45	94	40	NP	NP	800	NP	NFN-11	...
36	...	45	94	40	NP	NP	800	NP	NFN-11	G5
37	...	45	94	40	NP	NP	800	NP	NFN-11	...
38	...	45	94	40	NP	NP	800	NP	NFN-11	G5
39	...	45	94	40	NP	NP	800	NP	NFN-11	G14
40	...	45	94	40	NP	NP	800	NP	NFN-11	G5, G14
41	...	45	94	40	NP	NP	800	NP	NFN-11	...
42	...	45	94	40	NP	NP	800	NP	NFN-11	G5

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	22.9	...	22.9	...	22.6	...	22.2	...	22.1	...	22.1	22.0	21.9	21.8	21.8	...	...	...
2	22.9	...	20.6	...	19.7	...	18.9	...	18.2	...	17.7	17.5	17.4	17.2	16.8	...	...	...
3	22.9	...	20.6	...	19.7	...	18.9	...	18.2	...	17.7	17.5	17.4	17.2	16.8	...	...	...
4	22.9	...	22.9	...	22.6	...	22.2	...	22.1	...	22.1	22.0	21.9	21.8	21.8	...	...	...
5	22.9	...	22.9	...	22.6	...	22.2	...	22.1	...	22.1	22.0	21.9	21.8	21.8	...	...	...
6	22.9	...	20.6	...	19.7	...	18.9	...	18.2	...	17.7	17.5	17.4	17.2	16.8	...	...	...
7	22.9	...	20.6	...	19.7	...	18.9	...	18.2	...	17.7	17.5	17.4	17.2	16.8	...	...	...
8	22.9	...	22.9	...	22.6	...	22.2	...	22.1	...	22.1	22.0	21.9	21.8	21.8	...	...	...
9	22.9	...	22.9	...	22.6	...	22.2	...	22.1	...	22.1	22.0	21.9	21.8	21.8	...	...	...
10	19.4	...	17.5	...	16.7	...	16.1	...	15.5	...	15.0	14.9	14.8	14.6	14.3	...	...	...
11	19.4	...	19.4	...	19.2	...	18.8	...	18.8	...	18.8	18.7	18.6	18.5	18.5	...	...	...
12	22.9	...	22.9	...	22.6	...	22.2	...	22.1	...	22.1	22.0	21.9	21.8	21.8	...	...	...
13	19.4	...	17.5	...	16.7	...	16.1	...	15.5	...	15.0	14.9	14.8	14.6	14.3	...	...	...
14	19.4	...	19.4	...	19.2	...	18.8	...	18.8	...	18.8	18.7	18.6	18.5	18.5	...	...	...
15	22.9	...	22.9	...	22.6	...	22.2	...	22.1	...	22.1	22.0	21.9	21.8	21.8	...	...	...
16	22.9	...	20.6	...	19.2	...	18.1	...	17.0	...	16.0	15.6	15.2	14.8	14.6	...	...	...
17	22.9	...	22.9	...	22.6	...	21.9	...	21.4	...	20.8	20.6	20.4	20.0	19.6	...	...	...
18	19.4	...	17.5	...	16.3	...	15.4	...	14.5	...	13.6	13.2	12.9	12.6	12.4	...	...	...
19	19.4	...	19.4	...	19.2	...	18.6	...	18.2	...	17.7	17.5	17.3	17.0	16.7	...	...	...
20	19.4	...	17.5	...	16.3	...	15.4	...	14.5	...	13.6	13.2	12.9	12.6	12.4	...	...	...
21	19.4	...	19.4	...	19.2	...	18.6	...	18.2	...	17.7	17.5	17.3	17.0	16.7	...	...	...
22	22.9	...	20.7	...	19.0	...	17.5	...	16.3	...	15.3	14.9	14.5	14.2	13.9	...	...	...
23	22.9	...	22.9	...	22.5	...	21.8	...	21.2	...	20.6	20.1	19.6	19.2	18.8	...	...	...
24	19.4	...	17.6	...	16.1	...	14.9	...	13.8	...	13.0	12.7	12.4	12.1	11.9	...	...	...
25	19.4	...	19.4	...	19.1	...	18.5	...	18.0	...	17.5	17.1	16.7	16.3	16.0	...	...	...
26	19.4	...	17.6	...	16.1	...	14.9	...	13.8	...	13.0	12.7	12.4	12.1	11.9	...	...	...
27	19.4	...	19.4	...	19.1	...	18.5	...	18.0	...	17.5	17.1	16.7	16.3	16.0	...	...	...
28	20.7	...	18.9	...	17.7	...	16.5	...	15.4	...	14.4	14.0	13.6	13.1	12.8	12.4	...	...
29	20.7	...	20.7	...	20.1	...	19.3	...	18.7	...	18.2	18.0	17.8	17.5	17.2	16.7	...	...
30	20.7	...	18.9	...	17.7	...	16.5	...	15.4	...	14.4	14.0	13.6	13.1	12.8	12.4	...	...
31	20.7	...	20.7	...	20.1	...	19.3	...	18.7	...	18.2	18.0	17.8	17.5	17.2	16.7	...	...
32	26.7	...	26.7	...	25.8	...	24.5	...	23.3	...	22.2	21.7	21.3	20.9	20.5	...	...	...
33	26.7	...	22.0	...	19.8	...	18.3	...	17.3	...	16.4	16.1	15.8	15.5	15.2	...	...	...
34	26.7	...	26.7	...	25.8	...	24.5	...	23.3	...	22.2	21.7	21.3	20.9	20.5	...	...	...
35	26.7	...	22.0	...	19.8	...	18.3	...	17.3	...	16.4	16.1	15.8	15.5	15.2	...	...	...
36	26.7	...	26.7	...	25.8	...	24.5	...	23.3	...	22.2	21.7	21.3	20.9	20.5	...	...	...
37	26.7	...	22.0	...	19.8	...	18.3	...	17.3	...	16.4	16.1	15.8	15.5	15.2	...	...	...
38	26.7	...	26.7	...	25.8	...	24.5	...	23.3	...	22.2	21.7	21.3	20.9	20.5	...	...	...
39	22.7	...	18.7	...	16.8	...	15.6	...	14.7	...	13.9	13.7	13.4	13.2	12.9	...	...	...
40	22.7	...	22.7	...	21.9	...	20.8	...	19.8	...	18.9	18.4	18.1	17.8	17.4	...	...	...
41	26.7	...	22.0	...	19.8	...	18.3	...	17.3	...	16.4	16.1	15.8	15.5	15.2	...	...	...
42	26.7	...	26.7	...	25.8	...	24.5	...	23.3	...	22.2	21.7	21.3	20.9	20.5	...	...	...

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1
2
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TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Plate, sheet, strip	SB-625	...	N08031	Solution ann.
2	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Plate, sheet, strip	SB-625	...	N08031	Solution ann.
3	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Wld. tube	SB-626	...	N08031	Solution ann.
4	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Wld. tube	SB-626	...	N08031	Solution ann.
5	37Ni-33Fe-25Cr	Condenser tube	SB-163	...	N08120	Solution ann.
6	37Ni-33Fe-25Cr	Condenser tube	SB-163	...	N08120	Solution ann.
7	37Ni-33Fe-25Cr	Smls. & wld. fittings	SB-366	...	N08120	Solution ann.
8	37Ni-33Fe-25Cr	Smls. pipe & tube	SB-407	...	N08120	Solution ann.
9	37Ni-33Fe-25Cr	Smls. pipe & tube	SB-407	...	N08120	Solution ann.
10	37Ni-33Fe-25Cr	Bar, rod	SB-408	...	N08120	Solution ann.
11	37Ni-33Fe-25Cr	Bar, rod	SB-408	...	N08120	Solution ann.
12	37Ni-33Fe-25Cr	Plate, sheet, strip	SB-409	...	N08120	Solution ann.
13	37Ni-33Fe-25Cr	Plate, sheet, strip	SB-409	...	N08120	Solution ann.
14	37Ni-33Fe-25Cr	Wld. pipe	SB-514	...	N08120	Solution ann.
15	37Ni-33Fe-25Cr	Wld. pipe	SB-514	...	N08120	Solution ann.
16	37Ni-33Fe-25Cr	Wld. tube	SB-515	...	N08120	Solution ann.
17	37Ni-33Fe-25Cr	Wld. tube	SB-515	...	N08120	Solution ann.
18	37Ni-33Fe-25Cr	Forgings	SB-564	...	N08120	Solution ann.
19	37Ni-33Fe-25Cr	Forgings	SB-564	...	N08120	Solution ann.
20	26Ni-43Fe-22Cr-5Mo	Wld. pipe	SB-619	...	N08320	Solution ann.
21	26Ni-43Fe-22Cr-5Mo	Wld. pipe	SB-619	...	N08320	Solution ann.
22	26Ni-43Fe-22Cr-5Mo	Plate, sheet, strip	SB-620	...	N08320	Solution ann.
23	26Ni-43Fe-22Cr-5Mo	Plate, sheet, strip	SB-620	...	N08320	Solution ann.
24	26Ni-43Fe-22Cr-5Mo	Rod	SB-621	...	N08320	Solution ann.
25	26Ni-43Fe-22Cr-5Mo	Rod	SB-621	...	N08320	Solution ann.
26	26Ni-43Fe-22Cr-5Mo	Smls. pipe & tube	SB-622	...	N08320	Solution ann.
27	26Ni-43Fe-22Cr-5Mo	Smls. pipe & tube	SB-622	...	N08320	Solution ann.
28	26Ni-43Fe-22Cr-5Mo	Wld. tube	SB-626	...	N08320	Solution ann.
29	26Ni-43Fe-22Cr-5Mo	Wld. tube	SB-626	...	N08320	Solution ann.
30	35Ni-19Cr-1 $\frac{1}{4}$ Si	Bar	SB-511	...	N08330	...
31	35Ni-19Cr-1 $\frac{1}{4}$ Si	Bar	SB-511	...	N08330	...
32	35Ni-19Cr-1 $\frac{1}{4}$ Si	Bar	SB-511	...	N08330	...
33	35Ni-19Cr-1 $\frac{1}{4}$ Si	Bar	SB-511	...	N08330	...
34	35Ni-19Cr-1 $\frac{1}{4}$ Si	Pipe	SB-535	...	N08330	...
35	35Ni-19Cr-1 $\frac{1}{4}$ Si	Pipe	SB-535	...	N08330	...
36	35Ni-19Cr-1 $\frac{1}{4}$ Si	Plate	SB-536	...	N08330	...
37	35Ni-19Cr-1 $\frac{1}{4}$ Si	Plate	SB-536	...	N08330	...
38	35Ni-19Cr-1 $\frac{1}{4}$ Si	Smls. & wld. fittings	SB-366	...	N08330	Annealed
39	35Ni-19Cr-1 $\frac{1}{4}$ Si	Smls. & wld. pipe	SB-535	...	N08330	Annealed
40	35Ni-19Cr-1 $\frac{1}{4}$ Si	Smls. & wld. pipe	SB-535	...	N08330	Annealed
41	35Ni-19Cr-1 $\frac{1}{4}$ Si	Plate, sheet, strip	SB-536	...	N08330	Annealed
42	35Ni-19Cr-1 $\frac{1}{4}$ Si	Plate, sheet, strip	SB-536	...	N08330	Annealed
43	35Ni-19Cr-1 $\frac{1}{4}$ Si	Wld. pipe	SB-710	...	N08330	Annealed
44	35Ni-19Cr-1 $\frac{1}{4}$ Si	Wld. pipe	SB-710	...	N08330	Annealed

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	45	94	40	NP	NP	800	NP	NFN-11	...
2	...	45	94	40	NP	NP	800	NP	NFN-11	G5
3	...	45	94	40	NP	NP	800	NP	NFN-11	G14
4	...	45	94	40	NP	NP	800	NP	NFN-11	G5, G14
5	...	45	90	40	NP	NP	1650	NP	NFN-9	G4, G14, T16
6	...	45	90	40	NP	NP	1650	NP	NFN-9	G4, G5, G14, T15
7	...	45	90	40	NP	NP	1650	NP	NFN-9	G4, G5, T15, W12
8	...	45	90	40	NP	NP	1650	NP	NFN-9	G4, T16
9	...	45	90	40	NP	NP	1650	NP	NFN-9	G4, G5, T15
10	...	45	90	40	NP	NP	1650	NP	NFN-9	G4, T16
11	...	45	90	40	NP	NP	1650	NP	NFN-9	G4, G5, T15
12	...	45	90	40	NP	NP	1650	NP	NFN-9	G4, T16
13	...	45	90	40	NP	NP	1650	NP	NFN-9	G4, G5, T15
14	...	45	90	40	NP	NP	1650	NP	NFN-9	G4, G14, T16
15	...	45	90	40	NP	NP	1650	NP	NFN-9	G4, G5, G14, T15
16	...	45	90	40	NP	NP	1650	NP	NFN-9	G4, G14, T16
17	...	45	90	40	NP	NP	1650	NP	NFN-9	G4, G5, G14, T15
18	...	45	90	40	NP	NP	1650	NP	NFN-9	G4, T16
19	...	45	90	40	NP	NP	1650	NP	NFN-9	G4, G5, T15
20	...	45	75	28	NP	NP	800	650	NFN-13	G14
21	...	45	75	28	NP	NP	800	650	NFN-13	G5, G14
22	...	45	75	28	NP	NP	800	650	NFN-13	...
23	...	45	75	28	NP	NP	800	650	NFN-13	G5
24	...	45	75	28	NP	NP	800	650	NFN-13	...
25	...	45	75	28	NP	NP	800	650	NFN-13	G5
26	...	45	75	28	NP	NP	800	650	NFN-13	...
27	...	45	75	28	NP	NP	800	650	NFN-13	G5
28	...	45	75	28	NP	NP	800	650	NFN-13	G14
29	...	45	75	28	NP	NP	800	650	NFN-13	G5, G14
30	...	46	70	30	1500	NP	NP	NP	NFN-13	G2, H2, T14
31	...	46	70	30	1500	NP	NP	NP	NFN-13	G2, G5, H2, T12
32	...	46	70	30	NP	NP	1650	650	NFN-13	G4, H1, T14
33	...	46	70	30	NP	NP	1650	650	NFN-13	G4, G5, H1, T12
34	...	46	70	30	1500	NP	NP	NP	NFN-13	G2, H2, T14
35	...	46	70	30	1500	NP	NP	NP	NFN-13	G2, G5, H2, T12
36	...	46	70	30	1500	NP	NP	NP	NFN-13	G2, H2, T14
37	...	46	70	30	1500	NP	NP	NP	NFN-13	G2, G5, H2, T12
38	...	46	70	30	NP	NP	1650	650	NFN-13	G4, G5, T12, W12
39	...	46	70	30	NP	NP	1500	650	NFN-13	H1, T14, W12
40	...	46	70	30	NP	NP	1500	650	NFN-13	G5, H1, T12, W12
41	...	46	70	30	NP	NP	1650	650	NFN-13	G4, H1, T14
42	...	46	70	30	NP	NP	1650	650	NFN-13	G4, G5, H1, T12
43	...	46	70	30	NP	NP	1650	650	NFN-13	G4, G14, H1, T14
44	...	46	70	30	NP	NP	1650	650	NFN-13	G4, G5, G14, H1, T12

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	26.7	...	22.0	...	19.8	...	18.3	...	17.3	...	16.4	16.1	15.8	15.5	15.2	...	...	...
2	26.7	...	26.7	...	25.8	...	24.5	...	23.3	...	22.2	21.7	21.3	20.9	20.5	...	...	...
3	22.7	...	18.7	...	16.8	...	15.6	...	14.7	...	13.9	13.7	13.4	13.2	12.9	...	...	...
4	22.7	...	22.7	...	21.9	...	20.8	...	19.8	...	18.9	18.4	18.1	17.8	17.4	...	...	...
5	25.7	...	23.5	...	21.6	...	19.9	...	18.6	...	17.7	17.3	17.0	16.8	16.6	16.5	16.4	16.3
6	25.7	...	25.7	...	25.0	...	24.2	...	23.7	...	23.5	23.4	23.0	22.7	22.4	22.3	22.2	22.1
7	25.7	...	25.7	...	25.0	...	24.2	...	23.7	...	23.5	23.4	23.0	22.7	22.4	22.3	22.2	22.1
8	25.7	...	23.5	...	21.6	...	19.9	...	18.6	...	17.7	17.3	17.0	16.8	16.6	16.5	16.4	16.3
9	25.7	...	25.7	...	25.0	...	24.2	...	23.7	...	23.5	23.4	23.0	22.7	22.4	22.3	22.2	22.1
10	25.7	...	23.5	...	21.6	...	19.9	...	18.6	...	17.7	17.3	17.0	16.8	16.6	16.5	16.4	16.3
11	25.7	...	25.7	...	25.0	...	24.2	...	23.7	...	23.5	23.4	23.0	22.7	22.4	22.3	22.2	22.1
12	25.7	...	23.5	...	21.6	...	19.9	...	18.6	...	17.7	17.3	17.0	16.8	16.6	16.5	16.4	16.3
13	25.7	...	25.7	...	25.0	...	24.2	...	23.7	...	23.5	23.4	23.0	22.7	22.4	22.3	22.2	22.1
14	21.8	...	20.0	...	18.4	...	16.9	...	15.8	...	15.0	14.7	14.5	14.3	14.1	14.0	13.9	13.9
15	21.8	...	21.8	...	21.3	...	20.6	...	20.1	...	20.0	19.9	19.6	19.3	19.0	19.0	18.9	18.8
16	21.8	...	20.0	...	18.4	...	16.9	...	15.8	...	15.0	14.7	14.5	14.3	14.1	14.0	13.9	13.9
17	21.8	...	21.8	...	21.3	...	20.6	...	20.1	...	20.0	19.9	19.6	19.3	19.0	19.0	18.9	18.8
18	25.7	...	23.5	...	21.6	...	19.9	...	18.6	...	17.7	17.3	17.0	16.8	16.6	16.5	16.4	16.3
19	25.7	...	25.7	...	25.0	...	24.2	...	23.7	...	23.5	23.4	23.0	22.7	22.4	22.3	22.2	22.1
20	15.9	...	14.7	...	13.9	...	13.1	...	12.3	...	11.7	11.4	11.2	11.0	10.8	...	...	...
21	15.9	...	15.9	...	15.9	...	15.9	...	15.9	...	15.8	15.4	15.1	14.9	14.6	...	...	...
22	18.7	...	17.3	...	16.3	...	15.4	...	14.5	...	13.8	13.5	13.2	13.0	12.7	...	...	...
23	18.7	...	18.7	...	18.7	...	18.7	...	18.7	...	18.6	18.2	17.8	17.5	17.2	...	...	...
24	18.7	...	17.3	...	16.3	...	15.4	...	14.5	...	13.8	13.5	13.2	13.0	12.7	...	...	...
25	18.7	...	18.7	...	18.7	...	18.7	...	18.7	...	18.6	18.2	17.8	17.5	17.2	...	...	...
26	18.7	...	17.3	...	16.3	...	15.4	...	14.5	...	13.8	13.5	13.2	13.0	12.7	...	...	...
27	18.7	...	18.7	...	18.7	...	18.7	...	18.7	...	18.6	18.2	17.8	17.5	17.2	...	...	...
28	15.9	...	14.7	...	13.9	...	13.1	...	12.3	...	11.7	11.4	11.2	11.0	10.8	...	...	...
29	15.9	...	15.9	...	15.9	...	15.9	...	15.9	...	15.8	15.4	15.1	14.9	14.6	...	...	...
30	20.0	...	17.7	...	16.4	...	15.5	...	14.7	...	14.0	13.7	13.4	13.1	12.9	12.6	12.4	12.1
31	20.0	...	20.0	...	20.0	...	19.6	...	19.4	...	18.9	18.5	18.1	17.7	17.4	17.0	16.7	16.1
32	20.0	...	17.7	...	16.4	...	15.5	...	14.7	...	14.0	13.7	13.4	13.1	12.9	12.6	12.4	12.1
33	20.0	...	20.0	...	20.0	...	19.6	...	19.4	...	18.9	18.5	18.1	17.7	17.4	17.0	16.7	16.1
34	20.0	...	17.7	...	16.4	...	15.5	...	14.7	...	14.0	13.7	13.4	13.1	12.9	12.6	12.4	12.1
35	20.0	...	20.0	...	20.0	...	19.6	...	19.4	...	18.9	18.5	18.1	17.7	17.4	17.0	16.7	16.1
36	20.0	...	17.7	...	16.4	...	15.5	...	14.7	...	14.0	13.7	13.4	13.1	12.9	12.6	12.4	12.1
37	20.0	...	20.0	...	20.0	...	19.6	...	19.4	...	18.9	18.5	18.1	17.7	17.4	17.0	16.7	16.1
38	20.0	...	20.0	...	20.0	...	19.6	...	19.4	...	18.9	18.5	18.1	17.7	17.4	17.0	16.7	16.1
39	20.0	...	17.7	...	16.4	...	15.5	...	14.7	...	14.0	13.7	13.4	13.1	12.9	12.6	12.4	12.1
40	20.0	...	20.0	...	20.0	...	19.6	...	19.4	...	18.9	18.5	18.1	17.7	17.4	17.0	16.7	16.1
41	20.0	...	17.7	...	16.4	...	15.5	...	14.7	...	14.0	13.7	13.4	13.1	12.9	12.6	12.4	12.1
42	20.0	...	20.0	...	20.0	...	19.6	...	19.4	...	18.9	18.5	18.1	17.7	17.4	17.0	16.7	16.1
43	17.0	...	15.0	...	14.0	...	13.2	...	12.5	...	11.9	11.7	11.4	11.2	10.9	10.7	10.5	10.3
44	17.0	...	17.0	...	17.0	...	16.7	...	16.5	...	16.1	15.7	15.4	15.1	14.8	14.5	14.2	13.7

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	16.3	16.3	16.2	14.2	12.3	9.4	7.6	6.2	5.0	4.0	3.2	2.6	2.0	1.4	...	...	...
6	22.0	21.9	17.9	14.2	12.3	9.4	7.6	6.2	5.0	4.0	3.2	2.6	2.0	1.4	...	...	...
7	22.0	21.9	17.9	14.2	12.3	9.4	7.6	6.2	5.0	4.0	3.2	2.6	2.0	1.4	...	...	...
8	16.3	16.3	16.2	14.2	12.3	9.4	7.6	6.2	5.0	4.0	3.2	2.6	2.0	1.4	...	...	...
9	22.0	21.9	17.9	14.2	12.3	9.4	7.6	6.2	5.0	4.0	3.2	2.6	2.0	1.4	...	...	...
10	16.3	16.3	16.2	14.2	12.3	9.4	7.6	6.2	5.0	4.0	3.2	2.6	2.0	1.4	...	...	...
11	22.0	21.9	17.9	14.2	12.3	9.4	7.6	6.2	5.0	4.0	3.2	2.6	2.0	1.4	...	...	...
12	16.3	16.3	16.2	14.2	12.3	9.4	7.6	6.2	5.0	4.0	3.2	2.6	2.0	1.4	...	...	...
13	22.0	21.9	17.9	14.2	12.3	9.4	7.6	6.2	5.0	4.0	3.2	2.6	2.0	1.4	...	...	...
14	13.9	13.9	13.8	12.1	10.5	8.0	6.5	5.3	4.3	3.4	2.7	2.2	1.7	1.2	...	...	...
15	18.7	18.6	15.2	12.1	10.5	8.0	6.5	5.3	4.3	3.4	2.7	2.2	1.7	1.2	...	...	...
16	13.9	13.9	13.8	12.1	10.5	8.0	6.5	5.3	4.3	3.4	2.7	2.2	1.7	1.2	...	...	...
17	18.7	18.6	15.2	12.1	10.5	8.0	6.5	5.3	4.3	3.4	2.7	2.2	1.7	1.2	...	...	...
18	16.3	16.3	16.2	14.2	12.3	9.4	7.6	6.2	5.0	4.0	3.2	2.6	2.0	1.4	...	...	...
19	22.0	21.9	17.9	14.2	12.3	9.4	7.6	6.2	5.0	4.0	3.2	2.6	2.0	1.4	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	11.9	10.0	7.8	6.0	4.7	3.8	3.1	2.4	1.8	1.5	1.1	...	...	...	...	...	...
31	12.7	10.0	7.8	6.0	4.7	3.8	3.1	2.4	1.8	1.5	1.1	...	...	...	...	...	...
32	11.9	10.0	7.8	6.0	4.7	3.8	3.1	2.4	1.8	1.5	1.1	0.90	0.68	0.48	...	...	...
33	12.7	10.0	7.8	6.0	4.7	3.8	3.1	2.4	1.8	1.5	1.1	0.90	0.68	0.48	...	...	...
34	11.9	10.0	7.8	6.0	4.7	3.8	3.1	2.4	1.8	1.5	1.1	...	...	...	...	...	...
35	12.7	10.0	7.8	6.0	4.7	3.8	3.1	2.4	1.8	1.5	1.1	...	...	...	...	...	...
36	11.9	10.0	7.8	6.0	4.7	3.8	3.1	2.4	1.8	1.5	1.1	...	...	...	...	...	...
37	12.7	10.0	7.8	6.0	4.7	3.8	3.1	2.4	1.8	1.5	1.1	...	...	...	...	...	...
38	12.7	10.0	7.8	6.0	4.7	3.8	3.1	2.4	1.8	1.5	1.1	0.90	0.68	0.48	...	...	...
39	11.9	10.0	7.8	6.0	4.7	3.8	3.1	2.4	1.8	1.5	1.1	...	...	...	...	...	...
40	12.7	10.0	7.8	6.0	4.7	3.8	3.1	2.4	1.8	1.5	1.1	...	...	...	...	...	...
41	11.9	10.0	7.8	6.0	4.7	3.8	3.1	2.4	1.8	1.5	1.1	0.90	0.68	0.48	...	...	...
42	12.7	10.0	7.8	6.0	4.7	3.8	3.1	2.4	1.8	1.5	1.1	0.90	0.68	0.48	...	...	...
43	10.1	8.5	6.6	5.1	4.0	3.2	2.6	2.0	1.5	1.3	0.94	0.77	0.58	0.41	...	...	...
44	10.8	8.5	6.6	5.1	4.0	3.2	2.6	2.0	1.5	1.3	0.94	0.77	0.58	0.41	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	46Fe-24Ni-21Cr-6Mo-Cu-N	Smls. & wld. fittings	SB-366	...	N08367	Solution ann.
2	46Fe-24Ni-21Cr-6Mo-Cu-N	Forgings	SB-462	...	N08367	Solution ann.
3	46Fe-24Ni-21Cr-6Mo-Cu-N	Forgings	SB-462	...	N08367	Solution ann.
4	46Fe-24Ni-21Cr-6Mo-Cu-N	Forgings	SB-564	...	N08367	Solution ann.
5	46Fe-24Ni-21Cr-6Mo-Cu-N	Forgings	SB-564	...	N08367	Solution ann.
6	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. pipe	SB-675	...	N08367	Solution ann.
7	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. pipe	SB-675	...	N08367	Solution ann.
8	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. tube	SB-676	...	N08367	Solution ann.
9	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. tube	SB-676	...	N08367	Solution ann.
10	46Fe-24Ni-21Cr-6Mo-Cu-N	Plate, sheet, strip	SB-688	...	N08367	Solution ann.
11	46Fe-24Ni-21Cr-6Mo-Cu-N	Plate, sheet, strip	SB-688	...	N08367	Solution ann.
12	46Fe-24Ni-21Cr-6Mo-Cu-N	Smls. pipe & tube	SB-690	...	N08367	Solution ann.
13	46Fe-24Ni-21Cr-6Mo-Cu-N	Smls. pipe & tube	SB-690	...	N08367	Solution ann.
14	46Fe-24Ni-21Cr-6Mo-Cu-N	Bar, rod, wire	SB-691	...	N08367	Solution ann.
15	46Fe-24Ni-21Cr-6Mo-Cu-N	Bar, rod, wire	SB-691	...	N08367	Solution ann.
16	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. pipe	SB-804	...	N08367	Solution ann.
17	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. pipe	SB-804	...	N08367	Solution ann.
18	46Fe-24Ni-21Cr-6Mo-Cu-N	Smls. & wld. fittings	SB-366	...	N08367	Solution ann.
19	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. pipe	SB-675	...	N08367	Solution ann.
20	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. pipe	SB-675	...	N08367	Solution ann.
21	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. tube	SB-676	...	N08367	Solution ann.
22	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. tube	SB-676	...	N08367	Solution ann.
23	46Fe-24Ni-21Cr-6Mo-Cu-N	Plate, sheet, strip	SB-688	...	N08367	Solution ann.
24	46Fe-24Ni-21Cr-6Mo-Cu-N	Plate, sheet, strip	SB-688	...	N08367	Solution ann.
25	46Fe-24Ni-21Cr-6Mo-Cu-N	Smls. pipe & tube	SB-690	...	N08367	Solution ann.
26	46Fe-24Ni-21Cr-6Mo-Cu-N	Smls. pipe & tube	SB-690	...	N08367	Solution ann.
27	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. pipe	SB-804	...	N08367	Solution ann.
28	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. pipe	SB-804	...	N08367	Solution ann.
29	46Fe-24Ni-21Cr-6Mo-Cu-N	Castings	SA-351	CN3MN	J94651	Solution ann.
30	25Ni-47Fe-21Cr-5Mo	Plate, sheet, strip	SB-599	...	N08700	Solution ann.
31	25Ni-47Fe-21Cr-5Mo	Plate, sheet, strip	SB-599	...	N08700	Solution ann.
32	25Ni-47Fe-21Cr-5Mo	Bar, wire	SB-672	...	N08700	Solution ann.
33	32Ni-45Fe-20Cr-Cb	Castings	SA-351	CT15C	...	As cast
34	33Ni-42Fe-21Cr	Smls. tube	SB-163	...	N08800	Annealed
35	33Ni-42Fe-21Cr	Smls. tube	SB-163	...	N08800	Annealed
36	33Ni-42Fe-21Cr	Smls. & wld. fittings	SB-366	...	N08800	Annealed
37	33Ni-42Fe-21Cr	Smls. pipe & tube	SB-407	...	N08800	Annealed
38	33Ni-42Fe-21Cr	Smls. pipe & tube	SB-407	...	N08800	Annealed
39	33Ni-42Fe-21Cr	Bar	SB-408	...	N08800	Annealed
40	33Ni-42Fe-21Cr	Bar	SB-408	...	N08800	Annealed
41	33Ni-42Fe-21Cr	Plate	SB-409	...	N08800	Annealed
42	33Ni-42Fe-21Cr	Plate	SB-409	...	N08800	Annealed

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	> 3/16	45	95	45	NP	NP	800	NP	NFN-12	G5, W12
2	...	45	95	45	NP	800	800	650	NFN-12	...
3	...	45	95	45	NP	800	800	650	NFN-12	G5
4	...	45	95	45	NP	800	800	650	NFN-12	...
5	...	45	95	45	NP	800	800	650	NFN-12	G5
6	> 3/16	45	95	45	NP	800	800	650	NFN-12	G14
7	> 3/16	45	95	45	NP	800	800	650	NFN-12	G5, G14
8	> 3/16	45	95	45	NP	800	800	650	NFN-12	G14
9	> 3/16	45	95	45	NP	800	800	650	NFN-12	G5, G14
10	> 3/16	45	95	45	NP	800	800	650	NFN-12	...
11	> 3/16	45	95	45	NP	800	800	650	NFN-12	G5
12	> 3/16	45	95	45	NP	800	800	650	NFN-12	...
13	> 3/16	45	95	45	NP	800	800	650	NFN-12	G5
14	...	45	95	45	NP	800	800	650	NFN-12	...
15	...	45	95	45	NP	800	800	650	NFN-12	G5
16	> 3/16	45	95	45	NP	800	800	650	NFN-12	G14
17	> 3/16	45	95	45	NP	800	800	650	NFN-12	G5, G14
18	≤ 3/16	45	100	45	NP	NP	800	NP	NFN-12	G5, W12
19	≤ 3/16	45	100	45	NP	800	800	650	NFN-12	G14
20	≤ 3/16	45	100	45	NP	800	800	650	NFN-12	G5, G14
21	≤ 3/16	45	100	45	NP	800	800	650	NFN-12	G14
22	≤ 3/16	45	100	45	NP	800	800	650	NFN-12	G5, G14
23	≤ 3/16	45	100	45	NP	800	800	650	NFN-12	...
24	≤ 3/16	45	100	45	NP	800	800	650	NFN-12	G5
25	≤ 3/16	45	100	45	NP	800	800	650	NFN-12	...
26	≤ 3/16	45	100	45	NP	800	800	650	NFN-12	G5
27	≤ 3/16	45	100	45	NP	800	800	650	NFN-12	G14
28	≤ 3/16	45	100	45	NP	800	800	650	NFN-12	G5, G14
29	...	45	80	38	NP	800	800	650	NFN-12	G15
30	...	45	80	35	NP	NP	650	650	NFN-8	...
31	...	45	80	35	NP	NP	650	650	NFN-8	G5
32	...	45	80	35	NP	NP	650	650	NFN-8	...
33	...	45	63	25	NP	NP	1600	650	NFN-9	G4, G15
34	...	45	75	30	NP	800	1500	NP	NFN-8	G5, T14
35	...	45	75	30	NP	NP	1500	NP	NFN-8	T15
36	...	45	75	30	NP	NP	1500	NP	NFN-8	G5, T14, W12
37	...	45	75	30	1500	800	1500	NP	NFN-8	G5, T14
38	...	45	75	30	1500	NP	1500	NP	NFN-8	T15
39	...	45	75	30	1500	800	1500	NP	NFN-8	G5, T14
40	...	45	75	30	1500	NP	1500	NP	NFN-8	T15
41	...	45	75	30	1500	800	1500	NP	NFN-8	G5, T14
42	...	45	75	30	1500	NP	1500	NP	NFN-8	T15

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	27.1	...	26.2	...	23.8	...	21.9	...	20.5	...	19.4	19.0	18.6	18.3	18.0	...	...	...
2	27.1	...	26.2	...	23.8	...	21.9	...	20.5	...	19.4	19.0	18.6	18.3	18.0	...	...	...
3	27.1	...	27.1	...	25.7	...	24.6	...	23.8	...	23.3	23.1	22.9	22.8	22.6	...	...	...
4	27.1	...	26.2	...	23.8	...	21.9	...	20.5	...	19.4	19.0	18.6	18.3	18.0	...	...	...
5	27.1	...	27.1	...	25.7	...	24.6	...	23.8	...	23.3	23.1	22.9	22.8	22.6	...	...	...
6	23.1	...	22.2	...	20.2	...	18.7	...	17.4	...	16.5	16.1	15.8	15.5	15.3	...	...	...
7	23.1	...	23.1	...	21.8	...	20.9	...	20.2	...	19.8	19.6	19.5	19.4	19.2	...	...	...
8	23.1	...	22.2	...	20.2	...	18.7	...	17.4	...	16.5	16.1	15.8	15.5	15.3	...	...	...
9	23.1	...	23.1	...	21.8	...	20.9	...	20.2	...	19.8	19.6	19.5	19.4	19.2	...	...	...
10	27.1	...	26.2	...	23.8	...	21.9	...	20.5	...	19.4	19.0	18.6	18.3	18.0	...	...	...
11	27.1	...	27.1	...	25.7	...	24.6	...	23.8	...	23.3	23.1	22.9	22.8	22.6	...	...	...
12	27.1	...	26.2	...	23.8	...	21.9	...	20.5	...	19.4	19.0	18.6	18.3	18.0	...	...	...
13	27.1	...	27.1	...	25.7	...	24.6	...	23.8	...	23.3	23.1	22.9	22.8	22.6	...	...	...
14	27.1	...	26.2	...	23.8	...	21.9	...	20.5	...	19.4	19.0	18.6	18.3	18.0	...	...	...
15	27.1	...	27.1	...	25.7	...	24.6	...	23.8	...	23.3	23.1	22.9	22.8	22.6	...	...	...
16	23.1	...	22.2	...	20.2	...	18.7	...	17.4	...	16.5	16.1	15.8	15.5	15.3	...	...	...
17	23.1	...	23.1	...	21.8	...	20.9	...	20.2	...	19.8	19.6	19.5	19.4	19.2	...	...	...
18	28.6	...	26.2	...	23.8	...	21.9	...	20.5	...	19.4	19.0	18.6	18.3	18.0	...	...	...
19	24.3	...	22.2	...	20.2	...	18.7	...	17.4	...	16.5	16.1	15.8	15.5	15.3	...	...	...
20	24.3	...	24.3	...	23.0	...	22.0	...	21.3	...	20.8	20.7	20.5	20.4	20.2	...	...	...
21	24.3	...	22.2	...	20.2	...	18.7	...	17.4	...	16.5	16.1	15.8	15.5	15.3	...	...	...
22	24.3	...	24.3	...	23.0	...	22.0	...	21.3	...	20.8	20.7	20.5	20.4	20.2	...	...	...
23	28.6	...	26.2	...	23.8	...	21.9	...	20.5	...	19.4	19.0	18.6	18.3	18.0	...	...	...
24	28.6	...	28.6	...	27.0	...	25.8	...	25.0	...	24.5	24.3	24.1	24.0	23.8	...	...	...
25	28.6	...	26.2	...	23.8	...	21.9	...	20.5	...	19.4	19.0	18.6	18.3	18.0	...	...	...
26	28.6	...	28.6	...	27.0	...	25.8	...	25.0	...	24.5	24.3	24.1	24.0	23.8	...	...	...
27	24.3	...	22.2	...	20.2	...	18.7	...	17.4	...	16.5	16.1	15.8	15.5	15.3	...	...	...
28	24.3	...	24.3	...	23.0	...	22.0	...	21.3	...	20.8	20.7	20.5	20.4	20.2	...	...	...
29	22.9	...	21.4	...	18.8	...	16.9	...	15.7	...	14.9	14.7	14.5	14.4	14.2	...	...	...
30	22.9	...	21.0	...	19.0	...	17.7	...	17.1	...	16.5	15.8	...	...	...	...	...	...
31	22.9	...	22.9	...	22.6	...	22.0	...	21.5	...	21.4	21.4	...	...	...	...	...	...
32	22.9	...	21.0	...	19.0	...	17.7	...	17.1	...	16.5	15.8	...	...	...	...	...	...
33	16.7	...	15.7	...	15.3	...	14.9	...	14.6	...	14.2	13.9	13.7	13.5	13.3	13.1	12.9	12.7
34	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
35	20.0	...	18.5	...	17.8	...	17.2	...	16.8	...	16.3	16.1	15.9	15.7	15.5	15.3	15.1	14.9
36	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
37	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
38	20.0	...	18.5	...	17.8	...	17.2	...	16.8	...	16.3	16.1	15.9	15.7	15.5	15.3	15.1	14.9
39	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
40	20.0	...	18.5	...	17.8	...	17.2	...	16.8	...	16.3	16.1	15.9	15.7	15.5	15.3	15.1	14.9
41	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
42	20.0	...	18.5	...	17.8	...	17.2	...	16.8	...	16.3	16.1	15.9	15.7	15.5	15.3	15.1	14.9

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
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	11.5	10.1	8.9	7.8	6.7	5.7	4.8	4.0	3.3	2.7	2.2	1.8	1.4	...	...	...	...
34	19.9	17.0	13.0	9.8	6.6	4.2	2.0	1.6	1.1	1.0	0.80	...	...	...	...	...	...
35	14.7	14.5	13.0	9.8	6.6	4.2	2.0	1.6	1.1	1.0	0.80	...	...	...	...	...	...
36	19.9	17.0	13.0	9.8	6.6	4.2	2.0	1.6	1.1	1.0	0.80	...	...	...	...	...	...
37	19.9	17.0	13.0	9.8	6.6	4.2	2.0	1.6	1.1	1.0	0.80	...	...	...	...	...	...
38	14.7	14.5	13.0	9.8	6.6	4.2	2.0	1.6	1.1	1.0	0.80	...	...	...	...	...	...
39	19.9	17.0	13.0	9.8	6.6	4.2	2.0	1.6	1.1	1.0	0.80	...	...	...	...	...	...
40	14.7	14.5	13.0	9.8	6.6	4.2	2.0	1.6	1.1	1.0	0.80	...	...	...	...	...	...
41	19.9	17.0	13.0	9.8	6.6	4.2	2.0	1.6	1.1	1.0	0.80	...	...	...	...	...	...
42	14.7	14.5	13.0	9.8	6.6	4.2	2.0	1.6	1.1	1.0	0.80	...	...	...	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	33Ni-42Fe-21Cr	Wld. pipe	SB-514	...	N08800	Annealed
2	33Ni-42Fe-21Cr	Wld. pipe	SB-514	...	N08800	Annealed
3	33Ni-42Fe-21Cr	Wld. tube	SB-515	...	N08800	Annealed
4	33Ni-42Fe-21Cr	Wld. tube	SB-515	...	N08800	Annealed
5	33Ni-42Fe-21Cr	Forgings	SB-564	...	N08800	Annealed
6	33Ni-42Fe-21Cr	Forgings	SB-564	...	N08800	Annealed
7	32Ni-44Fe-21Cr	Smls. tube	SB-163	...	N08801	Ann./stabilized
8	32Ni-44Fe-21Cr	Smls. tube	SB-163	...	N08801	Ann./stabilized
9	32Ni-44Fe-21Cr	Smls. pipe & tube	SB-407	...	N08801	Ann./stabilized
10	32Ni-44Fe-21Cr	Smls. pipe & tube	SB-407	...	N08801	Ann./stabilized
11	33Ni-42Fe-21Cr	Smls. tube	SB-163	...	N08810	Annealed
12	33Ni-42Fe-21Cr	Smls. tube	SB-163	...	N08810	Sol. treat./ann.
13	33Ni-42Fe-21Cr	Smls. pipe & tube	SB-407	...	N08810	Annealed
14	33Ni-42Fe-21Cr	Smls. pipe & tube	SB-407	...	N08810	Hot fin./ann.
15	33Ni-42Fe-21Cr	Bar	SB-408	...	N08810	Annealed
16	33Ni-42Fe-21Cr	Bar	SB-408	...	N08810	Sol. treat./ann.
17	33Ni-42Fe-21Cr	Plate	SB-409	...	N08810	Annealed
18	33Ni-42Fe-21Cr	Plate	SB-409	...	N08810	Sol. treat./ann.
19	33Ni-42Fe-21Cr	Wld. pipe	SB-514	...	N08810	Annealed
20	33Ni-42Fe-21Cr	Wld. pipe	SB-514	...	N08810	Annealed
21	33Ni-42Fe-21Cr	Wld. tube	SB-515	...	N08810	Annealed
22	33Ni-42Fe-21Cr	Wld. tube	SB-515	...	N08810	Annealed
23	33Ni-42Fe-21Cr	Forgings	SB-564	...	N08810	Annealed
24	33Ni-42Fe-21Cr	Forgings	SB-564	...	N08810	Sol. treat./ann.
25	33Ni-42Fe-21Cr	Smls. tube	SB-163	...	N08811	Annealed
26	33Ni-42Fe-21Cr	Smls. tube	SB-163	...	N08811	Annealed
27	33Ni-42Fe-21Cr	Smls. pipe & tube	SB-407	...	N08811	Annealed
28	33Ni-42Fe-21Cr	Smls. pipe & tube	SB-407	...	N08811	Annealed
29	33Ni-42Fe-21Cr	Bar	SB-408	...	N08811	Annealed
30	33Ni-42Fe-21Cr	Bar	SB-408	...	N08811	Annealed
31	33Ni-42Fe-21Cr	Plate	SB-409	...	N08811	Annealed
32	33Ni-42Fe-21Cr	Plate	SB-409	...	N08811	Annealed
33	33Ni-42Fe-21Cr	Wld. tube	SB-515	...	N08811	Annealed
34	33Ni-42Fe-21Cr	Wld. tube	SB-515	...	N08811	Annealed
35	33Ni-42Fe-21Cr	Forgings	SB-564	...	N08811	Annealed
36	33Ni-42Fe-21Cr	Forgings	SB-564	...	N08811	Annealed
37	42Ni-21.5Cr-3Mo-2.3Cu	Smls. tube	SB-163	...	N08825	Annealed
38	42Ni-21.5Cr-3Mo-2.3Cu	Smls. tube	SB-163	...	N08825	Annealed
39	42Ni-21.5Cr-3Mo-2.3Cu	Smls. & wld. fittings	SB-366	...	N08825	Annealed
40	42Ni-21.5Cr-3Mo-2.3Cu	Smls. pipe & tube	SB-423	...	N08825	Cold worked/ann.
41	42Ni-21.5Cr-3Mo-2.3Cu	Smls. pipe & tube	SB-423	...	N08825	Cold worked/ann.
42	42Ni-21.5Cr-3Mo-2.3Cu	Plate	SB-424	...	N08825	Annealed
43	42Ni-21.5Cr-3Mo-2.3Cu	Plate	SB-424	...	N08825	Annealed
44	42Ni-21.5Cr-3Mo-2.3Cu	Bar, rod	SB-425	...	N08825	Annealed
45	42Ni-21.5Cr-3Mo-2.3Cu	Bar, rod	SB-425	...	N08825	Annealed

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	45	75	30	NP	NP	1500	NP	NFN-8	G14, T15
2	...	45	75	30	NP	NP	1500	NP	NFN-8	G5, G14, T14
3	...	45	75	30	1500	NP	1500	NP	NFN-8	G5, G14, T14
4	...	45	75	30	1500	NP	1500	NP	NFN-8	G14, T15
5	...	45	75	30	1500	800	1500	NP	NFN-8	G5, T14
6	...	45	75	30	1500	NP	1500	NP	NFN-8	T15
7	...	45	65	25	1050	NP	900	NP	NFN-9	H4
8	...	45	65	25	1050	NP	900	NP	NFN-9	G5, H4
9	...	45	65	25	1050	NP	900	NP	NFN-9	H4
10	...	45	65	25	1050	NP	900	NP	NFN-9	G5, H4
11	...	45	65	25	NP	NP	1650	NP	NFN-9	G4, T16
12	...	45	65	25	NP	800	1650	NP	NFN-9	G4, G5, T15
13	...	45	65	25	1500	NP	1800	NP	NFN-9	G4, T16
14	...	45	65	25	1500	800	1800	NP	NFN-9	G4, G5, T15
15	...	45	65	25	1500	NP	1650	NP	NFN-9	G4, T16
16	...	45	65	25	1500	800	1650	NP	NFN-9	G4, G5, T15
17	...	45	65	25	1500	NP	1650	NP	NFN-9	G4, T16
18	...	45	65	25	1500	800	1650	NP	NFN-9	G4, G5, T15
19	...	45	65	25	NP	NP	1650	NP	NFN-9	G4, G14, T16
20	...	45	65	25	NP	NP	1650	NP	NFN-9	G4, G5, G14, T15
21	...	45	65	25	1500	NP	1650	NP	NFN-9	G4, G14, T16
22	...	45	65	25	1500	NP	1650	NP	NFN-9	G4, G5, G14, T15
23	...	45	65	25	1500	NP	1650	NP	NFN-9	G4, T16
24	...	45	65	25	1500	800	1650	NP	NFN-9	G4, G5, T15
25	...	45	65	25	1500	NP	1650	NP	NFN-9	G4, T17
26	...	45	65	25	1500	NP	1650	NP	NFN-9	G4, G5, T15
27	...	45	65	25	1500	NP	1650	NP	NFN-9	G4, T17
28	...	45	65	25	1500	NP	1650	NP	NFN-9	G4, G5, T15
29	...	45	65	25	1500	NP	1650	NP	NFN-9	G4, T17
30	...	45	65	25	1500	NP	1650	NP	NFN-9	G4, G5, T15
31	...	45	65	25	1500	NP	1650	NP	NFN-9	G4, T17
32	...	45	65	25	1500	NP	1650	NP	NFN-9	G4, G5, T15
33	...	45	65	25	1500	NP	1650	NP	NFN-9	G4, G14, T17
34	...	45	65	25	1500	NP	1650	NP	NFN-9	G4, G5, G14, T16
35	...	45	65	25	1500	NP	1650	NP	NFN-9	G4, T17
36	...	45	65	25	1500	NP	1650	NP	NFN-9	G4, G5, T15
37	...	45	85	35	NP	800 (Cl. 3 only)	1000	650	NFN-7	...
38	...	45	85	35	NP	800 (Cl. 3 only)	1000	650	NFN-7	G5
39	...	45	85	35	NP	NP	1000	650	NFN-7	G5, W12
40	...	45	85	35	1000	800 (Cl. 3 only)	1000	650	NFN-7	...
41	...	45	85	35	1000	800 (Cl. 3 only)	1000	650	NFN-7	G5
42	...	45	85	35	1000	800 (Cl. 3 only)	1000	650	NFN-7	...
43	...	45	85	35	1000	800 (Cl. 3 only)	1000	650	NFN-7	G5
44	...	45	85	35	1000	800 (Cl. 3 only)	1000	650	NFN-7	...
45	...	45	85	35	1000	800 (Cl. 3 only)	1000	650	NFN-7	G5

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	17.0	...	15.7	...	15.1	...	14.6	...	14.2	...	13.9	13.7	13.5	13.3	13.2	13.0	12.8	12.7
2	17.0	...	17.0	...	17.0	...	17.0	...	17.0	...	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
3	17.0	...	17.0	...	17.0	...	17.0	...	17.0	...	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
4	17.0	...	15.7	...	15.1	...	14.6	...	14.2	...	13.9	13.7	13.5	13.3	13.2	13.0	12.8	12.7
5	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
6	20.0	...	18.5	...	17.8	...	17.2	...	16.8	...	16.3	16.1	15.9	15.7	15.5	15.3	15.1	14.9
7	16.7	...	15.4	...	14.4	...	13.6	...	12.9	...	12.2	11.9	11.6	11.4	11.1	10.9	10.7	10.5
8	16.7	...	16.7	...	16.7	...	16.7	...	16.7	...	16.5	16.1	15.7	15.3	15.0	14.7	14.5	14.2
9	16.7	...	15.4	...	14.4	...	13.6	...	12.9	...	12.2	11.9	11.6	11.4	11.1	10.9	10.7	10.5
10	16.7	...	16.7	...	16.7	...	16.7	...	16.7	...	16.5	16.1	15.7	15.3	15.0	14.7	14.5	14.2
11	16.7	...	15.4	...	14.4	...	13.6	...	12.9	...	12.2	11.9	11.6	11.4	11.1	10.9	10.7	10.5
12	16.7	...	16.7	...	16.7	...	16.7	...	16.7	...	16.5	16.1	15.7	15.3	15.0	14.7	14.5	14.2
13	16.7	...	15.4	...	14.4	...	13.6	...	12.9	...	12.2	11.9	11.6	11.4	11.1	10.9	10.7	10.5
14	16.7	...	16.7	...	16.7	...	16.7	...	16.7	...	16.5	16.1	15.7	15.3	15.0	14.7	14.5	14.2
15	16.7	...	15.4	...	14.4	...	13.6	...	12.9	...	12.2	11.9	11.6	11.4	11.1	10.9	10.7	10.5
16	16.7	...	16.7	...	16.7	...	16.7	...	16.7	...	16.5	16.1	15.7	15.3	15.0	14.7	14.5	14.2
17	16.7	...	15.4	...	14.4	...	13.6	...	12.9	...	12.2	11.9	11.6	11.4	11.1	10.9	10.7	10.5
18	16.7	...	16.7	...	16.7	...	16.7	...	16.7	...	16.5	16.1	15.7	15.3	15.0	14.7	14.5	14.2
19	14.2	...	13.1	...	12.3	...	11.6	...	10.9	...	10.4	10.1	9.9	9.7	9.5	9.3	9.1	9.0
20	14.2	...	14.2	...	14.2	...	14.2	...	14.2	...	14.0	13.7	13.3	13.0	12.8	12.5	12.3	12.1
21	14.2	...	13.1	...	12.3	...	11.6	...	10.9	...	10.4	10.1	9.9	9.7	9.5	9.3	9.1	9.0
22	14.2	...	14.2	...	14.2	...	14.2	...	14.2	...	14.0	13.7	13.3	13.0	12.8	12.5	12.3	12.1
23	16.7	...	15.4	...	14.4	...	13.6	...	12.9	...	12.2	11.9	11.6	11.4	11.1	10.9	10.7	10.5
24	16.7	...	16.7	...	16.7	...	16.7	...	16.7	...	16.5	16.1	15.7	15.3	15.0	14.7	14.5	14.2
25	16.7	...	15.4	...	14.4	...	13.6	...	12.9	...	12.2	11.9	11.6	11.4	11.1	10.9	10.7	10.5
26	16.7	...	16.7	...	16.7	...	16.7	...	16.7	...	16.5	16.1	15.7	15.3	15.0	14.7	14.5	14.2
27	16.7	...	15.4	...	14.4	...	13.6	...	12.9	...	12.2	11.9	11.6	11.4	11.1	10.9	10.7	10.5
28	16.7	...	16.7	...	16.7	...	16.7	...	16.7	...	16.5	16.1	15.7	15.3	15.0	14.7	14.5	14.2
29	16.7	...	15.4	...	14.4	...	13.6	...	12.9	...	12.2	11.9	11.6	11.4	11.1	10.9	10.7	10.5
30	16.7	...	16.7	...	16.7	...	16.7	...	16.7	...	16.5	16.1	15.7	15.3	15.0	14.7	14.5	14.2
31	16.7	...	15.4	...	14.4	...	13.6	...	12.9	...	12.2	11.9	11.6	11.4	11.1	10.9	10.7	10.5
32	16.7	...	16.7	...	16.7	...	16.7	...	16.7	...	16.5	16.1	15.7	15.3	15.0	14.7	14.5	14.2
33	14.2	...	13.1	...	12.3	...	11.6	...	10.9	...	10.4	10.1	9.9	9.7	9.5	9.3	9.1	9.0
34	14.2	...	14.2	...	14.2	...	14.2	...	14.2	...	14.0	13.7	13.3	13.0	12.8	12.5	12.3	12.1
35	16.7	...	15.4	...	14.4	...	13.6	...	12.9	...	12.2	11.9	11.6	11.4	11.1	10.9	10.7	10.5
36	16.7	...	16.7	...	16.7	...	16.7	...	16.7	...	16.5	16.1	15.7	15.3	15.0	14.7	14.5	14.2
37	23.3	...	21.4	...	20.3	...	19.4	...	18.5	...	17.8	17.5	17.3	17.2	17.0	17.0	16.9	16.8
38	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	23.3	23.3	23.3	23.2	23.0	22.9	22.8	22.6
39	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	23.3	23.3	23.3	23.2	23.0	22.9	22.8	22.6
40	23.3	...	21.4	...	20.3	...	19.4	...	18.5	...	17.8	17.5	17.3	17.2	17.0	17.0	16.9	16.8
41	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	23.3	23.3	23.3	23.2	23.0	22.9	22.8	22.6
42	23.3	...	21.4	...	20.3	...	19.4	...	18.5	...	17.8	17.5	17.3	17.2	17.0	17.0	16.9	16.8
43	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	23.3	23.3	23.3	23.2	23.0	22.9	22.8	22.6
44	23.3	...	21.4	...	20.3	...	19.4	...	18.5	...	17.8	17.5	17.3	17.2	17.0	17.0	16.9	16.8
45	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	23.3	23.3	23.3	23.2	23.0	22.9	22.8	22.6

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1	12.5	12.3	11.1	8.3	5.6	3.6	1.7	1.4	0.94	0.85	0.68	...	...	...	...	...	...
2	16.9	14.5	11.1	8.3	5.6	3.6	1.7	1.4	0.94	0.85	0.68	...	...	...	...	...	...
3	16.9	14.5	11.1	8.3	5.6	3.6	1.7	1.4	0.94	0.85	0.68	...	...	...	...	...	...
4	12.5	12.3	11.1	8.3	5.6	3.6	1.7	1.4	0.94	0.85	0.68	...	...	...	...	...	...
5	19.9	17.0	13.0	9.8	6.6	4.2	2.0	1.6	1.1	1.0	0.80	...	...	...	...	...	...
6	14.7	14.5	13.0	9.8	6.6	4.2	2.0	1.6	1.1	1.0	0.80	...	...	...	...	...	...
7	10.4	10.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	14.0	13.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	10.4	10.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	14.0	13.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	10.4	10.2	10.0	9.3	7.4	5.9	4.7	3.8	3.0	2.4	1.9	1.4	1.1	0.86	...	...	...
12	14.0	13.8	11.6	9.3	7.4	5.9	4.7	3.8	3.0	2.4	1.9	1.4	1.1	0.86	...	...	...
13	10.4	10.2	10.0	9.3	7.4	5.9	4.7	3.8	3.0	2.4	1.9	1.4	1.1	0.86	0.71	0.56	0.44
14	14.0	13.8	11.6	9.3	7.4	5.9	4.7	3.8	3.0	2.4	1.9	1.4	1.1	0.86	0.71	0.56	0.44
15	10.4	10.2	10.0	9.3	7.4	5.9	4.7	3.8	3.0	2.4	1.9	1.4	1.1	0.86	...	...	...
16	14.0	13.8	11.6	9.3	7.4	5.9	4.7	3.8	3.0	2.4	1.9	1.4	1.1	0.86	...	...	...
17	10.4	10.2	10.0	9.3	7.4	5.9	4.7	3.8	3.0	2.4	1.9	1.4	1.1	0.86	...	...	...
18	14.0	13.8	11.6	9.3	7.4	5.9	4.7	3.8	3.0	2.4	1.9	1.4	1.1	0.86	...	...	...
19	8.8	8.7	8.5	7.9	6.3	5.0	4.0	3.2	2.6	2.0	1.6	1.2	0.94	0.73	...	...	...
20	11.9	11.7	9.9	7.9	6.3	5.0	4.0	3.2	2.6	2.0	1.6	1.2	0.94	0.73	...	...	...
21	8.8	8.7	8.5	7.9	6.3	5.0	4.0	3.2	2.6	2.0	1.6	1.2	0.94	0.73	...	...	...
22	11.9	11.7	9.9	7.9	6.3	5.0	4.0	3.2	2.6	2.0	1.6	1.2	0.94	0.73	...	...	...
23	10.4	10.2	10.0	9.3	7.4	5.9	4.7	3.8	3.0	2.4	1.9	1.4	1.1	0.86	...	...	...
24	14.0	13.8	11.6	9.3	7.4	5.9	4.7	3.8	3.0	2.4	1.9	1.4	1.1	0.86	...	...	...
25	10.4	10.2	10.0	9.8	8.3	6.7	5.4	4.3	3.4	2.7	2.2	1.6	1.2	0.91	...	...	...
26	14.0	13.8	12.9	10.4	8.3	6.7	5.4	4.3	3.4	2.7	2.2	1.6	1.2	0.91	...	...	...
27	10.4	10.2	10.0	9.8	8.3	6.7	5.4	4.3	3.4	2.7	2.2	1.6	1.2	0.91	...	...	...
28	14.0	13.8	12.9	10.4	8.3	6.7	5.4	4.3	3.4	2.7	2.2	1.6	1.2	0.91	...	...	...
29	10.4	10.2	10.0	9.8	8.3	6.7	5.4	4.3	3.4	2.7	2.2	1.6	1.2	0.91	...	...	...
30	14.0	13.8	12.9	10.4	8.3	6.7	5.4	4.3	3.4	2.7	2.2	1.6	1.2	0.91	...	...	...
31	10.4	10.2	10.0	9.8	8.3	6.7	5.4	4.3	3.4	2.7	2.2	1.6	1.2	0.91	...	...	...
32	14.0	13.8	12.9	10.4	8.3	6.7	5.4	4.3	3.4	2.7	2.2	1.6	1.2	0.91	...	...	...
33	8.8	8.7	8.5	8.3	7.1	5.7	4.6	3.7	2.9	2.3	1.9	1.3	1.0	0.77	...	...	...
34	11.9	11.7	11.5	8.8	7.1	5.7	4.6	3.7	2.9	2.3	1.9	1.3	1.0	0.77	...	...	...
35	10.4	10.2	10.0	9.8	8.3	6.7	5.4	4.3	3.4	2.7	2.2	1.6	1.2	0.91	...	...	...
36	14.0	13.8	12.9	10.4	8.3	6.7	5.4	4.3	3.4	2.7	2.2	1.6	1.2	0.91	...	...	...
37	16.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	22.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	22.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	16.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	22.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	16.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	22.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44	16.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	22.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	42Ni-21.5Cr-3Mo-2.3Cu	Forgings	SB-564	...	N08825	Annealed
2	42Ni-21.5Cr-3Mo-2.3Cu	Forgings	SB-564	...	N08825	Annealed
3	42Ni-21.5Cr-3Mo-2.3Cu	Wld. tube	SB-704	...	N08825	Annealed
4	42Ni-21.5Cr-3Mo-2.3Cu	Wld. tube	SB-704	...	N08825	Annealed
5	42Ni-21.5Cr-3Mo-2.3Cu	Wld. pipe	SB-705	...	N08825	Annealed
6	42Ni-21.5Cr-3Mo-2.3Cu	Wld. pipe	SB-705	...	N08825	Annealed
7	44Fe-25Ni-21Cr-Mo	Fittings	SB-366	...	N08904	Annealed
8	44Fe-25Ni-21Cr-Mo	Plate, sheet, strip	SB-625	...	N08904	Annealed
9	44Fe-25Ni-21Cr-Mo	Bar, wire	SB-649	...	N08904	Annealed
10	44Fe-25Ni-21Cr-Mo	Wld. pipe	SB-673	...	N08904	Annealed
11	44Fe-25Ni-21Cr-Mo	Wld. tube	SB-674	...	N08904	Annealed
12	44Fe-25Ni-21Cr-Mo	Smls. pipe & tube	SB-677	...	N08904	Annealed
13	25Ni-20Cr-6Mo-Cu-N	Plate, sheet, strip	SB-625	...	N08925	Annealed
14	25Ni-20Cr-6Mo-Cu-N	Plate, sheet, strip	SB-625	...	N08925	Annealed
15	25Ni-20Cr-6Mo-Cu-N	Bar, wire	SB-649	...	N08925	Annealed
16	25Ni-20Cr-6Mo-Cu-N	Bar, wire	SB-649	...	N08925	Annealed
17	25Ni-20Cr-6Mo-Cu-N	Wld. pipe	SB-673	...	N08925	Annealed
18	25Ni-20Cr-6Mo-Cu-N	Wld. pipe	SB-673	...	N08925	Annealed
19	25Ni-20Cr-6Mo-Cu-N	Wld. tube	SB-674	...	N08925	Annealed
20	25Ni-20Cr-6Mo-Cu-N	Wld. tube	SB-674	...	N08925	Annealed
21	25Ni-20Cr-6Mo-Cu-N	Smls. pipe & tube	SB-677	...	N08925	Annealed
22	25Ni-20Cr-6Mo-Cu-N	Smls. pipe & tube	SB-677	...	N08925	Annealed
23	62Ni-28Mo-5Fe	Plate	SB-333	...	N10001	Annealed
24	62Ni-28Mo-5Fe	Plate	SB-333	...	N10001	Annealed
25	62Ni-28Mo-5Fe	Smls. & wld. fittings	SB-366	...	N10001	Annealed
26	62Ni-28Mo-5Fe	Wld. pipe	SB-619	...	N10001	Solution ann.
27	62Ni-28Mo-5Fe	Wld. pipe	SB-619	...	N10001	Solution ann.
28	62Ni-28Mo-5Fe	Smls. pipe & tube	SB-622	...	N10001	Solution ann.
29	62Ni-28Mo-5Fe	Smls. pipe & tube	SB-622	...	N10001	Solution ann.
30	62Ni-28Mo-5Fe	Wld. tube	SB-626	...	N10001	Solution ann.
31	62Ni-28Mo-5Fe	Wld. tube	SB-626	...	N10001	Solution ann.
32	62Ni-28Mo-5Fe	Rod	SB-335	...	N10001	Annealed
33	62Ni-28Mo-5Fe	Rod	SB-335	...	N10001	Annealed
34	62Ni-28Mo-5Fe	Rod	SB-335	...	N10001	Annealed
35	62Ni-28Mo-5Fe	Rod	SB-335	...	N10001	Annealed
36	62Ni-28Mo-5Fe	Sheet, strip	SB-333	...	N10001	Annealed
37	62Ni-28Mo-5Fe	Sheet, strip	SB-333	...	N10001	Annealed
38	70Ni-16Mo-7Cr-5Fe	Smls. & wld. fittings	SB-366	...	N10003	Annealed
39	70Ni-16Mo-7Cr-5Fe	Plate, sheet, strip	SB-434	...	N10003	Annealed
40	70Ni-16Mo-7Cr-5Fe	Rod	SB-573	...	N10003	Annealed
41	62Ni-25Mo-8Cr-2Fe	Smls. & wld. fittings	SB-366	...	N10242	Annealed
42	62Ni-25Mo-8Cr-2Fe	Plate, sheet, strip	SB-434	...	N10242	Annealed
43	62Ni-25Mo-8Cr-2Fe	Plate, sheet, strip	SB-434	...	N10242	Annealed

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	45	85	35	NP	NP	1000	NP	NFN-7	...
2	...	45	85	35	NP	NP	1000	NP	NFN-7	G5
3	...	45	85	35	NP	800	1000	650	NFN-7	G14
4	...	45	85	35	NP	NP	1000	650	NFN-7	G5, G14
5	...	45	85	35	NP	NP	1000	650	NFN-7	G14
6	...	45	85	35	NP	NP	1000	650	NFN-7	G5, G14
7	...	45	71	31	NP	700	700	650	NFN-9	W12
8	...	45	71	31	NP	700	700	650	NFN-9	...
9	...	45	71	31	NP	700	700	650	NFN-9	...
10	...	45	71	31	NP	700	700	650	NFN-9	G14
11	...	45	71	31	NP	700	700	650	NFN-9	G14
12	...	45	71	31	NP	700	700	650	NFN-9	...
13	...	45	87	43	NP	NP	800	650	NFN-12	...
14	...	45	87	43	NP	NP	800	650	NFN-12	G5
15	...	45	87	43	NP	NP	800	650	NFN-12	...
16	...	45	87	43	NP	NP	800	650	NFN-12	G5
17	...	45	87	43	NP	NP	800	650	NFN-12	G14
18	...	45	87	43	NP	NP	800	650	NFN-12	G5, G14
19	...	45	87	43	NP	NP	800	650	NFN-12	G14
20	...	45	87	43	NP	NP	800	650	NFN-12	G5, G14
21	...	45	87	43	NP	NP	800	650	NFN-12	...
22	...	45	87	43	NP	NP	800	650	NFN-12	G5
23	...	44	100	45	NP	800 (Cl. 3 only)	800	650	NFN-5	...
24	...	44	100	45	NP	800 (Cl. 3 only)	800	650	NFN-5	G5
25	...	44	100	45	NP	NP	800	650	NFN-5	G5, W12
26	...	44	100	45	NP	NP	800	650	NFN-5	G14
27	...	44	100	45	NP	NP	800	650	NFN-5	G5, G14
28	...	44	100	45	NP	NP	800	650	NFN-5	...
29	...	44	100	45	NP	NP	800	650	NFN-5	G5
30	...	44	100	45	NP	NP	800	650	NFN-5	G14
31	...	44	100	45	NP	NP	800	650	NFN-5	G5, G14
32	...	44	100	46	NP	800 (Cl. 3 only)	800	650	NFN-5	G13
33	...	44	100	46	NP	800 (Cl. 3 only)	800	650	NFN-5	G5, G13
34	...	44	115	46	NP	800 (Cl. 3 only)	800	650	NFN-5	G13
35	...	44	115	46	NP	800 (Cl. 3 only)	800	650	NFN-5	G5, G13
36	...	44	115	50	NP	800 (Cl. 3 only)	800	650	NFN-5	...
37	...	44	115	50	NP	800 (Cl. 3 only)	800	NP	NFN-5	G5
38	...	44	100	40	NP	NP	1300	650	NFN-6	T15, W12
39	...	44	100	40	NP	NP	1300	650	NFN-6	T15
40	...	44	100	40	NP	NP	1300	650	NFN-6	T15
41	...	44	105	45	NP	NP	1000	NP	NFN-6	G5, W12
42	...	44	105	45	NP	NP	1000	NP	NFN-6	G5
43	...	44	105	45	NP	NP	1000	NP	NFN-6	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	23.3	...	21.4	...	20.3	...	19.4	...	18.5	...	17.8	17.5	17.3	17.2	17.0	17.0	16.9	16.8
2	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	23.3	23.3	23.3	23.2	23.0	22.9	22.8	22.6
3	19.8	...	18.2	...	17.3	...	16.5	...	15.8	...	15.2	14.9	14.7	14.6	14.5	14.4	14.3	14.2
4	19.8	...	19.8	...	19.8	...	19.8	...	19.8	...	19.8	19.8	19.8	19.7	19.6	19.5	19.4	19.2
5	19.8	...	18.2	...	17.3	...	16.5	...	15.8	...	15.2	14.9	14.7	14.6	14.5	14.4	14.3	14.2
6	19.8	...	19.8	...	19.8	...	19.8	...	19.8	...	19.8	19.8	19.8	19.7	19.6	19.5	19.4	19.2
7	20.3	...	16.7	...	15.1	...	13.8	...	12.7	...	11.9	11.6	11.4	...	...	...	...	...
8	20.3	...	16.7	...	15.1	...	13.8	...	12.7	...	11.9	11.6	11.4	...	...	...	...	...
9	20.3	...	16.7	...	15.1	...	13.8	...	12.7	...	11.9	11.6	11.4	...	...	...	...	...
10	17.2	...	14.2	...	12.9	...	11.8	...	10.8	...	10.1	9.9	9.7	...	...	...	...	...
11	17.2	...	14.2	...	12.9	...	11.8	...	10.8	...	10.1	9.9	9.7	...	...	...	...	...
12	20.3	...	16.7	...	15.1	...	13.8	...	12.7	...	11.9	11.6	11.4	...	...	...	...	...
13	24.9	...	23.2	...	21.3	...	19.8	...	18.3	...	17.3	17.0	16.9	16.9	16.9	...	...	...
14	24.9	...	24.9	...	23.9	...	23.0	...	22.1	...	21.4	21.1	20.8	20.4	20.1	...	...	...
15	24.9	...	23.2	...	21.3	...	19.8	...	18.3	...	17.3	17.0	16.9	16.9	16.9	...	...	...
16	24.9	...	24.9	...	23.9	...	23.0	...	22.1	...	21.4	21.1	20.8	20.4	20.1	...	...	...
17	21.1	...	19.7	...	18.1	...	16.8	...	15.6	...	14.7	14.4	14.4	14.4	14.4	...	...	...
18	21.1	...	21.1	...	20.4	...	19.5	...	18.8	...	18.2	17.9	17.7	17.4	17.0	...	...	...
19	21.1	...	19.7	...	18.1	...	16.8	...	15.6	...	14.7	14.4	14.4	14.4	14.4	...	...	...
20	21.1	...	21.1	...	20.4	...	19.5	...	18.8	...	18.2	17.9	17.7	17.4	17.0	...	...	...
21	24.9	...	23.2	...	21.3	...	19.8	...	18.3	...	17.3	17.0	16.9	16.9	16.9	...	...	...
22	24.9	...	24.9	...	23.9	...	23.0	...	22.1	...	21.4	21.1	20.8	20.4	20.1	...	...	...
23	28.6	...	27.2	...	25.7	...	24.6	...	23.7	...	23.0	22.8	22.5	22.3	22.1	...	...	...
24	28.6	...	28.6	...	28.6	...	28.1	...	27.8	...	27.7	27.5	27.4	27.3	27.2	...	...	...
25	28.6	...	28.6	...	28.6	...	28.1	...	27.8	...	27.7	...	27.4	...	27.2	...	...	...
26	24.3	...	23.1	...	21.8	...	20.9	...	20.2	...	19.6	19.3	19.1	18.9	18.8	...	...	...
27	24.3	...	24.3	...	24.3	...	23.9	...	23.7	...	23.5	23.4	23.3	23.2	23.1	...	...	...
28	28.6	...	27.2	...	25.7	...	24.6	...	23.7	...	23.0	22.8	22.5	22.3	22.1	...	...	...
29	28.6	...	28.6	...	28.6	...	28.1	...	27.8	...	27.7	27.5	27.4	27.3	27.2	...	...	...
30	24.3	...	23.1	...	21.8	...	20.9	...	20.2	...	19.6	19.3	19.1	18.9	18.8	...	...	...
31	24.3	...	24.3	...	24.3	...	23.9	...	23.7	...	23.5	23.4	23.3	23.2	23.1	...	...	...
32	28.6	...	27.8	...	26.3	...	25.1	...	24.3	...	23.6	23.3	23.0	22.8	22.6	...	...	...
33	28.6	...	28.6	...	28.6	...	28.1	...	27.8	...	27.7	27.5	27.4	27.3	27.2	...	...	...
34	30.7	...	27.8	...	26.3	...	25.1	...	24.3	...	23.6	23.3	23.0	22.8	22.6	...	...	...
35	30.7	...	30.7	...	30.7	...	30.7	...	30.7	...	30.7	30.7	30.7	30.7	30.5	...	...	...
36	32.9	...	30.2	...	28.6	...	27.3	...	26.4	...	25.6	25.3	25.0	24.8	24.6	...	...	...
37	32.9	...	32.9	...	32.9	...	32.3	...	32.0	...	31.8	31.7	31.5	31.4	31.3	...	...	...
38	26.7	...	24.6	...	22.7	...	21.1	...	20.0	...	19.3	...	18.9	...	18.4	...	17.5	...
39	26.7	...	24.6	...	22.7	...	21.1	...	20.0	...	19.3	19.1	18.9	18.7	18.4	18.1	17.5	16.8
40	26.7	...	24.6	...	22.7	...	21.1	...	20.0	...	19.3	19.1	18.9	18.7	18.4	18.1	17.5	16.8
41	30.0	...	30.0	...	30.0	...	30.0	...	30.0	...	29.8	29.8	29.7	29.6	29.6	29.5	29.5	29.2
42	30.0	...	30.0	...	30.0	...	30.0	...	30.0	...	29.8	29.8	29.7	29.6	29.6	29.5	29.5	29.2
43	30.0	...	28.2	...	26.1	...	24.7	...	23.9	...	23.7	23.6	23.4	23.2	22.9	22.4	22.0	21.6

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1	16.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	22.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	14.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	18.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	14.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	18.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
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	16.0	...	12.4	...	6.0	...	3.5	...	...	...	...	...	...	...	...	...	...
39	16.0	14.9	12.4	9.3	6.0	4.8	3.5	...	...	...	...	...	...	...	...	...	...
40	16.0	14.9	12.4	9.3	6.0	4.8	3.5	...	...	...	...	...	...	...	...	...	...
41	29.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	29.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	21.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	62Ni-25Mo-8Cr-2Fe	Forgings	SB-564	...	N10242	Annealed
2	62Ni-25Mo-8Cr-2Fe	Forgings	SB-564	...	N10242	Annealed
3	62Ni-25Mo-8Cr-2Fe	Rod	SB-573	...	N10242	Annealed
4	62Ni-25Mo-8Cr-2Fe	Rod	SB-573	...	N10242	Annealed
5	62Ni-25Mo-8Cr-2Fe	Wld. pipe	SB-619	...	N10242	Solution ann.
6	62Ni-25Mo-8Cr-2Fe	Wld. pipe	SB-619	...	N10242	Solution ann.
7	62Ni-25Mo-8Cr-2Fe	Smls. pipe & tube	SB-622	...	N10242	Solution ann.
8	62Ni-25Mo-8Cr-2Fe	Smls. pipe & tube	SB-622	...	N10242	Solution ann.
9	62Ni-25Mo-8Cr-2Fe	Wld. tube	SB-626	...	N10242	Solution ann.
10	62Ni-25Mo-8Cr-2Fe	Wld. tube	SB-626	...	N10242	Solution ann.
11	54Ni-16Mo-15Cr	Smls. & wld. fittings	SB-366	...	N10276	Solution ann.
12	54Ni-16Mo-15Cr	Forgings	SB-462	...	N10276	Solution ann.
13	54Ni-16Mo-15Cr	Forgings	SB-462	...	N10276	Solution ann.
14	54Ni-16Mo-15Cr	Forgings	SB-564	...	N10276	Solution ann.
15	54Ni-16Mo-15Cr	Forgings	SB-564	...	N10276	Solution ann.
16	54Ni-16Mo-15Cr	Rod	SB-574	...	N10276	Solution ann.
17	54Ni-16Mo-15Cr	Rod	SB-574	...	N10276	Solution ann.
18	54Ni-16Mo-15Cr	Plate, sheet, strip	SB-575	...	N10276	Solution ann.
19	54Ni-16Mo-15Cr	Plate, sheet, strip	SB-575	...	N10276	Solution ann.
20	54Ni-16Mo-15Cr	Wld. pipe	SB-619	...	N10276	Solution ann.
21	54Ni-16Mo-15Cr	Wld. pipe	SB-619	...	N10276	Solution ann.
22	54Ni-16Mo-15Cr	Wld. pipe	SB-619	...	N10276	Solution ann.
23	54Ni-16Mo-15Cr	Wld. pipe	SB-619	...	N10276	Solution ann.
24	54Ni-16Mo-15Cr	Smls. pipe & tube	SB-622	...	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	54Ni-16Mo-15Cr	Wld. tube	SB-626	...	N10276	Solution ann.
28	54Ni-16Mo-15Cr	Wld. tube	SB-626	...	N10276	Solution ann.
29	54Ni-16Mo-15Cr	Wld. tube	SB-626	...	N10276	Solution ann.
30	Ni-28Mo-3Fe-1.3Cr-0.25Al	Plate, sheet, strip	SB-333	...	N10629	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	Rod	SB-335	...	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	Smls. & wld. fittings	SB-366	...	N10629	Solution ann.
35	Ni-28Mo-3Fe-1.3Cr-0.25Al	Forged fittings	SB-462	...	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	Forgings	SB-564	...	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	Wld. pipe	SB-619	...	N10629	Solution ann.
41	Ni-28Mo-3Fe-1.3Cr-0.25Al	Smls. pipe & tube	SB-622	...	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	Wld. tube	SB-626	...	N10629	Solution ann.
44	Ni-28Mo-3Fe-1.3Cr-0.25Al	Wld. tube	SB-626	...	N10629	Solution ann.

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	44	105	45	NP	NP	1000	NP	NFN-6	G5
2	...	44	105	45	NP	NP	1000	NP	NFN-6	...
3	...	44	105	45	NP	NP	1000	NP	NFN-6	G5
4	...	44	105	45	NP	NP	1000	NP	NFN-6	...
5	...	44	105	45	NP	NP	1000	NP	NFN-6	G5, G14
6	...	44	105	45	NP	NP	1000	NP	NFN-6	G14
7	...	44	105	45	NP	NP	1000	NP	NFN-6	G5
8	...	44	105	45	NP	NP	1000	NP	NFN-6	...
9	...	44	105	45	NP	NP	1000	NP	NFN-6	G5, G14
10	...	44	105	45	NP	NP	1000	NP	NFN-6	G14
11	...	43	100	41	1000	NP	1250	650	NFN-10	G5, T14, W12
12	...	43	100	41	NP	NP	1250	NP	NFN-10	T15
13	...	43	100	41	NP	NP	1250	NP	NFN-10	G5, T14
14	...	43	100	41	NP	NP	1250	650	NFN-10	T15
15	...	43	100	41	NP	NP	1250	650	NFN-10	G5, T14
16	...	43	100	41	1000	800 (Cl. 3 only)	1250	650	NFN-10	T15
17	...	43	100	41	1000	800	1250	650	NFN-10	G5, T14
18	...	43	100	41	1000	800	1250	650	NFN-10	G5, T14
19	...	43	100	41	1000	800 (Cl. 3 only)	1250	650	NFN-10	T15
20	...	43	100	41	NP	800 (Cl. 3 only)	NP	NP	NFN-10	W5
21	...	43	100	41	NP	800 (Cl. 3 only)	NP	NP	NFN-10	G5, W5
22	...	43	100	41	1000	800	1250	650	NFN-10	G5, G14, T14, W6
23	...	43	100	41	1000	NP	1250	650	NFN-10	G14, T15
24	...	43	100	41	1000	800	1250	650	NFN-10	G5, T14
25	...	43	100	41	1000	800 (Cl. 3 only)	1250	650	NFN-10	T15
26	...	43	100	41	NP	800 (Cl. 3 only)	NP	NP	NFN-10	W5
27	...	43	100	41	NP	800 (Cl. 3 only)	NP	NP	NFN-10	G5, W5
28	...	43	100	41	1000	800	1250	650	NFN-10	G5, G14, T14, W6
29	...	43	100	41	1000	NP	1250	650	NFN-10	G14, T15
30	...	44	110	51	NP	NP	800	NP	NFN-16	G5
31	...	44	110	51	NP	NP	800	NP	NFN-16	...
32	...	44	110	51	NP	NP	800	NP	NFN-16	G5
33	...	44	110	51	NP	NP	800	NP	NFN-16	...
34	...	44	110	51	NP	NP	800	NP	NFN-16	G5, W12
35	...	44	110	51	NP	NP	800	NP	NFN-16	G5
36	...	44	110	51	NP	NP	800	NP	NFN-16	...
37	...	44	110	51	NP	NP	800	NP	NFN-16	G5
38	...	44	110	51	NP	NP	800	NP	NFN-16	...
39	...	44	110	51	NP	NP	800	NP	NFN-16	G5, G14
40	...	44	110	51	NP	NP	800	NP	NFN-16	G14
41	...	44	110	51	NP	NP	800	NP	NFN-16	G5
42	...	44	110	51	NP	NP	800	NP	NFN-16	...
43	...	44	110	51	NP	NP	800	NP	NFN-16	G5, G14
44	...	44	110	51	NP	NP	800	NP	NFN-16	G14

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	30.0	...	30.0	...	30.0	...	30.0	...	30.0	...	29.8	29.8	29.7	29.6	29.6	29.5	29.5	29.2
2	30.0	...	28.2	...	26.1	...	24.7	...	23.9	...	23.7	23.6	23.4	23.2	22.9	22.4	22.0	21.6
3	30.0	...	30.0	...	30.0	...	30.0	...	30.0	...	29.8	29.8	29.7	29.6	29.6	29.5	29.5	29.2
4	30.0	...	28.2	...	26.1	...	24.7	...	23.9	...	23.7	23.6	23.4	23.2	22.9	22.4	22.0	21.6
5	25.5	...	25.5	...	25.5	...	25.5	...	25.5	...	25.4	25.3	25.2	25.2	25.1	25.1	25.1	24.8
6	25.5	...	24.0	...	22.2	...	21.0	...	20.3	...	20.1	20.0	19.9	19.7	19.4	19.1	18.7	18.4
7	30.0	...	30.0	...	30.0	...	30.0	...	30.0	...	29.8	29.8	29.7	29.6	29.6	29.5	29.5	29.2
8	30.0	...	28.2	...	26.1	...	24.7	...	23.9	...	23.7	23.6	23.4	23.2	22.9	22.4	22.0	21.6
9	25.5	...	25.5	...	25.5	...	25.5	...	25.5	...	25.4	25.3	25.2	25.2	25.1	25.1	25.1	24.8
10	25.5	...	24.0	...	22.2	...	21.0	...	20.3	...	20.1	20.0	19.9	19.7	19.4	19.1	18.7	18.4
11	27.3	...	27.3	...	27.3	...	27.3	...	26.9	...	25.2	24.6	24.0	23.5	23.1	22.8	22.6	22.4
12	27.3	...	24.9	...	23.0	...	21.3	...	19.9	...	18.7	18.2	17.8	17.4	17.1	16.9	16.7	16.6
13	27.3	...	27.3	...	27.3	...	27.3	...	26.9	...	25.2	24.6	24.0	23.5	23.1	22.8	22.6	22.4
14	27.3	...	24.9	...	23.0	...	21.3	...	19.9	...	18.7	18.2	17.8	17.4	17.1	16.9	16.7	16.6
15	27.3	...	27.3	...	27.3	...	27.3	...	26.9	...	25.2	24.6	24.0	23.5	23.1	22.8	22.6	22.4
16	27.3	...	24.9	...	23.0	...	21.3	...	19.9	...	18.7	18.2	17.8	17.4	17.1	16.9	16.7	16.6
17	27.3	...	27.3	...	27.3	...	27.3	...	26.9	...	25.2	24.6	24.0	23.5	23.1	22.8	22.6	22.4
18	27.3	...	27.3	...	27.3	...	27.3	...	26.9	...	25.2	24.6	24.0	23.5	23.1	22.8	22.6	22.4
19	27.3	...	24.9	...	23.0	...	21.3	...	19.9	...	18.7	18.2	17.8	17.4	17.1	16.9	16.7	16.6
20	27.3	...	24.9	...	23.0	...	21.3	...	19.9	...	18.7	18.2	17.8	17.4	17.1	...	...	...
21	27.3	...	27.3	...	27.3	...	27.3	...	26.9	...	25.2	24.6	24.0	23.5	23.1	...	...	...
22	23.2	...	23.2	...	23.2	...	23.2	...	22.8	...	21.5	20.9	20.4	20.0	19.6	19.4	19.2	19.0
23	23.2	...	21.1	...	19.6	...	18.1	...	16.9	...	15.9	15.5	15.1	14.8	14.5	14.3	14.2	14.1
24	27.3	...	27.3	...	27.3	...	27.3	...	26.9	...	25.2	24.6	24.0	23.5	23.1	22.8	22.6	22.4
25	27.3	...	24.9	...	23.0	...	21.3	...	19.9	...	18.7	18.2	17.8	17.4	17.1	16.9	16.7	16.6
26	27.3	...	24.9	...	23.0	...	21.3	...	19.9	...	18.7	18.2	17.8	17.4	17.1	...	...	...
27	27.3	...	27.3	...	27.3	...	27.3	...	26.9	...	25.2	24.6	24.0	23.5	23.1	...	...	...
28	23.2	...	23.2	...	23.2	...	23.2	...	22.8	...	21.5	20.9	20.4	20.0	19.6	19.4	19.2	19.0
29	23.2	...	21.1	...	19.6	...	18.1	...	16.9	...	15.9	15.5	15.1	14.8	14.5	14.3	14.2	14.1
30	31.4	...	31.4	...	31.4	...	31.4	...	31.1	...	30.6	30.4	30.2	30.1	29.9	...	...	...
31	31.4	...	31.4	...	29.6	...	28.1	...	27.0	...	26.1	25.8	25.5	25.3	25.1	...	...	...
32	31.4	...	31.4	...	31.4	...	31.4	...	31.1	...	30.6	30.4	30.2	30.1	29.9	...	...	...
33	31.4	...	31.4	...	29.6	...	28.1	...	27.0	...	26.1	25.8	25.5	25.3	25.1	...	...	...
34	31.4	...	31.4	...	31.4	...	31.4	...	31.1	...	30.6	30.4	30.2	30.1	29.9	...	...	...
35	31.4	...	31.4	...	31.4	...	31.4	...	31.1	...	30.6	30.4	30.2	30.1	29.9	...	...	...
36	31.4	...	31.4	...	29.6	...	28.1	...	27.0	...	26.1	25.8	25.5	25.3	25.1	...	...	...
37	31.4	...	31.4	...	31.4	...	31.4	...	31.1	...	30.6	30.4	30.2	30.1	29.9	...	...	...
38	31.4	...	31.4	...	29.6	...	28.1	...	27.0	...	26.1	25.8	25.5	25.3	25.1	...	...	...
39	26.7	...	26.7	...	26.7	...	26.7	...	26.4	...	26.0	25.8	25.7	25.6	25.4	...	...	...
40	26.7	...	26.7	...	25.2	...	23.9	...	23.0	...	22.2	21.9	21.7	21.5	21.3	...	...	...
41	31.4	...	31.4	...	31.4	...	31.4	...	31.1	...	30.6	30.4	30.2	30.1	29.9	...	...	...
42	31.4	...	31.4	...	29.6	...	28.1	...	27.0	...	26.1	25.8	25.5	25.3	25.1	...	...	...
43	26.7	...	26.7	...	26.7	...	26.7	...	26.4	...	26.0	25.8	25.7	25.6	25.4	...	...	...
44	26.7	...	26.7	...	25.2	...	23.9	...	23.0	...	22.2	21.9	21.7	21.5	21.3	...	...	...

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1	29.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	21.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	29.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	21.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	24.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	18.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	29.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	21.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	24.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	18.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	22.3	18.5	15.0	12.2	9.8	7.8	...	...	...	...	...	...	...	...	...	...	...
12	16.5	16.5	15.0	12.2	9.8	7.8	...	...	...	...	...	...	...	...	...	...	...
13	22.3	18.5	15.0	12.2	9.8	7.8	...	...	...	...	...	...	...	...	...	...	...
14	16.5	16.5	15.0	12.2	9.8	7.8	...	...	...	...	...	...	...	...	...	...	...
15	22.3	18.5	15.0	12.2	9.8	7.8	...	...	...	...	...	...	...	...	...	...	...
16	16.5	16.5	15.0	12.2	9.8	7.8	...	...	...	...	...	...	...	...	...	...	...
17	22.3	18.5	15.0	12.2	9.8	7.8	...	...	...	...	...	...	...	...	...	...	...
18	22.3	18.5	15.0	12.2	9.8	7.8	...	...	...	...	...	...	...	...	...	...	...
19	16.5	16.5	15.0	12.2	9.8	7.8	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	19.0	15.7	12.8	10.4	8.3	6.6	...	...	...	...	...	...	...	...	...	...	...
23	14.0	14.0	12.8	10.4	8.3	6.6	...	...	...	...	...	...	...	...	...	...	...
24	22.3	18.5	15.0	12.2	9.8	7.8
25	16.5	16.5	15.0	12.2	9.8	7.8
26
27
28	19.0	15.7	12.8	10.4	8.3	6.6
29	14.0	14.0	12.8	10.4	8.3	6.6
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TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ 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.

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	44	110	51	NP	NP	800	650	NFN-16	G5, W12
2	...	44	110	51	NP	800 (Cl. 3 only)	NP	NP	NFN-16	G5, W5
3	...	44	110	51	NP	800 (Cl. 3 only)	NP	NP	NFN-16	W5
4	...	44	110	51	NP	800 (Cl. 3 only)	NP	NP	NFN-16	G5, W5
5	...	44	110	51	NP	800 (Cl. 3 only)	NP	NP	NFN-16	W5
6	...	44	110	51	NP	800 (Cl. 3 only)	800	650	NFN-16	...
7	...	44	110	51	NP	800 (Cl. 3 only)	800	NP	NFN-16	G5
8	...	44	110	51	NP	800 (Cl. 3 only)	800	650	NFN-16	G13
9	...	44	110	51	NP	800 (Cl. 3 only)	800	650	NFN-16	G5, G13
10	...	44	110	51	NP	NP	800	NP	NFN-16	...
11	...	44	110	51	NP	NP	800	NP	NFN-16	G5
12	...	44	110	51	NP	NP	800	NP	NFN-16	...
13	...	44	110	51	NP	NP	800	NP	NFN-16	G5
14	...	44	110	51	NP	NP	800	650	NFN-16	G14
15	...	44	110	51	NP	NP	800	650	NFN-16	G5, G14
16	...	44	110	51	NP	800 (Cl. 3 only)	800	650	NFN-16	...
17	...	44	110	51	NP	800 (Cl. 3 only)	800	650	NFN-16	G5
18	...	44	110	51	NP	NP	800	650	NFN-16	G5, G14
19	...	44	110	51	NP	NP	800	650	NFN-16	G14
20	...	44	110	51	NP	NP	800	650	NFN-16	G5
21	...	44	110	51	NP	NP	800	650	NFN-16	...
22	...	44	110	51	NP	NP	800	650	NFN-16	G5
23	...	44	110	51	NP	NP	800	650	NFN-16	...
24	...	44	110	51	NP	NP	800	650	NFN-16	G5, W12
25	...	44	110	51	NP	NP	800	NP	NFN-16	G5
26	...	44	110	51	NP	NP	800	NP	NFN-16	...
27	...	44	110	51	NP	NP	800	650	NFN-16	G5
28	...	44	110	51	NP	NP	800	650	NFN-16	...
29	...	44	110	51	NP	NP	800	650	NFN-16	G5, G14
30	...	44	110	51	NP	NP	800	650	NFN-16	G14
31	...	44	110	51	NP	NP	800	650	NFN-16	G5
32	...	44	110	51	NP	NP	800	650	NFN-16	...
33	...	44	110	51	NP	NP	800	650	NFN-16	G5, G14
34	...	44	110	51	NP	NP	800	650	NFN-16	G14
35	...	46	90	35	NP	NP	1500	NP	NFN-13	G5, T14, W12
36	...	46	90	35	NP	NP	1500	NP	NFN-13	T14
37	...	46	90	35	NP	NP	1500	NP	NFN-13	G5, T14
38	...	46	90	35	NP	NP	1500	NP	NFN-13	T14
39	...	46	90	35	NP	NP	1500	NP	NFN-13	G5, T14
40	...	46	90	35	NP	NP	1500	NP	NFN-13	T14
41	...	46	90	35	NP	NP	1500	NP	NFN-13	G5, T14
42	...	46	90	35	NP	NP	1500	NP	NFN-13	G14, T14
43	...	46	90	35	NP	NP	1500	NP	NFN-13	G5, G14, T14

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	31.4	...	31.4	...	31.4	...	31.4	...	31.4	...	31.2	31.1	30.9	30.7	30.6	...	...	...
2	31.4	...	31.4	...	31.4	...	31.4	...	31.4	...	31.2	31.1	30.9	30.7	30.6	...	...	...
3	31.4	...	31.4	...	30.2	...	28.9	...	27.9	...	27.2	26.9	26.6	26.2	25.8	...	...	...
4	31.4	...	31.4	...	31.4	...	31.4	...	31.4	...	31.2	31.1	30.9	30.7	30.6	...	...	...
5	31.4	...	31.4	...	30.2	...	28.9	...	27.9	...	27.2	26.9	26.6	26.2	25.8	...	...	...
6	31.4	...	31.4	...	30.2	...	28.9	...	27.9	...	27.2	26.9	26.6	26.2	25.8	...	...	...
7	31.4	...	31.4	...	31.4	...	31.4	...	31.4	...	31.2	31.1	30.9	30.7	30.6	...	...	...
8	31.4	...	31.4	...	30.2	...	28.9	...	27.9	...	27.2	26.9	26.6	26.2	25.8	...	...	...
9	31.4	...	31.4	...	31.4	...	31.4	...	31.4	...	31.2	31.1	30.9	30.7	30.6	...	...	...
10	31.4	...	31.4	...	30.2	...	28.9	...	27.9	...	27.2	26.9	26.6	26.2	25.8	...	...	...
11	31.4	...	31.4	...	31.4	...	31.4	...	31.4	...	31.2	31.1	30.9	30.7	30.6	...	...	...
12	31.4	...	31.4	...	30.2	...	28.9	...	27.9	...	27.2	26.9	26.6	26.2	25.8	...	...	...
13	31.4	...	31.4	...	31.4	...	31.4	...	31.4	...	31.2	31.1	30.9	30.7	30.6	...	...	...
14	26.7	...	26.7	...	25.7	...	24.6	...	23.7	...	23.1	22.9	22.6	22.3	21.9	...	...	...
15	26.7	...	26.7	...	26.7	...	26.7	...	26.7	...	26.5	26.4	26.3	26.1	26.0	...	...	...
16	31.4	...	31.4	...	30.2	...	28.9	...	27.9	...	27.2	26.9	26.6	26.2	25.8	...	...	...
17	31.4	...	31.4	...	31.4	...	31.4	...	31.4	...	31.2	31.1	30.9	30.7	30.6	...	...	...
18	26.7	...	26.7	...	26.7	...	26.7	...	26.7	...	26.5	26.4	26.3	26.1	26.0	...	...	...
19	26.7	...	26.7	...	25.7	...	24.6	...	23.7	...	23.1	22.9	22.6	22.3	21.9	...	...	...
20	31.4	...	31.4	...	31.4	...	31.4	...	31.1	...	30.6	30.4	30.2	30.1	29.9	...	...	...
21	31.4	...	31.4	...	30.3	...	28.8	...	27.4	...	26.3	25.8	25.4	25.1	24.8	...	...	...
22	31.4	...	31.4	...	31.4	...	31.4	...	31.1	...	30.6	30.4	30.2	30.1	29.9	...	...	...
23	31.4	...	31.4	...	30.3	...	28.8	...	27.4	...	26.3	25.8	25.4	25.1	24.8	...	...	...
24	31.4	...	31.4	...	31.4	...	31.4	...	31.1	...	30.6	30.4	30.2	30.1	29.9	...	...	...
25	31.4	...	31.4	...	31.4	...	31.4	...	31.1	...	30.6	30.4	30.2	30.1	29.9	...	...	...
26	31.4	...	31.4	...	30.3	...	28.8	...	27.4	...	26.3	25.8	25.4	25.1	24.8	...	...	...
27	31.4	...	31.4	...	31.4	...	31.4	...	31.1	...	30.6	30.4	30.2	30.1	29.9	...	...	...
28	31.4	...	31.4	...	30.3	...	28.8	...	27.4	...	26.3	25.8	25.4	25.1	24.8	...	...	...
29	26.7	...	26.7	...	26.7	...	26.7	...	26.4	...	26.0	25.8	25.7	25.6	25.4	...	...	...
30	26.7	...	26.7	...	25.8	...	24.5	...	23.4	...	22.4	21.9	21.6	21.3	21.1	...	...	...
31	31.4	...	31.4	...	31.4	...	31.4	...	31.1	...	30.6	30.4	30.2	30.1	29.9	...	...	...
32	31.4	...	31.4	...	30.3	...	28.8	...	27.4	...	26.3	25.8	25.4	25.1	24.8	...	...	...
33	26.7	...	26.7	...	26.7	...	26.7	...	26.4	...	26.0	25.8	25.7	25.6	25.4	...	...	...
34	26.7	...	26.7	...	25.8	...	24.5	...	23.4	...	22.4	21.9	21.6	21.3	21.1	...	...	...
35	23.3	...	23.3	...	23.3	...	22.2	...	20.3	...	19.0	18.6	18.4	18.3	18.3	18.3	18.3	18.3
36	23.3	...	20.5	...	18.3	...	16.5	...	15.0	...	14.1	13.8	13.6	13.6	13.5	13.5	13.5	13.5
37	23.3	...	23.3	...	23.3	...	22.2	...	20.3	...	19.0	18.6	18.4	18.3	18.3	18.3	18.3	18.3
38	23.3	...	20.5	...	18.3	...	16.5	...	15.0	...	14.1	13.8	13.6	13.6	13.5	13.5	13.5	13.5
39	23.3	...	23.3	...	23.3	...	22.2	...	20.3	...	19.0	18.6	18.4	18.3	18.3	18.3	18.3	18.3
40	23.3	...	20.5	...	18.3	...	16.5	...	15.0	...	14.1	13.8	13.6	13.6	13.5	13.5	13.5	13.5
41	23.3	...	23.3	...	23.3	...	22.2	...	20.3	...	19.0	18.6	18.4	18.3	18.3	18.3	18.3	18.3
42	19.8	...	17.4	...	15.6	...	14.0	...	12.8	...	12.0	11.7	11.6	11.6	11.5	11.5	11.5	11.5
43	19.8	...	19.8	...	19.8	...	18.9	...	17.3	...	16.2	15.8	15.6	15.6	15.6	15.6	15.6	15.6

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
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	16.6	13.5	11.0	9.1	7.5	6.2	5.1	4.3	3.6	3.0	2.5	...	...	...	...	...	...
36	13.5	13.5	11.0	9.1	7.5	6.2	5.1	4.3	3.6	3.0	2.5	...	...	...	...	...	...
37	16.6	13.5	11.0	9.1	7.5	6.2	5.1	4.3	3.6	3.0	2.5	...	...	...	...	...	...
38	13.5	13.5	11.0	9.1	7.5	6.2	5.1	4.3	3.6	3.0	2.5	...	...	...	...	...	...
39	16.6	13.5	11.0	9.1	7.5	6.2	5.1	4.3	3.6	3.0	2.5	...	...	...	...	...	...
40	13.5	13.5	11.0	9.1	7.5	6.2	5.1	4.3	3.6	3.0	2.5	...	...	...	...	...	...
41	16.6	13.5	11.0	9.1	7.5	6.2	5.1	4.3	3.6	3.0	2.5	...	...	...	...	...	...
42	11.5	11.5	9.4	7.7	6.4	5.3	4.3	3.7	3.1	2.6	2.1	...	...	...	...	...	...
43	14.1	11.5	9.4	7.7	6.4	5.3	4.3	3.7	3.1	2.6	2.1	...	...	...	...	...	...

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

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	46	90	35	NP	NP	1500	NP	NFN-13	T14
2	...	46	90	35	NP	NP	1500	NP	NFN-13	G5, T14
3	...	46	90	35	NP	NP	1500	NP	NFN-13	G14, T14
4	...	46	90	35	NP	NP	1500	NP	NFN-13	G5, G14, T14
5	...	43	80	45	NP	NP	500	500	NFN-10	G15
6	72	40	NP	NP	1000	650	NFN-10	G15, W1
7	76	40	NP	NP	1000	650	NFN-10	G15, W1
8	...	45	109	55	NP	NP	800	NP	NFN-10	W12
9	...	45	109	55	NP	NP	800	NP	NFN-10	...
10	...	45	109	55	NP	NP	800	NP	NFN-10	...
11	...	45	109	55	NP	NP	800	NP	NFN-10	G14
12	...	45	109	55	NP	NP	800	NP	NFN-10	...
13	...	45	109	55	NP	NP	800	NP	NFN-10	...
14	...	45	109	55	NP	NP	800	NP	NFN-10	G14
15	...	45	109	55	NP	NP	800	NP	NFN-10	...
16	...	45	100	45	NP	NP	1650	650	NFN-15	G4, T17
17	...	45	100	45	NP	NP	1650	650	NFN-15	G4, G5, T16
18	...	45	100	45	NP	NP	1650	650	NFN-15	G4, T17
19	...	45	100	45	NP	NP	1650	650	NFN-15	G4, G5, T16
20	...	45	100	45	NP	NP	1650	650	NFN-15	G4, G14, T16
21	...	45	100	45	NP	NP	1650	650	NFN-15	G4, G5, G14, T15
22	...	45	100	45	NP	NP	1650	650	NFN-15	G4, T17
23	...	45	100	45	NP	NP	1650	650	NFN-15	G4, G5, T16
24	...	45	100	45	NP	NP	1650	650	NFN-15	G4, G14, T16
25	...	45	100	45	NP	NP	1650	650	NFN-15	G4, G5, G14, T15
26	...	49	130	55	NP	NP	800	NP	NFN-15	G8
27	...	49	130	55	NP	NP	800	NP	NFN-15	G8
28	...	51	35	20	600	600	600	NP	NFT-3	...
29	...	51	35	20	600	600	600	NP	NFT-3	...
30	...	51	35	20	600	600	600	NP	NFT-3	G14, W6
31	...	51	35	20	600	600	600	NP	NFT-3	...
32	...	51	35	20	NP	600	600	NP	NFT-3	W5, W12
33	...	51	35	20	NP	600	600	NP	NFT-3	...
34	...	51	35	20	600	600	600	NP	NFT-3	...
35	...	51	35	20	600	600	600	NP	NFT-3	G14, W6
36	...	51	50	40	NP	NP	500	500	NFT-2	G15, W1
37	...	51	50	40	600	600	600	600	NFT-2	...
38	...	51	50	40	600	600	600	600	NFT-2	...
39	...	51	50	40	600	600	600	600	NFT-2	G14, W6
40	...	51	50	40	600	600	600	600	NFT-2	...
41	...	51	50	40	NP	600	600	600	NFT-2	W5, W12
42	...	51	50	40	NP	600	600	600	NFT-2	...
43	...	51	50	40	600	600	600	600	NFT-2	...
44	...	51	50	40	600	600	600	600	NFT-2	G14, W6

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	23.3	...	20.5	...	18.3	...	16.5	...	15.0	...	14.1	13.8	13.6	13.6	13.5	13.5	13.5	13.5
2	23.3	...	23.3	...	23.3	...	22.2	...	20.3	...	19.0	18.6	18.4	18.3	18.3	18.3	18.3	18.3
3	19.8	...	17.4	...	15.6	...	14.0	...	12.8	...	12.0	11.7	11.6	11.6	11.5	11.5	11.5	11.5
4	19.8	...	19.8	...	19.8	...	18.9	...	17.3	...	16.2	15.8	15.6	15.6	15.6	15.6	15.6	15.6
5	22.9	...	22.2	...	21.6	...	21.4	...	21.4	...	...	...	...	...	...	...	...	...
6	20.6	...	19.5	...	18.5	...	18.5	...	18.1	...	16.9	16.9	16.9	16.9	16.9	16.9	16.5	16.1
7	21.7	...	20.3	...	20.3	...	20.3	...	20.3	...	18.6	18.3	18.0	17.7	17.3	17.0	16.6	16.2
8	31.1	...	30.9	...	28.1	...	26.1	...	24.8	...	23.6	23.5	23.1	22.9	22.6	...	...	...
9	31.1	...	30.9	...	28.1	...	26.1	...	24.8	...	23.6	23.5	23.1	22.9	22.6	...	...	...
10	31.1	...	30.9	...	28.1	...	26.1	...	24.8	...	23.6	23.5	23.1	22.9	22.6	...	...	...
11	26.4	...	26.3	...	23.9	...	22.2	...	21.1	...	20.1	20.0	19.6	19.5	19.2	...	...	...
12	31.1	...	30.9	...	28.1	...	26.1	...	24.8	...	23.6	23.5	23.1	22.9	22.6	...	...	...
13	31.1	...	30.9	...	28.1	...	26.1	...	24.8	...	23.6	23.5	23.1	22.9	22.6	...	...	...
14	26.4	...	26.3	...	23.9	...	22.2	...	21.1	...	20.1	20.0	19.6	19.5	19.2	...	...	...
15	31.1	...	30.9	...	28.1	...	26.1	...	24.8	...	23.6	23.5	23.1	22.9	22.6	...	...	...
16	28.6	...	25.6	...	23.1	...	21.3	...	20.1	...	19.3	18.9	18.7	18.4	18.2	18.0	17.8	17.6
17	28.6	...	28.6	...	28.0	...	27.1	...	26.4	...	26.0	25.6	25.2	24.9	24.6	24.3	24.1	23.8
18	28.6	...	25.6	...	23.1	...	21.3	...	20.1	...	19.3	18.9	18.7	18.4	18.2	18.0	17.8	17.6
19	28.6	...	28.6	...	28.0	...	27.1	...	26.4	...	26.0	25.6	25.2	24.9	24.6	24.3	24.1	23.8
20	24.3	...	21.8	...	19.6	...	18.1	...	17.1	...	16.4	16.1	15.9	15.7	15.5	15.3	15.2	15.0
21	24.3	...	24.3	...	23.8	...	23.0	...	22.5	...	22.1	21.7	21.4	21.1	20.9	20.7	20.5	20.2
22	28.6	...	25.6	...	23.1	...	21.3	...	20.1	...	19.3	18.9	18.7	18.4	18.2	18.0	17.8	17.6
23	28.6	...	28.6	...	28.0	...	27.1	...	26.4	...	26.0	25.6	25.2	24.9	24.6	24.3	24.1	23.8
24	24.3	...	21.8	...	19.6	...	18.1	...	17.1	...	16.4	16.1	15.9	15.7	15.5	15.3	15.2	15.0
25	24.3	...	24.3	...	23.8	...	23.0	...	22.5	...	22.1	21.7	21.4	21.1	20.9	20.7	20.5	20.2
26	34.2	...	32.1	...	28.5	...	25.5	...	23.4	...	22.0	21.5	21.2	20.9	20.5	...	...	...
27	34.2	...	32.1	...	28.5	...	25.5	...	23.4	...	22.0	21.5	21.2	20.9	20.5	...	...	...
28	10.0	9.3	8.3	7.4	6.6	6.0	5.4	4.7	4.2	3.8	3.5	...	...	...	...	...	...	...
29	10.0	9.3	8.3	7.4	6.6	6.0	5.5	4.7	4.2	3.8	3.5	...	...	...	...	...	...	...
30	8.5	7.9	7.0	6.3	5.6	5.1	4.7	4.1	3.6	3.2	3.0	...	...	...	...	...	...	...
31	10.0	9.3	8.3	7.4	6.6	6.0	5.5	4.7	4.2	3.8	3.5	...	...	...	...	...	...	...
32	10.0	9.3	8.3	7.4	6.6	6.0	5.5	4.7	4.2	3.8	3.5	...	...	...	...	...	...	...
33	10.0	9.3	8.3	7.4	6.6	6.0	5.5	4.7	4.2	3.8	3.5	...	...	...	...	...	...	...
34	10.0	9.3	8.3	7.4	6.6	6.0	5.5	4.7	4.2	3.8	3.5	...	...	...	...	...	...	...
35	8.5	7.9	7.0	6.3	5.6	5.1	4.7	4.1	3.6	3.2	3.0	...	...	...	...	...	...	...
36	14.3	13.1	11.8	10.7	9.7	8.9	8.1	7.4	6.8	...	...	...	...	...	...	...	...	...
37	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
38	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
39	12.1	11.7	10.6	9.6	8.8	8.1	7.5	7.0	6.5	6.0	5.5	...	...	...	...	...	...	...
40	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
41	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
42	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
43	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
44	12.1	11.7	10.6	9.6	8.8	8.1	7.5	7.0	6.5	6.0	5.5	...	...	...	...	...	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1	13.5	13.5	11.0	9.1	7.5	6.2	5.1	4.3	3.6	3.0	2.5	...	...	...	...	...	...
2	16.6	13.5	11.0	9.1	7.5	6.2	5.1	4.3	3.6	3.0	2.5
3	11.5	11.5	9.4	7.7	6.4	5.3	4.3	3.7	3.1	2.6	2.1
4	14.1	11.5	9.4	7.7	6.4	5.3	4.3	3.7	3.1	2.6	2.1
5
6	15.8
7	15.7
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10
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16	17.5	17.3	17.1	16.9	13.6	10.9	8.8	7.0	5.6	4.5	3.6	2.7	2.1	1.6
17	23.6	23.3	21.2	17.0	13.6	10.9	8.8	7.0	5.6	4.5	3.6	2.7	2.1	1.6
18	17.5	17.3	17.1	16.9	13.6	10.9	8.8	7.0	5.6	4.5	3.6	2.7	2.1	1.6	...	...	...
19	23.6	23.3	21.2	17.0	13.6	10.9	8.8	7.0	5.6	4.5	3.6	2.7	2.1	1.6	...	...	...
20	14.8	14.7	14.5	14.4	11.6	9.3	7.5	6.0	4.8	3.8	3.1	2.3	1.8	1.4	...	...	...
21	20.0	19.8	18.0	14.4	11.6	9.3	7.5	6.0	4.8	3.8	3.1	2.3	1.8	1.4	...	...	...
22	17.5	17.3	17.1	16.9	13.6	10.9	8.8	7.0	5.6	4.5	3.6	2.7	2.1	1.6	...	...	...
23	23.6	23.3	21.2	17.0	13.6	10.9	8.8	7.0	5.6	4.5	3.6	2.7	2.1	1.6	...	...	...
24	14.8	14.7	14.5	14.4	11.6	9.3	7.5	6.0	4.8	3.8	3.1	2.3	1.8	1.4
25	20.0	19.8	18.0	14.4	11.6	9.3	7.5	6.0	4.8	3.8	3.1	2.3	1.8	1.4
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	Ti	Plate, sheet, strip	SB-265	2H	R50400	Annealed
2	Ti	Smls. tube	SB-338	2H	R50400	Annealed
3	Ti	Wld. tube	SB-338	2H	R50400	Annealed
4	Ti	Bar, billet	SB-348	2H	R50400	Annealed
5	Ti	Smls. fittings	SB-363	WPT2H	R50400	Annealed
6	Ti	Wld. fittings	SB-363	WPT2HW	R50400	Annealed
7	Ti	Forgings	SB-381	F-2H	R50400	Annealed
8	Ti	Smls. pipe	SB-861	2H	R50400	Annealed
9	Ti	Wld. pipe	SB-862	2H	R50400	Annealed
10	Ti	Castings	SB-367	C-3	R50550	...
11	Ti	Plate, sheet, strip	SB-265	3	R50550	Annealed
12	Ti	Smls. tube	SB-338	3	R50550	Annealed
13	Ti	Wld. tube	SB-338	3	R50550	Annealed
14	Ti	Bar, billet	SB-348	3	R50550	Annealed
15	Ti	Smls. & wld. fittings	SB-363	WPT3	R50550	Annealed
16	Ti	Forgings	SB-381	F-3	R50550	Annealed
17	Ti	Smls. pipe	SB-861	3	R50550	Annealed
18	Ti	Wld. pipe	SB-862	3	R50550	Annealed
19	Ti-Pd	Plate, sheet, strip	SB-265	11	R52250	Annealed
20	Ti-Pd	Plate, sheet, strip	SB-265	17	R52252	Annealed
21	Ti-Ru	Plate, sheet, strip	SB-265	27	R52254	Annealed
22	Ti-Pd	Plate, sheet, strip	SB-265	7	R52400	Annealed
23	Ti-Pd	Smls. tube	SB-338	7	R52400	Annealed
24	Ti-Pd	Wld. tube	SB-338	7	R52400	Annealed
25	Ti-Pd	Bar, billet	SB-348	7	R52400	Annealed
26	Ti-Pd	Smls. fittings	SB-363	WPT7	R52400	Annealed
27	Ti-Pd	Wld. fittings	SB-363	WPT7W	R52400	Annealed
28	Ti-Pd	Castings	SB-367	C-7	R52400	Annealed
29	Ti-Pd	Forgings	SB-381	F-7	R52400	Annealed
30	Ti-Pd	Smls. pipe	SB-861	7	R52400	Annealed
31	Ti-Pd	Wld. pipe	SB-862	7	R52400	Annealed
32	Ti-0.15Pd	Plate, sheet, strip	SB-265	7H	R52400	Annealed
33	Ti-0.15Pd	Smls. tube	SB-338	7H	R52400	Annealed
34	Ti-0.15Pd	Wld. tube	SB-338	7H	R52400	Annealed
35	Ti-0.15Pd	Bar, billet	SB-348	7H	R52400	Annealed
36	Ti-0.15Pd	Smls. fittings	SB-363	WPT7H	R52400	Annealed
37	Ti-0.15Pd	Wld. fittings	SB-363	WPT7HW	R52400	Annealed
38	Ti-0.15Pd	Forgings	SB-381	F-7H	R52400	Annealed
39	Ti-0.15Pd	Smls. pipe	SB-861	7H	R52400	Annealed
40	Ti-0.15Pd	Wld. pipe	SB-862	7H	R52400	Annealed
41	Ti-Pd	Plate, sheet, strip	SB-265	16	R52402	Annealed
42	Ti-Pd	Smls. tube	SB-338	16	R52402	Annealed
43	Ti-Pd	Wld. tube	SB-338	16	R52402	Annealed
44	Ti-Pd	Bar, billet	SB-348	16	R52402	Annealed
45	Ti-Pd	Forgings	SB-381	F-16	R52402	Annealed

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	51	58	40	NP	NP	500	NP	NFT-2	...
2	...	51	58	40	NP	NP	500	NP	NFT-2	...
3	...	51	58	40	NP	NP	500	NP	NFT-2	G14, W6
4	...	51	58	40	NP	NP	500	NP	NFT-2	...
5	...	51	58	40	NP	NP	500	NP	NFT-2	...
6	...	51	58	40	NP	NP	500	NP	NFT-2	W12
7	...	51	58	40	NP	NP	500	NP	NFT-2	...
8	...	51	58	40	NP	NP	500	NP	NFT-2	...
9	...	51	58	40	NP	NP	500	NP	NFT-2	W12
10	...	52	65	55	NP	NP	500	NP	NFT-1	G15, W1
11	...	52	65	55	600	600	600	600	NFT-1	...
12	...	52	65	55	600	600	600	600	NFT-1	...
13	...	52	65	55	600	600	600	600	NFT-1	G14, W6
14	...	52	65	55	600	600	600	600	NFT-1	...
15	...	52	65	55	NP	600	600	600	NFT-1	W5, W12
16	...	52	65	55	NP	600	600	600	NFT-1	...
17	...	52	65	55	600	600	600	600	NFT-1	...
18	...	52	65	55	600	600	600	600	NFT-1	G14, W6
19	...	51	35	20	NP	NP	600	NP	NFT-3	...
20	...	51	35	20	NP	NP	600	NP	NFT-3	...
21	...	51	35	20	NP	NP	600	NP	NFT-3	...
22	...	51	50	40	NP	600	600	600	NFT-2	...
23	...	51	50	40	NP	600	600	600	NFT-2	...
24	...	51	50	40	NP	600	600	600	NFT-2	G14, W6
25	...	51	50	40	NP	600	600	600	NFT-2	...
26	...	51	50	40	NP	NP	600	600	NFT-2	...
27	...	51	50	40	NP	NP	600	600	NFT-2	G14
28	...	51	50	40	NP	NP	500	500	NFT-2	G15, W1
29	...	51	50	40	NP	NP	600	600	NFT-2	...
30	...	51	50	40	NP	600	600	600	NFT-2	...
31	...	51	50	40	NP	600	600	600	NFT-2	G14, W6
32	...	51	58	40	NP	NP	500	NP	NFT-2	...
33	...	51	58	40	NP	NP	500	NP	NFT-2	...
34	...	51	58	40	NP	NP	500	NP	NFT-2	G14, W6
35	...	51	58	40	NP	NP	500	NP	NFT-2	...
36	...	51	58	40	NP	NP	500	NP	NFT-2	...
37	...	51	58	40	NP	NP	500	NP	NFT-2	W12
38	...	51	58	40	NP	NP	500	NP	NFT-2	...
39	...	51	58	40	NP	NP	500	NP	NFT-2	...
40	...	51	58	40	NP	NP	500	NP	NFT-2	W12
41	...	51	50	40	NP	NP	600	600	NFT-2	...
42	...	51	50	40	NP	NP	600	600	NFT-2	...
43	...	51	50	40	NP	NP	600	600	NFT-2	G14, W6
44	...	51	50	40	NP	NP	600	600	NFT-2	...
45	...	51	50	40	NP	NP	600	600	NFT-2	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
2	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
3	14.1	13.5	12.2	11.1	10.2	9.5	8.7	8.1	7.5	...	...	...	...	...	...	...	...	...
4	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
5	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
6	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
7	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
8	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
9	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
10	18.6	17.5	15.8	14.2	12.8	11.5	10.3	9.3	8.5	...	...	...	...	...	...	...	...	...
11	18.6	17.5	15.8	14.2	12.8	11.5	10.3	9.3	8.5	7.9	7.4	...	...	...	...	...	...	...
12	18.6	17.5	15.8	14.2	12.8	11.5	10.3	9.3	8.5	7.9	7.4	...	...	...	...	...	...	...
13	15.8	14.9	13.4	12.1	10.8	9.7	8.8	7.9	7.2	6.7	6.3	...	...	...	...	...	...	...
14	18.6	17.5	15.8	14.2	12.8	11.5	10.3	9.3	8.5	7.9	7.4	...	...	...	...	...	...	...
15	18.6	17.5	15.8	14.2	12.8	11.5	10.3	9.3	8.5	7.9	7.4	...	...	...	...	...	...	...
16	18.6	17.5	15.8	14.2	12.8	11.5	10.3	9.3	8.5	7.9	7.4	...	...	...	...	...	...	...
17	18.6	17.5	15.8	14.2	12.8	11.5	10.3	9.3	8.5	7.9	7.4	...	...	...	...	...	...	...
18	15.8	14.9	13.4	12.1	10.8	9.7	8.8	7.9	7.2	6.7	6.3	...	...	...	...	...	...	...
19	10.0	9.3	8.3	7.4	6.6	6.0	5.4	4.7	4.2	3.8	3.5	...	...	...	...	...	...	...
20	10.0	9.3	8.3	7.4	6.6	6.0	5.4	4.7	4.2	3.8	3.5	...	...	...	...	...	...	...
21	10.0	9.3	8.3	7.4	6.6	6.0	5.4	4.7	4.2	3.8	3.5	...	...	...	...	...	...	...
22	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
23	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
24	12.1	11.7	10.6	9.6	8.8	8.1	7.5	7.0	6.5	6.0	5.5	...	...	...	...	...	...	...
25	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
26	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
27	12.1	11.7	10.6	9.6	8.8	8.1	7.5	7.0	6.5	6.0	5.5	...	...	...	...	...	...	...
28	14.3	13.1	11.8	10.7	9.7	8.9	8.1	7.4	6.8	...	...	...	...	...	...	...	...	...
29	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
30	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
31	12.1	11.7	10.6	9.6	8.8	8.1	7.5	7.0	6.5	6.0	5.5	...	...	...	...	...	...	...
32	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
33	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
34	14.1	13.5	12.2	11.1	10.2	9.5	8.7	8.1	7.5	...	...	...	...	...	...	...	...	...
35	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
36	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
37	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
38	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
39	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
40	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
41	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
42	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
43	12.1	11.7	10.6	9.6	8.8	8.1	7.5	7.0	6.5	6.0	5.5	...	...	...	...	...	...	...
44	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
45	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1
2
3
4
5
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
1	Ti-0.05Pd	Plate, sheet, strip	SB-265	16H	R52402	Annealed
2	Ti-0.05Pd	Smls. tube	SB-338	16H	R52402	Annealed
3	Ti-0.05Pd	Wld. tube	SB-338	16H	R52402	Annealed
4	Ti-0.05Pd	Bar, billet	SB-348	16H	R52402	Annealed
5	Ti-0.05Pd	Smls. fittings	SB-363	WPT16H	R52402	Annealed
6	Ti-0.05Pd	Wld. fittings	SB-363	WPT16HW	R52402	Annealed
7	Ti-0.05Pd	Forgings	SB-381	F-16H	R52402	Annealed
8	Ti-0.05Pd	Smls. pipe	SB-861	16H	R52402	Annealed
9	Ti-0.05Pd	Wld. pipe	SB-862	16H	R52402	Annealed
10	Ti-Ru	Plate, sheet, strip	SB-265	26	R52404	Annealed
11	Ti-Ru	Smls. tube	SB-338	26	R52404	Annealed
12	Ti-Ru	Wld. tube	SB-338	26	R52404	Annealed
13	Ti-Ru	Bar, billet	SB-348	26	R52404	Annealed
14	Ti-Ru	Smls. fittings	SB-363	WPT26	R52404	Annealed
15	Ti-Ru	Wld. fittings	SB-363	WPT26W	R52404	Annealed
16	Ti-Ru	Forgings	SB-381	F-26	R52404	Annealed
17	Ti-Ru	Smls. pipe	SB-861	26	R52404	Annealed
18	Ti-Ru	Wld. pipe	SB-862	26	R52404	Annealed
19	Ti-0.10Ru	Plate, sheet, strip	SB-265	26H	R52404	Annealed
20	Ti-0.10Ru	Smls. tube	SB-338	26H	R52404	Annealed
21	Ti-0.10Ru	Wld. tube	SB-338	26H	R52404	Annealed
22	Ti-0.10Ru	Bar, billet	SB-348	26H	R52404	Annealed
23	Ti-0.10Ru	Smls. fittings	SB-363	WPT26H	R52404	Annealed
24	Ti-0.10Ru	Wld. fittings	SB-363	WPT26HW	R52404	Annealed
25	Ti-0.10Ru	Forgings	SB-381	F-26H	R52404	Annealed
26	Ti-0.10Ru	Smls. pipe	SB-861	26H	R52404	Annealed
27	Ti-0.10Ru	Wld. pipe	SB-862	26H	R52404	Annealed
28	Ti-0.3Mo-0.8Ni	Plate, sheet, strip	SB-265	12	R53400	Annealed
29	Ti-0.3Mo-0.8Ni	Smls. tube	SB-338	12	R53400	Annealed
30	Ti-0.3Mo-0.8Ni	Wld. tube	SB-338	12	R53400	Annealed
31	Ti-0.3Mo-0.8Ni	Bar, billet	SB-348	12	R53400	Annealed
32	Ti-0.3Mo-0.8Ni	Smls. fittings	SB-363	WPT12	R53400	Annealed
33	Ti-0.3Mo-0.8Ni	Wld. fittings	SB-363	WPT12W	R53400	Annealed
34	Ti-0.3Mo-0.8Ni	Forgings	SB-381	F-12	R53400	Annealed
35	Ti-0.3Mo-0.8Ni	Smls. pipe	SB-861	12	R53400	Annealed
36	Ti-0.3Mo-0.8Ni	Wld. pipe	SB-862	12	R53400	Annealed
37	Ti-3Al-2.5V	Plate, sheet, strip	SB-265	9	R56320	Annealed
38	Ti-3Al-2.5V	Smls. tube	SB-338	9	R56320	Annealed
39	Ti-3Al-2.5V	Wld. tube	SB-338	9	R56320	Annealed
40	Ti-3Al-2.5V	Bar, billet	SB-348	9	R56320	Annealed
41	Ti-3Al-2.5V	Smls. fittings	SB-363	WPT9	R56320	Annealed
42	Ti-3Al-2.5V	Wld. fittings	SB-363	WPT9W	R56320	Annealed
43	Ti-3Al-2.5V	Forgings	SB-381	F-9	R56320	Annealed
44	Ti-3Al-2.5V	Smls. pipe	SB-861	9	R56320	Annealed
45	Ti-3Al-2.5V	Wld. pipe	SB-862	9	R56320	Annealed

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes
					I	III	VIII-1	XII		
1	...	51	58	40	NP	NP	500	NP	NFT-2	...
2	...	51	58	40	NP	NP	500	NP	NFT-2	...
3	...	51	58	40	NP	NP	500	NP	NFT-2	G14, W6
4	...	51	58	40	NP	NP	500	NP	NFT-2	...
5	...	51	58	40	NP	NP	500	NP	NFT-2	...
6	...	51	58	40	NP	NP	500	NP	NFT-2	W12
7	...	51	58	40	NP	NP	500	NP	NFT-2	...
8	...	51	58	40	NP	NP	500	NP	NFT-2	...
9	...	51	58	40	NP	NP	500	NP	NFT-2	W12
10	...	51	50	40	NP	NP	600	600	NFT-2	...
11	...	51	50	40	NP	NP	600	600	NFT-2	...
12	...	51	50	40	NP	NP	600	600	NFT-2	G14, W6
13	...	51	50	40	NP	NP	600	600	NFT-2	...
14	...	51	50	40	NP	NP	600	600	NFT-2	...
15	...	51	50	40	NP	NP	600	600	NFT-2	G14
16	...	51	50	40	NP	NP	600	600	NFT-2	...
17	...	51	50	40	NP	NP	600	600	NFT-2	...
18	...	51	50	40	NP	NP	600	600	NFT-2	G14, W6
19	...	51	58	40	NP	NP	500	NP	NFT-2	...
20	...	51	58	40	NP	NP	500	NP	NFT-2	...
21	...	51	58	40	NP	NP	500	NP	NFT-2	G14, W6
22	...	51	58	40	NP	NP	500	NP	NFT-2	...
23	...	51	58	40	NP	NP	500	NP	NFT-2	...
24	...	51	58	40	NP	NP	500	NP	NFT-2	W12
25	...	51	58	40	NP	NP	500	NP	NFT-2	...
26	...	51	58	40	NP	NP	500	NP	NFT-2	...
27	...	51	58	40	NP	NP	500	NP	NFT-2	W12
28	...	52	70	50	NP	NP	600	600	NFT-1	...
29	...	52	70	50	NP	NP	600	600	NFT-1	...
30	...	52	70	50	NP	NP	600	600	NFT-1	G14, W6
31	...	52	70	50	NP	NP	600	600	NFT-1	...
32	...	52	70	50	NP	NP	600	600	NFT-1	...
33	...	52	70	50	NP	NP	600	600	NFT-1	G14
34	...	52	70	50	NP	NP	600	600	NFT-1	...
35	...	52	70	50	NP	NP	600	600	NFT-1	...
36	...	52	70	50	NP	NP	600	600	NFT-1	G14, W6
37	...	53	90	70	NP	600	600	600	NFT-4	...
38	...	53	90	70	NP	600	600	600	NFT-4	...
39	...	53	90	70	NP	600	600	600	NFT-4	G14, W6
40	...	53	90	70	NP	600	NP	NP	NFT-4	...
41	...	53	90	70	NP	600	NP	NP	NFT-4	...
42	...	53	90	70	NP	600	NP	NP	NFT-4	G14, W6
43	...	53	90	70	NP	600	NP	NP	NFT-4	...
44	...	53	90	70	NP	600	600	600	NFT-4	...
45	...	53	90	70	NP	600	600	600	NFT-4	G14, W6

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
1	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
2	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
3	14.1	13.5	12.2	11.1	10.2	9.5	8.7	8.1	7.5	...	...	...	...	...	...	...	...	...
4	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
5	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
6	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
7	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
8	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
9	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
10	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
11	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
12	12.1	11.7	10.6	9.6	8.8	8.1	7.5	7.0	6.5	6.0	5.5	...	...	...	...	...	...	...
13	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
14	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
15	12.1	11.7	10.6	9.6	8.8	8.1	7.5	7.0	6.5	6.0	5.5	...	...	...	...	...	...	...
16	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
17	14.3	13.7	12.4	11.3	10.3	9.5	8.8	8.2	7.6	7.0	6.5	...	...	...	...	...	...	...
18	12.1	11.7	10.6	9.6	8.8	8.1	7.5	7.0	6.5	6.0	5.5	...	...	...	...	...	...	...
19	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
20	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
21	14.1	13.5	12.2	11.1	10.2	9.5	8.7	8.1	7.5	...	...	...	...	...	...	...	...	...
22	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
23	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
24	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
25	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
26	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
27	16.6	15.9	14.4	13.1	12.0	11.2	10.2	9.5	8.8	...	...	...	...	...	...	...	...	...
28	20.0	20.0	18.7	17.4	16.2	15.2	14.3	13.6	13.1	12.7	12.3	...	...	...	...	...	...	...
29	20.0	20.0	18.7	17.4	16.2	15.2	14.3	13.6	13.1	12.7	12.3	...	...	...	...	...	...	...
30	17.0	17.0	15.9	14.8	13.8	12.9	12.1	11.5	11.1	10.8	10.5	...	...	...	...	...	...	...
31	20.0	20.0	18.7	17.4	16.2	15.2	14.3	13.6	13.1	12.7	12.3	...	...	...	...	...	...	...
32	20.0	20.0	18.7	17.4	16.2	15.2	14.3	13.6	13.1	12.7	12.3	...	...	...	...	...	...	...
33	17.0	17.0	15.9	14.8	13.8	12.9	12.1	11.5	11.1	10.8	10.5	...	...	...	...	...	...	...
34	20.0	20.0	18.7	17.4	16.2	15.2	14.3	13.6	13.1	12.7	12.3	...	...	...	...	...	...	...
35	20.0	20.0	18.7	17.4	16.2	15.2	14.3	13.6	13.1	12.7	12.3	...	...	...	...	...	...	...
36	17.0	17.0	15.9	14.8	13.8	12.9	12.1	11.5	11.1	10.8	10.5	...	...	...	...	...	...	...
37	25.7	25.7	24.7	23.7	22.6	21.4	20.2	19.0	18.1	17.5	17.2	...	...	...	...	...	...	...
38	25.7	25.7	24.7	23.7	22.6	21.4	20.2	19.0	18.1	17.5	17.2	...	...	...	...	...	...	...
39	21.9	21.9	21.0	20.2	19.2	18.2	17.1	16.2	15.4	14.9	14.7	...	...	...	...	...	...	...
40	25.7	25.7	24.7	23.7	22.6	21.4	20.2	19.0	18.1	17.5	17.2	...	...	...	...	...	...	...
41	25.7	25.7	24.7	23.7	22.6	21.4	20.2	19.0	18.1	17.5	17.2	...	...	...	...	...	...	...
42	21.9	21.9	21.0	20.2	19.2	18.2	17.1	16.2	15.4	14.9	14.7	...	...	...	...	...	...	...
43	25.7	25.7	24.7	23.7	22.6	21.4	20.2	19.0	18.1	17.5	17.2	...	...	...	...	...	...	...
44	25.7	25.7	24.7	23.7	22.6	21.4	20.2	19.0	18.1	17.5	17.2	...	...	...	...	...	...	...
45	21.9	21.9	21.0	20.2	19.2	18.2	17.1	16.2	15.4	14.9	14.7	...	...	...	...	...	...	...

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800
1
2
3
4
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2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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 Designation/ UNS No.	Class/Condition/ Temper
(10) 1	Ti-3Al-2.5V-0.1Ru	Plate, sheet, strip	SB-265	28	R56323	Annealed
(10) 2	Ti-3Al-2.5V-0.1Ru	Smls. tube	SB-338	28	R56323	Annealed
(10) 3	Ti-3Al-2.5V-0.1Ru	Wld. tube	SB-338	28	R56323	Annealed
(10) 4	Ti-3Al-2.5V-0.1Ru	Bar, billet	SB-348	28	R56323	Annealed
(10) 5	Ti-3Al-2.5V-0.1Ru	Smls. fittings	SB-363	WPT28	R56323	Annealed
(10) 6	Ti-3Al-2.5V-0.1Ru	Wld. fittings	SB-363	WPT28W	R56323	Annealed
(10) 7	Ti-3Al-2.5V-0.1Ru	Forgings	SB-381	F-28	R56323	Annealed
(10) 8	Ti-3Al-2.5V-0.1Ru	Smls. pipe	SB-861	28	R56323	Annealed
(10) 9	Ti-3Al-2.5V-0.1Ru	Wld. pipe	SB-862	28	R56323	Annealed
10	99.2Zr	Forgings	SB-493	...	R60702	Annealed
11	99.2Zr	Smls. tube	SB-523	...	R60702	Annealed
12	99.2Zr	Wld. tube	SB-523	...	R60702	Annealed
13	99.2Zr	Bar, wire	SB-550	...	R60702	Annealed
14	99.2Zr	Plate, sheet, strip	SB-551	...	R60702	Annealed
15	99.2Zr	Smls. fittings	SB-653	PZ-2	R60702	Annealed
16	99.2Zr	Wld. fittings	SB-653	PZ-2W	R60702	Annealed
17	99.2Zr	Smls. & wld. pipe	SB-658	...	R60702	Annealed
18	95.2Zr + Nb	Forgings	SB-493	...	R60705	Annealed
19	95.2Zr + Nb	Smls. tube	SB-523	...	R60705	Annealed
20	95.2Zr + Nb	Wld. tube	SB-523	...	R60705	Annealed
21	95.2Zr + Nb	Bar, wire	SB-550	...	R60705	Annealed
22	95.2Zr + Nb	Plate, sheet, strip	SB-551	...	R60705	Annealed
23	95.2Zr + Nb	Smls. & wld. pipe	SB-658	...	R60705	Annealed

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted) (SPT = Supports Only)				External Pressure Chart No.	Notes	
					I	III	VIII-1	XII			
1	...	53	90	70	NP	NP	600	NP	NFT-4	...	(10)
2	...	53	90	70	NP	NP	600	NP	NFT-4	...	(10)
3	...	53	90	70	NP	NP	600	NP	NFT-4	G14, W6	(10)
4	...	53	90	70	NP	NP	600	NP	NFT-4	...	(10)
5	...	53	90	70	NP	NP	600	NP	NFT-4	...	(10)
6	...	53	90	70	NP	NP	600	NP	NFT-4	G14, W6	(10)
7	...	53	90	70	NP	NP	600	NP	NFT-4	...	(10)
8	...	53	90	70	NP	NP	600	NP	NFT-4	...	(10)
9	...	53	90	70	NP	NP	600	NP	NFT-4	G14, W6	(10)
10	...	61	55	30	NP	400	700	NP	NFZ-1	...	
11	...	61	55	30	NP	400	700	NP	NFZ-1	...	
12	...	61	55	30	NP	400	700	NP	NFZ-1	G14, W6	
13	...	61	55	30	NP	400	700	NP	NFZ-1	...	
14	...	61	55	30	NP	400	700	NP	NFZ-1	...	
15	...	61	55	30	NP	400	700	NP	NFZ-1	...	
16	...	61	55	30	NP	400	700	NP	NFZ-1	G14, W6	
17	...	61	55	30	NP	400	700	NP	NFZ-1	W12	
18	...	62	70	55	NP	NP	700	NP	NFZ-2	W2	
19	...	62	80	55	NP	NP	700	NP	NFZ-2	W2	
20	...	62	80	55	NP	NP	700	NP	NFZ-2	G14, W2, W6	
21	...	62	80	55	NP	NP	700	NP	NFZ-2	W2	
22	...	62	80	55	NP	NP	700	NP	NFZ-2	W2	
23	...	62	80	55	NP	NP	700	NP	NFZ-2	W2, W12	

2011a SECTION II, PART D (CUSTOMARY)

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950
(10)	1	25.7	25.7	24.7	23.7	22.6	21.4	20.2	19.0	18.1	17.5	17.2	...	...	...	...	...	...
(10)	2	25.7	25.7	24.7	23.7	22.6	21.4	20.2	19.0	18.1	17.5	17.2	...	...	...	...	...	...
(10)	3	21.9	21.9	21.0	20.2	19.2	18.2	17.1	16.2	15.4	14.9	14.7	...	...	...	...	...	...
(10)	4	25.7	25.7	24.7	23.7	22.6	21.4	20.2	19.0	18.1	17.5	17.2	...	...	...	...	...	...
(10)	5	25.7	25.7	24.7	23.7	22.6	21.4	20.2	19.0	18.1	17.5	17.2	...	...	...	...	...	...
(10)	6	21.9	21.9	21.0	20.2	19.2	18.2	17.1	16.2	15.4	14.9	14.7	...	...	...	...	...	...
(10)	7	25.7	25.7	24.7	23.7	22.6	21.4	20.2	19.0	18.1	17.5	17.2	...	...	...	...	...	...
(10)	8	25.7	25.7	24.7	23.7	22.6	21.4	20.2	19.0	18.1	17.5	17.2	...	...	...	...	...	...
(10)	9	21.9	21.9	21.0	20.2	19.2	18.2	17.1	16.2	15.4	14.9	14.7	...	...	...	...	...	...
	10	15.7	15.1	13.7	12.4	11.2	10.1	9.1	8.3	7.4	6.6	6.0	5.6	5.2	...	...	...	...
	11	15.7	15.1	13.7	12.4	11.2	10.1	9.1	8.3	7.4	6.6	6.0	5.6	5.2	...	...	...	...
	12	13.4	12.8	11.6	10.5	9.5	8.6	7.7	7.0	6.3	5.6	5.1	4.7	4.5	...	...	...	...
	13	15.7	15.1	13.7	12.4	11.2	10.1	9.1	8.3	7.4	6.6	6.0	5.6	5.2	...	...	...	...
	14	15.7	15.1	13.7	12.4	11.2	10.1	9.1	8.3	7.4	6.6	6.0	5.6	5.2	...	...	...	...
	15	15.7	15.1	13.7	12.4	11.2	10.1	9.1	8.3	7.4	6.6	6.0	5.6	5.2	...	...	...	...
	16	13.4	12.8	11.6	10.5	9.5	8.6	7.7	7.0	6.3	5.6	5.1	4.7	4.5	...	...	...	...
	17	15.7	15.1	13.7	12.4	11.2	10.1	9.1	8.3	7.4	6.6	6.0	5.6	5.2	...	...	...	...
	18	20.0	...	16.6	...	14.2	...	12.5	...	11.3	...	10.4	...	9.9	...	...	...	...
	19	22.9	...	19.0	...	16.2	...	14.3	...	12.9	...	11.9	...	11.3	...	...	...	...
	20	19.4	...	16.1	...	13.8	...	12.2	...	11.0	...	10.1	...	9.6	...	...	...	...
	21	22.9	...	19.0	...	16.2	...	14.3	...	12.9	...	11.9	...	11.3	...	...	...	...
	22	22.9	...	19.0	...	16.2	...	14.3	...	12.9	...	11.9	...	11.3	...	...	...	...
	23	22.9	...	19.0	...	16.2	...	14.3	...	12.9	...	11.9	...	11.3	...	...	...	...

TABLE 1B (CONT'D)
SECTION I; SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	1700	1750	1800	
1	(10)
2	(10)
3	(10)
4	(10)
5	(10)
6	(10)
7	(10)
8	(10)
9	(10)
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NOTES TO TABLE 1B

GENERAL NOTES

- (a) The following abbreviations are used: ann., annealed; cond., condenser; exch., exchanger; extr., extruded; fin., finished; fr., from; 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) For Section VIII and XII applications, stress values in restricted shear, such as dowel bolts, rivets, or similar construction in which the shearing is so restricted that the section under consideration would fail without reduction of areas, shall be 0.80 times the values in this Table.
- (d) For Section VIII and XII applications, stress values in bearing shall be 1.60 times the values in this Table.
- (e) An alternative typeface is used for stress values obtained from time-dependent properties (see Notes T1 through T19).
- (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.
- (10) (g) 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.

NOTES — GENERAL REQUIREMENTS

- G1 For steam at 250 psi (406°F), the values given for 400°F may be used.
- G2 At temperatures over 1000°F, 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 1500°F 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 66²/₃% 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 350°F.
- G7 Use 350°F curve for all temperature values below 350°F.
- G8 The stresses for this material are based on 120 ksi minimum tensile strength because of weld metal strength limitations.
- G9 Use Fig. NFC-6 up to and including 300°F. Use the 600°F curve of Fig. NFC-3 above 300°F up to and including 400°F. Maximum temperature for external pressure not to exceed 400°F.
- G10 Maximum temperature for external pressure not to exceed 450°F.
- G11 Referenced external pressure chart is applicable up to 700°F.
- G12 Referenced external pressure chart is applicable up to 800°F.
- 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.
- G17 Copper-silicon alloys are not always suitable when exposed to certain media and high temperatures, particularly steam above 212°F. 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 500°F because harder temper adversely affects design stress in the creep rupture temperature range.
- G22 The minimum tensile strength of reduced tension specimens in accordance with QW-462.1 of Section IX shall not be less than 110,000 psi.
- G23 This alloy is subject to severe loss of impact strength at room temperatures after exposure in the range of 1000°F to 1400°F.
- 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 0.500 in. and thicker is machined from the core and does not include the cladding alloy; therefore, the allowable stress values for thickness less than 0.500 in. shall be used.
- G26 The tension test specimen from plate 0.500 in. 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 1000°F to 1250°F.
- G28 For external pressure design, the maximum design temperature is limited to 1000°F.

NOTES TO TABLE 1B (CONT'D)

NOTES — HEAT TREATMENT REQUIREMENTS

- H1 For temperatures above 1000°F, these stress values may be used only if the material is annealed at a minimum temperature of 1900°F and has a carbon content of 0.04% or higher.
- H2 For temperatures above 1000°F, these stress values may be used only if the material is heat treated by heating it to a minimum temperature of 1900°F and quenching in water or rapidly cooling by other means.
- H3 For Section I applications, cold drawn pipe and tube shall be annealed at 1900°F minimum.
- H4 The material shall be given a 1725°F to 1825°F stabilizing heat treatment.

(10) NOTES — TIME-DEPENDENT PROPERTIES [See General Note (e)]

- T1 Allowable stresses for temperatures of 250°F and above are values obtained from time-dependent properties.
- T2 Allowable stresses for temperatures of 300°F and above are values obtained from time-dependent properties.
- T3 Allowable stresses for temperatures of 350°F and above are values obtained from time-dependent properties.
- T4 Allowable stresses for temperatures of 400°F and above are values obtained from time-dependent properties.
- T5 Allowable stresses for temperatures of 500°F and above are values obtained from time-dependent properties.
- T6 Allowable stresses for temperatures of 550°F and above are values obtained from time-dependent properties.
- T7 Allowable stresses for temperatures of 600°F and above are values obtained from time-dependent properties.
- T8 Allowable stresses for temperatures of 750°F and above are values obtained from time-dependent properties.
- T9 Allowable stresses for temperatures of 800°F and above are values obtained from time-dependent properties.
- T10 Allowable stresses for temperatures of 850°F and above are values obtained from time-dependent properties.
- T11 Allowable stresses for temperatures of 900°F and above are values obtained from time-dependent properties.
- T12 Allowable stresses for temperatures of 950°F and above are values obtained from time-dependent properties.
- T13 Allowable stresses for temperatures of 1000°F and above are values obtained from time-dependent properties.
- T14 Allowable stresses for temperatures of 1050°F and above are values obtained from time-dependent properties.
- T15 Allowable stresses for temperatures of 1100°F and above are values obtained from time-dependent properties.
- T16 Allowable stresses for temperatures of 1150°F and above are values obtained from time-dependent properties.
- T17 Allowable stresses for temperatures of 1200°F and above are values obtained from time-dependent properties.
- T18 Allowable stresses for temperatures of 1250°F and above are values obtained from time-dependent properties.
- T19 Allowable stresses for temperatures of 450°F 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 0 (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 After welding, heat treat at 1150°F to 1200°F, hold 1½ hr at temperature for the first inch of cross-section thickness and ½ hr for each additional inch, and air cool. For castings used in pumps, valves, and fittings 2 in. nominal pipe size and less, PWHT is not required for socket welds and attachment welds when the castings have been temper annealed at 1150°F to 1200°F prior to welding.
- W9 If welded or brazed, the allowable stress values for the annealed condition shall be used and the minimum tensile strength of the reduced tension specimen in accordance with QW-462.1 of Section IX shall not be less than 30.0 ksi.
- W10 When nonferrous materials conforming to specifications in Section II, Part B are used in welded or brazed construction, the maximum allowable working stresses shall not exceed the values given herein for annealed material at the metal temperature shown.
- 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 1200°F or higher, the deposited weld metal shall be of the same nominal chemistry as the base metal.
- W14 No welding permitted.
- W15 For Section VIII and XII applications, no welding is permitted.
- (10) W16 Use NFA-12 when welded with 5356 or 5556 filler metal, all thicknesses, or 4043 or 5554 filler metal, thickness $\leq \frac{3}{8}$ in. Use NFA-13 when welded with 4043 or 5554 filler metal, thickness $> \frac{3}{8}$ in.

†#

TABLE 2A
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	Carbon steel	Plate	SA-285	A	K01700	...	...	1	1
2	Carbon steel	Wld. pipe	SA-672	A45	K01700	...	...	1	1
3	Carbon steel	Wld. pipe	SA-53	E/A	K02504	...	...	1	1
4	Carbon steel	Smls. pipe	SA-53	S/A	K02504	...	...	1	1
5	Carbon steel	Smls. pipe	SA-106	A	K02501	...	...	1	1
6	Carbon steel	Bar, shapes	SA-675	50	...	...	...	1	1
7	Carbon steel	Plate	SA-285	B	K02200	...	≤ 2	1	1
8	Carbon steel	Wld. pipe	SA-672	A50	K02200	...	...	1	1
9	Carbon steel	Bar, shapes	SA-675	55	...	...	...	1	1
10	Carbon steel	Plate	SA-285	C	K02801	...	≤ 2	1	1
11	Carbon steel	Smls. & wld. pipe	SA-333	1	K03008	...	...	1	1
12	Carbon steel	Smls. & wld. tube	SA-334	1	K03008	...	...	1	1
13	Carbon steel	Plate	SA-516	55	K01800	...	...	1	1
14	Carbon steel	Wld. pipe	SA-671	CA55	K02801	...	...	1	1
15	Carbon steel	Wld. pipe	SA-671	CE55	K02202	...	...	1	1
16	Carbon steel	Wld. pipe	SA-672	A55	K02801	...	...	1	1
17	Carbon steel	Wld. pipe	SA-672	B55	K02001	...	...	1	1
18	Carbon steel	Wld. pipe	SA-672	C55	K01800	...	...	1	1
19	Carbon steel	Wld. pipe	SA-672	E55	K02202	...	...	1	1
20	Carbon steel	Plate, bar, shapes	SA-36	...	K02600	...	...	1	1
21	Carbon steel	Forgings	SA-181	...	K03502	60	...	1	1
22	Carbon steel	Castings	SA-216	WCA	J02502	...	...	1	1
23	Carbon steel	Forgings	SA-266	1	K03506	...	...	1	1
24	Carbon steel	Forgings	SA-350	LF1	K03009	1	...	1	1
25	Carbon steel	Castings	SA-352	LCA	J02504	...	...	1	1
26	Carbon steel	Cast pipe	SA-660	WCA	J02504	...	...	1	1
27	Carbon steel	Bar, shapes	SA-675	60	...	...	...	1	1
28	Carbon steel	Plate	SA-515	60	K02401	...	...	1	1
29	Carbon steel	Plate	SA-516	60	K02100	...	...	1	1
30	Carbon steel	Wld. pipe	SA-671	CB60	K02401	...	...	1	1
31	Carbon steel	Wld. pipe	SA-671	CC60	K02100	...	...	1	1
32	Carbon steel	Wld. pipe	SA-671	CE60	K02402	...	...	1	1
33	Carbon steel	Wld. pipe	SA-672	B60	K02401	...	...	1	1
34	Carbon steel	Wld. pipe	SA-672	C60	K02100	...	...	1	1
35	Carbon steel	Wld. pipe	SA-672	E60	K02402	...	...	1	1
36	Carbon steel	Wld. pipe	SA-53	E/B	K03005	...	...	1	1
37	Carbon steel	Smls. pipe	SA-53	S/B	K03005	...	...	1	1
38	Carbon steel	Smls. pipe	SA-106	B	K03006	...	...	1	1
39	Carbon steel	Fittings	SA-234	WPB	K03006	...	...	1	1
40	Carbon steel	Wld. fittings	SA-234	WPB	K03006	W	...	1	1
41	Carbon steel	Smls. & wld. pipe	SA-333	6	K03006	...	...	1	1
42	Carbon steel	Smls. & wld. tube	SA-334	6	K03006	...	...	1	1
43	Carbon steel	Fittings	SA-420	WPL6	...	...	...	1	1
44	Carbon steel	Wld. fittings	SA-420	WPL6	...	WP-W	...	1	1

TABLE 2A
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

#1

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Temp. Limit (SPT = Supports Only)	External Pressure Chart No.	Notes
1	45	24	700	CS-1	...
2	45	24	700	CS-1	G1, G4
3	48	30	700 (SPT)	CS-2	E2
4	48	30	700 (SPT)	CS-2	E2
5	48	30	700	CS-2	E2
6	50	25	700 (SPT)	CS-1	...
7	50	27	700	CS-1	E2
8	50	27	700	CS-1	E2, G1, G4
9	55	27.5	700 (SPT)	CS-1	...
10	55	30	700	CS-2	...
11	55	30	700	CS-2	...
12	55	30	700	CS-2	...
13	55	30	700	CS-2	...
14	55	30	700	CS-2	G1, G4
15	55	30	700	CS-2	G1, G4
16	55	30	700	CS-2	G1, G4
17	55	30	700	CS-2	G1, G4
18	55	30	700	CS-2	G1, G4
19	55	30	700	CS-2	G1, G4
20	58	36	700 (SPT)	CS-2	E2
21	60	30	700	CS-2	...
22	60	30	700	CS-2	...
23	60	30	700	CS-2	...
24	60	30	700	CS-2	...
25	60	30	700	CS-2	...
26	60	30	700	CS-2	...
27	60	30	700 (SPT)	CS-2	...
28	60	32	700	CS-2	...
29	60	32	700	CS-2	...
30	60	32	700	CS-2	G1, G4
31	60	32	700	CS-2	G1, G4
32	60	32	700	CS-2	G1, G4
33	60	32	700	CS-2	G1, G4
34	60	32	700	CS-2	G1, G4
35	60	32	700	CS-2	G1, G4
36	60	35	700 (SPT)	CS-2	E2
37	60	35	700 (SPT)	CS-2	E2
38	60	35	700	CS-2	E2
39	60	35	700	CS-2	E2
40	60	35	700	CS-2	E2
41	60	35	700	CS-2	E2
42	60	35	700	CS-2	E2
43	60	35	700	CS-2	E2
44	60	35	700	CS-2	E2

†#

TABLE 2A
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Design Stress Intensity, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	15.0	...	14.7	...	14.2	13.7	13.0	12.3	11.9	11.5	...	...	...	...
2	15.0	...	14.7	...	14.2	13.7	13.0	12.3	11.9	11.5	...	...	...	...
3	16.0	...	16.0	...	16.0	16.0	16.0	15.3	14.6	14.4	...	...	...	...
4	16.0	16.0	16.0	...	16.0	16.0	16.0	15.3	14.6	14.4	...	...	...	...
5	16.0	16.0	16.0	...	16.0	16.0	16.0	15.3	14.6	14.4	...	...	...	...
6	16.7	...	15.3	...	14.7	14.2	13.6	12.8	12.4	11.9	...	...	...	...
7	16.7	16.7	16.5	...	15.9	15.4	14.7	13.8	13.3	13.0	...	...	...	...
8	16.7	16.7	16.5	...	15.9	15.4	14.7	13.8	13.3	13.0	...	...	...	...
9	18.3	...	16.8	...	16.2	15.7	14.9	14.1	13.6	13.1	...	...	...	...
10	18.3	18.3	18.3	...	17.7	17.1	16.3	15.3	14.8	14.3	...	...	...	...
11	18.3	...	18.3	...	17.7	17.1	16.3	15.3	14.8	14.3	...	...	...	...
12	18.3	...	18.3	...	17.7	17.1	16.3	15.3	14.8	14.3	...	...	...	...
13	18.3	18.3	18.3	...	17.7	17.1	16.3	15.3	14.8	14.3	...	...	...	...
14	18.3	...	18.3	...	17.7	17.1	16.3	15.3	14.8	14.3	...	...	...	...
15	18.3	...	18.3	...	17.7	17.1	16.3	15.3	14.8	14.3	...	...	...	...
16	18.3	...	18.3	...	17.7	17.1	16.3	15.3	14.8	14.3	...	...	...	...
17	18.3	...	18.3	...	17.7	17.1	16.3	15.3	14.8	14.3	...	...	...	...
18	18.3	...	18.3	...	17.7	17.1	16.3	15.3	14.8	14.3	...	...	...	...
19	18.3	...	18.3	...	17.7	17.1	16.3	15.3	14.8	14.3	...	...	...	...
20	19.3	...	19.3	...	19.3	19.3	19.3	18.4	17.8	17.3	...	...	...	...
21	20.0	18.8	18.3	...	17.7	17.1	16.3	15.3	14.8	14.3	...	...	...	...
22	20.0	...	18.3	...	17.7	17.1	16.3	15.3	14.8	14.3	...	...	...	...
23	20.0	18.8	18.3	...	17.7	17.1	16.3	15.3	14.8	14.3	...	...	...	...
24	20.0	18.8	18.3	...	17.7	17.1	16.3	15.3	14.8	14.3	...	...	...	...
25	20.0	...	18.3	...	17.7	17.1	16.3	15.3	14.8	14.3	...	...	...	...
26	20.0	...	18.3	...	17.7	17.1	16.3	15.3	14.8	14.3	...	...	...	...
27	20.0	...	18.3	...	17.7	17.1	16.3	15.3	14.8	14.3	...	...	...	...
28	20.0	20.0	19.5	...	18.9	18.2	17.4	16.4	15.8	15.3	...	...	...	...
29	20.0	20.0	19.5	...	18.9	18.2	17.4	16.4	15.8	15.3	...	...	...	...
30	20.0	...	19.5	...	18.9	18.2	17.4	16.4	15.8	15.3	...	...	...	...
31	20.0	...	19.5	...	18.9	18.2	17.4	16.4	15.8	15.3	...	...	...	...
32	20.0	...	19.5	...	18.9	18.2	17.4	16.4	15.8	15.3	...	...	...	...
33	20.0	...	19.5	...	18.9	18.2	17.4	16.4	15.8	15.3	...	...	...	...
34	20.0	...	19.5	...	18.9	18.2	17.4	16.4	15.8	15.3	...	...	...	...
35	20.0	...	19.5	...	18.9	18.2	17.4	16.4	15.8	15.3	...	...	...	...
36	20.0	...	20.0	...	20.0	19.9	19.0	17.9	17.3	16.8	...	...	...	...
37	20.0	...	20.0	...	20.0	19.9	19.0	17.9	17.3	16.8	...	...	...	...
38	20.0	20.0	20.0	...	20.0	19.9	19.0	17.9	17.3	16.8	...	...	...	...
39	20.0	20.0	20.0	...	20.0	19.9	19.0	17.9	17.3	16.8	...	...	...	...
40	20.0	20.0	20.0	...	20.0	19.9	19.0	17.9	17.3	16.8	...	...	...	...
41	20.0	20.0	20.0	...	20.0	19.9	19.0	17.9	17.3	16.8	...	...	...	...
42	20.0	...	20.0	...	20.0	19.9	19.0	17.9	17.3	16.8
43	20.0	20.0	20.0	...	20.0	19.9	19.0	17.9	17.3	16.8
44	20.0	20.0	20.0	...	20.0	19.9	19.0	17.9	17.3	16.8

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	Carbon steel	Bar	SA-695	B/35	K03504	...	...	1	1
2	Carbon steel	Bar	SA-696	B	K03200	...	...	1	1
3	Carbon steel	Forgings	SA-727	...	K02506	...	...	1	1
4	Carbon steel	Wld. tube	SA-178	C	K03503	...	...	1	1
5	Carbon steel	Smls. tube	SA-210	A-1	K02707	...	...	1	1
6	Carbon steel	Castings	SA-352	LCB	J03003	...	...	1	1
7	Carbon steel	Plate	SA-515	65	K02800	...	...	1	1
8	Carbon steel	Plate	SA-516	65	K02403	...	...	1	1
9	Carbon steel	Wld. pipe	SA-671	CB65	K02800	...	...	1	1
10	Carbon steel	Wld. pipe	SA-671	CC65	K02403	...	...	1	1
11	Carbon steel	Wld. pipe	SA-672	B65	K02800	...	...	1	1
12	Carbon steel	Wld. pipe	SA-672	C65	K02403	...	...	1	1
13	Carbon steel	Plate	SA-537	...	K12437	1	$2\frac{1}{2} < t \leq 4$	1	2
14	Carbon steel	Wld. pipe	SA-691	CMSH-70	K12437	...	$2\frac{1}{2} < t \leq 4$	1	2
15	Carbon steel	Forgings	SA-105	...	K03504	...	...	1	2
16	Carbon steel	Forgings	SA-181	...	K03502	70	...	1	2
17	Carbon steel	Castings	SA-216	WCB	J03002	...	...	1	2
18	Carbon steel	Forgings	SA-266	2	K03506	...	...	1	2
19	Carbon steel	Forgings	SA-350	LF2	K03011	...	...	1	2
20	Carbon steel	Forgings	SA-508	1	K13502	...	...	1	2
21	Carbon steel	Forgings	SA-508	1A	K13502	...	...	1	2
22	Carbon steel	Forgings	SA-541	1	K03506	...	...	1	2
23	Carbon steel	Forgings	SA-541	1A	K03020	...	...	1	2
24	Carbon steel	Cast pipe	SA-660	WCB	J03003	...	...	1	2
25	Carbon steel	Plate	SA-515	70	K03101	...	...	1	2
26	Carbon steel	Plate	SA-516	70	K02700	...	...	1	2
27	Carbon steel	Wld. pipe	SA-671	CB70	K03101	...	...	1	2
28	Carbon steel	Wld. pipe	SA-671	CC70	K02700	...	...	1	2
29	Carbon steel	Wld. pipe	SA-672	B70	K03101	...	...	1	2
30	Carbon steel	Wld. pipe	SA-672	C70	K02700	...	...	1	2
31	Carbon steel	Smls. pipe	SA-106	C	K03501	...	...	1	2
32	Carbon steel	Castings	SA-216	WCC	K02503	...	...	1	2
33	Carbon steel	Fittings	SA-234	WPC	K03501	...	...	1	2
34	Carbon steel	Wld. fittings	SA-234	WPC	K03501	W	...	1	2
35	Carbon steel	Castings	SA-352	LCC	J02505	...	...	1	2
36	Carbon steel	Castings	SA-487	16	...	A	...	1	2
37	Carbon steel	Cast pipe	SA-660	WCC	J02505	...	...	1	2
38	Carbon steel	Bar	SA-695	B/40	K03504	...	...	1	2
39	Carbon steel	Bar	SA-696	C	K03200	...	...	1	2
40	Carbon steel	Plate	SA-537	...	K12437	2	$4 < t \leq 6$	1	3
41	Carbon steel	Plate	SA-537	...	K12437	1	$\leq 2\frac{1}{2}$	1	2
42	Carbon steel	Wld. pipe	SA-671	CD70	K12437	...	$\leq 2\frac{1}{2}$	1	2
43	Carbon steel	Wld. pipe	SA-672	D70	K12437	...	$\leq 2\frac{1}{2}$	1	2
44	Carbon steel	Wld. pipe	SA-691	CMSH-70	K12437	...	$\leq 2\frac{1}{2}$	1	2

TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

#1

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Temp. Limit (SPT = Supports Only)	External Pressure Chart No.	Notes
1	60	35	700	CS-2	E2
2	60	35	700	CS-2	E2
3	60	36	700 (SPT)	CS-2	E2
4	60	37	700	CS-2	E2
5	60	37	700	CS-2	E2
6	65	35	700	CS-2	...
7	65	35	700	CS-2	...
8	65	35	700	CS-2	...
9	65	35	700	CS-2	G1, G4
10	65	35	700	CS-2	G1, G4
11	65	35	700	CS-2	G1, G4
12	65	35	700	CS-2	G1, G4
13	65	45	700	CS-2	E2
14	65	45	700	CS-2	E2, G1, G2
15	70	36	700	CS-2	...
16	70	36	700	CS-2	...
17	70	36	700	CS-2	...
18	70	36	700	CS-2	...
19	70	36	700	CS-2	...
20	70	36	700	CS-2	...
21	70	36	700	CS-2	...
22	70	36	700	CS-2	...
23	70	36	700	CS-2	...
24	70	36	700	CS-2	...
25	70	38	700	CS-2	...
26	70	38	700	CS-2	...
27	70	38	700	CS-2	G1, G3
28	70	38	700	CS-2	G1, G4
29	70	38	700	CS-2	G1, G3
30	70	38	700	CS-2	G1, G4
31	70	40	700	CS-2	E2
32	70	40	700	CS-2	E2
33	70	40	700	CS-2	E2
34	70	40	700	CS-2	E2
35	70	40	700	CS-2	E2
36	70	40	700	CS-2	E2
37	70	40	700	CS-2	E2
38	70	40	700	CS-2	E2
39	70	40	700	CS-2	E2
40	70	46	700	CS-3	E2
41	70	50	700	CS-3	E2
42	70	50	700	CS-3	E2, G1, G4
43	70	50	700	CS-3	E2, G1, G4
44	70	50	700	CS-3	E2, G1, G4

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Design Stress Intensity, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	20.0	20.0	20.0	...	20.0	19.9	19.0	17.9	17.3	16.8	...	...	...	...
2	20.0	...	20.0	...	20.0	19.9	19.0	17.9	17.3	16.8	...	...	...	...
3	20.0	20.0	20.0	...	20.0	20.0	19.6	18.4	17.8	17.3	...	...	...	...
4	20.0	...	20.0	...	20.0	20.0	20.0	18.9	18.3	17.8	...	...	...	...
5	20.0	20.0	20.0	...	20.0	20.0	20.0	18.9	18.3	17.8	...	...	...	...
6	21.7	21.7	21.4	...	20.6	19.9	19.0	17.9	17.3	16.7	...	...	...	...
7	21.7	21.7	21.4	...	20.6	19.9	19.0	17.9	17.3	16.7	...	...	...	...
8	21.7	21.7	21.4	...	20.6	19.9	19.0	17.9	17.3	16.7	...	...	...	...
9	21.7	...	21.4	...	20.6	19.9	19.0	17.9	17.3	16.7	...	...	...	...
10	21.7	...	21.4	...	20.6	19.9	19.0	17.9	17.3	16.7	...	...	...	...
11	21.7	...	21.4	...	20.6	19.9	19.0	17.9	17.3	16.7	...	...	...	...
12	21.7	...	21.4	...	20.6	19.9	19.0	17.9	17.3	16.7	...	...	...	...
13	21.7	...	21.7	...	21.7	21.7	21.7	21.7	20.5	19.6	...	...	...	...
14	21.7	...	21.7	...	21.7	21.7	21.7	21.7	20.5	19.6	...	...	...	...
15	23.3	22.6	22.0	...	21.2	20.5	19.6	18.4	17.8	17.2	...	...	...	...
16	23.3	22.6	22.0	...	21.2	20.5	19.6	18.4	17.8	17.2	...	...	...	...
17	23.3	22.6	22.0	...	21.2	20.5	19.6	18.4	17.8	17.2	...	...	...	...
18	23.3	...	22.0	...	21.2	20.5	19.6	18.4	17.8	17.2	...	...	...	...
19	23.3	22.6	22.0	...	21.2	20.5	19.6	18.4	17.8	17.2	...	...	...	...
20	23.3	22.6	22.0	...	21.2	20.5	19.6	18.4	17.8	17.2	...	...	...	...
21	23.3	22.6	22.0	...	21.2	20.5	19.6	18.4	17.8	17.2	...	...	...	...
22	23.3	22.6	22.0	...	21.2	20.5	19.6	18.4	17.8	17.2	...	...	...	...
23	23.3	22.6	22.0	...	21.2	20.5	19.6	18.4	17.8	17.2	...	...	...	...
24	23.3	...	22.0	...	21.2	20.5	19.6	18.4	17.8	17.2	...	...	...	...
25	23.3	23.3	23.2	...	22.4	21.6	20.6	19.4	18.8	18.1	...	...	...	...
26	23.3	23.3	23.2	...	22.4	21.6	20.6	19.4	18.8	18.1	...	...	...	...
27	23.3	...	23.2	...	22.4	21.6	20.6	19.4	18.8	18.1	...	...	...	...
28	23.3	...	23.2	...	22.4	21.6	20.6	19.4	18.8	18.1	...	...	...	...
29	23.3	...	23.2	...	22.4	21.6	20.6	19.4	18.8	18.1	...	...	...	...
30	23.3	...	23.2	...	22.4	21.6	20.6	19.4	18.8	18.1	...	...	...	...
31	23.3	...	23.3	...	23.3	22.8	21.7	20.4	19.8	19.2	...	...	...	...
32	23.3	23.3	23.3	...	23.3	22.8	21.7	20.4	19.8	19.2	...	...	...	...
33	23.3	...	23.3	...	23.3	22.8	21.7	20.4	19.8	19.2	...	...	...	...
34	23.3	...	23.3	...	23.3	22.8	21.7	20.4	19.8	19.2	...	...	...	...
35	23.3	...	23.3	...	23.3	22.8	21.7	20.4	19.8	19.2	...	...	...	...
36	23.3	...	23.2	...	21.9	21.1	20.4	19.6	19.1	18.6	...	...	...	...
37	23.3	...	23.3	...	23.3	22.8	21.7	20.4	19.8	19.2	...	...	...	...
38	23.3	23.3	23.3	...	23.3	22.8	21.7	20.4	19.8	19.2	...	...	...	...
39	23.3	...	23.3	...	23.3	22.8	21.7	20.4	19.8	19.2	...	...	...	...
40	23.3	...	23.3	...	23.3	23.3	23.3	23.1	22.5	20.7	...	...	...	...
41	23.3	...	23.3	...	22.8	22.7	22.7	22.4	21.9	21.4	...	...	...	...
42	23.3	...	23.3	...	22.8	22.7	22.7	22.4	21.9	21.4
43	23.3	...	23.3	...	22.8	22.7	22.7	22.4	21.9	21.4
44	23.3	...	23.3	...	22.8	22.7	22.7	22.4	21.9	21.4

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	Carbon steel	Forgings	SA-266	3	K05001	...	...	1	2
2	Carbon steel	Plate	SA-299	...	K02803	...	> 1	1	2
3	Carbon steel	Wld. pipe	SA-691	CMS-75	K02803	...	> 1	1	2
4	Carbon steel	Plate	SA-299	...	K02803	...	≤ 1	1	2
5	Carbon steel	Wld. pipe	SA-671	CK75	K02803	...	≤ 1	1	2
6	Carbon steel	Wld. pipe	SA-672	N75	K02803	...	≤ 1	1	2
7	Carbon steel	Wld. pipe	SA-691	CMS-75	K02803	...	≤ 1	1	2
8	Carbon steel	Plate	SA-537	...	K12437	2	$2\frac{1}{2} < t \leq 4$	1	3
9	Carbon steel	Wld. pipe	SA-691	CMSH-80	K12437	...	$2\frac{1}{2} < t \leq 4$	1	3
10	Carbon steel	Plate	SA-537	...	K12437	2	≤ $2\frac{1}{2}$	1	3
11	Carbon steel	Wld. pipe	SA-671	CD80	K12437	...	≤ $2\frac{1}{2}$	1	3
12	Carbon steel	Wld. pipe	SA-672	D80	K12437	...	≤ $2\frac{1}{2}$	1	3
13	Carbon steel	Wld. pipe	SA-691	CMSH-80	K12437	...	≤ $2\frac{1}{2}$	1	3
(a) 14	Carbon steel	Plate	SA-738	B	K12007	...	...	1	3
15	C-Mn-Si-Cb	Plate	SA-737	B	K12001	...	...	1	2
16	C-Mn-Si-V	Plate	SA-737	C	K12202	...	...	1	3
17	C- $\frac{1}{2}$ Mo	Fittings	SA-234	WP1	K12821	...	...	3	1
18	C- $\frac{1}{2}$ Mo	Wld. fittings	SA-234	WP1	K12821	W	...	3	1
19	C- $\frac{1}{2}$ Mo	Smls. pipe	SA-335	P1	K11522	...	...	3	1
20	C- $\frac{1}{2}$ Mo	Forged pipe	SA-369	FP1	K11522	...	...	3	1
21	C- $\frac{1}{2}$ Mo	Castings	SA-217	WC1	J12524	...	...	3	1
22	C- $\frac{1}{2}$ Mo	Castings	SA-352	LC1	J12522	...	...	3	1
23	C- $\frac{1}{2}$ Mo	Cast pipe	SA-426	CP1	J12521	...	...	3	1
24	C- $\frac{1}{2}$ Mo	Plate	SA-204	A	K11820	...	...	3	1
25	C- $\frac{1}{2}$ Mo	Wld. pipe	SA-672	L65	K11820	...	...	3	1
26	C- $\frac{1}{2}$ Mo	Wld. pipe	SA-691	CM-65	K11820	...	...	3	1
27	C- $\frac{1}{2}$ Mo	Forgings	SA-182	F1	K12822	...	...	3	2
28	C- $\frac{1}{2}$ Mo	Plate	SA-204	B	K12020	...	...	3	2
29	C- $\frac{1}{2}$ Mo	Forgings	SA-336	F1	K12520	...	...	3	2
30	C- $\frac{1}{2}$ Mo	Wld. pipe	SA-672	L70	K12020	...	...	3	2
31	C- $\frac{1}{2}$ Mo	Wld. pipe	SA-691	CM-70	K12020	...	...	3	2
32	C- $\frac{1}{2}$ Mo	Plate	SA-204	C	K12320	...	...	3	2
33	C- $\frac{1}{2}$ Mo	Wld. pipe	SA-672	L75	K12320	...	...	3	2
34	C- $\frac{1}{2}$ Mo	Wld. pipe	SA-691	CM-75	K12320	...	...	3	2
35	$\frac{1}{2}$ Cr- $\frac{1}{5}$ Mo-V	Plate	SA-517	B	K11630	...	≤ $1\frac{1}{4}$	11B	4
36	$\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-Si	Forgings	SA-592	A	K11856	...	$2\frac{1}{2} < t \leq 4$	11B	1
37	$\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-Si	Plate	SA-517	A	K11856	...	≤ $1\frac{1}{4}$	11B	1
38	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Smls. pipe	SA-335	P2	K11547	...	...	3	1
39	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Forged pipe	SA-369	FP2	K11547	...	...	3	1
40	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Plate	SA-387	2	K12143	1	...	3	1
41	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Wld. pipe	SA-691	$\frac{1}{2}$ CR	K12143	...	...	3	1
42	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Smls. tube	SA-213	T2	K11547	...	...	3	1
43	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Cast pipe	SA-426	CP2	J11547	...	...	3	1

TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

#1

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Temp. Limit (SPT = Supports Only)	External Pressure Chart No.	Notes
1	75	37.5	700	CS-2	W1
2	75	40	700	CS-2	...
3	75	40	700	CS-2	G1, G4
4	75	42	700	CS-2	E2
5	75	42	700	CS-2	E2, G1
6	75	42	700	CS-2	E2, G1
7	75	42	700	CS-2	E2, G1
8	75	55	700	CS-5	E2
9	75	55	700	CS-5	E2
10	80	60	700	CS-5	E1
11	80	60	700	CS-5	E1, G1, G4
12	80	60	700	CS-5	E1, G1, G4
13	80	60	700	CS-5	E1, G1, G4
14	85	60	600	CS-5	...
15	70	50	700	CS-3	E2
16	80	60	700	CS-3	E1
17	55	30	700	CS-2	...
18	55	30	700	CS-2	...
19	55	30	700	CS-2	...
20	55	30	700	CS-2	...
21	65	35	700	CS-2	...
22	65	35	700	CS-2	...
23	65	35	700	CS-2	...
24	65	37	700	CS-2	...
25	65	37	700	CS-2	G1, G2
26	65	37	700	CS-2	G1, G2
27	70	40	700	CS-2	...
28	70	40	700	CS-2	...
29	70	40	700	CS-2	...
30	70	40	700	CS-2	G1, G2
31	70	40	700	CS-2	G1, G2
32	75	43	700	CS-2	...
33	75	43	700	CS-2	G1, G2
34	75	43	700	CS-2	G1, G2
35	115	100	700 (SPT)	HT-1	...
36	105	90	700 (SPT)	CS-5	...
37	115	100	700 (SPT)	HT-1	...
38	55	30	700	CS-2	...
39	55	30	700	CS-2	...
40	55	33	700	CS-2	...
41	55	33	700	CS-2	G1, G2
42	60	30	700	CS-2	...
43	60	30	700	CS-2	...

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Design Stress Intensity, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	25.0	23.5	22.9	...	22.1	21.4	20.4	19.2	18.5	17.9	...	...	...	...
2	25.0	25.0	24.4	...	23.6	22.8	21.7	20.4	19.8	19.1	...	...	...	...
3	25.0	...	24.4	...	23.6	22.8	21.7	20.4	19.8	19.1	...	...	...	...
4	25.0	25.0	25.0	...	24.8	23.9	22.8	21.5	20.8	20.2	...	...	...	...
5	25.0	25.0	25.0	...	24.8	23.9	22.8	21.5	20.8	20.2	...	...	...	...
6	25.0	25.0	25.0	...	24.8	23.9	22.8	21.5	20.8	20.2	...	...	...	...
7	25.0	...	25.0	...	24.8	23.9	22.8	21.5	20.8	20.2	...	...	...	...
8	25.0	...	25.0	...	25.0	25.0	25.0	24.8	24.4	24.3	...	...	...	...
9	25.0	...	25.0	...	25.0	25.0	25.0	24.8	24.4	24.3	...	...	...	...
10	26.7	...	26.7	...	26.7	26.7	26.7	26.4	26.0	24.3	...	...	...	...
11	26.7	...	26.7	...	26.7	26.7	26.7	26.4	26.0	24.3	...	...	...	...
12	26.7	...	26.7	...	26.7	26.7	26.7	26.4	26.0	24.3	...	...	...	...
13	26.7	...	26.7	...	26.7	26.7	26.7	26.4	26.0	24.3	...	...	...	...
(a) 14	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.1	...	...	...	...	...	...
15	23.3	23.3	23.3	...	23.3	23.3	23.3	22.6	22.3	22.1	...	...	...	...
16	26.7	...	26.7	...	26.7	26.7	26.7	26.7	26.2	25.9	...	...	...	...
17	18.3	18.3	18.3	...	18.0	17.4	16.9	16.4	16.1	15.7	...	...	...	...
18	18.3	18.3	18.3	...	18.0	17.4	16.9	16.4	16.1	15.7	...	...	...	...
19	18.3	...	18.3	...	18.0	17.4	16.9	16.4	16.1	15.7	...	...	...	...
20	18.3	...	18.3	...	18.0	17.4	16.9	16.4	16.1	15.7	...	...	...	...
21	21.7	...	21.7	...	21.0	20.3	19.7	19.1	18.7	18.4	...	...	...	...
22	21.7	...	21.7	...	21.0	20.3	19.7	19.1	18.7	18.4	...	...	...	...
23	21.7	...	21.7	...	21.0	20.3	19.7	19.1	18.7	18.4	...	...	...	...
24	21.7	...	21.7	...	21.7	21.5	20.8	20.2	19.8	19.4	...	...	...	...
25	21.7	...	21.7	...	21.7	21.5	20.8	20.2	19.8	19.4	...	...	...	...
26	21.7	...	21.7	...	21.7	21.5	20.8	20.2	19.8	19.4	...	...	...	...
27	23.3	...	23.3	...	23.3	23.2	22.5	21.8	21.4	21.0	...	...	...	...
28	23.3	...	23.3	...	23.3	23.2	22.5	21.8	21.4	21.0	...	...	...	...
29	23.3	...	23.3	...	23.3	23.2	22.5	21.8	21.4	21.0	...	...	...	...
30	23.3	...	23.3	...	23.3	23.2	22.5	21.8	21.4	21.0	...	...	...	...
31	23.3	...	23.3	...	23.3	23.2	22.5	21.8	21.4	21.0	...	...	...	...
32	25.0	...	25.0	...	25.0	25.0	24.2	23.4	23.0	22.6	...	...	...	...
33	25.0	...	25.0	...	25.0	25.0	24.2	23.4	23.0	22.6	...	...	...	...
34	25.0	...	25.0	...	25.0	25.0	24.2	23.4	23.0	22.6	...	...	...	...
35	38.3	...	38.3	...	38.3	38.3	38.3	38.3	38.3	37.5	...	...	...	...
36	35.0	...	35.0	...	35.0	35.0	35.0	34.8	34.0	33.2	...	...	...	...
37	38.3	...	38.3	...	38.3	38.3	38.3	38.3	38.3	37.5	...	...	...	...
38	18.3	...	18.3	...	18.0	17.4	16.9	16.4	16.1	15.7	...	...	...	...
39	18.3	...	18.3	...	18.0	17.4	16.9	16.4	16.1	15.7	...	...	...	...
40	18.3	...	18.3	...	18.3	18.3	18.3	18.0	17.7	17.3	...	...	...	...
41	18.3	...	18.3	...	18.3	18.3	18.3	18.0	17.7	17.3
42	20.0	...	18.8	...	18.0	17.4	16.9	16.4	16.1	15.7
43	20.0	...	18.8	...	18.0	17.4	16.9	16.4	16.1	15.7

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	1Cr- $\frac{1}{2}$ Mo	Plate	SA-387	12	K11757	1	...	4	1
2	1Cr- $\frac{1}{2}$ Mo	Wld. pipe	SA-691	1CR	K11757	22	...	4	1
3	1Cr- $\frac{1}{2}$ Mo	Cast pipe	SA-426	CP12	J11562	...	...	4	1
4	1Cr- $\frac{1}{2}$ Mo	Smls. tube	SA-213	T12	K11562	...	...	4	1
5	1Cr- $\frac{1}{2}$ Mo	Fittings	SA-234	WP12	K12062	1	...	4	1
6	1Cr- $\frac{1}{2}$ Mo	Smls. pipe	SA-335	P12	K11562	...	...	4	1
7	1Cr- $\frac{1}{2}$ Mo	Forged pipe	SA-369	FP12	K11562	...	...	4	1
8	1Cr- $\frac{1}{2}$ Mo	Plate	SA-387	12	K11757	2	...	4	1
9	1Cr- $\frac{1}{2}$ Mo	Wld. pipe	SA-691	1CR	K11757	42	...	4	1
10	1Cr- $\frac{1}{2}$ Mo	Forgings	SA-182	F12	K11564	2	...	4	1
11	1Cr- $\frac{1}{2}$ Mo	Forgings	SA-336	F12	K11564	...	...	4	1
12	$\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo	Castings	SA-217	WC6	J12072	...	...	4	1
13	$\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo	Cast pipe	SA-426	CP11	J12072	...	...	4	1
14	$\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo	Bar	SA-739	B11	K11797	...	...	4	1
15	$\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Smls. tube	SA-213	T11	K11597	...	...	4	1
16	$\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Fittings	SA-234	WP11	...	1	...	4	1
17	$\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Wld. fittings	SA-234	WP11	...	1/W	...	4	1
18	$\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Smls. pipe	SA-335	P11	K11597	...	...	4	1
19	$\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Forged pipe	SA-369	FP11	K11597	...	...	4	1
20	$\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Plate	SA-387	11	K11789	1	...	4	1
21	$\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Wld. pipe	SA-691	$\frac{1}{4}$ CR	K11789	...	...	4	1
22	$\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Forgings	SA-182	F11	K11572	2	...	4	1
23	$\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Plate	SA-387	11	K11789	2	...	4	1
24	$\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Wld. pipe	SA-691	$\frac{1}{4}$ CR	K11789	...	...	4	1
25	$\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo-Cu	Forgings	SA-592	E	K11695	...	$2\frac{1}{2} < t \leq 4$	11B	2
26	$\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo-Ti	Plate	SA-517	E	K21604	...	$2\frac{1}{2} < t \leq 6$	11B	2
27	$\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo-Ti	Plate	SA-517	E	K21604	...	$\leq 2\frac{1}{2}$	11B	2
28	$\frac{1}{4}$ Cr-1Mo	Forgings	SA-182	F22	K21590	1	...	5A	1
29	$\frac{1}{4}$ Cr-1Mo	Smls. tube	SA-213	T22	K21590	...	...	5A	1
30	$\frac{1}{4}$ Cr-1Mo	Fittings	SA-234	WP22	K21590	1	...	5A	1
31	$\frac{1}{4}$ Cr-1Mo	Wld. fittings	SA-234	WP22	K21590	1/W	...	5A	1
32	$\frac{1}{4}$ Cr-1Mo	Smls. pipe	SA-335	P22	K21590	...	...	5A	1
33	$\frac{1}{4}$ Cr-1Mo	Forgings	SA-336	F22	K21590	1	...	5A	1
34	$\frac{1}{4}$ Cr-1Mo	Forged pipe	SA-369	FP22	K21590	...	...	5A	1
35	$\frac{1}{4}$ Cr-1Mo	Plate	SA-387	22	K21590	1	...	5A	1
36	$\frac{1}{4}$ Cr-1Mo	Wld. pipe	SA-691	$\frac{1}{4}$ CR	K21590	...	...	5A	1
37	$\frac{1}{4}$ Cr-1Mo	Castings	SA-217	WC9	J21890	...	...	5A	1
38	$\frac{1}{4}$ Cr-1Mo	Castings	SA-217	WC9	J21890	...	...	5A	1
39	$\frac{1}{4}$ Cr-1Mo	Cast pipe	SA-426	CP22	J21890	...	...	5A	1

TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

#1

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Temp. Limit (SPT = Supports Only)	External Pressure Chart No.	Notes
1	55	33	700	CS-2	...
2	55	33	700	CS-2	G15
3	60	30	700	CS-2	...
4	60	32	700	CS-2	...
5	60	32	700	CS-2	...
6	60	32	700	CS-2	...
7	60	32	700	CS-2	...
8	65	40	700	CS-2	...
9	65	40	700	CS-2	G16, H2
10	70	40	700	CS-2	...
11	70	40	700	CS-2	...
12	70	40	700	CS-2	...
13	70	40	700	CS-2	...
14	70	45	700	CS-3	...
15	60	30	700	CS-2	...
16	60	30	700	CS-2	...
17	60	30	700	CS-2	...
18	60	30	700	CS-2	...
19	60	30	700	CS-2	...
20	60	35	700	CS-2	...
21	60	35	700	CS-2	G1, G2
22	70	40	700	CS-2	...
23	75	45	700	CS-3	...
24	75	45	700	CS-3	G1, G2, H2
25	105	90	700 (SPT)	CS-5	S1
26	105	90	700 (SPT)	CS-5	...
27	115	100	700 (SPT)	HT-1	...
28	60	30	700	CS-2	...
29	60	30	700	CS-2	W2
30	60	30	700	CS-2	W2
31	60	30	700	CS-2	...
32	60	30	700	CS-2	W2
33	60	30	700	CS-2	W2
34	60	30	700	CS-2	W2
35	60	30	700	CS-2	H1, W2
36	60	30	700	CS-2	G1, G2
37	70	40	700	CS-2	W2
38	70	40	700 (SPT)	CS-2	...
39	70	40	700	CS-2	...

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Design Stress Intensity, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	18.3	...	18.0	...	17.6	17.6	17.2	16.8	16.5	16.3	...	...	...	...
2	18.3	...	18.0	...	17.6	17.6	17.2	16.8	16.5	16.3	...	...	...	...
3	20.0	...	18.1	...	17.0	16.2	15.7	15.2	15.0	14.8	...	...	...	...
4	20.0	...	19.3	...	18.1	17.3	16.7	16.3	16.0	15.8	...	...	...	...
5	20.0	...	19.3	...	18.1	17.3	16.7	16.3	16.0	15.8	...	...	...	...
6	20.0	...	19.3	...	18.1	17.3	16.7	16.3	16.0	15.8	...	...	...	...
7	20.0	...	19.3	...	18.1	17.3	16.7	16.3	16.0	15.8	...	...	...	...
8	21.7	21.7	21.3	...	20.8	20.8	20.8	20.3	20.0	19.7	...	...	...	...
9	21.7	...	21.3	...	20.8	20.8	20.8	20.3	20.0	19.7	...	...	...	...
10	23.3	...	22.9	...	22.4	21.7	20.9	20.3	20.0	19.7	...	...	...	...
11	23.3	23.3	22.9	...	22.4	21.7	20.9	20.3	20.0	19.7	...	...	...	...
12	23.3	...	23.3	...	23.3	22.5	21.7	20.9	20.5	20.1	...	...	...	...
13	23.3	...	23.3	...	23.3	22.5	21.7	20.9	20.5	20.1	...	...	...	...
14	23.3	23.3	23.3	...	23.3	23.3	23.3	23.3	23.1	22.6	...	...	...	...
15	20.0	...	18.5	...	17.6	16.8	16.2	15.7	15.4	15.1	...	...	...	...
16	20.0	...	18.5	...	17.6	16.8	16.2	15.7	15.4	15.1	...	...	...	...
17	20.0	...	18.5	...	17.6	16.8	16.2	15.7	15.4	15.1	...	...	...	...
18	20.0	...	18.5	...	17.6	16.8	16.2	15.7	15.4	15.1	...	...	...	...
19	20.0	...	18.5	...	17.6	16.8	16.2	15.7	15.4	15.1	...	...	...	...
20	20.0	...	20.0	...	20.0	19.6	18.9	18.3	18.0	17.6	...	...	...	...
21	20.0	...	20.0	...	20.0	19.6	18.9	18.3	18.0	17.6	...	...	...	...
22	23.3	...	23.3	...	23.3	22.5	21.7	20.9	20.5	20.1	...	...	...	...
23	25.0	...	25.0	...	25.0	25.0	24.4	23.5	23.1	22.6	...	...	...	...
24	25.0	...	25.0	...	25.0	25.0	24.4	23.5	23.1	22.6	...	...	...	...
25	35.0	...	35.0	...	35.0	35.0	35.0	35.0	35.0	34.9	...	...	...	...
26	35.0	...	35.0	...	35.0	35.0	35.0	35.0	35.0	34.9	...	...	...	...
27	38.3	...	38.3	...	38.3	38.3	38.3	38.3	38.3	38.2	...	...	...	...
28	20.0	...	18.7	...	18.2	18.0	17.9	17.9	17.9	17.9	...	...	...	...
29	20.0	...	18.7	...	18.2	18.0	17.9	17.9	17.9	17.9	...	...	...	...
30	20.0	19.1	18.7	...	18.2	18.0	17.9	17.9	17.9	17.9	...	...	...	...
31	20.0	19.1	18.7	...	18.2	18.0	17.9	17.9	17.9	17.9	...	...	...	...
32	20.0	19.1	18.7	...	18.2	18.0	17.9	17.9	17.9	17.9	...	...	...	...
33	20.0	19.1	18.7	...	18.2	18.0	17.9	17.9	17.9	17.9	...	...	...	...
34	20.0	19.1	18.7	...	18.2	18.0	17.9	17.9	17.9	17.9	...	...	...	...
35	20.0	...	18.7	...	18.2	18.0	17.9	17.9	17.9	17.9	...	...	...	...
36	20.0	...	18.7	...	18.2	18.0	17.9	17.9	17.9	17.9	...	...	...	...
37	23.3	...	23.3	...	23.0	22.6	22.5	22.4	22.2	21.9
38	23.3	...	23.3	...	23.0	22.6	22.5	22.4	22.2	21.9
39	23.3	...	23.3	...	23.0	22.6	22.5	22.4	22.2	21.9

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/UNS No.	Class/Condition/Temper	Size/Thickness, in.	P-No.	Group No.
1	2¼Cr-1Mo	Forgings	SA-182	F22	K21590	3	...	5A	1
2	2½Cr-1Mo	Forgings	SA-336	F22	K21590	3	...	5A	1
3	2¼Cr-1Mo	Plate	SA-387	22	K21590	2	...	5A	1
4	2¼Cr-1Mo	Wld. pipe	SA-691	2¼CR	K21590	...	...	5A	1
5	2¼Cr-1Mo	Bar	SA-739	B22	K21390	...	...	5A	1
6	2¼Cr-1Mo	Castings	SA-487	8	J22091	A	...	5C	1
7	2¼Cr-1Mo	Forgings	SA-508	22	K21590	3	...	5C	1
8	2¼Cr-1Mo	Forgings	SA-541	22	K21390	4	≥ ¼	5C	4
9	3Cr-1Mo	Smls. tube	SA-213	T21	K31545	...	...	5A	1
10	3Cr-1Mo	Smls. pipe	SA-335	P21	K31545	...	...	5A	1
11	3Cr-1Mo	Forgings	SA-336	F21	K31545	1	...	5A	1
12	3Cr-1Mo	Forged pipe	SA-369	FP21	K31545	...	...	5A	1
13	3Cr-1Mo	Plate	SA-387	21	K31545	1	...	5A	1
14	3Cr-1Mo	Cast pipe	SA-426	CP21	J31545	...	...	5A	1
15	3Cr-1Mo	Forgings	SA-182	F21	K31545	...	...	5A	1
16	3Cr-1Mo	Forgings	SA-336	F21	K31545	3	...	5A	1
17	3Cr-1Mo	Plate	SA-387	21	K31545	2	...	5A	1
18	5Cr-½Mo	Smls. tube	SA-213	T5	K41545	...	...	5B	1
19	5Cr-½Mo	Fittings	SA-234	WP5	K41545	...	...	5B	1
20	5Cr-½Mo	Wld. fittings	SA-234	WP5	K41545	W	...	5B	1
21	5Cr-½Mo	Smls. pipe	SA-335	P5	K41545	...	...	5B	1
22	5Cr-½Mo	Forged pipe	SA-369	FP5	K41545	...	...	5B	1
23	5Cr-½Mo	Plate	SA-387	5	K41545	1	...	5B	1
24	5Cr-½Mo	Wld. pipe	SA-691	5CR	K41545	...	...	5B	1
25	5Cr-½Mo	Forgings	SA-182	F5	K41545	...	...	5B	1
26	5Cr-½Mo	Plate	SA-387	5	K41545	2	...	5B	1
27	5Cr-½Mo	Castings	SA-217	C5	J42045	...	...	5B	1
28	5Cr-½Mo	Cast pipe	SA-426	CP5	J42045	...	...	5B	1
29	9Cr-1Mo	Smls. tube	SA-213	T9	K90941	...	...	5B	1
30	9Cr-1Mo	Smls. pipe	SA-335	P9	K90941	...	...	5B	1
31	9Cr-1Mo	Forged pipe	SA-369	FP9	K90941	...	...	5B	1
32	9Cr-1Mo	Castings	SA-217	C12	J82090	...	...	5B	1
33	9Cr-1Mo	Cast pipe	SA-426	CP9	J82090	...	...	5B	1
34	9Cr-1Mo-V	Forgings	SA-182	F91	K90901	...	...	15E	1
35	9Cr-1Mo-V	Smls. tube	SA-213	T91	K90901	...	...	15E	1
36	9Cr-1Mo-V	Smls. pipe	SA-335	P91	K90901	...	...	15E	1
37	9Cr-1Mo-V	Plate	SA-387	91	K90901	2	...	15E	1
38	12Cr	Bar	SA-479	403	S40300	A	...	6	1
39	12Cr	Bar	SA-479	403	S40300	1	...	6	1
40	12Cr-Al	Plate	SA-240	405	S40500	...	...	7	1
41	12Cr-Al	Bar	SA-479	405	S40500	...	...	7	1
42	12Cr-Al	Bar	SA/JIS G4303	SUS405	...	...	...	7	1
43	12½Cr-2Ni	Bar	SA-479	414	S41400	...	...	6	4

TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

#1

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Temp. Limit (SPT = Supports Only)	External Pressure Chart No.	Notes
1	75	45	700	CS-3	W2
2	75	45	700	CS-3	W2
3	75	45	700	CS-3	W2
4	75	45	700	CS-3	G1, G2, H2
5	75	45	700	CS-3	W2
6	85	55	700	CS-3	...
7	85	55	700	CS-2	...
8	105	85	700	CS-3	S3, W1
9	60	30	700	CS-2	...
10	60	30	700	CS-2	...
11	60	30	700	CS-2	...
12	60	30	700	CS-2	...
13	60	30	700	CS-2	...
14	60	30	700	CS-2	...
15	75	45	700	CS-3	...
16	75	45	700	CS-3	...
17	75	45	700	CS-3	...
18	60	30	700	CS-2	...
19	60	30	700	CS-2	...
20	60	30	700	CS-2	...
21	60	30	700	CS-2	...
22	60	30	700	CS-2	...
23	60	30	700	CS-2	...
24	60	30	700	CS-2	G1, G2
25	70	40	700	CS-2	...
26	75	45	700	CS-3	...
27	90	60	700	CS-3	H2
28	90	60	700	CS-3	...
29	60	30	700	CS-2	...
30	60	30	700	CS-2	...
31	60	30	700	CS-2	...
32	90	60	700 (SPT)	CS-3	H2
33	90	60	700	CS-3	...
34	85	60	700	CS-3	...
35	85	60	700	CS-3	...
36	85	60	700	CS-3	...
37	85	60	700	CS-3	...
38	70	40	700	...	...
39	70	40	700
40	60	25	700	CS-1	G13
41	60	25	700	CS-1	G13
42	60	25	700	CS-1	G13
43	115	90	700	CS-3	...

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Design Stress Intensity, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	25.0	...	25.0	...	24.3	24.1	24.0	23.8	23.6	23.4	...	...	...	...
2	25.0	...	25.0	...	24.3	24.1	24.0	23.8	23.6	23.4	...	...	...	...
3	25.0	...	25.0	...	24.3	24.1	24.0	23.8	23.6	23.4	...	...	...	...
4	25.0	...	25.0	...	24.3	24.1	24.0	23.8	23.6	23.4	...	...	...	...
5	25.0	...	25.0	...	24.3	24.1	24.0	23.8	23.6	23.4	...	...	...	...
6	28.3	28.3	28.3	...	27.7	27.4	27.4	27.2	27.0	26.7	...	...	...	...
7	28.3	28.3	28.3	...	27.7	27.4	27.4	27.2	27.0	26.7	...	...	...	...
8	35.0	...	35.0	...	35.0	35.0	34.8	34.3	34.0	33.6	...	...	...	...
9	20.0	...	18.7	...	18.2	18.0	17.9	17.9	17.9	17.9	...	...	...	...
10	20.0	...	18.7	...	18.2	18.0	17.9	17.9	17.9	17.9	...	...	...	...
11	20.0	19.1	18.7	...	18.2	18.0	17.9	17.9	17.9	17.9	...	...	...	...
12	20.0	...	18.7	...	18.2	18.0	17.9	17.9	17.9	17.9	...	...	...	...
13	20.0	...	18.7	...	18.2	18.0	17.9	17.9	17.9	17.9	...	...	...	...
14	20.0	...	18.7	...	18.2	18.0	17.9	17.9	17.9	17.9	...	...	...	...
15	25.0	...	25.0	...	24.3	24.1	24.0	23.8	23.6	23.4	...	...	...	...
16	25.0	...	25.0	...	24.3	24.1	24.0	23.8	23.6	23.4	...	...	...	...
17	25.0	...	25.0	...	24.3	24.1	24.0	23.8	23.6	23.4	...	...	...	...
18	20.0	...	18.1	...	17.4	17.2	17.1	16.8	16.6	16.3	...	...	...	...
19	20.0	...	18.1	...	17.4	17.2	17.1	16.8	16.6	16.3	...	...	...	...
20	20.0	...	18.1	...	17.4	17.2	17.1	16.8	16.6	16.3	...	...	...	...
21	20.0	...	18.1	...	17.4	17.2	17.1	16.8	16.6	16.3	...	...	...	...
22	20.0	...	18.1	...	17.4	17.2	17.1	16.8	16.6	16.3	...	...	...	...
23	20.0	...	18.1	...	17.4	17.2	17.1	16.8	16.6	16.3	...	...	...	...
24	20.0	...	18.1	...	17.4	17.2	17.1	16.8	16.6	16.3	...	...	...	...
25	23.3	...	23.3	...	22.6	22.4	22.4	22.0	21.7	21.2	...	...	...	...
26	25.0	...	24.9	...	24.2	24.0	24.0	23.6	23.2	22.7	...	...	...	...
27	30.0	...	29.9	...	29.1	28.8	28.7	28.3	27.9	27.3	...	...	...	...
28	30.0	...	29.9	...	29.1	28.8	28.7	28.3	27.9	27.3	...	...	...	...
29	20.0	...	18.1	...	17.4	17.2	17.1	16.8	16.6	16.3	...	...	...	...
30	20.0	...	18.1	...	17.4	17.2	17.1	16.8	16.6	16.3	...	...	...	...
31	20.0	...	18.1	...	17.4	17.2	17.1	16.8	16.6	16.3	...	...	...	...
32	30.0	...	29.9	...	29.1	28.8	28.7	28.3	27.9	27.3	...	...	...	...
33	30.0	...	29.9	...	29.1	28.8	28.7	28.3	27.9	27.3	...	...	...	...
34	28.3	...	28.3	...	28.3	28.2	28.1	27.7	27.3	26.7	...	...	...	...
35	28.3	...	28.3	...	28.3	28.2	28.1	27.7	27.3	26.7	...	...	...	...
36	28.3	...	28.3	...	28.3	28.2	28.1	27.7	27.3	26.7	...	...	...	...
37	28.3	...	28.3	...	28.3	28.2	28.1	27.7	27.3	26.7	...	...	...	...
38	23.3	...	23.3	...	22.9	22.5	22.1	21.6	21.2	20.6	...	...	...	...
39	23.3	...	23.3	...	22.9	22.5	22.1	21.6	21.2	20.6	...	...	...	...
40	16.7	...	15.3	...	14.8	14.5	14.3	14.0	13.8	13.5	...	...	...	...
41	16.7	...	15.3	...	14.8	14.5	14.3	14.0	13.8	13.5
42	16.7	...	15.3	...	14.8	14.5	14.3	14.0	13.8	13.5
43	38.3	38.3	38.3	...	37.7	36.8	36.0	35.1	34.5	33.7

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	13Cr	Plate	SA-240	410S	S41008	...	...	7	1
2	13Cr	Forgings	SA-182	F6a	S41000	1	...	6	1
3	13Cr	Bar	SA-479	410	S41000	A	...	6	1
4	13Cr	Bar	SA-479	410	S41000	1	...	6	1
5	13Cr	Forgings	SA-182	F6a	S41000	2	...	6	3
6	13Cr	Castings	SA-217	CA15	J91150	...	...	6	3
7	13Cr	Cast pipe	SA-426	CPCA15	J91150	...	...	6	3
8	13Cr-4Ni	Castings	SA-487	CA6NM	J91540	A	...	6	4
9	13Cr-4Ni	Forgings	SA-182	F6NM	S41500	...	...	6	4
10	13Cr-8Ni-2Mo	Forgings	SA-705	XM-13	S13800	...	...	...	...
(a) 11	17Cr-4Ni-4Cu	Forgings, bar	SA-564	630	S17400	H1150	...	...	...
(a) 12	17Cr-4Ni-4Cu	Plate	SA-693	630	S17400	H1150	...	...	...
(a) 13	17Cr-4Ni-4Cu	Forgings	SA-705	630	S17400	H1150	...	...	...
(a) 14	17Cr-4Ni-4Cu	Bar	SA-564	630	S17400	H1100	...	...	...
(a) 15	17Cr-4Ni-4Cu	Plate	SA-693	630	S17400	H1100	...	...	...
(a) 16	17Cr-4Ni-4Cu	Forgings	SA-705	630	S17400	H1100	...	...	...
(a) 17	17Cr-4Ni-4Cu	Bar	SA-564	630	S17400	H1075	...	...	...
(a) 18	17Cr-4Ni-4Cu	Plate	SA-693	630	S17400	H1075	...	...	...
(a) 19	17Cr-4Ni-4Cu	Forgings	SA-705	630	S17400	H1075	...	...	...
20	27Cr-1Mo	Plate	SA-240	XM-27	S44627	...	...	10I	1
21	27Cr-1Mo	Smls. & wld. tube	SA-268	TPXM-27	S44627	...	...	10I	1
22	27Cr-1Mo	Bar	SA-479	XM-27	S44627	...	...	10I	1
23	Mn- $\frac{1}{4}$ Mo-V	Castings	SA-487	2	J13005	A	...	3	3
24	Mn- $\frac{1}{2}$ Mo	Plate	SA-302	A	K12021	...	...	3	2
25	Mn- $\frac{1}{2}$ Mo	Wld. pipe	SA-672	H75	K12021	...	...	3	2
26	Mn- $\frac{1}{2}$ Mo	Plate	SA-302	B	K12022	...	...	3	3
27	Mn- $\frac{1}{2}$ Mo	Plate	SA-533	A	K12521	1	...	3	3
28	Mn- $\frac{1}{2}$ Mo	Wld. pipe	SA-672	H80	K12022	...	...	3	3
29	Mn- $\frac{1}{2}$ Mo	Plate	SA-533	A	K12521	2	...	3	3
30	Mn- $\frac{1}{2}$ Mo	Plate	SA-533	A	K12521	3	...	11A	4
31	Mn- $\frac{1}{2}$ Mo- $\frac{1}{4}$ Ni	Plate	SA-533	D	K12529	1	...	3	3
32	Mn- $\frac{1}{2}$ Mo- $\frac{1}{4}$ Ni	Plate	SA-533	D	K12529	2	...	3	3
33	Mn- $\frac{1}{2}$ Mo- $\frac{1}{4}$ Ni	Plate	SA-533	D	K12529	3	...	11A	4
34	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Plate	SA-302	C	K12039	...	...	3	3
35	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Plate	SA-533	B	K12539	1	...	3	3
36	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Wld. pipe	SA-672	J80	K12539	...	...	3	3
37	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Plate	SA-533	B	K12539	2	...	3	3
38	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Wld. pipe	SA-672	J90	K12539	...	...	3	3
39	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Plate	SA-533	B	K12539	3	...	11A	4
40	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Wld. pipe	SA-672	J100	K12539	...	...	11A	4

TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

#1

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Temp. Limit (SPT = Supports Only)	External Pressure Chart No.	Notes	
1	60	30	700	CS-2	...	
2	70	40	700	CS-2	...	
3	70	40	700	CS-2	...	
4	70	40	700	CS-2	...	
5	85	55	700	CS-3	...	
6	90	65	700	CS-5	...	
7	90	65	700	CS-5	...	
8	110	80	700	CS-5	...	
9	115	90	700	CS-3	...	
10	150	135	600	HA-7	W1	
11	135	105	650	HT-1	G8, W1	(a)
12	135	105	650	HT-1	G8, W1	(a)
13	135	105	650	HT-1	G8, W1	(a)
14	140	115	650	HT-1	G8, W1	(a)
15	140	115	650	HT-1	G8, W1	(a)
16	140	115	650	HT-1	G8, W1	(a)
17	145	125	650	HT-1	G8, W1	(a)
18	145	125	650	HT-1	G8, W1	(a)
19	145	125	650	HT-1	G8, W1	(a)
20	65	40	650	HA-2	G13	
21	65	40	650	HA-2	G13	
22	65	40	650	HA-2	G13	
23	85	53	700 (SPT)	CS-3	...	
24	75	45	700	CS-3	...	
25	75	45	700	CS-3	G1, G2	
26	80	50	700	CS-3	...	
27	80	50	700	CS-5	...	
28	80	50	700	CS-3	G1, G2	
29	90	70	700	CS-5	...	
30	100	83	700	CS-5	...	
31	80	50	700	CS-5	...	
32	90	70	700	CS-5	...	
33	100	83	700	CS-5	...	
34	80	50	700	CS-3	...	
35	80	50	700	CS-5	...	
36	80	50	700	CS-5	G1, G2	
37	90	70	700	CS-5	...	
38	90	70	700	CS-5	G1, G2	
39	100	83	700	CS-5	...	
40	100	83	700	CS-5	G1, G2	

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Design Stress Intensity, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	20.0	...	18.4	...	17.8	17.4	17.2	16.8	16.6	16.2	...	...	...	...
2	23.3	...	23.3	...	22.9	22.5	22.1	21.6	21.2	20.6	...	...	...	...
3	23.3	...	23.3	...	22.9	22.5	22.1	21.6	21.2	20.6	...	...	...	...
4	23.3	...	23.3	...	22.9	22.5	22.1	21.6	21.2	20.6	...	...	...	...
5	28.3	...	28.3	...	27.8	27.3	26.9	26.2	25.7	25.1	...	...	...	...
6	30.0	...	30.0	...	29.4	28.9	28.4	27.7	27.2	26.5	...	...	...	...
7	30.0	...	30.0	...	29.4	28.9	28.4	27.7	27.2	26.5	...	...	...	...
8	36.7	...	36.7	...	36.0	35.1	34.4	33.6	33.1	32.6	...	...	...	...
9	38.3	...	38.3	...	38.3	37.9	36.5	35.0	34.3	33.4	...	...	...	...
10	50.0	50.0	50.0	...	50.0	49.3	47.7	45.7	...	...	...	...	...	...
(a) 11	45.0	...	45.0	...	45.0	43.7	42.9	42.2	41.8	...	...	...	...	...
(a) 12	45.0	...	45.0	...	45.0	43.7	42.9	42.2	41.8	...	...	...	...	...
(a) 13	45.0	...	45.0	...	45.0	43.7	42.9	42.2	41.8	...	...	...	...	...
(a) 14	46.7	...	46.7	...	46.7	45.4	44.5	43.8	43.4	...	...	...	...	...
(a) 15	46.7	...	46.7	...	46.7	45.4	44.5	43.8	43.4	...	...	...	...	...
(a) 16	46.7	...	46.7	...	46.7	45.4	44.5	43.8	43.4	...	...	...	...	...
(a) 17	48.3	...	48.3	...	48.3	47.0	46.1	45.4	44.9	...	...	...	...	...
(a) 18	48.3	...	48.3	...	48.3	47.0	46.1	45.4	44.9	...	...	...	...	...
(a) 19	48.3	...	48.3	...	48.3	47.0	46.1	45.4	44.9	...	...	...	...	...
20	21.7	...	21.7	...	20.9	19.5	18.9	18.7	18.6	...	...	...	...	...
21	21.7	...	21.7	...	20.9	19.5	18.9	18.7	18.6	...	...	...	...	...
22	21.7	...	21.7	...	20.9	19.5	18.9	18.7	18.6	...	...	...	...	...
23	28.3	...	28.3	...	28.3	28.2	28.2	27.3	27.0	26.5	...	...	...	...
24	25.0	...	25.0	...	25.0	25.0	25.0	25.0	24.9	24.4	...	...	...	...
25	25.0	...	25.0	...	25.0	25.0	25.0	25.0	24.9	24.4	...	...	...	...
26	26.7	...	26.7	...	26.7	26.7	26.7	26.7	26.7	26.7	...	...	...	...
27	26.7	26.7	26.7	...	26.7	26.7	26.7	26.7	26.7	26.7	...	...	...	...
28	26.7	26.7	26.7	...	26.7	26.7	26.7	26.7	26.7	26.7	...	...	...	...
29	30.0	...	30.0	...	30.0	30.0	30.0	30.0	30.0	30.0	...	...	...	...
30	33.3	...	33.3	...	33.3	33.3	33.3	33.3	33.3	33.3	...	...	...	...
31	26.7	...	26.7	...	26.7	26.7	26.7	26.7	26.7	26.7	...	...	...	...
32	30.0	...	30.0	...	30.0	30.0	30.0	30.0	30.0	30.0	...	...	...	...
33	33.3	...	33.3	...	33.3	33.3	33.3	33.3	33.3	33.3	...	...	...	...
34	26.7	...	26.7	...	26.7	26.7	26.7	26.7	26.7	26.7	...	...	...	...
35	26.7	26.7	26.7	...	26.7	26.7	26.7	26.7	26.7	26.7	...	...	...	...
36	26.7	...	26.7	...	26.7	26.7	26.7	26.7	26.7	26.7	...	...	...	...
37	30.0	...	30.0	...	30.0	30.0	30.0	30.0	30.0	30.0	...	...	...	...
38	30.0	...	30.0	...	30.0	30.0	30.0	30.0	30.0	30.0
39	33.3	...	33.3	...	33.3	33.3	33.3	33.3	33.3	33.3
40	33.3	...	33.3	...	33.3	33.3	33.3	33.3	33.3	33.3

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni	Plate	SA-302	D	K12054	...	...	3	3
2	Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni	Plate	SA-533	C	K12554	1	...	3	3
3	Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni	Plate	SA-533	C	K12554	2	...	3	3
4	Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni	Plate	SA-533	C	K12554	3	...	11A	4
5	Mn-V	Castings	SA-487	1	J13002	A	...	10A	1
6	$\frac{1}{2}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-V	Castings	SA-487	4	J13047	A	...	3	3
7	$\frac{1}{2}$ Ni- $\frac{1}{2}$ Mo-V	Forgings	SA-541	3	K12045	1	...	3	3
8	$\frac{1}{2}$ Ni- $\frac{1}{2}$ Mo-V	Forgings	SA-541	3	K12045	2	...	3	3
9	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-592	F	K11576	...	$2\frac{1}{2} < t \leq 4$	11B	3
10	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Plate	SA-517	F	K11576	...	$\leq 2\frac{1}{2}$	11B	3
11	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo- $\frac{1}{3}$ Cr-V	Forgings	SA-508	2	K12766	1	...	3	3
12	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo- $\frac{1}{3}$ Cr-V	Forgings	SA-541	2	K12765	1	...	3	3
13	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo- $\frac{1}{3}$ Cr-V	Forgings	SA-508	2	K12766	2	...	3	3
14	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo- $\frac{1}{3}$ Cr-V	Forgings	SA-541	2	K12765	2	...	3	3
15	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo-Cr-V	Forgings	SA-508	3	K12042	1	...	3	3
16	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo-Cr-V	Forgings	SA-508	3	K12042	2	...	3	3
17	$\frac{3}{4}$ Ni-1Mo- $\frac{3}{4}$ Cr	Castings	SA-217	WC5	J22000	...	...	4	1
18	1Ni- $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Castings	SA-217	WC4	J12082	...	...	4	1
19	$1\frac{1}{4}$ Ni-1Cr- $\frac{1}{2}$ Mo	Plate	SA-517	P	K21650	...	$2\frac{1}{2} < t \leq 4$	11B	8
20	$1\frac{1}{4}$ Ni-1Cr- $\frac{1}{2}$ Mo	Plate	SA-517	P	K21650	...	$\leq 2\frac{1}{2}$	11B	8
21	2Ni- $1\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-V	Forgings	SA-723	1	K23550	1	...	...	...
22	2Ni- $1\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-V	Forgings	SA-723	1	K23550	2	...	...	...
23	2Ni- $1\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-V	Forgings	SA-723	1	K23550	3	...	...	...
24	2Ni- $1\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-V	Forgings	SA-723	1	K23550	4	...	...	...
25	2Ni- $1\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-V	Forgings	SA-723	1	K23550	5	...	...	...
26	$2\frac{1}{2}$ Ni	Castings	SA-352	LC2	J22500	...	...	9A	1
27	$2\frac{3}{4}$ Ni- $1\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-723	2	K34035	1	...	...	...
28	$2\frac{3}{4}$ Ni- $1\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-723	2	K34035	2	...	...	...
29	$2\frac{3}{4}$ Ni- $1\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-723	2	K34035	3	...	...	...
30	$2\frac{3}{4}$ Ni- $1\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-723	2	K34035	4	...	...	...
31	$2\frac{3}{4}$ Ni- $1\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-723	2	K34035	5	...	...	...
32	3Ni- $1\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo	Plate	SA-543	B	K42339	1	...	11A	5
33	$3\frac{1}{2}$ Ni	Forgings	SA-350	LF3	K32025	...	...	9B	1
34	$3\frac{1}{2}$ Ni	Plate	SA-203	E	K32018	...	...	9B	1
35	$3\frac{1}{2}$ Ni	Plate	SA-203	E	K32018	...	...	9B	1
36	$3\frac{1}{2}$ Ni	Castings	SA-352	LC3	J31550	...	...	9B	1
37	$3\frac{1}{2}$ Ni- $1\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-508	4N	K22375	3	...	3	3
38	$3\frac{1}{2}$ Ni- $1\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-508	4N	K22375	1	...	11A	5
39	4Ni- $1\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-723	3	K44045	1	...	...	...
40	4Ni- $1\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-723	3	K44045	2	...	...	...
41	4Ni- $1\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-723	3	K44045	3	...	...	...
42	4Ni- $1\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-723	3	K44045	4	...	...	...
43	4Ni- $1\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-723	3	K44045	5	...	...	...
44	25Ni-15Cr-2Ti	Forgings, bar	SA-638	660	S66286	...	...	...	...

TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

#1

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Temp. Limit (SPT = Supports Only)	External Pressure Chart No.	Notes
1	80	50	700	CS-3	...
2	80	50	700	CS-5	...
3	90	70	700	CS-5	...
4	100	83	700	CS-5	...
5	85	55	700 (SPT)	CS-3	H2
6	90	60	700	CS-3	H2
7	80	50	700	CS-5	...
8	90	65	700	CS-5	...
9	105	90	700 (SPT)	CS-5	S1
10	115	100	700 (SPT)	HT-1	...
11	80	50	700	CS-5	...
12	80	50	700	CS-5	...
13	90	65	700	CS-5	...
14	90	65	700	CS-5	...
15	80	50	700	CS-5	...
16	90	65	700	CS-5	...
17	70	40	700	CS-2	...
18	70	40	700 (SPT)	CS-2	...
19	105	90	700 (SPT)	CS-5	...
20	115	100	700 (SPT)	HT-1	...
21	115	100	700 (SPT)	HT-1	G14, W1
22	135	120	700 (SPT)	HT-1	G6, W1
23	155	140	700 (SPT)	HT-1	W1
24	175	160	700 (SPT)	HT-1	W1
25	190	180	700 (SPT)	HT-1	W1
26	70	40	100	CS-2	...
27	115	100	700 (SPT)	HT-1	G14, W1
28	135	120	700 (SPT)	HT-1	G6, W1
29	155	140	700 (SPT)	HT-1	W1
30	175	160	700 (SPT)	HT-1	W1
31	190	180	700 (SPT)	HT-1	W1
32	105	85	650	CS-5	G5, H3, S4, W3
33	70	37.5	700	CS-2	...
34	70	40	300 (SPT)	CS-2	...
35	70	40	500	CS-2	...
36	70	40	100	CS-2	...
37	90	70	650	CS-5	...
38	105	85	650	CS-5	H3, S4, W3
39	115	100	700 (SPT)	HT-1	G14, W1
40	135	120	700 (SPT)	HT-1	G6, W1
41	155	140	700 (SPT)	HT-1	W1
42	175	160	700 (SPT)	HT-1	W1
43	190	180	700 (SPT)	HT-1	W1
44	130	85	700	HA-5	W1

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Design Stress Intensity, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	26.7	...	26.7	...	26.7	26.7	26.7	26.7	26.7	26.7	...	...	...	...
2	26.7	26.7	26.7	...	26.7	26.7	26.7	26.7	26.7	26.7	...	...	...	...
3	30.0	...	30.0	...	30.0	30.0	30.0	30.0	30.0	30.0	...	...	...	...
4	33.3	...	33.3	...	33.3	33.3	33.3	33.3	33.3	33.3	...	...	...	...
5	28.4	...	26.8	...	26.1	26.1	26.1	25.6	25.1	24.4	...	...	...	...
6	30.0	...	30.0	...	30.0	30.0	30.0	30.0	30.0	30.0	...	...	...	...
7	26.7	26.7	26.7	...	26.7	26.7	26.7	26.7	26.7	26.7	...	...	...	...
8	30.0	...	30.0	...	30.0	30.0	30.0	30.0	30.0	30.0	...	...	...	...
9	35.0	...	35.0	...	35.0	35.0	35.0	35.0	34.9	34.3	...	...	...	...
10	38.3	...	38.3	...	38.3	38.3	38.3	38.3	38.3	37.5	...	...	...	...
11	26.7	26.7	26.7	...	26.7	26.7	26.7	26.7	26.7	26.7	...	...	...	...
12	26.7	26.7	26.7	...	26.7	26.7	26.7	26.7	26.7	26.7	...	...	...	...
13	30.0	...	30.0	...	30.0	30.0	30.0	30.0	30.0	30.0	...	...	...	...
14	30.0	...	30.0	...	30.0	30.0	30.0	30.0	30.0	30.0	...	...	...	...
15	26.7	26.7	26.7	...	26.7	26.7	26.7	26.7	26.7	26.7	...	...	...	...
16	30.0	...	30.0	...	30.0	30.0	30.0	30.0	30.0	30.0	...	...	...	...
17	23.3	...	23.3	...	23.3	23.3	23.0	22.4	22.1	21.7	...	...	...	...
18	23.3	...	23.3	...	23.3	23.3	23.0	22.4	22.1	21.7	...	...	...	...
19	35.0	...	35.0	...	35.0	35.0	35.0	35.0	34.9	34.3	...	...	...	...
20	38.3	...	38.3	...	38.3	38.3	38.3	38.3	38.3	37.5	...	...	...	...
21	38.3	...	38.3	...	38.3	38.3	38.3	38.3	37.7	36.8	...	...	...	...
22	45.0	...	45.0	...	45.0	45.0	45.0	45.0	44.3	43.2	...	...	...	...
23	51.7	...	51.7	...	51.7	51.7	51.7	51.7	50.9	49.7	...	...	...	...
24	58.3	...	58.3	...	58.3	58.3	58.3	58.3	57.4	56.1	...	...	...	...
25	63.3	...	63.3	...	63.3	63.3	63.3	63.3	62.4	60.9	...	...	...	...
26	23.3	...	...	...	...	...	...	...	...	...	...	...	...	...
27	38.3	...	38.3	...	38.3	38.3	38.3	38.3	37.7	36.8	...	...	...	...
28	45.0	...	45.0	...	45.0	45.0	45.0	45.0	44.3	43.2	...	...	...	...
29	51.7	...	51.7	...	51.7	51.7	51.7	51.7	50.9	49.7	...	...	...	...
30	58.3	...	58.3	...	58.3	58.3	58.3	58.3	57.4	56.1	...	...	...	...
31	63.3	...	63.3	...	63.3	63.3	63.3	63.3	62.4	60.9	...	...	...	...
32	35.0	...	35.0	...	35.0	34.6	34.4	34.0	33.5	...	...	...	...	...
33	23.3	...	22.9	...	22.1	21.4	20.3	18.8	17.9	16.9	...	...	...	...
34	23.3	...	23.3	...	23.3	...	...	...	...	...	...	...	...	...
35	23.3	...	23.3	...	23.3	22.9	21.6	...	...	...	...	...	...	...
36	23.3	...	...	...	...	...	...	...	...	...	...	...	...	...
37	30.0	30.0	30.0	30.0	30.0	29.7	29.5	29.1	28.7	...	...	...	...	...
38	35.0	35.0	35.0	35.0	35.0	34.6	34.4	34.0	33.5	...	...	...	...	...
39	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	37.7	36.8	...	...	...	...
40	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	44.3	43.2	...	...	...	...
41	51.7	51.7	51.7	51.7	51.7	51.7	51.7	51.7	50.9	49.7	...	...	...	...
42	58.3	58.3	58.3	58.3	58.3	58.3	58.3	58.3	57.4	56.1
43	63.3	63.3	63.3	63.3	63.3	63.3	63.3	63.3	62.4	60.9
44	43.3	...	43.3	...	43.3	43.3	42.5	41.7	41.3	40.9

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/UNS No.	Class/Condition/Temper	Size/Thickness, in.	P-No.	Group No.
1	16Cr-12Ni-2Mo	Forgings	SA-182	F316L	S31603	...	> 5	8	1
2	16Cr-12Ni-2Mo	Forgings	SA-965	F316L	S31603	...	...	8	1
3	16Cr-12Ni-2Mo	Forgings	SA-182	F316L	S31603	...	≤ 5	8	1
4	16Cr-12Ni-2Mo	Smls. tube	SA-213	TP316L	S31603	...	...	8	1
5	16Cr-12Ni-2Mo	Plate	SA-240	316L	S31603	...	...	8	1
6	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316L	S31603	...	...	8	1
7	16Cr-12Ni-2Mo	Smls. & wld. pipe	SA-312	TP316L	S31603	...	...	8	1
8	16Cr-12Ni-2Mo	Wld. pipe	SA-358	316L	S31603	...	...	8	1
9	16Cr-12Ni-2Mo	Fittings	SA-403	316L	S31603	...	...	8	1
10	16Cr-12Ni-2Mo	Wld. fittings	SA-403	316L	S31603	WP-W	...	8	1
11	16Cr-12Ni-2Mo	Bar	SA-479	316L	S31603	...	...	8	1
12	16Cr-12Ni-2Mo	Wld. tube	SA-688	TP316L	S31603	...	...	8	1
13	16Cr-12Ni-2Mo	Wld. pipe	SA-813	TP316L	S31603	...	...	8	1
14	16Cr-12Ni-2Mo	Wld. pipe	SA-814	TP316L	S31603	...	...	8	1
15	16Cr-12Ni-2Mo	Bar	SA/JIS G4303	SUS316L	...	...	...	8	1
16	16Cr-12Ni-2Mo	Castings	SA-351	CF3M	J92800	...	...	8	1
17	16Cr-12Ni-2Mo	Cast pipe	SA-451	CPF3M	J92800	...	...	8	1
18	16Cr-12Ni-2Mo	Castings	SA-351	CF8M	J92900	...	...	8	1
19	16Cr-12Ni-2Mo	Cast pipe	SA-451	CPF8M	J92900	...	...	8	1
20	16Cr-12Ni-2Mo	Forgings	SA-182	F316	S31600	...	> 5	8	1
21	16Cr-12Ni-2Mo	Forgings	SA-965	F316	S31600	...	...	8	1
22	16Cr-12Ni-2Mo	Forgings	SA-182	F316H	S31609	...	> 5	8	1
23	16Cr-12Ni-2Mo	Forgings	SA-965	F316H	S31609	...	...	8	1
24	16Cr-12Ni-2Mo	Forgings	SA-182	F316	S31600	...	≤ 5	8	1
25	16Cr-12Ni-2Mo	Smls. tube	SA-213	TP316	S31600	...	...	8	1
26	16Cr-12Ni-2Mo	Plate	SA-240	316	S31600	...	...	8	1
27	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316	S31600	...	...	8	1
28	16Cr-12Ni-2Mo	Smls. & wld. pipe	SA-312	TP316	S31600	...	...	8	1
29	16Cr-12Ni-2Mo	Wld. pipe	SA-358	316	S31600	1	...	8	1
30	16Cr-12Ni-2Mo	Smls. pipe	SA-376	TP316	S31600	...	...	8	1
31	16Cr-12Ni-2Mo	Fittings	SA-403	316	S31600	...	...	8	1
32	16Cr-12Ni-2Mo	Wld. fittings	SA-403	316	S31600	WP-W	...	8	1
33	16Cr-12Ni-2Mo	Bar	SA-479	316	S31600	...	...	8	1
34	16Cr-12Ni-2Mo	Wld. tube	SA-688	TP316	S31600	...	...	8	1
35	16Cr-12Ni-2Mo	Wld. pipe	SA-813	TP316	S31600	...	...	8	1
36	16Cr-12Ni-2Mo	Wld. pipe	SA-814	TP316	S31600	...	...	8	1
37	16Cr-12Ni-2Mo	Bar	SA/JIS G4303	SUS316	...	...	...	8	1
38	16Cr-12Ni-2Mo	Forgings	SA-182	F316H	S31609	...	≤ 5	8	1
39	16Cr-12Ni-2Mo	Smls. tube	SA-213	TP316H	S31609	...	...	8	1
40	16Cr-12Ni-2Mo	Plate	SA-240	316H	S31609	...	...	8	1
41	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316H	S31609	...	...	8	1

TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

#1

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Temp. Limit (SPT = Supports Only)	External Pressure Chart No.	Notes
1	65	25	800	HA-4	G7
2	65	25	800	HA-4	G7
3	70	25	800	HA-4	G7
4	70	25	800	HA-4	G7
5	70	25	800	HA-4	G7
6	70	25	800	HA-4	G7
7	70	25	800	HA-4	G7
8	70	25	800	HA-4	G7
9	70	25	800	HA-4	G7
10	70	25	800	HA-4	G7
11	70	25	800	HA-4	G7
12	70	25	800	HA-4	G7
13	70	25	800	HA-4	G7
14	70	25	800	HA-4	G7
15	70	25	800	HA-4	G7
16	70	30	800	HA-4	G7, G13
17	70	30	800	HA-4	G7, G13
18	70	30	800	HA-2	G7, G9, G10, G13
19	70	30	800	HA-2	G7, G13
20	70	30	800	HA-2	G7
21	70	30	800	HA-2	G7, G9, G10
22	70	30	800	HA-2	G7
23	70	30	800	HA-2	G7
24	75	30	800	HA-2	G7, G9
25	75	30	800	HA-2	G7, G9
26	75	30	800	HA-2	G7, G9, G10
27	75	30	800	HA-2	G7
28	75	30	800	HA-2	G7, G9, G10
29	75	30	800	HA-2	G7
30	75	30	800	HA-2	G7, G9, G10
31	75	30	800	HA-2	G7
32	75	30	800	HA-2	G7
33	75	30	800	HA-2	G7
34	75	30	800	HA-2	G7
35	75	30	800	HA-2	G7
36	75	30	800	HA-2	G7
37	75	30	800	HA-2	G7
38	75	30	800	HA-2	G7
39	75	30	800	HA-2	G7
40	75	30	800	HA-2	G7
41	75	30	800	HA-2	G7

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Design Stress Intensity, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
2	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
3	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
4	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
5	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
6	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
7	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
8	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
9	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
10	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
11	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
12	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
13	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
14	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
15	16.7	...	16.7	...	16.7	15.7	14.8	14.0	13.7	13.5	13.2	12.9	...	...
16	20.0	...	20.0	...	20.0	19.2	17.9	17.0	16.6	16.3	16.0	15.8	...	...
17	20.0	...	20.0	...	20.0	19.2	17.9	17.0	16.6	16.3	16.0	15.8	...	...
18	20.0	...	20.0	...	20.0	19.2	17.9	17.0	16.6	16.3	16.0	15.8	...	...
19	20.0	...	20.0	...	20.0	19.2	17.9	17.0	16.6	16.3	16.0	15.8	...	...
20	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
21	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
22	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
23	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
24	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
25	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
26	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
27	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
28	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
29	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
30	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
31	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
32	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
33	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
34	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
35	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
36	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
37	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
38	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
39	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
40	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9
41	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	16Cr-12Ni-2Mo	Smls. & wld. pipe	SA-312	TP316H	S31609	...	...	8	1
2	16Cr-12Ni-2Mo	Wld. pipe	SA-358	316H	S31609	1	...	8	1
3	16Cr-12Ni-2Mo	Smls. pipe	SA-376	TP316H	S31609	...	...	8	1
4	16Cr-12Ni-2Mo	Fittings	SA-403	316H	S31609	...	...	8	1
5	16Cr-12Ni-2Mo	Wld. fittings	SA-403	316H	S31609	WP-W	...	8	1
6	16Cr-12Ni-2Mo	Bar	SA-479	316H	S31609	...	...	8	1
7	16Cr-12Ni-2Mo	Wld. pipe	SA-813	TP316H	S31609	...	...	8	1
8	16Cr-12Ni-2Mo	Wld. pipe	SA-814	TP316H	S31609	...	...	8	1
9	16Cr-12Ni-2Mo-N	Forgings	SA-182	F316LN	S31653	...	> 5	8	1
10	16Cr-12Ni-2Mo-N	Forgings	SA-965	F316LN	S31653	...	...	8	1
11	16Cr-12Ni-2Mo-N	Forgings	SA-182	F316LN	S31653	...	≤ 5	8	1
12	16Cr-12Ni-2Mo-N	Smls. tube	SA-213	TP316LN	S31653	...	...	8	1
13	16Cr-12Ni-2Mo-N	Plate	SA-240	316LN	S31653	...	...	8	1
14	16Cr-12Ni-2Mo-N	Wld. tube	SA-249	TP316LN	S31653	...	...	8	1
15	16Cr-12Ni-2Mo-N	Smls. & wld. pipe	SA-312	TP316LN	S31653	...	...	8	1
16	16Cr-12Ni-2Mo-N	Wld. pipe	SA-358	316LN	S31653	...	...	8	1
17	16Cr-12Ni-2Mo-N	Smls. pipe	SA-376	TP316LN	S31653	...	...	8	1
18	16Cr-12Ni-2Mo-N	Fittings	SA-403	316LN	S31653	...	...	8	1
19	16Cr-12Ni-2Mo-N	Wld. fittings	SA-403	316LN	S31653	WP-W	...	8	1
20	16Cr-12Ni-2Mo-N	Bar	SA-479	316LN	S31653	...	...	8	1
21	16Cr-12Ni-2Mo-N	Wld. tube	SA-688	TP316LN	S31653	...	...	8	1
22	16Cr-12Ni-2Mo-N	Wld. pipe	SA-813	TP316LN	S31653	...	...	8	1
23	16Cr-12Ni-2Mo-N	Wld. pipe	SA-814	TP316LN	S31653	...	...	8	1
24	16Cr-12Ni-2Mo-N	Forgings	SA-182	F316N	S31651	...	≤ 5	8	1
25	16Cr-12Ni-2Mo-N	Smls. tube	SA-213	TP316N	S31651	...	≤ 5	8	1
26	16Cr-12Ni-2Mo-N	Plate	SA-240	316N	S31651	...	≤ 5	8	1
27	16Cr-12Ni-2Mo-N	Smls. & wld. pipe	SA-312	TP316N	S31651	...	≤ 5	8	1
28	16Cr-12Ni-2Mo-N	Wld. pipe	SA-358	316N	S31651	...	≤ 5	8	1
29	16Cr-12Ni-2Mo-N	Smls. pipe	SA-376	TP316N	S31651	...	...	8	1
30	16Cr-12Ni-2Mo-N	Fittings	SA-403	316N	S31651	...	...	8	1
31	16Cr-12Ni-2Mo-N	Wld. fittings	SA-403	316N	S31651	WP-W	...	8	1
32	16Cr-12Ni-2Mo-N	Bar	SA-479	316N	S31651	...	...	8	1
33	16Cr-12Ni-2Mo-N	Wld. tube	SA-688	TP316N	S31651	...	...	8	1
34	16Cr-12Ni-2Mo-N	Wld. pipe	SA-813	TP316N	S31651	...	...	8	1
35	16Cr-12Ni-2Mo-N	Wld. pipe	SA-814	TP316N	S31651	...	...	8	1
36	16Cr-12Ni-2Mo-N	Forgings	SA-965	F316N	S31651	...	≤ 5	8	1
37	18Cr-8Ni	Forgings	SA-182	F304L	S30403	...	> 5	8	1
38	18Cr-8Ni	Forgings	SA-182	F304L	S30403	...	≤ 5	8	1
39	18Cr-8Ni	Smls. tube	SA-213	TP304L	S30403	...	...	8	1
40	18Cr-8Ni	Plate	SA-240	304L	S30403	...	...	8	1
41	18Cr-8Ni	Wld. tube	SA-249	TP304L	S30403	...	...	8	1
42	18Cr-8Ni	Smls. & wld. pipe	SA-312	TP304L	S30403	...	...	8	1
43	18Cr-8Ni	Wld. pipe	SA-358	304L	S30403	1	...	8	1
44	18Cr-8Ni	Fittings	SA-403	304L	S30403	...	...	8	1
45	18Cr-8Ni	Wld. fittings	SA-403	304L	S30403	WP-W	...	8	1

TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

#1

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Temp. Limit (SPT = Supports Only)	External Pressure Chart No.	Notes
1	75	30	800	HA-2	G7
2	75	30	800	HA-2	G7
3	75	30	800	HA-2	G7
4	75	30	800	HA-2	G7
5	75	30	800	HA-2	G7
6	75	30	800	HA-2	G7
7	75	30	800	HA-2	G7
8	75	30	800	HA-2	G7
9	70	30	800	HA-2	G7
10	70	30	800	HA-2	G7
11	75	30	800	HA-2	G7
12	75	30	800	HA-2	G7
13	75	30	800	HA-2	G7
14	75	30	800	HA-2	G7
15	75	30	800	HA-2	G7
16	75	30	800	HA-2	G7
17	75	30	800	HA-2	G7
18	75	30	800	HA-2	G7
19	75	30	800	HA-2	G7
20	75	30	800	HA-2	G7
21	75	30	800	HA-2	G7
22	75	30	800	HA-2	G7
23	75	30	800	HA-2	G7
24	80	35	800	HA-2	G7
25	80	35	800	HA-2	G7
26	80	35	800	HA-2	G7
27	80	35	800	HA-2	G7
28	80	35	800	HA-2	G7
29	80	35	800	HA-2	G7
30	80	35	800	HA-2	G7
31	80	35	800	HA-2	G7
32	80	35	800	HA-2	G7
33	80	35	800	HA-2	G7
34	80	35	800	HA-2	G7
35	80	35	800	HA-2	G7
36	80	35	800	HA-2	G7
37	65	25	800	HA-3	G7
38	70	25	800	HA-3	G7
39	70	25	800	HA-3	G7
40	70	25	800	HA-3	G7
41	70	25	800	HA-3	G7
42	70	25	800	HA-3	G7
43	70	25	800	HA-3	G7
44	70	25	800	HA-3	G7
45	70	25	800	HA-3	G7

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Design Stress Intensity, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
2	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
3	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
4	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
5	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
6	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
7	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
8	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
9	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
10	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
11	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
12	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
13	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
14	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
15	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
16	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
17	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
18	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
19	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
20	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
21	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
22	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
23	20.0	...	20.0	...	20.0	18.9	17.5	16.5	16.0	15.6	15.2	14.8	...	...
24	23.3	...	23.3	...	23.3	23.3	22.3	21.0	20.5	20.0	19.6	19.2	...	...
25	23.3	...	23.3	...	23.3	23.3	22.3	21.0	20.5	20.0	19.6	19.2	...	...
26	23.3	...	23.3	...	23.3	23.3	22.3	21.0	20.5	20.0	19.6	19.2	...	...
27	23.3	...	23.3	...	23.3	23.3	22.3	21.0	20.5	20.0	19.6	19.2	...	...
28	23.3	...	23.3	...	23.3	23.3	22.3	21.0	20.5	20.0	19.6	19.2	...	...
29	23.3	...	23.3	...	23.3	23.3	22.3	21.0	20.5	20.0	19.6	19.2	...	...
30	23.3	...	23.3	...	23.3	23.3	22.3	21.0	20.5	20.0	19.6	19.2	...	...
31	23.3	...	23.3	...	23.3	23.3	22.3	21.0	20.5	20.0	19.6	19.2	...	...
32	23.3	...	23.3	...	23.3	23.3	22.3	21.0	20.5	20.0	19.6	19.2	...	...
33	23.3	...	23.3	...	23.3	23.3	22.3	21.0	20.5	20.0	19.6	19.2	...	...
34	23.3	...	23.3	...	23.3	23.3	22.3	21.0	20.5	20.0	19.6	19.2	...	...
35	23.3	...	23.3	...	23.3	23.3	22.3	21.0	20.5	20.0	19.6	19.2	...	...
36	23.3	...	23.3	...	23.3	23.3	22.3	21.0	20.5	20.0	19.6	19.2	...	...
37	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	...	...
38	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	...	...
39	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	...	...
40	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	...	...
41	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	...	...
42	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	...	...
43	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	...	...
44	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0
45	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	18Cr-8Ni	Bar	SA-479	304L	S30403	...	...	8	1
2	18Cr-8Ni	Wld. tube	SA-688	TP304L	S30403	...	...	8	1
3	18Cr-8Ni	Wld. pipe	SA-813	TP304L	S30403	...	...	8	1
4	18Cr-8Ni	Wld. pipe	SA-814	TP304L	S30403	...	...	8	1
5	18Cr-8Ni	Bar	SA/JIS G4303	SUS304L	...	...	...	8	1
6	18Cr-8Ni	Castings	SA-351	CF3	J92500	...	...	8	1
7	18Cr-8Ni	Cast pipe	SA-451	CPF3	J92500	...	...	8	1
8	18Cr-8Ni	Castings	SA-351	CF8	J92600	...	...	8	1
9	18Cr-8Ni	Cast pipe	SA-451	CPF8	J92600	...	...	8	1
10	18Cr-8Ni	Forgings	SA-182	F304	S30400	...	> 5	8	1
11	18Cr-8Ni	Smls. pipe	SA-376	TP304	S30400	...	...	8	1
12	18Cr-8Ni	Forgings	SA-965	F304	S30400	...	...	8	1
13	18Cr-8Ni	Forgings	SA-182	F304H	S30409	...	> 5	8	1
14	18Cr-8Ni	Forgings	SA-965	F304H	S30409	...	...	8	1
15	18Cr-8Ni	Bar	SA-479	302	S30200	...	...	8	1
16	18Cr-8Ni	Bar	SA/JIS G4303	SUS302	...	...	...	8	1
17	18Cr-8Ni	Forgings	SA-182	F304	S30400	...	≤ 5	8	1
18	18Cr-8Ni	Smls. tube	SA-213	TP304	S30400	...	...	8	1
19	18Cr-8Ni	Plate	SA-240	304	S30400	...	...	8	1
20	18Cr-8Ni	Wld. tube	SA-249	TP304	S30400	...	...	8	1
21	18Cr-8Ni	Smls. & wld. pipe	SA-312	TP304	S30400	...	...	8	1
22	18Cr-8Ni	Wld. pipe	SA-358	304	S30400	1	...	8	1
23	18Cr-8Ni	Smls. pipe	SA-376	TP304	S30400	...	...	8	1
24	18Cr-8Ni	Fittings	SA-403	304	S30400	...	...	8	1
25	18Cr-8Ni	Wld. fittings	SA-403	304	S30400	WP-W	...	8	1
26	18Cr-8Ni	Bar	SA-479	304	S30400	...	...	8	1
27	18Cr-8Ni	Wld. tube	SA-688	TP304	S30400	...	...	8	1
28	18Cr-8Ni	Wld. tube	SA-813	TP304	S30400	...	...	8	1
29	18Cr-8Ni	Wld. tube	SA-814	TP304	S30400	...	...	8	1
30	18Cr-8Ni	Bar	SA/JIS G4303	SUS304	...	...	...	8	1
31	18Cr-8Ni	Forgings	SA-182	F304H	S30409	...	≤ 5	8	1
32	18Cr-8Ni	Smls. tube	SA-213	TP304H	S30409	...	...	8	1
33	18Cr-8Ni	Plate	SA-240	304H	S30409	...	...	8	1
34	18Cr-8Ni	Wld. tube	SA-249	TP304H	S30409	...	...	8	1
35	18Cr-8Ni	Smls. & wld. pipe	SA-312	TP304H	S30409	...	...	8	1
36	18Cr-8Ni	Wld. pipe	SA-358	304H	S30409	1	...	8	1
37	18Cr-8Ni	Smls. pipe	SA-376	TP304H	S30409	...	...	8	1
38	18Cr-8Ni	Fittings	SA-403	304H	S30409	...	...	8	1
39	18Cr-8Ni	Wld. fittings	SA-403	304H	S30409	WP-W	...	8	1
40	18Cr-8Ni	Bar	SA-479	304H	S30409	...	...	8	1
41	18Cr-8Ni	Wld. tube	SA-813	TP304H	S30409	...	...	8	1
42	18Cr-8Ni	Wld. tube	SA-814	TP304H	S30409	...	...	8	1

TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

#1

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Temp. Limit (SPT = Supports Only)	External Pressure Chart No.	Notes
1	70	25	800	HA-3	G7
2	70	25	800	HA-3	G7
3	70	25	800	HA-3	G7
4	70	25	800	HA-3	G7
5	70	25	800	HA-3	G7
6	70	30	800	HA-3	G7, G13
7	70	30	800	HA-3	G7, G13
8	70	30	800	HA-1	G7, G9, G10, G13
9	70	30	800	HA-1	G7, G13
10	70	30	800	HA-1	G7, G9, G10
11	70	30	800	HA-1	G7, G9, G10, S2
12	70	30	800	HA-1	G7, G9, G10
13	70	30	800	HA-1	G7
14	70	30	800	HA-1	G7
15	75	30	800	HA-1	G7
16	75	30	800	HA-1	G7
17	75	30	800	HA-1	G7, G9, G10
18	75	30	800	HA-1	G7, G9
19	75	30	800	HA-1	G7, G9, G10
20	75	30	800	HA-1	G7
21	75	30	800	HA-1	G7, G9, G10
22	75	30	800	HA-1	G7
23	75	30	800	HA-1	G7, G9, G10, S2
24	75	30	800	HA-1	G7
25	75	30	800	HA-1	G7
26	75	30	800	HA-1	G7
27	75	30	800	HA-1	G7
28	75	30	800	HA-1	G7
29	75	30	800	HA-1	G7
30	75	30	800	HA-1	G7
31	75	30	800	HA-1	G7
32	75	30	800	HA-1	G7
33	75	30	800	HA-1	G7
34	75	30	800	HA-1	G7
35	75	30	800	HA-1	G7
36	75	30	800	HA-1	G7
37	75	30	800	HA-1	G7
38	75	30	800	HA-1	G7
39	75	30	800	HA-1	G7
40	75	30	800	HA-1	G7
41	75	30	800	HA-1	G7
42	75	30	800	HA-1	G7

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Design Stress Intensity, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	...	...
2	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	...	...
3	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	...	...
4	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	...	...
5	16.7	...	16.7	...	16.7	15.8	14.7	14.0	13.7	13.5	13.3	13.0	...	...
6	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
7	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
8	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
9	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
10	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
11	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
12	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
13	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
14	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
15	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
16	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
17	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
18	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
19	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
20	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
21	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
22	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
23	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
24	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
25	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
26	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
27	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
28	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
29	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
30	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
31	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
32	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
33	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
34	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
35	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
36	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
37	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
38	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
39	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
40	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
41	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2
42	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	18Cr-8Ni	Castings	SA-351	CF3A	J92500	...	...	8	1
2	18Cr-8Ni	Cast pipe	SA-451	CPF3A	J92500	...	...	8	1
3	18Cr-8Ni	Castings	SA-351	CF8A	J92600	...	...	8	1
4	18Cr-8Ni	Cast pipe	SA-451	CPF8A	J92600	...	...	8	1
5	18Cr-8Ni-N	Forgings	SA-182	F304LN	S30453	...	> 5	8	1
6	18Cr-8Ni-N	Forgings	SA-965	F304LN	S30453	...	...	8	1
7	18Cr-8Ni-N	Forgings	SA-182	F304LN	S30453	...	≤ 5	8	1
8	18Cr-8Ni-N	Smls. tube	SA-213	TP304LN	S30453	...	...	8	1
9	18Cr-8Ni-N	Plate	SA-240	304LN	S30453	...	...	8	1
10	18Cr-8Ni-N	Wld. tube	SA-249	TP304LN	S30453	...	...	8	1
11	18Cr-8Ni-N	Smls. & wld. pipe	SA-312	TP304LN	S30453	...	...	8	1
12	18Cr-8Ni-N	Wld. pipe	SA-358	304LN	S30453	...	...	8	1
13	18Cr-8Ni-N	Smls. pipe	SA-376	TP304LN	S30453	...	...	8	1
14	18Cr-8Ni-N	Fittings	SA-403	304LN	S30453	...	...	8	1
15	18Cr-8Ni-N	Wld. fittings	SA-403	304LN	S30453	WP-W	...	8	1
16	18Cr-8Ni-N	Bar	SA-479	304LN	S30453	...	...	8	1
17	18Cr-8Ni-N	Wld. tube	SA-688	TP304LN	S30453	...	...	8	1
18	18Cr-8Ni-N	Wld. tube	SA-813	TP304LN	S30453	...	...	8	1
19	18Cr-8Ni-N	Wld. tube	SA-814	TP304LN	S30453	...	...	8	1
20	18Cr-8Ni-N	Forgings	SA-182	F304N	S30451	...	...	8	1
21	18Cr-8Ni-N	Smls. tube	SA-213	TP304N	S30451	...	...	8	1
22	18Cr-8Ni-N	Plate	SA-240	304N	S30451	...	...	8	1
23	18Cr-8Ni-N	Smls. & wld. pipe	SA-312	TP304N	S30451	...	...	8	1
24	18Cr-8Ni-N	Wld. pipe	SA-358	304N	S30451	1	...	8	1
25	18Cr-8Ni-N	Smls. pipe	SA-376	TP304N	S30451	...	...	8	1
26	18Cr-8Ni-N	Fittings	SA-403	304N	S30451	...	...	8	1
27	18Cr-8Ni-N	Wld. fittings	SA-403	304N	S30451	WP-W	...	8	1
28	18Cr-8Ni-N	Bar	SA-479	304N	S30451	...	...	8	1
29	18Cr-8Ni-N	Wld. tube	SA-688	TP304N	S30451	...	...	8	1
30	18Cr-8Ni-N	Wld. pipe	SA-813	TP304N	S30451	...	...	8	1
31	18Cr-8Ni-N	Wld. pipe	SA-814	TP304N	S30451	...	...	8	1
32	18Cr-8Ni-N	Forgings	SA-965	F304N	S30451	...	...	8	1
33	18Cr-8Ni-4Si-N	Bar	SA-479	...	S21800	...	...	8	3
34	18Cr-10Ni-Cb	Castings	SA-351	CF8C	J92710	...	...	8	1
35	18Cr-10Ni-Cb	Cast pipe	SA-451	CPF8C	J92710	...	...	8	1
36	18Cr-10Ni-Cb	Forgings	SA-182	F347	S34700	...	> 5	8	1
37	18Cr-10Ni-Cb	Forgings	SA-965	F347	S34700	...	...	8	1
38	18Cr-10Ni-Cb	Forgings	SA-182	F347H	S34709	...	> 5	8	1
39	18Cr-10Ni-Cb	Forgings	SA-965	F347H	S34709	...	...	8	1
40	18Cr-10Ni-Cb	Forgings	SA-182	F347	S34700	...	≤ 5	8	1
41	18Cr-10Ni-Cb	Smls. tube	SA-213	TP347	S34700	...	...	8	1
42	18Cr-10Ni-Cb	Plate	SA-240	347	S34700	...	...	8	1
43	18Cr-10Ni-Cb	Wld. tube	SA-249	TP347	S34700	...	...	8	1

TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

#1

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Temp. Limit (SPT = Supports Only)	External Pressure Chart No.	Notes
1	77	35	700	HA-3	G7, G13
2	77	35	700	HA-3	G7, G13
3	77	35	700	HA-1	G7, G13
4	77	35	700	HA-1	G7, G13
5	70	30	800	HA-1	G7
6	70	30	800	HA-1	G7
7	75	30	800	HA-1	G7
8	75	30	800	HA-1	G7
9	75	30	800	HA-1	G7
10	75	30	800	HA-1	G7
11	75	30	800	HA-1	G7
12	75	30	800	HA-1	G7
13	75	30	800	HA-1	G7
14	75	30	800	HA-1	G7
15	75	30	800	HA-1	G7
16	75	30	800	HA-1	G7
17	75	30	800	HA-1	G7
18	75	30	800	HA-1	G7
19	75	30	800	HA-1	G7
20	80	35	800	HA-1	G7
21	80	35	800	HA-1	G7
22	80	35	800	HA-1	G7
23	80	35	800	HA-1	G7
24	80	35	800	HA-1	G7
25	80	35	800	HA-1	G7
26	80	35	800	HA-1	G7
27	80	35	800	HA-1	G7
28	80	35	800	HA-1	G7
29	80	35	800	HA-1	G7
30	80	35	800	HA-1	G7
31	80	35	800	HA-1	G7
32	80	35	800	HA-1	G7
33	95	50	800	HA-6	...
34	70	30	800	HA-2	G7, G9, G13
35	70	30	800	HA-2	G7, G13
36	70	30	800	HA-2	G7, G9
37	70	30	800	HA-2	G7, G9
38	70	30	800	HA-2	G7
39	70	30	800	HA-2	G7, G9
40	75	30	800	HA-2	G7, G9
41	75	30	800	HA-2	G7, G9
42	75	30	800	HA-2	G7, G9
43	75	30	800	HA-2	G7

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Design Stress Intensity, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	23.3	...	23.3	...	22.7	21.7	20.4	19.3	18.9	18.5	...	...	...	...
2	23.3	...	23.3	...	22.7	21.7	20.4	19.3	18.9	18.5	...	...	...	...
3	23.3	...	23.3	...	22.7	21.7	20.4	19.3	18.9	18.5	...	...	...	...
4	23.3	...	23.3	...	22.7	21.7	20.4	19.3	18.9	18.5	...	...	...	...
5	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
6	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
7	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
8	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
9	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
10	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
11	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
12	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
13	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
14	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
15	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
16	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
17	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
18	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
19	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
20	23.3	...	23.3	...	22.5	20.3	18.9	17.9	17.5	17.2	16.9	16.6	...	...
21	23.3	...	23.3	...	22.5	20.3	18.9	17.9	17.5	17.2	16.9	16.6	...	...
22	23.3	...	23.3	...	22.5	20.3	18.9	17.9	17.5	17.2	16.9	16.6	...	...
23	23.3	...	23.3	...	22.5	20.3	18.9	17.9	17.5	17.2	16.9	16.6	...	...
24	23.3	...	23.3	...	22.5	20.3	18.9	17.9	17.5	17.2	16.9	16.6	...	...
25	23.3	...	23.3	...	22.5	20.3	18.9	17.9	17.5	17.2	16.9	16.6	...	...
26	23.3	...	23.3	...	22.5	20.3	18.9	17.9	17.5	17.2	16.9	16.6	...	...
27	23.3	...	23.3	...	22.5	20.3	18.9	17.9	17.5	17.2	16.9	16.6	...	...
28	23.3	...	23.3	...	22.5	20.3	18.9	17.9	17.5	17.2	16.9	16.6	...	...
29	23.3	...	23.3	...	22.5	20.3	18.9	17.9	17.5	17.2	16.9	16.6	...	...
30	23.3	...	23.3	...	22.5	20.3	18.9	17.9	17.5	17.2	16.9	16.6	...	...
31	23.3	...	23.3	...	22.5	20.3	18.9	17.9	17.5	17.2	16.9	16.6	...	...
32	23.3	...	23.3	...	22.5	20.3	18.9	17.9	17.5	17.2	16.9	16.6	...	...
33	31.7	...	25.9	...	22.1	19.8	18.4	17.6	17.3	17.1	16.9	16.8	...	...
34	20.0	...	20.0	...	20.0	19.3	18.7	18.4	18.3	18.3	18.3	18.3	...	...
35	20.0	...	20.0	...	20.0	19.3	18.7	18.4	18.3	18.3	18.3	18.3	...	...
36	20.0	...	20.0	...	20.0	19.3	18.7	18.4	18.3	18.3	18.3	18.3	...	...
37	20.0	...	20.0	...	20.0	19.3	18.7	18.4	18.3	18.3	18.3	18.3	...	...
38	20.0	...	20.0	...	20.0	19.3	18.7	18.4	18.3	18.3	18.3	18.3	...	...
39	20.0	...	20.0	...	20.0	19.3	18.7	18.4	18.3	18.3	18.3	18.3	...	...
40	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
41	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
42	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3
43	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	18Cr-10Ni-Cb	Smls. & wld. pipe	SA-312	TP347	S34700	...	...	8	1
2	18Cr-10Ni-Cb	Wld. pipe	SA-358	347	S34700	1	...	8	1
3	18Cr-10Ni-Cb	Smls. pipe	SA-376	TP347	S34700	...	...	8	1
4	18Cr-10Ni-Cb	Fittings	SA-403	347	S34700	...	...	8	1
5	18Cr-10Ni-Cb	Wld. fittings	SA-403	347	S34700	WP-W	...	8	1
6	18Cr-10Ni-Cb	Bar	SA-479	347	S34700	...	...	8	1
7	18Cr-10Ni-Cb	Wld. pipe	SA-813	TP347	S34700	...	...	8	1
8	18Cr-10Ni-Cb	Wld. pipe	SA-814	TP347	S34700	...	...	8	1
9	18Cr-10Ni-Cb	Bar	SA/JIS G4303	SUS347	...	...	...	8	1
10	18Cr-10Ni-Cb	Forgings	SA-182	F347H	S34709	...	≤ 5	8	1
11	18Cr-10Ni-Cb	Smls. tube	SA-213	TP347H	S34709	...	...	8	1
12	18Cr-10Ni-Cb	Plate	SA-240	347H	S34709	...	...	8	1
13	18Cr-10Ni-Cb	Wld. tube	SA-249	TP347H	S34709	...	...	8	1
14	18Cr-10Ni-Cb	Smls. & wld. pipe	SA-312	TP347H	S34709	...	...	8	1
15	18Cr-10Ni-Cb	Smls. pipe	SA-376	TP347H	S34709	...	...	8	1
16	18Cr-10Ni-Cb	Fittings	SA-403	347H	S34709	...	...	8	1
17	18Cr-10Ni-Cb	Wld. fittings	SA-403	347H	S34709	WP-W	...	8	1
18	18Cr-10Ni-Cb	Bar	SA-479	347H	S34709	...	...	8	1
19	18Cr-10Ni-Cb	Wld. pipe	SA-813	TP347H	S34709	...	...	8	1
20	18Cr-10Ni-Cb	Wld. pipe	SA-814	TP347H	S34709	...	...	8	1
21	18Cr-10Ni-Cb	Forgings	SA-182	F348	S34800	...	≤ 5	8	1
22	18Cr-10Ni-Cb	Smls. tube	SA-213	TP348	S34800	...	...	8	1
23	18Cr-10Ni-Cb	Plate	SA-240	348	S34800	...	...	8	1
24	18Cr-10Ni-Cb	Wld. tube	SA-249	TP348	S34800	...	...	8	1
25	18Cr-10Ni-Cb	Smls. & wld. pipe	SA-312	TP348	S34800	...	...	8	1
26	18Cr-10Ni-Cb	Wld. pipe	SA-358	348	S34800	1	...	8	1
27	18Cr-10Ni-Cb	Smls. pipe	SA-376	TP348	S34800	...	...	8	1
28	18Cr-10Ni-Cb	Fittings	SA-403	348	S34800	...	...	8	1
29	18Cr-10Ni-Cb	Wld. fittings	SA-403	348	S34800	WP-W	...	8	1
30	18Cr-10Ni-Cb	Bar	SA-479	348	S34800	...	...	8	1
31	18Cr-10Ni-Cb	Wld. pipe	SA-813	TP348	S34800	...	...	8	1
32	18Cr-10Ni-Cb	Wld. pipe	SA-814	TP348	S34800	...	...	8	1
33	18Cr-10Ni-Cb	Forgings	SA-182	F348H	S34809	...	≤ 5	8	1
34	18Cr-10Ni-Cb	Smls. tube	SA-213	TP348H	S34809	...	...	8	1
35	18Cr-10Ni-Cb	Plate	SA-240	348H	S34809	...	...	8	1
36	18Cr-10Ni-Cb	Wld. tube	SA-249	TP348H	S34809	...	...	8	1
37	18Cr-10Ni-Cb	Smls. & wld. pipe	SA-312	TP348H	S34809	...	...	8	1
38	18Cr-10Ni-Cb	Fittings	SA-403	348H	S34809	...	...	8	1
39	18Cr-10Ni-Cb	Wld. fittings	SA-403	348H	S34809	WP-W	...	8	1
40	18Cr-10Ni-Cb	Bar	SA-479	348H	S34809	...	...	8	1
41	18Cr-10Ni-Cb	Wld. pipe	SA-813	TP348H	S34809	...	...	8	1
42	18Cr-10Ni-Cb	Wld. pipe	SA-814	TP348H	S34809	...	...	8	1

TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

#1

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Temp. Limit (SPT = Supports Only)	External Pressure Chart No.	Notes
1	75	30	800	HA-2	G7, G9
2	75	30	800	HA-2	G7
3	75	30	800	HA-2	G7, G9
4	75	30	800	HA-2	G7
5	75	30	800	HA-2	G7
6	75	30	800	HA-2	G7
7	75	30	800	HA-2	G7
8	75	30	800	HA-2	G7
9	75	30	800	HA-2	G7
10	75	30	800	HA-2	G7
11	75	30	800	HA-2	G7
12	75	30	800	HA-2	G7
13	75	30	800	HA-2	G7
14	75	30	800	HA-2	G7
15	75	30	800	HA-2	G7
16	75	30	800	HA-2	G7
17	75	30	800	HA-2	G7
18	75	30	800	HA-2	G7
19	75	30	800	HA-2	G7
20	75	30	800	HA-2	G7
21	75	30	800	HA-2	G7, G9
22	75	30	800	HA-2	G7, G9
23	75	30	800	HA-2	G7, G9
24	75	30	800	HA-2	G7
25	75	30	800	HA-2	G7, G9
26	75	30	800	HA-2	G7
27	75	30	800	HA-2	G7, G9
28	75	30	800	HA-2	G7
29	75	30	800	HA-2	G7
30	75	30	800	HA-2	G7
31	75	30	800	HA-2	G7
32	75	30	800	HA-2	G7
33	75	30	800	HA-2	G7
34	75	30	800	HA-2	G7
35	75	30	800	HA-2	G7
36	75	30	800	HA-2	G7
37	75	30	800	HA-2	G7
38	75	30	800	HA-2	G7
39	75	30	800	HA-2	G7
40	75	30	800	HA-2	G7
41	75	30	800	HA-2	G7
42	75	30	800	HA-2	G7

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Design Stress Intensity, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
2	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
3	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
4	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
5	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
6	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
7	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
8	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
9	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
10	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
11	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
12	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
13	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
14	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
15	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
16	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
17	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
18	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
19	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
20	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
21	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
22	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
23	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
24	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
25	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
26	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
27	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
28	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
29	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
30	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
31	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
32	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
33	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
34	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
35	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
36	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
37	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
38	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
39	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
40	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3	...	...
41	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3
42	20.0	...	20.0	...	20.0	20.0	20.0	19.3	19.0	18.7	18.5	18.3

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321	S32100	...	$> \frac{3}{8}$	8	1
2	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321H	S32109	...	$> \frac{3}{8}$	8	1
3	18Cr-10Ni-Ti	Forgings	SA-182	F321	S32100	...	> 5	8	1
4	18Cr-10Ni-Ti	Forgings	SA-965	F321	S32100	...	...	8	1
5	18Cr-10Ni-Ti	Forgings	SA-182	F321H	S32109	...	> 5	8	1
6	18Cr-10Ni-Ti	Forgings	SA-965	F321H	S32109	...	...	8	1
7	18Cr-10Ni-Ti	Forgings	SA-182	F321	S32100	...	≤ 5	8	1
8	18Cr-10Ni-Ti	Smls. tube	SA-213	TP321	S32100	...	...	8	1
9	18Cr-10Ni-Ti	Plate	SA-240	321	S32100	...	...	8	1
10	18Cr-10Ni-Ti	Wld. tube	SA-249	TP321	S32100	...	...	8	1
11	18Cr-10Ni-Ti	Smls. & wld. pipe	SA-312	TP321	S32100	...	$\leq \frac{3}{8}$	8	1
12	18Cr-10Ni-Ti	Wld. pipe	SA-358	321	S32100	1	...	8	1
13	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321	S32100	...	$\leq \frac{3}{8}$	8	1
14	18Cr-10Ni-Ti	Fittings	SA-403	321	S32100	...	...	8	1
15	18Cr-10Ni-Ti	Wld. fittings	SA-403	321	S32100	WP-W	...	8	1
16	18Cr-10Ni-Ti	Bar	SA-479	321	S32100	...	...	8	1
17	18Cr-10Ni-Ti	Wld. pipe	SA-813	TP321	S32100	...	...	8	1
18	18Cr-10Ni-Ti	Wld. pipe	SA-814	TP321	S32100	...	...	8	1
19	18Cr-10Ni-Ti	Bar	SA/JIS G4303	SUS321	...	...	...	8	1
20	18Cr-10Ni-Ti	Forgings	SA-182	F321H	S32109	...	≤ 5	8	1
21	18Cr-10Ni-Ti	Smls. tube	SA-213	TP321H	S32109	...	...	8	1
22	18Cr-10Ni-Ti	Plate	SA-240	321H	S32109	...	...	8	1
23	18Cr-10Ni-Ti	Wld. tube	SA-249	TP321H	S32109	...	...	8	1
24	18Cr-10Ni-Ti	Smls. & wld. pipe	SA-312	TP321H	S32109	...	$\leq \frac{3}{16}$	8	1
25	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321H	S32109	...	$\leq \frac{3}{8}$	8	1
26	18Cr-10Ni-Ti	Fittings	SA-403	321H	S32109	...	...	8	1
27	18Cr-10Ni-Ti	Wld. fittings	SA-403	321H	S32109	WP-W	...	8	1
28	18Cr-10Ni-Ti	Bar	SA-479	321H	S32109	...	...	8	1
29	18Cr-10Ni-Ti	Wld. pipe	SA-813	TP321H	S32109	...	...	8	1
30	18Cr-10Ni-Ti	Wld. pipe	SA-814	TP321H	S32109	...	...	8	1
31	18Cr-11Ni	Plate	SA-240	305	S30500	...	...	8	1
32	18Cr-13Ni-3Mo	Wld. tube	SA-249	TP317	S31700	...	...	8	1
33	18Cr-13Ni-3Mo	Smls. & wld. pipe	SA-312	TP317	S31700	...	...	8	1
34	20Cr-10Ni	Bar	SA-479	ER308	S30880	...	...	8	1
35	21Cr-6Ni-9Mn	Forgings	SA-182	FXM-11	S21904	...	...	8	3
36	21Cr-6Ni-9Mn	Smls. & wld. pipe	SA-312	TPXM-11	S21904	...	...	8	3
37	21Cr-6Ni-9Mn	Plate	SA-666	XM-11	S21904	...	...	8	3
38	21Cr-6Ni-9Mn	Forgings	SA-965	FXM-11	S21904	...	...	8	3
39	22Cr-13Ni-5Mn	Forgings	SA-182	FXM-19	S20910	...	...	8	3
40	22Cr-13Ni-5Mn	Plate	SA-240	XM-19	S20910	...	...	8	3
41	22Cr-13Ni-5Mn	Wld. tube	SA-249	TPXM-19	S20910	...	...	8	3
42	22Cr-13Ni-5Mn	Smls. & wld. pipe	SA-312	TPXM-19	S20910	...	...	8	3
43	22Cr-13Ni-5Mn	Wld. pipe	SA-358	XM-19	S20910	1	...	8	3
44	22Cr-13Ni-5Mn	Fittings	SA-403	XM-19	S20910	...	...	8	3
45	22Cr-13Ni-5Mn	Wld. fittings	SA-403	XM-19	S20910	WP-W	...	8	3

TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

#1

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Temp. Limit (SPT = Supports Only)	External Pressure Chart No.	Notes
1	70	25	800	HA-2	G7, G9
2	70	25	800	HA-2	G7
3	70	30	800	HA-2	G7, G9
4	70	30	800	HA-2	G7, G9
5	70	30	800	HA-2	G7
6	70	30	800	HA-2	G7, G9
7	75	30	800	HA-2	G7, G9
8	75	30	800	HA-2	G7, G9
9	75	30	800	HA-2	G7, G9
10	75	30	800	HA-2	G7
11	75	30	800	HA-2	G7, G9
12	75	30	800	HA-2	G7
13	75	30	800	HA-2	G7, G9
14	75	30	800	HA-2	G7
15	75	30	800	HA-2	G7
16	75	30	800	HA-2	G7
17	75	30	800	HA-2	G7
18	75	30	800	HA-2	G7
19	75	30	800	HA-2	G7
20	75	30	800	HA-2	G7
21	75	30	800	HA-2	G7
22	75	30	800	HA-2	G7
23	75	30	800	HA-2	G7
24	75	30	800	HA-2	G7
25	75	30	800	HA-2	G7
26	75	30	800	HA-2	G7
27	75	30	800	HA-2	G7
28	75	30	800	HA-2	G7
29	75	30	800	HA-2	G7
30	75	30	800	HA-2	G7
31	75	30	800	HA-1	G7
32	75	30	800	HA-2	G7
33	75	30	800	HA-2	G7
34	75	30	800	HA-2	G7
35	90	50	600	HA-6	G7
36	90	50	600	HA-6	G7
37	90	50	600	HA-6	G7
38	90	50	600	HA-6	G7
39	100	55	800	HA-6	G7
40	100	55	800	HA-6	G7
41	100	55	800	HA-6	G7
42	100	55	800	HA-6	G7
43	100	55	800	HA-6	G7
44	100	55	800	HA-6	G7
45	100	55	800	HA-6	G7

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Design Stress Intensity, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	16.7	...	16.7	...	16.7	16.7	16.1	15.2	14.9	14.6	14.3	14.1	...	...
2	16.7	...	16.7	...	16.7	16.7	16.1	15.2	14.9	14.6	14.3	14.1	...	...
3	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
4	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
5	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
6	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
7	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
8	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
9	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
10	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
11	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
12	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
13	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
14	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
15	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
16	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
17	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
18	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
19	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
20	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
21	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
22	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
23	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
24	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
25	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
26	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
27	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
28	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
29	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
30	20.0	...	20.0	...	20.0	20.0	19.3	18.3	17.9	17.5	17.2	16.9	...	...
31	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
32	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
33	20.0	...	20.0	...	20.0	19.3	18.0	17.0	16.6	16.3	16.1	15.9	...	...
34	20.0	...	20.0	...	20.0	18.6	17.5	16.6	16.2	15.8	15.5	15.2	...	...
35	30.0	...	30.0	...	28.0	26.4	24.4	23.1	...	...	...	...	...	...
36	30.0	...	30.0	...	28.0	26.4	24.4	23.1	...	...	...	...	...	...
37	30.0	...	30.0	...	28.0	26.4	24.4	23.1	...	...	...	...	...	...
38	30.0	...	30.0	...	28.0	26.4	24.4	23.1	...	...	...	...	...	...
39	33.3	...	33.1	...	31.4	30.4	29.7	29.2	29.0	28.8	28.5	28.3	...	...
40	33.3	...	33.1	...	31.4	30.4	29.7	29.2	29.0	28.8	28.5	28.3	...	...
41	33.3	...	33.1	...	31.4	30.4	29.7	29.2	29.0	28.8	28.5	28.3	...	...
42	33.3	...	33.1	...	31.4	30.4	29.7	29.2	29.0	28.8	28.5	28.3	...	...
43	33.3	...	33.1	...	31.4	30.4	29.7	29.2	29.0	28.8	28.5	28.3	...	...
44	33.3	...	33.1	...	31.4	30.4	29.7	29.2	29.0	28.8	28.5	28.3
45	33.3	...	33.1	...	31.4	30.4	29.7	29.2	29.0	28.8	28.5	28.3

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	22Cr–13Ni–5Mn	Bar	SA-479	XM-19	S20910	...	...	8	3
2	22Cr–13Ni–5Mn	Wld. pipe	SA-813	TPXM-19	S20910	...	...	8	3
3	22Cr–13Ni–5Mn	Wld. pipe	SA-814	TPXM-19	S20910	...	...	8	3
4	22Cr–13Ni–5Mn	Forgings	SA-965	FXM-19	S20910	...	...	8	3
5	23Cr–12Ni	Fittings	SA-403	309	S30900	...	...	8	2
6	23Cr–12Ni	Wld. fittings	SA-403	309	S30900	WP-W	...	8	2
7	23Cr–12Ni	Wld. pipe	SA-358	309S	S30908	...	...	8	2
8	23Cr–12Ni	Bar	SA-479	309S	S30908	...	...	8	2
9	23Cr–12Ni	Bar	SA/JIS G4303	SUS309S	...	...	...	8	2
10	25Cr–12Ni	Castings	SA-351	CH8	J93400	...	...	8	2
11	25Cr–12Ni	Cast pipe	SA-451	CPH8	J93400	...	...	8	2
12	25Cr–12Ni	Castings	SA-351	CH20	J93402	...	...	8	2
13	25Cr–12Ni	Cast pipe	SA-451	CPH20	J93402	...	...	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-965	F310	S31000	...	...	8	2
17	25Cr–20Ni	Wld. pipe	SA-358	310S	S31008	1	...	8	2
18	25Cr–20Ni	Fittings	SA-403	310S	S31008	...	...	8	2
19	25Cr–20Ni	Wld. fittings	SA-403	310S	S31008	WP-W	...	8	2

TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

#1

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Temp. Limit (SPT = Supports Only)	External Pressure Chart No.	Notes
1	100	55	800	HA-6	G7
2	100	55	800	HA-6	G7
3	100	55	800	HA-6	G7
4	100	55	800	HA-6	G7
5	75	30	800	HA-2	G7
6	75	30	800	HA-2	G7
7	75	30	800	HA-2	G7
8	75	30	800	HA-2	G7
9	75	30	800	HA-2	G7
10	65	28	800	HA-3	G7, G9, G10, G13
11	65	28	800	HA-3	G7, G13
12	70	30	800	HA-2	G7
13	70	30	800	HA-2	G7
14	65	28	800	HA-3	G7
15	65	28	800	HA-3	G7
16	75	30	800	HA-2	G7, G9, G11, G12
17	75	30	800	HA-2	G7
18	75	30	800	HA-2	G7
19	75	30	800	HA-2	G7

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TABLE 2A (CONT'D)
SECTION III, DIVISION 1, CLASSES 1 AND MC, AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR FERROUS MATERIALS

Line No.	Design Stress Intensity, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	150	200	250	300	400	500	600	650	700	750	800	850	900
1	33.3	...	33.1	...	31.4	30.4	29.7	29.2	29.0	28.8	28.5	28.3	...	...
2	33.3	...	33.1	...	31.4	30.4	29.7	29.2	29.0	28.8	28.5	28.3	...	...
3	33.3	...	33.1	...	31.4	30.4	29.7	29.2	29.0	28.8	28.5	28.3	...	...
4	33.3	...	33.1	...	31.4	30.4	29.7	29.2	29.0	28.8	28.5	28.3	...	...
5	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	...	...
6	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	...	...
7	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	...	...
8	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	...	...
9	20.0	...	20.0	...	20.0	20.0	19.4	18.8	18.5	18.2	18.0	17.7	...	...
10	18.7	...	18.7	...	18.5	18.0	17.7	17.1	16.7	16.3	15.9	15.4	...	...
11	18.7	...	18.7	...	18.5	18.0	17.7	17.1	16.7	16.3	15.9	15.4	...	...
12	20.0	...	20.0	...	19.9	19.4	18.9	18.3	17.9	17.5	17.0	16.5	...	...
13	20.0	...	20.0	...	19.9	19.4	18.9	18.3	17.9	17.5	17.0	16.5	...	...
14	18.7	...	18.7	...	18.5	18.0	17.7	17.1	16.7	16.3	15.9	15.4	...	...
15	18.7	...	18.7	...	18.5	18.0	17.7	17.1	16.7	16.3	15.9	15.4	...	...
16	20.0	...	20.0	...	20.0	20.0	19.3	18.5	18.2	17.9	17.7	17.4	...	...
17	20.0	...	20.0	...	20.0	20.0	19.3	18.5	18.2	17.9	17.7	17.4	...	...
18	20.0	...	20.0	...	20.0	20.0	19.3	18.5	18.2	17.9	17.7	17.4	...	...
19	20.0	...	20.0	...	20.0	20.0	19.3	18.5	18.2	17.9	17.7	17.4	...	...

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 and E2).
- (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.
- (10) (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.

NOTES — EXPERIENCE CRITERION

- E1 For values at 650°F and above, the design stress intensity values are based on successful experience in service.
- E2 For values at 700°F and above, the design stress intensity 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 $\frac{3}{4}$ in.
- G4 Material that conforms to Class 11 or 12 is not permitted when the nominal thickness of the material exceeds $1\frac{1}{4}$ in.
- G5 A product analysis is required on this material.
- G6 SA-723 shall not be used for minimum permissible temperature below +40°F.
- 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 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.
- 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 500°F. See Appendix A, A-360.
- G9 At temperatures over 1000°F, these stress intensity values apply only when the carbon is 0.04% or higher. This note is applicable only when stresses above 1000°F are published.
- G10 For temperatures above 1000°F, these stress intensity values may be used only if the material has been heat treated by heating to a minimum temperature of 1900°F and quenching in water or rapidly cooling by other means. This note is applicable only when stresses above 1000°F are published.
- G11 These stress intensity values at temperatures of 1050°F 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 1000°F are published.
- G12 These stress intensity 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 Appendix A, A-340 and A-360.
- G14 All forgings shall have a maximum tensile strength not in excess of 25 ksi above the specified minimum.
- G15 Fabricated from SA-387 Grade 12 Class 1 plate.
- G16 Fabricated from SA-387 Grade 12 Class 2 plate.

NOTES — HEAT TREATMENT REQUIREMENTS

- H1 Annealed.
- H2 Normalized and tempered.
- H3 Pieces that are formed (after quenching and tempering) at a temperature lower than 25°F below the final tempering temperature shall be heat treated after forming when the extreme fiber strain from forming exceeds 3%. Heat treatment shall be 1075°F minimum, but not higher than 25°F below the final tempering temperature for a minimum time of 1 hr per inch of thickness. Pieces formed at temperatures within 25°F higher than the original tempering temperature shall be requenched and tempered, either before or after welding into the vessel.

NOTES — SIZE REQUIREMENTS

- S1 The maximum thickness of forgings shall not exceed $3\frac{3}{4}$ in. (4 in. as heat treated).
- S2 Both NPS 8 and larger, and schedule 140 and heavier.
- S3 The minimum thickness of pressure-retaining parts shall be $\frac{1}{4}$ in.
- S4 The minimum thickness of shells, heads, and other pressure-retaining parts shall be $\frac{1}{4}$ in. The maximum thickness shall be limited only by the ability to develop the specified mechanical properties.

NOTES TO TABLE 2A (CONT'D)

NOTES — WELDING REQUIREMENTS

- W1 Not for welded construction.
- W2 In welded construction, for temperatures above 850°F, 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 150°F.
 - (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 $\frac{1}{4}$ in.).
 - (2) For welded joints that are not quenched and tempered after welding, any change as follows:
 - (a) for T less than $\frac{5}{8}$ in., any decrease in thickness (the maximum thickness qualified is $2T$);
 - (b) for T equal to $\frac{5}{8}$ in. and over, any departure from the range of $\frac{5}{8}$ in. to $2T$.

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TABLE 2B
SECTION III, DIVISION 1, CLASS 1 AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR NONFERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Alloy Designation/ UNS No.	Class/Condition/ Temper	Size/ Thickness, in.	P-No.
1	...	Plate	SB-171	C71500	M20	$2\frac{1}{2} < t \leq 5$	34
2	...	Plate	SB-171	C71500	O25	$2\frac{1}{2} < t \leq 5$	34
3	...	Plate	SB-171	C71500	M20	$\leq 2\frac{1}{2}$	34
4	...	Plate	SB-171	C71500	O25	$\leq 2\frac{1}{2}$	34
5	...	Smls. tube	SB-111	C71500	O61	...	34
6	...	Smls. tube	SB-111	C71500	HR50	...	34
7	...	Castings	SB-584	C93700	M01 or M07	...	...
8	67Ni-30Cu	Bar, rod	SB-164	N04400	Annealed	...	42
9	67Ni-30Cu	Smls. pipe & tube	SB-165	N04400	Annealed	> 5 O.D.	42
10	67Ni-30Cu	Forgings	SB-564	N04400	Annealed	...	42
11	67Ni-30Cu	Plate	SB-127	N04400	Annealed	...	42
12	67Ni-30Cu	Smls. tube	SB-163	N04400	Annealed	...	42
13	67Ni-30Cu	Smls. pipe & tube	SB-165	N04400	Annealed	≤ 5 O.D.	42
14	67Ni-30Cu	Bar, rod	SB-164	N04400	Hot worked	...	42
15	67Ni-30Cu	Plate	SB-127	N04400	As rolled	...	42
16	67Ni-30Cu	Bar	SB-164	N04400	Hot worked	...	42
(10) 17	67Ni-30Cu	Smls. tube	SB-163	N04400	Stress rel.	...	42
18	67Ni-30Cu	Smls. pipe & tube	SB-165	N04400	Stress rel.	...	42
19	67Ni-30Cu-S	Bar, rod	SB-164	N04405	Annealed	...	42
20	67Ni-30Cu-S	Bar, rod	SB-164	N04405	Hot worked	...	42
21	47Ni-22Cr-9Mo-18Fe	Plate	SB-435	N06002	Annealed	$\frac{3}{16} < t \leq 2\frac{1}{2}$	43
22	47Ni-22Cr-9Mo-18Fe	Sheet	SB-435	N06002	Annealed	$\frac{1}{16} < t \leq \frac{3}{16}$	43
23	47Ni-22Cr-9Mo-18Fe	Rod	SB-572	N06002	Solution ann.	$\geq \frac{3}{16}$	43
24	47Ni-22Cr-9Mo-18Fe	Wld. pipe	SB-619	N06002	Solution ann.	...	43
25	47Ni-22Cr-9Mo-18Fe	Smls. pipe & tube	SB-622	N06002	Solution ann.	...	43
26	47Ni-22Cr-9Mo-18Fe	Wld. tube	SB-626	N06002	Solution ann.	...	43
27	55Ni-21Cr-13.5Mo	Smls. & wld. fittings	SB-366	N06022	Solution ann.	...	43
28	55Ni-21Cr-13.5Mo	Forgings	SB-462	N06022	Solution ann.	...	43
29	55Ni-21Cr-13.5Mo	Forgings	SB-564	N06022	Solution ann.	...	43
30	55Ni-21Cr-13.5Mo	Rod	SB-574	N06022	Solution ann.	...	43
31	55Ni-21Cr-13.5Mo	Plate, sheet, strip	SB-575	N06022	Solution ann.	...	43
32	55Ni-21Cr-13.5Mo	Wld. pipe	SB-619	N06022	Solution ann.	...	43
33	55Ni-21Cr-13.5Mo	Smls. pipe & tube	SB-622	N06022	Solution ann.	...	43
34	55Ni-21Cr-13.5Mo	Wld. tube	SB-626	N06022	Solution ann.	...	43
35	59Ni-23Cr-16Mo	Wld. fittings	SB-366	N06059	Solution ann.	...	43
36	59Ni-23Cr-16Mo	Smls. fittings	SB-366	N06059	Solution ann.	...	43
37	59Ni-23Cr-16Mo	Forged fittings	SB-462	N06059	Solution ann.	...	43
38	59Ni-23Cr-16Mo	Forgings	SB-564	N06059	Solution ann.	...	43
39	59Ni-23Cr-16Mo	Bar, rod	SB-574	N06059	Solution ann.	...	43
40	59Ni-23Cr-16Mo	Plate, sheet, strip	SB-575	N06059	Solution ann.	...	43
41	59Ni-23Cr-16Mo	Wld. pipe	SB-619	N06059	Solution ann.	...	43
42	59Ni-23Cr-16Mo	Smls. pipe & tube	SB-622	N06059	Solution ann.	...	43
43	59Ni-23Cr-16Mo	Wld. tube	SB-626	N06059	Solution ann.	...	43

TABLE 2B
SECTION III, DIVISION 1, CLASS 1 AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR NONFERROUS MATERIALS

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Temp. Limit (SPT = Supports Only)	External Pressure Chart No.	Notes	
1	45	18	500	NFC-4	G1, G4	
2	45	18	500	NFC-4	G1, G4	
3	50	20	500	NFC-4	G1, G4	
4	50	20	500	NFC-4	G1, G4	
5	52	18	500	NFC-4	G1	
6	72	50	500	NFC-4	G1	
7	30	12	400 (SPT)	NFC-1	...	
8	70	25	800	NFN-3	G1, G2, G4	
9	70	25	800	NFN-3	G1, G4	
10	70	25	800	NFN-3	G1, G2, G4	
11	70	28	800	NFN-3	G1, G4	
12	70	28	800	NFN-3	G1, G4	
13	70	28	800	NFN-3	G1, G4	
14	75	30	800	NFN-3	E2, G1	
15	75	40	800	NFN-3	E2, G1, G4	
16	75	40	800	NFN-3	E2, G1	
17	85	55	500	NFN-3	G1, G4, W1	(10)
18	85	55	500	NFN-3	G1	
19	70	25	800	NFN-3	G1, G2, G4	
20	75	35	800	NFN-3	G1	
21	95	35	800	NFN-15	G1, G4	
22	95	35	800	NFN-15	G1, G4	
23	95	35	800	NFN-15	G1, G2, G4	
24	100	40	800	NFN-15	G1	
25	100	40	800	NFN-15	G1, G4	
26	100	40	800	NFN-15	G1	
27	100	45	800	NFN-10	G1	
28	100	45	800	NFN-10	G1	
29	100	45	800	NFN-10	G1	
30	100	45	800	NFN-10	G1	
31	100	45	800	NFN-10	G1	
32	100	45	800	NFN-10	G1	
33	100	45	800	NFN-10	G1	
34	100	45	800	NFN-10	G1	
35	100	45	800	NFN-14	G1, G4	
36	100	45	800	NFN-14	G1, G4	
37	100	45	800	NFN-14	G1, G4	
38	100	45	800	NFN-14	G1, G4	
39	100	45	800	NFN-14	G1, G4	
40	100	45	800	NFN-14	G1, G4	
41	100	45	800	NFN-14	G1, G4	
42	100	45	800	NFN-14	G1, G4	
43	100	45	800	NFN-14	G1, G4	

TABLE 2B
SECTION III, DIVISION 1, CLASS 1 AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR NONFERROUS MATERIALS

Line No.	Design Stress Intensity, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800
1	12.0	11.6	11.3	11.0	10.8	10.5	10.3	10.1	9.9	...	...	...	...	...	...
2	12.0	11.6	11.3	11.0	10.8	10.5	10.3	10.1	9.9	...	...	...	...	...	...
3	13.3	12.9	12.6	12.3	12.0	11.7	11.5	11.2	11.0	...	...	...	...	...	...
4	13.3	12.9	12.6	12.3	12.0	11.7	11.5	11.2	11.0	...	...	...	...	...	...
5	12.0	11.6	11.3	11.0	10.8	10.5	10.3	10.1	9.9	...	...	...	...	...	...
6	24.0	24.0	24.0	24.0	24.0	23.5	23.0	22.5	22.0	...	...	...	...	...	...
7	8.0	7.4	6.9	6.8	6.6	6.5	6.4	...	...	...	...	...	...	...	...
8	16.7	15.3	14.6	14.0	13.6	13.3	13.2	13.1	13.1	13.1	13.1	13.1	13.0	12.9	12.7
9	16.7	15.3	14.6	14.0	13.6	13.3	13.2	13.1	13.1	13.1	13.1	13.1	13.0	12.9	12.7
10	16.7	15.3	14.6	14.0	13.6	13.3	13.2	13.1	13.1	13.1	13.1	13.1	13.0	12.9	12.7
11	18.7	17.2	16.4	15.7	15.2	14.9	14.7	14.7	14.7	14.7	14.7	14.7	14.6	14.5	14.3
12	18.7	17.2	16.4	15.7	15.2	14.9	14.7	14.7	14.7	14.7	14.7	14.7	14.6	14.5	14.3
13	18.7	17.2	16.4	15.7	15.2	14.9	14.7	14.7	14.7	14.7	14.7	14.7	14.6	14.5	14.3
14	20.0	19.7	19.4	19.0	18.6	18.2	17.9	17.7	17.6	17.5	17.3	17.2	17.0	16.8	15.2
15	25.0	25.0	25.0	25.0	24.8	24.3	23.9	23.7	23.4	23.3	23.1	22.9	22.7	20.9	20.3
16	25.0	25.0	25.0	25.0	24.8	24.3	23.9	23.7	23.4	23.3	23.1	22.9	22.7	20.9	20.3
(10) 17	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	...	...	...	...	...	...
18	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	...	...	...	...	...	...
19	16.7	15.3	14.6	14.0	13.6	13.3	13.2	13.1	13.1	13.1	13.1	13.1	13.0	12.9	12.7
20	23.3	...	20.6	...	19.2	...	18.5	...	18.5	...	18.5	18.5	18.5	18.2	17.6
21	23.3	21.9	21.0	20.1	19.2	18.4	17.7	17.1	16.5	16.1	15.7	15.3	15.1	14.9	14.7
22	23.3	21.9	21.0	20.1	19.2	18.4	17.7	17.1	16.5	16.1	15.7	15.3	15.1	14.9	14.7
23	23.3	21.9	21.0	20.1	19.2	18.4	17.7	17.1	16.5	16.1	15.7	15.3	15.1	14.9	14.7
24	26.7	25.0	24.0	22.9	22.0	21.1	20.3	19.5	18.9	18.4	17.9	17.5	17.2	17.0	16.8
25	26.7	25.0	24.0	22.9	22.0	21.1	20.3	19.5	18.9	18.4	17.9	17.5	17.2	17.0	16.8
26	26.7	25.0	24.0	22.9	22.0	21.1	20.3	19.5	18.9	18.4	17.9	17.5	17.2	17.0	16.8
27	30.0	...	30.0	...	30.0	...	30.0	...	29.0	...	27.6	27.0	26.5	26.1	25.7
28	30.0	...	30.0	...	30.0	...	30.0	...	29.0	...	27.6	27.0	26.5	26.1	25.7
29	30.0	...	30.0	...	30.0	...	30.0	...	29.0	...	27.6	27.0	26.5	26.1	25.7
30	30.0	...	30.0	...	30.0	...	30.0	...	29.0	...	27.6	27.0	26.5	26.1	25.7
31	30.0	...	30.0	...	30.0	...	30.0	...	29.0	...	27.6	27.0	26.5	26.1	25.7
32	25.5	...	25.5	...	25.5	...	25.5	...	24.7	...	23.5	23.0	22.5	22.2	21.8
33	30.0	...	30.0	...	30.0	...	30.0	...	29.0	...	27.6	27.0	26.5	26.1	25.7
34	25.5	...	25.5	...	25.5	...	25.5	...	24.7	...	23.5	23.0	22.5	22.2	21.8
35	30.0	...	30.0	...	30.0	...	30.0	...	30.0	...	28.9	28.1	27.3	26.5	25.7
36	30.0	...	30.0	...	30.0	...	30.0	...	30.0	...	28.9	28.1	27.3	26.5	25.7
37	30.0	...	30.0	...	30.0	...	30.0	...	30.0	...	28.9	28.1	27.3	26.5	25.7
38	30.0	...	30.0	...	30.0	...	30.0	...	30.0	...	28.9	28.1	27.3	26.5	25.7
39	30.0	...	30.0	...	30.0	...	30.0	...	30.0	...	28.9	28.1	27.3	26.5	25.7
40	30.0	...	30.0	...	30.0	...	30.0	...	30.0	...	28.9	28.1	27.3	26.5	25.7
41	30.0	...	30.0	...	30.0	...	30.0	...	30.0	...	28.9	28.1	27.3	26.5	25.7
42	30.0	...	30.0	...	30.0	...	30.0	...	30.0	...	28.9	28.1	27.3	26.5	25.7
43	30.0	...	30.0	...	30.0	...	30.0	...	30.0	...	28.9	28.1	27.3	26.5	25.7

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TABLE 2B (CONT'D)
SECTION III, DIVISION 1, CLASS 1 AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR NONFERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Alloy Designation/ UNS No.	Class/Condition/ Temper	Size/ Thickness, in.	P-No.
1	72Ni-15Cr-8Fe	Smls. pipe & tube	SB-167	N06600	Hot fin.	> 5 O.D.	43
2	72Ni-15Cr-8Fe	Smls. pipe & tube	SB-167	N06600	Annealed	> 5 O.D.	43
3	72Ni-15Cr-8Fe	Smls. tube	SB-163	N06600	Annealed	...	43
4	72Ni-15Cr-8Fe	Bar, rod	SB-166	N06600	Annealed	...	43
5	72Ni-15Cr-8Fe	Smls. pipe & tube	SB-167	N06600	Annealed	≤ 5 O.D.	43
6	72Ni-15Cr-8Fe	Plate	SB-168	N06600	Annealed	...	43
7	72Ni-15Cr-8Fe	Forgings	SB-564	N06600	Annealed	...	43
8	72Ni-15Cr-8Fe	Smls. tube	SB-163	N06600	Annealed	$\frac{1}{4} < \text{O.D.} \leq \frac{7}{8}$	43
9	60Ni-22Cr-9Mo-3.5Cb	Bar, rod	SB-446	N06625	Annealed	$4 < t \leq 10$	43
10	60Ni-22Cr-9Mo-3.5Cb	Plate	SB-443	N06625	Annealed	...	43
11	60Ni-22Cr-9Mo-3.5Cb	Smls. pipe & tube	SB-444	N06625	Annealed	...	43
12	60Ni-22Cr-9Mo-3.5Cb	Bar, rod	SB-446	N06625	Annealed	≤ 4	43
13	58Ni-29Cr-9Fe	Smls. tube	SB-163	N06690	Annealed	...	43
14	58Ni-29Cr-9Fe	Smls. pipe & tube	SB-167	N06690	Annealed	≤ 5 O.D.	43
15	58Ni-29Cr-9Fe	Plate	SB-168	N06690	Annealed	...	43
16	58Ni-29Cr-9Fe	Forgings	SB-564	N06690	Annealed	...	43
17	58Ni-29Cr-9Fe	Bar, rod	SB-166	N06690	Cold worked/ann.	...	43
18	58Ni-29Cr-9Fe	Bar, rod	SB-166	N06690	Hot worked	...	43
19	58Ni-29Cr-9Fe	Bar, rod	SB-166	N06690	Hot worked/ann.	...	43
20	58Ni-29Cr-9Fe	Smls. tube	SB-163	N06690	Annealed	$\frac{1}{4} < \text{O.D.} \leq \frac{7}{8}$	43
21	42Fe-33Ni-21Cr	Smls. tube	SB-163	N08800	Annealed	...	45
22	42Fe-33Ni-21Cr	Smls. pipe & tube	SB-407	N08800	Annealed	...	45
23	42Fe-33Ni-21Cr	Plate	SB-409	N08800	Annealed	...	45
24	42Fe-33Ni-21Cr	Forgings	SB-564	N08800	Annealed	...	45
25	42Fe-33Ni-21Cr	Bar, rod	SB-408	N08800	Hot fin.	...	45
26	42Fe-33Ni-21Cr	Smls. tube	SB-163	N08800	Annealed	$\frac{1}{4} < \text{O.D.} \leq \frac{7}{8}$	45
27	42Fe-33Ni-21Cr	Smls. tube	SB-163	N08800	Cold worked	...	45
28	42Fe-33Ni-21Cr	Smls. tube	SB-163	N08810	Annealed	...	45
29	42Fe-33Ni-21Cr	Smls. pipe & tube	SB-407	N08810	Annealed	...	45
30	42Fe-33Ni-21Cr	Bar, rod	SB-408	N08810	Annealed	...	45
31	42Fe-33Ni-21Cr	Plate	SB-409	N08810	Annealed	...	45
32	42Fe-33Ni-21Cr	Forgings	SB-564	N08810	Annealed	...	45
33	42Ni-21.5Cr-5Mo-2.3Cu	Smls. tube	SB-163	N08825	Annealed	...	45
34	42Ni-21.5Cr-5Mo-2.3Cu	Bar, rod	SB-425	N08825	Annealed	...	45
35	Ti-3Al-2.5V	Plate, sheet, strip	SB-265	R56320	Annealed	...	53
36	Ti-3Al-2.5V	Bar, billet	SB-348	R56320	Annealed	...	53
37	Ti-3Al-2.5V	Forgings	SB-381	R56320	Annealed	...	53
38	Ti-3Al-2.5V	Smls. & wld. tube	SB-338	R56320	Smls. ann.	...	53
39	Ti-3Al-2.5V	Wld. fittings	SB-363	R56320	Smls. ann.	...	53
40	Ti-3Al-2.5V	Smls. pipe	SB-861	R56320	Smls. ann.	...	53
41	Ti-3Al-2.5V	Smls. & wld. tube	SB-338	R56320	Wld. ann.	...	53
42	Ti-3Al-2.5V	Wld. fittings	SB-363	R56320	Wld. ann.	...	53
43	Ti-3Al-2.5V	Wld. pipe	SB-862	R56320	Wld. ann.	...	53

TABLE 2B (CONT'D)
SECTION III, DIVISION 1, CLASS 1 AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR NONFERROUS MATERIALS

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Temp. Limit (SPT = Supports Only)	External Pressure Chart No.	Notes
1	75	25	800	NFN-4	G1
2	80	30	800	NFN-4	G1, G4
3	80	35	800	NFN-4	G1, G4
4	80	35	800	NFN-4	G1, G2, G4
5	80	35	800	NFN-4	G1, G4
6	80	35	800	NFN-4	G1, G4
7	80	35	800	NFN-4	G1, G2, G4
8	80	40	800	NFN-21	G1, G3, S1
9	110	50	800	NFN-17	...
10	110	55	800	NFN-17	...
11	120	60	800	NFN-17	...
12	120	60	800	NFN-17	...
13	85	35	800	NFN-4	G1
14	85	35	800	NFN-4	G1
15	85	35	800	NFN-4	G1
16	85	35	800	NFN-4	G1
17	85	35	800	NFN-4	G1
18	85	35	800	NFN-4	G1
19	85	35	800	NFN-4	G1
20	85	40	800	NFN-21	G1, G3, S1
21	75	30	800	NFN-8	G1, G4
22	75	30	800	NFN-8	G1, G4
23	75	30	800	NFN-8	G1, G4
24	75	30	800	NFN-8	G1, G2, G4
25	75	30	800	NFN-8	G1, G2, G4
26	75	40	800	NFN-8	G1, G3, S1
27	83	47	650	NFN-23	G1
28	65	25	800	NFN-9	G1, G4
29	65	25	800	NFN-9	G1, G4
30	65	25	800	NFN-9	G1, G2, G4
31	65	25	800	NFN-9	G1, G4
32	65	25	800	NFN-9	G1, G2, G4
33	85	35	800	NFN-7	G1, G4
34	85	35	800	NFN-7	G2, G4
35	90	70	600	NFT-4	...
36	90	70	600	NFT-4	...
37	90	70	600	NFT-4	...
38	90	70	600	NFT-4	...
39	90	70	600	NFT-4	...
40	90	70	600	NFT-4	...
41	90	70	600	NFT-4	G5
42	90	70	600	NFT-4	G5
43	90	70	600	NFT-4	G5

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TABLE 2B (CONT'D)
SECTION III, DIVISION 1, CLASS 1 AND SECTION III, DIVISION 3, CLASSES TC AND SC
DESIGN STRESS INTENSITY VALUES S_m FOR NONFERROUS MATERIALS

Line No.	Design Stress Intensity, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800
1	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7
2	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
3	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	23.3	23.3	23.3	23.3	23.3
4	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	23.3	23.3	23.3	23.3	23.3
5	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	23.3	23.3	23.3	23.3	23.3
6	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	23.3	23.3	23.3	23.3	23.3
7	23.3	...	23.3	...	23.3	...	23.3	...	23.3	...	23.3	23.3	23.3	23.3	23.3
8	26.7	...	26.7	...	26.7	...	26.7	...	26.7	...	26.7	26.7	26.7	26.7	26.7
9	33.3	...	32.1	...	31.2	...	30.3	...	29.4	...	28.6	28.3	27.9	27.6	27.4
10	36.7	...	35.3	...	34.3	...	33.3	...	32.4	...	31.5	31.1	30.7	30.4	30.1
11	40.0	...	38.5	...	37.4	...	36.3	...	35.3	...	34.4	33.9	33.5	33.2	32.9
12	40.0	...	38.5	...	37.4	...	36.3	...	35.3	...	34.4	33.9	33.5	33.2	32.9
13	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3
14	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3
15	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3
16	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3
17	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3
18	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3
19	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3
20	26.7	...	26.7	...	26.7	...	26.7	...	26.7	...	26.7	26.7	26.6	26.5	26.4
21	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0
22	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0
23	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0
24	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0
25	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0
26	25.0	...	25.0	...	25.0	...	25.0	...	25.0	...	24.9	24.8	24.8	24.7	24.6
27	27.7	...	27.7	...	27.7	...	27.5	...	26.9	...	26.6	26.6	...	...	...
28	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.5	16.1	15.7	15.3	15.0
29	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.5	16.1	15.7	15.3	15.0
30	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.5	16.1	15.7	15.3	15.0
31	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.5	16.1	15.7	15.3	15.0
32	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.5	16.1	15.7	15.3	15.0
33	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.2	23.0
34	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.2	23.0
35	30.0	30.0	28.9	27.7	26.4	25.0	23.5	22.2	21.1	20.5	20.1	...	...	...	...
36	30.0	30.0	28.9	27.7	26.4	25.0	23.5	22.2	21.1	20.5	20.1	...	...	...	...
37	30.0	30.0	28.9	27.7	26.4	25.0	23.5	22.2	21.1	20.5	20.1	...	...	...	...
38	30.0	30.0	28.9	27.7	26.4	25.0	23.5	22.2	21.1	20.5	20.1	...	...	...	...
39	30.0	30.0	28.9	27.7	26.4	25.0	23.5	22.2	21.1	20.5	20.1	...	...	...	...
40	30.0	30.0	28.9	27.7	26.4	25.0	23.5	22.2	21.1	20.5	20.1	...	...	...	...
41	25.5	25.5	24.5	23.5	22.4	21.2	20.0	18.9	18.0	17.4	17.1	...	...	...	...
42	25.5	25.5	24.5	23.5	22.4	21.2	20.0	18.9	18.0	17.4	17.1	...	...	...	...
43	25.5	25.5	24.5	23.5	22.4	21.2	20.0	18.9	18.0	17.4	17.1	...	...	...	...

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 and E2).
- (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.
- (10) (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.

NOTES — EXPERIENCE CRITERION

- (10) E1 DELETED.
- E2 For values at 800°F, 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 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 SB-163 Supplementary Requirement S2 shall be met.
- G4 Design stress intensity values for 100°F may be used at temperatures down to -325°F without additional specification requirements.
- G5 A joint efficiency factor of 0.85 has been applied in arriving at the maximum allowable design stress intensity values for this material.

NOTES — SIZE REQUIREMENTS

- S1 Thickness ≤ 0.100 in.

NOTES — WELDING REQUIREMENTS

- W1 Welding except for seal welds is not permitted.

TABLE 3
SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/ Thickness, in.
Ferrous Materials							
(10)	1 Carbon steel	Bolting	SA-307	B	...	...	...
	2 Carbon steel	Bolting	SA-449	1	K04200	...	$1\frac{1}{2} < t \leq 3$
	3 Carbon steel	Bolting	SA-325	...	...	...	...
(10)	4 Carbon steel	Bolting	SA-325	1	K02706	...	$1\frac{1}{8} < t \leq 1\frac{1}{2}$
	5 Carbon steel	Bolting	SA-449	1	K04200	...	$1 < t < 1\frac{1}{2}$
	6 Carbon steel	Bolting	SA-354	BC	K04100	...	$2\frac{1}{2} < t \leq 4$
(10)	7 Carbon steel	Bolting	SA-325	1	K02706	...	$\frac{1}{2} < t \leq 1$
	8 Carbon steel	Bolting	SA-449	1	K04200	...	≤ 1
	9 Carbon steel	Bolting	SA-354	BC	K04100	...	$\frac{1}{4} < t \leq 2\frac{1}{2}$
	10 Carbon steel	Bolting	SA-354	BD	K04100	...	$2\frac{1}{2} < t \leq 4$
	11 Carbon steel	Bolting	SA-354	BD	K04100	...	$\frac{1}{4} < t \leq 2\frac{1}{2}$
(10)	12 C- $\frac{1}{4}$ Mo	Bolting	SA-320	L7A	G40370	...	$\leq 2\frac{1}{2}$
	13 C- $\frac{1}{4}$ Mo	Bolting	SA-574	4037	G40370	...	$\geq \frac{5}{8}$
	14 C- $\frac{1}{4}$ Mo	Bolting	SA-574	4042	G40420	...	$\geq \frac{5}{8}$
	15 C- $\frac{1}{4}$ Mo	Bolting	SA-574	4037	G40370	...	$\leq \frac{1}{2}$
	16 C- $\frac{1}{4}$ Mo	Bolting	SA-574	4042	G40420	...	$\leq \frac{1}{2}$
	17 ...	...	...	...	...	...	...
	18 $\frac{3}{4}$ Cr	Bolting	SA-574	5137M	...	...	$\geq \frac{5}{8}$
	19 $\frac{3}{4}$ Cr	Bolting	SA-574	51B37M	...	...	$\geq \frac{5}{8}$
	20 $\frac{3}{4}$ Cr	Bolting	SA-574	5137M	...	...	$\leq \frac{1}{2}$
	21 $\frac{3}{4}$ Cr	Bolting	SA-574	51B37M	...	...	$\leq \frac{1}{2}$
(10)	22 1Cr-1Mn- $\frac{1}{4}$ Mo	Bolting	SA-540	B22	H41420	5	$2 < t \leq 4$
	23 1Cr-1Mn- $\frac{1}{4}$ Mo	Bolting	SA-540	B22	H41420	5	≤ 2
	24 1Cr-1Mn- $\frac{1}{4}$ Mo	Bolting	SA-540	B22	H41420	4	≤ 4
	25 1Cr-1Mn- $\frac{1}{4}$ Mo	Bolting	SA-540	B22	H41420	3	≤ 4
	26 1Cr-1Mn- $\frac{1}{4}$ Mo	Bolting	SA-540	B22	H41420	2	≤ 3
	27 1Cr-1Mn- $\frac{1}{4}$ Mo	Bolting	SA-540	B22	H41420	1	$\leq 1\frac{1}{2}$
	28 1Cr- $\frac{1}{5}$ Mo	Bolting	SA-193	B7	G41400	...	$4 < t \leq 7$
	29 1Cr- $\frac{1}{5}$ Mo	Bolting	SA-193	B7M	G41400	...	$\leq 2\frac{1}{2}$
	30 1Cr- $\frac{1}{5}$ Mo	Bolting	SA-320	L7M	G41400	...	$\leq 2\frac{1}{2}$
	31 1Cr- $\frac{1}{5}$ Mo	Bolting	SA-193	B7	G41400	...	$2\frac{1}{2} < t \leq 4$
(10)	32 1Cr- $\frac{1}{5}$ Mo	Bolting	SA-193	B7	G41400	...	$\leq 2\frac{1}{2}$
	33 1Cr- $\frac{1}{5}$ Mo	Bolting	SA-320	L7	G41400	...	$\leq 2\frac{1}{2}$
	34 1Cr- $\frac{1}{5}$ Mo	Bolting	SA-574	4137	G41370	...	$\geq \frac{5}{8}$
	35 1Cr- $\frac{1}{5}$ Mo	Bolting	SA-574	4140	G41400	...	$\geq \frac{5}{8}$
	36 1Cr- $\frac{1}{5}$ Mo	Bolting	SA-574	4142	G41420	...	$\geq \frac{5}{8}$
	37 1Cr- $\frac{1}{5}$ Mo	Bolting	SA-574	4145	G41450	...	$\geq \frac{5}{8}$

TABLE 3
SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted)				Notes	
			III	VIII-1	VIII-2	XII		
	Ferrous Materials							
1	60	...	400	450	NP	450	...	(10)
2	90	58	700	650	650	650	...	
3	105	81	650	650	650	NP	...	
4	105	81	NP	650	650	650	...	(10)
5	105	81	700	700	700	650	...	
6	115	99	650	650	650	650	...	
7	120	92	NP	650	650	650	...	(10)
8	120	92	700	650	650	650	...	
9	125	109	650	650	650	650	...	
10	140	115	650	650	650	650	...	
11	150	130	650	650	650	650	...	
12	125	105	NP	650	650	650	W3	(0)
13	170	135	550	550	NP	550	G7, G11, W1	
14	170	135	550	550	NP	550	G7, G11, W1	
15	180	140	550	550	NP	550	G7, G11, W1	
16	180	140	550	550	NP	550	G7, G11, W1	
17	
18	170	135	550	550	NP	NP	G7, G11, W1	(10)
19	170	135	550	550	NP	NP	G7, G11, W1	
20	180	140	550	550	NP	NP	G7, G11, W1	
21	180	140	550	550	NP	NP	G7, G11, W1	
22	115	100	700	NP	NP	NP	...	
23	120	105	700	NP	NP	NP	...	
24	135	120	700	NP	NP	NP	...	
25	145	130	700	700	NP	650	...	
26	155	140	700	NP	NP	NP	...	
27	165	150	700	NP	NP	NP	...	
28	100	75	800	1000	800	650	...	
29	100	80	NP	1000	800	650	...	
30	100	80	NP	1000	800	650	...	
31	115	95	800	1000	800	650	...	
32	125	105	800	1000	800	650	...	
33	125	105	700	800	800	650	...	
34	170	135	550	NP	NP	NP	G7, G11, W1	(10)
35	170	135	550	550	NP	550	G7, G11, W1	
36	170	135	550	NP	NP	NP	G7, G11, W1	
37	170	135	550	NP	NP	NP	G7, G11, W1	

TABLE 3
SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
	Ferrous Materials																
(10) 1	7.0	...	7.0	...	7.0	...	7.0	7.0	...	...	...	...	...	...	...	...	...
2	14.5	14.5	14.5	...	14.5	...	14.5	...	14.5	14.5	14.5	14.5	14.5	...	...	...	...
3	20.2	...	20.2	...	20.2	...	20.2	...	20.2	...	20.2	20.2	...	...	...	...	...
4	20.2	20.2	20.2	...	20.2	...	20.2	...	20.2	20.2	20.2	20.2	...	...	...	...	...
(10) 5	20.2	...	20.2	...	20.2	...	20.2	...	20.2	...	20.2	20.2	20.2	...	...	...	...
6	23.0	23.0	23.0	...	23.0	...	23.0	...	23.0	23.0	23.0	23.0	...	...	...	...	...
7	23.0	23.0	23.0	...	23.0	...	23.0	...	23.0	23.0	23.0	23.0	...	...	...	...	...
(10) 8	23.0	23.0	23.0	...	23.0	...	23.0	...	23.0	23.0	23.0	23.0	23.0	...	...	...	...
9	25.0	25.0	25.0	...	25.0	...	25.0	...	25.0	25.0	25.0	25.0	...	...	...	...	...
10	28.0	28.0	28.0	...	28.0	...	28.0	...	28.0	...	28.0	28.0	...	...	...	...	...
11	30.0	30.0	30.0	...	30.0	...	30.0	...	30.0	30.0	30.0	30.0	...	...	...	...	...
12	25.0	25.0	25.0	...	25.0	...	25.0	...	25.0	25.0	25.0	25.0	...	...	...	...	...
13	33.8	...	33.8	...	33.8	...	33.8	...	33.8	33.8	...	...	...	...	...	...	...
14	33.8	...	33.8	...	33.8	...	33.8	...	33.8	33.8	...	...	...	...	...	...	...
15	35.0	...	35.0	...	35.0	...	35.0	...	35.0	35.0	...	...	...	...	...	...	...
16	35.0	...	35.0	...	35.0	...	35.0	...	35.0	35.0	...	...	...	...	...	...	...
(10) 17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	33.8	...	33.8	...	33.8	...	33.8	...	33.8	33.8	...	...	...	...	...	...	...
19	33.8	...	33.8	...	33.8	...	33.8	...	33.8	33.8	...	...	...	...	...	...	...
20	35.0	...	35.0	...	35.0	...	35.0	...	35.0	35.0	...	...	...	...	...	...	...
21	35.0	...	35.0	...	35.0	...	35.0	...	35.0	35.0	...	...	...	...	...	...	...
22	23.0	...	23.0	...	23.0	...	23.0	...	23.0	...	23.0	23.0	23.0	...	...	...	...
23	24.0	...	24.0	...	24.0	...	24.0	...	24.0	...	24.0	24.0	24.0	...	...	...	...
24	27.0	...	27.0	...	27.0	...	27.0	...	27.0	...	27.0	27.0	27.0	...	...	...	...
25	29.0	...	29.0	...	29.0	...	29.0	...	29.0	...	29.0	29.0	29.0	...	...	...	...
26	31.0	...	31.0	...	31.0	...	31.0	...	31.0	...	31.0	31.0	31.0	...	...	...	...
27	33.0	...	33.0	...	33.0	...	33.0	...	33.0	...	33.0	33.0	33.0	...	...	...	...
28	18.8	18.8	18.8	...	18.8	...	18.8	...	18.8	18.8	18.8	18.8	18.8	18.8	18.0	16.3	12.5
29	20.0	20.0	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	18.5	16.3	12.5
30	20.0	20.0	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	18.5	16.3	12.5
31	23.0	23.0	23.0	...	23.0	...	23.0	...	23.0	23.0	23.0	23.0	23.0	22.2	20.0	16.3	12.5
32	25.0	25.0	25.0	...	25.0	...	25.0	...	25.0	25.0	25.0	25.0	25.0	23.6	21.0	16.3	12.5
33	25.0	25.0	25.0	...	25.0	...	25.0	...	25.0	25.0	25.0	25.0	25.0	23.6	21.0	...	...
34	33.8	...	33.8	...	33.8	...	33.8	...	33.8	33.8	...	...	...	...	...	...	...
(10) 35	33.8	...	33.8	...	33.8	...	33.8	...	33.8	33.8	...	...	...	...	...	...	...
36	33.8	...	33.8	...	33.8	...	33.8	...	33.8	33.8	...	...	...	...	...	...	...
37	33.8	...	33.8	...	33.8	...	33.8	...	33.8	33.8	...	...	...	...	...	...	...

TABLE 3
SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
	Ferrous Materials														
1
2	(10)
3
4
5	(10)
6
7
8	(10)
9
10
11
12
13
14
15
16
17	(10)
18
19
20
21
22
23
24
25
26
27
28	8.5	4.5	...	...	...	...	...	...	...	...	...	...	...	...	...
29	8.5	4.5	...	...	...	...	...	...	...	...	...	...	...	...	...
30	8.5	4.5	...	...	...	...	...	...	...	...	...	...	...	...	...
31	8.5	4.5	...	...	...	...	...	...	...	...	...	...	...	...	...
32	8.5	4.5	...	...	...	...	...	...	...	...	...	...	...	...	...
33
34
35	(10)
36
37

TABLE 3 (CONT'D)
SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/ Thickness, in.
Ferrous Materials (Cont'd)							
1	1Cr- $\frac{1}{2}$ Mo	Bolting	SA-574	4137	G41370	...	$\leq \frac{1}{2}$
2	1Cr- $\frac{1}{2}$ Mo	Bolting	SA-574	4140	G41400	...	$\leq \frac{1}{2}$
3	1Cr- $\frac{1}{2}$ Mo	Bolting	SA-574	4142	G41420	...	$\leq \frac{1}{2}$
4	1Cr- $\frac{1}{2}$ Mo	Bolting	SA-574	4145	G41450	...	$\leq \frac{1}{2}$
5	1Cr- $\frac{1}{2}$ Mo-V	Bolting	SA-193	B16	K14072	...	$4 < t \leq 7$
6	1Cr- $\frac{1}{2}$ Mo-V	Bolting	SA-193	B16	K14072	...	$2\frac{1}{2} < t \leq 4$
7	1Cr- $\frac{1}{2}$ Mo-V	Bolting	SA-540	B21	K14073	5	$2 < t \leq 8$
8	1Cr- $\frac{1}{2}$ Mo-V	Bolting	SA-540	B21	K14073	5	≤ 2
9	1Cr- $\frac{1}{2}$ Mo-V	Bolting	SA-193	B16	K14072	...	$\leq 2\frac{1}{2}$
10	1Cr- $\frac{1}{2}$ Mo-V	Bolting	SA-540	B21	K14073	4	≤ 6
11	1Cr- $\frac{1}{2}$ Mo-V	Bolting	SA-540	B21	K14073	3	≤ 6
12	1Cr- $\frac{1}{2}$ Mo-V	Bolting	SA-540	B21	K14073	2	≤ 4
13	1Cr- $\frac{1}{2}$ Mo-V	Bolting	SA-540	B21	K14073	1	≤ 4
14	5Cr- $\frac{1}{2}$ Mo	Bolting	SA-193	B5	K50100	...	≤ 4
15	12Cr-1Mo-V-W	Bolting	SA-437	B4C	K91352	...	...
16	12Cr-1Mo-V-W	Bolting	SA-437	B4B	K91352	...	...
17	13Cr	Bolting	SA-193	B6	S41000	...	≤ 4
18	17Cr-4Ni-4Cu	Bolting	SA-564	630	S17400	H1150	≤ 8
19	17Cr-4Ni-4Cu	Bolting	SA-564	630	S17400	H1100	≤ 8
20	17Cr-4Ni-4Cu	Bolting	SA-705	630	S17400	H1100	≤ 8
21	$\frac{1}{2}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo	Bolting	SA-574	8740	G87400	...	$\geq \frac{5}{8}$
22	$\frac{1}{2}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo	Bolting	SA-574	8740	G87400	...	$\leq \frac{1}{2}$
23	$\frac{3}{4}$ Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	Bolting	SA-320	L43	G43400	...	≤ 4
24	$\frac{3}{4}$ Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	Bolting	SA-574	4340	G43400	...	$\geq \frac{5}{8}$
25	$\frac{3}{4}$ Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	Bolting	SA-574	4340	G43400	...	$\leq \frac{1}{2}$
26	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	Bolting	SA-540	B23	H43400	5	...
27	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	Bolting	SA-540	B23	H43400	5	...
28	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	Bolting	SA-540	B23	H43400	4	...
29	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	Bolting	SA-540	B23	H43400	3	...
30	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	Bolting	SA-540	B23	H43400	2	...
31	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	Bolting	SA-540	B23	H43400	1	...
32	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo	Bolting	SA-540	B24	K24064	5	...
33	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo	Bolting	SA-540	B24	K24064	5	...
34	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo	Bolting	SA-540	B24	K24064	4	...
35	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo	Bolting	SA-540	B24	K24064	3	...
36	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo	Bolting	SA-540	B24	K24064	2	...
37	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo	Bolting	SA-540	B24	K24064	1	...

TABLE 3 (CONT'D)
SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted)				Notes
			III	VIII-1	VIII-2	XII	
	Ferrous Materials (Cont'd)						
1	180	140	550	NP	NP	NP	G7, G11, W1
2	180	140	550	NP	NP	NP	G7, G11, W1
3	180	140	550	NP	NP	NP	G7, G11, W1
4	180	140	550	NP	NP	NP	G7, G11, W1
5	100	85	800	1100	800	650	...
6	110	95	800	1100	800	650	...
7	115	100	700	700	700	NP	...
8	120	105	700	700	700	NP	...
9	125	105	800	1100	800	650	...
10	135	120	700	700	700	650	...
11	145	130	700	700	700	650	...
12	155	140	700	700	700	650	...
13	165	150	700	700	700	650	...
14	100	80	800	1200	800	650	...
15	115	85	700	700	700	650	...
16	145	105	700	700	700	650	...
17	110	85	800	900	800	650	...
18	135	105	NP	650	650	NP	G4
19	140	115	650	650	650	650	G4
20	140	115	650	650	650	650	G4
21	170	135	550	NP	NP	NP	G7, G11, W1
22	180	140	550	NP	NP	NP	G7, G11, W1
23	125	105	400	400	700	400	...
24	170	135	550	550	NP	NP	G7, G11, W1
25	180	140	550	550	NP	NP	G7, G11, W1
26	115	100	700	700	700	650	...
27	120	105	700	700	700	650	...
28	135	120	700	700	700	650	...
29	145	130	700	700	700	650	...
30	155	140	700	700	700	650	...
31	165	150	700	700	700	650	...
32	115	100	700	700	700	650	...
33	120	105	700	700	700	650	...
34	135	120	700	700	700	650	...
35	145	130	700	700	700	650	...
36	155	140	700	700	700	650	...
37	165	150	700	700	700	650	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 3 (CONT'D)
SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
	Ferrous Materials (Cont'd)																
1	35.0	...	35.0	...	35.0	...	35.0	...	35.0	35.0	...	...	...	...	...	...	...
2	35.0	...	35.0	...	35.0	...	35.0	...	35.0	35.0	...	...	...	...	...	...	...
3	35.0	...	35.0	...	35.0	...	35.0	...	35.0	35.0	...	...	...	...	...	...	...
4	35.0	...	35.0	...	35.0	...	35.0	...	35.0	35.0	...	...	...	...	...	...	...
5	20.0	20.0	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	20.0	18.8	16.7
6	22.0	22.0	22.0	...	22.0	...	22.0	...	22.0	...	22.0	22.0	22.0	22.0	22.0	21.0	18.5
7	23.0	...	23.0	...	23.0	...	23.0	...	23.0	...	23.0	23.0	23.0	...	...	...	...
8	24.0	...	24.0	...	24.0	...	24.0	...	24.0	...	24.0	24.0	24.0	...	...	...	...
9	25.0	25.0	25.0	...	25.0	...	25.0	...	25.0	25.0	25.0	25.0	25.0	25.0	25.0	23.5	20.5
10	27.0	...	27.0	...	27.0	...	27.0	...	27.0	...	27.0	27.0	27.0	...	...	...	...
11	29.0	...	29.0	...	29.0	...	29.0	...	29.0	...	29.0	29.0	29.0	...	...	...	...
12	31.0	...	31.0	...	31.0	...	31.0	...	31.0	...	31.0	31.0	31.0	...	...	...	...
13	33.0	...	33.0	...	33.0	...	33.0	...	33.0	...	33.0	33.0	33.0	...	...	...	...
14	20.0	20.0	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	18.5	14.5	10.4
15	21.3	...	21.3	...	21.3	...	21.3	...	21.3	...	21.3	21.3	21.3	...	...	...	...
16	26.2	...	26.2	...	26.2	...	26.2	...	26.2	...	26.2	26.2	26.2	...	...	...	...
17	21.3	...	21.3	...	21.3	...	21.3	...	21.3	...	21.3	21.3	21.3	21.3	21.3	17.2	12.3
18	26.3	...	26.3	...	26.3	...	26.3	...	26.3	...	26.3	26.3	...	...	...	...	...
19	28.0	...	28.0	...	28.0	...	28.0	...	28.0	...	28.0	28.0	...	...	...	...	...
20	28.0	...	28.0	...	28.0	...	28.0	...	28.0	...	28.0	28.0	...	...	...	...	...
21	33.8	...	33.8	...	33.8	...	33.8	...	33.8	33.8	...	...	...	...	...	...	...
22	35.0	...	35.0	...	35.0	...	35.0	...	35.0	35.0	...	...	...	...	...	...	...
23	25.0	...	25.0	...	25.0	...	25.0	...	25.0	...	25.0	25.0	25.0	...	...	...	...
24	33.8	...	33.8	...	33.8	...	33.8	...	33.8	33.8	...	...	...	...	...	...	...
25	35.0	...	35.0	...	35.0	...	35.0	...	35.0	35.0	...	...	...	...	...	...	...
26	23.0	23.0	23.0	...	23.0	...	23.0	...	23.0	23.0	23.0	23.0	23.0	...	...	...	...
27	24.0	24.0	24.0	...	24.0	...	24.0	...	24.0	24.0	24.0	24.0	24.0	...	...	...	...
28	27.0	27.0	27.0	...	27.0	...	27.0	...	27.0	27.0	27.0	27.0	27.0	...	...	...	...
29	29.0	29.0	29.0	...	29.0	...	29.0	...	29.0	29.0	29.0	29.0	29.0	...	...	...	...
30	31.0	...	31.0	...	31.0	...	31.0	...	31.0	...	31.0	31.0	31.0	...	...	...	...
31	33.0	...	33.0	...	33.0	...	33.0	...	33.0	...	33.0	33.0	33.0	...	...	...	...
32	23.0	23.0	23.0	...	23.0	...	23.0	...	23.0	23.0	23.0	23.0	23.0	...	...	...	...
33	24.0	24.0	24.0	...	24.0	...	24.0	...	24.0	24.0	24.0	24.0	24.0	...	...	...	...
34	27.0	27.0	27.0	...	27.0	...	27.0	...	27.0	27.0	27.0	27.0	27.0	...	...	...	...
35	29.0	29.0	29.0	...	29.0	...	29.0	...	29.0	29.0	29.0	29.0	29.0	...	...	...	...
36	31.0	...	31.0	...	31.0	...	31.0	...	31.0	...	31.0	31.0	31.0	...	...	...	...
37	33.0	...	33.0	...	33.0	...	33.0	...	33.0	...	33.0	33.0	33.0	...	...	...	...

TABLE 3 (CONT'D)
SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
	Ferrous Materials (Cont'd)														
1
2
3
4
5	14.3	11.0	6.3	2.8
6	15.3	11.0	6.3	2.8
7
8
9	16.0	11.0	6.3	2.8
10
11
12
13
14	7.6	5.6	4.2	3.1	2.0	1.3
15
16
17
18
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TABLE 3 (CONT'D)
SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/ Thickness, in.
Ferrous Materials (Cont'd)							
1	2Ni-3/4Cr-1/2Mo-V	Bolting	SA-540	B24V	K24070	3	≤ 11
2	3 1/2 Ni-1 3/4 Cr-1/2 Mo-V	Forgings	SA-508	5	K42365	2	...
3	25Ni-15Cr-2Ti	Bolting	SA-453	660	S66286	A	...
4	25Ni-15Cr-2Ti	Bolting	SA-453	660	S66286	B	...
5	16Cr-12Ni-2Mo	Bolting	SA-193	B8M	S31600	1	...
6	16Cr-12Ni-2Mo	Bolting	SA-320	B8M	S31600	1	...
7	16Cr-12Ni-2Mo	Bolting	SA-320	B8MA	S31600	1A	...
8	16Cr-12Ni-2Mo	Bolting	SA-193	B8M2	S31600	...	2 1/2 < t ≤ 3
9	16Cr-12Ni-2Mo	Bolting	SA-193	B8M	S31600	2	1 1/4 < t ≤ 1 1/2
10	16Cr-12Ni-2Mo	Bolting	SA-320	B8M	S31600	2	1 1/4 < t ≤ 1 1/2
11	16Cr-12Ni-2Mo	Bolting	SA-193	B8M2	S31600	...	2 < t ≤ 2 1/2
12	16Cr-12Ni-2Mo	Bolting	SA-193	B8M	S31600	2	1 < t ≤ 1 1/4
13	16Cr-12Ni-2Mo	Bolting	SA-320	B8M	S31600	2	1 < t ≤ 1 1/4
14	16Cr-12Ni-2Mo	Bolting	SA-193	B8M2	S31600	...	≤ 2
15	16Cr-12Ni-2Mo	Bolting	SA-193	B8M	S31600	2	3/4 < t ≤ 1
16	16Cr-12Ni-2Mo	Bolting	SA-320	B8M	S31600	2	3/4 < t ≤ 1
17	16Cr-12Ni-2Mo	Bolting	SA-193	B8M	S31600	2	≤ 3/4
18	16Cr-12Ni-2Mo	Bolting	SA-320	B8M	S31600	2	≤ 3/4
19	16Cr-12Ni-2Mo-N	Bolting	SA-193	B8MNA	S31651	1A	...
20	18Cr-8Ni	Bolting	SA-193	B8	S30400	1	...
21	18Cr-8Ni	Bolting	SA-320	B8	S30400	1	...
22	18Cr-8Ni	Bolting	SA-320	B8A	S30400	1A	...
23	18Cr-8Ni	Bolting	SA-193	B8	S30400	2	1 1/4 < t ≤ 1 1/2
24	18Cr-8Ni	Bolting	SA-320	B8	S30400	2	1 1/4 < t ≤ 1 1/2
25	18Cr-8Ni	Bolting	SA-193	B8	S30400	2	1 < t ≤ 1 1/4
26	18Cr-8Ni	Bolting	SA-320	B8	S30400	2	1 < t ≤ 1 1/4
27	18Cr-8Ni	Bolting	SA-193	B8	S30400	2	3/4 < t ≤ 1
28	18Cr-8Ni	Bolting	SA-320	B8	S30400	2	3/4 < t ≤ 1
29	18Cr-8Ni	Bolting	SA-193	B8	S30400	2	≤ 3/4
30	18Cr-8Ni	Bolting	SA-320	B8	S30400	2	≤ 3/4
31	18Cr-8Ni-N	Bolting	SA-193	B8NA	S30451	1A	...
32	18Cr-8Ni-S	Bolting	SA-320	B8F	S30323	1	...
33	18Cr-8Ni-S	Bolting	SA-320	B8FA	S30323	1A	...
34	18Cr-8Ni-4Si-N	Bolting	SA-193	B8S	S21800	...	...
35	18Cr-8Ni-4Si-N	Bolting	SA-193	B8SA	S21800	...	...
36	18Cr-10Ni-Cb	Bolting	SA-193	B8C	S34700	1	...
37	18Cr-10Ni-Cb	Bolting	SA-320	B8C	S34700	1	...
38	18Cr-10Ni-Cb	Bolting	SA-320	B8CA	S34700	1A	...

TABLE 3 (CONT'D)
SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted)				Notes
			III	VIII-1	VIII-2	XII	
	Ferrous Materials (Cont'd)						
1	145	130	700	700	700	650	...
2	115	100	NP	100	100	100	...
3	130	85	800	1000	800	650	...
4	130	85	800	1000	800	650	...
5	75	30	800	1500	800	650	G5, G6
6	75	30	400	100	100	100	...
7	75	30	NP	100	100	100	...
8	80	55	NP	1000	800	650	G9
9	90	50	800	800	NP	650	G8
10	90	50	NP	100	100	100	G8, G9
11	90	65	NP	1000	800	650	G9
12	95	65	800	800	NP	650	G8
13	95	65	NP	100	100	100	G8
14	95	75	NP	1000	800	650	G9
15	100	80	800	800	NP	650	G8
16	100	80	NP	100	100	100	G8
17	110	95	800	800	NP	650	G8
18	110	95	NP	100	100	100	G8
19	75	30	800	1000	800	650	G5
20	75	30	800	1500	800	650	G5, G6
21	75	30	400	100	100	100	...
22	75	30	NP	100	100	100	...
23	100	50	NP	1000	800	650	G8, G9
24	100	50	NP	1000	800	100	G8
25	105	65	NP	1000	800	650	G8, G9
26	105	65	NP	1000	800	100	G8
27	115	80	NP	1000	800	650	G8, G9
28	115	80	NP	1000	800	100	G8
29	125	100	NP	1000	800	650	G8, G9
30	125	100	NP	1000	800	100	G8
31	75	30	800	1000	800	650	G5
32	75	30	400	100	100	100	...
33	75	30	NP	100	100	100	...
34	95	50	NP	950	800	650	...
35	95	50	NP	950	800	650	...
36	75	30	800	1500	800	650	G5, G6
37	75	30	400	100	100	100	...
38	75	30	NP	100	100	100	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 3 (CONT'D)
SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
Ferrous Materials (Cont'd)																	
1	29.0	...	29.0	...	29.0	...	29.0	...	29.0	...	29.0	29.0	29.0	...	...	...	...
2	23.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	21.3	...	21.3	...	21.3	...	21.3	...	21.3	...	21.3	21.3	21.3	21.3	21.3	21.3	21.3
4	21.3	...	21.3	...	21.3	...	21.3	...	21.3	...	21.3	21.3	21.3	21.3	21.3	21.3	21.3
5	18.8	...	17.7	...	15.6	...	14.3	...	13.3	...	12.6	12.3	12.1	11.9	11.7	11.6	11.5
6	18.8	...	17.7	...	15.6	...	14.3	...	...	...	...	...	...	...	...	...	...
7	18.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	18.8	...	17.7	...	15.6	...	14.3	...	13.8	...	13.8	13.8	13.8	13.8	13.8	13.8	13.8
9	18.8	...	17.7	...	15.6	...	14.3	...	13.3	...	12.6	12.5	12.5	12.5	12.5	...	...
10	18.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	18.8	...	17.7	...	16.3	...	16.3	...	16.3	...	16.3	16.3	16.3	16.3	16.3	16.3	16.3
12	18.8	...	17.7	...	16.3	...	16.3	...	16.3	...	16.3	16.3	16.3	16.3	16.3	...	...
13	18.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	18.8	...	18.8	...	18.8	...	18.8	...	18.8	...	18.8	18.8	18.8	18.8	18.8	18.8	18.8
15	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	...	...
16	20.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	22.0	...	22.0	...	22.0	...	22.0	...	22.0	...	22.0	22.0	22.0	22.0	22.0	...	...
18	22.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	18.8	...	17.8	...	16.3	...	15.2	...	14.2	...	13.4	13.1	12.8	12.5	12.3	12.0	11.8
20	18.8	...	16.7	...	15.0	...	13.8	...	12.9	...	12.1	12.0	11.8	11.5	11.2	11.0	10.8
21	18.8	...	16.7	...	15.0	...	13.8	...	...	...	...	...	...	...	...	...	...
22	18.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	18.8	...	16.7	...	15.0	...	13.8	...	12.9	...	12.5	12.5	12.5	12.5	12.5	12.5	12.5
24	18.8	...	16.7	...	15.0	...	13.8	...	12.9	...	12.5	12.5	12.5	12.5	12.5	12.5	12.5
25	18.8	...	16.7	...	16.3	...	16.3	...	16.3	...	16.3	16.3	16.3	16.3	16.3	16.3	16.3
26	18.8	...	16.7	...	16.3	...	16.3	...	16.3	...	16.3	16.3	16.3	16.3	16.3	16.3	16.3
27	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	20.0
28	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	20.0
29	25.0	...	25.0	...	25.0	...	25.0	...	25.0	...	25.0	25.0	25.0	25.0	25.0	25.0	25.0
30	25.0	...	25.0	...	25.0	...	25.0	...	25.0	...	25.0	25.0	25.0	25.0	25.0	25.0	25.0
31	18.8	...	16.5	...	14.4	...	12.9	...	12.0	...	11.4	11.2	11.0	10.8	10.6	10.4	10.2
32	18.8	...	15.0	...	13.6	...	12.6	...	...	...	...	...	...	...	...	...	...
33	18.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	23.8	...	23.4	...	21.8	...	19.7	...	18.5	...	17.6	17.3	17.1	16.9	16.7	16.7	16.7
35	23.8	...	23.4	...	21.8	...	19.7	...	18.5	...	17.6	17.3	17.1	16.9	16.7	16.7	16.7
36	18.8	...	17.9	...	16.4	...	15.5	...	15.0	...	14.3	14.1	13.8	13.7	13.6	13.5	13.5
37	18.8	...	17.9	...	16.4	...	15.5	...	...	...	...	...	...	...	...	...	...
38	18.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

TABLE 3 (CONT'D)
SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	21.3	21.3	...	...	...	...	...	...	...	...	...	...	...	...	...
4	21.3	21.3	...	...	...	...	...	...	...	...	...	...	...	...	...
5	11.4	11.3	11.2	11.0	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	13.8	13.8	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	16.3	16.3	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	18.8	18.8	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	11.6	11.4	...	...	...	...	...	...	...	...	...	...	...	...	...
20	10.6	10.4	10.1	9.8	7.7	6.0	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	12.5	12.5	...	...	...	...	...	...	...	...	...	...	...	...	...
24	12.5	12.5	...	...	...	...	...	...	...	...	...	...	...	...	...
25	16.3	16.3	...	...	...	...	...	...	...	...	...	...	...	...	...
26	16.3	16.3	...	...	...	...	...	...	...	...	...	...	...	...	...
27	20.0	20.0	...	...	...	...	...	...	...	...	...	...	...	...	...
28	20.0	20.0	...	...	...	...	...	...	...	...	...	...	...	...	...
29	24.8	24.1	...	...	...	...	...	...	...	...	...	...	...	...	...
30	24.8	24.1	...	...	...	...	...	...	...	...	...	...	...	...	...
31	9.9	9.7	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	16.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	16.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	13.4	13.4	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

TABLE 3 (CONT'D)
SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/ Thickness, in.
Ferrous Materials (Cont'd)							
1	18Cr-10Ni-Cb	Bolting	SA-193	B8C	S34700	2	$1\frac{1}{4} < t \leq 1\frac{1}{2}$
2	18Cr-10Ni-Cb	Bolting	SA-320	B8C	S34700	2	$1\frac{1}{4} < t \leq 1\frac{1}{2}$
3	18Cr-10Ni-Cb	Bolting	SA-193	B8C	S34700	2	$1 < t \leq 1\frac{1}{4}$
4	18Cr-10Ni-Cb	Bolting	SA-320	B8C	S34700	2	$1 < t \leq 1\frac{1}{4}$
5	18Cr-10Ni-Cb	Bolting	SA-193	B8C	S34700	2	$\frac{3}{4} < t \leq 1$
6	18Cr-10Ni-Cb	Bolting	SA-320	B8C	S34700	2	$\frac{3}{4} < t \leq 1$
7	18Cr-10Ni-Cb	Bolting	SA-193	B8C	S34700	2	$\leq \frac{3}{4}$
8	18Cr-10Ni-Cb	Bolting	SA-320	B8C	S34700	2	$\leq \frac{3}{4}$
9	18Cr-10Ni-Ti	Bolting	SA-193	B8T	S32100	1	...
10	18Cr-10Ni-Ti	Bolting	SA-320	B8T	S32100	1	...
11	18Cr-10Ni-Ti	Bolting	SA-320	B8TA	S32100	1A	...
12	18Cr-10Ni-Ti	Bolting	SA-193	B8T	S32100	2	$1\frac{1}{4} < t \leq 1\frac{1}{2}$
13	18Cr-10Ni-Ti	Bolting	SA-320	B8T	S32100	2	$1\frac{1}{4} < t \leq 1\frac{1}{2}$
14	18Cr-10Ni-Ti	Bolting	SA-193	B8T	S32100	2	$1 < t \leq 1\frac{1}{4}$
15	18Cr-10Ni-Ti	Bolting	SA-320	B8T	S32100	2	$1 < t \leq 1\frac{1}{4}$
16	18Cr-10Ni-Ti	Bolting	SA-193	B8T	S32100	2	$\frac{3}{4} < t \leq 1$
17	18Cr-10Ni-Ti	Bolting	SA-320	B8T	S32100	2	$\frac{3}{4} < t \leq 1$
18	18Cr-10Ni-Ti	Bolting	SA-193	B8T	S32100	2	$\leq \frac{3}{4}$
19	18Cr-10Ni-Ti	Bolting	SA-320	B8T	S32100	2	$\leq \frac{3}{4}$
20	18Cr-11Ni	Bolting	SA-193	B8P	S30500	1	...
21	18Cr-11Ni	Bolting	SA-193	B8P	S30500	2	$1\frac{1}{4} < t \leq 1\frac{1}{2}$
22	18Cr-11Ni	Bolting	SA-193	B8P	S30500	2	$1 < t \leq 1\frac{1}{4}$
23	18Cr-11Ni	Bolting	SA-193	B8P	S30500	2	$\frac{3}{4} < t \leq 1$
24	18Cr-11Ni	Bolting	SA-193	B8P	S30500	2	$\leq \frac{3}{4}$
25	19Cr-9Ni-Mo-W	Bolting	SA-453	651	S63198	B	> 3
26	19Cr-9Ni-Mo-W	Bolting	SA-453	651	S63198	B	> 3
27	19Cr-9Ni-Mo-W	Bolting	SA-453	651	S63198	B	≤ 3
28	19Cr-9Ni-Mo-W	Bolting	SA-453	651	S63198	B	≤ 3
29	19Cr-9Ni-Mo-W	Bolting	SA-453	651	S63198	A	> 3
30	19Cr-9Ni-Mo-W	Bolting	SA-453	651	S63198	A	> 3
31	19Cr-9Ni-Mo-W	Bolting	SA-453	651	S63198	A	≤ 3
32	19Cr-9Ni-Mo-W	Bolting	SA-453	651	S63198	A	≤ 3
33	22Cr-13Ni-5Mn	Bolting	SA-479	XM-19	S20910	Annealed	...
34	22Cr-13Ni-5Mn	Bolting	SA-479	XM-19	S20910	Hot rolled	$3 < t \leq 8$
35	22Cr-13Ni-5Mn	Bolting	SA-479	XM-19	S20910	Hot rolled	$2 < t \leq 3$
36	22Cr-13Ni-5Mn	Bolting	SA-479	XM-19	S20910	Hot rolled	≤ 2

TABLE 3 (CONT'D)
SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted)				Notes
			III	VIII-1	VIII-2	XII	
	Ferrous Materials (Cont'd)						
1	100	50	NP	100	100	100	G8
2	100	50	NP	100	100	100	G8
3	105	65	NP	100	100	100	G8
4	105	65	NP	100	100	100	G8
5	115	80	NP	100	100	100	G8
6	115	80	NP	100	100	100	G8
7	125	100	NP	100	100	100	G8
8	125	100	NP	100	100	100	G8
9	75	30	800	1500	800	650	G5, G6
10	75	30	400	100	100	100	...
11	75	30	NP	100	100	100	...
12	100	50	NP	1000	800	650	G8
13	100	50	NP	100	100	100	G8
14	105	65	NP	1000	800	650	G8
15	105	65	NP	100	100	100	G8
16	115	80	NP	1000	800	650	G8
17	115	80	NP	100	100	100	G8
18	125	100	NP	1000	800	650	G8
19	125	100	NP	100	100	100	G8
20	75	30	NP	1500	800	650	...
21	100	50	NP	1000	800	650	G8
22	105	65	NP	1000	800	650	G8
23	115	80	NP	1000	800	650	G8
24	125	100	NP	1000	800	650	G8
25	95	50	800	NP	NP	NP	...
26	95	50	NP	1000	800	650	...
27	95	60	800	NP	NP	NP	...
28	95	60	NP	1000	800	650	...
29	100	60	800	NP	NP	NP	...
30	100	60	NP	1000	800	650	...
31	100	70	800	NP	NP	NP	...
32	100	70	NP	1000	800	650	...
33	100	55	NP	1150	800	650	...
34	100	60	NP	1150	800	650	...
35	115	75	NP	1150	800	650	...
36	135	105	NP	1150	800	650	...

TABLE 3 (CONT'D)
SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
Ferrous Materials (Cont'd)																	
1	18.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	18.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	18.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	18.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	20.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	20.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	25.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	25.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	18.8	...	17.8	...	16.5	...	15.3	...	14.3	...	13.5	13.3	12.9	12.7	12.5	12.4	12.3
10	18.8	...	17.8	...	16.5	...	15.3	...	...	...	...	...	...	...	...	...	...
11	18.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	18.8	...	17.8	...	16.5	...	15.3	...	14.3	...	13.5	13.3	12.9	12.7	12.5	12.5	12.5
13	18.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	18.8	...	17.8	...	16.5	...	16.3	...	16.3	...	16.3	16.3	16.3	16.3	16.3	16.3	16.3
15	18.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	20.0
17	20.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	25.0	...	25.0	...	25.0	...	25.0	...	25.0	...	25.0	25.0	25.0	25.0	25.0	25.0	25.0
19	25.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	18.8	...	16.7	...	15.0	...	13.8	...	12.9	...	12.1	12.0	11.8	11.5	11.2	11.0	10.8
21	18.8	...	18.8	...	18.8	...	18.8	...	18.8	...	18.8	18.8	18.8	18.8	18.7	18.3	18.0
22	18.8	...	18.8	...	18.8	...	18.8	...	18.8	...	18.8	18.8	18.8	18.8	18.8	18.8	18.8
23	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	20.0	20.0	20.0	20.0	20.0	20.0
24	25.0	...	25.0	...	25.0	...	25.0	...	25.0	...	25.0	25.0	25.0	25.0	25.0	25.0	25.0
25	12.5	...	11.4	...	10.6	...	10.0	...	9.5	...	9.0	8.8	8.6	8.4	8.3	...	...
26	12.5	...	11.5	...	10.7	...	10.0	...	9.5	...	9.0	8.8	8.7	8.5	8.3	8.2	8.0
27	15.0	...	13.7	...	12.7	...	12.0	...	11.5	...	10.9	10.6	10.4	10.1	9.9	...	...
28	15.0	...	13.8	...	12.8	...	12.1	...	11.5	...	10.9	10.6	10.4	10.2	10.0	9.8	9.6
29	15.0	...	13.7	...	12.7	...	12.0	...	11.5	...	10.9	10.6	10.4	10.1	9.9	...	...
30	15.0	...	13.8	...	12.8	...	12.1	...	11.5	...	10.9	10.7	10.4	10.2	10.0	9.8	9.6
31	17.5	...	16.0	...	14.8	...	14.0	...	13.4	...	12.7	12.4	12.1	11.8	11.6	...	...
32	17.5	...	16.1	...	14.9	...	14.1	...	13.4	...	12.7	12.4	12.2	11.9	11.6	11.4	11.2
33	25.0	...	24.9	...	23.6	...	22.7	...	22.3	...	21.9	21.8	21.6	21.4	21.2	20.9	20.6
34	25.0	...	24.9	...	23.6	...	22.7	...	22.3	...	21.9	21.8	21.6	21.4	21.2	20.9	20.6
35	25.0	...	24.9	...	23.6	...	22.7	...	22.3	...	21.9	21.8	21.6	21.4	21.2	20.9	20.6
36	26.2	...	26.2	...	26.2	...	26.2	...	26.2	...	26.2	26.2	26.2	26.2	26.2	26.2	26.2

TABLE 3 (CONT'D)
SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
	Ferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	12.1	12.0	9.6	6.9	5.0	3.6	2.5	1.7	1.1	0.80	0.50	0.30	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	12.5	12.5	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	16.3	16.3	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	20.0	20.0	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	25.0	25.0	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	10.6	10.4	10.1	9.8	7.7	6.0	4.7	3.7	2.9	2.3	1.8	1.4	...	...	...
21	17.7	17.3	...	...	...	...	...	...	...	...	...	...	...	...	...
22	18.8	18.8	...	...	...	...	...	...	...	...	...	...	...	...	...
23	20.0	20.0	...	...	...	...	...	...	...	...	...	...	...	...	...
24	24.8	24.1	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	7.9	7.7	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	9.4	9.2	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	9.4	9.2	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	11.0	10.7	...	...	...	...	...	...	...	...	...	...	...	...	...
33	20.3	19.9	19.0	13.0	8.3	...	...	...	...	...	...	...	...	...	...
34	20.3	19.9	19.0	13.0	8.3	...	...	...	...	...	...	...	...	...	...
35	20.3	19.9	19.0	13.0	8.3	...	...	...	...	...	...	...	...	...	...
36	26.2	26.2	19.0	13.0	8.3	...	...	...	...	...	...	...	...	...	...

TABLE 3 (CONT'D)
SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/ Thickness, in.
Nonferrous Materials							
1	...	Bolting	SB-211	2014	A92014	T6	0.125–8.000
2	...	Bolting	SB-211	2014	A92014	T651	0.125–8.000
3	...	Bolting	SB-211	2024	A92024	T4	0.125–0.499
4	...	Bolting	SB-211	2024	A92024	T4	0.500–4.500
5	...	Bolting	SB-211	2024	A92024	T4	4.501–6.500
6	...	Bolting	SB-211	2024	A92024	T4	6.501–8.000
7	...	Bolting	SB-211	6061	A96061	T6	0.125–8.000
8	...	Bolting	SB-211	6061	A96061	T651	0.125–8.000
9	...	Rod	SB-187	...	C10200	O60	...
10	...	Rod	SB-187	...	C11000	O60	...
11	...	Bar, rod	SB-150	...	C61400	HR50	$2 < t \leq 3$
12	...	Bar, rod	SB-150	...	C61400	HR50	$1 < t \leq 2$
13	...	Bar, rod	SB-150	...	C61400	HR50	$\frac{1}{2} < t \leq 1$
14	...	Bar, rod	SB-150	...	C61400	HR50	$\leq \frac{1}{2}$
15	...	Bar, rod	SB-150	...	C62300	HR50	> 3
16	...	Bar, rod	SB-150	...	C62300	M20	> 3
17	...	Bar, rod	SB-150	...	C62300	M30	> 3
18	...	Bar, rod	SB-150	...	C62300	O20	> 3
19	...	Bar, rod	SB-150	...	C62300	O25	> 3
20	...	Bar, rod	SB-150	...	C62300	O30	> 3
21	...	Bar, rod	SB-150	...	C62300	HR50	$2 < t \leq 3$
22	...	Bar, rod	SB-150	...	C62300	HR50	$1 < t \leq 2$
23	...	Bar, rod	SB-150	...	C62300	HR50	$\frac{1}{2} < t \leq 1$
24	...	Bar, rod	SB-150	...	C62300	HR50	$\leq \frac{1}{2}$
25	...	Rod	SB-150	...	C63000	HR50	$2 < t \leq 3$
26	...	Bar	SB-150	...	C63000	M20	$2 < t \leq 4$
27	...	Bar, rod	SB-150	...	C63000	HR50	$1 < t \leq 2$
28	...	Bar, rod	SB-150	...	C63000	HR50	$\frac{1}{2} < t \leq 1$
29	...	Bar, rod	SB-150	...	C64200	M20	> 4
30	...	Bar, rod	SB-150	...	C64200	M30	> 4
31	...	Bar, rod	SB-150	...	C64200	M10	$3 < t \leq 4$
32	...	Bar, rod	SB-150	...	C64200	HR50	$2 < t \leq 3$
33	...	Bar, rod	SB-150	...	C64200	HR50	$1 < t \leq 2$
34	...	Bar, rod	SB-150	...	C64200	HR50	$\frac{1}{2} < t \leq 1$
35	...	Bar, rod	SB-150	...	C64200	HR50	$\leq \frac{1}{2}$

TABLE 3 (CONT'D)
SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted)				Notes
			III	VIII-1	VIII-2	XII	
			Nonferrous Materials				
1	65	55	400 (Cl. 3 only)	400	400	400	W4
2	65	55	NP	400	400	400	G10, W4
3	62	45	400 (Cl. 3 only)	400	400	400	W4
4	62	42	400 (Cl. 3 only)	400	400	400	W4
5	62	40	400 (Cl. 3 only)	400	400	400	W4
6	58	38	400 (Cl. 3 only)	400	400	400	W4
7	42	35	400 (Cl. 3 only)	400	400	400	W4
8	42	35	NP	400	400	400	G10, W4
9	30	10	NP	400	400	400	...
10	30	10	NP	400	400	400	...
11	70	30	500 (Cl. 3 only)	500	500	500	...
12	70	32	500 (Cl. 3 only)	500	500	500	...
13	75	35	500 (Cl. 3 only)	500	500	500	...
14	80	40	500 (Cl. 3 only)	500	500	500	...
15	75	30	400 (Cl. 3 only)	600	400	600	W1
16	75	30	400 (Cl. 3 only)	600	400	600	W1
17	75	30	400 (Cl. 3 only)	600	400	600	W1
18	75	30	400 (Cl. 3 only)	600	400	600	W1
19	75	30	400 (Cl. 3 only)	600	400	600	W1
20	75	30	400 (Cl. 3 only)	600	400	600	W1
21	76	37	400 (Cl. 3 only)	600	400	600	W1
22	84	40	400 (Cl. 3 only)	600	400	600	W1
23	88	44	400 (Cl. 3 only)	600	400	600	W1
24	90	50	400 (Cl. 3 only)	600	400	600	W1
25	85	42.5	700 (Cl. 3 only)	700	500	650	W4
26	85	42.5	700 (Cl. 3 only)	700	500	650	W4
27	90	45	700 (Cl. 3 only)	700	500	650	W4
28	100	50	700 (Cl. 3 only)	700	500	650	W4
29	70	25	350 (Cl. 3 only)	600	350	600	W1
30	70	25	350 (Cl. 3 only)	600	350	600	W1
31	70	30	350 (Cl. 3 only)	600	350	600	W4
32	75	35	350 (Cl. 3 only)	600	350	600	W1
33	80	42	350 (Cl. 3 only)	600	350	600	W1
34	85	45	350 (Cl. 3 only)	600	350	600	W1
35	90	45	350 (Cl. 3 only)	600	350	600	W1

TABLE 3 (CONT'D)
SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
Nonferrous Materials																	
1	13.0	13.0	13.0	13.0	11.4	6.8	3.9	...	...	...	...	...	...	...	...	...	...
2	13.0	13.0	13.0	13.0	11.4	6.8	3.9	...	...	...	...	...	...	...	...	...	...
3	11.3	11.3	11.3	11.3	10.4	6.5	4.5	...	...	...	...	...	...	...	...	...	...
4	10.5	10.5	10.5	10.5	10.4	6.5	4.5	...	...	...	...	...	...	...	...	...	...
5	10.0	10.0	10.0	10.0	10.0	6.5	4.5	...	...	...	...	...	...	...	...	...	...
6	9.5	9.5	9.5	9.5	9.5	6.1	4.2	...	...	...	...	...	...	...	...	...	...
7	8.4	8.4	8.4	8.4	8.4	6.3	4.4	...	...	...	...	...	...	...	...	...	...
8	8.4	8.4	8.4	8.4	8.4	6.3	4.4	...	...	...	...	...	...	...	...	...	...
9	6.7	5.8	5.5	5.2	5.1	4.0	3.0	...	...	...	...	...	...	...	...	...	...
10	6.7	5.8	5.5	5.2	5.1	4.0	3.0	...	...	...	...	...	...	...	...	...	...
11	17.5	17.5	17.5	17.5	17.5	17.5	17.2	16.6	16.1	...	...	...	...	...	...	...	...
12	17.5	17.5	17.5	17.5	17.5	17.5	17.2	16.6	16.1	...	...	...	...	...	...	...	...
13	17.5	17.5	17.5	17.5	17.5	17.5	17.2	16.6	16.1	...	...	...	...	...	...	...	...
14	17.5	17.5	17.5	17.5	17.5	17.5	17.2	16.6	16.1	...	...	...	...	...	...	...	...
15	18.8	18.8	18.8	18.8	18.7	18.1	17.7	16.0	12.5	10.6	9.9	...	...	...	...	...	...
16	18.8	18.8	18.8	18.8	18.7	18.1	17.7	16.0	12.5	10.6	9.9	...	...	...	...	...	...
17	18.8	18.8	18.8	18.8	18.7	18.1	17.7	16.0	12.5	10.6	9.9	...	...	...	...	...	...
18	18.8	18.8	18.8	18.8	18.7	18.1	17.7	16.0	12.5	10.6	9.9	...	...	...	...	...	...
19	18.8	18.8	18.8	18.8	18.7	18.1	17.7	16.0	12.5	10.6	9.9	...	...	...	...	...	...
20	18.8	18.8	18.8	18.8	18.7	18.1	17.7	16.0	12.5	10.6	9.9	...	...	...	...	...	...
21	18.8	18.8	18.8	18.8	18.7	18.1	17.7	16.0	12.5	10.6	9.9	...	...	...	...	...	...
22	18.8	18.8	18.8	18.8	18.7	18.1	17.7	16.0	12.5	10.6	9.9	...	...	...	...	...	...
23	18.8	18.8	18.8	18.8	18.7	18.1	17.7	16.0	12.5	10.6	9.9	...	...	...	...	...	...
24	18.8	18.8	18.8	18.8	18.7	18.1	17.7	16.0	12.5	10.6	9.9	...	...	...	...	...	...
25	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.4	16.4	12.0	8.5	6.0	...	...	...	...
26	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.4	16.4	12.0	8.5	6.0	...	...	...	...
27	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.4	16.4	12.0	8.5	6.0	...	...	...	...
28	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.4	16.4	12.0	8.5	6.0	...	...	...	...
29	16.7	14.5	14.0	13.5	13.5	13.0	11.0	7.5	5.2	2.5	1.7	...	...	...	...	...	...
30	16.7	14.5	14.0	13.5	13.5	13.0	11.0	7.5	5.2	2.5	1.7	...	...	...	...	...	...
31	16.7	14.5	14.0	13.5	13.5	13.0	11.0	7.5	5.2	2.5	1.7	...	...	...	...	...	...
32	16.7	14.5	14.0	13.5	13.5	13.0	11.0	7.5	5.2	2.5	1.7	...	...	...	...	...	...
33	16.7	14.5	14.0	13.5	13.5	13.0	11.0	7.5	5.2	2.5	1.7	...	...	...	...	...	...
34	16.7	14.5	14.0	13.5	13.5	13.0	11.0	7.5	5.2	2.5	1.7	...	...	...	...	...	...
35	16.7	14.5	14.0	13.5	13.5	13.0	11.0	7.5	5.2	2.5	1.7	...	...	...	...	...	...

TABLE 3 (CONT'D)
SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
	Nonferrous Materials														
1
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TABLE 3 (CONT'D)
SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/ Thickness, in.
Nonferrous Materials (Cont'd)							
1	...	Rod	SB-98	...	C65100	O60	...
2	...	Rod	SB-98	...	C65100	H06	$1 < t \leq 1\frac{1}{2}$
3	...	Rod	SB-98	...	C65100	H06	$\frac{1}{2} < t \leq 1$
4	...	Rod	SB-98	...	C65100	H06	$\leq \frac{1}{2}$
5	...	Rod	SB-98	...	C65500	O60	...
6	...	Rod	SB-98	...	C65500	H01	...
7	...	Rod	SB-98	...	C65500	H02	...
8	...	Rod	SB-98	...	C66100	O60	...
9	...	Rod	SB-98	...	C66100	H01	...
10	...	Rod	SB-98	...	C66100	H02	...
11	99Ni	Bolting	SB-160	...	N02200	Annealed	...
12	99Ni	Bolting	SB-160	...	N02200	Hot fin./ann.	...
13	99Ni	Bolting	SB-160	...	N02200	Cold drawn	...
14	99Ni–Low C	Bolting	SB-160	...	N02201	Hot fin./ann.	...
15	67Ni–30Cu	Bolting	SB-164	...	N04400	Annealed	...
16	67Ni–30Cu	Bolting	SB-164	...	N04400	Hot worked	...
17	67Ni–30Cu	Bolting	SB-164	...	N04400	Hot worked	...
18	67Ni–30Cu	Bolting	SB-164	...	N04400	CD-str. rel.	...
19	67Ni–30Cu	Bolting	SB-164	...	N04400	Cold worked	...
20	67Ni–30Cu	Bolting	SB-164	...	N04400	CD-str. rel.	...
21	67Ni–30Cu–S	Bolting	SB-164	...	N04405	Annealed	...
22	67Ni–30Cu–S	Bolting	SB-164	...	N04405	Annealed	...
23	67Ni–30Cu–S	Bolting	SB-164	...	N04405	Hot worked	...
24	67Ni–30Cu–S	Bolting	SB-164	...	N04405	Hot worked	...
25	67Ni–30Cu–S	Bolting	SB-164	...	N04405	Cold worked	...
26	67Ni–28Cu–3Al	Bolting	SF-468	...	N05500	Ann./aged	1.000–1.500
27	67Ni–28Cu–3Al	Bolting	SF-468	...	N05500	Ann./aged	0.250–0.875
28	47Ni–22Cr–9Mo–18Fe	Bolting	SB-572	...	N06002	Annealed	...
29	47Ni–22Cr–19Fe–6Mo	Bolting	SB-581	...	N06007	Solution ann.	$> \frac{3}{4}$
30	47Ni–22Cr–19Fe–6Mo	Bolting	SB-581	...	N06007	Solution ann.	$< \frac{3}{4}$
31	55Ni–21Cr–13.5Mo	Bolting	SB-574	...	N06022	Solution ann.	...
32	40Ni–29Cr–15Fe–5Mo	Bolting	SB-581	...	N06030	Solution ann.	...
33	61Ni–16Mo–16Cr	Bolting	SB-574	...	N06455	Solution ann.	...
34	72Ni–15Cr–8Fe	Bolting	SB-166	...	N06600	Annealed	...
35	72Ni–15Cr–8Fe	Bolting	SB-166	...	N06600	Hot fin.	...
36	72Ni–15Cr–8Fe	Bolting	SB-166	...	N06600	Cold drawn	...
37	72Ni–15Cr–8Fe	Bolting	SB-166	...	N06600	Hot fin.	...
38	72Ni–15Cr–8Fe	Bolting	SB-166	...	N06600	Hot fin.	...

TABLE 3 (CONT'D)
SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted)				Notes
			III	VIII-1	VIII-2	XII	
	Nonferrous Materials (Cont'd)						
1	40	12	350 (Cl. 3 only)	350	350	350	G2
2	75	40	350 (Cl. 3 only)	350	350	350	G2, W2
3	75	45	350 (Cl. 3 only)	350	350	350	G2, W2
4	85	55	350 (Cl. 3 only)	350	350	350	G2, W2
5	52	15	350 (Cl. 3 only)	350	350	350	G2
6	55	24	350 (Cl. 3 only)	NP	350	NP	G2, W2
7	70	38	350 (Cl. 3 only)	NP	350	NP	G2, W2
8	52	15	350 (Cl. 3 only)	350	350	350	G2
9	55	24	350 (Cl. 3 only)	NP	350	NP	G2, W2
10	70	38	350 (Cl. 3 only)	NP	350	NP	G2, W2
11	55	15	600 (Cl. 3 only)	600	600	600	...
12	60	15	600 (Cl. 3 only)	600	600	600	...
13	65	40	600 (Cl. 3 only)	600	600	600	...
14	50	10	600 (Cl. 3 only)	1200	800	650	...
15	70	25	800	900	800	650	...
16	75	30	800	900	800	650	...
17	80	40	800	900	800	650	...
18	84	50	500	500	500	500	G3
19	85	55	500	500	500	500	G3
20	87	60	NP	500	500	500	G3
21	70	25	800	NP	NP	NP	...
22	70	25	NP	900	800	650	...
23	75	35	800	NP	NP	NP	...
24	75	35	NP	900	800	650	...
25	85	50	500	500	500	500	G3
26	130	85	NP	500	NP	NP	...
27	130	90	NP	500	NP	NP	...
28	95	35	NP	1650	800	650	...
29	85	30	NP	1000	800	650	...
30	90	35	NP	1000	800	650	...
31	100	45	NP	800	800	650	...
32	85	35	NP	800	800	650	...
33	100	40	NP	800	800	650	...
34	80	35	800	1200	800	650	...
35	85	35	800	1200	800	650	...
36	90	40	NP	500	500	500	G3, H1
37	90	40	800	NP	NP	NP	...
38	90	40	NP	1200	800	650	...

TABLE 3 (CONT'D)
SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
Nonferrous Materials (Cont'd)																	
1	8.0	8.0	8.0	8.0	7.9	7.7	...	...	...	...	...	...	...	...	...	...	...
2	10.0	10.0	10.0	10.0	10.0	10.0	...	...	...	...	...	...	...	...	...	...	...
3	11.3	11.3	11.3	11.3	11.3	11.3	...	...	...	...	...	...	...	...	...	...	...
4	13.7	13.7	13.7	13.7	13.7	13.7	...	...	...	...	...	...	...	...	...	...	...
5	10.0	10.0	10.0	10.0	10.0	9.7	...	...	...	...	...	...	...	...	...	...	...
6	10.0	10.0	10.0	10.0	10.0	9.7	...	...	...	...	...	...	...	...	...	...	...
7	10.0	10.0	10.0	10.0	10.0	9.7	...	...	...	...	...	...	...	...	...	...	...
8	10.0	10.0	10.0	10.0	10.0	9.7	...	...	...	...	...	...	...	...	...	...	...
9	10.0	10.0	10.0	10.0	10.0	9.7	...	...	...	...	...	...	...	...	...	...	...
10	10.0	10.0	10.0	10.0	10.0	9.7	...	...	...	...	...	...	...	...	...	...	...
11	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	...	...	...	...	...	...
12	10.0	10.0	10.0	10.0	10.0	10.0	10.0	9.8	9.5	8.9	8.3	...	...	...	...	...	...
13	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	...	...	...	...	...	...
14	6.7	6.6	6.4	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.0	5.9	5.8	4.8
15	16.7	...	14.6	...	13.6	...	13.2	...	13.1	...	13.1	13.1	13.1	12.9	12.7	11.0	8.0
16	16.7	...	14.6	...	13.6	...	13.2	...	13.1	...	13.1	13.1	13.1	12.9	12.7	11.0	8.0
17	16.7	...	14.6	...	13.6	...	13.2	...	13.1	...	13.1	13.1	13.0	12.9	12.7	8.5	4.0
18	16.7	...	14.6	...	13.6	...	13.2	...	13.1	...	...	...	...	...	...	...	...
19	16.7	...	14.6	...	13.8	...	13.8	...	13.8	...	...	...	...	...	...	...	...
20	16.7	...	15.0	...	15.0	...	15.0	...	15.0	...	...	...	...	...	...	...	...
21	16.6	...	14.6	...	13.6	...	13.2	...	13.1	...	13.1	13.1	13.1	12.9	12.7	...	...
22	16.6	...	14.6	...	13.6	...	13.2	...	13.1	...	13.1	13.1	13.1	13.0	12.7	11.0	8.0
23	18.7	...	18.7	...	18.7	...	18.7	...	18.7	...	18.7	18.4	18.0	16.3	14.5	...	...
24	18.7	...	18.7	...	18.7	...	18.7	...	18.7	...	18.7	18.7	18.0	17.2	14.5	8.5	4.0
25	12.5	...	12.5	...	12.5	...	12.5	...	12.5	...	...	...	...	...	...	...	...
26	21.3	...	21.3	...	21.3	...	21.3	...	21.3	...	...	...	...	...	...	...	...
27	22.5	...	22.5	...	22.5	...	22.5	...	22.5	...	...	...	...	...	...	...	...
28	23.3	...	20.9	...	19.2	...	17.8	...	16.5	...	15.6	15.3	15.0	14.9	14.7	14.6	14.5
29	20.0	...	19.9	...	16.6	...	15.6	...	15.0	...	14.4	14.2	14.0	13.9	13.8	13.7	13.6
30	22.5	...	20.9	...	19.5	...	18.2	...	17.4	...	16.8	16.6	16.4	16.3	16.1	16.0	16.0
31	25.0	...	25.0	...	24.5	...	22.7	...	21.2	...	20.1	19.6	19.2	18.9	18.6	...	...
32	21.3	...	20.0	...	18.3	...	17.2	...	16.4	...	15.8	15.5	15.2	14.9	14.6	...	...
33	25.0	...	24.6	...	23.0	...	21.7	...	20.9	...	20.1	19.8	19.6	19.4	19.1	...	...
34	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	20.0	19.8	19.6	19.4	19.1	18.7	16.0
35	21.2	...	21.2	...	21.2	...	21.2	...	21.2	...	21.2	21.2	21.1	21.0	20.4	20.2	19.5
36	20.0	...	20.0	...	20.0	...	20.0	...	20.0	...	...	...	...	...	...	...	...
37	10.0	...	9.5	...	9.2	...	9.1	...	9.1	...	9.1	9.0	8.9	8.9	8.8	...	...
38	21.2	...	21.2	...	21.2	...	21.2	...	21.2	...	21.2	21.2	21.1	21.0	20.4	20.2	19.5

TABLE 3 (CONT'D)
SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
	Nonferrous Materials (Cont'd)														
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	3.7	3.0	2.4	2.0	1.5	1.2	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	14.4	14.3	14.2	14.2	14.1	11.3	9.3	7.7	6.1	4.8	3.8	3.0	2.3	1.7	1.2
29	13.6	13.5	...	...	...	...	...	...	...	...	...	...	...	...	...
30	15.9	15.8	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	10.6	7.0	4.5	3.0	2.2	2.2	...	...	...	...	...	...	...	...	...
35	19.3	14.5	10.3	7.2	5.8	5.5	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	19.3	14.5	10.3	7.2	5.8	5.5	...	...	...	...	...	...	...	...	...

TABLE 3 (CONT'D)
SECTION III, 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/ Thickness, in.
Nonferrous Materials (Cont'd)							
1	60Ni–22Cr–9Mo–3.5Cb	Bolting	SB-446	1	N06625	Annealed	...
2	49Ni–25Cr–18Fe–6Mo	Bolting	SB-581	...	N06975	Solution ann.	...
3	53Ni–19Cr–19Fe–Cb–Mo	Bolting	SB-637	...	N07718	Solution ann.	≤ 6
4	70Ni–16Cr–7Fe–Ti–Al	Bolting	SB-637	2	N07750	Solution ann.	...
5	26Ni–43Fe–22Cr–5Mo	Bolting	SB-621	...	N08320	Solution ann.	...
6	46Fe–24Ni–21Cr–6Mo–Cu–N	Bolting	SB-691	...	N08367	Solution ann.	...
7	33Ni–42Fe–21Cr	Bolting	SB-408	...	N08800	Annealed	...
8	33Ni–42Fe–21Cr	Bolting	SB-408	...	N08810	Annealed	...
9	42Ni–21.5Cr–3Mo–2.3Cu	Bolting	SB-425	...	N08825	Annealed	...
10	62Ni–28Mo–5Fe	Bolting	SB-335	...	N10001	Annealed	$1\frac{1}{2} < t \leq 3\frac{1}{2}$
11	62Ni–28Mo–5Fe	Bolting	SB-335	...	N10001	Annealed	$\leq 1\frac{1}{2}$
12	70Ni–16Mo–7Cr–5Fe	Bolting	SB-573	...	N10003	Annealed	...
13	54Ni–16Mo–15Cr	Bolting	SB-574	...	N10276	Solution ann.	...
14	65Ni–28Mo–2Fe	Bolting	SB-335	...	N10665	Solution ann.	...
15	21Ni–30Fe–22Cr–18Co–3Mo–3W	Bolting	SB-572	...	R30556	Annealed	...

TABLE 3 (CONT'D)
SECTION III, 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, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted)				Notes
			III	VIII-1	VIII-2	XII	
	Nonferrous Materials (Cont'd)						
1	120	60	NP	1200	800	650	G1
2	85	32	NP	800	800	650	...
3	185	150	800	1150	800	650	W4, W5
4	170	115	800	800	800	650	...
5	75	28	NP	800	800	650	...
6	95	45	800	800	NP	NP	...
7	75	30	NP	1500	800	650	...
8	65	25	NP	1650	800	650	...
9	85	35	NP	1000	800	650	...
10	100	46	800	800	800	650	...
11	115	46	800	800	800	650	...
12	100	40	NP	1300	800	650	...
13	100	41	NP	1250	800	650	T1
14	110	51	NP	800	800	650	...
15	100	45	NP	1650	800	650	...

TABLE 3 (CONT'D)
SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
	Nonferrous Materials (Cont'd)																
1	30.0	...	30.0	...	30.0	...	28.2	...	27.0	...	26.4	26.2	26.0	26.0	24.6	24.3	24.0
2	21.3	...	19.6	...	18.4	...	17.6	...	16.5	...	15.6	15.3	15.1	14.9	14.7	...	...
3	37.0	...	36.0	...	35.2	...	34.6	...	34.2	...	33.8	33.7	33.6	33.5	33.3	33.1	32.9
4	28.7	...	28.7	...	28.7	...	28.7	...	28.7	...	28.7	28.7	28.7	28.7	28.7	...	...
5	18.7	...	17.3	...	16.4	...	15.3	...	14.6	...	13.7	13.5	13.2	12.9	12.8	...	...
6	23.8	...	23.8	...	22.4	...	21.5	...	20.5	...	19.4	19.0	18.6	18.3	18.0	...	...
7	18.7	...	18.7	...	17.9	...	17.2	...	16.7	...	16.3	16.1	15.9	15.7	15.5	15.3	15.1
8	16.2	...	15.4	...	14.5	...	13.5	...	12.9	...	12.2	11.9	11.7	11.4	11.1	10.9	10.7
9	21.2	...	21.2	...	20.4	...	19.2	...	18.3	...	17.8	17.6	17.3	17.2	17.1	16.9	16.8
10	25.0	...	25.0	...	25.0	...	24.7	...	24.3	...	23.7	23.4	23.0	22.8	22.5	...	...
11	11.5	...	10.0	...	9.8	...	9.1	...	8.8	...	8.3	8.3	8.3	8.3	8.3	...	...
12	25.0	...	24.0	...	23.0	...	21.0	...	20.0	...	20.0	19.5	19.0	18.5	18.0	17.7	17.5
13	25.0	...	25.0	...	23.0	...	21.2	...	20.0	...	18.8	18.3	17.8	17.4	17.1	16.8	16.6
14	27.5	...	27.5	...	27.5	...	27.5	...	27.5	...	27.2	26.8	26.6	26.1	25.6	...	...
15	25.0	...	25.0	...	23.1	...	21.3	...	20.1	...	19.3	19.0	18.7	18.5	18.2	18.0	17.8

TABLE 3 (CONT'D)
SECTION III, 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, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
	Nonferrous Materials (Cont'd)														
1	23.9	23.7	23.6	23.4	21.0	13.2	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	32.6	32.3	32.0	30.7	29.5	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	14.9	14.7	14.5	13.0	9.8	6.6	4.2	2.2	1.6	1.1	1.0	0.80	...	...	...
8	10.5	10.3	10.1	10.0	9.3	7.4	5.9	4.7	3.8	3.0	2.4	1.9	1.5	1.2	0.98
9	16.7	16.6	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	17.3	17.0	15.5	12.4	9.3	6.6	4.8	3.5	...	...	...	...	...	...	...
13	16.5	16.5	16.5	15.0	12.2	9.8	7.8	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	17.6	17.4	17.2	17.1	16.9	13.6	10.9	8.8	7.0	5.6	4.5	3.6	2.8	2.2	1.8

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) For Section VIII applications, stress values in restricted shear, such as in dowel bolts, rivets, or similar construction in which the shearing member is so restricted that the section under consideration would fail without reduction of area, shall be 0.80 times the values in this Table.
- (c) For Section VIII applications, stress values in bearing shall be 1.60 times the values in this Table.
- (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 -20 to 100°F 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; 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 Note T1).
- (10) (j) 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.

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 1000°F to 1400°F.
- G2 Copper-silicon alloys are not always suitable when exposed to certain media and high temperatures, particularly steam above 212°F. 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 500°F 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 hr at 600°F and after shorter exposure above 650°F.
- G5 At temperatures above 1000°F, these stress values apply only when the carbon is 0.04% or higher on heat analysis.
- G6 For temperatures above 1000°F, these stress values may be used only if the material is heat treated by heating it to a minimum temperature of 1900°F.
- 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 $\frac{1}{8}$ in. 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 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, 10.3, is prohibited.

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

- T1 Allowable stresses for temperatures of 1100°F 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.
- (10) W5 Except for nonstructural tack welds used as a locking device, welding is prohibited for Section VIII, Division 1 use.

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TABLE 4
SECTION III, CLASSES 1, TC, AND SC; AND SECTION VIII, DIVISION 2*
DESIGN STRESS INTENSITY VALUES S_m 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/ Thickness, in.
Ferrous Materials						
1	1Cr-1Mn- $\frac{1}{4}$ Mo	SA-540	B22	K41420	5	$2 < t \leq 4$
2	1Cr-1Mn- $\frac{1}{4}$ Mo	SA-540	B22	K41420	5	≤ 2
3	1Cr-1Mn- $\frac{1}{4}$ Mo	SA-540	B22	K41420	4	≤ 4
4	1Cr-1Mn- $\frac{1}{4}$ Mo	SA-540	B22	K41420	3	≤ 4
5	1Cr-1Mn- $\frac{1}{4}$ Mo	SA-540	B22	K41420	2	≤ 3
6	1Cr-1Mn- $\frac{1}{4}$ Mo	SA-540	B22	K41420	1	$\leq 1\frac{1}{2}$
7	1Cr- $\frac{1}{2}$ Mo	SA-193	B7	G41400	...	$4 < t \leq 7$
8	1Cr- $\frac{1}{2}$ Mo	SA-193	B7M	G41400	...	$\leq 2\frac{1}{2}$
9	1Cr- $\frac{1}{2}$ Mo	SA-193	B7	G41400	...	$2\frac{1}{2} < t \leq 4$
10	1Cr- $\frac{1}{2}$ Mo	SA-193	B7	G41400	...	$\leq 2\frac{1}{2}$
11	1Cr- $\frac{1}{2}$ Mo-V	SA-193	B16	K14072	...	$4 < t \leq 7$
12	1Cr- $\frac{1}{2}$ Mo-V	SA-193	B16	K14072	...	$4 < t \leq 7$
13	1Cr- $\frac{1}{2}$ Mo-V	SA-193	B16	K14072	...	$2\frac{1}{2} < t \leq 4$
14	1Cr- $\frac{1}{2}$ Mo-V	SA-193	B16	K14072	...	$2\frac{1}{2} < t \leq 4$
15	1Cr- $\frac{1}{2}$ Mo-V	SA-540	B21	K14073	5	$2 < t \leq 8$
16	1Cr- $\frac{1}{2}$ Mo-V	SA-540	B21	K14073	5	≤ 2
17	1Cr- $\frac{1}{2}$ Mo-V	SA-193	B16	K14072	...	$\leq 2\frac{1}{2}$
18	1Cr- $\frac{1}{2}$ Mo-V	SA-193	B16	K14072	...	$\leq 2\frac{1}{2}$
19	1Cr- $\frac{1}{2}$ Mo-V	SA-540	B21	K14073	4	≤ 6
20	1Cr- $\frac{1}{2}$ Mo-V	SA-540	B21	K14073	3	≤ 6
21	1Cr- $\frac{1}{2}$ Mo-V	SA-540	B21	K14073	2	≤ 4
22	1Cr- $\frac{1}{2}$ Mo-V	SA-540	B21	K14073	1	≤ 4
23	12Cr-1Mo-V-W	SA-437	B4C	K91352	...	...
24	12Cr-1Mo-V-W	SA-437	B4B	K91352	...	...
25	13Cr	SA-193	B6	S41000	...	≤ 4
26	17Cr-4Ni-4Cu	SA-564	630	S17400	H1100	≤ 8
27	17Cr-4Ni-4Cu	SA-705	630	S17400	H1100	≤ 8
28	$1\frac{3}{4}$ Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	SA-320	L43	G43400	...	≤ 4
29	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	SA-540	B23	H43400	5	$6 < t \leq 9\frac{1}{2}$
30	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	SA-540	B23	H43400	5	$6 < t \leq 9\frac{1}{2}$
31	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	SA-540	B23	H43400	5	≤ 6

TABLE 4
SECTION III, CLASSES 1, TC, AND SC; AND SECTION VIII, DIVISION 2*
DESIGN STRESS INTENSITY VALUES S_m FOR BOLTING MATERIALS
(*Use With Part 5 and Annex 5.F of Section VIII, Division 2)

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted)		Notes
			III	VIII-2	
	Ferrous Materials				
1	115	100	700	700	G4
2	120	105	700	700	G4
3	135	120	700	700	G4
4	145	130	700	700	G3
5	155	140	700	700	G3
6	165	150	600	600	G1
7	100	75	800	800	G4
8	100	80	NP	800	G4
9	115	95	800	800	G4
10	125	105	800	800	G4
11	100	85	800	NP	...
12	100	85	NP	800	...
13	110	95	800	NP	...
14	110	95	NP	800	...
15	115	100	700	700	G4
16	120	105	700	700	G4
17	125	105	800	NP	...
18	125	105	NP	800	...
19	135	120	700	700	G4
20	145	130	700	700	G3
21	155	140	700	700	G3
22	165	150	700	700	G1
23	115	85	700	700	...
24	145	105	700	700	...
25	110	85	700	700	...
26	140	115	650	650	G2
27	140	115	650	650	G2
28	125	105	800	800	G4
29	115	100	700	NP	G4
30	115	100	NP	700	G4
31	120	105	700	700	G4

TABLE 4
SECTION III, CLASSES 1, TC, AND SC; AND SECTION VIII, DIVISION 2*
DESIGN STRESS INTENSITY VALUES S_m FOR BOLTING MATERIALS
(*Use with Part 5 and Annex 5.F of Section VIII, Division 2)

Line No.	Design Stress Intensity, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	-20 to 100	200	300	400	500	600	650	700	750	800
	Ferrous Materials									
1	33.3	31.8	30.9	29.8	28.9	27.6	...	25.9	...	...
2	35.0	33.4	32.4	31.3	30.3	29.0	...	27.2	...	...
3	40.0	38.2	36.9	35.9	34.7	33.1	...	31.1	...	...
4	43.3	41.4	40.2	38.8	37.6	35.9	...	33.7	...	...
5	46.7	44.6	43.1	41.8	40.5	38.7	...	36.3	...	...
6	50.0	47.8	46.2	44.8	43.4	41.4	...	...	...	...
7	25.0	23.3	22.4	21.8	21.1	20.3	19.8	19.2	18.5	17.6
8	26.7	24.9	23.9	23.2	22.5	21.7	21.1	20.5	19.7	18.8
9	31.7	29.5	28.4	27.6	26.7	25.7	25.0	24.3	23.4	22.3
10	35.0	32.6	31.4	30.5	29.5	28.4	27.7	26.9	25.9	24.6
11	28.3	27.4	26.6	25.9	25.2	24.5	...	23.7	...	22.6
12	28.3	27.5	26.9	26.3	25.7	25.0	...	23.8	...	22.4
13	31.7	30.6	29.7	29.0	28.2	27.4	...	26.5	...	25.3
14	31.7	30.7	30.0	29.4	28.8	27.9	...	26.6	...	25.1
15	33.3	32.2	31.3	30.5	29.7	28.8	...	27.9	...	...
16	35.0	33.8	32.8	32.0	31.2	30.3	...	29.3	...	...
17	35.0	33.8	32.8	32.0	31.2	30.3	...	29.3	...	27.9
18	35.0	34.0	33.2	32.5	31.8	30.9	...	29.4	...	27.7
19	40.0	38.7	37.5	36.6	35.6	34.6	...	33.4	...	...
20	43.3	41.9	40.6	39.7	38.6	37.5	...	36.2	...	...
21	46.7	45.1	43.8	42.7	41.5	40.4	...	39.0	...	...
22	50.0	48.4	46.9	45.8	44.5	43.3	...	41.8	...	...
23	28.3	27.2	26.3	25.6	25.0	24.6	24.3	24.0	...	...
24	35.0	33.5	32.4	31.6	30.9	30.2	29.9	29.7	...	...
25	28.3	27.0	26.1	25.3	24.6	23.9	...	23.3	...	...
26	38.3	35.4	33.9	32.7	31.7	30.9	30.5	...	...	...
27	38.3	35.4	33.9	32.7	31.7	30.9	30.5	...	...	...
28	35.0	33.0	31.9	30.6	29.5	28.1	...	26.4	...	24.2
29	33.3	31.8	30.9	29.8	28.9	27.6	...	25.9
30	33.3	31.8	30.7	29.8	28.9	27.6	...	25.9
31	35.0	33.4	32.4	31.3	30.3	29.0	...	27.2

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TABLE 4 (CONT'D)
SECTION III, CLASSES 1, TC, AND SC; AND SECTION VIII, DIVISION 2*
DESIGN STRESS INTENSITY VALUES S_m 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/ Thickness, in.
Ferrous Materials (Cont'd)						
1	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	SA-540	B23	H43400	4	$\leq 9\frac{1}{2}$
2	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	SA-540	B23	H43400	3	$\leq 9\frac{1}{2}$
3	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	SA-540	B23	H43400	2	$\leq 9\frac{1}{2}$
4	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	SA-540	B23	H43400	1	≤ 8
5	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo	SA-540	B24	K24064	5	$6 < t \leq 9\frac{1}{2}$
6	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo	SA-540	B24	K24064	5	$6 < t \leq 9\frac{1}{2}$
7	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo	SA-540	B24	K24064	5	≤ 6
8	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo	SA-540	B24	K24064	4	$\leq 9\frac{1}{2}$
9	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo	SA-540	B24	K24064	3	$\leq 9\frac{1}{2}$
10	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo	SA-540	B24	K24064	2	$\leq 9\frac{1}{2}$
11	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo	SA-540	B24	K24064	1	≤ 8
12	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo-V	SA-540	B24V	K24070	3	≤ 11
13	25Ni-15Cr-2Ti	SA-453	660	S66286	A	...
14	25Ni-15Cr-2Ti	SA-453	660	S66286	B	...
15	16Cr-12Ni-2Mo	SA-193	B8M	S31600	1/Sol. treat.	...
16	16Cr-12Ni-2Mo-N	SA-193	B8MNA	S31651	1A/Sol. treat.	...
17	18Cr-8Ni	SA-193	B8	S30400	1/Sol. treat.	...
18	18Cr-8Ni-N	SA-193	B8NA	S30451	1A/Sol. treat.	...
19	18Cr-8Ni-4Si-N	SA-193	B8S	S21800	Sol. treat.	...
20	18Cr-8Ni-4Si-N	SA-193	B8SA	S21800	Sol. treat.	...
21	18Cr-10Ni-Cb	SA-193	B8C	S34700	1/Sol. treat.	...
22	18Cr-10Ni-Ti	SA-193	B8T	S32100	1/Sol. treat.	...
23	19Cr-9Ni-Mo-W	SA-453	651	S63198	B	> 3
24	19Cr-9Ni-Mo-W	SA-453	651	S63198	B	≤ 3
25	19Cr-9Ni-Mo-W	SA-453	651	S63198	A	> 3
26	19Cr-9Ni-Mo-W	SA-453	651	S63198	A	≤ 3
27	22Cr-13Ni-5Mn	SA-193	B8R	S20910	1C/Sol. treat.	...
28	22Cr-13Ni-5Mn	SA-193	B8RA	S20910	Sol. treat.	...

TABLE 4 (CONT'D)
SECTION III, CLASSES 1, TC, AND SC; AND SECTION VIII, DIVISION 2*
DESIGN STRESS INTENSITY VALUES S_m FOR BOLTING MATERIALS
(*Use With Part 5 and Annex 5.F of Section VIII, Division 2)

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted)		Notes
			III	VIII-2	
	Ferrous Materials (Cont'd)				
1	135	120	700	700	G4
2	145	130	700	700	G3
3	155	140	700	700	G3
4	165	150	600	600	G1
5	115	100	700	NP	G4
6	115	100	NP	700	G4
7	120	105	700	700	G4
8	135	120	700	700	G4
9	145	130	700	700	G3, G4
10	155	140	700	700	G3
11	165	150	600	600	G1
12	145	130	700	700	G3
13	130	85	800	800	...
14	130	85	800	800	...
15	75	30	800	800	...
16	75	30	800	800	...
17	75	30	800	800	...
18	75	30	800	800	...
19	95	50	800	800	...
20	95	50	800	800	...
21	75	30	800	800	...
22	75	30	800	800	...
23	95	50	800	800	...
24	95	60	800	800	...
25	100	60	800	800	...
26	100	70	800	800	...
27	100	55	800	800	...
28	100	55	800	800	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 4 (CONT'D)
SECTION III, CLASSES 1, TC, AND SC; AND SECTION VIII, DIVISION 2*
DESIGN STRESS INTENSITY VALUES S_m FOR BOLTING MATERIALS
(*Use with Part 5 and Annex 5.F of Section VIII, Division 2)

Line No.	Design Stress Intensity, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	-20 to 100	200	300	400	500	600	650	700	750	800
	Ferrous Materials (Cont'd)									
1	40.0	38.2	36.9	35.9	34.7	33.1	...	31.1	...	...
2	43.3	41.4	40.2	38.8	37.6	35.9	...	33.7	...	...
3	46.7	44.6	43.1	41.8	40.5	38.7	...	36.3	...	...
4	50.0	47.8	46.2	44.8	43.4	41.4	...	...	...	...
5	33.3	31.8	30.9	29.8	28.9	27.6	...	25.9	...	...
6	33.3	31.8	30.7	29.8	28.9	27.6	...	25.9	...	...
7	35.0	33.4	32.4	31.3	30.3	29.0	...	27.2	...	...
8	40.0	38.2	36.9	35.9	34.7	33.1	...	31.1	...	...
9	43.3	41.4	40.2	38.8	37.6	35.9	...	33.7	...	...
10	46.7	44.6	43.1	41.8	40.5	38.7	...	36.3	...	...
11	50.0	47.8	46.2	44.8	43.4	41.4	...	...	...	...
12	43.3	41.4	40.2	38.8	37.6	35.9	...	33.7	...	...
13	28.3	27.8	27.3	26.9	26.4	26.0	25.7	25.5	25.2	25.0
14	28.3	27.8	27.3	26.9	26.4	26.0	25.7	25.5	25.2	25.0
15	10.0	8.6	7.8	7.2	6.7	6.3	...	6.0	...	5.8
16	10.0	8.9	8.1	7.6	7.1	6.7	6.5	6.4	6.2	6.1
17	10.0	8.3	7.5	6.9	6.5	6.1	...	5.9	...	5.6
18	10.0	8.2	7.2	6.4	6.0	5.7	5.6	5.4	5.4	5.3
19	16.7	13.0	11.0	9.9	9.2	8.8	8.7	8.5	8.5	8.4
20	16.7	13.0	11.0	9.9	9.2	8.8	8.7	8.5	8.5	8.4
21	10.0	9.2	8.6	8.0	7.5	7.2	...	6.9	...	6.8
22	10.0	9.0	8.3	7.7	7.2	6.8	...	6.5	...	6.3
23	16.7	15.3	14.2	13.3	12.7	12.0	...	11.5	...	11.1
24	20.0	18.3	17.0	16.0	15.1	14.5	...	13.8	...	13.2
25	20.0	18.3	17.0	16.0	15.1	14.5	...	13.8	...	13.2
26	23.3	21.4	19.8	18.7	17.7	16.9	...	16.1	...	15.4
27	18.3	15.7	14.5	13.6	12.9	12.4	12.3	12.1	11.9	11.8
28	18.3	15.7	14.5	13.6	12.9	12.4	12.3	12.1	11.9	11.8

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TABLE 4 (CONT'D)
SECTION III, CLASSES 1, TC, AND SC; AND SECTION VIII, DIVISION 2*
DESIGN STRESS INTENSITY VALUES S_m 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 Designation/ UNS No.	Class/ Condition/ Temper	Size/ Thickness, in.
Nonferrous Materials						
1	67Ni-30Cu	SB-164	...	N04400	Annealed	...
2	67Ni-30Cu	SB-164	...	N04400	Hot worked	...
3	67Ni-30Cu	SB-164	...	N04400	Hot worked	...
4	67Ni-30Cu	SB-164	...	N04400	CD-str. rel.	...
5	67Ni-30Cu	SB-164	...	N04400	CD-str. rel.	...
6	67Ni-30Cu	SB-164	...	N04400	As drawn	...
7	67Ni-30Cu	SB-164	...	N04400	CD-str. rel.	...
8	67Ni-30Cu	SB-164	...	N04400	As drawn	...
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	...	≤ 6
13	70Ni-16Cr-7Fe-Ti-Al	SB-637	2	N07750	...	< 4

TABLE 4 (CONT'D)
SECTION III, CLASSES 1, TC, AND SC; AND SECTION VIII, DIVISION 2*
DESIGN STRESS INTENSITY VALUES S_m FOR BOLTING MATERIALS
(*Use With Part 5 and Annex 5.F of Section VIII, Division 2)

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Applicability and Max. Temperature Limits (NP = Not Permitted)		Notes
			III	VIII-2	
			Nonferrous Materials		
1	70	25	800	800	...
2	75	30	800	800	...
3	80	40	800	800	...
4	80	50	500	500	...
5	84	55	500	500	...
6	85	55	500	500	...
7	87	60	500	500	...
8	110	85	500	500	...
9	70	25	800	800	...
10	75	35	800	800	...
11	85	50	500	500	...
12	185	150	800	800	...
13	170	115	800	800	...

TABLE 4 (CONT'D)
SECTION III, CLASSES 1, TC, AND SC; AND SECTION VIII, DIVISION 2*
DESIGN STRESS INTENSITY VALUES S_m FOR BOLTING MATERIALS
(*Use with Part 5 and Annex 5.F of Section VIII, Division 2)

Line No.	Design Stress Intensity, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	-20 to 100	200	300	400	500	600	650	700	750	800
	Nonferrous Materials									
1	8.3	7.3	6.9	6.6	6.6	6.6	6.6	6.6	...	6.3
2	10.0	8.8	8.2	7.9	7.9	7.9	7.9	7.9	...	7.6
3	13.3	11.7	11.0	10.6	10.6	10.6	10.6	10.6	...	10.1
4	16.6	14.6	13.8	13.2	13.2	...	...	...	...	...
5	18.3	16.1	15.1	14.6	14.6	...	...	...	...	...
6	18.3	16.1	15.1	14.6	14.6	...	...	...	...	...
7	20.0	17.6	16.4	15.8	15.8	...	...	...	...	...
8	28.3	24.9	23.4	22.5	22.5	...	...	...	...	...
9	8.3	7.3	6.9	6.6	6.6	6.6	6.6	6.6	...	6.3
10	11.7	10.3	9.6	9.3	9.3	9.3	9.3	9.3	...	8.9
11	16.6	14.6	13.8	13.2	13.2	...	...	...	...	...
12	50.0	48.0	46.9	46.1	45.6	45.1	...	44.8	...	44.4
13	38.3	37.3	36.8	36.3	36.0	35.8	35.7	35.6	35.5	35.4

NOTES TO TABLE 4

GENERAL NOTES

- (a) The allowable 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 when 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 NB-3230 and Appendix E.
- (b) Stress values for -20°F to 100°F 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; 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.
- (10) (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.

NOTES — GENERAL REQUIREMENTS

- G1 Stress values may result in relaxation of the bolting materials after prolonged service at temperatures of 500°F 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 hr at 600°F and after shorter exposure above 650°F .
- G3 Stress values may result in relaxation of the bolting materials after prolonged service at temperatures of 600°F 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 700°F and higher, and the designer is to investigate the effect of this relaxation on the application.

TABLE 5A
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	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
5	Carbon steel	Plate	SA-283	B	...	...	...	1	1
6	Carbon steel	Plate	SA-285	B	K02200	...	$t \leq 2$	1	1
7	Carbon steel	Bar, shapes	SA-675	55	...	...	...	1	1
8	Carbon steel	Plate	SA-285	C	K02801	...	$t \leq 2$	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
37	Carbon steel	Plate	SA-662	B	K02203	...	...	1	1
38	Carbon steel	Plate	SA-537	...	K12437	1	$2\frac{1}{2} < t \leq 4$	1	2
39	Carbon steel	Bar, shapes	SA-675	70	...	...	...	1	1
40	Carbon steel	Forgings	SA-105	...	K03504	...	...	1	2
41	Carbon steel	Forgings	SA-181	...	K03502	70	...	1	2
42	Carbon steel	Castings	SA-216	WCB	J03002	...	...	1	2

TABLE 5A
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Maximum Use Temperature, °F	External Pressure Chart No.	Notes
1	45	22.5	900	CS-6	G13, T4
2	45	24	900	CS-1	G13, T3
3	48	30	1000	CS-2	G13, T1
4	50	25	900	CS-1	G13, T3
5	50	27	700	CS-1	...
6	50	27	900	CS-1	G13, T3
7	55	27.5	900	CS-1	G13, T4
8	55	30	1000	CS-2	G13, T3
9	55	30	1000	CS-2	T4
10	55	30	700	CS-2	...
11	55	30	1000	CS-2	G13, T3
12	55	30	1000	CS-2	G13, T3
13	58	36	650	CS-2	G13
14	58	40	700	CS-2	...
15	60	30	1000	CS-2	G13, T4
16	60	30	1000	CS-2	G13, T4
17	60	30	1000	CS-2	G13, T4
18	60	30	700	CS-2	G13
19	60	30	900	CS-2	G13, T4
20	60	30	1000	CS-2	G13, T4
21	60	32	1000	CS-2	G13, T3
22	60	32	1000	CS-2	G13, T3
23	60	33	700	CS-2	...
24	60	35	700	CS-2	G13
25	60	35	1000	CS-2	G13, T3
26	60	35	1000	CS-2	G13, T3
27	60	35	650	CS-2	G9, H5
28	60	35	850	CS-2	G13, T3
29	60	35	1000	CS-2	G13, T3
30	60	36	1000	CS-2	G13, T3
31	60	37	1000	CS-2	G6, G13, T2
32	60	37	1000	CS-2	G13, T3
33	65	32.5	1000	CS-2	G13, T3
34	65	35	650	CS-2	...
35	65	35	1000	CS-2	G13, T3
36	65	35	1000	CS-2	G13, T3
37	65	40	700	CS-2	...
38	65	45	700	CS-2	...
39	70	35	1000	CS-2	G13, T3
40	70	36	1000	CS-2	G13, T3
41	70	36	1000	CS-2	G13, T3
42	70	36	1000	CS-2	G13, T3

TABLE 5A
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
Line No.	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
1	15.0	14.1	13.7	13.5	13.3	13.1	12.8	12.5	12.2	11.9	11.5	11.1	10.7	10.4	9.2	7.9	5.9
2	16.0	15.0	14.7	14.4	14.2	13.9	13.7	13.4	13.0	12.7	12.3	11.9	11.5	10.7	9.2	7.9	5.9
3	20.0	18.8	18.3	18.0	17.7	17.4	17.1	16.7	16.3	15.8	15.3	14.6	14.4	10.7	9.2	7.9	5.9
4	16.7	15.7	15.3	15.0	14.7	14.5	14.2	13.9	13.6	13.2	12.8	12.4	11.9	10.7	9.2	7.9	5.9
5	18.0	16.9	16.5	16.2	15.9	15.7	15.4	15.0	14.7	14.2	13.8	13.3	13.0	...	...	...	...
6	18.0	16.9	16.5	16.2	15.9	15.7	15.4	15.0	14.7	14.2	13.8	13.3	13.0	10.7	9.2	7.9	5.9
7	18.3	17.2	16.8	16.5	16.2	16.0	15.7	15.3	14.9	14.5	14.1	13.6	13.1	12.7	10.8	8.7	5.9
8	20.0	18.8	18.3	18.0	17.7	17.4	17.1	16.7	16.3	15.8	15.3	14.8	14.3	13.0	10.8	8.7	5.9
9	20.0	18.8	18.3	18.0	17.7	17.4	17.1	16.7	16.3	15.8	15.3	14.8	14.3	13.8	11.4	8.7	5.9
10	20.0	18.8	18.3	18.0	17.7	17.4	17.1	16.7	16.3	15.8	15.3	14.8	14.3	...	...	...	...
11	20.0	18.8	18.3	18.0	17.7	17.4	17.1	16.7	16.3	15.8	15.3	14.8	14.3	13.0	10.8	8.7	5.9
12	20.0	18.8	18.3	18.0	17.7	17.4	17.1	16.7	16.3	15.8	15.3	14.8	14.3	13.0	10.8	8.7	5.9
13	24.0	22.6	22.0	21.6	21.2	20.9	20.5	20.1	19.6	19.0	18.4	17.8	...	...	...	...	...
14	24.2	24.2	24.2	24.0	23.6	23.2	22.8	22.3	21.7	21.1	20.4	19.3	19.2	...	...	...	...
15	20.0	18.8	18.3	18.0	17.7	17.4	17.1	16.7	16.3	15.8	15.3	14.8	14.3	13.8	11.4	8.7	5.9
16	20.0	18.8	18.3	18.0	17.7	17.4	17.1	16.7	16.3	15.8	15.3	14.8	14.3	13.8	11.4	8.7	5.9
17	20.0	18.8	18.3	18.0	17.7	17.4	17.1	16.7	16.3	15.8	15.3	14.8	14.3	13.8	11.4	8.7	5.9
18	20.0	18.8	18.3	18.0	17.7	17.4	17.1	16.7	16.3	15.8	15.3	14.8	14.3	...	...	...	...
19	20.0	18.8	18.3	18.0	17.7	17.4	17.1	16.7	16.3	15.8	15.3	14.8	14.3	13.8	11.4	8.7	5.9
20	20.0	18.8	18.3	18.0	17.7	17.4	17.1	16.7	16.3	15.8	15.3	14.8	14.3	13.8	11.4	8.7	5.9
21	21.3	20.0	19.5	19.2	18.9	18.6	18.2	17.8	17.4	16.9	16.4	15.8	15.3	13.9	11.4	8.7	5.9
22	21.3	20.0	19.5	19.2	18.9	18.6	18.2	17.8	17.4	16.9	16.4	15.8	15.3	13.9	11.4	8.7	5.9
23	22.0	20.7	20.2	19.8	19.5	19.1	18.8	18.4	17.9	17.4	16.9	16.3	15.4	...	...	...	...
24	23.3	21.9	21.4	21.0	20.6	20.3	19.9	19.5	19.0	18.5	17.9	17.3	16.8	...	...	...	...
25	23.3	21.9	21.4	21.0	20.6	20.3	19.9	19.5	19.0	18.5	17.9	17.3	16.8	13.9	11.4	8.7	5.9
26	23.3	21.9	21.4	21.0	20.6	20.3	19.9	19.5	19.0	18.5	17.9	17.3	16.8	13.9	11.4	8.7	5.9
27	23.3	22.4	21.4	20.3	19.3	18.4	17.6	16.9	16.5	16.1	15.8	15.6	...	...	...	...	...
28	23.3	21.9	21.4	21.0	20.6	20.3	19.9	19.5	19.0	18.5	17.9	17.3	16.8	13.9	11.4	8.7	...
29	23.3	21.9	21.4	21.0	20.6	20.3	19.9	19.5	19.0	18.5	17.9	17.3	16.8	13.9	11.4	8.7	5.9
30	24.0	22.6	22.0	21.6	21.2	20.9	20.5	20.1	19.6	19.0	18.4	17.8	17.3	13.9	11.4	8.7	5.9
31	21.0	19.7	19.2	18.8	18.5	18.2	17.9	17.5	17.1	16.6	16.1	15.5	14.4	11.8	9.7	7.4	5.0
32	24.7	23.2	22.6	22.2	21.8	21.5	21.1	20.6	20.1	19.5	18.9	18.3	17.8	13.9	11.4	8.7	5.9
33	21.7	20.4	19.8	19.5	19.2	18.9	18.5	18.1	17.7	17.1	16.6	16.1	15.5	13.9	11.4	9.0	6.3
34	23.3	21.9	21.4	21.0	20.6	20.3	19.9	19.5	19.0	18.5	17.9	17.3	...	...	...	...	...
35	23.3	21.9	21.4	21.0	20.6	20.3	19.9	19.5	19.0	18.5	17.9	17.3	16.7	13.9	11.4	9.0	6.3
36	23.3	21.9	21.4	21.0	20.6	20.3	19.9	19.5	19.0	18.5	17.9	17.3	16.7	13.9	11.4	9.0	6.3
37	26.7	25.1	24.4	24.0	23.6	23.2	22.8	22.3	21.7	21.1	20.4	19.8	19.2	...	...	...	...
38	27.1	27.1	26.5	25.3	24.3	23.4	22.6	21.9	21.2	20.7	20.5	20.5	19.6	...	...	...	...
39	23.3	21.9	21.4	21.0	20.6	20.3	19.9	19.5	19.0	18.5	17.9	17.3	16.7	14.8	12.0	9.3	6.7
40	24.0	22.6	22.0	21.6	21.2	20.9	20.5	20.1	19.6	19.0	18.4	17.8	17.2	14.8	12.0	9.3	6.7
41	24.0	22.6	22.0	21.6	21.2	20.9	20.5	20.1	19.6	19.0	18.4	17.8	17.2	14.8	12.0	9.3	6.7
42	24.0	22.6	22.0	21.6	21.2	20.9	20.5	20.1	19.6	19.0	18.4	17.8	17.2	14.8	12.0	9.3	6.7

TABLE 5A
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding											
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
1	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...
3	4.0	2.5	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...
8	4.0	2.5	...	...	...	...	...	...	...	...	...	...
9	4.0	2.5	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...
11	4.0	2.5	...	...	...	...	...	...	...	...	...	...
12	4.0	2.5	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...
15	4.0	2.5	...	...	...	...	...	...	...	...	...	...
16	4.0	2.5	...	...	...	...	...	...	...	...	...	...
17	4.0	2.5	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...
20	4.0	2.5	...	...	...	...	...	...	...	...	...	...
21	4.0	2.5	...	...	...	...	...	...	...	...	...	...
22	4.0	2.5	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...
25	4.0	2.5	...	...	...	...	...	...	...	...	...	...
26	4.0	2.5	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...
29	4.0	2.5	...	...	...	...	...	...	...	...	...	...
30	4.0	2.5	...	...	...	...	...	...	...	...	...	...
31	3.4	2.1	...	...	...	...	...	...	...	...	...	...
32	4.0	2.5	...	...	...	...	...	...	...	...	...	...
33	4.0	2.5	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...	...
35	4.0	2.5	...	...	...	...	...	...	...	...	...	...
36	4.0	2.5	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...
39	4.0	2.5	...	...	...	...	...	...	...	...	...	...
40	4.0	2.5	...	...	...	...	...	...	...	...	...	...
41	4.0	2.5	...	...	...	...	...	...	...	...	...	...
42	4.0	2.5	...	...	...	...	...	...	...	...	...	...

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	Carbon steel	Forgings	SA-266	2	K03506	...	...	1	2
2	Carbon steel	Forgings	SA-266	4	K03017	...	...	1	2
3	Carbon steel	Forgings	SA-350	LF2	K03011	...	...	1	2
4	Carbon steel	Forgings	SA-508	1	K13502	...	...	1	2
5	Carbon steel	Forgings	SA-508	1A	K13502	...	...	1	2
6	Carbon steel	Forgings	SA-541	1	K03506	...	...	1	2
7	Carbon steel	Forgings	SA-541	1A	K03020	...	...	1	2
8	Carbon steel	Forgings	SA-765	II	K03047	...	...	1	2
9	Carbon steel	Plate	SA-515	70	K03101	...	...	1	2
10	Carbon steel	Plate	SA-516	70	K02700	...	...	1	2
11	Carbon steel	Smls. pipe	SA-106	C	K03501	...	...	1	2
12	Carbon steel	Smls. tube	SA-210	C	K03501	...	...	1	2
13	Carbon steel	Castings	SA-216	WCC	K02503	...	...	1	2
14	Carbon steel	Fittings	SA-234	WPC	K03501	...	...	1	2
15	Carbon steel	Plate	SA-537	...	K12437	3	$4 < t \leq 6$	1	3
16	Carbon steel	Plate	SA-662	C	K02007	...	...	1	2
17	Carbon steel	Plate	SA-537	...	K12437	2	$4 < t \leq 6$	1	3
18	Carbon steel	Plate	SA-738	C	K02008	...	$4 < t \leq 6$	1	3
19	Carbon steel	Plate	SA-537	...	K12437	1	$t \leq 2\frac{1}{2}$	1	2
(a) 20	Carbon steel	Plate	SA-841	A	...	1	$t \leq 2\frac{1}{2}$	1	2
21	Carbon steel	Forgings	SA-266	3	K05001	...	...	1	2
22	Carbon steel	Plate	SA-299	...	K02803	...	$t > 1$	1	2
23	Carbon steel	Plate	SA-299	...	K02803	...	$t \leq 1$	1	2
24	Carbon steel	Forgings	SA-372	B	K04001	...	...	1	2
25	Carbon steel	Plate	SA-738	A	K12447	...	$t \leq 2\frac{1}{2}$	1	2
26	Carbon steel	Plate	SA-738	A	K12447	...	...	1	2
27	Carbon steel	Plate	SA-537	...	K12437	3	$2\frac{1}{2} < t \leq 4$	1	3
28	Carbon steel	Plate	SA-537	...	K12437	2	$2\frac{1}{2} < t \leq 4$	1	3
29	Carbon steel	Plate	SA-738	C	K02008	...	$2\frac{1}{2} < t \leq 4$	1	3
30	Carbon steel	Forgings	SA-765	IV	K02009	...	...	1	3
31	Carbon steel	Plate	SA-537	...	K12437	3	$t \leq 2\frac{1}{2}$	1	3
32	Carbon steel	Plate	SA-537	...	K12437	2	$t \leq 2\frac{1}{2}$	1	3
33	Carbon steel	Plate	SA-738	C	K02008	...	$t \leq 2\frac{1}{2}$	1	3
(a) 34	Carbon steel	Plate	SA-841	B	...	2	$t \leq 2\frac{1}{2}$	1	3
(10) 35	Carbon steel	Plate	SA-612	...	K02900	...	$\frac{1}{2} < t \leq 1$	10C	1
(10) 36	Carbon steel	Plate	SA-612	...	K02900	...	$t \leq \frac{1}{2}$	10C	1
37	Carbon steel	Plate	SA-738	B	K12007	...	...	1	3
38	Carbon steel	Forgings	SA-372	C	K04801	...	...	...	...
39	Carbon steel	Plate	SA-724	A	K11831	...	...	1	4
40	Carbon steel	Plate	SA-724	C	K12037	...	...	1	4
41	Carbon steel	Plate	SA-724	B	K12031	...	...	1	4
42	C-Mn-Si-Cb	Plate	SA-737	B	K12001	...	...	1	2
43	C-Mn-Si-V	Plate	SA-737	C	K12202	...	...	1	3

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Maximum Use Temperature, °F	External Pressure Chart No.	Notes
1	70	36	1000	CS-2	G13, T3
2	70	36	1000	CS-2	G13, T3
3	70	36	1000	CS-2	G13, T2
4	70	36	1000	CS-2	G13, T3
5	70	36	1000	CS-2	G13, T3
6	70	36	1000	CS-2	G13, T3
7	70	36	1000	CS-2	G13, T3
8	70	36	1000	CS-2	G13, T3
9	70	38	1000	CS-2	G13, T3
10	70	38	1000	CS-2	G13, T3
11	70	40	1000	CS-2	G13, T3
12	70	40	1000	CS-2	G13, T3
13	70	40	1000	CS-2	G13, T3
14	70	40	800	CS-2	G13, T3
15	70	40	700	CS-2	...
16	70	43	700	CS-3	...
17	70	46	650	CS-3	...
18	70	46	650	CS-3	T1
19	70	50	700	CS-3	T1
20	70	50	650	CS-3	... (a)
21	75	37.5	1000	CS-2	G13, T3, W1, W6
22	75	40	1000	CS-2	G13, T3
23	75	42	1000	CS-2	G13, T3
24	75	45	650	CS-3	G9, H5, W2, W6
25	75	45	700	CS-2	H7
26	75	45	700	CS-2	H3
27	75	50	700	CS-5	T1
28	75	55	650	CS-5	T1
29	75	55	650	CS-5	T1
30	80	50	700	CS-3	T1
31	80	55	700	CS-5	...
32	80	60	650	CS-5	...
33	80	60	650	CS-5	...
34	80	60	650	CS-3	... (a)
35	81	50	650	CS-3	H7 (10)
36	83	50	650	CS-3	H7 (10)
37	85	60	650	CS-5	T1
38	90	55	650	CS-3	G9, H5, T1, W2, W6
39	90	70	700	CS-5	...
40	90	70	700	CS-5	...
41	95	75	700	CS-5	...
42	70	50	700	CS-3	...
43	80	60	700	CS-3	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
Line No.	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
1	24.0	22.6	22.0	21.6	21.2	20.9	20.5	20.1	19.6	19.0	18.4	17.8	17.2	14.8	12.0	9.3	6.7
2	24.0	22.6	22.0	21.6	21.2	20.9	20.5	20.1	19.6	19.0	18.4	17.8	17.2	14.8	12.0	9.3	6.7
3	24.0	22.6	22.0	21.6	21.2	20.9	20.5	20.1	19.6	19.0	18.4	17.8	16.9	13.9	11.4	8.7	5.9
4	24.0	22.6	22.0	21.6	21.2	20.9	20.5	20.1	19.6	19.0	18.4	17.8	17.2	14.8	12.0	9.3	6.7
5	24.0	22.6	22.0	21.6	21.2	20.9	20.5	20.1	19.6	19.0	18.4	17.8	17.2	14.8	12.0	9.3	6.7
6	24.0	22.6	22.0	21.6	21.2	20.9	20.5	20.1	19.6	19.0	18.4	17.8	17.2	14.8	12.0	9.3	6.7
7	24.0	22.6	22.0	21.6	21.2	20.9	20.5	20.1	19.6	19.0	18.4	17.8	17.2	14.8	12.0	9.3	6.7
8	24.0	22.6	22.0	21.6	21.2	20.9	20.5	20.1	19.6	19.0	18.4	17.8	17.2	14.8	12.0	9.3	6.7
9	25.3	23.8	23.2	22.8	22.4	22.1	21.6	21.2	20.6	20.1	19.4	18.8	18.1	14.8	12.0	9.3	6.7
10	25.3	23.8	23.2	22.8	22.4	22.1	21.6	21.2	20.6	20.1	19.4	18.8	18.1	14.8	12.0	9.3	6.7
11	26.7	25.1	24.4	24.0	23.6	23.2	22.8	22.3	21.7	21.1	20.4	19.8	19.2	14.8	12.0	9.3	6.7
12	26.7	25.1	24.4	24.0	23.6	23.2	22.8	22.3	21.7	21.1	20.4	19.8	19.2	14.8	12.0	9.3	6.7
13	26.7	25.1	24.4	24.0	23.6	23.2	22.8	22.3	21.7	21.1	20.4	19.8	19.2	14.8	12.0	9.3	6.7
14	26.7	25.1	24.4	24.0	23.6	23.2	22.8	22.3	21.7	21.1	20.4	19.8	19.2	14.8	12.0	...	...
15	26.7	25.3	24.5	23.8	23.2	22.7	22.2	21.7	21.3	20.9	20.6	20.2	19.2	...	...	...	...
16	28.7	26.9	26.3	25.8	25.4	25.0	24.5	24.0	23.4	22.7	22.0	21.2	20.7	...	...	...	...
17	29.2	28.4	27.1	25.9	24.8	23.9	23.1	22.4	21.7	21.2	20.7	20.2	...	...	...	...	...
18	29.2	28.8	28.1	27.6	27.1	26.7	26.2	25.6	25.0	24.3	23.5	22.5	...	...	...	...	...
19	29.2	29.2	29.2	29.2	29.0	28.3	27.7	27.2	26.7	26.2	25.7	22.5	18.3	...	...	...	...
(a) 20	29.2	29.2	29.2	29.2	29.2	28.6	28.2	...	27.5	27.2	26.8	26.2	...	...	...	...	...
21	25.0	23.5	22.9	22.5	22.1	21.8	21.4	20.9	20.4	19.8	19.2	18.5	17.9	15.7	12.6	9.3	6.7
22	26.7	25.1	24.4	24.0	23.6	23.2	22.8	22.3	21.7	21.1	20.4	19.8	19.1	15.7	12.6	9.3	6.7
23	28.0	26.3	25.7	25.2	24.8	24.4	23.9	23.4	22.8	22.2	21.5	20.8	20.2	15.7	12.6	9.3	6.7
24	30.0	28.2	27.5	27.0	26.5	26.1	25.6	25.1	24.4	23.7	23.0	22.2	...	...	...	...	...
25	30.0	27.8	26.5	25.3	24.3	23.4	22.6	21.9	21.2	20.7	20.2	19.7	19.3	...	...	...	...
26	30.0	27.8	26.5	25.3	24.3	23.4	22.6	21.9	21.2	20.7	20.2	19.7	19.3	...	...	...	...
27	31.3	31.3	30.7	29.8	29.0	28.3	27.7	27.2	26.7	26.2	25.7	24.4	21.4	...	...	...	...
28	31.3	31.3	31.3	31.3	31.3	31.2	30.5	29.9	29.3	28.8	28.3	24.4	...	...	...	...	...
29	31.3	31.3	31.3	31.3	31.3	31.2	30.5	29.9	29.3	28.8	28.3	24.4	...	...	...	...	...
30	33.3	31.3	30.5	30.0	29.5	29.0	28.5	27.9	27.2	26.4	25.6	24.4	19.6	...	...	...	...
31	33.3	33.3	33.3	32.8	31.9	31.2	30.5	29.9	29.3	28.8	28.3	25.1	24.7	...	...	...	...
32	33.3	33.3	33.3	33.3	33.3	33.3	33.3	32.6	32.0	31.4	30.8	26.0	...	...	...	...	...
33	33.3	33.3	33.3	33.3	33.3	33.3	33.3	32.6	32.0	31.4	30.8	26.0	...	...	...	...	...
(a) 34	33.3	...	33.3	...	33.3	...	33.3	...	33.0	32.6	32.1	31.4	...	...	...	...	...
(10) 35	33.3	31.9	30.6	29.1	27.6	26.2	25.1	24.2	23.5	23.0	22.6	22.3	...	...	...	...	...
(10) 36	33.3	31.9	30.6	29.1	27.6	26.2	25.1	24.2	23.5	23.0	22.6	22.3	...	...	...	...	...
37	35.4	35.4	35.4	35.4	34.8	34.0	33.3	32.6	32.0	31.4	30.8	24.4	...	...	...	...	...
38	36.7	35.1	33.6	32.0	30.3	28.9	27.6	26.6	25.9	25.3	24.9	24.4	...	...	...	...	...
39	37.5	37.5	37.5	37.5	37.5	36.7	35.2	33.9	32.9	32.2	31.7	26.2	25.9	...	...	...	...
40	37.5	37.5	37.5	37.5	37.5	36.7	35.2	33.9	32.9	32.2	31.7	26.2	25.9	...	...	...	...
41	39.6	39.6	39.6	39.6	39.6	39.4	37.7	36.3	35.3	34.5	33.9	26.2	25.9	...	...	...	...
42	29.2	29.2	29.2	29.1	27.6	26.2	25.1	24.2	23.5	23.0	22.6	22.3	22.1	...	...	...	...
43	33.3	33.3	33.3	33.3	33.1	31.5	30.1	29.1	28.2	27.6	27.1	26.2	25.9	...	...	...	...

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding											
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
1	4.0	2.5	...	...	...	...	...	...	...	...	...	...
2	4.0	2.5	...	...	...	...	...	...	...	...	...	...
3	4.0	2.5	...	...	...	...	...	...	...	...	...	...
4	4.0	2.5	...	...	...	...	...	...	...	...	...	...
5	4.0	2.5	...	...	...	...	...	...	...	...	...	...
6	4.0	2.5	...	...	...	...	...	...	...	...	...	...
7	4.0	2.5	...	...	...	...	...	...	...	...	...	...
8	4.0	2.5	...	...	...	...	...	...	...	...	...	...
9	4.0	2.5	...	...	...	...	...	...	...	...	...	...
10	4.0	2.5
11	4.0	2.5
12	4.0	2.5
13	4.0	2.5
14
15
16
17
18
19
20
21	4.0	2.5
22	4.0	2.5
23	4.0	2.5
24
25
26
27
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39
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41
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43

(a)

(a)

(10)

(10)

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	C- $\frac{1}{2}$ Mo	Smls. tube	SA-209	T1b	K11422	...	...	3	1
2	C- $\frac{1}{2}$ Mo	Smls. tube	SA-209	T1	K11522	...	...	3	1
3	C- $\frac{1}{2}$ Mo	Fittings	SA-234	WP1	K12821	...	...	3	1
4	C- $\frac{1}{2}$ Mo	Smls. pipe	SA-335	P1	K11522	...	...	3	1
5	C- $\frac{1}{2}$ Mo	Forged pipe	SA-369	FP1	K11522	...	...	3	1
6	C- $\frac{1}{2}$ Mo	Smls. tube	SA-209	T1a	K12023	...	...	3	1
7	C- $\frac{1}{2}$ Mo	Castings	SA-217	WC1	J12524	...	...	3	1
8	C- $\frac{1}{2}$ Mo	Castings	SA-352	LC1	J12522	...	...	3	1
9	C- $\frac{1}{2}$ Mo	Plate	SA-204	A	K11820	...	...	3	1
10	C- $\frac{1}{2}$ Mo	Forgings	SA-182	F1	K12822	...	...	3	2
11	C- $\frac{1}{2}$ Mo	Plate	SA-204	B	K12020	...	...	3	2
12	C- $\frac{1}{2}$ Mo	Forgings	SA-336	F1	K12520	...	...	3	2
13	C- $\frac{1}{2}$ Mo	Plate	SA-204	C	K12320	...	...	3	2
14	$\frac{1}{2}$ Cr- $\frac{1}{5}$ Mo	Forgings	SA-372	G	K13049	70	...	11B	...
15	$\frac{1}{2}$ Cr- $\frac{1}{5}$ Mo	Forgings	SA-372	H	K13547	70	...	11B	...
16	$\frac{1}{2}$ Cr- $\frac{1}{5}$ Mo-V	Plate	SA-517	B	K11630	...	$t \leq 1\frac{1}{4}$	11B	4
17	$\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-Si	Plate	SA-517	A	K11856	...	$t \leq 1\frac{1}{4}$	11B	1
18	$\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-Si	Forgings	SA-592	A	K11856	...	$t \leq 2\frac{1}{2}$	11B	1
19	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Smls. pipe	SA-335	P2	K11547	...	...	3	1
20	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Forged pipe	SA-369	FP2	K11547	...	...	3	1
21	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Plate	SA-387	2	K12143	1	...	3	1
22	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Smls. tube	SA-213	T2	K11547	...	...	3	1
23	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Forgings	SA-182	F2	K12122	...	...	3	2
24	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Plate	SA-387	2	K12143	2	...	3	2
25	$\frac{3}{4}$ Cr- $\frac{1}{2}$ Ni-Cu	Smls. tube	SA-423	1	K11535	...	...	4	2
26	$\frac{3}{4}$ Cr- $\frac{3}{4}$ Ni-Cu-Al	Smls. pipe	SA-333	4	K11267	...	...	4	2
27	1Cr- $\frac{1}{5}$ Mo	Forgings	SA-372	E	K13047	70	...	11B	1
28	1Cr- $\frac{1}{5}$ Mo	Forgings	SA-372	F	G41350	70	...	11B	1
29	1Cr- $\frac{1}{5}$ Mo	Forgings	SA-372	J	K13548	70	...	11B	1
30	1Cr- $\frac{1}{5}$ Mo	Forgings	SA-372	J	G41370	110	...	11B	1
31	1Cr- $\frac{1}{2}$ Mo	Plate	SA-387	12	K11757	1	...	4	1
32	1Cr- $\frac{1}{2}$ Mo	Forgings	SA-182	F12	K11562	1	...	4	1
33	1Cr- $\frac{1}{2}$ Mo	Smls. tube	SA-213	T12	K11562	...	...	4	1
34	1Cr- $\frac{1}{2}$ Mo	Fittings	SA-234	WP12	K12062	1	...	4	1
35	1Cr- $\frac{1}{2}$ Mo	Smls. pipe	SA-335	P12	K11562	...	...	4	1
36	1Cr- $\frac{1}{2}$ Mo	Forged pipe	SA-369	FP12	K11562	...	...	4	1
37	1Cr- $\frac{1}{2}$ Mo	Plate	SA-387	12	K11757	2	...	4	1
38	1Cr- $\frac{1}{2}$ Mo	Forgings	SA-182	F12	K11564	2	...	4	1
39	1Cr- $\frac{1}{2}$ Mo	Forgings	SA-336	F12	K11564	...	...	4	1
40	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo	Castings	SA-217	WC6	J12072	...	...	4	1
41	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo	Bar	SA-739	B11	K11797	...	...	4	1
42	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Forgings	SA-182	F11	K11597	1	...	4	1
43	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Smls. tube	SA-213	T11	K11597	...	...	4	1
44	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Fittings	SA-234	WP11	...	1	...	4	1

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Maximum Use Temperature, °F	External Pressure Chart No.	Notes
1	53	28	1000	CS-1	G14, T7
2	55	30	1000	CS-2	G14, T6
3	55	30	1000	CS-2	G14, T6
4	55	30	1000	CS-2	G14, T6
5	55	30	1000	CS-2	G14, T6
6	60	32	1000	CS-2	G14, T6
7	65	35	1000	CS-2	G14, T6
8	65	35	650	CS-2	...
9	65	37	1000	CS-2	G14, T6
10	70	40	1000	CS-2	G14, T6
11	70	40	1000	CS-2	G14, T6
12	70	40	1000	CS-2	G14, T6
13	75	43	1000	CS-2	G14, T6
14	120	70	200	CS-3	G9, H4, W2, W6
15	120	70	200	CS-3	G9, H4, W2, W6
16	115	100	650	HT-1	...
17	115	100	650	HT-1	...
18	115	100	650	HT-1	...
19	55	30	1000	CS-2	T7
20	55	30	1000	CS-2	T7
21	55	33	1000	CS-2	T6
22	60	30	1000	CS-2	T7
23	70	40	1000	CS-2	G14, T6
24	70	45	1000	CS-3	H2, T6
25	60	37	650	CS-2	...
26	60	35	650	CS-2	...
27	120	70	650	CS-5	G9, H4, W2, W6
28	120	70	650	CS-5	G9, H4, W2, W6
29	120	70	650	CS-5	G9, H4, W2, W6
30	135	110	650	HT-1	H4, W2, W6
31	55	33	1200	CS-2	T7
32	60	32	1200	CS-2	T7
33	60	32	1200	CS-2	T7
34	60	32	1200	CS-2	T7
35	60	32	1200	CS-2	T7
36	60	32	1200	CS-2	T7
37	65	40	1200	CS-2	T6
38	70	40	1200	CS-2	T6
39	70	40	1200	CS-2	T6
40	70	40	1100	CS-2	T6
41	70	45	1200	CS-3	T5
42	60	30	1200	CS-2	T7
43	60	30	1200	CS-2	T7
44	60	30	1200	CS-2	T7

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
Line No.	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
1	18.7	18.0	17.5	17.2	16.8	16.5	16.3	16.0	15.8	15.5	15.3	15.0	14.7	14.3	14.0	13.5	13.0
2	20.0	19.2	18.8	18.4	18.0	17.7	17.4	17.1	16.9	16.6	16.4	16.1	15.7	15.4	14.9	14.5	13.7
3	20.0	19.2	18.8	18.4	18.0	17.7	17.4	17.1	16.9	16.6	16.4	16.1	15.7	15.4	14.9	14.5	13.7
4	20.0	19.2	18.8	18.4	18.0	17.7	17.4	17.1	16.9	16.6	16.4	16.1	15.7	15.4	14.9	14.5	13.7
5	20.0	19.2	18.8	18.4	18.0	17.7	17.4	17.1	16.9	16.6	16.4	16.1	15.7	15.4	14.9	14.5	13.7
6	21.3	20.5	20.1	19.6	19.2	18.9	18.6	18.3	18.0	17.7	17.4	17.1	16.8	16.4	15.9	15.4	13.7
7	23.3	22.5	21.9	21.5	21.0	20.7	20.3	20.0	19.7	19.4	19.1	18.7	18.4	17.9	17.4	16.9	13.7
8	23.3	22.5	21.9	21.5	21.0	20.7	20.3	20.0	19.7	19.4	19.1	18.7	...	...	...	...	...
9	24.7	23.7	23.2	22.7	22.2	21.8	21.5	21.1	20.8	20.5	20.2	19.8	19.4	19.0	18.4	17.9	13.7
10	26.7	25.7	25.1	24.5	24.0	23.6	23.2	22.9	22.5	22.2	21.8	21.4	21.0	20.5	19.9	19.3	13.7
11	26.7	25.7	25.1	24.5	24.0	23.6	23.2	22.9	22.5	22.2	21.8	21.4	21.0	20.5	19.9	19.3	13.7
12	26.7	25.7	25.1	24.5	24.0	23.6	23.2	22.9	22.5	22.2	21.8	21.4	21.0	20.5	19.9	19.3	13.7
13	28.7	27.6	26.9	26.4	25.9	25.4	25.0	24.6	24.2	23.8	23.4	23.0	22.6	22.0	21.4	20.7	13.7
14	46.7	46.7	46.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	46.7	46.7	46.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	...	...	...	...	...
17	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	...	...	...	...	...
18	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	...	...	...	...	...
19	20.0	19.2	18.8	18.4	18.0	17.7	17.4	17.1	16.9	16.6	16.4	16.1	15.7	15.4	14.9	14.5	13.9
20	20.0	19.2	18.8	18.4	18.0	17.7	17.4	17.1	16.9	16.6	16.4	16.1	15.7	15.4	14.9	14.5	13.9
21	22.0	21.2	20.7	20.2	19.8	19.5	19.2	18.9	18.6	18.3	18.0	17.7	17.3	16.9	16.4	15.9	14.3
22	20.0	19.2	18.8	18.4	18.0	17.7	17.4	17.1	16.9	16.6	16.4	16.1	15.7	15.4	14.9	14.5	13.9
23	26.7	25.7	25.1	24.5	24.0	23.6	23.2	22.9	22.5	22.2	21.8	21.4	21.0	20.5	19.9	19.3	15.0
24	29.2	28.9	28.2	27.6	27.1	26.6	26.1	25.7	25.3	24.9	24.5	24.1	23.6	23.1	22.4	21.7	14.5
25	24.7	23.3	22.7	22.3	22.0	21.8	21.5	21.3	21.1	20.9	20.6	20.3	...	...	...	...	...
26	23.3	22.1	21.5	21.1	20.8	20.6	20.4	20.2	20.0	19.7	19.5	19.2	...	...	...	...	...
27	46.7	44.5	43.5	42.6	41.9	41.2	40.6	40.0	39.4	38.7	37.9	36.9	...	...	...	...	...
28	46.7	44.5	43.5	42.6	41.9	41.2	40.6	40.0	39.4	38.7	37.9	36.9	...	...	...	...	...
29	46.7	44.5	43.5	42.6	41.9	41.2	40.6	40.0	39.4	38.7	37.9	36.9	...	...	...	...	...
30	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	...	...	...	...	...
31	22.0	20.6	19.9	19.2	18.7	18.2	17.9	17.5	17.2	17.0	16.8	16.5	16.3	16.0	15.7	15.4	15.0
32	21.3	20.0	19.3	18.7	18.1	17.7	17.3	17.0	16.7	16.5	16.3	16.0	15.8	15.5	15.3	14.9	14.5
33	21.3	20.0	19.3	18.7	18.1	17.7	17.3	17.0	16.7	16.5	16.3	16.0	15.8	15.5	15.3	14.9	14.5
34	21.3	20.0	19.3	18.7	18.1	17.7	17.3	17.0	16.7	16.5	16.3	16.0	15.8	15.5	15.3	14.9	14.5
35	21.3	20.0	19.3	18.7	18.1	17.7	17.3	17.0	16.7	16.5	16.3	16.0	15.8	15.5	15.3	14.9	14.5
36	21.3	20.0	19.3	18.7	18.1	17.7	17.3	17.0	16.7	16.5	16.3	16.0	15.8	15.5	15.3	14.9	14.5
37	26.7	25.0	24.1	23.3	22.7	22.1	21.7	21.3	20.9	20.6	20.3	20.0	19.7	19.4	19.1	18.6	18.0
38	26.7	25.0	24.1	23.3	22.7	22.1	21.7	21.3	20.9	20.6	20.3	20.0	19.7	19.4	19.1	18.6	18.0
39	26.7	25.0	24.1	23.3	22.7	22.1	21.7	21.3	20.9	20.6	20.3	20.0	19.7	19.4	19.1	18.6	18.0
40	26.7	25.4	24.6	24.0	23.4	22.9	22.5	22.0	21.7	21.3	20.9	20.5	20.1	19.7	19.2	18.7	13.7
41	29.2	28.5	27.7	27.0	26.3	25.8	25.3	24.8	24.4	23.9	23.5	23.1	22.6	22.2	21.6	20.2	13.7
42	20.0	19.0	18.5	18.0	17.6	17.2	16.8	16.5	16.2	16.0	15.7	15.4	15.1	14.8	14.4	14.0	13.6
43	20.0	19.0	18.5	18.0	17.6	17.2	16.8	16.5	16.2	16.0	15.7	15.4	15.1	14.8	14.4	14.0	13.6
44	20.0	19.0	18.5	18.0	17.6	17.2	16.8	16.5	16.2	16.0	15.7	15.4	15.1	14.8	14.4	14.0	13.6

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding											
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
1	8.2	4.8	...	...	...	...	...	...	...	...	...	...
2	8.2	4.8	...	...	...	...	...	...	...	...	...	...
3	8.2	4.8	...	...	...	...	...	...	...	...	...	...
4	8.2	4.8	...	...	...	...	...	...	...	...	...	...
5	8.2	4.8	...	...	...	...	...	...	...	...	...	...
6	8.2	4.8	...	...	...	...	...	...	...	...	...	...
7	8.2	4.8	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...
9	8.2	4.8	...	...	...	...	...	...	...	...	...	...
10	8.2	4.8	...	...	...	...	...	...	...	...	...	...
11	8.2	4.8	...	...	...	...	...	...	...	...	...	...
12	8.2	4.8	...	...	...	...	...	...	...	...	...	...
13	8.2	4.8	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...
19	9.2	5.9	...	...	...	...	...	...	...	...	...	...
20	9.2	5.9	...	...	...	...	...	...	...	...	...	...
21	9.2	5.9	...	...	...	...	...	...	...	...	...	...
22	9.2	5.9	...	...	...	...	...	...	...	...	...	...
23	9.2	5.9	...	...	...	...	...	...	...	...	...	...
24	10.0	6.3	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...
31	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...
32	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...
33	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...
34	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...
35	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...
36	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...
37	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...
38	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...
39	11.3	7.2	4.5	2.8	1.8	1.1	...	...	...	...	...	...
40	9.3	6.3	4.2	2.8	...	...	...	...	...	...	...	...
41	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...
42	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...
43	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...
44	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Si}$	Smls. pipe	SA-335	P11	K11597	...	...	4	1
2	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Si}$	Forged pipe	SA-369	FP11	K11597	...	...	4	1
3	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Si}$	Plate	SA-387	11	K11789	1	...	4	1
4	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Si}$	Forgings	SA-182	F11	K11572	2	...	4	1
5	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Si}$	Forgings	SA-336	F11	K11572	2	...	4	1
6	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Si}$	Forgings	SA-336	F11	K11572	3	...	4	1
7	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Si}$	Plate	SA-387	11	K11789	2	...	4	1
8	$1\frac{3}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Cu}$	Forgings	SA-592	E	K11695	...	$2\frac{1}{2} < t \leq 4$	11B	2
9	$1\frac{3}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Cu}$	Forgings	SA-592	E	K11695	...	$t \leq 2\frac{1}{2}$	11B	2
10	$1\frac{3}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Ti}$	Plate	SA-517	E	K21604	...	$2\frac{1}{2} < t \leq 6$	11B	2
11	$1\frac{3}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Ti}$	Plate	SA-517	E	K21604	...	$t \leq 2\frac{1}{2}$	11B	2
12	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Forgings	SA-182	F22	K21590	1	...	5A	1
13	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Smls. tube	SA-213	T22	K21590	...	...	5A	1
14	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Fittings	SA-234	WP22	K21590	1	...	5A	1
15	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Smls. pipe	SA-335	P22	K21590	...	...	5A	1
16	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Forgings	SA-336	F22	K21590	1	...	5A	1
17	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Forged pipe	SA-369	FP22	K21590	...	...	5A	1
18	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Plate	SA-387	22	K21590	1	...	5A	1
19	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Castings	SA-217	WC9	J21890	...	...	5A	1
20	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Forgings	SA-182	F22	K21590	3	...	5A	1
21	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Forgings	SA-336	F22	K21590	3	...	5A	1
22	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Plate	SA-387	22	K21590	2	...	5A	1
23	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Bar	SA-739	B22	K21390	...	...	5A	1
24	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Castings	SA-487	8	J22091	A	...	5C	1
25	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Forgings	SA-508	22	K21590	3	...	5C	1
26	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Forgings	SA-541	22	K21390	3	...	5C	1
27	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Plate	SA-542	B	K21590	4	...	5C	1
28	$2\frac{1}{4}\text{Cr}-1\text{Mo}-\text{V}$	Forgings	SA-182	F22V	K31835	...	...	5C	1
29	$2\frac{1}{4}\text{Cr}-1\text{Mo}-\text{V}$	Forgings	SA-336	F22V	K31835	...	...	5C	1
30	$2\frac{1}{4}\text{Cr}-1\text{Mo}-\text{V}$	Forgings	SA-541	22V	K31835	...	...	5C	1
31	$2\frac{1}{4}\text{Cr}-1\text{Mo}-\text{V}$	Plate	SA-542	D	K31835	4a	...	5C	1
32	$2\frac{1}{4}\text{Cr}-1\text{Mo}-\text{V}$	Plate	SA-832	22V	K31835	...	...	5C	1
33	3Cr-1Mo	Smls. tube	SA-213	T21	K31545	...	...	5A	1
34	3Cr-1Mo	Smls. pipe	SA-335	P21	K31545	...	...	5A	1
35	3Cr-1Mo	Forgings	SA-336	F21	K31545	1	...	5A	1
36	3Cr-1Mo	Forged pipe	SA-369	FP21	K31545	...	...	5A	1
37	3Cr-1Mo	Plate	SA-387	21	K31545	1	...	5A	1
38	3Cr-1Mo	Forgings	SA-182	F21	K31545	...	...	5A	1
39	3Cr-1Mo	Forgings	SA-336	F21	K31545	3	...	5A	1
40	3Cr-1Mo	Plate	SA-387	21	K31545	2	...	5A	1

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Maximum Use Temperature, °F	External Pressure Chart No.	Notes
1	60	30	1200	CS-2	T7
2	60	30	1200	CS-2	T7
3	60	35	1200	CS-2	T6
4	70	40	1200	CS-2	T7
5	70	40	1200	CS-2	T7
6	75	45	1200	CS-3	T5
7	75	45	1200	CS-3	T5
8	105	90	650	CS-5	S1
9	115	100	650	HT-1	...
10	105	90	650	CS-5	...
11	115	100	650	HT-1	...
12	60	30	1200	CS-2	T5, W5
13	60	30	1200	CS-2	T5, W5
14	60	30	1200	CS-2	T5, W5
15	60	30	1200	CS-2	T5, W5
16	60	30	1200	CS-2	T5, W5
17	60	30	1200	CS-2	T5, W5
18	60	30	1200	CS-2	H1, T5, W5
19	70	40	1200	CS-2	T7, W5
20	75	45	1200	CS-3	T5, W5
21	75	45	1200	CS-3	T5, W5
22	75	45	1200	CS-3	T5, W5
23	75	45	1200	CS-3	T5, W5
24	85	55	1000	CS-3	T5, W5
25	85	55	850	CS-2	G12, T5
26	85	55	850	CS-2	G12, T5
27	85	55	850	CS-2	G12, T5
28	85	60	900	CS-2	G12, T5
29	85	60	900	CS-2	G12, T5
30	85	60	900	CS-2	G12, T5
31	85	60	900	CS-2	G12, T5
32	85	60	900	CS-2	G12, T5
33	60	30	1200	CS-2	T5
34	60	30	1200	CS-2	T5
35	60	30	1200	CS-2	T5
36	60	30	1200	CS-2	T5
37	60	30	1200	CS-2	T5
38	75	45	1200	CS-3	T6
39	75	45	1200	CS-3	T6
40	75	45	1200	CS-3	T6

2011a SECTION II, PART D (CUSTOMARY)

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
Line No.	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
1	20.0	19.0	18.5	18.0	17.6	17.2	16.8	16.5	16.2	16.0	15.7	15.4	15.1	14.8	14.4	14.0	13.6
2	20.0	19.0	18.5	18.0	17.6	17.2	16.8	16.5	16.2	16.0	15.7	15.4	15.1	14.8	14.4	14.0	13.6
3	23.3	22.2	21.5	21.0	20.5	20.0	19.6	19.3	18.9	18.6	18.3	18.0	17.6	17.2	16.8	16.4	13.7
4	26.7	25.4	24.6	24.0	23.4	22.9	22.5	22.0	21.7	21.3	20.9	20.5	20.1	19.7	19.2	18.7	14.5
5	26.7	25.4	24.6	24.0	23.4	22.9	22.5	22.0	21.7	21.3	20.9	20.5	20.1	19.7	19.2	18.7	14.5
6	30.0	28.5	27.7	27.0	26.3	25.8	25.3	24.8	24.4	23.9	23.5	23.1	22.6	22.2	21.6	20.2	13.7
7	30.0	28.5	27.7	27.0	26.3	25.8	25.3	24.8	24.4	23.9	23.5	23.1	22.6	22.2	21.6	20.2	13.7
8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	...	...	...	...	...
9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	...	...	...	...	...
10	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	...	...	...	...	...
11	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	...	...	...	...	...
12	20.0	19.1	18.7	18.4	18.2	18.0	18.0	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.7	17.1	13.6
13	20.0	19.1	18.7	18.4	18.2	18.0	18.0	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.7	17.1	13.6
14	20.0	19.1	18.7	18.4	18.2	18.0	18.0	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.7	17.1	13.6
15	20.0	19.1	18.7	18.4	18.2	18.0	18.0	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.7	17.1	13.6
16	20.0	19.1	18.7	18.4	18.2	18.0	18.0	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.7	17.1	13.6
17	20.0	19.1	18.7	18.4	18.2	18.0	18.0	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.7	17.1	13.6
18	20.0	19.1	18.7	18.4	18.2	18.0	18.0	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.7	17.1	13.6
19	26.7	25.3	24.7	24.2	23.9	23.6	23.4	23.2	23.0	22.7	22.5	22.2	21.9	21.6	21.2	20.7	16.0
20	30.0	28.3	27.5	26.8	26.2	25.8	25.4	25.1	24.8	24.6	24.3	24.0	23.7	23.3	22.9	21.9	17.0
21	30.0	28.3	27.5	26.8	26.2	25.8	25.4	25.1	24.8	24.6	24.3	24.0	23.7	23.3	22.9	21.9	17.0
22	30.0	28.3	27.5	26.8	26.2	25.8	25.4	25.1	24.8	24.6	24.3	24.0	23.7	23.3	22.9	21.9	17.0
23	30.0	28.3	27.5	26.8	26.2	25.8	25.4	25.1	24.8	24.6	24.3	24.0	23.7	23.3	22.9	21.9	17.0
24	35.4	34.7	33.9	33.3	32.8	32.4	32.1	31.9	31.6	31.3	31.0	30.6	30.2	29.7	29.2	21.9	15.8
25	35.4	34.7	33.9	33.3	32.8	32.4	32.1	31.9	31.6	31.3	31.0	30.6	30.2	29.7	29.2	21.9	...
26	35.4	34.7	33.9	33.3	32.8	32.4	32.1	31.9	31.6	31.3	31.0	30.6	30.2	29.7	29.2	21.9	...
27	35.4	34.7	33.9	33.3	32.8	32.4	32.1	31.9	31.6	31.3	31.0	30.6	30.2	29.7	29.2	21.9	...
28	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	34.9	34.2	33.4	28.9	23.8
29	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	34.9	34.2	33.4	28.9	23.8
30	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	34.9	34.2	33.4	28.9	23.8
31	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	34.9	34.2	33.4	28.9	23.8
32	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	34.9	34.2	33.4	28.9	23.8
33	20.0	19.1	18.7	18.4	18.2	18.0	18.0	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.7	16.0	12.0
34	20.0	19.1	18.7	18.4	18.2	18.0	18.0	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.7	16.0	12.0
35	20.0	19.1	18.7	18.4	18.2	18.0	18.0	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.7	16.0	12.0
36	20.0	19.1	18.7	18.4	18.2	18.0	18.0	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.7	16.0	12.0
37	20.0	19.1	18.7	18.4	18.2	18.0	18.0	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.7	16.0	12.0
38	30.0	28.3	27.5	26.8	26.2	25.8	25.4	25.1	24.8	24.6	24.3	24.0	23.7	23.3	22.9	19.0	13.1
39	30.0	28.3	27.5	26.8	26.2	25.8	25.4	25.1	24.8	24.6	24.3	24.0	23.7	23.3	22.9	19.0	13.1
40	30.0	28.3	27.5	26.8	26.2	25.8	25.4	25.1	24.8	24.6	24.3	24.0	23.7	23.3	22.9	19.0	13.1

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding											
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
1	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...
2	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...
3	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...
4	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...
5	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...
6	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...
7	9.3	6.3	4.2	2.8	1.9	1.2	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...
12	10.8	8.0	5.7	3.8	2.4	1.4	...	...	...	...	...	...
13	10.8	8.0	5.7	3.8	2.4	1.4	...	...	...	...	...	...
14	10.8	8.0	5.7	3.8	2.4	1.4	...	...	...	...	...	...
15	10.8	8.0	5.7	3.8	2.4	1.4	...	...	...	...	...	...
16	10.8	8.0	5.7	3.8	2.4	1.4	...	...	...	...	...	...
17	10.8	8.0	5.7	3.8	2.4	1.4	...	...	...	...	...	...
18	10.8	8.0	5.7	3.8	2.4	1.4	...	...	...	...	...	...
19	11.4	7.8	5.1	3.2	2.0	1.2	...	...	...	...	...	...
20	11.4	7.8	5.1	3.2	2.0	1.2	...	...	...	...	...	...
21	11.4	7.8	5.1	3.2	2.0	1.2	...	...	...	...	...	...
22	11.4	7.8	5.1	3.2	2.0	1.2	...	...	...	...	...	...
23	11.4	7.8	5.1	3.2	2.0	1.2	...	...	...	...	...	...
24	11.4	7.8	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...	...
33	9.0	7.0	5.5	4.0	2.7	1.5	...	...	...	...	...	...
34	9.0	7.0	5.5	4.0	2.7	1.5	...	...	...	...	...	...
35	9.0	7.0	5.5	4.0	2.7	1.5	...	...	...	...	...	...
36	9.0	7.0	5.5	4.0	2.7	1.5	...	...	...	...	...	...
37	9.0	7.0	5.5	4.0	2.7	1.5	...	...	...	...	...	...
38	9.5	6.8	4.9	3.2	2.4	1.3	...	...	...	...	...	...
39	9.5	6.8	4.9	3.2	2.4	1.3	...	...	...	...	...	...
40	9.5	6.8	4.9	3.2	2.4	1.3	...	...	...	...	...	...

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Forgings	SA-182	F3V	K31830	...	...	5C	1
2	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Forgings	SA-336	F3V	K31830	...	...	5C	1
3	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Forgings	SA-508	3V	K31830	...	...	5C	1
4	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Forgings	SA-541	3V	K31830	...	...	5C	1
5	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Plate	SA-542	C	K31830	4a	...	5C	1
6	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Plate	SA-832	21V	K31830	...	...	5C	1
7	5Cr- $\frac{1}{2}$ Mo	Smls. tube	SA-213	T5	K41545	...	...	5B	1
8	5Cr- $\frac{1}{2}$ Mo	Fittings	SA-234	WP5	K41545	...	...	5B	1
9	5Cr- $\frac{1}{2}$ Mo	Smls. pipe	SA-335	P5	K41545	...	...	5B	1
10	5Cr- $\frac{1}{2}$ Mo	Forged pipe	SA-369	FP5	K41545	...	...	5B	1
11	5Cr- $\frac{1}{2}$ Mo	Plate	SA-387	5	K41545	1	...	5B	1
12	5Cr- $\frac{1}{2}$ Mo	Forgings	SA-336	F5	K41545	...	...	5B	1
13	5Cr- $\frac{1}{2}$ Mo	Forgings	SA-182	F5	K41545	...	...	5B	1
14	5Cr- $\frac{1}{2}$ Mo	Plate	SA-387	5	K41545	2	...	5B	1
15	5Cr- $\frac{1}{2}$ Mo	Forgings	SA-336	F5A	K42544	...	...	5B	1
16	5Cr- $\frac{1}{2}$ Mo	Castings	SA-217	C5	J42045	...	...	5B	1
17	5Cr- $\frac{1}{2}$ Mo	Forgings	SA-182	F5a	K42544	...	...	5B	1
18	5Cr- $\frac{1}{2}$ Mo-Si	Smls. tube	SA-213	T5b	K51545	...	...	5B	1
19	5Cr- $\frac{1}{2}$ Mo-Si	Smls. pipe	SA-335	P5b	K51545	...	...	5B	1
20	5Cr- $\frac{1}{2}$ Mo-Ti	Smls. tube	SA-213	T5c	K41245	...	...	5B	1
21	5Cr- $\frac{1}{2}$ Mo-Ti	Smls. pipe	SA-335	P5c	K41245	...	...	5B	1
22	9Cr-1Mo	Smls. tube	SA-213	T9	K90941	...	...	5B	1
23	9Cr-1Mo	Fittings	SA-234	WP9	K90941	...	...	5B	1
24	9Cr-1Mo	Smls. pipe	SA-335	P9	K90941	...	...	5B	1
25	9Cr-1Mo	Forged pipe	SA-369	FP9	K90941	...	...	5B	1
26	9Cr-1Mo	Forgings	SA-182	F9	K90941	...	...	5B	1
27	9Cr-1Mo	Forgings	SA-336	F9	K90941	...	...	5B	1
28	9Cr-1Mo	Castings	SA-217	C12	J82090	...	...	5B	1
29	9Cr-1Mo-V	Forgings	SA-182	F91	K90901	...	...	15E	1
30	9Cr-1Mo-V	Smls. tube	SA-213	T91	K90901	...	...	15E	1
31	9Cr-1Mo-V	Smls. pipe	SA-335	P91	K90901	...	...	15E	1
32	9Cr-1Mo-V	Plate	SA-387	91	K90901	2	...	15E	1
33	12Cr-Al	Plate	SA-240	405	S40500	...	...	7	1
34	12Cr-Al	Smls. tube	SA-268	TP405	S40500	...	...	7	1
35	13Cr	Plate	SA-240	410S	S41008	...	...	7	1
36	13Cr	Smls. tube	SA-268	TP410	S41000	...	...	6	1
37	13Cr	Plate	SA-240	410	S41000	...	...	6	1
38	13Cr	Forgings	SA-182	F6a	S41000	1	...	6	3
39	13Cr	Forgings	SA-182	F6a	S41000	2	...	6	3
40	13Cr	Forgings	SA-336	F6	S41000	...	...	6	3
41	13Cr	Castings	SA-217	CA15	J91150	...	...	6	3
42	15Cr	Smls. tube	SA-268	TP429	S42900	...	...	6	2
43	15Cr	Plate	SA-240	429	S42900	...	...	6	2
44	17Cr	Smls. tube	SA-268	TP430	S43000	...	...	7	2
45	17Cr	Plate	SA-240	430	S43000	...	...	7	2

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Maximum Use Temperature, °F	External Pressure Chart No.	Notes
1	85	60	900	CS-3	G12, T4
2	85	60	900	CS-3	G12, T4
3	85	60	900	CS-3	G12, T4
4	85	60	900	CS-3	G12, T4
5	85	60	900	CS-3	G12, T4
6	85	60	900	CS-3	G12, T4
7	60	30	1200	CS-2	T5
8	60	30	1200	CS-2	T5
9	60	30	1200	CS-2	T5
10	60	30	1200	CS-2	T5
11	60	30	1200	CS-2	T5
12	60	36	1200	CS-2	T5
13	70	40	1200	CS-2	T5
14	75	45	1200	CS-3	T5
15	80	50	1200	CS-3	T5
16	90	60	1200	CS-3	H2, T5
17	90	65	1200	CS-5	T5
18	60	30	1200	CS-2	T5
19	60	30	1200	CS-2	T5
20	60	30	1200	CS-2	T5
21	60	30	1200	CS-2	T5
22	60	30	1200	CS-2	T7
23	60	30	1200	CS-2	T7
24	60	30	1200	CS-2	T7
25	60	30	1200	CS-2	T7
26	85	55	1200	CS-3	T6
27	85	55	1200	CS-3	T6
28	90	60	1200	CS-3	H2, T6
29	85	60	1200	CS-3	T7
30	85	60	1200	CS-3	T7
31	85	60	1200	CS-3	T7
32	85	60	1200	CS-3	T7
33	60	25	1000	CS-1	G8, T7
34	60	30	1000	CS-2	G8, T7
35	60	30	1200	CS-2	T6
36	60	30	1200	CS-2	T6
37	65	30	1200	CS-2	T6
38	70	40	1200	CS-3	T4
39	80	55	1200	CS-3	T4
40	85	55	1200	CS-3	T4
41	90	65	1200	CS-5	T4
42	60	35	1200	CS-2	G8, T5
43	65	30	1200	CS-2	G8, T6
44	60	35	1200	CS-2	G8, T5
45	65	30	1200	CS-2	G8, T6

2011a SECTION II, PART D (CUSTOMARY)

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
Line No.	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
1	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	34.8	34.1	33.3	31.2	25.8	21.0
2	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	34.8	34.1	33.3	31.2	25.8	21.0
3	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	34.8	34.1	33.3	31.2	25.8	21.0
4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	34.8	34.1	33.3	31.2	25.8	21.0
5	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	34.8	34.1	33.3	31.2	25.8	21.0
6	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	34.8	34.1	33.3	31.2	25.8	21.0
7	20.0	18.7	18.1	17.7	17.4	17.3	17.2	17.1	17.1	17.0	16.8	16.6	16.3	15.9	15.4	14.3	10.9
8	20.0	18.7	18.1	17.7	17.4	17.3	17.2	17.1	17.1	17.0	16.8	16.6	16.3	15.9	15.4	14.3	10.9
9	20.0	18.7	18.1	17.7	17.4	17.3	17.2	17.1	17.1	17.0	16.8	16.6	16.3	15.9	15.4	14.3	10.9
10	20.0	18.7	18.1	17.7	17.4	17.3	17.2	17.1	17.1	17.0	16.8	16.6	16.3	15.9	15.4	14.3	10.9
11	20.0	18.7	18.1	17.7	17.4	17.3	17.2	17.1	17.1	17.0	16.8	16.6	16.3	15.9	15.4	14.3	10.9
12	24.0	22.4	21.7	21.2	20.9	20.7	20.6	20.5	20.5	20.4	20.2	19.9	19.6	19.1	18.5	14.3	10.9
13	26.7	24.9	24.1	23.6	23.2	23.0	22.9	22.8	22.7	22.6	22.4	22.1	21.7	21.2	20.5	14.3	10.9
14	30.0	28.0	27.1	26.5	26.1	25.9	25.8	25.7	25.6	25.4	25.2	24.9	24.5	23.9	23.1	14.3	10.9
15	33.3	31.1	30.1	29.5	29.0	28.8	28.6	28.5	28.4	28.3	28.0	27.7	27.2	26.5	25.7	14.3	10.9
16	37.5	37.3	36.2	35.4	34.8	34.5	34.4	34.2	34.1	33.9	33.6	33.2	32.6	31.8	30.8	14.3	10.9
17	37.5	37.5	37.5	37.5	37.5	37.4	37.2	37.1	36.9	36.7	36.4	36.0	35.3	34.5	33.4	14.3	10.9
18	20.0	18.7	18.1	17.7	17.4	17.3	17.2	17.1	17.1	17.0	16.8	16.6	16.3	15.9	15.4	14.3	10.9
19	20.0	18.7	18.1	17.7	17.4	17.3	17.2	17.1	17.1	17.0	16.8	16.6	16.3	15.9	15.4	14.3	10.9
20	20.0	18.7	18.1	17.7	17.4	17.3	17.2	17.1	17.1	17.0	16.8	16.6	16.3	15.9	15.4	14.3	10.9
21	20.0	18.7	18.1	17.7	17.4	17.3	17.2	17.1	17.1	17.0	16.8	16.6	16.3	15.9	15.4	14.3	10.9
22	20.0	18.7	18.1	17.7	17.4	17.3	17.2	17.1	17.1	17.0	16.8	16.6	16.3	15.9	15.4	14.8	14.1
23	20.0	18.7	18.1	17.7	17.4	17.3	17.2	17.1	17.1	17.0	16.8	16.6	16.3	15.9	15.4	14.8	14.1
24	20.0	18.7	18.1	17.7	17.4	17.3	17.2	17.1	17.1	17.0	16.8	16.6	16.3	15.9	15.4	14.8	14.1
25	20.0	18.7	18.1	17.7	17.4	17.3	17.2	17.1	17.1	17.0	16.8	16.6	16.3	15.9	15.4	14.8	14.1
26	35.4	34.2	33.1	32.4	31.9	31.7	31.5	31.4	31.3	31.1	30.8	30.4	29.9	29.2	28.2	27.1	16.4
27	35.4	34.2	33.1	32.4	31.9	31.7	31.5	31.4	31.3	31.1	30.8	30.4	29.9	29.2	28.2	27.1	16.4
28	37.5	37.3	36.2	35.4	34.8	34.5	34.4	34.2	34.1	33.9	33.6	33.2	32.6	31.8	30.8	29.6	16.4
29	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	34.7	33.6	32.3	30.8
30	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	34.7	33.6	32.3	30.8
31	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	34.7	33.6	32.3	30.8
32	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	34.7	33.6	32.3	30.8
33	16.7	15.8	15.3	15.0	14.8	14.6	14.5	14.4	14.3	14.2	14.0	13.8	13.5	13.1	12.6	12.0	11.3
34	20.0	18.9	18.4	18.0	17.8	17.6	17.4	17.3	17.2	17.0	16.8	16.6	16.2	15.7	15.1	14.4	13.5
35	20.0	18.9	18.4	18.0	17.8	17.6	17.4	17.3	17.2	17.0	16.8	16.6	16.2	15.7	15.1	14.4	12.3
36	20.0	18.9	18.4	18.0	17.8	17.6	17.4	17.3	17.2	17.0	16.8	16.6	16.2	15.7	15.1	14.4	12.3
37	20.0	18.9	18.4	18.0	17.8	17.6	17.4	17.3	17.2	17.0	16.8	16.6	16.2	15.7	15.1	14.4	12.3
38	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	24.0	17.2	12.3
39	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	24.0	17.2	12.3
40	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	24.0	17.2	12.3
41	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	24.0	17.2	12.3
42	23.3	22.1	21.5	21.0	20.7	20.5	20.3	20.2	20.1	19.9	19.6	19.3	18.9	18.3	17.6	15.7	12.0
43	20.0	18.9	18.4	18.0	17.8	17.6	17.4	17.3	17.2	17.0	16.8	16.6	16.2	15.7	15.1	14.4	12.0
44	23.3	22.1	21.5	21.0	20.7	20.5	20.3	20.2	20.1	19.9	19.6	19.3	18.9	18.3	17.6	15.7	12.0
45	20.0	18.9	18.4	18.0	17.8	17.6	17.4	17.3	17.2	17.0	16.8	16.6	16.2	15.7	15.1	14.4	12.0

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding											
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
1	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...
7	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...
8	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...
9	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...
10	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...
11	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...
12	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...
13	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...
14	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...
15	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...
16	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...
17	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...
18	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...
19	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...
20	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...
21	8.0	5.8	4.2	2.9	1.8	1.0	...	...	...	...	...	...
22	10.6	7.4	5.0	3.3	2.2	1.5	...	...	...	...	...	...
23	10.6	7.4	5.0	3.3	2.2	1.5	...	...	...	...	...	...
24	10.6	7.4	5.0	3.3	2.2	1.5	...	...	...	...	...	...
25	10.6	7.4	5.0	3.3	2.2	1.5	...	...	...	...	...	...
26	11.0	7.4	5.0	3.3	2.2	1.5	...	...	...	...	...	...
27	11.0	7.4	5.0	3.3	2.2	1.5	...	...	...	...	...	...
28	11.0	7.4	5.0	3.3	2.2	1.5	...	...	...	...	...	...
29	25.9	19.0	14.0	10.3	7.0	4.3	...	...	...	...	...	...
30	25.9	19.0	14.0	10.3	7.0	4.3	...	...	...	...	...	...
31	25.9	19.0	14.0	10.3	7.0	4.3	...	...	...	...	...	...
32	25.9	19.0	14.0	10.3	7.0	4.3	...	...	...	...	...	...
33	8.4	4.0	...	...	...	...	...	...	...	...	...	...
34	8.4	4.0	...	...	...	...	...	...	...	...	...	...
35	8.8	6.4	4.4	2.9	1.8	1.0	...	...	...	...	...	...
36	8.8	6.4	4.4	2.9	1.8	1.0	...	...	...	...	...	...
37	8.8	6.4	4.4	2.9	1.8	1.0	...	...	...	...	...	...
38	8.8	6.4	4.4	2.9	1.8	1.0	...	...	...	...	...	...
39	8.8	6.4	4.4	2.9	1.8	1.0	...	...	...	...	...	...
40	8.8	6.4	4.4	2.9	1.8	1.0	...	...	...	...	...	...
41	8.8	6.4	4.4	2.9	1.8	1.0	...	...	...	...	...	...
42	9.2	6.5	4.5	3.2	2.4	1.8	...	...	...	...	...	...
43	9.2	6.5	4.5	3.2	2.4	1.8	...	...	...	...	...	...
44	9.2	6.5	4.5	3.2	2.4	1.8	...	...	...	...	...	...
45	9.2	6.5	4.5	3.2	2.4	1.8	...	...	...	...	...	...

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
(10)	1	17Cr-4Ni-4Cu	Bar	SA-564	630	S17400	H1100	...	...
(10)	2	17Cr-4Ni-4Cu	Plate	SA-693	630	S17400	H1100	...	...
(10)	3	17Cr-4Ni-4Cu	Forgings	SA-705	630	S17400	H1100	...	...
	4	26Cr-3Ni-3Mo	Plate	SA-240	26-3-3	S44660	...	$t \leq \frac{2}{10}$	10K 1
	5	26Cr-3Ni-3Mo	Smls. tube	SA-268	26-3-3	S44660	...	$t \leq \frac{2}{10}$	10K 1
	6	26Cr-3Ni-3Mo	Wld. tube	SA-268	26-3-3	S44660	...	$t \leq \frac{2}{10}$	10K 1
	7	26Cr-3Ni-3Mo	Wld. tube	SA-803	26-3-3	S44660	...	$t \leq \frac{2}{10}$	10K 1
	8	29Cr-4Mo-Ti	Smls. tube	SA-268	...	S44735	...	...	10J 1
	9	Mn- $\frac{1}{4}$ Mo	Forgings	SA-372	D	K14508	...	...	11A 4
	10	Mn- $\frac{1}{4}$ Mo	Forgings	SA-372	D	K10508	...	...	11A 4
	11	Mn- $\frac{1}{2}$ Mo	Plate	SA-302	A	K12021	...	...	3 2
	12	Mn- $\frac{1}{2}$ Mo	Plate	SA-302	B	K12022	...	...	3 3
	13	Mn- $\frac{1}{2}$ Mo	Plate	SA-533	A	K12521	1	...	3 3
	14	Mn- $\frac{1}{2}$ Mo	Plate	SA-533	A	K12521	2	...	3 3
	15	Mn- $\frac{1}{2}$ Mo- $\frac{1}{4}$ Ni	Plate	SA-533	D	K12529	2	...	3 3
	16	Mn- $\frac{1}{2}$ Mo- $\frac{1}{4}$ Ni	Plate	SA-533	D	K12529	3	...	11A 4
	17	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Plate	SA-302	C	K12039	...	...	3 3
	18	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Plate	SA-533	B	K12539	1	...	3 3
	19	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Plate	SA-533	B	K12539	2	...	3 3
	20	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Plate	SA-533	B	K12539	3	...	11A 4
	21	Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni	Plate	SA-302	D	K12054	...	...	3 3
	22	Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni	Plate	SA-533	C	K12554	1	...	3 3
	23	Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni	Plate	SA-533	C	K12554	2	...	3 3
	24	Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni	Plate	SA-533	B, Cl. 3	K12554	...	...	3 3
	25	Mn- $\frac{1}{2}$ Ni-V	Plate	SA-225	C	K12524	...	...	10A 1
	26	Mn-V	Castings	SA-487	1	J13002	A	...	10A 1
	27	$\frac{1}{2}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-V	Castings	SA-487	4	J13047	A	...	3 3
	28	$\frac{1}{2}$ Ni- $\frac{1}{2}$ Mo-V	Forgings	SA-541	3	K12045	1	...	3 3
	29	$\frac{1}{2}$ Ni- $\frac{1}{2}$ Mo-V	Forgings	SA-541	3	K12045	2	...	3 3
	30	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-592	F	K11576	...	$2\frac{1}{2} < t \leq 4$	11B 3
	31	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Plate	SA-517	F	K11576	...	$t \leq 2\frac{1}{2}$	11B 3
	32	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-592	F	K11576	...	$t \leq 2\frac{1}{2}$	11B 3
	33	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Cu-Mo	Smls. tube	SA-423	2	K11540	...	...	4 2
	34	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo- $\frac{1}{3}$ Cr-V	Forgings	SA-508	2	K12766	1	...	3 3
	35	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo- $\frac{1}{3}$ Cr-V	Forgings	SA-541	2	K12765	1	...	3 3
	36	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo- $\frac{1}{3}$ Cr-V	Forgings	SA-508	2	K12766	2	...	3 3
	37	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo- $\frac{1}{3}$ Cr-V	Forgings	SA-541	2	K12765	2	...	3 3
	38	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo-Cr-V	Forgings	SA-508	3	K12042	1	...	3 3
	39	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo-Cr-V	Forgings	SA-508	3	K12042	2	...	3 3
	40	$\frac{3}{4}$ Ni-1Mo- $\frac{3}{4}$ Cr	Castings	SA-217	WC5	J22000	...	...	4 1
	41	1Ni- $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Castings	SA-217	WC4	J12082	...	...	4 1
	42	$1\frac{1}{4}$ Ni-1Cr- $\frac{1}{2}$ Mo	Plate	SA-517	P	K21650	...	$2\frac{1}{2} < t \leq 4$	11B 8
	43	$1\frac{1}{4}$ Ni-1Cr- $\frac{1}{2}$ Mo	Plate	SA-517	P	K21650	...	$t \leq 2\frac{1}{2}$	11B 8

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Maximum Use Temperature, °F	External Pressure Chart No.	Notes
1	140	115	600	HT-1	G8, W1 (10)
2	140	115	600	HT-1	G8, W1 (10)
3	140	115	600	HT-1	G8, W1 (10)
4	85	65	700	HA-5	G8, H6
5	85	65	700	HA-5	G8, H6
6	85	65	700	HA-5	G6, G8, H6
7	85	65	600	HA-5	G6, G8, H6
8	75	60	800	HA-6	G8
9	105	65	650	CS-5	G9, H3, T1, W2, W6
10	105	65	650	CS-5	G9, H5, W2, W6
11	75	45	1000	CS-3	G14, T5
12	80	50	1000	CS-3	G14, T5
13	80	50	1000	CS-5	T5
14	90	70	800	CS-5	...
15	90	70	800	CS-5	...
16	100	83	750	CS-5	...
17	80	50	1000	CS-3	G14, T5
18	80	50	800	CS-5	...
19	90	70	800	CS-5	...
20	100	83	800	CS-5	...
21	80	50	1000	CS-3	G14, T5
22	80	50	800	CS-5	...
23	90	70	800	CS-5	...
24	100	83	800	CS-5	...
25	105	70	700	CS-5	T1
26	85	55	650	CS-3	H2, T1
27	90	60	650	CS-3	H2
28	80	50	800	CS-5	...
29	90	65	700	CS-5	...
30	105	90	650	CS-5	S1
31	115	100	650	HT-1	...
32	115	100	650	HT-1	...
33	60	37	650	CS-2	...
34	80	50	800	CS-5	...
35	80	50	800	CS-5	...
36	90	65	700	CS-5	...
37	90	65	700	CS-5	...
38	80	50	800	CS-5	...
39	90	65	700	CS-5	...
40	70	40	1100	CS-2	T6
41	70	40	1000	CS-2	T6
42	105	90	650	CS-5	...
43	115	100	650	HT-1	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
Line No.	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
(10)	1	58.3	58.3	58.3	58.3	58.3	58.3	58.3	58.3	58.3	58.3	...	...	...	...	...	...
(10)	2	58.3	58.3	58.3	58.3	58.3	58.3	58.3	58.3	58.3	58.3	...	...	...	...	...	...
(10)	3	58.3	58.3	58.3	58.3	58.3	58.3	58.3	58.3	58.3	58.3	...	...	...	...	...	...
	4	35.4	35.4	35.4	35.4	35.4	34.8	34.2	33.8	33.4	33.2	33.0	32.8	...	...	...	...
	5	35.4	35.4	35.4	35.4	35.4	34.8	34.2	33.8	33.4	33.2	33.0	32.8	...	...	...	...
	6	30.1	30.1	30.1	30.1	30.1	29.6	29.1	28.7	28.4	28.2	28.0	27.9	...	...	...	...
	7	30.1	30.1	30.1	30.1	30.1	29.6	29.1	28.7	28.4	28.2	...	...	...	...	...	...
	8	31.3	31.3	31.3	31.3	29.6	28.1	26.8	25.7	24.9	24.3	23.9	23.7	23.6	23.3	22.7	...
	9	43.3	41.8	41.2	40.4	39.4	38.2	36.9	35.7	34.7	33.9	33.5	24.4	...	...	...	...
	10	43.3	41.6	40.8	40.0	39.4	38.8	38.3	37.9	37.4	36.9	36.5	35.9	...	...	...	...
	11	30.0	28.8	28.2	27.7	27.3	26.9	26.5	26.2	25.9	25.6	25.2	24.9	24.4	23.9	23.2	20.0 13.7
	12	33.3	32.0	31.4	30.8	30.3	29.9	29.5	29.1	28.8	28.4	28.0	27.6	27.1	26.5	25.7	20.0 13.7
	13	33.3	32.0	31.4	30.8	30.3	29.9	29.5	29.1	28.8	28.4	28.0	27.6	27.1	26.5	25.7	20.0 13.7
	14	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.2	36.0	...
	15	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.2	36.0	...
	16	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	...	...
	17	33.3	32.0	31.4	30.8	30.3	29.9	29.5	29.1	28.8	28.4	28.0	27.6	27.1	26.5	25.7	20.0 13.7
	18	33.3	32.0	31.4	30.8	30.3	29.9	29.5	29.1	28.8	28.4	28.0	27.6	27.1	26.5	25.7	...
	19	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.2	36.0	...
	20	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	...
	21	33.3	32.0	31.4	30.8	30.3	29.9	29.5	29.1	28.8	28.4	28.0	27.6	27.1	26.5	25.7	20.0 13.7
	22	33.3	32.0	31.4	30.8	30.3	29.9	29.5	29.1	28.8	28.4	28.0	27.6	27.1	26.5	25.7	...
	23	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.2	36.0	...
	24	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	41.7	...
	25	43.8	43.3	42.5	42.1	41.6	40.9	39.9	38.6	37.3	36.0	34.9	24.4	19.6	...	...	...
	26	35.4	35.2	34.5	33.9	33.3	32.9	32.4	32.0	31.6	31.3	30.9	24.4	...	...	...	...
	27	37.5	37.5	37.5	37.0	36.3	35.8	35.5	35.2	34.6	33.7	32.4	31.0	...	...	...	...
	28	33.3	32.6	31.7	30.8	30.2	29.9	29.6	29.3	28.9	28.1	27.0	25.8	24.9	24.9	24.9	...
	29	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	36.5	35.1	33.6	32.3	...	...	...
	30	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	...	...	...	...
	31	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	...	...	...	...
	32	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	...	...	...	...
	33	24.7	23.3	22.7	22.3	22.0	21.8	21.5	21.3	21.1	20.9	20.6	20.3	...	...	...	...
	34	33.3	32.0	31.4	30.8	30.3	29.9	29.5	29.1	28.8	28.4	28.0	27.6	27.1	26.5	25.7	...
	35	33.3	32.0	31.4	30.8	30.3	29.9	29.5	29.1	28.8	28.4	28.0	27.6	27.1	26.5	25.7	...
	36	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.4	36.9	36.5	35.9	35.3	...	...	...
	37	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.4	36.9	36.5	35.9	35.3	...	...	...
	38	33.3	32.0	31.4	30.8	30.3	29.9	29.5	29.1	28.8	28.4	28.0	27.6	27.1	26.5	25.7	...
	39	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.4	36.9	36.5	35.9	35.3	...	...	...
	40	26.7	25.6	25.1	24.6	24.3	23.9	23.6	23.3	23.0	22.7	22.4	22.1	21.7	21.2	20.6	19.8 16.3
	41	26.7	25.6	25.1	24.6	24.3	23.9	23.6	23.3	23.0	22.7	22.4	22.1	21.7	21.2	20.6	19.8 15.0
	42	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	...	...	...	...
	43	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	...	...	...	...

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding											
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
1
2
3
4
5
6
7
8
9
10
11	8.2	4.8	...	...	...	...	...	...	...	...	...	...
12	8.2	4.8	...	...	...	...	...	...	...	...	...	...
13	8.2	4.8	...	...	...	...	...	...	...	...	...	...
14
15
16
17	8.2	4.8	...	...	...	...	...	...	...	...	...	...
18
19
20
21	8.2	4.8	...	...	...	...	...	...	...	...	...	...
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40	11.0	6.9	4.6	2.8	...	...	...	...	...	...	...	...
41	9.2	5.9	...	...	...	...	...	...	...	...	...	...
42
43

(10)
(10)
(10)

2011a SECTION II, PART D (CUSTOMARY)

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	2Ni-1Cu	Forgings	SA-182	FR	K22035	...	...	9A	1
2	2Ni-1Cu	Smls. pipe	SA-333	9	K22035	...	...	9A	1
3	2Ni-1Cu	Smls. pipe	SA-334	9	K22035	...	...	9A	1
4	2Ni-1Cu	Forgings	SA-350	LF9	K22036	...	...	9A	1
5	2Ni-1Cu	Fittings	SA-420	WPL9	K22035	...	...	9A	1
6	2Ni-1½Cr-¼Mo-V	Forgings	SA-723	1	K23550	1	...	11B	10
7	2Ni-1½Cr-¼Mo-V	Forgings	SA-723	1	K23550	2	...	11B	10
8	2½Ni	Plate	SA-203	A	K21703	...	...	9A	1
9	2½Ni	Plate	SA-203	B	K22103	...	...	9A	1
10	2½Ni	Castings	SA-352	LC2	J22500	...	...	9A	1
11	2¾Ni-1½Cr-½Mo	Plate	SA-543	C	K34035	3	...	3	3
12	2¾Ni-1½Cr-½Mo	Plate	SA-543	C	K34035	1	...	11A	5
13	2¾Ni-1½Cr-½Mo	Plate	SA-543	C	K34035	2	...	11B	10
14	2¾Ni-1½Cr-½Mo-V	Forgings	SA-723	2	K34035	1	...	11B	10
15	2¾Ni-1½Cr-½Mo-V	Forgings	SA-723	2	K34035	2	...	11B	10
16	3Ni-1¾Cr-½Mo	Plate	SA-543	B	K42339	3	...	3	3
17	3Ni-1¾Cr-½Mo	Plate	SA-543	B	K42339	1	...	11A	5
18	3Ni-1¾Cr-½Mo	Plate	SA-543	B	K42339	2	...	11B	10
19	3½Ni	Smls. pipe	SA-333	3	K31918	...	...	9B	1
20	3½Ni	Smls. tube	SA-334	3	K31918	...	...	9B	1
21	3½Ni	Fittings	SA-420	WPL3	...	...	...	9B	1
22	3½Ni	Plate	SA-203	D	K31718	...	...	9B	1
23	3½Ni	Forgings	SA-350	LF3	K32025	...	...	9B	1
24	3½Ni	Forgings	SA-765	III	K32026	...	...	9B	1
25	3½Ni	Plate	SA-203	E	K32018	...	...	9B	1
26	3½Ni	Castings	SA-352	LC3	J31550	...	...	9B	1
27	3½Ni	Plate	SA-203	F	...	...	$t > 2$	9B	1
28	3½Ni	Plate	SA-203	F	...	...	$t \leq 2$	9B	1
29	3½Ni-1¾Cr-½Mo-V	Forgings	SA-508	4N	K22375	3	...	3	3
30	3½Ni-1¾Cr-½Mo-V	Forgings	SA-508	4N	K22375	1	...	11A	5
31	3½Ni-1¾Cr-½Mo-V	Forgings	SA-508	4N	K22375	2	...	11B	10
32	4Ni-1½Cr-½Mo-V	Forgings	SA-723	3	K44045	1	...	11B	10
33	4Ni-1½Cr-½Mo-V	Forgings	SA-723	3	K44045	2	...	11B	10
(10) 34	5Ni-¼Mo	Plate	SA-645	A	K41583	...	...	11A	2
35	8Ni	Plate	SA-553	II	K71340	...	...	11A	1
36	8Ni	Plate	SA-553	II	K71340	...	...	11A	1
37	9Ni	Smls. pipe	SA-333	8	K81340	...	...	11A	1
38	9Ni	Smls. pipe	SA-333	8	K81340	...	...	11A	1
39	9Ni	Smls. tube	SA-334	8	K81340	...	...	11A	1
40	9Ni	Smls. tube	SA-334	8	K81340	...	...	11A	1
41	9Ni	Plate	SA-353	...	K81340	...	...	11A	1
42	9Ni	Plate	SA-353	...	K81340	...	...	11A	1

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Maximum Use Temperature, °F	External Pressure Chart No.	Notes
1	63	46	100	CS-3	...
2	63	46	100	CS-3	...
3	63	46	100	CS-3	...
4	63	46	100	CS-3	...
5	63	46	100	CS-3	...
6	115	100	650	HT-1	G10, G11, W1
7	135	120	650	HT-1	G11, W1
8	65	37	1000	CS-2	T3
9	70	40	1000	CS-2	T2
10	70	40	650	CS-2	...
11	90	70	650	CS-5	...
12	105	85	650	CS-5	...
13	115	100	650	HT-1	...
14	115	100	650	HT-1	G10, G11, W1
15	135	120	650	HT-1	G11, W1
16	90	70	650	CS-5	...
17	105	85	650	CS-5	W7
18	115	100	650	HT-1	...
19	65	35	650	CS-2	...
20	65	35	650	CS-2	...
21	65	35	650	CS-2	...
22	65	37	1000	CS-2	T3
23	70	37.5	650	CS-2	...
24	70	37.5	650	CS-2	...
25	70	40	1000	CS-2	T3
26	70	40	650	CS-2	...
27	75	50	650	CS-3	T1
28	80	55	650	CS-3	...
29	90	70	650	CS-5	...
30	105	85	650	CS-5	W7
31	115	100	650	HT-1	...
32	115	100	650	HT-1	G10, G11, W1
33	135	120	650	HT-1	G11, W1
34	95	65	250	CS-3	W4
35	100	85	250	CS-3	W3
36	100	85	250	CS-3	W4
37	100	75	250	CS-3	W3
38	100	75	250	CS-3	W4
39	100	75	250	CS-3	W3
40	100	75	250	CS-3	W4
41	100	75	250	CS-3	W3
42	100	75	250	CS-3	W4

(10)

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
Line No.	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
1	26.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	26.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	26.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	26.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	26.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	...	...	...	...	...
7	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	...	...	...	...	...
8	24.7	23.2	22.6	22.2	21.8	21.5	21.1	20.6	20.0	19.3	18.5	17.6	16.6	13.9	11.4	9.0	6.5
9	26.7	25.1	24.4	24.0	23.6	23.2	22.8	22.3	21.6	20.9	20.0	19.0	16.9	13.9	11.4	9.0	6.5
10	26.7	25.1	24.4	24.0	23.6	23.2	22.8	22.3	21.6	20.9	20.0	19.0	...	...	...	...	...
11	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	...	...	...	...	...
12	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	...	...	...	...	...
13	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	...	...	...	...	...
14	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	...	...	...	...	...
15	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	...	...	...	...	...
16	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	...	...	...	...	...
17	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	...	...	...	...	...
18	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	...	...	...	...	...
19	23.3	21.9	21.4	21.0	20.6	20.3	19.9	19.5	18.9	18.3	17.5	16.7	...	...	...	...	...
20	23.3	21.9	21.4	21.0	20.6	20.3	19.9	19.5	18.9	18.3	17.5	16.7	...	...	...	...	...
21	23.3	21.9	21.4	21.0	20.6	20.3	19.9	19.5	18.9	18.3	17.5	16.7	...	...	...	...	...
22	24.7	23.2	22.6	22.2	21.8	21.5	21.1	20.6	20.0	19.3	18.5	17.6	16.6	13.9	11.4	9.0	6.5
23	25.0	23.5	22.9	22.5	22.1	21.8	21.4	20.9	20.3	19.6	18.8	17.9	...	...	...	...	...
24	25.0	23.5	22.9	22.5	22.1	21.8	21.4	20.9	20.3	19.6	18.8	17.9	...	...	...	...	...
25	26.7	25.1	24.4	24.0	23.6	23.2	22.8	22.3	21.6	20.9	20.0	19.0	18.0	14.8	12.0	9.3	6.5
26	26.7	25.1	24.4	24.0	23.6	23.2	22.8	22.3	21.6	20.9	20.0	19.0	...	...	...	...	...
27	31.3	31.3	30.5	29.9	29.5	29.0	28.5	27.8	27.1	26.1	25.0	22.5	...	...	...	...	...
28	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	...	...	...	...	...
29	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	...	...	...	...	...
30	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	...	...	...	...	...
31	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	...	...	...	...	...
32	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	47.9	...	...	...	...	...
33	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	56.3	...	...	...	...	...
34	39.6	39.6	39.6	39.6	...	...	...	...	...	...	...	...	...	...	...	...	...
35	41.7	41.7	41.7	41.7	...	...	...	...	...	...	...	...	...	...	...	...	...
36	39.6	39.6	39.6	39.6	...	...	...	...	...	...	...	...	...	...	...	...	...
37	41.7	41.7	41.7	41.7	...	...	...	...	...	...	...	...	...	...	...	...	...
38	39.6	39.6	39.6	39.6	...	...	...	...	...	...	...	...	...	...	...	...	...
39	41.7	41.7	41.7	41.7	...	...	...	...	...	...	...	...	...	...	...	...	...
40	39.6	39.6	39.6	39.6	...	...	...	...	...	...	...	...	...	...	...	...	...
41	41.7	41.7	41.7	41.7	...	...	...	...	...	...	...	...	...	...	...	...	...
42	39.6	39.6	39.6	39.6	...	...	...	...	...	...	...	...	...	...	...	...	...

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding											
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
1
2
3
4
5
6
7
8	4.5	2.5	...	...	...	...	...	...	...	...	...	...
9	4.5	2.5	...	...	...	...	...	...	...	...	...	...
10
11
12
13
14
15
16
17
18
19
20
21
22	4.5	2.5	...	...	...	...	...	...	...	...	...	...
23
24
25	4.5	2.5	...	...	...	...	...	...	...	...	...	...
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42

(10)

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	9Ni	Fittings	SA-420	WPL8	K81340	...	...	11A	1
2	9Ni	Fittings	SA-420	WPL8	K81340	...	...	11A	1
3	9Ni	Forgings	SA-522	I	K81340	...	...	11A	1
4	9Ni	Forgings	SA-522	I	K81340	...	...	11A	1
5	9Ni	Plate	SA-553	I	K81340	...	...	11A	1
6	9Ni	Plate	SA-553	I	K81340	...	...	11A	1
7	16Cr-4Ni-6Mn	Plate	SA-240	201LN	S20153	...	...	8	3
8	16Cr-4Ni-6Mn	Plate	SA-240	201LN	S20153	...	...	8	3
9	16Cr-12Ni-2Mo	Forgings	SA-182	F316L	S31603	...	$t > 5$	8	1
10	16Cr-12Ni-2Mo	Forgings	SA-965	F316L	S31603	...	...	8	1
11	16Cr-12Ni-2Mo	Forgings	SA-182	F316L	S31603	...	$t \leq 5$	8	1
12	16Cr-12Ni-2Mo	Smls. tube	SA-213	TP316L	S31603	...	...	8	1
13	16Cr-12Ni-2Mo	Plate	SA-240	316L	S31603	...	...	8	1
14	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316L	S31603	...	...	8	1
15	16Cr-12Ni-2Mo	Smls. pipe	SA-312	TP316L	S31603	...	...	8	1
16	16Cr-12Ni-2Mo	Wld. pipe	SA-312	TP316L	S31603	...	...	8	1
17	16Cr-12Ni-2Mo	Fittings	SA-403	316L	S31603	CR	...	8	1
18	16Cr-12Ni-2Mo	Wld. fittings	SA-403	316L	S31603	WP-W	...	8	1
19	16Cr-12Ni-2Mo	Wld. fittings	SA-403	316L	S31603	WP-WX	...	8	1
20	16Cr-12Ni-2Mo	Wld. pipe	SA-688	TP316L	S31603	...	...	8	1
21	16Cr-12Ni-2Mo	Castings	SA-351	CF8M	J92900	...	...	8	1
22	16Cr-12Ni-2Mo	Forgings	SA-182	F316	S31600	...	$t > 5$	8	1
23	16Cr-12Ni-2Mo	Forgings	SA-965	F316	S31600	...	...	8	1
24	16Cr-12Ni-2Mo	Forgings	SA-182	F316H	S31609	...	$t > 5$	8	1
25	16Cr-12Ni-2Mo	Forgings	SA-965	F316H	S31609	...	...	8	1
26	16Cr-12Ni-2Mo	Forgings	SA-182	F316	S31600	...	$t \leq 5$	8	1
27	16Cr-12Ni-2Mo	Smls. tube	SA-213	TP316	S31600	...	...	8	1
28	16Cr-12Ni-2Mo	Plate	SA-240	316	S31600	...	...	8	1
29	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316	S31600	...	...	8	1
30	16Cr-12Ni-2Mo	Smls. pipe	SA-312	TP316	S31600	...	...	8	1
31	16Cr-12Ni-2Mo	Wld. pipe	SA-312	TP316	S31600	...	...	8	1
32	16Cr-12Ni-2Mo	Smls. pipe	SA-376	TP316	S31600	...	...	8	1
33	16Cr-12Ni-2Mo	Fittings	SA-403	316	S31600	WP-S	...	8	1
34	16Cr-12Ni-2Mo	Wld. tube	SA-688	TP316	S31600	...	...	8	1
35	16Cr-12Ni-2Mo	Forgings	SA-182	F316H	S31609	...	$t \leq 5$	8	1
36	16Cr-12Ni-2Mo	Smls. tube	SA-213	TP316H	S31609	...	...	8	1
37	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316H	S31609	...	...	8	1
38	16Cr-12Ni-2Mo	Smls. pipe	SA-312	TP316H	S31609	...	...	8	1
39	16Cr-12Ni-2Mo	Wld. pipe	SA-312	TP316H	S31609	...	...	8	1
40	16Cr-12Ni-2Mo	Smls. pipe	SA-376	TP316H	S31609	...	...	8	1
41	16Cr-12Ni-2Mo-N	Smls. tube	SA-213	TP316N	S31651	...	$t \leq 5$	8	1
42	16Cr-12Ni-2Mo-N	Plate	SA-240	316N	S31651	...	$t \leq 5$	8	1
43	16Cr-12Ni-2Mo-N	Wld. tube	SA-249	TP316N	S31651	...	...	8	1
44	16Cr-12Ni-2Mo-N	Smls. pipe	SA-312	TP316N	S31651	...	$t \leq 5$	8	1
45	16Cr-12Ni-2Mo-N	Wld. pipe	SA-312	TP316N	S31651	...	$t \leq 5$	8	1
46	16Cr-12Ni-2Mo-N	Smls. pipe	SA-376	TP316N	S31651	...	...	8	1

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Maximum Use Temperature, °F	External Pressure Chart No.	Notes
1	100	75	250	CS-3	W3
2	100	75	250	CS-3	W4
3	100	75	250	CS-3	G9, S2, W3
4	100	75	250	CS-3	G9, S2, W4
5	100	85	250	CS-3	W3
6	100	85	250	CS-3	W4
7	95	45	800	HA-6	...
8	95	45	800	HA-6	G2
9	65	25	850	HA-4	G2
10	65	25	850	HA-4	G2
11	70	25	850	HA-4	G2
12	70	25	850	HA-4	G2
13	70	25	850	HA-4	G2
14	70	25	850	HA-4	G2, G6
15	70	25	850	HA-4	G2
16	70	25	850	HA-4	G2, G6
17	70	25	850	HA-4	G2, G6
18	70	25	850	HA-4	G2, G6
19	70	25	850	HA-4	G2, G6
20	70	25	850	HA-4	G2, G6
21	70	30	1500	HA-2	G2, G3, G4, G8, T10
22	70	30	1500	HA-2	G2, T10
23	70	30	1500	HA-2	G2, G3, G4, T10
24	70	30	1500	HA-2	G2, T10
25	70	30	1500	HA-2	G2, T10
26	75	30	1500	HA-2	G2, G3, T10
27	75	30	1500	HA-2	G2, G3, T10
28	75	30	1500	HA-2	G2, G3, G4, T10
29	75	30	1500	HA-2	G2, G3, G6, T10
30	75	30	1500	HA-2	G2, G3, G4, T10
31	75	30	1500	HA-2	G2, G3, G4, G6, T10
32	75	30	1500	HA-2	G2, G3, G4, T10
33	75	30	1500	HA-2	G2, T10
34	75	30	1500	HA-2	G2, G3, G6, T10
35	75	30	1500	HA-2	G2, T10
36	75	30	1500	HA-2	G2, T10
37	75	30	1500	HA-2	G2, G6, T10
38	75	30	1500	HA-2	G2, T10
39	75	30	1500	HA-2	G2, G6, T10
40	75	30	1500	HA-2	G2, G4, T10
41	80	35	1200	HA-2	G2, T9
42	80	35	1200	HA-2	G2, T9
43	80	35	1200	HA-2	G2, G6, T9
44	80	35	1200	HA-2	G2, T9
45	80	35	1200	HA-2	G2, G6, T9
46	80	35	1200	HA-2	G2, G4, T9

2011a SECTION II, PART D (CUSTOMARY)

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
Line No.	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
1	41.7	41.7	41.7	41.7	...	...	...	...	...	...	...	...	...	...	...	...	...
2	39.6	39.6	39.6	39.6	...	...	...	...	...	...	...	...	...	...	...	...	...
3	41.7	41.7	41.7	41.7	...	...	...	...	...	...	...	...	...	...	...	...	...
4	39.6	39.6	39.6	39.6	...	...	...	...	...	...	...	...	...	...	...	...	...
5	41.7	41.7	41.7	41.7	...	...	...	...	...	...	...	...	...	...	...	...	...
6	39.6	39.6	39.6	39.6	...	...	...	...	...	...	...	...	...	...	...	...	...
7	30.0	...	24.2	...	21.9	...	20.7	...	20.0	...	19.1	18.6	18.0	17.3	16.7	...	...
8	30.0	...	30.0	...	29.6	...	28.0	...	27.0	...	25.8	25.1	24.3	23.4	22.6	...	...
9	16.7	16.7	16.7	16.7	16.7	16.4	15.7	15.2	14.8	14.4	14.0	13.7	13.5	13.2	12.9	12.7	...
10	16.7	16.7	16.7	16.7	16.7	16.4	15.7	15.2	14.8	14.4	14.0	13.7	13.5	13.2	12.9	12.7	...
11	16.7	16.7	16.7	16.7	16.7	16.4	15.7	15.2	14.8	14.4	14.0	13.7	13.5	13.2	12.9	12.7	...
12	16.7	16.7	16.7	16.7	16.7	16.4	15.7	15.2	14.8	14.4	14.0	13.7	13.5	13.2	12.9	12.7	...
13	16.7	16.7	16.7	16.7	16.7	16.4	15.7	15.2	14.8	14.4	14.0	13.7	13.5	13.2	12.9	12.7	...
14	14.2	14.2	14.2	14.2	14.2	13.9	13.4	12.9	12.5	12.2	11.9	11.7	11.4	11.2	11.0	10.8	...
15	16.7	16.7	16.7	16.7	16.7	16.4	15.7	15.2	14.8	14.4	14.0	13.7	13.5	13.2	12.9	12.7	...
16	14.2	14.2	14.2	14.2	14.2	13.9	13.4	12.9	12.5	12.2	11.9	11.7	11.4	11.2	11.0	10.8	...
17	14.2	14.2	14.2	14.2	14.2	13.9	13.4	12.9	12.5	12.2	11.9	11.7	11.4	11.2	11.0	10.8	...
18	14.2	14.2	14.2	14.2	14.2	13.9	13.4	12.9	12.5	12.2	11.9	11.7	11.4	11.2	11.0	10.8	...
19	14.2	14.2	14.2	14.2	14.2	13.9	13.4	12.9	12.5	12.2	11.9	11.7	11.4	11.2	11.0	10.8	...
20	14.2	14.2	14.2	14.2	14.2	13.9	13.4	12.9	12.5	12.2	11.9	11.7	11.4	11.2	11.0	10.8	...
21	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.4	17.0	16.6	16.3	16.1	15.9	15.7	15.6
22	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.4	17.0	16.6	16.3	16.1	15.9	15.7	15.6
23	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.4	17.0	16.6	16.3	16.1	15.9	15.7	15.6
24	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.4	17.0	16.6	16.3	16.1	15.9	15.7	15.6
25	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.4	17.0	16.6	16.3	16.1	15.9	15.7	15.6
26	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.4	17.0	16.6	16.3	16.1	15.9	15.7	15.6
27	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.4	17.0	16.6	16.3	16.1	15.9	15.7	15.6
28	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.4	17.0	16.6	16.3	16.1	15.9	15.7	15.6
29	17.0	17.0	17.0	17.0	17.0	17.0	16.4	15.8	15.3	14.8	14.5	14.1	13.9	13.7	13.5	13.4	13.2
30	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.4	17.0	16.6	16.3	16.1	15.9	15.7	15.6
31	17.0	17.0	17.0	17.0	17.0	17.0	16.4	15.8	15.3	14.8	14.5	14.1	13.9	13.7	13.5	13.4	13.2
32	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.4	17.0	16.6	16.3	16.1	15.9	15.7	15.6
33	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.4	17.0	16.6	16.3	16.1	15.9	15.7	15.6
34	17.0	17.0	17.0	17.0	17.0	17.0	16.4	15.8	15.3	14.8	14.5	14.1	13.9	13.7	13.5	13.4	13.2
35	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.4	17.0	16.6	16.3	16.1	15.9	15.7	15.6
36	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.4	17.0	16.6	16.3	16.1	15.9	15.7	15.6
37	17.0	17.0	17.0	17.0	17.0	17.0	16.4	15.8	15.3	14.8	14.5	14.1	13.9	13.7	13.5	13.4	13.2
38	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.4	17.0	16.6	16.3	16.1	15.9	15.7	15.6
39	17.0	17.0	17.0	17.0	17.0	17.0	16.4	15.8	15.3	14.8	14.5	14.1	13.9	13.7	13.5	13.4	13.2
40	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.4	17.0	16.6	16.3	16.1	15.9	15.7	15.6
41	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.0	22.3	21.6	21.0	20.5	20.0	19.6	19.2	18.8	18.5
42	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.0	22.3	21.6	21.0	20.5	20.0	19.6	19.2	18.8	18.5
43	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.5	18.9	18.4	17.9	17.4	17.0	16.7	16.3	16.0	15.7
44	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.0	22.3	21.6	21.0	20.5	20.0	19.6	19.2	18.8	18.5
45	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.5	18.9	18.4	17.9	17.4	17.0	16.7	16.3	16.0	15.7
46	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.0	22.3	21.6	21.0	20.5	20.0	19.6	19.2	18.8	18.5

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding											
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
1
2
3
4
5
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19
20
21	15.4	15.3	15.1	12.4	9.8	7.4	5.6	4.2	3.2	2.4	1.8	1.4
22	15.4	15.3	15.1	12.4	9.8	7.4	5.6	4.2	3.2	2.4	1.8	1.4
23	15.4	15.3	15.1	12.4	9.8	7.4	5.6	4.2	3.2	2.4	1.8	1.4
24	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3
25	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3
26	15.4	15.3	15.1	12.4	9.8	7.4	5.6	4.2	3.2	2.4	1.8	1.4
27	15.4	15.3	15.1	12.4	9.8	7.4	5.6	4.2	3.2	2.4	1.8	1.4
28	15.4	15.3	15.1	12.4	9.8	7.4	5.6	4.2	3.2	2.4	1.8	1.4
29	13.1	13.0	12.9	10.5	8.3	6.3	4.7	3.6	2.7	2.0	1.5	1.2
30	15.4	15.3	15.1	12.4	9.8	7.4	5.6	4.2	3.2	2.4	1.8	1.4
31	13.1	13.0	12.9	10.5	8.3	6.3	4.7	3.6	2.7	2.0	1.5	1.2
32	15.4	15.3	15.1	12.4	9.8	7.4	5.6	4.2	3.2	2.4	1.8	1.4
33	15.4	15.3	15.1	12.4	9.8	7.4	5.6	4.2	3.2	2.4	1.8	1.4
34	13.1	13.0	12.9	10.5	8.3	6.3	4.7	3.6	2.7	2.0	1.5	1.2
35	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3
36	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3
37	13.1	13.0	12.9	10.5	8.3	6.3	4.7	3.5	2.6	1.9	1.4	1.1
38	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3
39	13.1	13.0	12.9	10.5	8.3	6.3	4.7	3.5	2.6	1.9	1.4	1.1
40	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3
41	18.1	17.8	15.8	12.3	9.8	7.4	...	...	...	...	...	...
42	18.1	17.8	15.8	12.3	9.8	7.4	...	...	...	...	...	...
43	15.4	15.1	13.4	10.5	8.3	6.3	...	...	...	...	...	...
44	18.1	17.8	15.8	12.3	9.8	7.4	...	...	...	...	...	...
45	15.4	15.1	13.4	10.5	8.3	6.3	...	...	...	...	...	...
46	18.1	17.8	15.8	12.3	9.8	7.4	...	...	...	...	...	...

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	16Cr-12Ni-2Mo-N	Fittings	SA-403	316N	S31651	CR	...	8	1
2	16Cr-12Ni-2Mo-N	Wld. fittings	SA-403	316N	S31651	WP-W	...	8	1
3	16Cr-12Ni-2Mo-N	Wld. fittings	SA-403	316N	S31651	WP-WX	...	8	1
4	16Cr-12Ni-2Mo-N	Forgings	SA-965	F316N	S31651	...	...	8	1
5	17.5Cr-17.5Ni-5.3Si	Plate	SA-240	...	S30601	...	...	8	1
6	18Cr-3Ni-12Mn	Plate	SA-240	XM-29	S24000	...	$t > \frac{3}{16}$	8	3
7	18Cr-3Ni-12Mn	Plate	SA-240	XM-29	S24000	...	$t \leq \frac{3}{16}$	8	3
8	18Cr-5Ni-3Mo	Smls. tube	SA-789	...	S31500	...	...	10H	1
9	18Cr-5Ni-3Mo	Wld. tube	SA-789	...	S31500	...	...	10H	1
10	18Cr-5Ni-3Mo	Smls. pipe	SA-790	...	S31500	...	...	10H	1
11	18Cr-5Ni-3Mo	Wld. pipe	SA-790	...	S31500	...	...	10H	1
12	18Cr-8Ni	Forgings	SA-182	F304L	S30403	...	$t > 5$	8	1
13	18Cr-8Ni	Forgings	SA-965	F304L	S30403	...	...	8	1
14	18Cr-8Ni	Forgings	SA-182	F304L	S30403	...	$t \leq 5$	8	1
15	18Cr-8Ni	Smls. tube	SA-213	TP304L	S30403	...	...	8	1
16	18Cr-8Ni	Plate	SA-240	304L	S30403	...	...	8	1
17	18Cr-8Ni	Wld. tube	SA-249	TP304L	S30403	...	...	8	1
18	18Cr-8Ni	Smls. pipe	SA-312	TP304L	S30403	...	...	8	1
19	18Cr-8Ni	Wld. pipe	SA-312	TP304L	S30403	...	...	8	1
20	18Cr-8Ni	Fittings	SA-403	304L	S30403	WP-S	...	8	1
21	18Cr-8Ni	Wld. tube	SA-688	TP304L	S30403	...	...	8	1
22	18Cr-8Ni	Castings	SA-351	CF3	J92500	...	...	8	1
23	18Cr-8Ni	Castings	SA-351	CF10	J92590	...	...	8	1
24	18Cr-8Ni	Castings	SA-351	CF8	J92600	...	...	8	1
25	18Cr-8Ni	Forgings	SA-182	F304	S30400	...	$t > 5$	8	1
26	18Cr-8Ni	Forgings	SA-965	F304	S30400	...	...	8	1
27	18Cr-8Ni	Forgings	SA-182	F304H	S30409	...	$t > 5$	8	1
28	18Cr-8Ni	Forgings	SA-965	F304H	S30409	...	...	8	1
29	18Cr-8Ni	Plate	SA-240	302	S30200	...	...	8	1
30	18Cr-8Ni	Forgings	SA-182	F304	S30400	...	$t \leq 5$	8	1
31	18Cr-8Ni	Smls. tube	SA-213	TP304	S30400	...	...	8	1
32	18Cr-8Ni	Plate	SA-240	304	S30400	...	...	8	1
33	18Cr-8Ni	Wld. tube	SA-249	TP304	S30400	...	...	8	1
34	18Cr-8Ni	Smls. pipe	SA-312	TP304	S30400	...	...	8	1
35	18Cr-8Ni	Wld. pipe	SA-312	TP304	S30400	...	...	8	1
36	18Cr-8Ni	Smls. pipe	SA-376	TP304	S30400	...	...	8	1
37	18Cr-8Ni	Fittings	SA-403	304	S30400	CR	...	8	1
38	18Cr-8Ni	Fittings	SA-403	304	S30400	WP-S	...	8	1
39	18Cr-8Ni	Wld. fittings	SA-403	304	S30400	WP-W	...	8	1
40	18Cr-8Ni	Wld. fittings	SA-403	304	S30400	WP-WX	...	8	1
41	18Cr-8Ni	Wld. tube	SA-688	TP304	S30400	...	...	8	1
42	18Cr-8Ni	Forgings	SA-182	F304H	S30409	...	$t \leq 5$	8	1
43	18Cr-8Ni	Smls. tube	SA-213	TP304H	S30409	...	...	8	1
44	18Cr-8Ni	Plate	SA-240	304H	S30409	...	...	8	1
45	18Cr-8Ni	Wld. tube	SA-249	TP304H	S30409	...	...	8	1

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Maximum Use Temperature, °F	External Pressure Chart No.	Notes
1	80	35	1200	HA-2	G2, G6, T9
2	80	35	1200	HA-2	G2, G6, T9
3	80	35	1200	HA-2	G2, G6, T9
4	80	35	1200	HA-2	G2, T9
5	78	37	400	HA-1	...
6	100	55	800	HA-6	G2
7	100	60	800	HA-6	G2
8	92	64	650	HA-5	G8
9	92	64	650	HA-5	G6, G8
10	92	64	650	HA-5	G8
11	92	64	650	HA-5	G6, G8
12	65	25	1200	HA-3	G2, T9
13	65	25	1200	HA-3	G2, T9
14	70	25	1200	HA-3	G2, T9
15	70	25	1200	HA-3	G2, T9
16	70	25	1200	HA-3	G2, T9
17	70	25	1200	HA-3	G2, G6, T9
18	70	25	1200	HA-3	G2, T9
19	70	25	1200	HA-3	G2, G6, T9
20	70	25	1200	HA-3	G2, T9
21	70	25	1200	HA-3	G2, G6, T9
22	70	30	800	HA-3	G2, G8
23	70	30	1500	HA-3	G2, G4, G8, T8
24	70	30	1500	HA-1	G2, G3, G4, G8, T8
25	70	30	1500	HA-1	G2, G3, G4, T9
26	70	30	1500	HA-1	G2, G3, G4, T9
27	70	30	1500	HA-1	G2, T9
28	70	30	1500	HA-1	G2, T9
29	75	30	750	HA-1	G2, G3
30	75	30	1500	HA-1	G2, G3, G4, T9
31	75	30	1500	HA-1	G2, G3, T9
32	75	30	1500	HA-1	G2, G3, G4, T9
33	75	30	1500	HA-1	G2, G3, G6, T9
34	75	30	1500	HA-1	G2, G3, G4, T9
35	75	30	1500	HA-1	G2, G3, G4, G6, T9
36	75	30	1500	HA-1	G2, G3, G4, S3, T9
37	75	30	1500	HA-1	G2, G6, T9
38	75	30	1500	HA-1	G2, T9
39	75	30	1500	HA-1	G2, G6, T9
40	75	30	1500	HA-1	G2, G6, T9
41	75	30	1500	HA-1	G2, G3, G6, T9
42	75	30	1500	HA-1	G2, T9
43	75	30	1500	HA-1	G2, T9
44	75	30	1500	HA-1	G2, T9
45	75	30	1500	HA-1	G2, G6, T9

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
Line No.	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
1	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.5	18.9	18.4	17.9	17.4	17.0	16.7	16.3	16.0	15.7
2	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.5	18.9	18.4	17.9	17.4	17.0	16.7	16.3	16.0	15.7
3	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.5	18.9	18.4	17.9	17.4	17.0	16.7	16.3	16.0	15.7
4	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.0	22.3	21.6	21.0	20.5	20.0	19.6	19.2	18.8	18.5
5	24.7	24.7	24.7	24.7	24.4	23.2	22.2	...	...	...	...	...	...	...	...	...	...
6	36.7	36.7	36.7	36.6	33.8	31.5	29.6	28.2	27.2	26.4	25.9	25.4	25.0	24.5	24.0	...	...
7	40.0	40.0	40.0	39.9	36.8	34.3	32.3	30.8	29.6	28.8	28.2	27.7	27.3	26.8	26.2	...	...
8	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	...	...	...	...	...
9	32.6	32.6	32.6	32.6	32.6	32.6	32.6	32.6	32.6	32.6	32.6	32.6	...	...	...	...	...
10	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	38.3	...	...	...	...	...
11	32.6	32.6	32.6	32.6	32.6	32.6	32.6	32.6	32.6	32.6	32.6	32.6	...	...	...	...	...
12	16.7	16.7	16.7	16.7	16.7	16.5	15.8	15.2	14.7	14.3	14.0	13.7	13.5	13.3	13.0	12.8	12.6
13	16.7	16.7	16.7	16.7	16.7	16.5	15.8	15.2	14.7	14.3	14.0	13.7	13.5	13.3	13.0	12.8	12.6
14	16.7	16.7	16.7	16.7	16.7	16.5	15.8	15.2	14.7	14.3	14.0	13.7	13.5	13.3	13.0	12.8	12.6
15	16.7	16.7	16.7	16.7	16.7	16.5	15.8	15.2	14.7	14.3	14.0	13.7	13.5	13.3	13.0	12.8	12.6
16	16.7	16.7	16.7	16.7	16.7	16.5	15.8	15.2	14.7	14.3	14.0	13.7	13.5	13.3	13.0	12.8	12.6
17	16.7	16.7	16.7	16.7	16.7	16.5	15.8	15.2	14.7	14.3	14.0	13.7	13.5	13.3	13.0	12.8	12.6
18	16.7	16.7	16.7	16.7	16.7	16.5	15.8	15.2	14.7	14.3	14.0	13.7	13.5	13.3	13.0	12.8	12.6
19	14.2	14.2	14.2	14.2	14.2	14.0	13.4	12.9	12.5	12.2	11.9	11.7	11.4	11.3	11.1	10.9	10.7
20	16.7	16.7	16.7	16.7	16.7	16.5	15.8	15.2	14.7	14.3	14.0	13.7	13.5	13.3	13.0	12.8	12.6
21	14.2	14.2	14.2	14.2	14.2	14.0	13.4	12.9	12.5	12.2	11.9	11.7	11.4	11.3	11.1	10.9	10.7
22	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	...	...
23	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
24	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
25	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
26	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
27	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
28	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
29	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	...	...	...
30	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
31	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
32	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
33	17.0	17.0	17.0	17.0	17.0	16.4	15.8	15.3	14.8	14.4	14.1	13.8	13.5	13.2	12.9	12.6	12.4
34	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
35	17.0	17.0	17.0	17.0	17.0	16.4	15.8	15.3	14.8	14.4	14.1	13.8	13.5	13.2	12.9	12.6	12.4
36	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
37	17.0	17.0	17.0	17.0	17.0	16.4	15.8	15.3	14.8	14.4	14.1	13.8	13.5	13.2	12.9	12.6	12.4
38	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
39	17.0	17.0	17.0	17.0	17.0	16.4	15.8	15.3	14.8	14.4	14.1	13.8	13.5	13.2	12.9	12.6	12.4
40	17.0	17.0	17.0	17.0	17.0	16.4	15.8	15.3	14.8	14.4	14.1	13.8	13.5	13.2	12.9	12.6	12.4
41	17.0	17.0	17.0	17.0	17.0	16.4	15.8	15.3	14.8	14.4	14.1	13.8	13.5	13.2	12.9	12.6	12.4
42	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
43	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
44	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
45	17.0	17.0	17.0	17.0	17.0	16.4	15.8	15.3	14.8	14.4	14.1	13.8	13.5	13.2	12.9	12.6	12.4

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding											
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
1	15.4	15.1	13.4	10.5	8.3	6.3	...	...	...	...	...	...
2	15.4	15.1	13.4	10.5	8.3	6.3	...	...	...	...	...	...
3	15.4	15.1	13.4	10.5	8.3	6.3	...	...	...	...	...	...
4	18.1	17.8	15.8	12.3	9.8	7.4	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...
12	12.3	12.0	6.3	5.1	4.0	3.2	...	...	...	...	...	...
13	12.3	12.0	6.3	5.1	4.0	3.2	...	...	...	...	...	...
14	12.3	12.0	6.3	5.1	4.0	3.2	...	...	...	...	...	...
15	12.3	12.0	6.3	5.1	4.0	3.2	...	...	...	...	...	...
16	12.3	12.0	6.3	5.1	4.0	3.2	...	...	...	...	...	...
17	12.3	12.0	6.3	5.1	4.0	3.2	...	...	...	...	...	...
18	12.3	12.0	6.3	5.1	4.0	3.2	...	...	...	...	...	...
19	10.5	10.2	5.4	4.3	3.4	2.7	...	...	...	...	...	...
20	12.3	12.0	6.3	5.1	4.0	3.2	...	...	...	...	...	...
21	10.5	10.2	5.4	4.3	3.4	2.7	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...	...
23	14.3	12.2	9.5	7.5	6.0	4.8	3.9	3.3	2.7	2.3	2.0	1.7
24	14.3	12.2	9.5	7.5	6.0	4.8	3.9	3.3	2.7	2.3	2.0	1.7
25	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4
26	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4
27	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4
28	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4
29	...	...	...	...	...	...	...	...	...	...	...	...
30	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4
31	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4
32	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4
33	12.1	11.9	10.5	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2
34	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4
35	12.1	11.9	10.5	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2
36	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4
37	12.1	11.9	10.5	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2
38	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4
39	12.1	11.9	10.5	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2
40	12.1	11.9	10.5	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2
41	12.1	11.9	10.5	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2
42	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4
43	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4
44	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4
45	12.1	11.9	10.5	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	18Cr-8Ni	Smls. pipe	SA-312	TP304H	S30409	...	...	8	1
2	18Cr-8Ni	Wld. pipe	SA-312	TP304H	S30409	...	...	8	1
3	18Cr-8Ni	Smls. pipe	SA-376	TP304H	S30409	...	...	8	1
4	18Cr-8Ni	Fittings	SA-403	304H	S30409	CR	...	8	1
5	18Cr-8Ni	Fittings	SA-403	304H	S30409	WP-S	...	8	1
6	18Cr-8Ni	Wld. fittings	SA-403	304H	S30409	WP-W	...	8	1
7	18Cr-8Ni	Wld. fittings	SA-403	304H	S30409	WP-WX	...	8	1
8	18Cr-8Ni-N	Smls. tube	SA-213	TP304N	S30451	...	...	8	1
9	18Cr-8Ni-N	Plate	SA-240	304N	S30451	...	...	8	1
10	18Cr-8Ni-N	Wld. tube	SA-249	TP304N	S30451	...	...	8	1
11	18Cr-8Ni-N	Smls. pipe	SA-312	TP304N	S30451	...	...	8	1
12	18Cr-8Ni-N	Wld. pipe	SA-312	TP304N	S30451	...	...	8	1
13	18Cr-8Ni-N	Smls. pipe	SA-376	TP304N	S30451	...	...	8	1
14	18Cr-8Ni-N	Fittings	SA-403	304N	S30451	CR	...	8	1
15	18Cr-8Ni-N	Wld. fittings	SA-403	304N	S30451	WP-W	...	8	1
16	18Cr-8Ni-N	Wld. fittings	SA-403	304N	S30451	WP-WX	...	8	1
17	18Cr-8Ni-N	Forgings	SA-965	F304N	S30451	...	...	...	...
18	18Cr-10Ni-Cb	Castings	SA-351	CF8C	J92710	...	...	8	1
19	18Cr-10Ni-Cb	Forgings	SA-182	F347	S34700	...	$t > 5$	8	1
20	18Cr-10Ni-Cb	Forgings	SA-965	F347	S34700	...	...	8	1
21	18Cr-10Ni-Cb	Forgings	SA-182	F347H	S34709	...	$t > 5$	8	1
22	18Cr-10Ni-Cb	Forgings	SA-965	F347H	S34709	...	...	8	1
23	18Cr-10Ni-Cb	Forgings	SA-182	F348	S34800	...	$t > 5$	8	1
24	18Cr-10Ni-Cb	Forgings	SA-182	F348H	S34809	...	$t > 5$	8	1
25	18Cr-10Ni-Cb	Forgings	SA-182	F347	S34700	...	$t \leq 5$	8	1
26	18Cr-10Ni-Cb	Smls. tube	SA-213	TP347	S34700	...	...	8	1
27	18Cr-10Ni-Cb	Plate	SA-240	347	S34700	...	...	8	1
28	18Cr-10Ni-Cb	Wld. tube	SA-249	TP347	S34700	...	...	8	1
29	18Cr-10Ni-Cb	Smls. pipe	SA-312	TP347	S34700	...	...	8	1
30	18Cr-10Ni-Cb	Wld. pipe	SA-312	TP347	S34700	...	...	8	1
31	18Cr-10Ni-Cb	Smls. pipe	SA-376	TP347	S34700	...	...	8	1
32	18Cr-10Ni-Cb	Fittings	SA-403	347	S34700	CR	...	8	1
33	18Cr-10Ni-Cb	Fittings	SA-403	347	S34700	WP-S	...	8	1
34	18Cr-10Ni-Cb	Wld. fittings	SA-403	347	S34700	WP-W	...	8	1
35	18Cr-10Ni-Cb	Wld. fittings	SA-403	347	S34700	WP-WX	...	8	1
36	18Cr-10Ni-Cb	Forgings	SA-182	F347H	S34709	...	$t \leq 5$	8	1
37	18Cr-10Ni-Cb	Smls. tube	SA-213	TP347H	S34709	...	...	8	1
38	18Cr-10Ni-Cb	Plate	SA-240	347H	S34709	...	...	8	1
39	18Cr-10Ni-Cb	Wld. tube	SA-249	TP347H	S34709	...	...	8	1
40	18Cr-10Ni-Cb	Smls. pipe	SA-312	TP347H	S34709	...	...	8	1
41	18Cr-10Ni-Cb	Wld. pipe	SA-312	TP347H	S34709	...	...	8	1
42	18Cr-10Ni-Cb	Smls. pipe	SA-376	TP347H	S34709	...	...	8	1

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Maximum Use Temperature, °F	External Pressure Chart No.	Notes
1	75	30	1500	HA-1	G2, T9
2	75	30	1500	HA-1	G2, G6, T9
3	75	30	1500	HA-1	G2, G4, T9
4	75	30	1500	HA-1	G2, G6, T9
5	75	30	1500	HA-1	G2, T9
6	75	30	1500	HA-1	G2, G6, T9
7	75	30	1500	HA-1	G2, G6, T9
8	80	35	1200	HA-1	G2, T9
9	80	35	1200	HA-1	G2, T9
10	80	35	1200	HA-1	G2, G6, T9
11	80	35	1200	HA-1	G2, T9
12	80	35	1200	HA-1	G2, G6, T9
13	80	35	1200	HA-1	G2, G4, T9
14	80	35	1200	HA-1	G2, G6, T9
15	80	35	1200	HA-1	G2, G6, T9
16	80	35	1200	HA-1	G2, G6, T9
17	80	35	1200	HA-1	G2, T9
18	70	30	1500	HA-2	G2, G3, G8, T8
19	70	30	1500	HA-2	G2, G3, T8
20	70	30	1500	HA-2	G2, G3, G4, T8
21	70	30	1500	HA-2	G1, G2, T9
22	70	30	1500	HA-2	G1, G2, G3, T9
23	70	30	1500	HA-2	G2, G3, T8
24	70	30	1500	HA-2	G2, T9
25	75	30	1500	HA-2	G2, G3, G4, T8
26	75	30	1500	HA-2	G2, G3, G4, T8
27	75	30	1500	HA-2	G2, G3, T8
28	75	30	1500	HA-2	G2, G3, G6, T8
29	75	30	1500	HA-2	G2, G3, T8
30	75	30	1500	HA-2	G2, G3, G6, T8
31	75	30	1500	HA-2	G2, G3, G4, T8
32	75	30	1500	HA-2	G2, G6, T8
33	75	30	1500	HA-2	G2, T8
34	75	30	1500	HA-2	G2, G6, T8
35	75	30	1500	HA-2	G2, G6, T8
36	75	30	1500	HA-2	G1, G2, T9
37	75	30	1500	HA-2	G1, G2, T9
38	75	30	1500	HA-2	G1, G2, T9
39	75	30	1500	HA-2	G2, G6, T9
40	75	30	1500	HA-2	G1, G2, T9
41	75	30	1500	HA-2	G1, G2, G6, T9
42	75	30	1500	HA-2	G1, G2, T9

2011a SECTION II, PART D (CUSTOMARY)

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
Line No.	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
1	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
2	17.0	17.0	17.0	17.0	17.0	16.4	15.8	15.3	14.8	14.4	14.1	13.8	13.5	13.2	12.9	12.6	12.4
3	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
4	17.0	17.0	17.0	17.0	17.0	16.4	15.8	15.3	14.8	14.4	14.1	13.8	13.5	13.2	12.9	12.6	12.4
5	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
6	17.0	17.0	17.0	17.0	17.0	16.4	15.8	15.3	14.8	14.4	14.1	13.8	13.5	13.2	12.9	12.6	12.4
7	17.0	17.0	17.0	17.0	17.0	16.4	15.8	15.3	14.8	14.4	14.1	13.8	13.5	13.2	12.9	12.6	12.4
8	23.3	23.3	23.3	23.3	22.5	21.3	20.3	19.5	18.9	18.3	17.9	17.5	17.2	16.9	16.6	16.3	16.0
9	23.3	23.3	23.3	23.3	22.5	21.3	20.3	19.5	18.9	18.3	17.9	17.5	17.2	16.9	16.6	16.3	16.0
10	19.8	19.8	19.8	19.8	19.2	18.1	17.3	16.6	16.0	15.6	15.2	14.9	14.6	14.4	14.1	13.8	13.6
11	23.3	23.3	23.3	23.3	22.5	21.3	20.3	19.5	18.9	18.3	17.9	17.5	17.2	16.9	16.6	16.3	16.0
12	19.8	19.8	19.8	19.8	19.2	18.1	17.3	16.6	16.0	15.6	15.2	14.9	14.6	14.4	14.1	13.8	13.6
13	23.3	23.3	23.3	23.3	22.5	21.3	20.3	19.5	18.9	18.3	17.9	17.5	17.2	16.9	16.6	16.3	16.0
14	19.8	19.8	19.8	19.8	19.2	18.1	17.3	16.6	16.0	15.6	15.2	14.9	14.6	14.4	14.1	13.8	13.6
15	19.8	19.8	19.8	19.8	19.2	18.1	17.3	16.6	16.0	15.6	15.2	14.9	14.6	14.4	14.1	13.8	13.6
16	19.8	19.8	19.8	19.8	19.2	18.1	17.3	16.6	16.0	15.6	15.2	14.9	14.6	14.4	14.1	13.8	13.6
17	23.3	23.3	23.3	23.3	22.5	21.3	20.3	19.5	18.9	18.3	17.9	17.5	17.2	16.9	16.6	16.3	16.0
18	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
19	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
20	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
21	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
22	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
23	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
24	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
25	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
26	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
27	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
28	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.1	15.9	15.7	15.6	15.5	15.4
29	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
30	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.1	15.9	15.7	15.6	15.5	15.4
31	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
32	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.1	15.9	15.7	15.6	15.5	15.4
33	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
34	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.1	15.9	15.7	15.6	15.5	15.4
35	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.1	15.9	15.7	15.6	15.5	15.4
36	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
37	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
38	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
39	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.1	15.9	15.7	15.6	15.5	15.4
40	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
41	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.1	15.9	15.7	15.6	15.5	15.4
42	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding											
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
1	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4
2	12.1	11.9	10.5	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2
3	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4
4	12.1	11.9	10.5	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2
5	14.3	14.0	12.4	9.8	7.7	6.1	4.7	3.7	2.9	2.3	1.8	1.4
6	12.1	11.9	10.5	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2
7	12.1	11.9	10.5	8.3	6.6	5.2	4.0	3.1	2.5	2.0	1.6	1.2
8	15.6	15.2	12.4	9.8	7.7	6.1	...	...	...	...	...	...
9	15.6	15.2	12.4	9.8	7.7	6.1	...	...	...	...	...	...
10	13.3	13.0	10.5	8.3	6.6	5.2	...	...	...	...	...	...
11	15.6	15.2	12.4	9.8	7.7	6.1	...	...	...	...	...	...
12	13.3	13.0	10.5	8.3	6.6	5.2	...	...	...	...	...	...
13	15.6	15.2	12.4	9.8	7.7	6.1	...	...	...	...	...	...
14	13.3	13.0	10.5	8.3	6.6	5.2	...	...	...	...	...	...
15	13.3	13.0	10.5	8.3	6.6	5.2	...	...	...	...	...	...
16	13.3	13.0	10.5	8.3	6.6	5.2	...	...	...	...	...	...
17	15.6	15.2	12.4	9.8	7.7	6.1	...	...	...	...	...	...
18	18.1	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80
19	18.1	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80
20	18.1	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80
21	18.1	18.1	17.4	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3
22	18.1	18.1	17.4	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3
23	18.1	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80
24	18.1	18.1	17.4	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3
25	18.1	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80
26	18.1	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80
27	18.1	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80
28	15.4	13.6	10.3	7.8	5.2	3.8	2.8	1.9	1.3	1.0	0.76	0.68
29	18.1	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80
30	15.4	13.6	10.3	7.8	5.2	3.8	2.8	1.9	1.3	1.0	0.76	0.68
31	18.1	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80
32	15.4	13.6	10.3	7.8	5.2	3.8	2.8	1.9	1.3	1.0	0.76	0.68
33	18.1	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80
34	15.4	13.6	10.3	7.8	5.2	3.8	2.8	1.9	1.3	1.0	0.76	0.68
35	15.4	13.6	10.3	7.8	5.2	3.8	2.8	1.9	1.3	1.0	0.76	0.68
36	18.1	18.1	17.4	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3
37	18.1	18.1	17.4	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3
38	18.1	18.1	17.4	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3
39	15.4	15.4	14.8	12.0	8.9	6.7	5.0	3.7	2.7	2.1	1.6	1.1
40	18.1	18.1	17.4	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3
41	15.4	15.4	14.8	12.0	8.9	6.7	5.0	3.7	2.7	2.1	1.6	1.1
42	18.1	18.1	17.4	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	18Cr-10Ni-Cb	Fittings	SA-403	347H	S34709	CR	...	8	1
2	18Cr-10Ni-Cb	Fittings	SA-403	347H	S34709	WP-S	...	8	1
3	18Cr-10Ni-Cb	Wld. fittings	SA-403	347H	S34709	WP-W	...	8	1
4	18Cr-10Ni-Cb	Wld. fittings	SA-403	347H	S34709	WP-WX	...	8	1
5	18Cr-10Ni-Cb	Forgings	SA-182	F348	S34800	...	$t \leq 5$	8	1
6	18Cr-10Ni-Cb	Smls. tube	SA-213	TP348	S34800	...	...	8	1
7	18Cr-10Ni-Cb	Plate	SA-240	348	S34800	...	...	8	1
8	18Cr-10Ni-Cb	Wld. tube	SA-249	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	Smls. pipe	SA-376	TP348	S34800	...	...	8	1
12	18Cr-10Ni-Cb	Fittings	SA-403	348	S34800	CR	...	8	1
13	18Cr-10Ni-Cb	Fittings	SA-403	348	S34800	WP-S	...	8	1
14	18Cr-10Ni-Cb	Wld. fittings	SA-403	348	S34800	WP-W	...	8	1
15	18Cr-10Ni-Cb	Wld. fittings	SA-403	348	S34800	WP-WX	...	8	1
16	18Cr-10Ni-Cb	Forgings	SA-182	F348H	S34809	...	$t \leq 5$	8	1
17	18Cr-10Ni-Cb	Smls. tube	SA-213	TP348H	S34809	...	...	8	1
18	18Cr-10Ni-Cb	Wld. tube	SA-249	TP348H	S34809	...	...	8	1
19	18Cr-10Ni-Cb	Smls. pipe	SA-312	TP348H	S34809	...	...	8	1
20	18Cr-10Ni-Cb	Wld. pipe	SA-312	TP348H	S34809	...	...	8	1
21	18Cr-10Ni-Cb	Fittings	SA-403	348H	S34809	CR	...	8	1
22	18Cr-10Ni-Cb	Fittings	SA-403	348H	S34809	WP-S	...	8	1
23	18Cr-10Ni-Cb	Wld. fittings	SA-403	348H	S34809	WP-W	...	8	1
24	18Cr-10Ni-Cb	Wld. fittings	SA-403	348H	S34809	WP-WX	...	8	1
25	18Cr-10Ni-Ti	Smls. pipe	SA-312	TP321	S32100	...	$t > \frac{3}{8}$	8	1
26	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321	S32100	...	$t > \frac{3}{8}$	8	1
27	18Cr-10Ni-Ti	Smls. pipe	SA-312	TP321H	S32109	...	$t > \frac{3}{16}$	8	1
28	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321H	S32109	...	$t > \frac{3}{8}$	8	1
29	18Cr-10Ni-Ti	Forgings	SA-182	F321	S32100	...	$t > 5$	8	1
30	18Cr-10Ni-Ti	Forgings	SA-965	F321	S32100	...	...	8	1
31	18Cr-10Ni-Ti	Forgings	SA-182	F321H	S32109	...	$t > 5$	8	1
32	18Cr-10Ni-Ti	Forgings	SA-965	F321H	S32109	...	...	8	1
33	18Cr-10Ni-Ti	Forgings	SA-182	F321	S32100	...	$t \leq 5$	8	1
34	18Cr-10Ni-Ti	Smls. tube	SA-213	TP321	S32100	...	...	8	1
35	18Cr-10Ni-Ti	Plate	SA-240	321	S32100	...	...	8	1
36	18Cr-10Ni-Ti	Wld. tube	SA-249	TP321	S32100	...	...	8	1
37	18Cr-10Ni-Ti	Smls. pipe	SA-312	TP321	S32100	...	$t \leq \frac{3}{8}$	8	1
38	18Cr-10Ni-Ti	Wld. pipe	SA-312	TP321	S32100	...	...	8	1
39	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321	S32100	...	$t \leq \frac{3}{8}$	8	1
40	18Cr-10Ni-Ti	Fittings	SA-403	321	S32100	CR	...	8	1
41	18Cr-10Ni-Ti	Fittings	SA-403	321	S32100	WP-S	...	8	1
42	18Cr-10Ni-Ti	Wld. fittings	SA-403	321	S32100	WP-W	...	8	1
43	18Cr-10Ni-Ti	Wld. fittings	SA-403	321	S32100	WP-WX	...	8	1

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Maximum Use Temperature, °F	External Pressure Chart No.	Notes
1	75	30	1500	HA-2	G1, G2, G6, T9
2	75	30	1500	HA-2	G1, G2, T9
3	75	30	1500	HA-2	G1, G2, G6, T9
4	75	30	1500	HA-2	G1, G2, G6, T9
5	75	30	1500	HA-2	G2, G3, T8
6	75	30	1500	HA-2	G2, G3, T8
7	75	30	1500	HA-2	G2, G3, T8
8	75	30	1500	HA-2	G2, G3, G6, T8
9	75	30	1500	HA-2	G2, G3, T8
10	75	30	1500	HA-2	G2, G3, G6, T8
11	75	30	1500	HA-2	G2, G3, G4, T8
12	75	30	1500	HA-2	G1, G2, G6, T8
13	75	30	1500	HA-2	G1, G2, T8
14	75	30	1500	HA-2	G1, G2, G6, T8
15	75	30	1500	HA-2	G1, G2, G6, T8
16	75	30	1500	HA-2	G2, T9
17	75	30	1500	HA-2	G1, G2, T9
18	75	30	1500	HA-2	G2, G6, T9
19	75	30	1500	HA-2	G1, G2, T9
20	75	30	1500	HA-2	G1, G2, G6, T9
21	75	30	1500	HA-2	G1, G2, G6, T9
22	75	30	1500	HA-2	G1, G2, T9
23	75	30	1500	HA-2	G1, G2, G6, T9
24	75	30	1500	HA-2	G1, G2, G6, T9
25	70	25	1500	HA-2	G2, G3, T9
26	70	25	1500	HA-2	G2, G3, G4, T9
27	70	25	1500	HA-2	G2, T9
28	70	25	1500	HA-2	G1, G2, T9
29	70	30	1500	HA-2	G2, G3, T8
30	70	30	1500	HA-2	G2, G3, T8
31	70	30	1500	HA-2	G1, G2, T9
32	70	30	1500	HA-2	G1, G2, G3, T9
33	75	30	1500	HA-2	G2, G3, T8
34	75	30	1500	HA-2	G2, G3, T8
35	75	30	1500	HA-2	G2, G3, T8
36	75	30	1500	HA-2	G2, G3, G6, T8
37	75	30	1500	HA-2	G2, G3, T8
38	75	30	1500	HA-2	G2, G3, G6, T8
39	75	30	1500	HA-2	G2, G3, G4, T8
40	75	30	1500	HA-2	G2, G6, T8
41	75	30	1500	HA-2	G2, T8
42	75	30	1500	HA-2	G2, G6, T8
43	75	30	1500	HA-2	G2, G6, T8

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
Line No.	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
1	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.1	15.9	15.7	15.6	15.5	15.4
2	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
3	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.1	15.9	15.7	15.6	15.5	15.4
4	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.1	15.9	15.7	15.6	15.5	15.4
5	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
6	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
7	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
8	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.1	15.9	15.7	15.6	15.5	15.4
9	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
10	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.1	15.9	15.7	15.6	15.5	15.4
11	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
12	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.1	15.9	15.7	15.6	15.5	15.4
13	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
14	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.1	15.9	15.7	15.6	15.5	15.4
15	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.1	15.9	15.7	15.6	15.5	15.4
16	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
17	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
18	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.1	15.9	15.7	15.6	15.5	15.4
19	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
20	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.1	15.9	15.7	15.6	15.5	15.4
21	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.1	15.9	15.7	15.6	15.5	15.4
22	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	19.0	18.7	18.5	18.3	18.2	18.1
23	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.1	15.9	15.7	15.6	15.5	15.4
24	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.1	15.9	15.7	15.6	15.5	15.4
25	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.6	16.1	15.6	15.2	14.9	14.6	14.3	14.1	13.9	13.8
26	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.6	16.1	15.6	15.2	14.9	14.6	14.3	14.1	13.9	13.8
27	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.6	16.1	15.6	15.2	14.9	14.6	14.3	14.1	13.9	13.8
28	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.6	16.1	15.6	15.2	14.9	14.6	14.3	14.1	13.9	13.8
29	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.8	18.3	17.9	17.5	17.2	16.9	16.7	16.5
30	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.8	18.3	17.9	17.5	17.2	16.9	16.7	16.5
31	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.8	18.3	17.9	17.5	17.2	16.9	16.7	16.5
32	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.8	18.3	17.9	17.5	17.2	16.9	16.7	16.5
33	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.8	18.3	17.9	17.5	17.2	16.9	16.7	16.5
34	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.8	18.3	17.9	17.5	17.2	16.9	16.7	16.5
35	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.8	18.3	17.9	17.5	17.2	16.9	16.7	16.5
36	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.4	16.0	15.5	15.2	14.9	14.6	14.4	14.2	14.1
37	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.8	18.3	17.9	17.5	17.2	16.9	16.7	16.5
38	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.4	16.0	15.5	15.2	14.9	14.6	14.4	14.2	14.1
39	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.8	18.3	17.9	17.5	17.2	16.9	16.7	16.5
40	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.4	16.0	15.5	15.2	14.9	14.6	14.4	14.2	14.1
41	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.8	18.3	17.9	17.5	17.2	16.9	16.7	16.5
42	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.4	16.0	15.5	15.2	14.9	14.6	14.4	14.2	14.1
43	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.4	16.0	15.5	15.2	14.9	14.6	14.4	14.2	14.1

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding											
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
1	15.4	15.4	14.8	12.0	8.9	6.7	5.0	3.7	2.7	2.1	1.6	1.1
2	18.1	18.1	17.4	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3
3	15.4	15.4	14.8	12.0	8.9	6.7	5.0	3.7	2.7	2.1	1.6	1.1
4	15.4	15.4	14.8	12.0	8.9	6.7	5.0	3.7	2.7	2.1	1.6	1.1
5	18.1	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80
6	18.1	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80
7	18.1	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80
8	15.4	13.6	10.3	7.8	5.2	3.8	2.8	1.9	1.3	1.0	0.76	0.68
9	18.1	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80
10	15.4	13.6	10.3	7.8	5.2	3.8	2.8	1.9	1.3	1.0	0.76	0.68
11	18.1	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80
12	15.4	13.6	10.3	7.8	5.2	3.8	2.8	1.9	1.3	1.0	0.76	0.68
13	18.1	16.0	12.1	9.1	6.1	4.4	3.3	2.2	1.5	1.2	0.90	0.80
14	15.4	13.6	10.3	7.8	5.2	3.8	2.8	1.9	1.3	1.0	0.76	0.68
15	15.4	13.6	10.3	7.8	5.2	3.8	2.8	1.9	1.3	1.0	0.76	0.68
16	18.1	18.1	17.4	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3
17	18.1	18.1	17.4	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3
18	15.4	15.4	14.8	12.0	8.9	6.7	5.0	3.7	2.7	2.1	1.6	1.1
19	18.1	18.1	17.4	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3
20	15.4	15.4	14.8	12.0	8.9	6.7	5.0	3.7	2.7	2.1	1.6	1.1
21	15.4	15.4	14.8	12.0	8.9	6.7	5.0	3.7	2.7	2.1	1.6	1.1
22	18.1	18.1	17.4	14.1	10.5	7.9	5.9	4.4	3.2	2.5	1.8	1.3
23	15.4	15.4	14.8	12.0	8.9	6.7	5.0	3.7	2.7	2.1	1.6	1.1
24	15.4	15.4	14.8	12.0	8.9	6.7	5.0	3.7	2.7	2.1	1.6	1.1
25	13.6	13.5	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30
26	13.6	13.5	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30
27	13.6	13.5	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1
28	13.6	13.5	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1
29	16.4	16.2	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30
30	16.4	16.2	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30
31	16.4	16.2	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1
32	16.4	16.2	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1
33	16.4	16.2	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30
34	16.4	16.2	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30
35	16.4	16.2	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30
36	13.9	13.8	8.2	5.9	4.3	3.1	2.2	1.4	0.94	0.68	0.43	0.26
37	16.4	16.2	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30
38	13.9	13.8	8.2	5.9	4.3	3.1	2.2	1.4	0.94	0.68	0.43	0.26
39	16.4	16.2	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30
40	13.9	13.8	8.2	5.9	4.3	3.1	2.2	1.4	0.94	0.68	0.43	0.26
41	16.4	16.2	9.6	6.9	5.0	3.6	2.6	1.7	1.1	0.80	0.50	0.30
42	13.9	13.8	8.2	5.9	4.3	3.1	2.2	1.4	0.94	0.68	0.43	0.26
43	13.9	13.8	8.2	5.9	4.3	3.1	2.2	1.4	0.94	0.68	0.43	0.26

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	18Cr-10Ni-Ti	Forgings	SA-182	F321H	S32109	...	$t \leq 5$	8	1
2	18Cr-10Ni-Ti	Smls. tube	SA-213	TP321H	S32109	...	...	8	1
3	18Cr-10Ni-Ti	Plate	SA-240	321H	S32109	...	...	8	1
4	18Cr-10Ni-Ti	Wld. tube	SA-249	TP321H	S32109	...	...	8	1
5	18Cr-10Ni-Ti	Smls. pipe	SA-312	TP321H	S32109	...	$t \leq \frac{3}{16}$	8	1
6	18Cr-10Ni-Ti	Wld. pipe	SA-312	TP321H	S32109	...	$t \leq \frac{3}{16}$	8	1
7	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321H	S32109	...	$t \leq \frac{3}{8}$	8	1
8	18Cr-10Ni-Ti	Fittings	SA-403	321H	S32109	CR	...	8	1
9	18Cr-10Ni-Ti	Fittings	SA-403	321H	S32109	WP-S	...	8	1
10	18Cr-10Ni-Ti	Wld. fittings	SA-403	321H	S32109	WP-W	...	8	1
11	18Cr-10Ni-Ti	Wld. fittings	SA-403	321H	S32109	WP-WX	...	8	1
12	18Cr-13Ni-3Mo	Plate	SA-240	317	S31700	...	$t \leq 5$	8	1
13	18Cr-13Ni-3Mo	Wld. tube	SA-249	TP317	S31700	...	...	8	1
14	18Cr-13Ni-3Mo	Smls. pipe	SA-312	TP317	S31700	...	$t \leq 5$	8	1
15	18Cr-13Ni-3Mo	Wld. pipe	SA-312	TP317	S31700	...	$t \leq 5$	8	1
16	18Cr-13Ni-3Mo	Fittings	SA-403	317	S31700	WP-S	...	8	1
17	18Cr-13Ni-3Mo	Plate	SA-240	317L	S31703	...	...	8	1
18	18Cr-13Ni-3Mo	Fittings	SA-403	317L	S31703	WP-S	...	8	1
19	18Cr-18Ni-2Si	Smls. tube	SA-213	XM-15	S38100	...	$t \leq 5$	8	1
20	18Cr-18Ni-2Si	Plate	SA-240	XM-15	S38100	...	$t \leq 5$	8	1
21	18Cr-18Ni-2Si	Wld. tube	SA-249	TPXM-15	S38100	...	$t \leq 5$	8	1
22	18Cr-18Ni-2Si	Smls. pipe	SA-312	TPXM-15	S38100	...	$t \leq 5$	8	1
23	18Cr-18Ni-2Si	Wld. pipe	SA-312	TPXM-15	S38100	...	$t \leq 5$	8	1
24	21Cr-6Ni-9Mn	Forgings	SA-182	FXM-11	S21904	...	...	8	3
25	21Cr-6Ni-9Mn	Smls. pipe	SA-312	TPXM-11	S21904	...	...	8	3
26	21Cr-6Ni-9Mn	Wld. pipe	SA-312	TPXM-11	S21904	...	...	8	3
27	21Cr-6Ni-9Mn	Plate	SA-666	XM-11	S21904	...	...	8	3
28	21Cr-6Ni-9Mn	Forgings	SA-965	FXM-11	S21904	...	...	8	3
29	22Cr-5Ni-3Mo-N	Forgings	SA-182	F51	S31803	...	...	10H	1
30	22Cr-5Ni-3Mo-N	Plate	SA-240	...	S31803	...	...	10H	1
31	22Cr-5Ni-3Mo-N	Smls. tube	SA-789	...	S31803	...	...	10H	1
32	22Cr-5Ni-3Mo-N	Wld. tube	SA-789	...	S31803	...	...	10H	1
33	22Cr-5Ni-3Mo-N	Smls. pipe	SA-790	...	S31803	...	...	10H	1
34	22Cr-5Ni-3Mo-N	Wld. pipe	SA-790	...	S31803	...	...	10H	1
35	22Cr-13Ni-5Mn	Forgings	SA-182	FXM-19	S20910	...	...	8	3
36	22Cr-13Ni-5Mn	Plate	SA-240	XM-19	S20910	...	...	8	3
37	22Cr-13Ni-5Mn	Wld. tube	SA-249	TPXM-19	S20910	...	...	8	3
38	22Cr-13Ni-5Mn	Smls. pipe	SA-312	TPXM-19	S20910	...	...	8	3
39	22Cr-13Ni-5Mn	Wld. pipe	SA-312	TPXM-19	S20910	...	...	8	3
40	22Cr-13Ni-5Mn	Fittings	SA-403	XM-19	S20910	CR	...	8	3
41	22Cr-13Ni-5Mn	Wld. fittings	SA-403	XM-19	S20910	WP-W	...	8	3
42	22Cr-13Ni-5Mn	Wld. fittings	SA-403	XM-19	S20910	WP-WX	...	8	3
43	22Cr-13Ni-5Mn	Bar	SA-479	XM-19	S20910	...	...	8	3
44	22Cr-13Ni-5Mn	Forgings	SA-965	FXM-19	S20910	...	...	8	3

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Maximum Use Temperature, °F	External Pressure Chart No.	Notes
1	75	30	1500	HA-2	G1, G2, T9
2	75	30	1500	HA-2	G1, G2, T9
3	75	30	1500	HA-2	G1, G2, T9
4	75	30	1500	HA-2	G2, G6, T9
5	75	30	1500	HA-2	G2, T9
6	75	30	1500	HA-2	G2, G6, T9
7	75	30	1500	HA-2	G1, G2, T9
8	75	30	1500	HA-2	G1, G2, G6, T9
9	75	30	1500	HA-2	G1, G2, T9
10	75	30	1500	HA-2	G1, G2, G6, T9
11	75	30	1500	HA-2	G1, G2, G6, T9
12	75	30	1500	HA-2	G2, G3, T10
13	75	30	1500	HA-2	G2, G3, G6, T10
14	75	30	1500	HA-2	G2, G3, T10
15	75	30	1500	HA-2	G2, G3, G6, T10
16	75	30	1500	HA-2	G2, T10
17	75	30	850	HA-4	G2
18	75	30	850	HA-4	G2
19	75	30	1000	HA-2	G2, G3
20	75	30	1000	HA-2	G2, G3
21	75	30	1000	HA-2	G2, G3, G6
22	75	30	1000	HA-2	G2, G3
23	75	30	1000	HA-2	G2, G3, G6
24	90	50	600	HA-6	G2
25	90	50	600	HA-6	G2
26	90	50	600	HA-6	G2, G6
27	90	50	600	HA-6	G2
28	90	50	600	HA-6	G2
29	90	65	400	HA-5	G8
30	90	65	400	HA-5	G8
31	90	65	400	HA-5	G8
32	90	65	400	HA-5	G6, G8
33	90	65	400	HA-5	G8
34	90	65	400	HA-5	G6, G8
35	100	55	1200	HA-6	G2, T10
36	100	55	1200	HA-6	G2, T10
37	100	55	1200	HA-6	G2, G6, T10
38	100	55	1200	HA-6	G2, T10
39	100	55	1200	HA-6	G2, G6, T10
40	100	55	1200	HA-6	G2, G6, T10
41	100	55	1200	HA-6	G2, G6, T10
42	100	55	1200	HA-6	G2, G6, T10
43	100	55	1200	HA-6	G2, T10
44	100	55	1200	HA-6	G2, T10

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
Line No.	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
1	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.8	18.3	17.9	17.5	17.2	16.9	16.7	16.5
2	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.8	18.3	17.9	17.5	17.2	16.9	16.7	16.5
3	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.8	18.3	17.9	17.5	17.2	16.9	16.7	16.5
4	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.4	16.0	15.5	15.2	14.9	14.6	14.4	14.2	14.1
5	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.8	18.3	17.9	17.5	17.2	16.9	16.7	16.5
6	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.4	16.0	15.5	15.2	14.9	14.6	14.4	14.2	14.1
7	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.8	18.3	17.9	17.5	17.2	16.9	16.7	16.5
8	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.4	16.0	15.5	15.2	14.9	14.6	14.4	14.2	14.1
9	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.8	18.3	17.9	17.5	17.2	16.9	16.7	16.5
10	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.4	16.0	15.5	15.2	14.9	14.6	14.4	14.2	14.1
11	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.4	16.0	15.5	15.2	14.9	14.6	14.4	14.2	14.1
12	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.4	17.0	16.6	16.3	16.1	15.9	15.7	15.6
13	17.0	17.0	17.0	17.0	17.0	17.0	16.4	15.8	15.3	14.8	14.5	14.1	13.9	13.7	13.5	13.4	13.2
14	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.4	17.0	16.6	16.3	16.1	15.9	15.7	15.6
15	17.0	17.0	17.0	17.0	17.0	17.0	16.4	15.8	15.3	14.8	14.5	14.1	13.9	13.7	13.5	13.4	13.2
16	20.0	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.4	17.0	16.6	16.3	16.1	15.9	15.7	15.6
17	20.0	20.0	20.0	20.0	20.0	19.6	18.9	18.2	17.7	17.3	16.9	16.5	16.2	15.8	15.5	15.2	...
18	20.0	20.0	20.0	20.0	20.0	19.6	18.9	18.2	17.7	17.3	16.9	16.5	16.2	15.8	15.5	15.2	...
19	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
20	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
21	17.0	17.0	17.0	17.0	17.0	16.4	15.8	15.3	14.8	14.4	14.1	13.8	13.5	13.2	12.9	12.6	12.4
22	20.0	20.0	20.0	20.0	20.0	19.3	18.6	18.0	17.5	17.0	16.6	16.2	15.8	15.5	15.2	14.9	14.6
23	17.0	17.0	17.0	17.0	17.0	16.4	15.8	15.3	14.8	14.4	14.1	13.8	13.5	13.2	12.9	12.6	12.4
24	33.3	33.3	33.3	32.0	29.7	27.9	26.4	25.3	24.4	23.7	23.1	...	...	...	...	...	...
25	33.3	33.3	33.3	32.0	29.7	27.9	26.4	25.3	24.4	23.7	23.1	...	...	...	...	...	...
26	28.3	28.3	28.3	27.2	25.3	23.7	22.5	21.5	20.7	20.1	19.7	...	...	...	...	...	...
27	33.3	33.3	33.3	32.0	29.7	27.9	26.4	25.3	24.4	23.7	23.1	...	...	...	...	...	...
28	33.3	33.3	33.3	32.0	29.7	27.9	26.4	25.3	24.4	23.7	23.1	...	...	...	...	...	...
29	37.5	37.5	37.5	37.0	35.8	34.9	34.2	...	...	...	...	...	...	...	...	...	...
30	37.5	37.5	37.5	37.0	35.8	34.9	34.2	...	...	...	...	...	...	...	...	...	...
31	37.5	37.5	37.5	37.0	35.8	34.9	34.2	...	...	...	...	...	...	...	...	...	...
32	31.9	31.9	31.9	31.5	30.5	29.7	29.0	...	...	...	...	...	...	...	...	...	...
33	37.5	37.5	37.5	37.0	35.8	34.9	34.2	...	...	...	...	...	...	...	...	...	...
34	31.9	31.9	31.9	31.9	31.9	31.9	31.9	...	...	...	...	...	...	...	...	...	...
35	36.7	36.7	36.7	36.7	36.7	36.7	36.7	35.8	35.0	34.3	33.7	33.1	32.6	32.2	31.8	31.4	31.1
36	36.7	36.7	36.7	36.7	36.7	36.7	36.7	35.8	35.0	34.3	33.7	33.1	32.6	32.2	31.8	31.4	31.1
37	31.2	31.2	31.2	31.2	31.2	31.2	31.2	30.4	29.7	29.1	28.6	28.2	27.7	27.4	27.0	26.7	26.4
38	36.7	36.7	36.7	36.7	36.7	36.7	36.7	35.8	35.0	34.3	33.7	33.1	32.6	32.2	31.8	31.4	31.1
39	31.2	31.2	31.2	31.2	31.2	31.2	31.2	30.4	29.7	29.1	28.6	28.2	27.7	27.4	27.0	26.7	26.4
40	31.2	31.2	31.2	31.2	31.2	31.2	31.2	30.4	29.7	29.1	28.6	28.2	27.7	27.4	27.0	26.7	26.4
41	31.2	31.2	31.2	31.2	31.2	31.2	31.2	30.4	29.7	29.1	28.6	28.2	27.7	27.4	27.0	26.7	26.4
42	31.2	31.2	31.2	31.2	31.2	31.2	31.2	30.4	29.7	29.1	28.6	28.2	27.7	27.4	27.0	26.7	26.4
43	36.7	36.7	36.7	36.7	36.7	36.7	36.7	35.8	35.0	34.3	33.7	33.1	32.6	32.2	31.8	31.4	31.1
44	36.7	36.7	36.7	36.7	36.7	36.7	36.7	35.8	35.0	34.3	33.7	33.1	32.6	32.2	31.8	31.4	31.1

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding											
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
1	16.4	16.2	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1
2	16.4	16.2	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1
3	16.4	16.2	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1
4	13.9	13.8	10.5	7.7	5.9	4.6	3.5	2.7	2.1	1.6	1.3	0.94
5	16.4	16.2	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1
6	13.9	13.8	10.5	7.7	5.9	4.6	3.5	2.7	2.1	1.6	1.3	0.94
7	16.4	16.2	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1
8	13.9	13.8	10.5	7.7	5.9	4.6	3.5	2.7	2.1	1.6	1.3	0.94
9	16.4	16.2	12.3	9.1	6.9	5.4	4.1	3.2	2.5	1.9	1.5	1.1
10	13.9	13.8	10.5	7.7	5.9	4.6	3.5	2.7	2.1	1.6	1.3	0.94
11	13.9	13.8	10.5	7.7	5.9	4.6	3.5	2.7	2.1	1.6	1.3	0.94
12	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3
13	13.1	13.0	12.9	10.5	8.3	6.3	4.7	3.5	2.6	1.9	1.5	1.1
14	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3
15	13.1	13.0	12.9	10.5	8.3	6.3	4.7	3.5	2.6	1.9	1.5	1.1
16	15.4	15.3	15.1	12.4	9.8	7.4	5.5	4.1	3.1	2.3	1.7	1.3
17
18
19	14.3	14.0
20	14.3	14.0
21	12.1	11.9
22	14.3	14.0
23	12.1	11.9
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35	30.7	30.3	29.7	20.4	13.0	8.3
36	30.7	30.3	29.7	20.4	13.0	8.3
37	26.1	25.7	25.2	17.3	11.1	7.1
38	30.7	30.3	29.7	20.4	13.0	8.3
39	26.1	25.7	25.2	17.3	11.1	7.1	...	...	...	...	...	...
40	26.1	25.7	25.2	17.3	11.1	7.1	...	...	...	...	...	...
41	26.1	25.7	25.2	17.3	11.1	7.1	...	...	...	...	...	...
42	26.1	25.7	25.2	17.3	11.1	7.1	...	...	...	...	...	...
43	30.7	30.3	29.7	20.4	13.0	8.3	...	...	...	...	...	...
44	30.7	30.3	29.7	20.4	13.0	8.3	...	...	...	...	...	...

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
(10)	1 23Cr-4Ni-Mo-Cu-N	Plate	SA-240	...	S32304	...	...	10H	1
	2 23Cr-12Ni	Fittings	SA-403	309	S30900	...	...	8	2
	3 23Cr-12Ni	Fittings	SA-403	309	S30900	WP-S	...	8	2
	4 23Cr-12Ni	Wld. fittings	SA-403	309	S30900	WP-W	...	8	2
	5 23Cr-12Ni	Wld. fittings	SA-403	309	S30900	WP-WX	...	8	2
	6 23Cr-12Ni	Smls. tube	SA-213	TP309S	S30908	...	...	8	2
	7 23Cr-12Ni	Plate	SA-240	309S	S30908	...	...	8	2
	8 23Cr-12Ni	Wld. tube	SA-249	TP309S	S30908	...	...	8	2
	9 23Cr-12Ni	Smls. pipe	SA-312	TP309S	S30908	...	...	8	2
	10 23Cr-12Ni	Wld. pipe	SA-312	TP309S	S30908	...	...	8	2
	11 23Cr-12Ni	Wld. pipe	SA-813	TP309S	S30908	...	...	8	2
	12 23Cr-12Ni	Wld. pipe	SA-814	TP309S	S30908	...	...	8	2
	13 23Cr-12Ni	Smls. tube	SA-213	TP309H	S30909	...	...	8	2
	14 23Cr-12Ni	Plate	SA-240	309H	S30909	...	...	8	2
	15 23Cr-12Ni	Wld. tube	SA-249	TP309H	S30909	...	...	8	2
	16 23Cr-12Ni	Smls. pipe	SA-312	TP309H	S30909	...	...	8	2
	17 23Cr-12Ni	Wld. pipe	SA-312	TP309H	S30909	...	...	8	2
	18 23Cr-12Ni	Bar	SA-479	309H	S30909	...	...	8	2
	19 23Cr-12Ni-Cb	Smls. tube	SA-213	TP309Cb	S30940	...	...	8	2
	20 23Cr-12Ni-Cb	Plate	SA-240	309Cb	S30940	...	...	8	2
	21 23Cr-12Ni-Cb	Wld. tube	SA-249	TP309Cb	S30940	...	...	8	2
	22 23Cr-12Ni-Cb	Smls. pipe	SA-312	TP309Cb	S30940	...	...	8	2
	23 23Cr-12Ni-Cb	Wld. pipe	SA-312	TP309Cb	S30940	...	...	8	2
	24 23Cr-12Ni-Cb	Wld. pipe	SA-813	TP309Cb	S30940	...	...	8	2
	25 23Cr-12Ni-Cb	Wld. pipe	SA-814	TP309Cb	S30940	...	...	8	2
(10)	26 25Cr-5Ni-3Mo-2Cu	Plate	SA-240	255	S32550	...	...	10H	1
	27 25Cr-6Ni-Mo-N	Plate	SA-240	...	S31200	...	...	10H	1
	28 25Cr-12Ni	Castings	SA-351	CH8	J93400	...	...	8	2
	29 25Cr-12Ni	Castings	SA-351	CH20	J93402	...	...	8	2
	30 25Cr-20Ni	Castings	SA-351	CK20	J94202	...	...	8	2
	31 25Cr-20Ni	Forgings	SA-182	F310	S31000	...	$t \leq 5$	8	2
	32 25Cr-20Ni	Forgings	SA-965	F310	S31000	...	...	8	2
	33 25Cr-20Ni	Smls. tube	SA-213	TP310S	S31008	...	...	8	2
	34 25Cr-20Ni	Plate	SA-240	310S	S31008	...	...	8	2
	35 25Cr-20Ni	Wld. tube	SA-249	TP310S	S31008	...	...	8	2
	36 25Cr-20Ni	Smls. pipe	SA-312	TP310S	S31008	...	...	8	2
	37 25Cr-20Ni	Wld. pipe	SA-312	TP310S	S31008	...	...	8	2
	38 25Cr-20Ni	Fittings	SA-403	310S	S31008	CR	...	8	2
	39 25Cr-20Ni	Fittings	SA-403	310S	S31008	WP-S	...	8	2
	40 25Cr-20Ni	Wld. fittings	SA-403	310S	S31008	WP-W	...	8	2
	41 25Cr-20Ni	Wld. fittings	SA-403	310S	S31008	WP-WX	...	8	2
	42 25Cr-20Ni	Wld. pipe	SA-813	TP310S	S31008	...	...	8	2
	43 25Cr-20Ni	Wld. pipe	SA-814	TP310S	S31008	...	...	8	2

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Maximum Use Temperature, °F	External Pressure Chart No.	Notes	
1	87	58	600	HA-6	G2, G8	(10)
2	75	30	1500	HA-2	G2, G6, T7	
3	75	30	1500	HA-2	G2, T7	
4	75	30	1500	HA-2	G2, G6, T7	
5	75	30	1500	HA-2	G2, G6, T7	
6	75	30	1500	HA-2	G2, G3, T7	
7	75	30	1500	HA-2	G2, G3, T7	
8	75	30	1500	HA-2	G2, G6, T7	
9	75	30	1500	HA-2	G2, G3, T7	
10	75	30	1500	HA-2	G2, G3, G6, T7	
11	75	30	1500	HA-2	G2, G3, G6, T7	
12	75	30	1500	HA-2	G2, G3, G6, T7	
13	75	30	1500	HA-2	G2, T8	
14	75	30	1500	HA-2	G2, G4, T8	
15	75	30	1500	HA-2	G2, G6, T8	
16	75	30	1500	HA-2	G2, T8	
17	75	30	1500	HA-2	G2, G6, T8	
18	75	30	1500	HA-2	G2, T8	
19	75	30	1500	HA-2	G2, G3, T7	
20	75	30	1500	HA-2	G2, G3, T7	
21	75	30	1500	HA-2	G2, G3, G6, T7	
22	75	30	1500	HA-2	G2, G3, T7	
23	75	30	1500	HA-2	G2, G3, G6, T7	
24	75	30	1500	HA-2	G2, G3, G6, T7	
25	75	30	1500	HA-2	G2, G3, G6, T7	
26	110	80	500	HA-5	G8	(10)
27	100	65	650	HA-5	G2, G8	
28	65	28	1500	HA-3	G2, G3, G4, G8, T8	
29	70	30	1500	HA-2	G2, T8	
30	65	28	1500	HA-3	G2, T8	
31	75	30	1500	HA-2	G2, G3, G5, G7, T7	
32	75	30	1500	HA-2	G2, G3, G5, G7, T7	
33	75	30	1500	HA-2	G2, G3, G5, G7, T7	
34	75	30	1500	HA-2	G2, G3, G5, G7, T7	
35	75	30	1500	HA-2	G2, G3, G5, G6, G7, T7	
36	75	30	1500	HA-2	G2, G3, G5, G7, T7	
37	75	30	100	HA-2	G2, G3, G5, G6, G7	
38	75	30	1500	HA-2	G2, G6, T7	
39	75	30	1500	HA-2	G2, T7	
40	75	30	1500	HA-2	G2, G6, T7	
41	75	30	1500	HA-2	G2, G6, T7	
42	75	30	1500	HA-2	G2, G3, G5, G6, G7, T7	
43	75	30	1500	HA-2	G2, G3, G5, G6, G7, T7	

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
Line No.	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
(10)	1	36.3	35.0	33.2	31.9	30.9	30.1	29.6	29.3	28.9	28.5	28.1	...	...	...	...	...
	2	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.9	16.5	16.2	15.9	15.7	15.5	15.3	15.1	14.8
	3	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.9	19.4	19.1	18.8	18.5	18.2	18.0	17.7	17.5
	4	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.9	16.5	16.2	15.9	15.7	15.5	15.3	15.1	14.8
	5	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.9	16.5	16.2	15.9	15.7	15.5	15.3	15.1	14.8
	6	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.9	19.4	19.1	18.8	18.5	18.2	18.0	17.7	17.5
	7	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.9	19.4	19.1	18.8	18.5	18.2	18.0	17.7	17.5
	8	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.9	16.5	16.2	15.9	15.7	15.5	15.3	15.1	14.8
	9	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.9	19.4	19.1	18.8	18.5	18.2	18.0	17.7	17.5
	10	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.9	16.5	16.2	15.9	15.7	15.5	15.3	15.1	14.8
	11	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.9	16.5	16.2	15.9	15.7	15.5	15.3	15.1	14.8
	12	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.9	16.5	16.2	15.9	15.7	15.5	15.3	15.1	14.8
	13	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.9	19.4	19.1	18.8	18.5	18.2	18.0	17.7	17.5
	14	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.9	19.4	19.1	18.8	18.5	18.2	18.0	17.7	17.5
	15	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.9	16.5	16.2	15.9	15.7	15.5	15.3	15.1	14.8
	16	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.9	19.4	19.1	18.8	18.5	18.2	18.0	17.7	17.5
	17	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.9	16.5	16.2	15.9	15.7	15.5	15.3	15.1	14.8
	18	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.9	19.4	19.1	18.8	18.5	18.2	18.0	17.7	17.5
	19	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.9	19.4	19.1	18.8	18.5	18.2	18.0	17.7	17.5
	20	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.9	19.4	19.1	18.8	18.5	18.2	18.0	17.7	17.5
	21	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.9	16.5	16.2	15.9	15.7	15.5	15.3	15.1	14.8
	22	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.9	19.4	19.1	18.8	18.5	18.2	18.0	17.7	17.5
	23	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.9	16.5	16.2	15.9	15.7	15.5	15.3	15.1	14.8
	24	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.9	16.5	16.2	15.9	15.7	15.5	15.3	15.1	14.8
	25	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.9	16.5	16.2	15.9	15.7	15.5	15.3	15.1	14.8
	26	45.8	45.8	45.8	44.7	42.9	41.4	40.3	39.6	39.1	...	...	...	...	...	...	...
	27	41.7	41.7	41.7	41.7	41.7	41.7	41.7	40.9	40.1	39.2	38.0	...	...	...	...	...
	28	18.7	18.7	18.7	18.7	18.7	18.6	18.2	17.9	17.7	17.4	17.1	16.7	16.3	15.9	15.4	14.9
	29	20.0	20.0	20.0	20.0	20.0	19.9	19.5	19.2	18.9	18.6	18.3	17.9	17.5	17.0	16.5	16.0
	30	18.7	18.7	18.7	18.7	18.7	18.6	18.2	17.9	17.7	17.4	17.1	16.7	16.3	15.9	15.4	14.9
	31	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	18.9	18.5	18.2	17.9	17.7	17.4	17.2
	32	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	18.9	18.5	18.2	17.9	17.7	17.4	17.2
	33	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	18.9	18.5	18.2	17.9	17.7	17.4	17.2
	34	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	18.9	18.5	18.2	17.9	17.7	17.4	17.2
	35	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.0	15.7	15.5	15.2	15.0	14.8	14.6
	36	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	18.9	18.5	18.2	17.9	17.7	17.4	17.2
	37	17.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	38	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.0	15.7	15.5	15.2	15.0	14.8	14.6
	39	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	18.9	18.5	18.2	17.9	17.7	17.4	17.2
	40	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.0	15.7	15.5	15.2	15.0	14.8	14.6
	41	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.0	15.7	15.5	15.2	15.0	14.8	14.6
	42	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.0	15.7	15.5	15.2	15.0	14.8	14.6
	43	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.0	15.7	15.5	15.2	15.0	14.8	14.6

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding												
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	
1	(10)
2	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	
3	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	
4	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	
5	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	
6	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	
7	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	
8	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	
9	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	
10	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	
11	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	
12	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	
13	16.9	13.8	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	0.97	0.75	
14	16.9	13.8	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	0.97	0.75	
15	14.4	11.7	8.8	6.5	4.7	3.4	2.6	1.9	1.4	1.1	0.82	0.64	
16	16.9	13.8	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	0.97	0.75	
17	14.4	11.7	8.8	6.5	4.7	3.4	2.6	1.9	1.4	1.1	0.82	0.64	
18	16.9	13.8	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	0.97	0.75	
19	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	
20	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	
21	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	
22	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	
23	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	
24	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	
25	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	
26	(10)
27	...	...	...	...	...	...	...	...	...	...	...	...
28	13.9	11.1	8.5	6.5	5.0	3.8	2.9	2.3	1.8	1.3	0.90	0.80	
29	14.9	11.1	8.5	6.5	5.0	3.8	2.9	2.3	1.8	1.3	0.90	0.80	
30	13.9	11.3	9.8	8.5	7.3	6.0	4.8	3.5	2.4	1.6	1.1	0.80	
31	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	
32	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	
33	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	
34	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	
35	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	
36	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	
37	...	...	...	...	...	...	...	...	...	...	...	...
38	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	
39	15.9	9.9	7.1	5.0	3.6	2.5	1.5	0.80	0.50	0.40	0.30	0.20	
40	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	
41	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	
42	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	
43	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17	

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ UNS No.	Class/ Condition/ Temper	Size/Thickness, in.	P-No.	Group No.
1	25Cr–20Ni	Smls. tube	SA-213	TP310H	S31009	...	...	8	2
2	25Cr–20Ni	Plate	SA-240	310H	S31009	...	...	8	2
3	25Cr–20Ni	Wld. tube	SA-249	TP310H	S31009	...	...	8	2
4	25Cr–20Ni	Smls. pipe	SA-312	TP310H	S31009	...	...	8	2
5	25Cr–20Ni	Wld. pipe	SA-312	TP310H	S31009	...	...	8	2
6	25Cr–20Ni–Cb	Wld. tube	SA-249	TP310Cb	S31040	...	...	8	2
7	25Cr–20Ni–Cb	Wld. pipe	SA-312	TP310Cb	S31040	...	...	8	2
8	25Cr–20Ni–Cb	Wld. pipe	SA-813	TP310Cb	S31040	...	...	8	2
9	25Cr–20Ni–Cb	Wld. pipe	SA-814	TP310Cb	S31040	...	...	8	2
10	25Cr–22Ni–2Mo–N	Forgings	SA-182	F310MoLN	S31050	...	...	8	2
11	25Cr–22Ni–2Mo–N	Smls. tube	SA-213	TP310MoLN	S31050	...	$0.25 < t \leq 1.25$	8	2
12	25Cr–22Ni–2Mo–N	Wld. tube	SA-249	TP310MoLN	S31050	...	$0.25 < t \leq 1.25$	8	2
13	25Cr–22Ni–2Mo–N	Wld. pipe	SA-312	TP310MoLN	S31050	...	$0.25 < t \leq 1.25$	8	2
14	25Cr–22Ni–2Mo–N	Plate	SA-240	310MoLN	S31050	...	...	8	2
15	25Cr–22Ni–2Mo–N	Smls. tube	SA-213	TP310MoLN	S31050	...	$t \leq 0.25$	8	2
16	25Cr–22Ni–2Mo–N	Wld. tube	SA-249	TP310MoLN	S31050	...	$t \leq 0.25$	8	2
17	25Cr–22Ni–2Mo–N	Wld. pipe	SA-312	TP310MoLN	S31050	...	$t \leq 0.25$	8	2

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Maximum Use Temperature, °F	External Pressure Chart No.	Notes
1	75	30	1500	HA-2	G2, T8
2	75	30	1500	HA-2	G2, T8
3	75	30	1500	HA-2	G2, G6, T8
4	75	30	1500	HA-2	G2, T8
5	75	30	1500	HA-2	G2, G6, T8
6	75	30	1500	HA-2	G2, G3, G5, G6, G7, T7
7	75	30	1500	HA-2	G2, G3, G5, G6, G7, T7
8	75	30	1500	HA-2	G2, G3, G5, G6, G7, T7
9	75	30	1500	HA-2	G2, G3, G5, G6, G7, T7
10	78	37	900	HA-2	...
11	78	37	900	HA-2	...
12	78	37	900	HA-2	G6
13	78	37	900	HA-2	G6
14	80	35	600	HA-2	...
15	84	39	900	HA-2	...
16	84	39	900	HA-2	G6
17	84	39	900	HA-2	G6

2011a SECTION II, PART D (CUSTOMARY)

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
Line No.	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
1	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	18.9	18.5	18.2	17.9	17.7	17.4	17.2	16.9
2	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	18.9	18.5	18.2	17.9	17.7	17.4	17.2	16.9
3	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.0	15.7	15.5	15.2	15.0	14.8	14.6	14.4
4	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.3	18.9	18.5	18.2	17.9	17.7	17.4	17.2	16.9
5	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.0	15.7	15.5	15.2	15.0	14.8	14.6	14.4
6	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.0	15.7	15.5	15.2	15.0	14.8	14.6	14.4
7	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.0	15.7	15.5	15.2	15.0	14.8	14.6	14.4
8	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.0	15.7	15.5	15.2	15.0	14.8	14.6	14.4
9	17.0	17.0	17.0	17.0	17.0	17.0	17.0	16.8	16.4	16.0	15.7	15.5	15.2	15.0	14.8	14.6	14.4
10	24.7	24.7	24.7	24.7	24.7	24.7	24.0	23.3	22.7	22.1	21.5	21.0	20.4	19.9	19.4	18.9	18.5
11	24.7	24.7	24.7	24.7	24.7	24.7	24.0	23.3	22.7	22.1	21.5	21.0	20.4	19.9	19.4	18.9	18.5
12	21.0	21.0	21.0	21.0	21.0	21.0	20.4	19.8	19.3	18.8	18.3	17.8	17.4	16.9	16.5	16.1	15.7
13	21.0	21.0	21.0	21.0	21.0	21.0	20.4	19.8	19.3	18.8	18.3	17.8	17.4	16.9	16.5	16.1	15.7
14	23.3	23.3	23.3	23.3	23.3	23.3	22.7	22.0	21.4	20.9	20.3	...	...	...	...	...	...
15	26.0	26.0	26.0	26.0	26.0	26.0	25.3	24.5	23.9	23.3	22.7	22.1	21.5	21.0	20.5	20.0	19.5
16	22.1	22.1	22.1	22.1	22.1	22.1	21.5	20.9	20.3	19.8	19.3	18.8	18.3	17.8	17.4	17.0	16.6
17	22.1	22.1	22.1	22.1	22.1	22.1	21.5	20.9	20.3	19.8	19.3	18.8	18.3	17.8	17.4	17.0	16.6

TABLE 5A (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR FERROUS MATERIALS

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding											
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500
1	16.7	13.8	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	0.97	0.75
2	16.7	13.8	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	0.97	0.75
3	14.2	11.7	8.8	6.5	4.7	3.4	2.6	1.9	1.4	1.1	0.82	0.64
4	16.7	13.8	10.3	7.6	5.5	4.0	3.0	2.2	1.7	1.3	0.97	0.75
5	14.2	11.7	8.8	6.5	4.7	3.4	2.6	1.9	1.4	1.1	0.82	0.64
6	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17
7	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17
8	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17
9	13.5	8.4	6.0	4.3	3.1	2.1	1.3	0.68	0.43	0.34	0.26	0.17
10	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...

NOTES TO TABLE 5A

GENERAL NOTES

- (a) The following abbreviations are used: 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 T10).
- (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.
- (10) (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.

NOTES — GENERAL REQUIREMENTS

- (10) G1 For temperatures above 1000°F, these stress values may be used only if the material is heat treated by heating to a minimum temperature of 2000°F, 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 66²/₃% 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 1000°F, these stress values apply only when the carbon is 0.04% or higher. This note is applicable only when stresses above 1000°F are published.
- G4 For temperatures above 1000°F, these stress values may be used only if the material has been heat treated by heating to a minimum temperature of 1900°F and quenching in water or rapidly cooling by other means. This note is applicable only when stresses above 1000°F are published.
- G5 These stress values at temperatures of 1050°F 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 1000°F 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 Appendix A, A-340 and A-360.
- G9 The tensile strength shall not be in excess of 20,000 psi above the specified minimum.
- G10 All forgings shall have a maximum tensile strength not in excess of 25 ksi above the specified minimum.
- G11 SA-723 is exempt from the requirement in Section VIII, Division 2, AF-730.3(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, Appendix 26.
- G13 Upon prolonged exposure to temperatures above 800°F, the carbide phase of carbon steel may be converted to graphite. See Appendix A, A-240.
- G14 Upon prolonged exposure to temperatures above 875°F, the carbide phase of carbon-molybdenum steel may be converted to graphite. See Appendix A, A-240.
- (10) G15 DELETED.

NOTES — HEAT TREATMENT REQUIREMENTS

- H1 Annealed.
- H2 Normalized and tempered.
- H3 Quenched and tempered.
- H4 Liquid quenched and tempered.
- H5 Normalized, normalized and tempered, or quenched and tempered.
- H6 For applications involving consideration of heat treatment after forming or welding, see Section VIII, Division 2, Table AF-402.1 for P-No. 10K, Group No. 1 materials.
- H7 Normalized.

NOTES — SIZE REQUIREMENTS

- S1 The maximum thickness of forgings shall not exceed 3³/₄ in. (4 in. as heat treated).
- S2 The maximum section thickness shall not exceed 3 in. for double-normalized-and-tempered forgings, or 5 in. for quenched-and-tempered forgings.
- S3 Both NPS 8 and larger, and schedule 140 and heavier.

NOTES — TIME-DEPENDENT PROPERTIES

- T1 Allowable stresses for temperatures of 650°F and above are values obtained from time-dependent properties.
- T2 Allowable stresses for temperatures of 700°F and above are values obtained from time-dependent properties.
- T3 Allowable stresses for temperatures of 750°F and above are values obtained from time-dependent properties.
- T4 Allowable stresses for temperatures of 800°F and above are values obtained from time-dependent properties.
- T5 Allowable stresses for temperatures of 850°F and above are values obtained from time-dependent properties.
- T6 Allowable stresses for temperatures of 900°F and above are values obtained from time-dependent properties.

NOTES TO TABLE 5A (CONT'D)

NOTES — TIME-DEPENDENT PROPERTIES (CONT'D)

- T7 Allowable stresses for temperatures of 950°F and above are values obtained from time-dependent properties.
 T8 Allowable stresses for temperatures of 1000°F and above are values obtained from time-dependent properties.
 T9 Allowable stresses for temperatures of 1050°F and above are values obtained from time-dependent properties.
 T10 Allowable stresses for temperatures of 1100°F 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 AF.
 W3 Nonwelded, or welded if the tensile strength of the Section IX reduced section tension test is not less than 100 ksi.
 W4 Welded, with the tensile strength of the Section IX reduced section tension test less than 100 ksi but not less than 95 ksi.
 W5 In welded construction, for temperatures above 850°F, 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 AF.
 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 150°F.
 (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 $\frac{1}{4}$ in.).
 (2) For welded joints that are not quenched and tempered after welding, any change as follows:
 (a) for T less than $\frac{5}{8}$ in., any decrease in thickness (the maximum thickness qualified is $2T$);
 (b) for T equal to $\frac{5}{8}$ in. and over, any departure from the range of $\frac{5}{8}$ in. to $2T$.

TABLE 5B
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Alloy Designation/ UNS No.	Class/ Condition/ Temper
1	...	Drawn smls. tube	SB-210	Alclad 3003	0
2	...	Drawn smls. tube	SB-210	Alclad 3003	H113
3	...	Smls. extr. tube	SB-241	Alclad 3003	0
4	...	Smls. extr. tube	SB-241	Alclad 3003	H112
5	...	Plate, sheet	SB-209	A93003	0
6	...	Plate, sheet	SB-209	A93003	H112
7	...	Plate, sheet	SB-209	A93003	H112
8	...	Plate, sheet	SB-209	A93003	H112
9	...	Drawn smls. tube	SB-210	A93003	0
10	...	Drawn smls. tube	SB-210	A93003	H113
11	...	Bar, rod, shapes	SB-221	A93003	0
12	...	Bar, rod, shapes	SB-221	A93003	H112
13	...	Smls. extr. tube	SB-241	A93003	0
14	...	Smls. pipe	SB-241	A93003	H112
15	...	Smls. extr. tube	SB-241	A93003	H112
16	...	Plate, sheet	SB-209	A93004	0
17	...	Plate, sheet	SB-209	A93004	H112
18	...	Plate, sheet	SB-209	A95052	0
19	...	Plate, sheet	SB-209	A95052	H112
20	...	Plate, sheet	SB-209	A95052	H112
21	...	Plate, sheet	SB-209	A95083	0
22	...	Plate, sheet	SB-209	A95083	0
23	...	Plate, sheet	SB-209	A95083	0
24	...	Plate, sheet	SB-209	A95083	0
25	...	Plate, sheet	SB-209	A95083	0
26	...	Plate, sheet	SB-209	A95083	H112
27	...	Plate, sheet	SB-209	A95083	H112
28	...	Bar, rod, shapes	SB-221	A95083	H111
29	...	Smls. extr. tube	SB-241	A95083	H111
30	...	Plate, sheet	SB-209	A95086	0
31	...	Plate, sheet	SB-209	A95086	H112
32	...	Plate, sheet	SB-209	A95086	H112
33	...	Plate, sheet	SB-209	A95086	H112
34	...	Plate, sheet	SB-209	A95086	H112
35	...	Plate, sheet	SB-209	A95454	0
36	...	Plate, sheet	SB-209	A95454	H112
37	...	Plate, sheet	SB-209	A95454	H112
38	...	Bar, rod, shapes	SB-221	A95454	0
39	...	Bar, rod, shapes	SB-221	A95454	H112
40	...	Smls. extr. tube	SB-241	A95454	0
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
(10) 45	...	Plate, sheet	SB-209	A96061	T651
(10) 46	...	Plate, sheet	SB-209	A96061	T651

TABLE 5B
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Use Temperature, °F	External Pressure Chart No.	Notes
1	$0.010 \leq t \leq 0.5$	21	13	4.5	400	NFA-7	G4, T3
2	$0.050 \leq t \leq 0.5$	21	13	4.5	400	NFA-7	G4, T3, W2
3	...	21	13	4.5	400	NFA-7	G4, T3
4	...	21	13	4.5	400	NFA-7	G4, T3, W2
5	$0.006 \leq t \leq 3$	21	14.5	6	400	NFA-1	G4, T2
6	$0.250 \leq t < 0.5$	21	14	5	400	NFA-1	G4, T4, W2
7	$0.5 \leq t \leq 2$	21	17	10	400	NFA-1	G4, T2, W2
8	$2 < t \leq 3$	21	15	6	400	NFA-1	G4, T2, W2
9	$0.010 \leq t \leq 0.5$	21	14	5	400	NFA-1	G4, T2
10	$0.010 \leq t \leq 0.5$	21	14	5	400	NFA-1	G4, T2, W2
11	...	21	14	5	400	NFA-1	G2, G4, T2
12	...	21	14	5	400	NFA-1	G2, G4, T2, W2
13	...	21	14	5	400	NFA-1	G4, T2
14	$t \geq 1$	21	14	5	400	NFA-1	G4, T2
15	...	21	14	5	400	NFA-1	G4, T2, W2
16	$0.006 \leq t \leq 3$	22	22	8.5	400	NFA-3	G4, T3
17	$0.250 \leq t \leq 3$	22	23	9	400	NFA-3	G4, T2, W2
18	$0.051 \leq t \leq 3$	22	25	9.5	400	NFA-8	G4, T2
19	$0.25 \leq t < 0.5$	22	28	16	400	NFA-8	G4, T2, W2
20	$0.5 \leq t \leq 3$	22	25	9.5	400	NFA-8	G4, T2, W2
21	$0.051 \leq t \leq 1.5$	25	40	18	150	NFA-11	G4, G6
22	$1.5 < t \leq 3$	25	39	17	150	NFA-11	G4, G6
23	$3 < t \leq 5$	25	38	16	150	NFA-11	G4, G6
24	$5 < t \leq 7$	25	37	15	150	NFA-11	G4, G6
25	$7 < t \leq 8$	25	36	14	150	NFA-11	G4, G6
26	$0.25 \leq t \leq 1.5$	25	40	18	150	NFA-11	G4, G6, W2
27	$1.5 < t \leq 3$	25	39	17	150	NFA-11	G4, G6, W2
28	$t \leq 5$	25	40	24	150	NFA-11	G2, G4, G6, W2
29	...	25	40	24	150	NFA-11	G4, G6, W2
30	$0.051 \leq t \leq 2$	25	35	14	150	NFA-9	G4, G6
31	$0.063 \leq t < 0.5$	25	36	18	150	NFA-9	G4, G6, W2
32	$0.5 \leq t < 1$	25	35	16	150	NFA-9	G4, G6, W2
33	$1 < t \leq 2$	25	35	14	150	NFA-9	G4, G6, W2
34	$2 < t \leq 3$	25	34	14	150	NFA-9	G4, G6, W2
35	$0.051 \leq t \leq 3$	22	31	12	400	NFA-6	G4, T1
36	$0.250 \leq t < 0.5$	22	32	18	400	NFA-6	G4, T2, W2
37	$0.5 \leq t \leq 3$	22	31	12	400	NFA-6	G4, T1, W2
38	$t \leq 5$	22	31	12	400	NFA-6	G2, G4, T1
39	$t \leq 5$	22	31	12	400	NFA-6	G2, G4, T1, W2
40	$t \leq 5$	22	31	12	400	NFA-6	G4, T1
41	$t \leq 5$	22	31	12	400	NFA-6	G4, T1, W2
42	$0.051 \leq t < 0.25$	23	30	16	400	NFA-13	G4, G8, T4, W3
43	$0.25 \leq t \leq 3$	23	30	16	400	NFA-13	G4, G8, T4, W3
44	$0.051 \leq t < 0.25$	23	42	35	400	NFA-12	G4, G8, T2, W3
45	$0.25 \leq t \leq 4$	23	42	35	400	NFA-12,13	G4, G8, T2, W3, W4
46	$4 < t \leq 6$	23	40	35	400	NFA-12,13	G4, G8, T3, W3, W4

(10)
(10)

TABLE 5B
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
Line No.	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
1	3.0	2.9	2.8	2.7	2.5	1.9	1.5	...	...	...	...	...	...	...	...	...	...
2	3.0	2.9	2.8	2.7	2.5	1.9	1.5	...	...	...	...	...	...	...	...	...	...
3	3.0	2.9	2.8	2.7	2.5	1.9	1.5	...	...	...	...	...	...	...	...	...	...
4	3.0	2.9	2.8	2.7	2.5	1.9	1.5	...	...	...	...	...	...	...	...	...	...
5	4.0	3.8	3.8	3.6	2.7	1.9	1.5	...	...	...	...	...	...	...	...	...	...
6	3.3	3.2	3.1	3.0	2.8	2.6	2.3	...	...	...	...	...	...	...	...	...	...
7	6.7	6.4	6.3	6.0	2.7	1.9	1.5	...	...	...	...	...	...	...	...	...	...
8	4.0	3.9	3.8	3.6	2.7	1.9	1.5	...	...	...	...	...	...	...	...	...	...
9	3.3	3.2	3.1	3.0	2.7	1.9	1.5	...	...	...	...	...	...	...	...	...	...
10	3.3	3.2	3.1	3.0	2.7	1.9	1.5	...	...	...	...	...	...	...	...	...	...
11	3.3	3.2	3.1	3.0	2.7	1.9	1.5	...	...	...	...	...	...	...	...	...	...
12	3.3	3.2	3.1	3.0	2.7	1.9	1.5	...	...	...	...	...	...	...	...	...	...
13	3.3	3.2	3.1	3.0	2.7	1.9	1.5	...	...	...	...	...	...	...	...	...	...
14	3.3	3.2	3.1	3.0	2.7	1.9	1.5	...	...	...	...	...	...	...	...	...	...
15	3.3	3.2	3.1	3.0	2.7	1.9	1.5	...	...	...	...	...	...	...	...	...	...
16	5.7	5.7	5.7	5.7	5.7	3.8	2.3	...	...	...	...	...	...	...	...	...	...
17	6.0	6.0	6.0	6.0	5.7	3.8	2.3	...	...	...	...	...	...	...	...	...	...
18	6.3	6.3	6.3	6.3	6.1	4.1	2.3	...	...	...	...	...	...	...	...	...	...
19	10.7	10.7	10.7	10.7	6.1	4.1	2.3	...	...	...	...	...	...	...	...	...	...
20	6.3	6.3	6.3	6.3	6.1	4.1	2.3	...	...	...	...	...	...	...	...	...	...
21	12.0	12.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	11.3	11.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	10.7	10.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	10.0	10.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	9.3	9.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	12.0	12.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	11.3	11.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	16.0	16.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	16.0	16.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	9.3	9.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	12.0	12.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32	10.7	10.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33	9.3	9.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	9.3	9.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
35	8.0	8.0	8.0	7.5	5.5	4.1	3.0	...	...	...	...	...	...	...	...	...	...
36	12.0	12.0	12.0	12.0	5.5	4.1	3.0	...	...	...	...	...	...	...	...	...	...
37	8.0	8.0	8.0	7.5	5.5	4.1	3.0	...	...	...	...	...	...	...	...	...	...
38	8.0	8.0	8.0	7.5	5.5	4.1	3.0	...	...	...	...	...	...	...	...	...	...
39	8.0	8.0	8.0	7.5	5.5	4.1	3.0	...	...	...	...	...	...	...	...	...	...
40	8.0	8.0	8.0	7.5	5.5	4.1	3.0	...	...	...	...	...	...	...	...	...	...
41	8.0	8.0	8.0	7.5	5.5	4.1	3.0	...	...	...	...	...	...	...	...	...	...
42	10.7	10.5	10.4	10.2	10.2	10.2	5.2	...	...	...	...	...	...	...	...	...	...
43	10.7	10.5	10.4	10.2	10.2	10.2	5.2	...	...	...	...	...	...	...	...	...	...
44	17.5	17.5	17.5	17.5	16.7	10.7	5.2	...	...	...	...	...	...	...	...	...	...
45	17.5	17.5	17.5	17.5	16.7	10.7	5.2	...	...	...	...	...	...	...	...	...	...
46	16.7	16.7	16.7	16.7	16.7	10.7	5.2	...	...	...	...	...	...	...	...	...	...

TABLE 5B
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding															
Line No.	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
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(10)

TABLE 5B (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Alloy Designation/ UNS No.	Class/ Condition/ Temper
(10) 1	...	Drawn smls. tube	SB-210	A96061	T4
(10) 2	...	Drawn smls. tube	SB-210	A96061	T6
(10) 3	...	Bar, rod, shapes	SB-221	A96061	T4
(10) 4	...	Bar, rod, shapes	SB-221	A96061	T6
(10) 5	...	Smls. extr. tube/pipe	SB-241	A96061	T4
(10) 6	...	Smls. extr. tube/pipe	SB-241	A96061	T6
(10) 7	...	Smls. drawn pipe	SB-241	A96061	T6
(10) 8	...	Smls. drawn pipe	SB-241	A96061	T6
(10) 9	...	Shapes	SB-308	A96061	T6
10	...	Drawn smls. tube	SB-210	A96063	T6
11	...	Bar, rod, shapes	SB-221	A96063	T5
12	...	Bar, rod, shapes	SB-221	A96063	T5
13	...	Bar, rod, shapes	SB-221	A96063	T6
14	...	Smls. extr. tube	SB-241	A96063	T5
15	...	Smls. extr. tube	SB-241	A96063	T5
16	...	Smls. extr. tube	SB-241	A96063	T6
17	...	Bar, rod	SB-187	C10200	060
18	...	Bar, rod	SB-187	C11000	060
19	...	Smls. tube	SB-111	C28000	061
20	...	Smls. tube	SB-111	C44300	061
21	...	Smls. tube	SB-111	C44400	061
22	...	Smls. tube	SB-111	C44500	061
23	...	Plate	SB-171	C46400	M20 or 025
24	...	Plate	SB-171	C46400	M20 or 025
25	...	Smls. tube	SB-111	C60800	061
(10) 26	...	Plate, sheet	SB-169	C61400	025 or 060
(10) 27	...	Plate, sheet	SB-169	C61400	025 or 060
(10) 28	...	Plate, sheet	SB-169	C61400	025 or 060
29	...	Plate, sheet	SB-96	C65500	061
(10) 30	...	Plate	SB-171	C70600	M20 or 025
31	...	Cond. tube	SB-111	C70600	061
32	...	Smls. U-bend tube	SB-395	C70600	061
(10) 33	...	Plate	SB-171	C71500	M20 or 025
34	...	Plate	SB-171	C71500	M20 or 025
35	...	Cond. tube	SB-111	C71500	061
36	...	Smls. U-bend tube	SB-395	C71500	061
37	99Ni	Smls. pipe & tube	SB-161	N02200	Annealed
38	99Ni	Bar, rod	SB-160	N02200	Annealed
39	99Ni	Smls. pipe & tube	SB-161	N02200	Annealed
40	99Ni	Plate, sheet, strip	SB-162	N02200	Annealed
41	99Ni	Smls. tube	SB-163	N02200	Annealed
42	99Ni	Plate, sheet, strip	SB-162	N02200	As rolled
43	99Ni-Low C	Bar, rod	SB-160	N02201	Annealed
44	99Ni-Low C	Smls. pipe & tube	SB-161	N02201	Annealed
45	99Ni-Low C	Bar, rod	SB-160	N02201	Hot fin.

TABLE 5B (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Use Temperature, °F	External Pressure Chart No.	Notes
1	$0.025 \leq t \leq 0.5$	23	30	16	400	NFA-13	G4, T4, W3
2	$0.025 \leq t \leq 0.5$	23	42	35	400	NFA-12,13	G4, T2, W3, W4
3	...	23	26	16	400	NFA-13	G2, G4, G8, T4, W3
4	...	23	38	35	400	NFA-12,13	G2, G4, G8, T3, W3, W4
5	...	23	26	16	400	NFA-13	G4, G8, T4, W3
6	...	23	38	35	400	NFA-12,13	G4, G8, T3, W3, W4
7	$NPS < 1$	23	42	35	400	NFA-12,13	G4, T2, W3, W4
8	$NPS \geq 1$	23	38	35	400	NFA-12,13	G4, T3, W3, W4
9	...	23	38	35	400	NFA-12,13	G2, G4, T3, W3, W4
10	$0.025 \leq t \leq 0.5$	23	33	28	400	NFA-1	G4, T1, W3
11	$t \leq 0.5$	23	22	16	400	NFA-1	G2, G4, T1, W3
12	$0.501 \leq t \leq 1$	23	21	15	400	NFA-1	G2, G4, T1, W3
13	$t \leq 1$	23	30	25	400	NFA-1	G2, G4, T1, W3
14	$t \leq 0.5$	23	22	16	400	NFA-1	G4, T1, W3
15	$0.501 \leq t \leq 1$	23	21	15	400	NFA-1	G4, T1, W3
16	$t \leq 1$	23	30	25	400	NFA-1	G4, T1, W3
17	...	31	28	8	400	NFC-1	G3, T3
18	...	31	28	8	400	NFC-1	G3, T3
19	...	32	50	20	400	NFC-3	G3, G5, T3
20	...	32	45	15	400	NFC-2	G3, G5, T3
21	...	32	45	15	400	NFC-2	G3, G5, T3
22	...	32	45	15	400	NFC-2	G3, G5, T3
23	$3 < t \leq 5$	32	50	18	400	NFC-2	G3, T3
24	$t \leq 3$	32	50	20	400	NFC-2	G3, T3
25	...	35	50	19	500	NFC-3	G3, G5, T3
26	$2 < t \leq 5$	35	65	28	500	NFC-8	G3
27	$\frac{1}{2} < t \leq 2$	35	70	30	500	NFC-8	G3
28	$t \leq \frac{1}{2}$	35	72	32	500	NFC-8	G3
29	...	33	50	18	350	NFC-2	G3, G9, T3
30	$t \leq 5$	34	40	15	600	NFC-3	G3, T5
31	...	34	40	15	600	NFC-3	G3, T5
32	...	34	40	15	600	NFC-3	G3, T5
33	$2\frac{1}{2} < t \leq 5$	34	45	18	700	NFC-4	G1, G3, T5
34	$t \leq 2\frac{1}{2}$	34	50	20	700	NFC-4	G1, G3, T6
35	...	34	52	18	700	NFC-4	G3, T5
36	...	34	52	18	700	NFC-4	G3, T5
37	O.D. ≤ 5	41	55	12	600	NFN-2	G3
38	...	41	55	15	600	NFN-2	G2, G3
39	O.D. > 5	41	55	15	600	NFN-2	G3
40	...	41	55	15	600	NFN-2	G3
41	...	41	55	15	600	NFN-2	G3
42	...	41	55	20	600	NFN-2	G3
43	...	41	50	10	600	NFN-1	G2, G3
44	O.D. ≤ 5	41	50	10	1200	NFN-1	G3, T9
45	...	41	50	10	600	NFN-1	G2, G3

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TABLE 5B (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																	
Line No.	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
(10)	1	10.7	10.5	10.4	10.2	10.2	10.2	5.2	...	...	...	...	...	...	...	...	...
	2	17.5	17.5	17.5	17.5	16.7	10.7	5.2	...	...	...	...	...	...	...	...	...
	3	10.7	10.6	10.2	10.2	10.2	10.2	5.2	...	...	...	...	...	...	...	...	...
(10)	4	15.8	15.8	15.8	15.8	15.8	10.7	5.2	...	...	...	...	...	...	...	...	...
(10)	5	10.7	10.6	10.2	10.2	10.2	10.2	5.2	...	...	...	...	...	...	...	...	...
	6	15.8	15.8	15.8	15.8	15.8	10.7	5.2	...	...	...	...	...	...	...	...	...
	7	17.5	17.5	17.5	17.5	16.7	10.7	5.2	...	...	...	...	...	...	...	...	...
(10)	8	15.8	15.8	15.8	15.8	15.8	10.7	5.2	...	...	...	...	...	...	...	...	...
(10)	9	15.8	15.8	15.8	15.8	15.8	10.7	5.2	...	...	...	...	...	...	...	...	...
	10	13.8	13.8	13.8	9.6	7.3	3.8	2.0	...	...	...	...	...	...	...	...	...
	11	9.2	9.2	9.2	8.8	4.6	3.4	2.0	...	...	...	...	...	...	...	...	...
	12	8.8	8.8	8.8	8.8	4.6	3.4	2.0	...	...	...	...	...	...	...	...	...
	13	12.5	12.5	12.5	9.6	7.3	3.8	2.0	...	...	...	...	...	...	...	...	...
	14	9.2	9.2	9.2	8.8	4.6	3.4	2.0	...	...	...	...	...	...	...	...	...
	15	8.8	8.8	8.8	8.8	4.6	3.4	2.0	...	...	...	...	...	...	...	...	...
	16	12.5	12.5	12.5	9.6	7.3	3.8	2.0	...	...	...	...	...	...	...	...	...
	17	5.3	4.5	4.3	4.2	4.2	4.0	3.0	...	...	...	...	...	...	...	...	...
	18	5.3	4.5	4.3	4.2	4.2	4.0	3.0	...	...	...	...	...	...	...	...	...
	19	13.3	13.3	13.3	13.3	13.3	10.8	5.3	...	...	...	...	...	...	...	...	...
	20	10.0	10.0	10.0	10.0	10.0	9.8	3.5	...	...	...	...	...	...	...	...	...
	21	10.0	10.0	10.0	10.0	10.0	9.8	3.5	...	...	...	...	...	...	...	...	...
	22	10.0	10.0	10.0	10.0	10.0	9.8	3.5	...	...	...	...	...	...	...	...	...
	23	12.0	12.0	12.0	11.9	11.9	6.3	2.5	...	...	...	...	...	...	...	...	...
	24	13.3	13.3	13.3	13.3	13.3	6.3	2.5	...	...	...	...	...	...	...	...	...
	25	12.7	12.2	12.2	12.2	12.0	10.0	6.0	4.0	2.0	...	...	...	...	...	...	...
(10)	26	18.7	18.6	18.5	18.4	18.2	18.1	17.9	17.7	17.6	...	...	...	...	...	...	...
	27	20.0	19.9	19.8	19.7	19.5	19.4	19.2	19.0	18.8	...	...	...	...	...	...	...
	28	21.3	21.3	21.1	20.9	20.9	20.7	20.5	20.3	20.1	...	...	...	...	...	...	...
	29	12.0	11.9	11.9	11.7	11.6	5.0	...	...	...	...	...	...	...	...	...	...
(10)	30	10.0	9.7	9.5	9.3	9.0	8.8	8.7	8.5	8.0	7.0	6.0	...	...	...	...	...
	31	10.0	9.7	9.5	9.3	9.0	8.8	8.7	8.5	8.0	7.0	6.0	...	...	...	...	...
	32	10.0	9.7	9.5	9.3	9.0	8.8	8.7	8.5	8.0	7.0	6.0	...	...	...	...	...
(10)	33	12.0	11.6	11.3	11.0	10.8	10.5	10.3	10.1	9.9	9.8	9.6	9.5	9.4	...	...	...
	34	13.3	12.9	12.6	12.3	12.0	11.7	11.5	11.2	11.0	10.8	10.7	10.5	10.4	...	...	...
	35	12.0	11.6	11.3	11.0	10.8	10.5	10.3	10.1	9.9	9.8	9.6	9.5	9.4	...	...	...
	36	12.0	11.6	11.3	11.0	10.8	10.5	10.3	10.1	9.9	9.8	9.6	9.5	9.4	...	...	...
	37	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	...	...	...	...	...	...
	38	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	...	...	...	...	...	...
	39	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	...	...	...	...	...	...
	40	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	...	...	...	...	...	...
	41	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	...	...	...	...	...	...
	42	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	...	...	...	...	...	...
	43	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	...	...	...	...	...	...
	44	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	5.8	4.5
	45	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	...	...	...	...	...	...

TABLE 5B (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding															
Line No.	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1
2	(10)
3	(10)
4	(10)
5	(10)
6	(10)
7	(10)
8	(10)
9	(10)
10	
11	
12	
13	
14	
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16	
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21	
22	
23	
24	
25	
26	(10)
27	(10)
28	(10)
29	(10)
30	(10)
31	(10)
32	(10)
33	(10)
34	(10)
35	(10)
36	(10)
37	(10)
38	(10)
39	(10)
40	(10)
41	(10)
42	(10)
43	(10)
44	3.7	3.0	2.4	2.0	1.5	1.2	...	...	...	...	...	...	...	...	(10)
45	(10)

TABLE 5B (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Alloy Designation/ UNS No.	Class/ Condition/ Temper
1	99Ni–Low C	Smls. pipe & tube	SB-161	N02201	Annealed
2	99Ni–Low C	Plate, sheet, strip	SB-162	N02201	Annealed
3	99Ni–Low C	Smls. tube	SB-163	N02201	Annealed
4	67Ni–30Cu	Bar, rod	SB-164	N04400	Annealed
5	67Ni–30Cu	Smls. pipe & tube	SB-165	N04400	Annealed
6	67Ni–30Cu	Forgings	SB-564	N04400	Annealed
7	67Ni–30Cu	Plate	SB-127	N04400	Annealed
8	67Ni–30Cu	Smls. tube	SB-163	N04400	Annealed
9	67Ni–30Cu	Smls. pipe & tube	SB-165	N04400	Annealed
10	67Ni–30Cu	Plate	SB-127	N04400	As rolled
11	67Ni–30Cu	Smls. tube	SB-163	N04400	Stress rel.
12	67Ni–30Cu–S	Bar, rod	SB-164	N04405	Annealed
13	47Ni–22Cr–9Mo–18Fe	Plate	SB-435	N06002	Annealed
14	47Ni–22Cr–9Mo–18Fe	Sheet	SB-435	N06002	Annealed
15	47Ni–22Cr–9Mo–18Fe	Rod	SB-572	N06002	Solution ann.
16	47Ni–22Cr–9Mo–18Fe	Wld. pipe	SB-619	N06002	Solution ann.
17	47Ni–22Cr–9Mo–18Fe	Smls. pipe & tube	SB-622	N06002	Solution ann.
18	47Ni–22Cr–9Mo–18Fe	Wld. tube	SB-626	N06002	Solution ann.
19	47Ni–22Cr–19Fe–6Mo	Rod	SB-581	N06007	Solution ann.
20	47Ni–22Cr–19Fe–6Mo	Plate, sheet, strip	SB-582	N06007	Solution ann.
21	47Ni–22Cr–19Fe–6Mo	Rod	SB-581	N06007	Solution ann.
22	47Ni–22Cr–19Fe–6Mo	Plate, sheet, strip	SB-582	N06007	Solution ann.
23	47Ni–22Cr–19Fe–6Mo	Wld. pipe	SB-619	N06007	Solution ann.
24	47Ni–22Cr–19Fe–6Mo	Smls. pipe & tube	SB-622	N06007	Solution ann.
25	47Ni–22Cr–19Fe–6Mo	Wld. tube	SB-626	N06007	Solution ann.
26	55Ni–21Cr–13.5Mo	Smls. & wld. fittings	SB-366	N06022	Solution ann.
27	55Ni–21Cr–13.5Mo	Forgings	SB-462	N06022	Solution ann.
28	55Ni–21Cr–13.5Mo	Forgings	SB-564	N06022	Solution ann.
29	55Ni–21Cr–13.5Mo	Rod	SB-574	N06022	Solution ann.
30	55Ni–21Cr–13.5Mo	Plate, sheet, strip	SB-575	N06022	Solution ann.
31	55Ni–21Cr–13.5Mo	Wld. pipe	SB-619	N06022	Solution ann.
32	55Ni–21Cr–13.5Mo	Smls. pipe & tube	SB-622	N06022	Solution ann.
33	55Ni–21Cr–13.5Mo	Wld. tube	SB-626	N06022	Solution ann.
34	59Ni–23Cr–16Mo	Wld. fittings	SB-366	N06059	Solution ann.
35	59Ni–23Cr–16Mo	Smls. fittings	SB-366	N06059	Solution ann.
36	59Ni–23Cr–16Mo	Forged fittings	SB-462	N06059	Solution ann.
37	59Ni–23Cr–16Mo	Forgings	SB-564	N06059	Solution ann.
38	59Ni–23Cr–16Mo	Bar, rod	SB-574	N06059	Solution ann.
39	59Ni–23Cr–16Mo	Plate, sheet, strip	SB-575	N06059	Solution ann.
40	59Ni–23Cr–16Mo	Wld. pipe	SB-619	N06059	Solution ann.
41	59Ni–23Cr–16Mo	Smls. pipe & tube	SB-622	N06059	Solution ann.
42	59Ni–23Cr–16Mo	Wld. tube	SB-626	N06059	Solution ann.

TABLE 5B (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Use Temperature, °F	External Pressure Chart No.	Notes
1	O.D. > 5	41	50	12	1200	NFN-1	G3, T8
2	...	41	50	12	600	NFN-1	G3
3	...	41	50	12	1200	NFN-1	G3, T8
4	...	42	70	25	900	NFN-3	G1, G2, G3, T8
5	O.D. > 5	42	70	25	900	NFN-3	G1, G3, T8
6	...	42	70	25	900	NFN-3	G1, G2, G3, T8
7	...	42	70	28	900	NFN-3	G1, G3, T8
8	...	42	70	28	900	NFN-3	G1, G3, T8
9	O.D. ≤ 5	42	70	28	900	NFN-3	G1, G3, T8
10	...	42	75	40	900	NFN-3	G1, G3, T7
11	...	42	85	55	800	NFN-3	G1, G3, T7, W1
12	...	42	70	25	900	NFN-3	G1, G2, G3, T8
13	$\frac{3}{16} < t \leq 2\frac{1}{2}$	43	95	35	900	NFN-15	G1, G3, G13
14	$\frac{1}{16} < t \leq \frac{3}{16}$	43	95	35	900	NFN-15	G1, G3, G13
15	$t > \frac{3}{16}$	43	95	35	900	NFN-15	G1, G2, G3, G13
16	...	43	100	40	1650	NFN-15	G1, G3, G7, G13, T10
17	...	43	100	40	1650	NFN-15	G1, G3, G13, T10
18	...	43	100	40	1650	NFN-15	G1, G3, G7, G13, T10
19	$t > \frac{3}{4}$	45	85	30	1000	NFN-11	G1, G2, G3
20	$t > \frac{3}{4}$	45	85	30	1000	NFN-11	G1, G3
21	$\frac{5}{16} < t \leq \frac{3}{4}$	45	90	35	1000	NFN-11	G1, G2, G3, T10
22	$\frac{3}{16} < t \leq \frac{3}{4}$	45	90	35	1000	NFN-11	G1, G3, T10
23	...	45	90	35	1000	NFN-11	G1, G3, G7, T10
24	...	45	90	35	1000	NFN-11	G1, G3, T10
25	...	45	90	35	1000	NFN-11	G1, G3, G7, T10
26	...	43	100	45	1250	NFN-10	G1, G12, T13
27	...	43	100	45	1250	NFN-10	G1, G12, T13
28	...	43	100	45	1250	NFN-10	G1, G12, T13
29	...	43	100	45	1250	NFN-10	G1, G12, T13
30	...	43	100	45	1250	NFN-10	G1, G12, T13
31	...	43	100	45	1250	NFN-10	G1, G7, G12, T13
32	...	43	100	45	1250	NFN-10	G1, G12, T13
33	...	43	100	45	1250	NFN-10	G1, G7, G12, T13
34	...	43	100	45	1400	NFN-14	G1, G3, G7, G11, T14
35	...	43	100	45	1400	NFN-14	G1, G3, G11, T14
36	...	43	100	45	1400	NFN-14	G1, G3, G11, T14
37	...	43	100	45	1400	NFN-14	G1, G3, G11, T14
38	...	43	100	45	1400	NFN-14	G1, G3, G11, T14
39	...	43	100	45	1400	NFN-14	G1, G3, G11, T14
40	...	43	100	45	1400	NFN-14	G1, G3, G7, G11, T14
41	...	43	100	45	1400	NFN-14	G1, G3, G11, T14
42	...	43	100	45	1400	NFN-14	G1, G3, G7, G11, T14

2011a SECTION II, PART D (CUSTOMARY)

**TABLE 5B (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS**

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
1	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.2	5.8	4.5
2	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	...	...	...	...	...	...
3	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.2	5.8	4.5
4	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	15.0	11.0	8.0
5	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	15.0	11.0	8.0
6	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	15.0	11.0	8.0
7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	15.0	11.0	8.0
8	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	15.0	11.0	8.0
9	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	15.0	11.0	8.0
10	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	20.9	14.5	8.5	4.0
11	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	18.0	12.7	...	...
12	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	15.0	11.0	8.0
13	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.1	22.3	21.7	21.2	20.7	20.3	20.1	19.9	19.7	19.6
14	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.1	22.3	21.7	21.2	20.7	20.3	20.1	19.9	19.7	19.6
15	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.1	22.3	21.7	21.2	20.7	20.3	20.1	19.9	19.7	19.6
16	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.4	21.7	21.1	20.5	20.1	19.8	19.5	19.3	19.1	16.7
17	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.4	25.5	24.8	24.2	23.7	23.3	22.9	22.7	22.5	19.6
18	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.4	21.7	21.1	20.5	20.1	19.8	19.5	19.3	19.1	16.7
19	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.5	19.2	19.0	18.8	18.7	18.6	18.5
20	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.5	19.2	19.0	18.8	18.7	18.6	18.5
21	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.1	22.7	22.4	22.2	22.0	21.8	21.7	20.0
22	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.1	22.7	22.4	22.2	22.0	21.8	21.7	20.0
23	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.6	19.3	19.1	18.8	18.7	18.5	18.4	17.0
24	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.1	22.7	22.4	22.2	22.0	21.8	21.7	20.0
25	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.6	19.3	19.1	18.8	18.7	18.5	18.4	17.0
26	30.0	30.0	30.0	30.0	30.0	30.0	30.0	29.9	29.0	28.2	27.6	27.0	26.5	26.1	25.7	25.4	25.1
27	30.0	30.0	30.0	30.0	30.0	30.0	30.0	29.9	29.0	28.2	27.6	27.0	26.5	26.1	25.7	25.4	25.1
28	30.0	30.0	30.0	30.0	30.0	30.0	30.0	29.9	29.0	28.2	27.6	27.0	26.5	26.1	25.7	25.4	25.1
29	30.0	30.0	30.0	30.0	30.0	30.0	30.0	29.9	29.0	28.2	27.6	27.0	26.5	26.1	25.7	25.4	25.1
30	30.0	30.0	30.0	30.0	30.0	30.0	30.0	29.9	29.0	28.2	27.6	27.0	26.5	26.1	25.7	25.4	25.1
31	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.4	24.7	24.0	23.4	22.9	22.5	22.2	21.8	21.6	21.4
32	30.0	30.0	30.0	30.0	30.0	30.0	30.0	29.9	29.0	28.2	27.6	27.0	26.5	26.1	25.7	25.4	25.1
33	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.4	24.7	24.0	23.4	22.9	22.5	22.2	21.8	21.6	21.4
34	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.2	24.6	23.9	23.3	22.8	22.2	21.7	21.2	20.8
35	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	29.7	28.9	28.2	27.5	26.8	26.1	25.5	25.0	24.5
36	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	29.7	28.9	28.2	27.5	26.8	26.1	25.5	25.0	24.5
37	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	29.7	28.9	28.2	27.5	26.8	26.1	25.5	25.0	24.5
38	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	29.7	28.9	28.2	27.5	26.8	26.1	25.5	25.0	24.5
39	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	29.7	28.9	28.2	27.5	26.8	26.1	25.5	25.0	24.5
40	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.2	24.6	23.9	23.3	22.8	22.2	21.7	21.2	20.8
41	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	29.7	28.9	28.2	27.5	26.8	26.1	25.5	25.0	24.5
42	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.2	24.6	23.9	23.3	22.8	22.2	21.7	21.2	20.8

2011a SECTION II, PART D (CUSTOMARY)

TABLE 5B (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	3.7	3.0	2.4	2.0	1.5	1.2	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	3.7	3.0	2.4	2.0	1.5	1.2	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	16.6	16.4	16.4	14.9	12.0	9.6	7.9	6.5	5.2	4.1	3.2	2.6	2.0	1.6	1.3
17	19.5	19.3	19.3	17.5	14.1	11.3	9.3	7.7	6.1	4.8	3.8	3.0	2.4	1.9	1.5
18	16.6	16.4	16.4	14.9	12.0	9.6	7.9	6.5	5.2	4.1	3.2	2.6	2.0	1.6	1.3
19	18.4	18.3	...	...	...	...	...	...	...	...	...	...	...	...	...
20	18.4	18.3	...	...	...	...	...	...	...	...	...	...	...	...	...
21	19.5	18.9	...	...	...	...	...	...	...	...	...	...	...	...	...
22	19.5	18.9	...	...	...	...	...	...	...	...	...	...	...	...	...
23	16.6	16.1	...	...	...	...	...	...	...	...	...	...	...	...	...
24	19.5	18.9	...	...	...	...	...	...	...	...	...	...	...	...	...
25	16.6	16.1	...	...	...	...	...	...	...	...	...	...	...	...	...
26	24.9	24.7	24.1	17.5	12.7	9.6	7.6	...	...	...	...	...	...	...	...
27	24.9	24.7	24.1	17.5	12.7	9.6	7.6	...	...	...	...	...	...	...	...
28	24.9	24.7	24.1	17.5	12.7	9.6	7.6	...	...	...	...	...	...	...	...
29	24.9	24.7	24.1	17.5	12.7	9.6	7.6	...	...	...	...	...	...	...	...
30	24.9	24.7	24.1	17.5	12.7	9.6	7.6	...	...	...	...	...	...	...	...
31	21.2	21.0	20.5	14.9	10.8	8.2	6.5	...	...	...	...	...	...	...	...
32	24.9	24.7	24.1	17.5	12.7	9.6	7.6	...	...	...	...	...	...	...	...
33	21.2	21.0	20.5	14.9	10.8	8.2	6.5	...	...	...	...	...	...	...	...
34	20.5	20.4	20.4	16.0	12.4	9.9	8.0	6.3	5.0	4.1	...	...	...	...	...
35	24.2	24.0	24.0	18.8	14.6	11.6	9.4	7.4	5.9	4.8	...	...	...	...	...
36	24.2	24.0	24.0	18.8	14.6	11.6	9.4	7.4	5.9	4.8	...	...	...	...	...
37	24.2	24.0	24.0	18.8	14.6	11.6	9.4	7.4	5.9	4.8	...	...	...	...	...
38	24.2	24.0	24.0	18.8	14.6	11.6	9.4	7.4	5.9	4.8	...	...	...	...	...
39	24.2	24.0	24.0	18.8	14.6	11.6	9.4	7.4	5.9	4.8	...	...	...	...	...
40	20.5	20.4	20.4	16.0	12.4	9.9	8.0	6.3	5.0	4.1	...	...	...	...	...
41	24.2	24.0	24.0	18.8	14.6	11.6	9.4	7.4	5.9	4.8	...	...	...	...	...
42	20.5	20.4	20.4	16.0	12.4	9.9	8.0	6.3	5.0	4.1	...	...	...	...	...

TABLE 5B (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Alloy Designation/ UNS No.	Class/ Condition/ Temper
1	61Ni-16Mo-16Cr	Rod	SB-574	N06455	Solution ann.
2	61Ni-16Mo-16Cr	Plate, sheet, strip	SB-575	N06455	Solution ann.
3	61Ni-16Mo-16Cr	Wld. pipe	SB-619	N06455	Solution ann.
4	61Ni-16Mo-16Cr	Smls. pipe & tube	SB-622	N06455	Solution ann.
5	61Ni-16Mo-16Cr	Wld. tube	SB-626	N06455	Solution ann.
6	72Ni-15Cr-8Fe	Smls. pipe & tube	SB-167	N06600	Annealed
7	72Ni-15Cr-8Fe	Smls. tube	SB-163	N06600	Annealed
8	72Ni-15Cr-8Fe	Bar, rod	SB-166	N06600	Annealed
9	72Ni-15Cr-8Fe	Smls. pipe & tube	SB-167	N06600	Annealed
10	72Ni-15Cr-8Fe	Plate	SB-168	N06600	Annealed
11	72Ni-15Cr-8Fe	Forgings	SB-564	N06600	Annealed
12	72Ni-15Cr-8Fe	Wld. tube	SB-516	N06600	Cold drawn/ann.
13	72Ni-15Cr-8Fe	Wld. pipe	SB-517	N06600	Cold drawn/ann.
14	35Ni-19Cr-1.25Si	Bar	SB-511	N08330	Annealed
15	35Ni-19Cr-1.25Si	Smls. & wld. pipe	SB-535	N08330	Annealed
16	35Ni-19Cr-1.25Si	Plate, sheet, strip	SB-536	N08330	Annealed
17	42Fe-33Ni-21Cr	Smls. tube	SB-163	N08800	Annealed
18	42Fe-33Ni-21Cr	Smls. pipe & tube	SB-407	N08800	Annealed
19	42Fe-33Ni-21Cr	Plate	SB-409	N08800	Annealed
20	42Fe-33Ni-21Cr	Wld. pipe	SB-514	N08800	Annealed
21	42Fe-33Ni-21Cr	Wld. tube	SB-515	N08800	Annealed
22	42Fe-33Ni-21Cr	Forgings	SB-564	N08800	Annealed
23	42Fe-33Ni-21Cr	Bar, rod	SB-408	N08800	Hot fin.
24	42Fe-33Ni-21Cr	Smls. tube	SB-163	N08810	Annealed
25	42Fe-33Ni-21Cr	Smls. pipe & tube	SB-407	N08810	Annealed
26	42Fe-33Ni-21Cr	Bar, rod	SB-408	N08810	Annealed
27	42Fe-33Ni-21Cr	Plate	SB-409	N08810	Annealed
28	42Fe-33Ni-21Cr	Wld. pipe	SB-514	N08810	Annealed
29	42Fe-33Ni-21Cr	Wld. tube	SB-515	N08810	Annealed
30	42Fe-33Ni-21Cr	Forgings	SB-564	N08810	Annealed
31	42Ni-21.5Cr-5Mo-2.3Cu	Smls. tube	SB-163	N08825	Annealed
32	42Ni-21.5Cr-5Mo-2.3Cu	Smls. pipe & tube	SB-423	N08825	Annealed
33	42Ni-21.5Cr-5Mo-2.3Cu	Plate, sheet, strip	SB-424	N08825	Annealed
34	42Ni-21.5Cr-5Mo-2.3Cu	Bar, rod	SB-425	N08825	Annealed
35	62Ni-28Mo-5Fe	Plate	SB-333	N10001	Solution ann.
36	62Ni-28Mo-5Fe	Wld. pipe	SB-619	N10001	Solution ann.
37	62Ni-28Mo-5Fe	Smls. pipe & tube	SB-622	N10001	Solution ann.
38	62Ni-28Mo-5Fe	Wld. tube	SB-626	N10001	Solution ann.
39	62Ni-28Mo-5Fe	Rod	SB-335	N10001	Solution ann.
40	62Ni-28Mo-5Fe	Rod	SB-335	N10001	Solution ann.
41	62Ni-28Mo-5Fe	Sheet, strip	SB-333	N10001	Solution ann.
42	70Ni-16Mo-7Cr-5Fe	Plate, sheet, strip	SB-434	N10003	Annealed
43	70Ni-16Mo-7Cr-5Fe	Rod	SB-573	N10003	Solution ann.

TABLE 5B (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Use Temperature, °F	External Pressure Chart No.	Notes
1	...	43	100	40	800	NFN-14	G1, G2, G3
2	...	43	100	40	800	NFN-14	G1, G3
3	...	43	100	40	800	NFN-14	G1, G3, G7
4	...	43	100	40	800	NFN-14	G1, G3
5	...	43	100	40	800	NFN-14	G1, G3, G7
6	O.D. > 5	43	80	30	1200	NFN-4	G1, G3, T10
7	...	43	80	35	1200	NFN-4	G1, G3, T10
8	...	43	80	35	1200	NFN-4	G1, G2, G3, T10
9	O.D. ≤ 5	43	80	35	1200	NFN-4	G1, G3, T10
10	...	43	80	35	1200	NFN-4	G1, G3, T10
11	...	43	80	35	1200	NFN-4	G1, G2, G3, T10
12	O.D. ≤ 4½	43	80	35	1200	NFN-4	G1, G3, G7, T10
13	O.D. ≤ 4½	43	80	35	1200	NFN-4	G1, G3, G7, T10
14	...	46	70	30	1650	NFN-13	G1, G2, G3, G13, H1, T11
15	...	46	70	30	1650	NFN-13	G1, G3, G7, G10, H2, T11
16	...	46	70	30	1650	NFN-13	G1, G3, G10, H2, T11
17	...	45	75	30	1500	NFN-8	G1, G3, T12
18	...	45	75	30	1500	NFN-8	G1, G3, T12
19	...	45	75	30	1500	NFN-8	G1, G3, T12
20	...	45	75	30	1500	NFN-8	G1, G3, G7, T12
21	...	45	75	30	1500	NFN-8	G1, G3, G7, T12
22	...	45	75	30	1500	NFN-8	G1, G2, G3, T12
23	...	45	75	30	1500	NFN-8	G1, G2, G3, T12
24	...	45	65	25	1650	NFN-9	G1, G3, G13, T14
25	...	45	65	25	1650	NFN-9	G1, G3, G13, T14
26	...	45	65	25	1650	NFN-9	G1, G2, G3, G13, T14
27	...	45	65	25	1650	NFN-9	G1, G3, G13, T14
28	...	45	65	25	1650	NFN-9	G1, G3, G7, G13, T14
29	...	45	65	25	1650	NFN-9	G1, G3, G7, G13, T14
30	...	45	65	25	1650	NFN-9	G1, G2, G3, G13, T14
31	...	45	85	35	1000	NFN-7	G1, G3
32	...	45	85	35	1000	NFN-7	G1, G3
33	...	45	85	35	1000	NFN-7	G3
34	...	45	85	35	1000	NFN-7	G2, G3
35	3/16 ≤ t ≤ 2½	44	100	45	800	NFN-5	G1, G3
36	...	44	100	45	800	NFN-5	G1, G3, G7
37	...	44	100	45	800	NFN-5	G1, G3
38	...	44	100	45	800	NFN-5	G1, G3, G7
39	1½ < t ≤ 3½	44	100	46	800	NFN-5	G1, G2, G3
40	5/16 ≤ t ≤ 1½	44	115	46	800	NFN-5	G1, G2, G3
41	t < 3/16	44	115	50	800	NFN-5	G1, G3
42	t < 2½	44	100	40	800	NFN-6	G3
43	...	44	100	40	800	NFN-6	G1, G2, G3

2011a SECTION II, PART D (CUSTOMARY)

**TABLE 5B (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS**

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
1	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.5	26.1	25.8	...	...
2	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.5	26.1	25.8	...	...
3	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.5	22.2	21.9	...	...
4	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.5	26.1	25.8	...	...
5	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	...	...
6	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	16.0
7	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	16.0
8	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	16.0
9	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	16.0
10	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	16.0
11	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	16.0
12	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	13.6
13	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	13.6
14	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.4	18.9	18.5	18.1	17.7	17.4	17.0	16.7
15	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.4	18.9	18.5	18.1	17.7	17.4	17.0	16.7
16	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.8	19.4	18.9	18.5	18.1	17.7	17.4	17.0	16.7
17	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
18	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
19	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
20	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
21	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
22	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
23	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
24	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.5	16.1	15.7	15.3	15.0	14.7	14.5
25	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.5	16.1	15.7	15.3	15.0	14.7	14.5
26	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.5	16.1	15.7	15.3	15.0	14.7	14.5
27	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.5	16.1	15.7	15.3	15.0	14.7	14.5
28	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.0	13.7	13.3	13.0	12.8	12.5	12.3
29	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.0	13.7	13.3	13.0	12.8	12.5	12.3
30	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.5	16.1	15.7	15.3	15.0	14.7	14.5
31	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.2	23.0	22.9	22.8
32	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.2	23.0	22.9	22.8
33	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.2	23.0	22.9	22.8
34	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.3	23.2	23.0	22.9	22.8
35	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	29.9	...	...
36	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.4	...	...
37	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	29.9	...	...
38	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.4	...	...
39	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.5	...	...
40	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.5	...	...
41	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.2	...	...
42	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.5	26.1	25.8	25.5	25.3	24.9	...	...
43	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.5	26.1	25.8	25.5	25.3	24.9	...	...

2011a SECTION II, PART D (CUSTOMARY)

TABLE 5B (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding															
Line No.	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	10.6	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...
7	10.6	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...
8	10.6	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...
9	10.6	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...
10	10.6	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...
11	10.6	7.0	4.5	3.0	2.2	2.0	...	...	...	...	...	...	...	...	...
12	9.0	6.0	3.8	2.6	1.9	1.7	...	...	...	...	...	...	...	...	...
13	9.0	6.0	3.8	2.6	1.9	1.7	...	...	...	...	...	...	...	...	...
14	16.1	12.7	10.0	7.8	6.0	4.7	3.8	3.1	2.4	1.8	1.5	1.1	0.90	0.68	0.48
15	16.1	12.7	10.0	7.8	6.0	4.7	3.8	3.1	2.4	1.8	1.5	1.1	0.90	0.68	0.48
16	16.1	12.7	10.0	7.8	6.0	4.7	3.8	3.1	2.4	1.8	1.5	1.1	0.90	0.68	0.48
17	20.0	18.9	14.5	11.1	8.3	5.6	3.6	1.7	1.4	0.94	0.85	0.68	...	...	...
18	20.0	18.9	14.5	11.1	8.3	5.6	3.6	1.7	1.4	0.94	0.85	0.68	...	...	...
19	20.0	18.9	14.5	11.1	8.3	5.6	3.6	1.7	1.4	0.94	0.85	0.68	...	...	...
20	17.0	16.1	12.3	9.4	7.1	4.8	3.1	1.4	1.2	0.80	0.72	0.58	...	...	...
21	17.0	16.1	12.3	9.4	7.1	4.8	3.1	1.4	1.2	0.80	0.72	0.58	...	...	...
22	20.0	18.9	14.5	11.1	8.3	5.6	3.6	1.7	1.4	0.94	0.85	0.68	...	...	...
23	20.0	18.9	14.5	11.1	8.3	5.6	3.6	1.7	1.4	0.94	0.85	0.68	...	...	...
24	14.2	14.0	13.8	11.6	9.3	7.4	5.9	4.7	3.8	3.0	2.4	1.9	1.5	1.2	1.0
25	14.2	14.0	13.8	11.6	9.3	7.4	5.9	4.7	3.8	3.0	2.4	1.9	1.5	1.2	1.0
26	14.2	14.0	13.8	11.6	9.3	7.4	5.9	4.7	3.8	3.0	2.4	1.9	1.5	1.2	1.0
27	14.2	14.0	13.8	11.6	9.3	7.4	5.9	4.7	3.8	3.0	2.4	1.9	1.5	1.2	1.0
28	12.1	11.9	11.7	9.9	7.9	6.3	5.0	4.0	3.2	2.6	2.0	1.6	1.3	1.0	0.83
29	12.1	11.9	11.7	9.9	7.9	6.3	5.0	4.0	3.2	2.6	2.0	1.6	1.3	1.0	0.83
30	14.2	14.0	13.8	11.6	9.3	7.4	5.9	4.7	3.8	3.0	2.4	1.9	1.5	1.2	1.0
31	22.6	22.3	...	...	...	...	...	...	...	...	...	...	...	...	...
32	22.6	22.3	...	...	...	...	...	...	...	...	...	...	...	...	...
33	22.6	22.3	...	...	...	...	...	...	...	...	...	...	...	...	...
34	22.6	22.3	...	...	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

TABLE 5B (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Alloy Designation/ UNS No.	Class/ Condition/ Temper
1	54Ni–16Mo–15Cr	Smls. fittings	SB-366	N10276	Solution ann.
2	54Ni–16Mo–15Cr	Wld. fittings	SB-366	N10276	Solution ann.
3	54Ni–16Mo–15Cr	Forgings	SB-462	N10276	Solution ann.
4	54Ni–16Mo–15Cr	Rod	SB-574	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	Smls. pipe & tube	SB-622	N10276	Solution ann.
8	54Ni–16Mo–15Cr	Wld. tube	SB-626	N10276	Solution ann.
9	65Ni–28Mo–2Fe	Plate, sheet, strip	SB-333	N10665	Solution ann.
10	65Ni–28Mo–2Fe	Rod	SB-335	N10665	Solution ann.
11	65Ni–28Mo–2Fe	Smls. fittings	SB-366	N10665	Solution ann.
12	65Ni–28Mo–2Fe	Wld. fittings	SB-366	N10665	Solution ann.
13	65Ni–28Mo–2Fe	Forgings	SB-462	N10665	Solution ann.
14	65Ni–28Mo–2Fe	Wld. pipe	SB-619	N10665	Solution ann.
15	65Ni–28Mo–2Fe	Smls. pipe & tube	SB-622	N10665	Solution ann.
16	65Ni–28Mo–2Fe	Wld. tube	SB-626	N10665	Solution ann.
17	Ti	Plate, sheet, strip	SB-265	R50250	Annealed
18	Ti	Bar, billet	SB-348	R50250	Annealed
19	Ti	Forgings	SB-381	R50250	Annealed
20	Ti	Smls. tube	SB-338	R50250	Smls. ann.
21	Ti	Smls. pipe	SB-861	R50250	Smls. ann.
22	Ti	Wld. tube	SB-338	R50250	Wld. ann.
23	Ti	Wld. pipe	SB-862	R50250	Wld. ann.
(10) 24	Ti	Plate, sheet, strip	SB-265	R50400	Annealed
(10) 25	Ti	Bar, billet	SB-348	R50400	Annealed
(10) 26	Ti	Forgings	SB-381	R50400	Annealed
(10) 27	Ti	Smls. tube	SB-338	R50400	Smls. ann.
(10) 28	Ti	Smls. pipe	SB-861	R50400	Smls. ann.
(10) 29	Ti	Wld. tube	SB-338	R50400	Wld. ann.
(10) 30	Ti	Wld. pipe	SB-862	R50400	Wld. ann.
31	Ti	Plate, sheet, strip	SB-265	R50550	Annealed
32	Ti	Bar, billet	SB-348	R50550	Annealed
33	Ti	Forgings	SB-381	R50550	Annealed
34	Ti	Smls. tube	SB-338	R50550	Smls. ann.
35	Ti	Smls. pipe	SB-861	R50550	Smls. ann.
36	Ti	Wld. tube	SB-338	R50550	Wld. ann.
37	Ti	Wld. pipe	SB-862	R50550	Wld. ann.
(10) 38	Ti–Pd	Plate, sheet, strip	SB-265	R52400	Annealed
(10) 39	Ti–Pd	Bar, billet	SB-348	R52400	Annealed
(10) 40	Ti–Pd	Forgings	SB-381	R52400	Annealed
(10) 41	Ti–Pd	Smls. tube	SB-338	R52400	Smls. ann.
(10) 42	Ti–Pd	Smls. pipe	SB-861	R52400	Smls. ann.
(10) 43	Ti–Pd	Wld. tube	SB-338	R52400	Wld. ann.
(10) 44	Ti–Pd	Wld. pipe	SB-862	R52400	Wld. ann.

TABLE 5B (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Use Temperature, °F	External Pressure Chart No.	Notes
1	...	43	100	41	800	NFN-10	G1, G3
2	...	43	100	41	800	NFN-10	G1, G3, G7
3	...	43	100	41	800	NFN-10	G1, G3
4	...	43	100	41	1250	NFN-10	G1, G2, G3, T13
5	...	43	100	41	1250	NFN-10	G1, G3, T13
6	...	43	100	41	1250	NFN-10	G1, G3, G7, T13
7	...	43	100	41	1250	NFN-10	G1, G3, T13
8	...	43	100	41	1250	NFN-10	G1, G3, G7, T13
9	...	44	110	51	800	NFN-16	G1, G3
10	...	44	110	51	800	NFN-16	G1, G2, G3
11	...	44	110	51	800	NFN-16	G1, G3
12	...	44	110	51	800	NFN-16	G1, G3, G7
13	...	44	110	51	800	NFN-16	G1, G3
14	...	44	110	51	800	NFN-16	G1, G3, G7
15	...	44	110	51	800	NFN-16	G1, G3
16	...	44	110	51	800	NFN-16	G1, G3, G7
17	...	51	35	25	600	NFT-3	...
18	...	51	35	25	600	NFT-3	...
19	...	51	35	25	600	NFT-3	...
20	...	51	35	25	600	NFT-3	...
21	...	51	35	25	600	NFT-3	...
22	...	51	35	25	600	NFT-3	G7
23	...	51	35	25	600	NFT-3	G7
24	...	51	50	40	600	NFT-2	...
25	...	51	50	40	600	NFT-2	...
26	...	51	50	40	600	NFT-2	...
27	...	51	50	40	600	NFT-2	...
28	...	51	50	40	600	NFT-2	...
29	...	51	50	40	600	NFT-2	G7
30	...	51	50	40	600	NFT-2	G7
31	...	52	65	55	600	NFT-1	...
32	...	52	65	55	600	NFT-1	...
33	...	52	65	55	600	NFT-1	...
34	...	52	65	55	600	NFT-1	...
35	...	52	65	55	600	NFT-1	...
36	...	52	65	55	600	NFT-1	G7
37	...	52	65	55	600	NFT-1	G7
38	...	51	50	40	600	NFT-2	...
39	...	51	50	40	600	NFT-2	...
40	...	51	50	40	600	NFT-2	...
41	...	51	50	40	600	NFT-2	...
42	...	51	50	40	600	NFT-2	...
43	...	51	50	40	600	NFT-2	G7
44	...	51	50	40	600	NFT-2	G7

2011a SECTION II, PART D (CUSTOMARY)

TABLE 5B (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Line No.	Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
	-20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
1	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	26.9	26.0	25.2	24.6	24.0	23.5	23.1	...	...
2	23.2	23.2	23.2	23.2	23.2	23.2	23.2	23.2	22.8	22.1	21.5	20.9	20.4	20.0	19.6	...	...
3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	26.9	26.0	25.2	24.6	24.0	23.5	23.1	...	...
4	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	26.9	26.0	25.2	24.6	24.0	23.5	23.1	22.8	22.6
5	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	26.9	26.0	25.2	24.6	24.0	23.5	23.1	22.8	22.6
6	23.2	23.2	23.2	23.2	23.2	23.2	23.2	23.2	22.8	22.1	21.5	20.9	20.4	20.0	19.6	19.4	19.2
7	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	26.9	26.0	25.2	24.6	24.0	23.5	23.1	22.8	22.6
8	23.2	23.2	23.2	23.2	23.2	23.2	23.2	23.2	22.8	22.1	21.5	20.9	20.4	20.0	19.6	19.4	19.2
9	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	...	...
10	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	...	...
11	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	...	...
12	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	...	...
13	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	...	...
14	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	...	...
15	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	...	...
16	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	28.9	...	...
17	14.6	13.4	11.7	10.2	9.0	7.8	6.8	5.9	5.2	4.7	4.4	...	...	...	...	...	...
18	14.6	13.4	11.7	10.2	9.0	7.8	6.8	5.9	5.2	4.7	4.4	...	...	...	...	...	...
19	14.6	13.4	11.7	10.2	9.0	7.8	6.8	5.9	5.2	4.7	4.4	...	...	...	...	...	...
20	14.6	13.4	11.7	10.2	9.0	7.8	6.8	5.9	5.2	4.7	4.4	...	...	...	...	...	...
21	14.6	13.4	11.7	10.2	9.0	7.8	6.8	5.9	5.2	4.7	4.4	...	...	...	...	...	...
22	12.4	11.4	9.9	8.7	7.6	6.7	5.8	5.1	4.5	4.0	3.8	...	...	...	...	...	...
23	12.4	11.4	9.9	8.7	7.6	6.7	5.8	5.1	4.5	4.0	3.8	...	...	...	...	...	...
(10) 24	20.8	20.8	20.8	19.1	17.1	15.1	13.1	11.3	9.8	8.7	8.0	...	...	...	...	...	...
(10) 25	20.8	20.8	20.8	19.1	17.1	15.1	13.1	11.3	9.8	8.7	8.0	...	...	...	...	...	...
(10) 26	20.8	20.8	20.8	19.1	17.1	15.1	13.1	11.3	9.8	8.7	8.0	...	...	...	...	...	...
(10) 27	20.8	20.8	20.8	19.1	17.1	15.1	13.1	11.3	9.8	8.7	8.0	...	...	...	...	...	...
(10) 28	20.8	20.8	20.8	19.1	17.1	15.1	13.1	11.3	9.8	8.7	8.0	...	...	...	...	...	...
(10) 29	17.7	17.7	17.7	16.2	14.5	12.8	11.1	9.6	8.4	7.4	6.8	...	...	...	...	...	...
(10) 30	17.7	17.7	17.7	16.2	14.5	12.8	11.1	9.6	8.4	7.4	6.8	...	...	...	...	...	...
31	27.1	27.1	27.1	26.5	23.8	21.3	19.1	17.0	15.0	13.2	11.4	...	...	...	...	...	...
32	27.1	27.1	27.1	26.5	23.8	21.3	19.1	17.0	15.0	13.2	11.4	...	...	...	...	...	...
33	27.1	27.1	27.1	26.5	23.8	21.3	19.1	17.0	15.0	13.2	11.4	...	...	...	...	...	...
34	27.1	27.1	27.1	26.5	23.8	21.3	19.1	17.0	15.0	13.2	11.4	...	...	...	...	...	...
35	27.1	27.1	27.1	26.5	23.8	21.3	19.1	17.0	15.0	13.2	11.4	...	...	...	...	...	...
36	23.0	23.0	23.0	22.5	20.3	18.1	16.2	14.4	12.8	11.2	9.7	...	...	...	...	...	...
37	23.0	23.0	23.0	22.5	20.3	18.1	16.2	14.4	12.8	11.2	9.7	...	...	...	...	...	...
(10) 38	20.8	20.8	20.8	19.1	17.1	15.1	13.1	11.3	9.8	8.7	8.0	...	...	...	...	...	...
(10) 39	20.8	20.8	20.8	19.1	17.1	15.1	13.1	11.3	9.8	8.7	8.0	...	...	...	...	...	...
(10) 40	20.8	20.8	20.8	19.1	17.1	15.1	13.1	11.3	9.8	8.7	8.0	...	...	...	...	...	...
(10) 41	20.8	20.8	20.8	19.1	17.1	15.1	13.1	11.3	9.8	8.7	8.0	...	...	...	...	...	...
(10) 42	20.8	20.8	20.8	19.1	17.1	15.1	13.1	11.3	9.8	8.7	8.0	...	...	...	...	...	...
(10) 43	17.7	17.7	17.7	16.2	14.5	12.8	11.1	9.6	8.4	7.4	6.8	...	...	...	...	...	...
(10) 44	17.7	17.7	17.7	16.2	14.5	12.8	11.1	9.6	8.4	7.4	6.8	...	...	...	...	...	...

TABLE 5B (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding															
Line No.	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650
1
2
3
4	22.4	22.3	18.5	15.0	12.2	9.8	7.8	...	...	...	...	...	...	...	...
5	22.4	22.3	18.5	15.0	12.2	9.8	7.8	...	...	...	...	...	...	...	...
6	19.0	19.0	15.7	12.8	10.4	8.3	6.6	...	...	...	...	...	...	...	...
7	22.4	22.3	18.5	15.0	12.2	9.8	7.8	...	...	...	...	...	...	...	...
8	19.0	19.0	15.7	12.8	10.4	8.3	6.6	...	...	...	...	...	...	...	...
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24	(10)
25	(10)
26	(10)
27	(10)
28	(10)
29	(10)
30	(10)
31
32
33
34
35
36
37
38	(10)
39	(10)
40	(10)
41	(10)
42	(10)
43	(10)
44	(10)

TABLE 5B (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Alloy Designation/ UNS No.	Class/ Condition/ Temper
(10) 1	Ti–Pd	Plate, sheet, strip	SB-265	R52402	Annealed
(10) 2	Ti–Pd	Smls. tube	SB-338	R52402	Annealed
(10) 3	Ti–Pd	Wld. tube	SB-338	R52402	Annealed
(10) 4	Ti–Pd	Bar, billet	SB-348	R52402	Annealed
(10) 5	Ti–Pd	Forgings	SB-381	R52402	Annealed
(10) 6	Ti–0.3Mo–0.8Ni	Plate, sheet, strip	SB-265	R53400	Annealed
(10) 7	Ti–0.3Mo–0.8Ni	Bar, billet	SB-348	R53400	Annealed
(10) 8	Ti–0.3Mo–0.8Ni	Forgings	SB-381	R53400	Annealed
(10) 9	Ti–0.3Mo–0.8Ni	Smls. tube	SB-338	R53400	Smls. ann.
(10) 10	Ti–0.3Mo–0.8Ni	Smls. pipe	SB-861	R53400	Smls. ann.
(10) 11	Ti–0.3Mo–0.8Ni	Wld. tube	SB-338	R53400	Wld. ann.
(10) 12	Ti–0.3Mo–0.8Ni	Wld. pipe	SB-862	R53400	Wld. ann.

TABLE 5B (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	P-No.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Max. Use Temperature, °F	External Pressure Chart No.	Notes
1	...	51	50	40	600	NFT-2	...
2	...	51	50	40	600	NFT-2	...
3	...	51	50	40	600	NFT-2	...
4	...	51	50	40	600	NFT-2	...
5	...	51	50	40	600	NFT-2	...
6	...	52	70	50	600	NFT-1	...
7	...	52	70	50	600	NFT-1	...
8	...	52	70	50	600	NFT-1	...
9	...	52	70	50	600	NFT-1	...
10	...	52	70	50	600	NFT-1	...
11	...	52	70	50	600	NFT-1	G7
12	...	52	70	50	600	NFT-1	G7

TABLE 5B (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

		Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
Line No.		–20 to 100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900
(10)	1	20.8	20.8	20.8	19.1	17.1	15.1	13.1	11.3	9.8	8.7	8.0	...	...	...	...	...	...
(10)	2	20.8	20.8	20.8	19.1	17.1	15.1	13.1	11.3	9.8	8.7	8.0	...	...	...	...	...	...
(10)	3	17.7	17.7	17.7	16.2	14.5	12.8	11.1	9.6	8.4	7.4	6.8	...	...	...	...	...	...
(10)	4	20.8	20.8	20.8	19.1	17.1	15.1	13.1	11.3	9.8	8.7	8.0	...	...	...	...	...	...
(10)	5	20.8	20.8	20.8	19.1	17.1	15.1	13.1	11.3	9.8	8.7	8.0	...	...	...	...	...	...
(10)	6	29.2	29.2	26.2	23.8	21.3	18.8	16.4	14.1	12.3	10.9	10.0	...	...	...	...	...	...
(10)	7	29.2	29.2	26.2	23.8	21.3	18.8	16.4	14.1	12.3	10.9	10.0	...	...	...	...	...	...
(10)	8	29.2	29.2	26.2	23.8	21.3	18.8	16.4	14.1	12.3	10.9	10.0	...	...	...	...	...	...
(10)	9	29.2	29.2	26.2	23.8	21.3	18.8	16.4	14.1	12.3	10.9	10.0	...	...	...	...	...	...
(10)	10	29.2	29.2	26.2	23.8	21.3	18.8	16.4	14.1	12.3	10.9	10.0	...	...	...	...	...	...
(10)	11	24.8	24.8	22.3	20.2	18.1	16.0	13.9	12.0	10.5	9.3	8.5	...	...	...	...	...	...
(10)	12	24.8	24.8	22.3	20.2	18.1	16.0	13.9	12.0	10.5	9.3	8.5	...	...	...	...	...	...

TABLE 5B (CONT'D)
SECTION VIII, DIVISION 2
MAXIMUM ALLOWABLE STRESS VALUES S_m FOR NONFERROUS MATERIALS

Maximum Allowable Stress, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding																
Line No.	950	1000	1050	1100	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600	1650	
1	(10)
2	(10)
3	(10)
4	(10)
5	(10)
6	(10)
7	(10)
8	(10)
9	(10)
10	(10)
11	(10)
12	(10)

NOTES TO TABLE 5B

GENERAL NOTES

- (a) The following abbreviations are used: ann., annealed; Cond., Condenser; extr., extruded; fin., finished; rel., relieved; Smls., Seamless; and Wld., Welded.
- (b) An alternative typeface is used for stress values obtained from time-dependent properties (see Notes T1 through T14).
- (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.
- (10) (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.

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 100°F may be used at temperatures down to -325°F without additional specification requirements.
- G4 Maximum allowable stress values for 100°F may be used at temperatures down to -452°F without additional specification requirements.
- G5 Maximum temperature for external pressure design not to exceed 350°F.
- 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 212°F. 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 1000°F, 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 1000°F to 1400°F.
- 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 1000°F to 1250°F.
- G13 Creep-fatigue, thermal ratcheting, and environmental effects are increasingly significant failure modes at temperatures in excess of 1500°F and shall be considered in the design.

NOTES — HEAT TREATMENT REQUIREMENTS

- H1 For temperatures above 1000°F, these stress values may be used only if the material is annealed at a minimum temperature of 1900°F and has a carbon content of 0.04% or higher.
- H2 For temperatures above 1000°F, these stress values may be used only if the material is heat treated by heating it to a minimum temperature of 1900°F and quenching in water or rapidly cooling by other means.

NOTES — TIME-DEPENDENT PROPERTIES

- T1 Allowable stresses for temperatures of 250°F and above are values obtained from time-dependent properties.
- T2 Allowable stresses for temperatures of 300°F and above are values obtained from time-dependent properties.
- T3 Allowable stresses for temperatures of 350°F and above are values obtained from time-dependent properties.
- T4 Allowable stresses for temperatures of 400°F and above are values obtained from time-dependent properties.
- T5 Allowable stresses for temperatures of 500°F and above are values obtained from time-dependent properties.
- T6 Allowable stresses for temperatures of 700°F and above are values obtained from time-dependent properties.
- T7 Allowable stresses for temperatures of 750°F and above are values obtained from time-dependent properties.
- T8 Allowable stresses for temperatures of 800°F and above are values obtained from time-dependent properties.
- T9 Allowable stresses for temperatures of 850°F and above are values obtained from time-dependent properties.
- T10 Allowable stresses for temperatures of 900°F and above are values obtained from time-dependent properties.
- T11 Allowable stresses for temperatures of 950°F and above are values obtained from time-dependent properties.
- T12 Allowable stresses for temperatures of 1000°F and above are values obtained from time-dependent properties.
- T13 Allowable stresses for temperatures of 1050°F and above are values obtained from time-dependent properties.
- T14 Allowable stresses for temperatures of 1100°F 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 0 temper shall be used.
- W3 The stress values given for this material are not applicable when either welding or thermal cutting is employed.
- (10) W4 Use NFA-12 when welded with 5356 or 5556 filler metal, all thicknesses, or 4043 or 5554 filler metal, thickness $\leq \frac{3}{8}$ in. Use NFA-13 when welded with 4043 or 5554 filler metal, thickness $> \frac{3}{8}$ in.

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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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials								
1	Carbon steel	Sheet	SA-1008	CS-A	...	...	...	40
2	Carbon steel	Sheet	SA-1008	CS-B	...	...	...	40
3	Carbon steel	Bar	SA-675	45	...	...	...	45
4	Carbon steel	Wld. pipe	SA-134	A283A	...	...	...	45
5	Carbon steel	Plate	SA-283	A	...	...	...	45
6	Carbon steel	Plate	SA-285	A	K01700	...	...	45
7	Carbon steel	Wld. pipe	SA-672	A45	K01700	...	...	45
8	Carbon steel	Sheet	SA-414	A	K01501	...	...	45
9	Carbon steel	Wld. tube	SA-178	A	K01200	...	...	47
10	Carbon steel	Smls. tube	SA-179	...	K01200	...	...	47
11	Carbon steel	Smls. tube	SA-192	...	K01201	...	...	47
12	Carbon steel	Wld. tube	SA-214	...	K01807	...	...	47
13	Carbon steel	Smls. tube	SA-556	A2	K01807	...	...	47
14	Carbon steel	Wld. tube	SA-557	A2	K01807	...	...	47
15	Carbon steel	Wld. pipe	SA-53	E/A	K02504	...	...	48
16	Carbon steel	Smls. pipe	SA-53	S/A	K02504	...	...	48
17	Carbon steel	Smls. pipe	SA-106	A	K02501	...	...	48
18	Carbon steel	Wld. pipe	SA-135	A	...	...	...	48
19	Carbon steel	Forged pipe	SA-369	FPA	K02501	...	...	48
20	Carbon steel	Wld. pipe	SA-587	...	K11500	...	...	48
21	Carbon steel	Bar	SA-675	50	...	...	...	50
22	Carbon steel	Wld. pipe	SA-134	A283B	...	...	...	50
23	Carbon steel	Plate	SA-283	B	...	...	...	50
24	Carbon steel	Plate	SA-285	B	K02200	...	...	50
25	Carbon steel	Wld. pipe	SA-672	A50	K02200	...	...	50
26	Carbon steel	Sheet	SA-414	B	K02201	...	...	50
(10) 27	Carbon steel	Plate	SA/EN 10028-3	P275NH	...	...	6 < t ≤ 10	51
(10) 28	Carbon steel	Plate	SA/EN 10028-3	P275NH	...	...	4 < t ≤ 6	52
29	Carbon steel	Plate	SA/EN 10028-3	P275NH	...	...	2 < t ≤ 4	53.5
30	Carbon steel	Bar	SA-675	55	...	...	...	55
31	Carbon steel	Wld. pipe	SA-134	A283C	K02401	...	...	55
32	Carbon steel	Plate	SA-283	C	K02401	...	...	55
33	Carbon steel	Plate	SA-285	C	K02801	...	...	55
34	Carbon steel	Smls. & wld. pipe	SA-333	1	K03008	...	...	55
35	Carbon steel	Smls. & wld. tube	SA-334	1	K03008	...	...	55
36	Carbon steel	Plate	SA-516	55	K01800	...	...	55
37	Carbon steel	Smls. pipe	SA-524	II	K02104	...	...	55
38	Carbon steel	Wld. pipe	SA-671	CA55	K02801	...	...	55
39	Carbon steel	Wld. pipe	SA-671	CE55	K02202	...	...	55
40	Carbon steel	Wld. pipe	SA-672	A55	K02801	...	...	55
41	Carbon steel	Wld. pipe	SA-672	B55	K02001	...	...	55
42	Carbon steel	Wld. pipe	SA-672	C55	K01800	...	...	55
43	Carbon steel	Wld. pipe	SA-672	E55	K02202	...	...	55
44	Carbon steel	Sheet	SA-414	C	K02503	...	...	55
45	Carbon steel	Plate	SA/EN 10028-3	P275NH	...	...	≤ 2	56.5
46	Carbon steel	Plate, sheet, bar	SA-36	...	K02600	...	...	58
47	Carbon steel	Plate, sheet	SA-662	A	K01701	...	...	58

TABLE U
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials													
1	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	39.5	36.8	33.5	29.9	26.2	23.1
2	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	39.5	36.8	33.5	29.9	26.2	23.1
3	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	44.4	41.3	37.7	33.6	29.5	25.9
4	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	44.4	41.3	37.7	33.6	29.5	25.9
5	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	44.4	41.3	37.7	33.6	29.5	25.9
6	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	44.4	41.3	37.7	33.6	29.5	25.9
7	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	44.4	41.3	37.7	33.6	29.5	25.9
8	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	44.4	41.3	37.7	33.6	29.5	25.9
9	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	46.4	43.2	39.3	35.1	30.8	27.1
10	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	46.4	43.2	39.3	35.1	30.8	27.1
11	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	46.4	43.2	39.3	35.1	30.8	27.1
12	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	46.4	43.2	39.3	35.1	30.8	27.1
13	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	46.4	43.2	39.3	35.1	30.8	27.1
14	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	46.4	43.2	39.3	35.1	30.8	27.1
15	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	47.4	44.1	40.2	35.8	31.5	27.7
16	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	47.4	44.1	40.2	35.8	31.5	27.7
17	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	47.4	44.1	40.2	35.8	31.5	27.7
18	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	47.4	44.1	40.2	35.8	31.5	27.7
19	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	47.4	44.1	40.2	35.8	31.5	27.7
20	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	47.4	44.1	40.2	35.8	31.5	27.7
21	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	49.4	45.9	41.8	37.3	32.8	28.8
22	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	49.4	45.9	41.8	37.3	32.8	28.8
23	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	49.4	45.9	41.8	37.3	32.8	28.8
24	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	49.4	45.9	41.8	37.3	32.8	28.8
25	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	49.4	45.9	41.8	37.3	32.8	28.8
26	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	49.4	45.9	41.8	37.3	32.8	28.8
27	51.0	51.0	51.0	51.0	51.0	51.0	51.0	51.0	51.0	51.0	46.3	41.3	36.3	31.9 (10)
28	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	47.7	42.5	37.4	32.8 (10)
29	53.5	53.5	53.5	53.5	...	...	...	...	...	...	...	...	...	...
30	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	54.3	50.5	46.0	41.1	36.1	31.7
31	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	54.3	50.5	46.0	41.1	36.1	31.7
32	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	54.3	50.5	46.0	41.1	36.1	31.7
33	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	54.3	50.5	46.0	41.1	36.1	31.7
34	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	54.3	50.5	46.0	41.1	36.1	31.7
35	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	54.3	50.5	46.0	41.1	36.1	31.7
36	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	54.3	50.5	46.0	41.1	36.1	31.7
37	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	54.3	50.5	46.0	41.1	36.1	31.7
38	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	54.3	50.5	46.0	41.1	36.1	31.7
39	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	54.3	50.5	46.0	41.1	36.1	31.7
40	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	54.3	50.5	46.0	41.1	36.1	31.7
41	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	54.3	50.5	46.0	41.1	36.1	31.7
42	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	54.3	50.5	46.0	41.1	36.1	31.7
43	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	54.3	50.5	46.0	41.1	36.1	31.7
44	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	54.3	50.5	46.0	41.1	36.1	31.7
45	56.5	56.5	56.5	56.5	...	...	...	...	...	...	...	...	...	...
46	58.0	58.0	58.0	58.0	58.0	58.0	58.0	58.0	57.3	53.3	48.5	43.3	38.0	33.4
47	58.0	58.0	58.0	58.0	58.0	58.0	58.0	58.0	57.3	53.3	48.5	43.3	38.0	33.4

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	Carbon steel	Forgings	SA-181	...	K03502	60	...	60
2	Carbon steel	Castings	SA-216	WCA	J02502	...	...	60
3	Carbon steel	Forgings	SA-266	1	K03506	...	...	60
4	Carbon steel	Bolting	SA-307	B	...	...	...	60
5	Carbon steel	Forgings	SA-350	LF1	K03009	1	...	60
6	Carbon steel	Castings	SA-352	LCA	J02504	...	...	60
7	Carbon steel	Cast pipe	SA-660	WCA	J02504	...	...	60
8	Carbon steel	Bar	SA-675	60	...	...	...	60
9	Carbon steel	Forgings	SA-765	I	K03046	...	...	60
10	Carbon steel	Plate	SA-515	60	K02401	...	...	60
11	Carbon steel	Plate	SA-516	60	K02100	...	...	60
12	Carbon steel	Wld. pipe	SA-671	CB60	K02401	...	...	60
13	Carbon steel	Wld. pipe	SA-671	CC60	K02100	...	...	60
14	Carbon steel	Wld. pipe	SA-671	CE60	K02402	...	...	60
15	Carbon steel	Wld. pipe	SA-672	B60	K02401	...	...	60
16	Carbon steel	Wld. pipe	SA-672	C60	K02100	...	...	60
17	Carbon steel	Wld. pipe	SA-672	E60	K02402	...	...	60
18	Carbon steel	Wld. pipe	SA-134	A283D	K02702	...	...	60
19	Carbon steel	Plate	SA-283	D	K02702	...	...	60
20	Carbon steel	Wld. pipe	SA-53	E/B	K03005	...	...	60
21	Carbon steel	Smls. pipe	SA-53	S/B	K03005	...	...	60
22	Carbon steel	Smls. pipe	SA-106	B	K03006	...	...	60
23	Carbon steel	Wld. pipe	SA-135	B	...	...	...	60
24	Carbon steel	Smls. & wld. fittings	SA-234	WPB	K03006	...	...	60
25	Carbon steel	Smls. & wld. pipe	SA-333	6	K03006	...	...	60
26	Carbon steel	Smls. & wld. tube	SA-334	6	K03006	...	...	60
27	Carbon steel	Forged pipe	SA-369	FPB	K03006	...	...	60
28	Carbon steel	Forgings	SA-372	A	K03002	...	...	60
29	Carbon steel	Sheet	SA-414	D	K02505	...	...	60
30	Carbon steel	Smls. & wld. fittings	SA-420	WPL6	...	...	...	60
31	Carbon steel	Smls. pipe	SA-524	I	K02104	...	...	60
32	Carbon steel	Bar	SA-695	B/35	K03504	...	...	60
33	Carbon steel	Bar	SA-696	B	K03200	...	...	60
34	Carbon steel	Forgings	SA-727	...	K02506	...	...	60
35	Carbon steel	Wld. tube	SA-178	C	K03503	...	...	60
36	Carbon steel	Smls. tube	SA-210	A-1	K02707	...	...	60
37	Carbon steel	Smls. tube	SA-556	B2	K02707	...	...	60
38	Carbon steel	Wld. tube	SA-557	B2	K03007	...	...	60
39	Carbon steel	Plate, bar	SA/CSA-G40.21	38W	...	...	...	60
(a) 40	Carbon steel	Plate	SA/AS 1548	PT430	...	...	≤ 6	62.5
41	Carbon steel	Plate	SA/EN 10028-2	P295GH	...	...	6 < t ≤ 10	62.5
42	Carbon steel	Plate	SA/EN 10028-2	P295GH	...	...	4 < t ≤ 6	64
43	Carbon steel	Bar	SA-675	65	...	...	...	65
44	Carbon steel	Castings	SA-352	LCB	J03003	...	...	65
45	Carbon steel	Plate	SA-515	65	K02800	...	...	65
46	Carbon steel	Plate	SA-516	65	K02403	...	...	65

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
2	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
3	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
4	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
5	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
6	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
7	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
8	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
9	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
10	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
11	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
12	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
13	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
14	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
15	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
16	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
17	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
18	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
19	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
20	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
21	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
22	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
23	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
24	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
25	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
26	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
27	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
28	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
29	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
30	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
31	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
32	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
33	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
34	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
35	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
36	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
37	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
38	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	59.3	55.1	50.2	44.8	39.4	34.6
39	60.0	58.0	58.0	58.0	58.0	58.0	58.0	58.0	57.3	53.3	48.5	43.3	38.0	33.4
40	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	61.7	57.4	52.3	46.7	41.0	36.0 (a)
41	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	61.7	57.4	52.3	46.7	41.0	36.0
42	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	63.2	58.8	53.5	47.5	42.0	36.9
43	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	64.2	59.7	54.4	48.5	42.6	37.5
44	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	64.2	59.7	54.4	48.5	42.6	37.5
45	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	64.2	59.7	54.4	48.5	42.6	37.5
46	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	64.2	59.7	54.4	48.5	42.6	37.5

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	Carbon steel	Wld. pipe	SA-671	CB65	K02800	...	...	65
2	Carbon steel	Wld. pipe	SA-671	CC65	K02403	...	...	65
3	Carbon steel	Wld. pipe	SA-672	B65	K02800	...	...	65
4	Carbon steel	Wld. pipe	SA-672	C65	K02403	...	...	65
5	Carbon steel	Sheet	SA-414	E	K02704	...	...	65
6	Carbon steel	Plate	SA-662	B	K02203	...	...	65
7	Carbon steel	Plate	SA/GB 6654	16MnR	...	...	$4 < t \leq 5$	65
8	Carbon steel	Plate	SA-537	...	K12437	1	$2\frac{1}{2} < t \leq 4$	65
9	Carbon steel	Wld. pipe	SA-691	CMSH-70	K12437	...	$2\frac{1}{2} < t \leq 4$	65
(a) 10	Carbon steel	Plate	SA/AS 1548	PT460	≤ 6	66.5
11	Carbon steel	Plate	SA/EN 10028-2	P295GH	≤ 4	66.5
12	Carbon steel	Plate	SA/GB 6654	16MnR	...	...	$2.4 < t \leq 4$	67
13	Carbon steel	Plate	SA/GB 6654	16MnR	...	...	$1.5 < t \leq 2.4$	68
14	Carbon steel	Plate	SA-455	...	K03300	...	$0.58 < t \leq \frac{3}{4}$	70
15	Carbon steel	Bar	SA-675	70	...	...	...	70
16	Carbon steel	Forgings	SA-105	...	K03504	...	...	70
17	Carbon steel	Forgings	SA-181	...	K03502	70	...	70
18	Carbon steel	Castings	SA-216	WCB	J03002	...	...	70
19	Carbon steel	Forgings	SA-266	2	K03506	...	...	70
20	Carbon steel	Forgings	SA-266	4	K03017	...	...	70
21	Carbon steel	Forgings	SA-350	LF2	K03011	...	...	70
22	Carbon steel	Forgings	SA-508	1	K13502	...	...	70
23	Carbon steel	Forgings	SA-508	1A	K13502	...	...	70
24	Carbon steel	Forgings	SA-541	1	K03506	...	...	70
25	Carbon steel	Forgings	SA-541	1A	K03020	...	...	70
26	Carbon steel	Cast pipe	SA-660	WCB	J03003	...	...	70
27	Carbon steel	Forgings	SA-765	II	K03047	...	...	70
28	Carbon steel	Plate	SA-515	70	K03101	...	...	70
29	Carbon steel	Plate	SA-516	70	K02700	...	...	70
30	Carbon steel	Wld. pipe	SA-671	CB70	K03101	...	...	70
31	Carbon steel	Wld. pipe	SA-671	CC70	K02700	...	...	70
32	Carbon steel	Wld. pipe	SA-672	B70	K03101	...	...	70
33	Carbon steel	Wld. pipe	SA-672	C70	K02700	...	...	70
34	Carbon steel	Smls. pipe	SA-106	C	K03501	...	...	70
35	Carbon steel	Wld. tube	SA-178	D	...	...	...	70
36	Carbon steel	Smls. tube	SA-210	C	K03501	...	...	70
37	Carbon steel	Castings	SA-216	WCC	J02503	...	...	70
38	Carbon steel	Smls. & wld. fittings	SA-234	WPC	K03501	...	...	70
39	Carbon steel	Castings	SA-352	LCC	J02505	...	...	70
40	Carbon steel	Castings	SA-487	16	...	A	...	70
41	Carbon steel	Plate	SA-537	...	K12437	3	$4 < t \leq 6$	70
42	Carbon steel	Smls. tube	SA-556	C2	K03006	...	...	70
43	Carbon steel	Tube	SA-557	C2	K03505	...	...	70
44	Carbon steel	Cast pipe	SA-660	WCC	J02505	...	...	70
45	Carbon steel	Bar	SA-695	B/40	K03504	...	...	70
46	Carbon steel	Bar	SA-696	C	K03200	...	...	70

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	64.2	59.7	54.4	48.5	42.6	37.5
2	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	64.2	59.7	54.4	48.5	42.6	37.5
3	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	64.2	59.7	54.4	48.5	42.6	37.5
4	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	64.2	59.7	54.4	48.5	42.6	37.5
5	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	64.2	59.7	54.4	48.5	42.6	37.5
6	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	64.2	59.7	54.4	48.5	42.6	37.5
7	65.3	65.3	65.3	65.3	65.3	...	...	...	...	...	...	...	...	...
8	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	64.2	59.7	54.4	48.5	42.6	37.5
9	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	64.2	59.7	54.4	48.5	42.6	37.5
10	66.5	66.5	66.5	66.5	66.5	66.5	66.5	66.5	65.7	61.1	55.6	49.6	43.6	38.3 (a)
11	66.5	66.5	66.5	66.5	66.5	66.5	66.5	66.5	65.7	61.1	55.6	49.6	43.6	38.3
12	66.7	66.7	66.7	66.7	66.7	...	...	...	...	...	...	...	...	...
13	68.2	68.2	68.2	68.2	68.2	...	...	...	...	...	...	...	...	...
14	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
15	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
16	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
17	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
18	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
19	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
20	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
21	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
22	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
23	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
24	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
25	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
26	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
27	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
28	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
29	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
30	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
31	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
32	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
33	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
34	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
35	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
36	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
37	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
38	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
39	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
40	70.0	69.5	65.7	63.3	62.6	62.6	62.6	62.6	62.3	59.2	...	...	...	...
41	70.0	70.0	69.1	68.4	68.4	68.4	68.4	68.4	67.7	65.4	...	...	...	...
42	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
43	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
44	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
45	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
46	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	Carbon steel	Sheet	SA-414	F	K03102	...	...	70
2	Carbon steel	Plate	SA-662	C	K02007	...	...	70
3	Carbon steel	Plate	SA-537	...	K12437	2	$4 < t \leq 6$	70
4	Carbon steel	Plate	SA-738	C	K02008	...	$4 < t \leq 6$	70
5	Carbon steel	Plate	SA-537	...	K12437	1	$\leq 2\frac{1}{2}$	70
6	Carbon steel	Wld. pipe	SA-671	CD70	K12437	...	$\leq 2\frac{1}{2}$	70
7	Carbon steel	Wld. pipe	SA-672	D70	K12437	...	$\leq 2\frac{1}{2}$	70
8	Carbon steel	Wld. pipe	SA-691	CMSH-70	K12437	...	$\leq 2\frac{1}{2}$	70
(a) 9	Carbon steel	Plate	SA-841	A	...	1	$\leq 2\frac{1}{2}$	70
(a) 10	...	...	...	...	...	...	...	...
11	Carbon steel	Plate	SA/GB 6654	16MnR	...	...	$0.65 < t \leq 1.5$	71
12	Carbon steel	Plate	SA-455	...	K03300	...	$\frac{3}{8} < t \leq \frac{5}{8}$	73
13	Carbon steel	Plate	SA/GB 6654	16MnR	...	...	$0.25 < t \leq 0.65$	74
14	Carbon steel	Forgings	SA-266	3	K05001	...	...	75
15	Carbon steel	Plate	SA-455	...	K03300	...	$\leq \frac{3}{8}$	75
(10) 16	Carbon steel	Plate	SA-299	A	K02803	...	> 1	75
17	Carbon steel	Wld. pipe	SA-671	CK75	K02803	...	> 1	75
18	Carbon steel	Wld. pipe	SA-672	N75	K02803	...	> 1	75
19	Carbon steel	Wld. pipe	SA-691	CMS-75	K02803	...	> 1	75
(10) 20	Carbon steel	Plate	SA-299	A	K02803	...	≤ 1	75
21	Carbon steel	Wld. pipe	SA-691	CMS-75	K02803	...	≤ 1	75
22	Carbon steel	Forgings	SA-372	B	K04001	...	...	75
23	Carbon steel	Sheet	SA-414	G	K03103	...	...	75
24	Carbon steel	Plate	SA-738	A	K12447	...	...	75
25	Carbon steel	Plate	SA-537	...	K12437	3	$2\frac{1}{2} < t \leq 4$	75
26	Carbon steel	Plate	SA-537	...	K12437	2	$2\frac{1}{2} < t \leq 4$	75
27	Carbon steel	Wld. pipe	SA-691	CMSH-80	K12437	...	$2\frac{1}{2} < t \leq 4$	75
28	Carbon steel	Plate	SA-738	C	K02008	...	$2\frac{1}{2} < t \leq 4$	75
(10) 29	Carbon steel	Plate	SA-299	B	K02803	...	> 1	80
(10) 30	Carbon steel	Plate	SA-299	B	K02803	...	≤ 1	80
31	Carbon steel	Forgings	SA-765	IV	K02009	...	...	80
32	Carbon steel	Plate	SA-537	...	K12437	3	$\leq 2\frac{1}{2}$	80
33	Carbon steel	Plate	SA-537	...	K12437	2	$\leq 2\frac{1}{2}$	80
34	Carbon steel	Wld. pipe	SA-671	CD80	K12437	...	$\leq 2\frac{1}{2}$	80
35	Carbon steel	Wld. pipe	SA-672	D80	K12437	...	$\leq 2\frac{1}{2}$	80
36	Carbon steel	Wld. pipe	SA-691	CMSH-80	K12437	...	$\leq 2\frac{1}{2}$	80
37	Carbon steel	Plate	SA-738	C	K02008	...	$\leq 2\frac{1}{2}$	80
(a) 38	Carbon steel	Plate	SA-841	B	...	2	$\leq 2\frac{1}{2}$	80
39	Carbon steel	Plate	SA-612	...	K02900	...	$\frac{1}{2} < t \leq 1$	81
40	Carbon steel	Plate	SA-612	...	K02900	...	$\leq \frac{1}{2}$	83
41	Carbon steel	Plate	SA-738	B	K12007	...	...	85
42	Carbon steel	Forgings	SA-372	C	K04801	...	...	90
43	Carbon steel	Bolting	SA-449	...	K04200	...	$1\frac{1}{2} < t \leq 3$	90
44	Carbon steel	Plate	SA-724	A	K11831	...	...	90
45	Carbon steel	Plate	SA-724	C	K12037	...	...	90
46	Carbon steel	Plate	SA-724	B	K12031	...	...	95

2011a SECTION II, PART D (CUSTOMARY)

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
2	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.1	64.3	58.6	52.3	45.9	40.4
3	70.0	70.0	69.1	68.4	68.4	68.4	68.4	68.4	67.7	65.4	...	...	...	...
4	70.0	70.0	69.1	68.4	68.4	68.4	68.4	68.4	67.7	65.4	...	...	...	...
5	70.0	70.0	69.1	68.4	68.4	68.4	68.4	68.4	67.7	65.4	...	...	...	...
6	70.0	70.0	69.1	68.4	68.4	68.4	68.4	68.4	67.7	65.4	...	...	...	...
7	70.0	70.0	69.1	68.4	68.4	68.4	68.4	68.4	67.7	65.4	...	...	...	...
8	70.0	70.0	69.1	68.4	68.4	68.4	68.4	68.4	67.7	65.4	...	...	...	...
9	70.0	70.0	70.0	70.0	70.0	69.9	68.4	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	71.1	71.1	71.1	71.1	71.1	...	...	...	...	...	...	...	...	...
12	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	72.1	67.1	61.1	54.5	47.9	42.1
13	74.0	74.0	74.0	74.0	74.0	...	...	...	...	...	...	...	...	...
14	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	74.1	68.9	62.8	56.0	49.2	43.2
15	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	74.1	68.9	62.8	56.0	49.2	43.2
16	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	74.1	68.9	62.8	56.0	49.2	43.2
17	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	74.1	68.9	62.8	56.0	49.2	43.2
18	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	74.1	68.9	62.8	56.0	49.2	43.2
19	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	74.1	68.9	62.8	56.0	49.2	43.2
20	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	74.1	68.9	62.8	56.0	49.2	43.2
21	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	74.1	68.9	62.8	56.0	49.2	43.2
22	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	74.1	68.9	62.8	56.0	49.2	43.2
23	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	74.1	68.9	62.8	56.0	49.2	43.2
24	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	74.1	68.9	62.8	56.0	49.2	43.2
25	75.0	75.0	74.0	73.3	73.2	73.2	73.2	73.2	72.5	70.1	...	...	...	...
26	75.0	75.0	74.0	73.3	73.2	73.2	73.2	73.2	72.5	70.1	...	...	...	...
27	75.0	75.0	74.0	73.3	73.2	73.2	73.2	73.2	72.5	70.1	...	...	...	...
28	75.0	75.0	74.0	73.3	73.2	73.2	73.2	73.2	72.5	70.1	...	...	...	...
29	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	79.0	73.5	66.9	59.7	52.5	46.1
30	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	79.0	73.5	66.9	59.7	52.5	46.1
31	80.0	80.0	80.0	79.1	79.1	79.1	78.8	77.7	...	...	...	...	...	...
32	80.0	80.0	78.9	78.2	78.1	78.1	78.1	78.1	77.4	74.8	...	...	...	...
33	80.0	80.0	78.9	78.2	78.1	78.1	78.1	78.1	77.4	74.8	...	...	...	...
34	80.0	80.0	78.9	78.2	78.1	78.1	78.1	78.1	77.4	74.8	...	...	...	...
35	80.0	80.0	78.9	78.2	78.1	78.1	78.1	78.1	77.4	74.8	...	...	...	...
36	80.0	80.0	78.9	78.2	78.1	78.1	78.1	78.1	77.4	74.8	...	...	...	...
37	80.0	80.0	78.9	78.2	78.1	78.1	78.1	78.1	77.4	74.8	...	...	...	...
38	80.0	80.0	80.0	80.0	80.0	79.9	78.2	...	...	...	...	...	...	...
39	81.0	81.0	79.4	79.4	79.4	79.4	79.4	79.4	...	...	...	...	...	...
40	83.0	83.0	81.3	81.3	81.3	81.3	81.3	81.3	...	...	...	...	...	...
41	85.0	85.0	85.0	85.0	85.0	84.2	83.0	81.0	78.3	74.6	...	...	...	...
42	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	88.9	82.7	75.3	67.2	59.0	51.9
43	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	88.9	82.7	75.3	67.2	59.0	51.9
44	90.0	90.0	88.8	87.9	87.9	87.9	87.9	87.9	87.0	84.1	...	...	...	...
45	90.0	90.0	88.8	87.9	87.9	87.9	87.9	87.9	87.0	84.1	...	...	...	...
46	95.0	95.0	93.7	92.8	92.8	92.8	92.8	92.8	91.9	88.8	...	...	...	...

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	Carbon steel	Bolting	SA-325	...	...	...	...	105
2	Carbon steel	Bolting	SA-325	1	K02706	...	$1\frac{1}{8} < t \leq 1\frac{1}{2}$	105
3	Carbon steel	Bolting	SA-449	...	K04200	...	$1 < t < 1\frac{1}{2}$	105
4	Carbon steel	Bolting	SA-354	BC	K04100	...	$2\frac{1}{2} < t \leq 4$	115
5	Carbon steel	Bolting	SA-325	1	K02706	...	$\frac{1}{2} < t \leq 1$	120
6	Carbon steel	Bolting	SA-449	...	K04200	...	≤ 1	120
7	Carbon steel	Bolting	SA-354	BC	K04100	...	$\frac{1}{4} < t \leq 2\frac{1}{2}$	125
8	Carbon steel	Bolting	SA-354	BD	K04100	...	$2\frac{1}{2} < t \leq 4$	140
9	Carbon steel	Bolting	SA-354	BD	K04100	...	$\frac{1}{4} < t \leq 2\frac{1}{2}$	150
(a) 10	C-Mn-Si-Cb	Plate	SA-737	B	K12001	...	...	70
11	C-Mn-Si-Cb	Plate	SA/AS 1548	PT490	≤ 6	71
12	C-Mn-Si-V	Plate	SA-737	C	K12202	...	...	80
13	C-Mn-Si-V-Cb	Plate	SA-656	T3	≤ 2	60
14	C-Mn-Si-V-Cb	Plate	SA-656	T7	≤ 2	60
15	C-Mn-Si-V-Cb	Plate	SA-656	T3	...	...	$\leq 1\frac{1}{2}$	70
16	C-Mn-Si-V-Cb	Plate	SA-656	T7	...	...	$\leq 1\frac{1}{2}$	70
17	C-Mn-Si-V-Cb	Plate	SA-656	T3	≤ 1	80
18	C-Mn-Si-V-Cb	Plate	SA-656	T7	≤ 1	80
19	C-Mn-Si-V-Cb	Plate	SA-656	T3	...	...	$\leq \frac{3}{4}$	90
20	C-Mn-Si-V-Cb	Plate	SA-656	T7	...	...	$\leq \frac{3}{4}$	90
21	C-Mn-Ti	Plate, sheet	SA-562	...	K11224	...	...	55
22	C-Si-Ti	Forgings	SA-836	...	...	1	...	55
23	C- $\frac{1}{4}$ Mo	Bolting	SA-320	L7A	G40370	...	$\leq 2\frac{1}{2}$	125
24	C- $\frac{1}{4}$ Mo	Bolting	SA-574	4037	G40370	...	$\geq \frac{5}{8}$	170
25	C- $\frac{1}{4}$ Mo	Bolting	SA-574	4042	G40420	...	$\geq \frac{5}{8}$	170
26	C- $\frac{1}{4}$ Mo	Bolting	SA-574	4140	G41400	...	$\geq \frac{5}{8}$	170
27	C- $\frac{1}{4}$ Mo	Bolting	SA-574	4037	G40370	...	$\geq \frac{1}{2}$	180
28	C- $\frac{1}{4}$ Mo	Bolting	SA-574	4042	G40420	...	$\leq \frac{1}{2}$	180
29	C- $\frac{1}{2}$ Mo	Smls. tube	SA-209	T1b	K11422	...	...	53
30	C- $\frac{1}{2}$ Mo	Wld. tube	SA-250	T1b	K11422	...	...	53
31	C- $\frac{1}{2}$ Mo	Smls. tube	SA-209	T1	K11522	...	...	55
32	C- $\frac{1}{2}$ Mo	Smls. & wld. fittings	SA-234	WP1	K12821	...	...	55
33	C- $\frac{1}{2}$ Mo	Wld. tube	SA-250	T1	K11522	...	...	55
34	C- $\frac{1}{2}$ Mo	Smls. pipe	SA-335	P1	K11522	...	...	55
35	C- $\frac{1}{2}$ Mo	Forged pipe	SA-369	FP1	K11522	...	...	55
36	C- $\frac{1}{2}$ Mo	Smls. tube	SA-209	T1a	K12023	...	...	60
37	C- $\frac{1}{2}$ Mo	Wld. tube	SA-250	T1a	K12023	...	...	60
38	C- $\frac{1}{2}$ Mo	Castings	SA-217	WC1	J12524	...	...	65
39	C- $\frac{1}{2}$ Mo	Castings	SA-352	LC1	J12522	...	...	65
40	C- $\frac{1}{2}$ Mo	Cast pipe	SA-426	CP1	J12521	...	...	65
41	C- $\frac{1}{2}$ Mo	Plate	SA-204	A	K11820	...	...	65
42	C- $\frac{1}{2}$ Mo	Wld. pipe	SA-672	L65	K11820	...	...	65
43	C- $\frac{1}{2}$ Mo	Wld. pipe	SA-691	CM-65	K11820	...	...	65

2011a SECTION II, PART D (CUSTOMARY)

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	105.0	105.0	103.6	102.6	102.5	102.5	102.5	102.5	101.5	98.1	91.5	80.3	62.5	35.8
2	105.0	105.0	103.6	102.6	102.5	102.5	102.5	102.5	101.5	98.1	91.5	80.3	62.5	35.8
3	105.0	105.0	103.6	102.6	102.5	102.5	102.5	102.5	101.5	98.1	91.5	80.3	62.5	35.8
4	115.0	115.0	115.0	115.0	115.0	115.0	115.0	113.6	105.7	96.2	85.8	75.4	66.3	...
5	120.0	120.0	118.4	117.3	117.2	117.2	117.2	117.2	116.1	112.1	104.6	91.8	71.5	41.0
6	120.0	120.0	118.4	117.3	117.2	117.2	117.2	117.2	116.1	112.1	104.6	91.8	71.5	41.0
7	125.0	125.0	125.0	125.0	125.0	125.0	125.0	125.0	123.5	114.8	104.6	93.3	82.0	72.1
8	140.0	140.0	140.0	140.0	140.0	140.0	140.0	140.0	138.3	128.6	117.1	104.5	91.8	80.7
9	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	147.8	137.3	124.9	111.3	97.6	85.5
10	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.4	66.7	63.0	58.2	52.7	47.0	...
11	71.0	71.0	71.0	71.0	71.0	71.0	71.0	70.4	67.7	63.9	59.1	53.5	47.6	42.2 (a)
12	80.0	80.0	80.0	80.0	80.0	80.0	80.0	79.4	76.3	72.0	66.5	60.3	53.7	...
13	60.0	60.0	60.0	60.0	60.0	60.0	60.0	...	...	...	...	...	...	...
14	60.0	60.0	60.0	60.0	60.0	60.0	60.0	...	...	...	...	...	...	...
15	70.0	70.0	70.0	70.0	70.0	70.0	70.0	...	...	...	...	...	...	...
16	70.0	70.0	70.0	70.0	70.0	70.0	70.0	...	...	...	...	...	...	...
17	80.0	80.0	80.0	80.0	80.0	80.0	80.0	...	...	...	...	...	...	...
18	80.0	80.0	80.0	80.0	80.0	80.0	80.0	...	...	...	...	...	...	...
19	90.0	90.0	90.0	90.0	90.0	90.0	90.0	...	...	...	...	...	...	...
20	90.0	90.0	90.0	90.0	90.0	90.0	90.0	...	...	...	...	...	...	...
21	55.0	44.4	41.5	39.5	38.1	36.9	36.3	35.6	34.8	...	...	...	...	...
22	55.0	54.3	50.7	48.3	46.6	45.1	44.3	43.5	42.5	...	...	...	...	...
23	125.0	125.0	125.0	125.0	125.0	125.0	125.0	125.0	123.5	114.8	104.6	93.3	82.0	72.1
24	170.0	170.0	170.0	170.0	170.0	170.0	170.0	170.0	170.0	170.0	166.0	158.1	148.4	137.2
25	170.0	170.0	170.0	170.0	170.0	170.0	170.0	170.0	170.0	170.0	166.0	158.1	148.4	137.2
26	170.0	170.0	170.0	170.0	170.0	170.0	170.0	170.0	170.0	170.0	166.0	158.1	148.4	137.2
27	180.0	180.0	180.0	180.0	180.0	180.0	180.0	180.0	180.0	180.0	175.8	167.4	157.2	145.3
28	180.0	180.0	180.0	180.0	180.0	180.0	180.0	180.0	180.0	180.0	175.8	167.4	157.2	145.3
29	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	51.8	49.3	46.3	42.8
30	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	51.8	49.3	46.3	42.8
31	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	53.7	51.1	48.0	44.4
32	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	53.7	51.1	48.0	44.4
33	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	53.7	51.1	48.0	44.4
34	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	53.7	51.1	48.0	44.4
35	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	53.7	51.1	48.0	44.4
36	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	58.6	55.8	52.4	48.4
37	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	58.6	55.8	52.4	48.4
38	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	63.5	60.4	56.8	52.5
39	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	63.5	60.4	56.8	52.5
40	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	63.5	60.4	56.8	52.5
41	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	63.5	60.4	56.8	52.5
42	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	63.5	60.4	56.8	52.5
43	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	63.5	60.4	56.8	52.5

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	C- $\frac{1}{2}$ Mo	Forgings	SA-182	F1	K12822	...	...	70
2	C- $\frac{1}{2}$ Mo	Plate	SA-204	B	K12020	...	...	70
3	C- $\frac{1}{2}$ Mo	Forgings	SA-336	F1	K12520	...	...	70
4	C- $\frac{1}{2}$ Mo	Wld. pipe	SA-672	L70	K12020	...	...	70
5	C- $\frac{1}{2}$ Mo	Wld. pipe	SA-691	CM-70	K12020	...	...	70
6	C- $\frac{1}{2}$ Mo	Plate	SA-204	C	K12320	...	...	75
7	C- $\frac{1}{2}$ Mo	Wld. pipe	SA-672	L75	K12320	...	...	75
8	C- $\frac{1}{2}$ Mo	Wld. pipe	SA-691	CM-75	K12320	...	...	75
9	$\frac{1}{2}$ Cr- $\frac{1}{5}$ Mo	Forgings	SA-372	G	K13049	70	...	120
10	$\frac{1}{2}$ Cr- $\frac{1}{5}$ Mo	Forgings	SA-372	H	K13547	70	...	120
11	$\frac{1}{2}$ Cr- $\frac{1}{5}$ Mo-V	Plate	SA-517	B	K11630	...	$\leq 1\frac{1}{4}$	115
12	$\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-Si	Plate	SA-517	A	K11856	...	$\leq 1\frac{1}{4}$	115
13	$\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-Si	Forgings	SA-592	A	K11856	...	$\leq 2\frac{1}{2}$	115
14	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Smls. pipe	SA-335	P2	K11547	...	...	55
15	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Forged pipe	SA-369	FP2	K11547	...	...	55
16	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Plate	SA-387	2	K12143	1	...	55
17	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Wld. pipe	SA-691	$\frac{1}{2}$ CR	K12143	...	...	55
18	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Smls. tube	SA-213	T2	K11547	...	...	60
19	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Cast pipe	SA-426	CP2	J11547	...	...	60
20	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Forgings	SA-182	F2	K12122	...	...	70
21	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Plate	SA-387	2	K12143	2	...	70
22	$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Wld. pipe	SA-691	$\frac{1}{2}$ CR	K12143	...	...	70
23	$\frac{1}{2}$ Cr- $1\frac{1}{4}$ Mn-Si	Plate	SA-202	A	K11742	...	...	75
24	$\frac{1}{2}$ Cr- $1\frac{1}{4}$ Mn-Si	Plate	SA-202	B	K12542	...	...	85
25	$\frac{3}{4}$ Cr- $\frac{1}{2}$ Ni-Cu	Wld. tube	SA-423	1	K11535	...	...	60
26	$\frac{3}{4}$ Cr- $\frac{3}{4}$ Ni-Cu-Al	Pipe	SA-333	4	K11267	...	...	60
27	1Cr- $\frac{1}{5}$ Mo	Bolting	SA-193	B7	G41400	...	$4 < t \leq 7$	100
28	1Cr- $\frac{1}{5}$ Mo	Bolting	SA-193	B7M	G41400	...	$\leq 2\frac{1}{2}$	100
29	1Cr- $\frac{1}{5}$ Mo	Bolting	SA-320	L7M	G41400	...	$\leq 2\frac{1}{2}$	100
30	1Cr- $\frac{1}{5}$ Mo	Bolting	SA-193	B7	G41400	...	$2\frac{1}{2} < t \leq 4$	115
31	1Cr- $\frac{1}{5}$ Mo	Forgings	SA-372	E	K13047	70	...	120
32	1Cr- $\frac{1}{5}$ Mo	Forgings	SA-372	F	G41350	70	...	120
33	1Cr- $\frac{1}{5}$ Mo	Forgings	SA-372	J	K13548	70	...	120
34	1Cr- $\frac{1}{5}$ Mo	Bolting	SA-193	B7	G41400	...	$\leq 2\frac{1}{2}$	125
35	1Cr- $\frac{1}{5}$ Mo	Bolting	SA-320	L7	G41400	...	$\leq 2\frac{1}{2}$	125
36	1Cr- $\frac{1}{5}$ Mo	Forgings	SA-372	J	G41370	110	...	135
37	1Cr- $\frac{1}{2}$ Mo	Plate	SA-387	12	K11757	1	...	55
38	1Cr- $\frac{1}{2}$ Mo	Wld. pipe	SA-691	1CR	K11757	...	...	55
39	1Cr- $\frac{1}{2}$ Mo	Cast pipe	SA-426	CP12	J11562	...	...	60
40	1Cr- $\frac{1}{2}$ Mo	Forgings	SA-182	F12	K11562	1	...	60
41	1Cr- $\frac{1}{2}$ Mo	Smls. tube	SA-213	T12	K11562	...	...	60
42	1Cr- $\frac{1}{2}$ Mo	Smls. & wld. fittings	SA-234	WP12	K12062	1	...	60
43	1Cr- $\frac{1}{2}$ Mo	Smls. pipe	SA-335	P12	K11562	...	...	60
44	1Cr- $\frac{1}{2}$ Mo	Forged pipe	SA-369	FP12	K11562	...	...	60

2011a SECTION II, PART D (CUSTOMARY)

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	68.4	65.1	61.1	56.5
2	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	68.4	65.1	61.1	56.5
3	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	68.4	65.1	61.1	56.5
4	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	68.4	65.1	61.1	56.5
5	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	68.4	65.1	61.1	56.5
6	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	73.2	69.7	65.5	60.5
7	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	73.2	69.7	65.5	60.5
8	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	73.2	69.7	65.5	60.5
9	120.0	120.0	120.0	120.0	120.0	120.0	119.2	115.2	110.3	104.4	97.7	90.4	82.9	75.5
10	120.0	120.0	120.0	120.0	120.0	120.0	119.2	115.2	110.3	104.4	97.7	90.4	82.9	75.5
11	115.0	115.0	115.0	115.0	115.0	115.0	114.8	112.6	109.6	106.0	101.6	96.6	90.8	84.4
12	115.0	115.0	115.0	115.0	115.0	115.0	114.8	112.6	109.6	106.0	101.6	96.6	90.8	84.4
13	115.0	115.0	115.0	115.0	115.0	115.0	114.8	112.6	109.6	106.0	101.6	96.6	90.8	84.4
14	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	53.7	51.1	48.0	44.4
15	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	53.7	51.1	48.0	44.4
16	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	53.7	51.1	48.0	44.4
17	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	53.7	51.1	48.0	44.4
18	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	58.6	55.8	52.4	48.4
19	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	58.6	55.8	52.4	48.4
20	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	68.4	65.1	61.1	56.5
21	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	68.4	65.1	61.1	56.5
22	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	68.4	65.1	61.1	56.5
23	75.0	75.0	75.0	75.0	75.0	75.0	75.0	71.2	66.5	62.0	57.9	53.7	48.7	41.9
24	85.0	85.0	85.0	85.0	85.0	85.0	85.0	80.7	75.3	70.3	65.6	60.8	55.2	47.5
25	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	...	...	...
26	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	...	...	...
27	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.7	91.4	86.7	81.4	75.7	69.4	62.7
28	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.7	91.4	86.7	81.4	75.7	69.4	62.7
29	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.7	91.4	86.7	81.4	75.7	69.4	62.7
30	115.0	115.0	115.0	115.0	115.0	115.0	114.5	110.1	105.1	99.7	93.6	87.0	79.8	72.1
31	120.0	120.0	120.0	120.0	120.0	120.0	119.2	115.2	110.3	104.4	97.7	90.4	82.9	75.5
32	120.0	120.0	120.0	120.0	120.0	120.0	119.2	115.2	110.3	104.4	97.7	90.4	82.9	75.5
33	120.0	120.0	120.0	120.0	120.0	120.0	119.2	115.2	110.3	104.4	97.7	90.4	82.9	75.5
34	125.0	125.0	125.0	125.0	125.0	125.0	124.4	119.6	114.3	108.4	101.8	94.6	86.8	78.4
35	125.0	125.0	125.0	125.0	125.0	125.0	124.4	119.6	114.3	108.4	101.8	94.6	86.8	78.4
36	135.0	135.0	135.0	135.0	135.0	135.0	134.1	129.7	124.0	117.4	109.9	101.7	93.3	85.0
37	55.0	54.0	52.9	52.9	52.9	52.9	52.9	52.9	52.9	52.9	52.9	51.4	48.9	45.8
38	55.0	54.0	52.9	52.9	52.9	52.9	52.9	52.9	52.9	52.9	52.9	51.4	48.9	45.8
39	60.0	58.9	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	56.1	53.3	50.0
40	60.0	58.9	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	56.1	53.3	50.0
41	60.0	58.9	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	56.1	53.3	50.0
42	60.0	58.9	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	56.1	53.3	50.0
43	60.0	58.9	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	56.1	53.3	50.0
44	60.0	58.9	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	56.1	53.3	50.0

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	1Cr- $\frac{1}{2}$ Mo	Plate	SA-387	12	K11757	2	...	65
2	1Cr- $\frac{1}{2}$ Mo	Wld. pipe	SA-691	1CR	K11757	...	...	65
3	1Cr- $\frac{1}{2}$ Mo	Forgings	SA-182	F12	K11564	2	...	70
4	1Cr- $\frac{1}{2}$ Mo	Forgings	SA-336	F12	K11564	...	...	70
5	1Cr- $\frac{1}{2}$ Mo-V	Bolting	SA-193	B16	K14072	...	$4 < t \leq 7$	100
6	1Cr- $\frac{1}{2}$ Mo-V	Bolting	SA-193	B16	K14072	...	$2\frac{1}{2} < t \leq 4$	110
7	1Cr- $\frac{1}{2}$ Mo-V	Bolting	SA-540	B21	K14073	5	$2 < t \leq 8$	115
8	1Cr- $\frac{1}{2}$ Mo-V	Bolting	SA-540	B21	K14073	5	≤ 2	120
9	1Cr- $\frac{1}{2}$ Mo-V	Bolting	SA-193	B16	K14072	...	$\leq 2\frac{1}{2}$	125
10	1Cr- $\frac{1}{2}$ Mo-V	Bolting	SA-540	B21	K14073	4	≤ 6	135
11	1Cr- $\frac{1}{2}$ Mo-V	Bolting	SA-540	B21	K14073	3	≤ 6	145
12	1Cr- $\frac{1}{2}$ Mo-V	Bolting	SA-540	B21	K14073	2	≤ 4	155
13	1Cr- $\frac{1}{2}$ Mo-V	Bolting	SA-540	B21	K14073	1	≤ 4	165
14	1Cr-V	Smls. tube	SA-213	T17	K12047	...	...	60
15	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo	Castings	SA-217	WC6	J12072	...	...	70
16	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo	Cast pipe	SA-426	CP11	J12072	...	...	70
17	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo	Bar	SA-739	B11	K11797	...	...	70
18	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Forgings	SA-182	F11	K11597	1	...	60
19	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Smls. tube	SA-213	T11	K11597	...	...	60
20	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Smls. & wld. fittings	SA-234	WP11	...	1	...	60
21	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Smls. pipe	SA-335	P11	K11597	...	...	60
22	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Forgings	SA-336	F11	K11597	1	...	60
23	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Forged pipe	SA-369	FP11	K11597	...	...	60
24	$1\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-Si	Plate	SA-387	11	K11789	1	...	60
25	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Wld. pipe	SA-691	$1\frac{1}{4}$ CR	K11789	...	...	60
26	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Forgings	SA-182	F11	K11572	2	...	70
27	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Forgings	SA-336	F11	K11572	2	...	70
28	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Forgings	SA-336	F11	K11572	3	...	75
29	$1\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-Si	Plate	SA-387	11	K11789	2	...	75
30	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si	Wld. pipe	SA-691	$1\frac{1}{4}$ CR	K11789	...	...	75
31	$1\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo-Cu	Forgings	SA-592	E	K11695	...	$2\frac{1}{2} < t \leq 4$	105
32	$1\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo-Cu	Forgings	SA-592	E	K11695	...	$\leq 2\frac{1}{2}$	115
33	$1\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo-Ti	Plate	SA-517	E	K21604	...	$2\frac{1}{2} < t \leq 6$	105
34	$1\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo-Ti	Plate	SA-517	E	K21604	...	$\leq 2\frac{1}{2}$	115
35	$2\frac{1}{4}$ Cr-1Mo	Forgings	SA-182	F22	K21590	1	...	60
36	$2\frac{1}{4}$ Cr-1Mo	Smls. tube	SA-213	T22	K21590	...	...	60
37	$2\frac{1}{4}$ Cr-1Mo	Smls. & wld. fittings	SA-234	WP22	K21590	1	...	60
38	$2\frac{1}{4}$ Cr-1Mo	Smls. pipe	SA-335	P22	K21590	...	...	60
39	$2\frac{1}{4}$ Cr-1Mo	Forgings	SA-336	F22	K21590	1	...	60
40	$2\frac{1}{4}$ Cr-1Mo	Forged pipe	SA-369	FP22	K21590	...	...	60
41	$2\frac{1}{4}$ Cr-1Mo	Plate	SA-387	22	K21590	1	...	60
42	$2\frac{1}{4}$ Cr-1Mo	Wld. pipe	SA-691	$2\frac{1}{4}$ CR	K21590	...	...	60
43	$2\frac{1}{4}$ Cr-1Mo	Castings	SA-217	WC9	J21890	...	...	70
44	$2\frac{1}{4}$ Cr-1Mo	Cast pipe	SA-426	CP22	J21890	...	...	70

2011a SECTION II, PART D (CUSTOMARY)

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	65.0	63.8	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	60.8	57.8	54.2
2	65.0	63.8	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	62.5	60.8	57.8	54.2
3	70.0	68.7	67.3	67.3	67.3	67.3	67.3	67.3	67.3	67.3	67.3	65.5	62.2	58.3
4	70.0	68.7	67.3	67.3	67.3	67.3	67.3	67.3	67.3	67.3	67.3	65.5	62.2	58.3
5	100.0	100.0	100.0	100.0	100.0	100.0	98.7	95.8	92.5	88.8	84.7	80.2	75.5	70.4
6	110.0	110.0	110.0	110.0	110.0	110.0	108.5	105.4	101.8	97.7	93.1	88.2	83.0	77.4
7	115.0	115.0	115.0	115.0	115.0	115.0	113.9	109.8	106.3	101.8	97.2	91.7	87.0	81.6
8	120.0	120.0	120.0	120.0	120.0	120.0	118.8	114.6	110.9	106.3	101.4	95.7	90.8	85.1
9	125.0	125.0	125.0	125.0	125.0	125.0	125.0	125.0	125.0	125.0	125.0	99.7	94.6	88.7
10	135.0	135.0	135.0	135.0	135.0	135.0	135.0	135.0	124.7	119.5	114.0	107.7	102.2	95.8
11	145.0	145.0	145.0	145.0	145.0	145.0	143.6	138.4	134.0	128.4	122.5	115.6	109.7	102.9
12	155.0	155.0	155.0	155.0	155.0	155.0	153.5	148.0	143.2	137.3	130.9	123.6	117.3	110.0
13	165.0	165.0	165.0	165.0	165.0	165.0	163.4	157.5	152.5	146.1	139.4	131.6	124.9	117.1
14	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	58.3	55.8	52.6	48.8
15	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	68.0	65.1	61.4	56.9
16	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	68.0	65.1	61.4	56.9
17	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	68.0	65.1	61.4	56.9
18	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	58.3	55.8	52.6	48.8
19	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	58.3	55.8	52.6	48.8
20	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	58.3	55.8	52.6	48.8
21	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	58.3	55.8	52.6	48.8
22	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	58.3	55.8	52.6	48.8
23	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	58.3	55.8	52.6	48.8
24	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	58.3	55.8	52.6	48.8
25	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	58.3	55.8	52.6	48.8
26	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	68.0	65.1	61.4	56.9
27	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	68.0	65.1	61.4	56.9
28	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	72.8	69.7	65.7	61.0
29	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	72.8	69.7	65.7	61.0
30	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	72.8	69.7	65.7	61.0
31	105.0	105.0	105.0	105.0	105.0	105.0	105.0	104.6	102.7	100.4	97.7	94.8	91.5	88.1
32	115.0	115.0	115.0	115.0	115.0	115.0	115.0	114.6	112.5	110.0	107.0	103.8	100.2	96.5
33	105.0	105.0	105.0	105.0	105.0	105.0	105.0	104.6	102.7	100.4	97.7	94.8	91.5	88.1
34	115.0	115.0	115.0	115.0	115.0	115.0	115.0	114.6	112.5	110.0	107.0	103.8	100.2	96.5
35	60.0	59.9	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	57.5	53.9
36	60.0	59.9	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	57.5	53.9
37	60.0	59.9	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	57.5	53.9
38	60.0	59.9	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	57.5	53.9
39	60.0	59.9	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	57.5	53.9
40	60.0	59.9	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	57.5	53.9
41	60.0	59.9	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	57.5	53.9
42	60.0	59.9	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	57.5	53.9
43	70.0	70.0	69.0	67.9	67.6	67.3	66.8	66.0	64.6	62.7	60.1	56.9	52.8	48.1
44	70.0	70.0	69.0	67.9	67.6	67.3	66.8	66.0	64.6	62.7	60.1	56.9	52.8	48.1

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	2 $\frac{1}{4}$ Cr-1Mo	Forgings	SA-182	F22	K21590	3	...	75
2	2 $\frac{1}{4}$ Cr-1Mo	Forgings	SA-336	F22	K21590	3	...	75
3	2 $\frac{1}{4}$ Cr-1Mo	Plate	SA-387	22	K21590	2	...	75
4	2 $\frac{1}{4}$ Cr-1Mo	Wld. pipe	SA-691	2 $\frac{1}{4}$ CR	K21590	...	...	75
5	2 $\frac{1}{4}$ Cr-1Mo	Bar	SA-739	B22	K21390	...	...	75
6	2 $\frac{1}{4}$ Cr-1Mo	Castings	SA-487	8	J22091	A	...	85
7	2 $\frac{1}{4}$ Cr-1Mo	Forgings	SA-508	22	K21590	3	...	85
8	2 $\frac{1}{4}$ Cr-1Mo	Forgings	SA-541	22	K21390	3	...	85
9	2 $\frac{1}{4}$ Cr-1Mo	Plate	SA-542	B	K21590	4	...	85
10	2 $\frac{1}{4}$ Cr-1Mo	Forgings	SA-541	22	K21390	4	...	105
11	2 $\frac{1}{4}$ Cr-1Mo-V	Forgings	SA-182	F22V	K31835	...	...	85
12	2 $\frac{1}{4}$ Cr-1Mo-V	Forgings	SA-336	F22V	K31835	...	...	85
13	2 $\frac{1}{4}$ Cr-1Mo-V	Forgings	SA-541	22V	K31835	...	...	85
14	2 $\frac{1}{4}$ Cr-1Mo-V	Plate	SA-542	D	K31835	4a	...	85
15	2 $\frac{1}{4}$ Cr-1Mo-V	Plate	SA-832	22V	K31835	...	...	85
16	3Cr-1Mo	Smls. tube	SA-213	T21	K31545	...	...	60
17	3Cr-1Mo	Smls. pipe	SA-335	P21	K31545	...	...	60
18	3Cr-1Mo	Forgings	SA-336	F21	K31545	1	...	60
19	3Cr-1Mo	Forged pipe	SA-369	FP21	K31545	...	...	60
20	3Cr-1Mo	Plate	SA-387	21	K31545	1	...	60
21	3Cr-1Mo	Cast pipe	SA-426	CP21	J31545	...	...	60
22	3Cr-1Mo	Forgings	SA-182	F21	K31545	...	...	75
23	3Cr-1Mo	Forgings	SA-336	F21	K31545	3	...	75
24	3Cr-1Mo	Plate	SA-387	21	K31545	2	...	75
25	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Forgings	SA-182	F3V	K31830	...	...	85
26	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Forgings	SA-336	F3V	K31830	...	...	85
27	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Forgings	SA-508	3V	K31830	...	...	85
28	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Forgings	SA-541	3V	K31830	...	...	85
29	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Plate	SA-542	C	K31830	4a	...	85
30	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Plate	SA-832	21V	K31830	...	...	85
31	3Cr-1Mo- $\frac{1}{4}$ V-Cb-Ca	Forgings	SA-182	F3VCb	...	...	...	85
32	3Cr-1Mo- $\frac{1}{4}$ V-Cb-Ca	Forgings	SA-336	F3VCb	...	...	...	85
33	3Cr-1Mo- $\frac{1}{4}$ V-Cb-Ca	Forgings	SA-508	3VCb	...	...	...	85
34	3Cr-1Mo- $\frac{1}{4}$ V-Cb-Ca	Forgings	SA-541	3VCb	...	...	...	85
35	3Cr-1Mo- $\frac{1}{4}$ V-Cb-Ca	Plate	SA-542	E	...	4a	...	85
36	3Cr-1Mo- $\frac{1}{4}$ V-Cb-Ca	Plate	SA-832	23V	...	...	...	85
37	5Cr- $\frac{1}{2}$ Mo	Smls. tube	SA-213	T5	K41545	...	...	60
38	5Cr- $\frac{1}{2}$ Mo	Smls. & wld. fittings	SA-234	WP5	K41545	...	...	60
39	5Cr- $\frac{1}{2}$ Mo	Smls. pipe	SA-335	P5	K41545	...	...	60
40	5Cr- $\frac{1}{2}$ Mo	Forged pipe	SA-369	FP5	K41545	...	...	60
41	5Cr- $\frac{1}{2}$ Mo	Plate	SA-387	5	K41545	1	...	60
42	5Cr- $\frac{1}{2}$ Mo	Wld. pipe	SA-691	5CR	K41545	...	...	60
43	5Cr- $\frac{1}{2}$ Mo	Forgings	SA-336	F5	K41545	...	...	60

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	75.0	75.0	73.0	72.2	71.9	71.4	70.8	70.1	69.0	67.5	65.6	63.0	59.7	55.4
2	75.0	75.0	73.0	72.2	71.9	71.4	70.8	70.1	69.0	67.5	65.6	63.0	59.7	55.4
3	75.0	75.0	73.0	72.2	71.9	71.4	70.8	70.1	69.0	67.5	65.6	63.0	59.7	55.4
4	75.0	75.0	73.0	72.2	71.9	71.4	70.8	70.1	69.0	67.5	65.6	63.0	59.7	55.4
5	75.0	75.0	73.0	72.2	71.9	71.4	70.8	70.1	69.0	67.5	65.6	63.0	59.7	55.4
6	85.0	85.0	83.0	82.2	82.1	81.7	81.1	80.0	78.4	76.1	73.0	69.0	64.1	58.2
7	85.0	85.0	84.9	84.9	83.5	81.7	81.0	80.3	79.1	76.5	71.4	...	...	...
8	85.0	85.0	84.9	84.9	83.5	81.7	81.0	80.3	79.1	76.5	71.4	...	...	...
9	85.0	85.0	84.9	84.9	83.5	81.7	81.0	80.3	79.1	76.5	71.4	...	...	...
10	105.0	105.0	105.0	105.0	104.3	103.0	102.1	100.9	99.4	97.5	95.0	92.1	88.5	84.4
11	85.0	85.0	85.0	85.0	85.0	82.8	81.3	79.6	77.7	75.6	73.4	71.0	...	...
12	85.0	85.0	85.0	85.0	85.0	82.8	81.3	79.6	77.7	75.6	73.4	71.0	...	...
13	85.0	85.0	85.0	85.0	85.0	82.8	81.3	79.6	77.7	75.6	73.4	71.0	...	...
14	85.0	85.0	85.0	85.0	85.0	82.8	81.3	79.6	77.7	75.6	73.4	71.0	...	...
15	85.0	85.0	85.0	85.0	85.0	82.8	81.3	79.6	77.7	75.6	73.4	71.0	...	...
16	60.0	59.9	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	57.5	53.9
17	60.0	59.9	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	57.5	53.9
18	60.0	59.9	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	57.5	53.9
19	60.0	59.9	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	57.5	53.9
20	60.0	59.9	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	57.5	53.9
21	60.0	59.9	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	57.5	53.9
22	75.0	75.0	73.0	72.2	71.9	71.4	70.8	70.1	69.0	67.5	65.6	63.0	59.7	55.4
23	75.0	75.0	73.0	72.2	71.9	71.4	70.8	70.1	69.0	67.5	65.6	63.0	59.7	55.4
24	75.0	75.0	73.0	72.2	71.9	71.4	70.8	70.1	69.0	67.5	65.6	63.0	59.7	55.4
25	85.0	85.0	81.5	79.0	77.5	76.4	75.7	75.0	74.1	72.9	71.4	69.8	...	...
26	85.0	85.0	81.5	79.0	77.5	76.4	75.7	75.0	74.1	72.9	71.4	69.8	...	...
27	85.0	85.0	81.5	79.0	77.5	76.4	75.7	75.0	74.1	72.9	71.4	69.8	...	...
28	85.0	85.0	81.5	79.0	77.5	76.4	75.7	75.0	74.1	72.9	71.4	69.8	...	...
29	85.0	85.0	81.5	79.0	77.5	76.4	75.7	75.0	74.1	72.9	71.4	69.8	...	...
30	85.0	85.0	81.5	79.0	77.5	76.4	75.7	75.0	74.1	72.9	71.4	69.8	...	...
31	85.0	85.0	81.5	79.0	77.5	76.4	75.7	75.0	74.1	72.9	71.4	69.8	...	...
32	85.0	85.0	81.5	79.0	77.5	76.4	75.7	75.0	74.1	72.9	71.4	69.8	...	...
33	85.0	85.0	81.5	79.0	77.5	76.4	75.7	75.0	74.1	72.9	71.4	69.8	...	...
34	85.0	85.0	81.5	79.0	77.5	76.4	75.7	75.0	74.1	72.9	71.4	69.8	...	...
35	85.0	85.0	81.5	79.0	77.5	76.4	75.7	75.0	74.1	72.9	71.4	69.8	...	...
36	85.0	85.0	81.5	79.0	77.5	76.4	75.7	75.0	74.1	72.9	71.4	69.8	...	...
37	60.0	59.9	58.1	57.7	57.5	56.7	55.8	54.6	52.9	50.9	48.5	45.6	42.5	39.0
38	60.0	59.9	58.1	57.7	57.5	56.7	55.8	54.6	52.9	50.9	48.5	45.6	42.5	39.0
39	60.0	59.9	58.1	57.7	57.5	56.7	55.8	54.6	52.9	50.9	48.5	45.6	42.5	39.0
40	60.0	59.9	58.1	57.7	57.5	56.7	55.8	54.6	52.9	50.9	48.5	45.6	42.5	39.0
41	60.0	59.9	58.1	57.7	57.5	56.7	55.8	54.6	52.9	50.9	48.5	45.6	42.5	39.0
42	60.0	59.9	58.1	57.7	57.5	56.7	55.8	54.6	52.9	50.9	48.5	45.6	42.5	39.0
43	60.0	59.9	58.1	57.7	57.5	56.7	55.8	54.6	52.9	50.9	48.5	45.6	42.5	39.0

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	5Cr- $\frac{1}{2}$ Mo	Forgings	SA-182	F5	K41545	...	...	70
2	5Cr- $\frac{1}{2}$ Mo	Plate	SA-387	5	K41545	2	...	75
3	5Cr- $\frac{1}{2}$ Mo	Forgings	SA-336	F5A	K42544	...	...	80
4	5Cr- $\frac{1}{2}$ Mo	Castings	SA-217	C5	J42045	...	...	90
5	5Cr- $\frac{1}{2}$ Mo	Cast pipe	SA-426	CP5	J42045	...	...	90
6	5Cr- $\frac{1}{2}$ Mo	Forgings	SA-182	F5a	K42544	...	...	90
7	5Cr- $\frac{1}{2}$ Mo	Bolting	SA-193	B5	K50100	...	≤ 4	100
8	5Cr- $\frac{1}{2}$ Mo-Si	Smls. tube	SA-213	T5b	K51545	...	...	60
9	5Cr- $\frac{1}{2}$ Mo-Si	Smls. pipe	SA-335	P5b	K51545	...	...	60
10	5Cr- $\frac{1}{2}$ Mo-Ti	Smls. tube	SA-213	T5c	K41245	...	...	60
11	5Cr- $\frac{1}{2}$ Mo-Ti	Smls. pipe	SA-335	P5c	K41245	...	...	60
12	9Cr-1Mo	Smls. tube	SA-213	T9	K90941	...	...	60
13	9Cr-1Mo	Fittings	SA-234	WP9	K90941	...	...	60
14	9Cr-1Mo	Smls. pipe	SA-335	P9	K90941	...	...	60
15	9Cr-1Mo	Forged pipe	SA-369	FP9	K90941	...	...	60
16	9Cr-1Mo	Forgings	SA-182	F9	K90941	...	...	85
17	9Cr-1Mo	Forgings	SA-336	F9	K90941	...	...	85
18	9Cr-1Mo	Castings	SA-217	C12	J82090	...	...	90
19	9Cr-1Mo	Cast pipe	SA-426	CP9	J82090	...	...	90
20	9Cr-1Mo-V	Forgings	SA-182	F91	K90901	...	≤ 3	85
21	9Cr-1Mo-V	Smls. tube	SA-213	T91	K90901	...	≤ 3	85
22	9Cr-1Mo-V	Fittings	SA-234	WP91	K90901	...	≤ 3	85
23	9Cr-1Mo-V	Smls. pipe	SA-335	P91	K90901	...	≤ 3	85
24	9Cr-1Mo-V	Forgings	SA-336	F91	K90901	...	≤ 3	85
25	9Cr-1Mo-V	Forged pipe	SA-369	FP91	K90901	...	≤ 3	85
26	9Cr-1Mo-V	Plate	SA-387	91	K90901	2	≤ 3	85
27	11Cr-Ti	Plate	SA-240	...	S40910	...	...	55
28	11Cr-Ti	Plate	SA-240	...	S40920	...	...	55
29	11Cr-Ti	Plate	SA-240	...	S40930	...	...	55
30	11Cr-Ti	Smls. & wld. tube	SA-268	TP409	S40900	...	...	55
31	12Cr	Plate	SA-1010	40	S41003	...	$\leq \frac{3}{4}$	66
32	12Cr	Bar	SA-479	403	S40300	A	...	70
33	12Cr	Bar	SA-479	403	S40300	1	...	70
34	12Cr	Plate	SA-1010	50	S41003	...	$\leq \frac{3}{4}$	70
35	12Cr-Al	Plate	SA-240	405	S40500	...	...	60
36	12Cr-Al	Bar	SA-479	405	S40500	...	...	60
37	12Cr-Al	Bar	SA/JIS G4303	SUS405	...	...	...	60
38	12Cr-Al	Smls. & wld. tube	SA-268	TP405	S40500	...	...	60
39	12Cr-Ti	Smls. & wld. tube	SA-268	...	S40800	...	...	55
40	13Cr	Plate	SA-240	410S	S41008	...	...	60
41	13Cr	Smls. & wld. tube	SA-268	TP410	S41000	...	...	60
42	13Cr	Plate	SA-240	410	S41000	...	...	65

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	70.0	69.9	67.8	67.3	67.1	66.1	65.1	63.7	61.8	59.4	56.5	53.2	49.5	45.5
2	75.0	74.8	72.7	72.1	71.9	70.8	69.7	68.2	66.2	63.6	60.6	57.0	53.1	48.7
3	80.0	79.8	77.5	76.9	76.7	75.5	74.4	72.8	70.6	67.9	64.6	60.9	56.6	52.0
4	90.0	89.8	87.2	86.5	86.2	85.0	83.7	81.9	79.4	76.4	72.7	68.5	63.7	58.5
5	90.0	89.8	87.2	86.5	86.2	85.0	83.7	81.9	79.4	76.4	72.7	68.5	63.7	58.5
6	90.0	89.8	87.2	86.5	86.2	85.0	83.7	81.9	79.4	76.4	72.7	68.5	63.7	58.5
7	100.0	99.6	96.8	95.7	95.5	94.1	92.6	91.1	88.0	85.3	81.2	76.5	71.7	66.0
8	60.0	59.9	58.1	57.7	57.5	56.7	55.8	54.6	52.9	50.9	48.5	45.6	42.5	39.0
9	60.0	59.9	58.1	57.7	57.5	56.7	55.8	54.6	52.9	50.9	48.5	45.6	42.5	39.0
10	60.0	59.9	58.1	57.7	57.5	56.7	55.8	54.6	52.9	50.9	48.5	45.6	42.5	39.0
11	60.0	59.9	58.1	57.7	57.5	56.7	55.8	54.6	52.9	50.9	48.5	45.6	42.5	39.0
12	60.0	59.9	58.1	57.7	57.5	56.7	55.8	54.6	52.9	50.9	48.5	45.6	42.5	39.0
13	60.0	59.9	58.1	57.7	57.5	56.7	55.8	54.6	52.9	50.9	48.5	45.6	42.5	39.0
14	60.0	59.9	58.1	57.7	57.5	56.7	55.8	54.6	52.9	50.9	48.5	45.6	42.5	39.0
15	60.0	59.9	58.1	57.7	57.5	56.7	55.8	54.6	52.9	50.9	48.5	45.6	42.5	39.0
16	85.0	84.8	82.3	81.7	81.4	80.3	79.0	77.3	75.0	72.1	68.7	64.7	60.1	55.2
17	85.0	84.8	82.3	81.7	81.4	80.3	79.0	77.3	75.0	72.1	68.7	64.7	60.1	55.2
18	90.0	89.8	87.2	86.5	86.2	85.0	83.7	81.9	79.4	76.4	72.7	68.5	63.7	58.5
19	90.0	89.8	87.2	86.5	86.2	85.0	83.7	81.9	79.4	76.4	72.7	68.5	63.7	58.5
20	85.0	85.0	85.0	84.7	84.4	83.1	81.8	80.0	77.6	74.7	71.1	66.9	62.2	57.0
21	85.0	85.0	85.0	84.7	84.4	83.1	81.8	80.0	77.6	74.7	71.1	66.9	62.2	57.0
22	85.0	85.0	85.0	84.7	84.4	83.1	81.8	80.0	77.6	74.7	71.1	66.9	62.2	57.0
23	85.0	85.0	85.0	84.7	84.4	83.1	81.8	80.0	77.6	74.7	71.1	66.9	62.2	57.0
24	85.0	85.0	85.0	84.7	84.4	83.1	81.8	80.0	77.6	74.7	71.1	66.9	62.2	57.0
25	85.0	85.0	85.0	84.7	84.4	83.1	81.8	80.0	77.6	74.7	71.1	66.9	62.2	57.0
26	85.0	85.0	85.0	84.7	84.4	83.1	81.8	80.0	77.6	74.7	71.1	66.9	62.2	57.0
27	55.0	55.0	53.9	53.0	52.1	50.9	49.9	48.6	47.1	45.2	42.9	40.3	37.4	34.1
28	55.0	55.0	53.9	53.0	52.1	50.9	49.9	48.6	47.1	45.2	42.9	40.3	37.4	34.1
29	55.0	55.0	53.9	53.0	52.1	50.9	49.9	48.6	47.1	45.2	42.9	40.3	37.4	34.1
30	55.0	55.0	53.9	53.0	52.1	50.9	49.9	48.6	47.1	45.2	42.9	40.3	37.4	34.1
31	66.0	66.0	66.0	64.3	62.1	59.8	58.5	56.9	55.0	52.6	49.7	46.1	41.8	36.7
32	70.0	70.0	68.6	67.4	66.4	64.7	63.5	61.9	59.9	57.5	54.6	51.3	47.6	43.5
33	70.0	70.0	68.6	67.4	66.4	64.7	63.5	61.9	59.9	57.5	54.6	51.3	47.6	43.5
34	70.0	70.0	70.0	68.2	65.8	63.4	62.0	60.4	58.3	55.8	52.7	48.9	44.3	38.9
35	60.0	60.0	58.8	57.8	56.9	55.5	54.4	53.1	51.4	49.3	46.8	44.0	40.8	37.2
36	60.0	60.0	58.8	57.8	56.9	55.5	54.4	53.1	51.4	49.3	46.8	44.0	40.8	37.2
37	60.0	60.0	58.8	57.8	56.9	55.5	54.4	53.1	51.4	49.3	46.8	44.0	40.8	37.2
38	60.0	60.0	58.8	57.8	56.9	55.5	54.4	53.1	51.4	49.3	46.8	44.0	40.8	37.2
39	55.0	55.0	53.9	53.0	52.1	50.9	49.9	48.6	47.1	45.2	42.9	40.3	37.4	34.1
40	60.0	60.0	58.8	57.8	56.9	55.5	54.4	53.1	51.4	49.3	46.8	44.0	40.8	37.2
41	60.0	60.0	58.8	57.8	56.9	55.5	54.4	53.1	51.4	49.3	46.8	44.0	40.8	37.2
42	65.0	65.0	63.7	62.6	61.6	60.1	59.0	57.5	55.6	53.4	50.7	47.7	44.2	40.3

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	13Cr	Forgings	SA-182	F6a	S41000	1	...	70
2	13Cr	Bar	SA-479	410	S41000	...	...	70
3	13Cr	Bar	SA-479	410	S41000	A	...	70
4	13Cr	Bar	SA-479	410	S41000	1	...	70
5	13Cr	Forgings	SA-182	F6a	S41000	2	...	85
6	13Cr	Castings	SA-217	CA15	J91150	...	...	90
7	13Cr	Cast pipe	SA-426	CPCA15	J91150	...	...	90
8	13Cr	Bolting	SA-193	B6	S41000	...	≤ 4	110
9	13Cr-4Ni	Castings	SA-487	CA6NM	J91540	A	...	110
10	13Cr-4Ni	Forgings	SA-182	F6NM	S41500	...	...	115
11	15Cr	Smls. & wld. tube	SA-268	TP429	S42900	...	...	60
12	15Cr	Plate	SA-240	429	S42900	...	...	65
13	17Cr	Smls. & wld. tube	SA-268	TP430	S43000	...	...	60
14	17Cr	Plate	SA-240	430	S43000	...	...	65
15	17Cr	Bar	SA-479	430	S43000	...	...	70
16	17Cr-4Ni-4Cu	Bar	SA-564	630	S17400	H1150	...	135
17	17Cr-4Ni-4Cu	Plate	SA-693	630	S17400	H1150	...	135
18	17Cr-4Ni-4Cu	Forgings	SA-705	630	S17400	H1150	...	135
19	17Cr-4Ni-4Cu	Bar	SA-564	630	S17400	H1100	...	140
20	17Cr-4Ni-4Cu	Plate	SA-693	630	S17400	H1100	...	140
21	17Cr-4Ni-4Cu	Forgings	SA-705	630	S17400	H1100	...	140
22	17Cr-4Ni-4Cu	Bar	SA-564	630	S17400	H1075	...	145
23	17Cr-4Ni-4Cu	Plate	SA-693	630	S17400	H1075	...	145
24	17Cr-4Ni-4Cu	Forgings	SA-705	630	S17400	H1075	...	145
25	17Cr-4Ni-4Cu	Forgings	SA-705	630	S17400	H1025	...	155
26	17Cr-4Ni-4Cu	Forgings	SA-705	630	S17400	H925	...	170
27	17Cr-4Ni-4Cu	Forgings	SA-705	630	S17400	H900	...	190
(10) 28	...	...	...	...	...	...	...	...
(10) 29	...	...	...	...	...	...	...	...
(10) 30	...	...	...	...	...	...	...	...
(10) 31	...	...	...	...	...	...	...	...
(10) 32	...	...	...	...	...	...	...	...
33	18Cr-2Mo	Plate	SA-240	...	S44400	...	...	60
34	18Cr-2Mo	Smls. & wld. tube	SA-268	...	S44400	...	...	60
35	18Cr-Ti	Smls. & wld. tube	SA-268	TP439	S43035	...	...	60
36	18Cr-Ti	Wld. tube	SA-803	TP439	S43035	...	...	60
37	18Cr-Ti	Smls. & wld. pipe	SA-731	TP439	S43035	...	...	60
38	18Cr-Ti	Smls. & wld. tube	SA-268	TP430 Ti	S43036	...	...	60
39	18Cr-Ti	Bar	SA-479	439	S43035	...	...	70
40	26Cr-3Ni-3Mo	Plate	SA-240	26-3-3	S44660	...	≤ $\frac{2}{10}$	85
41	26Cr-3Ni-3Mo	Smls. & wld. tube	SA-268	26-3-3	S44660	...	≤ $\frac{2}{10}$	85
42	26Cr-3Ni-3Mo	Wld. tube	SA-803	26-3-3	S44660	...	≤ $\frac{2}{10}$	85

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	70.0	70.0	68.6	67.4	66.4	64.7	63.5	61.9	59.9	57.5	54.6	51.3	47.6	43.5
2	70.0	70.0	68.6	67.4	66.4	64.7	63.5	61.9	59.9	57.5	54.6	51.3	47.6	43.5
3	70.0	70.0	68.6	67.4	66.4	64.7	63.5	61.9	59.9	57.5	54.6	51.3	47.6	43.5
4	70.0	70.0	68.6	67.4	66.4	64.7	63.5	61.9	59.9	57.5	54.6	51.3	47.6	43.5
5	85.0	85.0	83.3	81.8	80.6	78.6	77.1	75.2	72.8	69.8	66.3	62.3	57.8	52.8
6	90.0	90.0	88.2	86.7	85.3	83.2	81.6	79.6	77.0	73.9	70.2	66.0	61.2	55.9
7	90.0	90.0	88.2	86.7	85.3	83.2	81.6	79.6	77.0	73.9	70.2	66.0	61.2	55.9
8	110.0	110.0	109.0	107.0	105.0	102.0	100.0	97.7	94.6	90.9	86.4	81.1	75.1	68.4
9	110.0	110.0	108.0	105.3	103.1	100.7	99.4	97.8	95.9	93.5	90.5	86.7	81.7	75.4
10	115.0	115.0	115.0	113.7	109.5	105.1	102.8	100.3	97.6	94.7	91.4	...	...	...
11	60.0	60.0	58.8	57.8	56.9	55.5	54.4	53.1	51.4	49.3	46.8	44.0	40.8	37.2
12	65.0	65.0	63.7	62.6	61.6	60.1	59.0	57.5	55.6	53.4	50.7	47.7	44.2	40.3
13	60.0	60.0	58.8	57.8	56.9	55.5	54.4	53.1	51.4	49.3	46.8	44.0	40.8	37.2
14	65.0	65.0	63.7	62.6	61.6	60.1	59.0	57.5	55.6	53.4	50.7	47.7	44.2	40.3
15	70.0	70.0	68.6	67.4	66.4	64.7	63.5	61.9	59.9	57.5	54.6	51.3	47.6	43.5
16	135.0	135.0	135.0	131.2	128.6	126.7	125.5	123.8	121.5	118.1	113.6	107.5	99.6	89.7
17	135.0	135.0	135.0	131.2	128.6	126.7	125.5	123.8	121.5	118.1	113.6	107.5	99.6	89.7
18	135.0	135.0	135.0	131.2	128.6	126.7	125.5	123.8	121.5	118.1	113.6	107.5	99.6	89.7
19	140.0	140.0	140.0	136.1	133.4	131.4	130.1	128.4	126.0	122.5	117.8	111.5	103.3	93.0
20	140.0	140.0	140.0	136.1	133.4	131.4	130.1	128.4	126.0	122.5	117.8	111.5	103.3	93.0
21	140.0	140.0	140.0	136.1	133.4	131.4	130.1	128.4	126.0	122.5	117.8	111.5	103.3	93.0
22	145.0	145.0	145.0	140.9	138.2	136.1	134.8	133.0	130.5	126.9	122.0	115.4	107.0	96.3
23	145.0	145.0	145.0	140.9	138.2	136.1	134.8	133.0	130.5	126.9	122.0	115.4	107.0	96.3
24	145.0	145.0	145.0	140.9	138.2	136.1	134.8	133.0	130.5	126.9	122.0	115.4	107.0	96.3
25	155.0	155.0	155.0	150.7	147.7	145.5	144.1	142.2	...	...	...	...	...	...
26	170.0	170.0	170.0	165.2	162.0	159.5	158.0	144.9
27	190.0	190.0	190.0	184.7	181.1	178.3	176.6	174.3
28
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33	60.0	60.0	58.2	56.8	55.5	53.9	52.9	51.8	50.4	48.9	47.1	44.9	42.2	38.9
34	60.0	60.0	58.2	56.8	55.5	53.9	52.9	51.8	50.4	48.9	47.1	44.9	42.2	38.9
35	60.0	60.0	57.9	56.4	55.2	53.8	53.0	51.9	50.7	49.2	47.3	45.0	42.3	39.0
36	60.0	60.0	57.9	56.4	55.2	53.8	53.0	51.9	50.7	49.2	47.3	45.0	42.3	39.0
37	60.0	60.0	57.9	56.4	55.2	53.8	53.0	51.9	50.7	49.2	47.3	45.0	42.3	39.0
38	60.0	60.0	57.9	56.4	55.2	53.8	53.0	51.9	50.7	49.2	47.3	45.0	42.3	39.0
39	70.0	70.0	67.6	65.8	64.4	62.8	61.8	60.6	59.1	57.3	55.2	52.5	49.3	45.4
40	85.0	85.0	84.8	83.7	83.2	82.8	82.4	81.8	...	...	...	...	...	...
41	85.0	85.0	84.8	83.7	83.2	82.8	82.4	81.8	...	...	...	...	...	...
42	85.0	85.0	84.8	83.7	83.2	82.8	82.4	81.8	...	...	...	...	...	...

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
(10)	1	...	...	...	...	...	...	...
(10)	2	...	...	...	...	...	...	...
(10)	3	...	...	...	...	...	...	...
(10)	4	...	...	...	...	...	...	...
(10)	5	...	...	...	...	...	...	...
(10)	6	...	...	...	...	...	...	...
	7	27Cr	Smls. tube	SA-268	TP446-1	S44600	...	70
	8	27Cr-1Mo	Forgings	SA-182	FXM-27Cb	S44627	...	60
	9	27Cr-1Mo	Plate	SA-240	XM-27	S44627	...	65
	10	27Cr-1Mo	Smls. & wld. tube	SA-268	TPXM-27	S44627	...	65
	11	27Cr-1Mo	Bar	SA-479	XM-27	S44627	...	65
	12	27Cr-1Mo	Smls. & wld. pipe	SA-731	TPXM-27	S44627	...	65
	13	27Cr-1Mo-Ti	Smls. & wld. pipe	SA-731	TPXM-33	S44626	...	65
	14	27Cr-1Mo-Ti	Plate	SA-240	XM-33	S44626	...	68
	15	27Cr-1Mo-Ti	Smls. & wld. tube	SA-268	TPXM-33	S44626	...	68
	16	29Cr-4Mo	Bar	SA-479	...	S44700	...	70
	17	29Cr-4Mo	Plate	SA-240	...	S44700	...	80
	18	29Cr-4Mo	Smls. & wld. tube	SA-268	29-4	S44700	...	80
	19	29Cr-4Mo-2Ni	Bar	SA-479	...	S44800	...	70
	20	29Cr-4Mo-2Ni	Plate	SA-240	...	S44800	...	80
	21	29Cr-4Mo-2Ni	Smls. & wld. tube	SA-268	29-4-2	S44800	...	80
	22	29Cr-4Mo-Ti	Smls. & wld. tube	SA-268	...	S44735	...	75
	23	Mn- $\frac{1}{4}$ Mo	Forgings	SA-372	D	K14508	...	105
	24	Mn- $\frac{1}{4}$ Mo-V	Castings	SA-487	2	J13005	A	85
	25	Mn- $\frac{1}{4}$ Mo-V	Castings	SA-487	2	J13005	B	90
	26	Mn- $\frac{1}{2}$ Mo	Plate	SA-302	A	K12021	...	75
	27	Mn- $\frac{1}{2}$ Mo	Wld. pipe	SA-672	H75	K12021	...	75
	28	Mn- $\frac{1}{2}$ Mo	Plate	SA-302	B	K12022	...	80
	29	Mn- $\frac{1}{2}$ Mo	Plate	SA-533	A	K12521	1	80
	30	Mn- $\frac{1}{2}$ Mo	Plate	SA-533	A	K12521	2	90
	31	Mn- $\frac{1}{2}$ Mo	Plate	SA-533	A	K12521	3	100
	32	Mn- $\frac{1}{2}$ Mo- $\frac{1}{4}$ Ni	Plate	SA-533	D	K12529	1	80
	33	Mn- $\frac{1}{2}$ Mo- $\frac{1}{4}$ Ni	Plate	SA-533	D	K12529	2	90
	34	Mn- $\frac{1}{2}$ Mo- $\frac{1}{4}$ Ni	Plate	SA-533	D	K12529	3	100
	35	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Plate	SA-302	C	K12039	...	80
	36	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Plate	SA-533	B	K12539	1	80
	37	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Wld. pipe	SA-672	H80	K12039	...	80
	38	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Wld. pipe	SA-672	J80	K12539	...	80
	39	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Plate	SA-533	B	K12539	2	90
	40	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Wld. pipe	SA-672	J90	K12539	...	90
	41	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Plate	SA-533	B	K12539	3	100
	42	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Wld. pipe	SA-672	J100	K12539	...	100

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	70.0	70.0	67.6	65.8	64.4	62.8	61.8	60.6	59.1	57.3	55.2	52.5	49.3	45.4
8	60.0	60.0	58.1	56.5	56.5	56.5	56.5	...	...	...	...	...	...	...
9	65.0	65.0	64.0	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5
10	65.0	65.0	64.0	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5
11	65.0	65.0	64.0	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5
12	65.0	65.0	64.0	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5	63.5
13	65.0	65.0	64.6	63.6	62.9	61.7	60.7	59.3	57.3	54.5	...	...	...	...
14	68.0	68.0	67.6	66.5	65.8	64.5	63.5	62.0	59.9	57.0	...	...	...	...
15	68.0	68.0	67.6	66.5	65.8	64.5	63.5	62.0	59.9	57.0	...	...	...	...
16	70.0	69.8	67.6	67.2	67.2	67.2	67.2	67.2	67.2	...	...	...	...	...
17	80.0	79.8	77.2	76.8	76.8	76.8	76.8	76.8	76.8	...	...	...	...	...
18	80.0	79.8	77.2	76.8	76.8	76.8	76.8	76.8	76.8	...	...	...	...	...
19	70.0	68.7	67.6	67.1	66.2	65.3	64.8	64.3	63.5	...	...	...	...	...
20	80.0	78.6	77.3	76.7	75.7	74.6	74.1	73.5	72.6	...	...	...	...	...
21	80.0	78.6	77.3	76.7	75.7	74.6	74.1	73.5	72.6	...	...	...	...	...
22	75.0	73.7	72.5	71.9	70.9	69.9	69.5	68.9	68.0	...	...	...	...	...
23	105.0	105.0	105.0	105.0	105.0	105.0	105.0	105.0	102.7	95.5	87.3	79.1	72.3	68.7
24	85.0	85.0	85.0	84.6	84.6	84.6	84.5	84.5	...	...	...	...	...	...
25	90.0	90.0	90.0	89.5	89.5	89.5	89.5	89.5	...	...	...	...	...	...
26	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	72.4	68.6	63.7	57.9
27	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	72.4	68.6	63.7	57.9
28	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	77.3	73.1	68.0	61.7
29	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	77.3	73.1	68.0	61.7
30	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	86.9	82.3	76.4	69.4
31	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.6	91.4	84.9	77.1
32	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	77.3	73.1	68.0	61.7
33	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	86.9	82.3	76.4	69.4
34	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.6	91.4	84.9	77.1
35	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	77.3	73.1	68.0	61.7
36	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	77.3	73.1	68.0	61.7
37	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	77.3	73.1	68.0	61.7
38	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	77.3	73.1	68.0	61.7
39	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	86.9	82.3	76.4	69.4
40	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	86.9	82.3	76.4	69.4
41	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.6	91.4	84.9	77.1
42	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.6	91.4	84.9	77.1

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni	Plate	SA-302	D	K12054	...	...	80
2	Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni	Plate	SA-533	C	K12554	1	...	80
3	Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni	Plate	SA-533	C	K12554	2	...	90
4	Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni	Plate	SA-533	C	K12554	3	...	100
5	Mn- $\frac{1}{2}$ Ni-V	Plate	SA-225	C	K12524	...	...	105
6	Mn-V	Castings	SA-487	1	J13002	A	...	85
7	Mn-V	Castings	SA-487	1	J13002	B	...	90
8	$\frac{1}{2}$ Si- $\frac{1}{2}$ Mo	Smls. pipe	SA-335	P15	K11578	...	...	60
9	$\frac{1}{2}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-V	Castings	SA-487	4	J13047	A	...	90
10	$\frac{1}{2}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-V	Castings	SA-487	4	J13047	B	...	105
11	$\frac{1}{2}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-V	Castings	SA-487	4	J13047	E	...	115
12	$\frac{1}{2}$ Ni- $\frac{1}{2}$ Mo-V	Forgings	SA-541	3	K12045	1	...	80
13	$\frac{1}{2}$ Ni- $\frac{1}{2}$ Mo-V	Forgings	SA-541	3	K12045	2	...	90
14	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-592	F	K11576	...	$2\frac{1}{2} < t \leq 4$	105
15	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Plate	SA-517	F	K11576	...	$\leq 2\frac{1}{2}$	115
16	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	Forgings	SA-592	F	K11576	...	$\leq 2\frac{1}{2}$	115
17	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Cu-Mo	Smls. & wld. tube	SA-423	2	K11540	...	...	60
18	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo- $\frac{1}{3}$ Cr-V	Forgings	SA-508	2	K12766	1	...	80
19	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo- $\frac{1}{3}$ Cr-V	Forgings	SA-541	2	K12765	1	...	80
20	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo- $\frac{1}{3}$ Cr-V	Forgings	SA-508	2	K12766	2	...	90
21	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo- $\frac{1}{3}$ Cr-V	Forgings	SA-541	2	K12765	2	...	90
22	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo-Cr-V	Forgings	SA-508	3	K12042	1	...	80
23	$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo-Cr-V	Forgings	SA-508	3	K12042	2	...	90
24	$\frac{3}{4}$ Ni-1Mo- $\frac{3}{4}$ Cr	Castings	SA-217	WC5	J22000	...	...	70
25	1Ni- $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	Castings	SA-217	WC4	J12082	...	...	70
26	$\frac{1}{2}$ Ni-1Cr- $\frac{1}{2}$ Mo	Plate	SA-517	P	K21650	...	$2\frac{1}{2} < t \leq 4$	105
27	$\frac{1}{4}$ Ni-1Cr- $\frac{1}{2}$ Mo	Plate	SA-517	P	K21650	...	$\leq 2\frac{1}{2}$	115
28	$\frac{1}{2}$ Ni	Forgings	SA-350	LF5	K13050	1	...	60
29	$\frac{1}{2}$ Ni	Forgings	SA-350	LF5	K13050	2	...	70
30	$\frac{3}{4}$ Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	Forgings	SA-372	L	K24055	...	...	155
31	$\frac{3}{4}$ Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	Bolting	SA-574	4340	G43400	...	$\geq \frac{5}{8}$	170
32	$\frac{3}{4}$ Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	Bolting	SA-574	4340	G43400	...	$\leq \frac{1}{2}$	180
33	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	Bolting	SA-540	B23	H43400	5	$6 < t \leq 9\frac{1}{2}$	115
34	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	Bolting	SA-540	B23	H43400	5	≤ 6	120
35	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	Bolting	SA-540	B23	H43400	4	$\leq 9\frac{1}{2}$	135
36	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	Bolting	SA-540	B23	H43400	3	$\leq 9\frac{1}{2}$	145
37	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	Bolting	SA-540	B23	H43400	2	$\leq 9\frac{1}{2}$	155
38	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo	Bolting	SA-540	B23	H43400	1	≤ 8	165
39	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo	Bolting	SA-540	B24	K24064	5	...	115
40	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo	Bolting	SA-540	B24	K24064	5	...	120
41	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo	Bolting	SA-540	B24	K24064	4	...	135
42	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo	Bolting	SA-540	B24	K24064	3	...	145
43	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo	Bolting	SA-540	B24	K24064	2	...	155
44	2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo	Bolting	SA-540	B24	K24064	1	...	165

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	77.3	73.1	68.0	61.7
2	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	77.3	73.1	68.0	61.7
3	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	86.9	82.3	76.4	69.4
4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.6	91.4	84.9	77.1
5	105.0	105.0	105.0	105.0	105.0	105.0	105.0	105.0	104.3	96.2	...	...	...	...
6	85.0	...	...	...	...	...	...	...	...	...	...	...	...	...
7	90.0	...	...	...	...	...	...	...	...	...	...	...	...	...
8	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	57.9	54.9	51.0	46.3
9	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	...	...	...	...	...	...
10	105.0	105.0	105.0	105.0	105.0	105.0	105.0	105.0	...	...	...	...	...	...
11	115.0	115.0	115.0	115.0	115.0	115.0	115.0	115.0	...	...	...	...	...	...
12	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	77.3	73.1	68.0	61.7
13	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	88.7	86.3	82.9	78.5	73.0	66.4
14	105.0	105.0	105.0	105.0	105.0	105.0	104.8	102.8	100.1	96.8	92.8	88.2	82.9	77.0
15	115.0	115.0	115.0	115.0	115.0	115.0	114.8	112.6	109.6	106.0	101.6	96.6	90.8	84.4
16	115.0	115.0	115.0	115.0	115.0	115.0	114.8	112.6	109.6	106.0	101.6	96.6	90.8	84.4
17	60.0	...	...	...	...	...	...	...	...	...	...	...	...	...
18	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	77.3	73.1	68.0	61.7
19	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	77.3	73.1	68.0	61.7
20	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	86.9	82.3	76.4	69.4
21	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	86.9	82.3	76.4	69.4
22	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	77.3	73.1	68.0	61.7
23	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	86.9	82.3	76.4	69.4
24	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	67.6	64.0	59.5	54.0
25	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	67.6	64.0	59.5	54.0
26	105.0	105.0	105.0	105.0	105.0	105.0	104.8	102.8	100.1	96.8	92.8	88.2	82.9	77.0
27	115.0	115.0	115.0	115.0	115.0	115.0	114.8	112.6	109.6	106.0	101.6	96.6	90.8	84.4
28	60.0	...	...	...	...	...	...	...	...	...	...	...	...	...
29	70.0	...	...	...	...	...	...	...	...	...	...	...	...	...
30	155.0	155.0	155.0	155.0	155.0	155.0	155.0	155.0	155.0	153.1	147.1	141.7	137.7	136.4
31	170.0	170.0	170.0	170.0	170.0	170.0	167.4	163.4	158.4	152.7	146.8	141.3	137.3	136.0
32	180.0	180.0	180.0	180.0	180.0	180.0	177.3	173.0	167.7	161.7	155.4	149.7	145.4	144.0
33	115.0	115.0	115.0	115.0	115.0	115.0	113.2	110.5	107.1	103.3	99.3	95.6	92.9	92.0
34	120.0	120.0	120.0	120.0	120.0	120.0	118.2	115.3	111.8	107.8	103.6	99.8	96.9	96.0
35	135.0	135.0	135.0	135.0	135.0	135.0	132.9	129.7	125.8	121.3	116.6	112.2	109.0	108.0
36	145.0	145.0	145.0	145.0	145.0	145.0	142.8	139.3	135.1	130.3	125.2	120.6	117.1	116.0
37	155.0	155.0	155.0	155.0	155.0	155.0	152.6	149.0	144.4	139.2	133.9	128.9	125.2	124.0
38	165.0	165.0	165.0	165.0	165.0	165.0	165.0	158.6	153.7	148.2	142.5	137.2	133.3	132.0
39	115.0	115.0	115.0	115.0	115.0	115.0	113.2	110.5	107.1	103.3	99.3	95.6	92.9	92.0
40	120.0	120.0	120.0	120.0	120.0	120.0	118.2	115.3	111.8	107.8	103.6	99.8	96.9	96.0
41	135.0	135.0	135.0	135.0	135.0	135.0	132.9	129.7	125.8	121.3	116.6	112.2	109.0	108.0
42	145.0	145.0	145.0	145.0	145.0	145.0	142.8	139.3	135.1	130.3	125.2	120.6	117.1	116.0
43	155.0	155.0	155.0	155.0	155.0	155.0	152.6	149.0	144.4	139.2	133.9	128.9	125.2	124.0
44	165.0	165.0	165.0	165.0	165.0	165.0	165.0	158.6	153.7	148.2	142.5	137.2	133.3	132.0

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	2Ni-1Cu	Forgings	SA-182	FR	K22035	...	...	63
2	2Ni-1Cu	Fittings	SA-234	WPR	K22035	...	...	63
3	2Ni-1Cu	Smls. & wld. pipe	SA-333	9	K22035	...	...	63
4	2Ni-1Cu	Tube	SA-334	9	K22035	...	...	63
5	2Ni-1Cu	Forgings	SA-350	LF9	K22036	...	...	63
6	2Ni-1Cu	Smls. & wld. fittings	SA-420	WPL9	K22035	...	...	63
7	2Ni-1½Cr-¼Mo-V	Forgings	SA-723	1	K23550	1	...	115
8	2Ni-1½Cr-¼Mo-V	Forgings	SA-723	1	K23550	2	...	135
9	2Ni-1½Cr-¼Mo-V	Forgings	SA-723	1	K23550	3	...	155
10	2Ni-1½Cr-¼Mo-V	Forgings	SA-723	1	K23550	4	...	175
11	2Ni-1½Cr-¼Mo-V	Forgings	SA-723	1	K23550	5	...	190
12	2½Ni	Pipe	SA-333	7	K21903	...	...	65
13	2½Ni	Tube	SA-334	7	K21903	...	...	65
14	2½Ni	Plate	SA-203	A	K21703	...	...	65
15	2½Ni	Plate	SA-203	B	K22103	...	...	70
16	2½Ni	Castings	SA-352	LC2	J22500	...	...	70
17	2¾Ni-1½Cr-½Mo	Plate	SA-543	C	...	3	...	90
18	2¾Ni-1½Cr-½Mo	Plate	SA-543	C	...	1	...	105
19	2¾Ni-1½Cr-½Mo	Plate	SA-543	C	...	2	...	115
20	2¾Ni-1½Cr-½Mo-V	Forgings	SA-723	2	K34035	1	...	115
21	2¾Ni-1½Cr-½Mo-V	Forgings	SA-723	2	K34035	2	...	135
22	2¾Ni-1½Cr-½Mo-V	Forgings	SA-723	2	K34035	3	...	155
23	2¾Ni-1½Cr-½Mo-V	Forgings	SA-723	2	K34035	4	...	175
24	2¾Ni-1½Cr-½Mo-V	Forgings	SA-723	2	K34035	5	...	190
25	3Ni-1¾Cr-½Mo	Plate	SA-543	B	K42339	3	...	90
26	3Ni-1¾Cr-½Mo	Forgings	SA-372	M	K42365	A	...	105
27	3Ni-1¾Cr-½Mo	Plate	SA-543	B	K42339	1	...	105
28	3Ni-1¾Cr-½Mo	Plate	SA-543	B	K42339	2	...	115
29	3Ni-1¾Cr-½Mo	Forgings	SA-372	M	K42365	B	...	120
30	3½Ni	Pipe	SA-333	3	K31918	...	...	65
31	3½Ni	Tube	SA-334	3	K31918	...	...	65
32	3½Ni	Fittings	SA-420	WPL3	...	...	...	65
33	3½Ni	Plate	SA-203	D	K31718	...	...	65
34	3½Ni	Forgings	SA-350	LF3	K32025	...	...	70
35	3½Ni	Forgings	SA-765	III	K32026	...	...	70
36	3½Ni	Plate	SA-203	E	K32018	...	...	70
37	3½Ni	Castings	SA-352	LC3	J31550	...	...	70
38	3½Ni	Plate	SA-203	F	...	...	> 2	75
39	3½Ni	Plate	SA-203	F	...	...	≤ 2	80
40	3½Ni-1¾Cr-½Mo-V	Forgings	SA-508	4N	K22375	3	...	90
41	3½Ni-1¾Cr-½Mo-V	Forgings	SA-508	4N	K22375	1	...	105
42	3½Ni-1¾Cr-½Mo-V	Forgings	SA-508	4N	K22375	2	...	115
43	4Ni-1½Cr-½Mo-V	Forgings	SA-723	3	K44045	1	...	115
44	4Ni-1½Cr-½Mo-V	Forgings	SA-723	3	K44045	2	...	135
45	4Ni-1½Cr-½Mo-V	Forgings	SA-723	3	K44045	3	...	155
46	4Ni-1½Cr-½Mo-V	Forgings	SA-723	3	K44045	4	...	175
47	4Ni-1½Cr-½Mo-V	Forgings	SA-723	3	K44045	5	...	190

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	63.0	...	...	...	...	...	...	...	...	...	...	...	...	...
2	63.0	...	...	...	...	...	...	...	...	...	...	...	...	...
3	63.0	...	...	...	...	...	...	...	...	...	...	...	...	...
4	63.0	...	...	...	...	...	...	...	...	...	...	...	...	...
5	63.0	...	...	...	...	...	...	...	...	...	...	...	...	...
6	63.0	...	...	...	...	...	...	...	...	...	...	...	...	...
7	115.0	115.0	115.0	115.0	115.0	115.0	113.2	110.5	107.1	103.3	...	...	...	...
8	135.0	135.0	135.0	135.0	135.0	135.0	132.9	129.7	125.8	121.3	...	...	...	...
9	155.0	155.0	155.0	155.0	155.0	155.0	152.6	149.0	144.4	139.2	...	...	...	...
10	175.0	175.0	175.0	175.0	175.0	175.0	172.3	168.2	163.1	157.2	...	...	...	...
11	190.0	190.0	190.0	190.0	190.0	190.0	187.1	182.6	177.0	170.7	...	...	...	...
12	65.0	65.0	65.0	65.0	65.0	65.0	65.0	61.7	57.6	53.7	50.1	46.5	42.2	36.3
13	65.0	65.0	65.0	65.0	65.0	65.0	65.0	61.7	57.6	53.7	50.1	46.5	42.2	36.3
14	65.0	65.0	65.0	65.0	65.0	65.0	65.0	61.7	57.6	53.7	50.1	46.5	42.2	36.3
15	70.0	70.0	70.0	70.0	70.0	70.0	70.0	66.5	62.0	57.9	54.0	50.1	45.5	39.1
16	70.0	70.0	70.0	70.0	70.0	70.0	70.0	66.5	62.0	57.9	54.0	50.1	45.5	39.1
17	90.0	90.0	90.0	89.1	88.5	87.3	86.2	84.7	82.6	79.9	76.5	72.5	67.7	62.1
18	105.0	105.0	105.0	103.9	103.3	101.9	100.6	98.8	96.4	93.2	89.3	84.5	78.9	72.5
19	115.0	115.0	115.0	113.8	113.1	111.6	110.2	108.2	105.5	102.1	97.8	92.6	86.5	79.4
20	115.0	115.0	115.0	115.0	115.0	115.0	113.2	110.5	107.1	103.3	...	...	...	...
21	135.0	135.0	135.0	135.0	135.0	135.0	132.9	129.7	125.8	121.3	...	...	...	...
22	155.0	155.0	155.0	155.0	155.0	155.0	152.6	149.0	144.4	139.2	...	...	...	...
23	175.0	175.0	175.0	175.0	175.0	175.0	172.3	168.2	163.1	157.2	...	...	...	...
24	190.0	190.0	190.0	190.0	190.0	190.0	187.1	182.6	177.0	170.7	...	...	...	...
25	90.0	90.0	90.0	89.1	88.5	87.3	86.2	84.7	82.6	79.9	76.5	72.5	67.7	62.1
26	105.0	105.0	105.0	103.9	103.3	101.9	100.6	98.8	96.4	93.2	89.3	84.5	78.9	72.5
27	105.0	105.0	105.0	103.9	103.3	101.9	100.6	98.8	96.4	93.2	89.3	84.5	78.9	72.5
28	115.0	115.0	115.0	113.8	113.1	111.6	110.2	108.2	105.5	102.1	97.8	92.6	86.5	79.4
29	120.0	120.0	120.0	118.8	118.0	116.4	115.0	112.9	110.1	106.5	102.0	96.6	90.2	82.8
30	65.0	65.0	65.0	65.0	65.0	65.0	65.0	61.7	57.6	53.7	50.1	46.5	42.2	36.3
31	65.0	65.0	65.0	65.0	65.0	65.0	65.0	61.7	57.6	53.7	50.1	46.5	42.2	36.3
32	65.0	65.0	65.0	65.0	65.0	65.0	65.0	61.7	57.6	53.7	50.1	46.5	42.2	36.3
33	65.0	65.0	65.0	65.0	65.0	65.0	65.0	61.7	57.6	53.7	50.1	46.5	42.2	36.3
34	70.0	70.0	70.0	70.0	70.0	70.0	70.0	66.5	62.0	57.9	54.0	50.1	45.5	39.1
35	70.0	70.0	70.0	70.0	70.0	70.0	70.0	66.5	62.0	57.9	54.0	50.1	45.5	39.1
36	70.0	70.0	70.0	70.0	70.0	70.0	70.0	66.5	62.0	57.9	54.0	50.1	45.5	39.1
37	70.0	70.0	70.0	70.0	70.0	70.0	70.0	66.5	62.0	57.9	54.0	50.1	45.5	39.1
38	75.0	75.0	75.0	75.0	75.0	75.0	75.0	71.2	66.5	62.0	57.9	53.7	48.7	41.9
39	80.0	80.0	80.0	80.0	80.0	80.0	80.0	76.0	70.9	66.1	61.7	57.2	52.0	44.7
40	90.0	90.0	90.0	89.1	88.5	87.3	86.2	84.7	82.6	79.9	76.5	72.5	67.7	62.1
41	105.0	105.0	105.0	103.9	103.3	101.9	100.6	98.8	96.4	93.2	89.3	84.5	78.9	72.5
42	115.0	115.0	115.0	113.8	113.1	111.6	110.2	108.2	105.5	102.1	97.8	92.6	86.5	79.4
43	115.0	115.0	115.0	115.0	115.0	115.0	113.2	110.5	107.1	103.3	...	...	...	...
44	135.0	135.0	135.0	135.0	135.0	135.0	132.9	129.7	125.8	121.3	...	...	...	...
45	155.0	155.0	155.0	155.0	155.0	155.0	152.6	149.0	144.4	139.2	...	...	...	...
46	175.0	175.0	175.0	175.0	175.0	175.0	172.3	168.2	163.1	157.2	...	...	...	...
47	190.0	190.0	190.0	190.0	190.0	190.0	187.1	182.6	177.0	170.7	...	...	...	...

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
(10)	1 5Ni- $\frac{1}{4}$ Mo	Plate	SA-645	A	K41583	...	...	95
	2 8Ni	Forgings	SA-522	II	K71340	...	...	100
	3 8Ni	Plate	SA-553	II	K71340	...	...	100
	4 9Ni	Smls. & wld. pipe	SA-333	8	K81340	...	...	100
	5 9Ni	Smls. & wld. tube	SA-334	8	K81340	...	...	100
	6 9Ni	Plate	SA-353	...	K81340	...	...	100
	7 9Ni	Smls. & wld. fittings	SA-420	WPL8	K81340	...	...	100
	8 9Ni	Forgings	SA-522	I	K81340	...	...	100
	9 9Ni	Plate	SA-553	I	K81340	...	...	100
	10 25Ni-15Cr-2Ti	Bolting	SA-453	660	S66286	A	...	130
	11 25Ni-15Cr-2Ti	Bolting	SA-453	660	S66286	B	...	130
	12 25Ni-15Cr-2Ti	Bar	SA-638	660	S66286	...	...	130
	13 27Ni-22Cr-7Mo-Mn-Cu-N	Forgings	SA-182	...	S31277	...	...	112
	14 27Ni-22Cr-7Mo-Mn-Cu-N	Smls. tube	SA-213	...	S31277	...	...	112
	15 27Ni-22Cr-7Mo-Mn-Cu-N	Plate	SA-240	...	S31277	...	...	112
	16 27Ni-22Cr-7Mo-Mn-Cu-N	Wld. tube	SA-249	...	S31277	...	...	112
(10)	17 ...	...	...	...	...	...	...	...
(10)	18 ...	...	...	...	...	...	...	...
	19 29Ni-20Cr-3Cu-2Mo	Castings	SA-351	CN7M	J95150	...	...	62
	20 16Cr-4Ni-6Mn	Plate	SA-240	201LN	S20153	...	...	95
	21 16Cr-9Mn-2Ni-N	Plate	SA-240	204	S20400	...	...	95
	22 16Cr-12Ni-2Mo	Forgings	SA-182	F316L	S31603	...	> 5	65
	23 16Cr-12Ni-2Mo	Forgings	SA-965	F316L	S31603	...	...	65
	24 16Cr-12Ni-2Mo	Forgings	SA-182	F316L	S31603	...	≤ 5	70
	25 16Cr-12Ni-2Mo	Smls. tube	SA-213	TP316L	S31603	...	...	70
	26 16Cr-12Ni-2Mo	Plate	SA-240	316L	S31603	...	...	70
	27 16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316L	S31603	...	...	70
	28 16Cr-12Ni-2Mo	Smls. & wld. pipe	SA-312	TP316L	S31603	...	...	70
	29 16Cr-12Ni-2Mo	Wld. pipe	SA-358	316L	S31603	1	...	70
	30 16Cr-12Ni-2Mo	Smls. & wld. fittings	SA-403	316L	S31603	...	...	70
	31 16Cr-12Ni-2Mo	Wld. pipe	SA-409	TP316L	S31603	...	...	70
	32 16Cr-12Ni-2Mo	Bar	SA-479	316L	S31603	...	...	70
	33 16Cr-12Ni-2Mo	Wld. tube	SA-688	TP316L	S31603	...	...	70
	34 16Cr-12Ni-2Mo	Wld. pipe	SA-813	TP316L	S31603	...	...	70
	35 16Cr-12Ni-2Mo	Wld. pipe	SA-814	TP316L	S31603	...	...	70
	36 16Cr-12Ni-2Mo	Bar	SA/JIS G4303	SUS316L	...	...	...	70
	37 16Cr-12Ni-2Mo	Castings	SA-351	CF3M	J92800	...	...	70
	38 16Cr-12Ni-2Mo	Cast pipe	SA-451	CPF3M	J92800	...	...	70
	39 16Cr-12Ni-2Mo	Castings	SA-351	CF8M	J92900	...	...	70
	40 16Cr-12Ni-2Mo	Cast pipe	SA-451	CPF8M	J92900	...	...	70
	41 16Cr-12Ni-2Mo	Forgings	SA-182	F316	S31600	...	> 5	70
	42 16Cr-12Ni-2Mo	Forgings	SA-965	F316	S31600	...	...	70
	43 16Cr-12Ni-2Mo	Forgings	SA-182	F316	S31600	...	≤ 5	75
	44 16Cr-12Ni-2Mo	Bolting	SA-193	B8M	S31600	1	...	75
	45 16Cr-12Ni-2Mo	Smls. tube	SA-213	TP316	S31600	...	...	75
	46 16Cr-12Ni-2Mo	Plate	SA-240	316	S31600	...	...	75

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding														
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000	
	Ferrous Materials (Cont'd)														
1	95.0	...	...	...	...	...	...	...	...	...	...	...	...	...	(10)
2	100.0	100.0	99.5	...	...	...	...	...	...	...	...	...	...	...
3	100.0	100.0	99.5	...	...	...	...	...	...	...	...	...	...	...
4	100.0	100.0	99.5	...	...	...	...	...	...	...	...	...	...	...
5	100.0	100.0	99.5	...	...	...	...	...	...	...	...	...	...	...
6	100.0	100.0	99.5	...	...	...	...	...	...	...	...	...	...	...
7	100.0	100.0	99.5	...	...	...	...	...	...	...	...	...	...	...
8	100.0	100.0	99.5	...	...	...	...	...	...	...	...	...	...	...
9	100.0	100.0	99.5	...	...	...	...	...	...	...	...	...	...	...
10	130.0	130.0	130.0	129.7	127.1	124.8	123.7	122.6	121.3	119.8	118.3	116.4	114.4	112.1	
11	130.0	130.0	130.0	129.7	127.1	124.8	123.7	122.6	121.3	119.8	118.3	116.4	114.4	112.1	
12	130.0	130.0	130.0	130.0	127.6	125.2	124.0	122.7	121.3	119.8	118.1	116.3	114.4	112.1	
13	112.0	103.3	97.6	93.4	90.3	87.6	86.3	85.2	84.2	83.6	...	...	...	...
14	112.0	103.3	97.6	93.4	90.3	87.6	86.3	85.2	84.2	83.6	...	...	...	...
15	112.0	103.3	97.6	93.4	90.3	87.6	86.3	85.2	84.2	83.6	...	...	...	...
16	112.0	103.3	97.6	93.4	90.3	87.6	86.3	85.2	84.2	83.6	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(10)
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(10)
19	62.0	52.4	47.7	44.6	42.4	40.6	39.9	39.2	...	...	...	...	...	...
20	95.0	82.9	74.2	70.3	69.1	68.7	68.4	67.9	67.0	65.9	64.5	63.0	61.7	60.9	
21	95.0	82.6	72.2	66.2	63.5	62.7	62.6	62.6	62.3	61.8	60.8	59.2	56.8	53.4	
22	65.0	63.2	59.5	57.8	57.3	57.3	57.2	57.1	56.7	56.2	55.4	54.4	53.0	51.4	
23	65.0	63.2	59.5	57.8	57.3	57.3	57.2	57.1	56.7	56.2	55.4	54.4	53.0	51.4	
24	70.0	68.1	64.0	62.2	61.8	61.7	61.6	61.5	61.1	60.5	59.7	58.6	57.1	55.4	
25	70.0	68.1	64.0	62.2	61.8	61.7	61.6	61.5	61.1	60.5	59.7	58.6	57.1	55.4	
26	70.0	68.1	64.0	62.2	61.8	61.7	61.6	61.5	61.1	60.5	59.7	58.6	57.1	55.4	
27	70.0	68.1	64.0	62.2	61.8	61.7	61.6	61.5	61.1	60.5	59.7	58.6	57.1	55.4	
28	70.0	68.1	64.0	62.2	61.8	61.7	61.6	61.5	61.1	60.5	59.7	58.6	57.1	55.4	
29	70.0	68.1	64.0	62.2	61.8	61.7	61.6	61.5	61.1	60.5	59.7	58.6	57.1	55.4	
30	70.0	68.1	64.0	62.2	61.8	61.7	61.6	61.5	61.1	60.5	59.7	58.6	57.1	55.4	
31	70.0	68.1	64.0	62.2	61.8	61.7	61.6	61.5	61.1	60.5	59.7	58.6	57.1	55.4	
32	70.0	68.1	64.0	62.2	61.8	61.7	61.6	61.5	61.1	60.5	59.7	58.6	57.1	55.4	
33	70.0	68.1	64.0	62.2	61.8	61.7	61.6	61.5	61.1	60.5	59.7	58.6	57.1	55.4	
34	70.0	68.1	64.0	62.2	61.8	61.7	61.6	61.5	61.1	60.5	59.7	58.6	57.1	55.4	
35	70.0	68.1	64.0	62.2	61.8	61.7	61.6	61.5	61.1	60.5	59.7	58.6	57.1	55.4	
36	70.0	68.1	64.0	62.2	61.8	61.7	61.6	61.5	61.1	60.5	59.7	58.6	57.1	55.4	
37	70.0	70.0	68.0	67.2	67.2	67.2	67.2	67.2	66.8	66.2	65.2	63.9	62.3	60.2	
38	70.0	70.0	68.0	67.2	67.2	67.2	67.2	67.2	66.8	66.2	65.2	63.9	62.3	60.2	
39	70.0	70.0	68.0	67.2	67.2	67.2	67.2	67.2	66.8	66.2	65.2	63.9	62.3	60.2	
40	70.0	70.0	68.0	67.2	67.2	67.2	67.2	67.2	66.8	66.2	65.2	63.9	62.3	60.2	
41	70.0	70.0	68.0	67.1	67.0	67.0	67.0	67.0	66.7	66.1	65.1	63.8	62.1	60.0	
42	70.0	70.0	68.0	67.1	67.0	67.0	67.0	67.0	66.7	66.1	65.1	63.8	62.1	60.0	
43	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3	
44	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3	
45	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3	
46	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3	

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316	S31600	...	...	75
2	16Cr-12Ni-2Mo	Smls. & wld. pipe	SA-312	TP316	S31600	...	...	75
3	16Cr-12Ni-2Mo	Bolting	SA-320	B8M	S31600	1	...	75
4	16Cr-12Ni-2Mo	Bolting	SA-320	B8MA	S31600	1A	...	75
5	16Cr-12Ni-2Mo	Wld. pipe	SA-358	316	S31600	1	...	75
6	16Cr-12Ni-2Mo	Smls. pipe	SA-376	TP316	S31600	...	...	75
7	16Cr-12Ni-2Mo	Smls. & wld. fittings	SA-403	316	S31600	...	...	75
8	16Cr-12Ni-2Mo	Wld. pipe	SA-409	TP316	S31600	...	...	75
9	16Cr-12Ni-2Mo	Bar	SA-479	316	S31600	...	...	75
10	16Cr-12Ni-2Mo	Wld. tube	SA-688	TP316	S31600	...	...	75
11	16Cr-12Ni-2Mo	Wld. pipe	SA-813	TP316	S31600	...	...	75
12	16Cr-12Ni-2Mo	Wld. pipe	SA-814	TP316	S31600	...	...	75
13	16Cr-12Ni-2Mo	Bar	SA/JIS G4303	SUS316	...	...	...	75
14	16Cr-12Ni-2Mo	Plate	SA/EN 10028-7	X5CrNiMo17-12-2	...	...	≤ 3	75
15	16Cr-12Ni-2Mo	Bolting	SA-193	B8M2	S31600	...	$2\frac{1}{2} < t \leq 3$	80
16	16Cr-12Ni-2Mo	Bolting	SA-193	B8M	S31600	2	$1\frac{1}{4} < t \leq 1\frac{1}{2}$	90
17	16Cr-12Ni-2Mo	Bolting	SA-320	B8M	S31600	2	$1\frac{1}{4} < t \leq 1\frac{1}{2}$	90
18	16Cr-12Ni-2Mo	Bolting	SA-193	B8M2	S31600	...	$2 < t \leq 2\frac{1}{2}$	90
19	16Cr-12Ni-2Mo	Bolting	SA-193	B8M	S31600	2	$1 < t \leq 1\frac{1}{4}$	95
20	16Cr-12Ni-2Mo	Bolting	SA-320	B8M	S31600	2	$1 < t \leq 1\frac{1}{4}$	95
21	16Cr-12Ni-2Mo	Bolting	SA-193	B8M2	S31600	...	≤ 2	95
22	16Cr-12Ni-2Mo	Bolting	SA-193	B8M	S31600	2	$\frac{3}{4} < t \leq 1$	100
23	16Cr-12Ni-2Mo	Bolting	SA-320	B8M	S31600	2	$\frac{3}{4} < t \leq 1$	100
24	16Cr-12Ni-2Mo	Bolting	SA-193	B8M	S31600	2	≤ $\frac{3}{4}$	110
25	16Cr-12Ni-2Mo	Bolting	SA-320	B8M	S31600	2	≤ $\frac{3}{4}$	110
26	16Cr-12Ni-2Mo	Forgings	SA-182	F316H	S31609	...	> 5	70
27	16Cr-12Ni-2Mo	Forgings	SA-965	F316H	S31609	...	...	70
28	16Cr-12Ni-2Mo	Forgings	SA-182	F316H	S31609	...	≤ 5	75
29	16Cr-12Ni-2Mo	Smls. tube	SA-213	TP316H	S31609	...	...	75
30	16Cr-12Ni-2Mo	Plate	SA-240	316H	S31609	...	...	75
31	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316H	S31609	...	...	75
32	16Cr-12Ni-2Mo	Smls. & wld. pipe	SA-312	TP316H	S31609	...	...	75
33	16Cr-12Ni-2Mo	Wld. pipe	SA-358	316H	S31609	1	...	75
34	16Cr-12Ni-2Mo	Smls. pipe	SA-376	TP316H	S31609	...	...	75
35	16Cr-12Ni-2Mo	Smls. & wld. fittings	SA-403	316H	S31609	...	...	75
36	16Cr-12Ni-2Mo	Bar	SA-479	316H	S31609	...	...	75
37	16Cr-12Ni-2Mo	Wld. pipe	SA-813	TP316H	S31609	...	...	75
38	16Cr-12Ni-2Mo	Wld. pipe	SA-814	TP316H	S31609	...	...	75
39	16Cr-12Ni-2Mo-Cb	Plate	SA-240	316Cb	S31640	...	...	75
40	16Cr-12Ni-2Mo-N	Forgings	SA-182	F316LN	S31653	...	> 5	70
41	16Cr-12Ni-2Mo-N	Forgings	SA-965	F316LN	S31653	...	...	70
42	16Cr-12Ni-2Mo-N	Forgings	SA-182	F316LN	S31653	...	≤ 5	75
43	16Cr-12Ni-2Mo-N	Smls. tube	SA-213	TP316LN	S31653	...	...	75

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
2	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
3	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
4	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
5	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
6	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
7	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
8	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
9	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
10	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
11	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
12	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
13	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
14	75.4	75.4	73.3	72.3	72.2	72.2	72.2	72.2	71.9	71.2	70.1	68.7	64.6	61.9
15	80.0	80.0	77.2	74.4	74.4	74.4	74.4	74.4	73.9	73.5	72.2	70.4	68.6	66.9
16	90.0	90.0	86.8	83.7	83.7	83.7	83.7	83.7	83.2	82.7	81.2	79.2	77.2	75.2
17	90.0	90.0	86.8	83.7	83.7	83.7	83.7	83.7	83.2	82.7	81.2	79.2	77.2	75.2
18	90.0	90.0	86.8	83.7	83.7	83.7	83.7	83.7	83.2	82.7	81.2	79.2	77.2	75.2
19	95.0	95.0	91.6	88.3	88.3	88.3	88.3	88.3	87.8	87.3	85.7	83.6	81.5	79.4
20	95.0	95.0	91.6	88.3	88.3	88.3	88.3	88.3	87.8	87.3	85.7	83.6	81.5	79.4
21	95.0	95.0	91.6	88.3	88.3	88.3	88.3	88.3	87.8	87.3	85.7	83.6	81.5	79.4
22	100.0	100.0	98.6	96.3	95.7	95.7	95.7	95.7	95.3	94.4	93.0	91.1	88.7	85.7
23	100.0	100.0	98.6	96.3	95.7	95.7	95.7	95.7	95.3	94.4	93.0	91.1	88.7	85.7
24	110.0	110.0	108.4	105.9	105.3	105.3	105.3	105.3	104.8	103.8	102.3	100.2	97.6	94.3
25	110.0	110.0	108.4	105.9	105.3	105.3	105.3	105.3	104.8	103.8	102.3	100.2	97.6	94.3
26	70.0	70.0	68.0	67.1	67.0	67.0	67.0	67.0	66.7	66.1	65.1	63.8	62.1	60.0
27	70.0	70.0	68.0	67.1	67.0	67.0	67.0	67.0	66.7	66.1	65.1	63.8	62.1	60.0
28	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
29	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
30	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
31	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
32	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
33	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
34	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
35	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
36	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
37	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
38	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
39	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	...	...	...
40	70.0	70.0	66.0	62.6	60.3	59.0	58.6	58.3	57.9	57.6	57.1	56.4	55.6	54.6
41	70.0	70.0	66.0	62.6	60.3	59.0	58.6	58.3	57.9	57.6	57.1	56.4	55.6	54.6
42	75.0	75.0	70.7	67.1	64.6	63.3	62.8	62.4	62.1	61.7	61.1	60.4	59.6	58.4
43	75.0	75.0	70.7	67.1	64.6	63.3	62.8	62.4	62.1	61.7	61.1	60.4	59.6	58.4

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	16Cr-12Ni-2Mo-N	Plate	SA-240	316LN	S31653	...	...	75
2	16Cr-12Ni-2Mo-N	Wld. tube	SA-249	TP316LN	S31653	...	...	75
3	16Cr-12Ni-2Mo-N	Smls. & wld. pipe	SA-312	TP316LN	S31653	...	...	75
4	16Cr-12Ni-2Mo-N	Wld. pipe	SA-358	316LN	S31653	1	...	75
5	16Cr-12Ni-2Mo-N	Smls. pipe	SA-376	TP316LN	S31653	...	...	75
6	16Cr-12Ni-2Mo-N	Fittings	SA-403	316LN	S31653	...	...	75
7	16Cr-12Ni-2Mo-N	Bar	SA-479	316LN	S31653	...	...	75
8	16Cr-12Ni-2Mo-N	Wld. tube	SA-688	TP316LN	S31653	...	...	75
9	16Cr-12Ni-2Mo-N	Forgings	SA-182	F316N	S31651	...	...	80
10	16Cr-12Ni-2Mo-N	Smls. tube	SA-213	TP316N	S31651	...	...	80
11	16Cr-12Ni-2Mo-N	Plate	SA-240	316N	S31651	...	...	80
12	16Cr-12Ni-2Mo-N	Wld. tube	SA-249	TP316N	S31651	...	...	80
13	16Cr-12Ni-2Mo-N	Smls. & wld. pipe	SA-312	TP316N	S31651	...	...	80
14	16Cr-12Ni-2Mo-N	Wld. pipe	SA-358	316N	S31651	1	...	80
15	16Cr-12Ni-2Mo-N	Smls. pipe	SA-376	TP316N	S31651	...	...	80
16	16Cr-12Ni-2Mo-N	Smls. & wld. fittings	SA-403	316N	S31651	...	...	80
17	16Cr-12Ni-2Mo-N	Bar	SA-479	316N	S31651	...	...	80
18	16Cr-12Ni-2Mo-N	Wld. tube	SA-688	TP316N	S31651	...	...	80
19	16Cr-12Ni-2Mo-N	Wld. pipe	SA-813	TP316N	S31651	...	...	80
20	16Cr-12Ni-2Mo-N	Wld. pipe	SA-814	TP316N	S31651	...	...	80
21	16Cr-12Ni-2Mo-N	Forgings	SA-965	F316N	S31651	...	...	80
22	16Cr-12Ni-2Mo-Ti	Plate	SA-240	316Ti	S31635	...	...	75
(10) 23	17Cr-4Ni-6Mn	Plate	SA-240	201-1	S20100	...	...	75
(10) 24	17Cr-4Ni-6Mn	Plate	SA-666	201-1	S20100	...	...	75
(10) 25	17Cr-4Ni-6Mn	Plate	SA-240	201-2	S20100	...	...	95
(10) 26	17Cr-4Ni-6Mn	Plate	SA-666	201-2	S20100	...	...	95
(10) 27	17Cr-7Ni	Plate, sheet, strip	SA-240	301	S30100	...	...	75
28	17.5Cr-17.5Ni-5.3Si	Plate	SA-240	...	S30601	Solution ann.	...	78
29	18Cr-3Ni-12Mn	Plate	SA-240	XM-29	S24000	...	...	100
30	18Cr-3Ni-12Mn	Wld. tube	SA-249	XM-29	S24000	...	...	100
31	18Cr-3Ni-12Mn	Wld. pipe	SA-312	XM-29	S24000	...	...	100
32	18Cr-3Ni-12Mn	Bar	SA-479	XM-29	S24000	...	...	100
33	18Cr-3Ni-12Mn	Wld. tube	SA-688	TPXM-29	S24000	...	...	100
34	18Cr-5Ni-3Mo	Smls. & wld. tube	SA-789	...	S31500	...	...	92
35	18Cr-5Ni-3Mo	Smls. & wld. pipe	SA-790	...	S31500	...	...	92
36	18Cr-8Ni	Forgings	SA-182	F304L	S30403	...	> 5	65
37	18Cr-8Ni	Forgings	SA-965	F304L	S30403	...	...	65
38	18Cr-8Ni	Forgings	SA-182	F304L	S30403	...	≤ 5	70
39	18Cr-8Ni	Smls. tube	SA-213	TP304L	S30403	...	...	70
40	18Cr-8Ni	Plate	SA-240	304L	S30403	...	...	70
41	18Cr-8Ni	Wld. tube	SA-249	TP304L	S30403	...	...	70
42	18Cr-8Ni	Smls. & wld. pipe	SA-312	TP304L	S30403	...	...	70
43	18Cr-8Ni	Wld. pipe	SA-358	304L	S30403	1	...	70
44	18Cr-8Ni	Smls. & wld. fittings	SA-403	304L	S30403	...	...	70

2011a SECTION II, PART D (CUSTOMARY)

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	75.0	75.0	70.7	67.1	64.6	63.3	62.8	62.4	62.1	61.7	61.1	60.4	59.6	58.4
2	75.0	75.0	70.7	67.1	64.6	63.3	62.8	62.4	62.1	61.7	61.1	60.4	59.6	58.4
3	75.0	75.0	70.7	67.1	64.6	63.3	62.8	62.4	62.1	61.7	61.1	60.4	59.6	58.4
4	75.0	75.0	70.7	67.1	64.6	63.3	62.8	62.4	62.1	61.7	61.1	60.4	59.6	58.4
5	75.0	75.0	70.7	67.1	64.6	63.3	62.8	62.4	62.1	61.7	61.1	60.4	59.6	58.4
6	75.0	75.0	70.7	67.1	64.6	63.3	62.8	62.4	62.1	61.7	61.1	60.4	59.6	58.4
7	75.0	75.0	70.7	67.1	64.6	63.3	62.8	62.4	62.1	61.7	61.1	60.4	59.6	58.4
8	75.0	75.0	70.7	67.1	64.6	63.3	62.8	62.4	62.1	61.7	61.1	60.4	59.6	58.4
9	80.0	80.0	77.0	75.1	74.4	74.3	74.3	74.3	74.2	73.9	73.3	72.4	71.1	69.3
10	80.0	80.0	77.0	75.1	74.4	74.3	74.3	74.3	74.2	73.9	73.3	72.4	71.1	69.3
11	80.0	80.0	77.0	75.1	74.4	74.3	74.3	74.3	74.2	73.9	73.3	72.4	71.1	69.3
12	80.0	80.0	77.0	75.1	74.4	74.3	74.3	74.3	74.2	73.9	73.3	72.4	71.1	69.3
13	80.0	80.0	77.0	75.1	74.4	74.3	74.3	74.3	74.2	73.9	73.3	72.4	71.1	69.3
14	80.0	80.0	77.0	75.1	74.4	74.3	74.3	74.3	74.2	73.9	73.3	72.4	71.1	69.3
15	80.0	80.0	77.0	75.1	74.4	74.3	74.3	74.3	74.2	73.9	73.3	72.4	71.1	69.3
16	80.0	80.0	77.0	75.1	74.4	74.3	74.3	74.3	74.2	73.9	73.3	72.4	71.1	69.3
17	80.0	80.0	77.0	75.1	74.4	74.3	74.3	74.3	74.2	73.9	73.3	72.4	71.1	69.3
18	80.0	80.0	77.0	75.1	74.4	74.3	74.3	74.3	74.2	73.9	73.3	72.4	71.1	69.3
19	80.0	80.0	77.0	75.1	74.4	74.3	74.3	74.3	74.2	73.9	73.3	72.4	71.1	69.3
20	80.0	80.0	77.0	75.1	74.4	74.3	74.3	74.3	74.2	73.9	73.3	72.4	71.1	69.3
21	80.0	80.0	77.0	75.1	74.4	74.3	74.3	74.3	74.2	73.9	73.3	72.4	71.1	69.3
22	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	...	...	...
23	75.0	65.6	60.3	58.4	...	...	...	...	...	...	...	...	...	...
24	75.0	65.6	60.3	58.4	...	...	...	...	...	...	...	...	...	...
25	95.0	83.1	76.4	74.0	...	...	...	...	...	...	...	...	...	...
26	95.0	83.1	76.4	74.0	...	...	...	...	...	...	...	...	...	...
27	75.0	61.1	55.1	53.9	53.9	53.9	53.9	53.7	52.5	51.2	49.9	49.2	...	...
28	78.0	78.0	74.0	70.0	66.0	...	...	...	...	...	...	...	...	...
29	100.0	97.7	91.1	87.3	85.1	83.3	82.0	80.5	78.5	76.3	73.8	71.4	69.4	68.3
30	100.0	97.7	91.1	87.3	85.1	83.3	82.0	80.5	78.5	76.3	73.8	71.4	69.4	68.3
31	100.0	97.7	91.1	87.3	85.1	83.3	82.0	80.5	78.5	76.3	73.8	71.4	69.4	68.3
32	100.0	97.7	91.1	87.3	85.1	83.3	82.0	80.5	78.5	76.3	73.8	71.4	69.4	68.3
33	100.0	97.7	91.1	87.3	85.1	83.3	82.0	80.5	78.5	76.3	73.8	71.4	69.4	68.3
34	92.0	88.8	85.4	84.8	84.8	84.8	84.8	84.8	84.8	...	...	...	...	...
35	92.0	88.8	85.4	84.8	84.8	84.8	84.8	84.8	84.8	...	...	...	...	...
36	65.0	61.3	56.9	54.5	53.4	52.9	52.6	52.4	52.0	51.4	50.7	49.8	48.6	47.1
37	65.0	61.3	56.9	54.5	53.4	52.9	52.6	52.4	52.0	51.4	50.7	49.8	48.6	47.1
38	70.0	66.1	61.2	58.7	57.5	56.9	56.7	56.4	56.0	55.4	54.6	53.6	52.3	50.7
39	70.0	66.1	61.2	58.7	57.5	56.9	56.7	56.4	56.0	55.4	54.6	53.6	52.3	50.7
40	70.0	66.1	61.2	58.7	57.5	56.9	56.7	56.4	56.0	55.4	54.6	53.6	52.3	50.7
41	70.0	66.1	61.2	58.7	57.5	56.9	56.7	56.4	56.0	55.4	54.6	53.6	52.3	50.7
42	70.0	66.1	61.2	58.7	57.5	56.9	56.7	56.4	56.0	55.4	54.6	53.6	52.3	50.7
43	70.0	66.1	61.2	58.7	57.5	56.9	56.7	56.4	56.0	55.4	54.6	53.6	52.3	50.7
44	70.0	66.1	61.2	58.7	57.5	56.9	56.7	56.4	56.0	55.4	54.6	53.6	52.3	50.7

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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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	18Cr-8Ni	Wld. pipe	SA-409	TP304L	S30403	...	...	70
2	18Cr-8Ni	Bar	SA-479	304L	S30403	...	...	70
3	18Cr-8Ni	Wld. tube	SA-688	TP304L	S30403	...	...	70
4	18Cr-8Ni	Wld. pipe	SA-813	TP304L	S30403	...	...	70
5	18Cr-8Ni	Wld. pipe	SA-814	TP304L	S30403	...	...	70
6	18Cr-8Ni	Bar	SA/JIS G4303	SUS304L	...	...	...	70
7	18Cr-8Ni	Forgings	SA-182	F304	S30400	...	> 5	70
8	18Cr-8Ni	Forgings	SA-182	F304H	S30409	...	> 5	70
9	18Cr-8Ni	Castings	SA-351	CF3	J92500	...	...	70
10	18Cr-8Ni	Castings	SA-351	CF8	J92600	...	...	70
11	18Cr-8Ni	Smls. pipe	SA-376	TP304	S30400	...	...	70
12	18Cr-8Ni	Cast pipe	SA-451	CPF3	J92500	...	...	70
13	18Cr-8Ni	Cast pipe	SA-451	CPF8	J92600	...	...	70
14	18Cr-8Ni	Forgings	SA-965	F304	S30400	...	...	70
15	18Cr-8Ni	Forgings	SA-965	F304H	S30409	...	...	70
16	18Cr-8Ni	Forgings	SA-182	F304	S30400	...	≤ 5	75
17	18Cr-8Ni	Forgings	SA-182	F304H	S30409	...	≤ 5	75
18	18Cr-8Ni	Bolting	SA-193	B8	S30400	1	...	75
19	18Cr-8Ni	Smls. tube	SA-213	TP304	S30400	...	...	75
20	18Cr-8Ni	Smls. tube	SA-213	TP304H	S30409	...	...	75
21	18Cr-8Ni	Plate	SA-240	302	S30200	...	...	75
22	18Cr-8Ni	Plate	SA-240	304	S30400	...	...	75
23	18Cr-8Ni	Plate	SA-240	304H	S30409	...	...	75
24	18Cr-8Ni	Wld. tube	SA-249	TP304	S30400	...	...	75
25	18Cr-8Ni	Wld. tube	SA-249	TP304H	S30409	...	...	75
26	18Cr-8Ni	Smls. & wld. pipe	SA-312	TP304	S30400	...	...	75
27	18Cr-8Ni	Smls. & wld. pipe	SA-312	TP304H	S30409	...	...	75
28	18Cr-8Ni	Bolting	SA-320	B8	S30400	1	...	75
29	18Cr-8Ni	Bolting	SA-320	B8A	S30400	1A	...	75
30	18Cr-8Ni	Wld. pipe	SA-358	304	S30400	1	...	75
31	18Cr-8Ni	Wld. pipe	SA-358	304H	S30409	1	...	75
32	18Cr-8Ni	Wld. pipe	SA-358	304LN	S30453	1	...	75
33	18Cr-8Ni	Smls. pipe	SA-376	TP304	S30400	...	...	75
34	18Cr-8Ni	Smls. pipe	SA-376	TP304H	S30409	...	...	75
35	18Cr-8Ni	Smls. & wld. fittings	SA-403	304	S30400	...	...	75
36	18Cr-8Ni	Smls. & wld. fittings	SA-403	304H	S30409	...	...	75
37	18Cr-8Ni	Wld. pipe	SA-409	TP304	S30400	...	...	75
38	18Cr-8Ni	Bar	SA-479	302	S30200	...	...	75
39	18Cr-8Ni	Bar	SA-479	304	S30400	...	...	75
40	18Cr-8Ni	Bar	SA-479	304H	S30409	...	...	75
41	18Cr-8Ni	Wld. tube	SA-688	TP304	S30400	...	...	75
42	18Cr-8Ni	Wld. pipe	SA-813	TP304	S30400	...	...	75
43	18Cr-8Ni	Wld. pipe	SA-813	TP304H	S30409	...	...	75
44	18Cr-8Ni	Wld. pipe	SA-814	TP304	S30400	...	...	75
45	18Cr-8Ni	Wld. pipe	SA-814	TP304H	S30409	...	...	75

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	70.0	66.1	61.2	58.7	57.5	56.9	56.7	56.4	56.0	55.4	54.6	53.6	52.3	50.7
2	70.0	66.1	61.2	58.7	57.5	56.9	56.7	56.4	56.0	55.4	54.6	53.6	52.3	50.7
3	70.0	66.1	61.2	58.7	57.5	56.9	56.7	56.4	56.0	55.4	54.6	53.6	52.3	50.7
4	70.0	66.1	61.2	58.7	57.5	56.9	56.7	56.4	56.0	55.4	54.6	53.6	52.3	50.7
5	70.0	66.1	61.2	58.7	57.5	56.9	56.7	56.4	56.0	55.4	54.6	53.6	52.3	50.7
6	70.0	66.1	61.2	58.7	57.5	56.9	56.7	56.4	56.0	55.4	54.6	53.6	52.3	50.7
7	70.0	66.3	61.8	59.7	59.2	59.2	59.2	59.2	59.0	58.6	57.9	56.8	55.4	53.6
8	70.0	66.3	61.8	59.7	59.2	59.2	59.2	59.2	59.0	58.6	57.9	56.8	55.4	53.6
9	70.0	66.3	61.8	59.7	59.2	59.2	59.2	59.2	59.0	58.6	57.9	56.8	55.4	53.6
10	70.0	66.3	61.8	59.7	59.2	59.2	59.2	59.2	59.0	58.6	57.9	56.8	55.4	53.6
11	70.0	66.3	61.8	59.7	59.2	59.2	59.2	59.2	59.0	58.6	57.9	56.8	55.4	53.6
12	70.0	66.3	61.8	59.7	59.2	59.2	59.2	59.2	59.0	58.6	57.9	56.8	55.4	53.6
13	70.0	66.3	61.8	59.7	59.2	59.2	59.2	59.2	59.0	58.6	57.9	56.8	55.4	53.6
14	70.0	66.3	61.8	59.7	59.2	59.2	59.2	59.2	59.0	58.6	57.9	56.8	55.4	53.6
15	70.0	66.3	61.8	59.7	59.2	59.2	59.2	59.2	59.0	58.6	57.9	56.8	55.4	53.6
16	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
17	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
18	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
19	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
20	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
21	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
22	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
23	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
24	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
25	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
26	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
27	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
28	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
29	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
30	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
31	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
32	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
33	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
34	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
35	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
36	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
37	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
38	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
39	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
40	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
41	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
42	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
43	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
44	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
45	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	18Cr-8Ni	Bar	SA/JIS G4303	SUS302	...	...	...	75
2	18Cr-8Ni	Bar	SA/JIS G4303	SUS304	...	...	...	75
3	18Cr-8Ni	Plate	SA/EN 10028-7	X5CrNi18-10	...	...	≤ 3	75
4	18Cr-8Ni	Castings	SA-351	CF3A	J92500	...	...	77
5	18Cr-8Ni	Castings	SA-351	CF8A	J92600	...	...	77
6	18Cr-8Ni	Cast pipe	SA-451	CPF3A	J92500	...	...	77
7	18Cr-8Ni	Cast pipe	SA-451	CPF8A	J92600	...	...	77
8	18Cr-8Ni-N	Forgings	SA-182	F304LN	S30453	...	> 5	70
9	18Cr-8Ni-N	Forgings	SA-965	F304LN	S30453	...	...	70
10	18Cr-8Ni-N	Forgings	SA-182	F304LN	S30453	...	≤ 5	75
11	18Cr-8Ni-N	Bolting	SA-193	B8NA	S30451	1A	...	75
12	18Cr-8Ni-N	Smls. tube	SA-213	TP304LN	S30453	...	...	75
13	18Cr-8Ni-N	Plate	SA-240	304LN	S30453	...	...	75
14	18Cr-8Ni-N	Wld. tube	SA-249	TP304LN	S30453	...	...	75
15	18Cr-8Ni-N	Smls. & wld. pipe	SA-312	TP304LN	S30453	...	...	75
16	18Cr-8Ni-N	Smls. pipe	SA-376	TP304LN	S30453	...	...	75
17	18Cr-8Ni-N	Smls. & wld. fittings	SA-403	304LN	S30453	WP	...	75
18	18Cr-8Ni-N	Bar	SA-479	304LN	S30453	...	...	75
19	18Cr-8Ni-N	Wld. tube	SA-688	TP304LN	S30453	...	...	75
20	18Cr-8Ni-N	Wld. pipe	SA-813	TP304LN	S30453	...	...	75
21	18Cr-8Ni-N	Wld. pipe	SA-814	TP304LN	S30453	...	...	75
22	18Cr-8Ni-N	Forgings	SA-182	F304N	S30451	...	...	80
23	18Cr-8Ni-N	Smls. tube	SA-213	TP304N	S30451	...	...	80
24	18Cr-8Ni-N	Plate	SA-240	304N	S30451	...	...	80
25	18Cr-8Ni-N	Wld. tube	SA-249	TP304N	S30451	...	...	80
26	18Cr-8Ni-N	Smls. & wld. pipe	SA-312	TP304N	S30451	...	...	80
27	18Cr-8Ni-N	Wld. pipe	SA-358	304N	S30451	1	...	80
28	18Cr-8Ni-N	Smls. pipe	SA-376	TP304N	S30451	...	...	80
29	18Cr-8Ni-N	Smls. & wld. fittings	SA-403	304N	S30451	...	...	80
30	18Cr-8Ni-N	Bar	SA-479	304N	S30451	...	...	80
31	18Cr-8Ni-N	Wld. tube	SA-688	TP304N	S30451	...	...	80
32	18Cr-8Ni-N	Wld. pipe	SA-813	TP304N	S30451	...	...	80
33	18Cr-8Ni-N	Wld. pipe	SA-814	TP304N	S30451	...	...	80
34	18Cr-8Ni-N	Forgings	SA-965	F304N	S30451	...	...	80
35	18Cr-8Ni-S	Bolting	SA-320	B8F	S30323	1	...	75
36	18Cr-8Ni-S	Bolting	SA-320	B8FA	S30323	1A	...	75
37	18Cr-8Ni-4Si-N	Bar	SA-479	...	S21800	...	...	95
38	18Cr-10Ni-Cb	Forgings	SA-965	F348H	S34809	...	...	65
39	18Cr-10Ni-Cb	Castings	SA-351	CF8C	J92710	...	...	70
40	18Cr-10Ni-Cb	Cast pipe	SA-451	CPF8C	J92710	...	...	70
41	18Cr-10Ni-Cb	Forgings	SA-182	F347	S34700	...	> 5	70
42	18Cr-10Ni-Cb	Forgings	SA-965	F347	S34700	...	...	70
43	18Cr-10Ni-Cb	Forgings	SA-182	F347H	S34709	...	> 5	70
44	18Cr-10Ni-Cb	Forgings	SA-965	F347H	S34709	...	...	70

2011a SECTION II, PART D (CUSTOMARY)

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
2	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
3	75.4	71.4	66.6	64.3	63.7	63.4	63.4	63.4	63.4	63.1	62.3	61.2	59.6	57.7
4	77.0	72.9	68.0	65.7	65.1	65.1	65.1	65.1	65.0	64.5	63.6	62.5	60.9	58.9
5	77.0	72.9	68.0	65.7	65.1	65.1	65.1	65.1	65.0	64.5	63.6	62.5	60.9	58.9
6	77.0	72.9	68.0	65.7	65.1	65.1	65.1	65.1	65.0	64.5	63.6	62.5	60.9	58.9
7	77.0	72.9	68.0	65.7	65.1	65.1	65.1	65.1	65.0	64.5	63.6	62.5	60.9	58.9
8	70.0	66.3	61.8	59.7	59.2	59.2	59.2	59.2	59.0	58.6	57.9	56.8	55.4	53.6
9	70.0	66.3	61.8	59.7	59.2	59.2	59.2	59.2	59.0	58.6	57.9	56.8	55.4	53.6
10	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
11	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
12	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
13	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
14	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
15	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
16	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
17	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
18	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
19	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
20	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
21	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
22	80.0	80.0	76.1	73.2	71.2	69.7	69.1	68.6	67.9	67.3	66.5	65.5	64.4	63.0
23	80.0	80.0	76.1	73.2	71.2	69.7	69.1	68.6	67.9	67.3	66.5	65.5	64.4	63.0
24	80.0	80.0	76.1	73.2	71.2	69.7	69.1	68.6	67.9	67.3	66.5	65.5	64.4	63.0
25	80.0	80.0	76.1	73.2	71.2	69.7	69.1	68.6	67.9	67.3	66.5	65.5	64.4	63.0
26	80.0	80.0	76.1	73.2	71.2	69.7	69.1	68.6	67.9	67.3	66.5	65.5	64.4	63.0
27	80.0	80.0	76.1	73.2	71.2	69.7	69.1	68.6	67.9	67.3	66.5	65.5	64.4	63.0
28	80.0	80.0	76.1	73.2	71.2	69.7	69.1	68.6	67.9	67.3	66.5	65.5	64.4	63.0
29	80.0	80.0	76.1	73.2	71.2	69.7	69.1	68.6	67.9	67.3	66.5	65.5	64.4	63.0
30	80.0	80.0	76.1	73.2	71.2	69.7	69.1	68.6	67.9	67.3	66.5	65.5	64.4	63.0
31	80.0	80.0	76.1	73.2	71.2	69.7	69.1	68.6	67.9	67.3	66.5	65.5	64.4	63.0
32	80.0	80.0	76.1	73.2	71.2	69.7	69.1	68.6	67.9	67.3	66.5	65.5	64.4	63.0
33	80.0	80.0	76.1	73.2	71.2	69.7	69.1	68.6	67.9	67.3	66.5	65.5	64.4	63.0
34	80.0	80.0	76.1	73.2	71.2	69.7	69.1	68.6	67.9	67.3	66.5	65.5	64.4	63.0
35	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
36	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
37	95.0	93.9	87.0	82.1	79.3	77.9	77.5	77.1	76.7	76.2	75.5	74.7	73.6	72.5
38	65.0	62.2	57.1	53.9	52.0	51.2	51.0	51.0	51.0	51.0	50.9	50.7	50.4	49.8
39	70.0	66.9	61.5	58.0	56.0	55.1	55.0	54.9	54.9	54.9	54.8	54.6	54.2	53.6
40	70.0	67.0	61.5	58.0	56.0	55.1	54.9	54.9	54.9	54.9	54.8	54.6	54.3	53.7
41	70.0	66.9	61.5	58.0	56.0	55.1	55.0	54.9	54.9	54.9	54.8	54.6	54.2	53.6
42	70.0	66.9	61.5	58.0	56.0	55.1	55.0	54.9	54.9	54.9	54.8	54.6	54.2	53.6
43	70.0	67.0	61.5	58.0	56.0	55.1	54.9	54.9	54.9	54.9	54.8	54.6	54.3	53.7
44	70.0	67.0	61.5	58.0	56.0	55.1	54.9	54.9	54.9	54.9	54.8	54.6	54.3	53.7

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	18Cr-10Ni-Cb	Forgings	SA-182	F348	S34800	...	> 5	70
2	18Cr-10Ni-Cb	Forgings	SA-965	F348	S34800	...	...	70
3	18Cr-10Ni-Cb	Forgings	SA-182	F348H	S34809	...	> 5	70
4	18Cr-10Ni-Cb	Forgings	SA-182	F347	S34700	...	≤ 5	75
5	18Cr-10Ni-Cb	Bolting	SA-193	B8C	S34700	1	...	75
6	18Cr-10Ni-Cb	Smls. tube	SA-213	TP347	S34700	...	...	75
7	18Cr-10Ni-Cb	Plate	SA-240	347	S34700	...	...	75
8	18Cr-10Ni-Cb	Wld. tube	SA-249	TP347	S34700	...	...	75
9	18Cr-10Ni-Cb	Smls. & wld. pipe	SA-312	TP347	S34700	...	...	75
10	18Cr-10Ni-Cb	Bolting	SA-320	B8C	S34700	1	...	75
11	18Cr-10Ni-Cb	Bolting	SA-320	B8CA	S34700	1A	...	75
12	18Cr-10Ni-Cb	Wld. pipe	SA-358	347	S34700	1	...	75
13	18Cr-10Ni-Cb	Smls. pipe	SA-376	TP347	S34700	...	...	75
14	18Cr-10Ni-Cb	Smls. & wld. fittings	SA-403	347	S34700	...	...	75
15	18Cr-10Ni-Cb	Wld. pipe	SA-409	TP347	S34700	...	...	75
16	18Cr-10Ni-Cb	Bar	SA-479	347	S34700	...	...	75
17	18Cr-10Ni-Cb	Wld. pipe	SA-813	TP347	S34700	...	...	75
18	18Cr-10Ni-Cb	Bar	SA/JIS G4303	SUS347	...	...	...	75
19	18Cr-10Ni-Cb	Forgings	SA-182	F347H	S34709	...	≤ 5	75
20	18Cr-10Ni-Cb	Smls. tube	SA-213	TP347H	S34709	...	...	75
21	18Cr-10Ni-Cb	Plate	SA-240	347H	S34709	...	...	75
22	18Cr-10Ni-Cb	Wld. tube	SA-249	TP347H	S34709	...	...	75
23	18Cr-10Ni-Cb	Smls. & wld. pipe	SA-312	TP347H	S34709	...	...	75
24	18Cr-10Ni-Cb	Smls. pipe	SA-376	TP347H	S34709	...	...	75
25	18Cr-10Ni-Cb	Smls. & wld. fittings	SA-403	347H	S34709	...	...	75
26	18Cr-10Ni-Cb	Bar	SA-479	347H	S34709	...	...	75
27	18Cr-10Ni-Cb	Wld. pipe	SA-813	TP347H	S34709	...	...	75
28	18Cr-10Ni-Cb	Wld. pipe	SA-814	TP347H	S34709	...	...	75
(a) 29	18Cr-10Ni-Cb	Smls. tube	SA-213	TP347LN	S34751	...	...	75
(a) 30	18Cr-10Ni-Cb	Smls. pipe	SA-312	TP347LN	S34751	...	...	75
31	18Cr-10Ni-Cb	Forgings	SA-182	F348	S34800	...	≤ 5	75
32	18Cr-10Ni-Cb	Smls. tube	SA-213	TP348	S34800	...	...	75
33	18Cr-10Ni-Cb	Plate	SA-240	348	S34800	...	...	75
34	18Cr-10Ni-Cb	Wld. tube	SA-249	TP348	S34800	...	...	75
35	18Cr-10Ni-Cb	Smls. & wld. pipe	SA-312	TP348	S34800	...	...	75
36	18Cr-10Ni-Cb	Wld. pipe	SA-358	348	S34800	1	...	75
37	18Cr-10Ni-Cb	Smls. pipe	SA-376	TP348	S34800	...	...	75
38	18Cr-10Ni-Cb	Smls. & wld. fittings	SA-403	348	S34800	...	...	75
39	18Cr-10Ni-Cb	Wld. pipe	SA-409	TP348	S34800	...	...	75
40	18Cr-10Ni-Cb	Bar	SA-479	348	S34800	...	...	75
41	18Cr-10Ni-Cb	Wld. pipe	SA-813	TP348	S34800	...	...	75
42	18Cr-10Ni-Cb	Wld. pipe	SA-814	TP348	S34800	...	...	75
43	18Cr-10Ni-Cb	Forgings	SA-182	F348H	S34809	...	≤ 5	75
44	18Cr-10Ni-Cb	Smls. tube	SA-213	TP348H	S34809	...	...	75
45	18Cr-10Ni-Cb	Plate	SA-240	348H	S34809	...	...	75
46	18Cr-10Ni-Cb	Wld. tube	SA-249	TP348H	S34809	...	...	75
47	18Cr-10Ni-Cb	Smls. & wld. pipe	SA-312	TP348H	S34809	...	...	75

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	70.0	66.9	61.5	58.0	56.0	55.1	55.0	54.9	54.9	54.9	54.8	54.6	54.2	53.6
2	70.0	66.9	61.5	58.0	56.0	55.1	55.0	54.9	54.9	54.9	54.8	54.6	54.2	53.6
3	70.0	67.0	61.5	58.0	56.0	55.1	54.9	54.9	54.9	54.9	54.8	54.6	54.3	53.7
4	75.0	71.7	65.9	62.1	60.0	59.1	58.9	58.8	58.8	58.8	58.7	58.5	58.1	57.5
5	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
6	75.0	71.7	65.9	62.1	60.0	59.1	58.9	58.8	58.8	58.8	58.7	58.5	58.1	57.5
7	75.0	71.7	65.9	62.1	60.0	59.1	58.9	58.8	58.8	58.8	58.7	58.5	58.1	57.5
8	75.0	71.7	65.9	62.1	60.0	59.1	58.9	58.8	58.8	58.8	58.7	58.5	58.1	57.5
9	75.0	71.7	65.9	62.1	60.0	59.1	58.9	58.8	58.8	58.8	58.7	58.5	58.1	57.5
10	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
11	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
12	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
13	75.0	71.7	65.9	62.1	60.0	59.1	58.9	58.8	58.8	58.8	58.7	58.5	58.1	57.5
14	75.0	71.7	65.9	62.1	60.0	59.1	58.9	58.8	58.8	58.8	58.7	58.5	58.1	57.5
15	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
16	75.0	71.7	65.9	62.1	60.0	59.1	58.9	58.8	58.8	58.8	58.7	58.5	58.1	57.5
17	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
18	75.0	71.7	65.9	62.1	60.0	59.1	58.9	58.8	58.8	58.8	58.7	58.5	58.1	57.5
19	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
20	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
21	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
22	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
23	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
24	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
25	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
26	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
27	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
28	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
29	75.0	73.1	66.9	62.3	59.3	57.7	57.4	57.2	57.1	57.0	56.9	56.6	56.2	55.4 (a)
30	75.0	73.1	66.9	62.3	59.3	57.7	57.4	57.2	57.1	57.0	56.9	56.6	56.2	55.4 (a)
31	75.0	71.7	65.9	62.1	60.0	59.1	58.9	58.8	58.8	58.8	58.7	58.5	58.1	57.5
32	75.0	71.7	65.9	62.1	60.0	59.1	58.9	58.8	58.8	58.8	58.7	58.5	58.1	57.5
33	75.0	71.7	65.9	62.1	60.0	59.1	58.9	58.8	58.8	58.8	58.7	58.5	58.1	57.5
34	75.0	71.7	65.9	62.1	60.0	59.1	58.9	58.8	58.8	58.8	58.7	58.5	58.1	57.5
35	75.0	71.7	65.9	62.1	60.0	59.1	58.9	58.8	58.8	58.8	58.7	58.5	58.1	57.5
36	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
37	75.0	71.7	65.9	62.1	60.0	59.1	58.9	58.8	58.8	58.8	58.7	58.5	58.1	57.5
38	75.0	71.7	65.9	62.1	60.0	59.1	58.9	58.8	58.8	58.8	58.7	58.5	58.1	57.5
39	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
40	75.0	71.7	65.9	62.1	60.0	59.1	58.9	58.8	58.8	58.8	58.7	58.5	58.1	57.5
41	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
42	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
43	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
44	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
45	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
46	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
47	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	18Cr-10Ni-Cb	Smls. & wld. fittings	SA-403	348H	S34809	...	...	75
2	18Cr-10Ni-Cb	Bar	SA-479	348H	S34809	...	...	75
3	18Cr-10Ni-Cb	Wld. pipe	SA-813	TP348H	S34809	...	...	75
4	18Cr-10Ni-Cb	Wld. pipe	SA-814	TP348H	S34809	...	...	75
5	18Cr-10Ni-Cb	Smls. tube	SA-213	TP347HFG	S34710	...	...	80
6	18Cr-10Ni-Ti	Smls. & wld. pipe	SA-312	TP321	S32100	...	$> \frac{3}{8}$	70
7	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321	S32100	...	$> \frac{3}{8}$	70
8	18Cr-10Ni-Ti	Smls. & wld. pipe	SA-312	TP321H	S32109	...	$> \frac{3}{16}$	70
9	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321H	S32109	...	$> \frac{3}{8}$	70
10	18Cr-10Ni-Ti	Forgings	SA-182	F321	S32100	...	> 5	70
11	18Cr-10Ni-Ti	Forgings	SA-965	F321	S32100	...	...	70
12	18Cr-10Ni-Ti	Forgings	SA-182	F321H	S32109	...	> 5	70
13	18Cr-10Ni-Ti	Forgings	SA-965	F321H	S32109	...	...	70
14	18Cr-10Ni-Ti	Forgings	SA-182	F321	S32100	...	≤ 5	75
15	18Cr-10Ni-Ti	Bolting	SA-193	B8T	S32100	1	...	75
16	18Cr-10Ni-Ti	Smls. tube	SA-213	TP321	S32100	...	...	75
17	18Cr-10Ni-Ti	Plate	SA-240	321	S32100	...	...	75
18	18Cr-10Ni-Ti	Wld. tube	SA-249	TP321	S32100	...	...	75
19	18Cr-10Ni-Ti	Smls. & wld. pipe	SA-312	TP321	S32100	...	$\leq \frac{3}{8}$	75
20	18Cr-10Ni-Ti	Bolting	SA-320	B8T	S32100	1	...	75
21	18Cr-10Ni-Ti	Bolting	SA-320	B8TA	S32100	1A	...	75
22	18Cr-10Ni-Ti	Wld. pipe	SA-358	321	S32100	1	...	75
23	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321	S32100	...	$\leq \frac{3}{8}$	75
24	18Cr-10Ni-Ti	Smls. & wld. fittings	SA-403	321	S32100	...	...	75
25	18Cr-10Ni-Ti	Wld. pipe	SA-409	TP321	S32100	...	...	75
26	18Cr-10Ni-Ti	Bar	SA-479	321	S32100	...	...	75
27	18Cr-10Ni-Ti	Wld. pipe	SA-813	TP321	S32100	...	...	75
28	18Cr-10Ni-Ti	Wld. pipe	SA-814	TP321	S32100	...	...	75
29	18Cr-10Ni-Ti	Bar	SA/JIS G4303	SUS321	...	...	...	75
30	18Cr-10Ni-Ti	Forgings	SA-182	F321H	S32109	...	≤ 5	75
31	18Cr-10Ni-Ti	Smls. tube	SA-213	TP321H	S32109	...	...	75
32	18Cr-10Ni-Ti	Plate	SA-240	321H	S32109	...	...	75
33	18Cr-10Ni-Ti	Wld. tube	SA-249	TP321H	S32109	...	...	75
34	18Cr-10Ni-Ti	Smls. & wld. pipe	SA-312	TP321H	S32109	...	$\leq \frac{3}{16}$	75
35	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321H	S32109	...	$\leq \frac{3}{8}$	75
36	18Cr-10Ni-Ti	Smls. & wld. fittings	SA-403	321H	S32109	...	...	75
37	18Cr-10Ni-Ti	Bar	SA-479	321H	S32109	...	...	75
38	18Cr-10Ni-Ti	Wld. pipe	SA-813	TP321H	S32109	...	...	75
39	18Cr-10Ni-Ti	Wld. pipe	SA-814	TP321H	S32109	...	...	75
40	18Cr-11Ni	Plate	SA-240	305	S30500	...	...	75
41	18Cr-13Ni-3Mo	Forgings	SA-182	F317L	S31703	...	> 5	65
42	18Cr-13Ni-3Mo	Forgings	SA-182	F317L	S31703	...	≤ 5	70
43	18Cr-13Ni-3Mo	Forgings	SA-182	F317	S31700	...	≤ 5	75
44	18Cr-13Ni-3Mo	Plate	SA-240	317	S31700	...	...	75
45	18Cr-13Ni-3Mo	Plate	SA-240	317L	S31703	...	...	75

2011a SECTION II, PART D (CUSTOMARY)

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
2	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
3	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
4	75.0	71.8	65.9	62.1	60.0	59.0	58.9	58.8	58.8	58.8	58.7	58.5	58.2	57.5
5	80.0	77.7	72.8	69.6	67.7	66.7	66.4	66.2	66.0	65.8	65.4	64.9	64.3	63.3
6	70.0	66.4	62.4	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	59.6
7	70.0	66.4	62.4	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	59.6
8	70.0	66.4	62.4	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	59.6
9	70.0	66.4	62.4	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	59.6
10	70.0	66.4	62.4	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	59.6
11	70.0	66.4	62.4	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	59.6
12	70.0	66.4	62.4	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	59.6
13	70.0	66.4	62.4	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	59.6
14	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
15	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
16	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
17	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
18	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
19	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
20	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
21	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
22	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
23	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
24	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
25	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
26	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
27	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
28	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
29	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
30	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
31	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
32	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
33	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
34	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
35	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
36	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
37	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
38	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
39	75.0	71.1	66.9	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	65.5	63.8
40	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
41	65.0	63.2	59.5	57.8	57.3	57.3	57.2	57.1	56.7	56.2	55.4	54.4	53.0	51.4
42	70.0	68.1	64.0	62.2	61.8	61.7	61.6	61.5	61.1	60.5	59.7	58.6	57.1	55.4
43	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
44	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
45	75.0	72.9	68.6	66.7	66.2	66.1	66.1	65.9	65.5	64.9	64.0	62.7	61.2	59.3

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	18Cr-13Ni-3Mo	Wld. tube	SA-249	TP317	S31700	...	...	75
2	18Cr-13Ni-3Mo	Wld. tube	SA-249	TP317L	S31703	...	...	75
3	18Cr-13Ni-3Mo	Smls. & wld. pipe	SA-312	TP317	S31700	...	...	75
4	18Cr-13Ni-3Mo	Smls. & wld. pipe	SA-312	TP317L	S31703	...	...	75
5	18Cr-13Ni-3Mo	Smls. & wld. fittings	SA-403	317	S31700	...	...	75
6	18Cr-13Ni-3Mo	Fittings	SA-403	317L	S31703	...	...	75
7	18Cr-15Ni-4Si	Forgings	SA-182	...	S30600	Solution ann.	...	78
8	18Cr-15Ni-4Si	Plate	SA-240	...	S30600	Solution ann.	≤ 2	78
9	18Cr-15Ni-4Si	Smls. & wld. pipe	SA-312	...	S30600	Solution ann.	...	78
10	18Cr-15Ni-4Si	Bar	SA-479	...	S30600	Solution ann.	≤ 4	78
11	18Cr-18Ni-2Si	Smls. tube	SA-213	XM-15	S38100	...	...	75
12	18Cr-18Ni-2Si	Plate	SA-240	XM-15	S38100	...	...	75
13	18Cr-18Ni-2Si	Wld. tube	SA-249	TPXM-15	S38100	...	...	75
14	18Cr-18Ni-2Si	Wld. pipe	SA-312	TPXM-15	S38100	...	...	75
15	18Cr-20Ni-5.5Si	Smls. tube	SA-213	...	S32615	Solution ann.	...	80
16	18Cr-20Ni-5.5Si	Plate	SA-240	...	S32615	Solution ann.	...	80
17	18Cr-20Ni-5.5Si	Smls. & wld. pipe	SA-312	...	S32615	Solution ann.	...	80
18	18Cr-20Ni-5.5Si	Bar	SA-479	...	S32615	Solution ann.	...	80
19	19Cr-9Ni-½Mo	Castings	SA-351	CF10	J92590	...	...	70
20	19Cr-9Ni-Mo-W	Bolting	SA-453	651	S63198	B	...	95
21	19Cr-9Ni-Mo-W	Bolting	SA-453	651	S63198	A	...	100
22	19Cr-9Ni-2Mo	Castings	SA-351	CF10M	...	...	...	70
23	19Cr-10Ni-3Mo	Castings	SA-351	CG8M	J93000	...	...	75
24	19Cr-15Ni-4Mo	Smls. tube	SA-213	...	S31725	...	...	75
25	19Cr-15Ni-4Mo	Plate	SA-240	...	S31725	...	...	75
26	19Cr-15Ni-4Mo	Wld. tube	SA-249	...	S31725	...	...	75
27	19Cr-15Ni-4Mo	Smls. & wld. pipe	SA-312	...	S31725	...	...	75
28	19Cr-15Ni-4Mo	Wld. pipe	SA-358	...	S31725	...	...	75
29	19Cr-15Ni-4Mo	Smls. pipe	SA-376	...	S31725	...	...	75
30	19Cr-15Ni-4Mo	Wld. pipe	SA-409	...	S31725	...	...	75
31	19Cr-15Ni-4Mo	Bar	SA-479	...	S31725	...	...	75
32	20Cr-10Ni	Bar	SA-479	ER308	S30880	...	...	75
33	20Cr-18Ni-6Mo	Castings	SA-351	CK3MCuN	J93254	...	...	80
34	20Cr-18Ni-6Mo	Forgings	SA-182	F44	S31254	...	...	94
35	20Cr-18Ni-6Mo	Wld. tube	SA-249	...	S31254	...	...	94
36	20Cr-18Ni-6Mo	Smls. & wld. pipe	SA-312	...	S31254	...	...	94
37	20Cr-18Ni-6Mo	Wld. pipe	SA-358	...	S31254	...	...	94
38	20Cr-18Ni-6Mo	Plate	SA-240	...	S31254	...	...	100
39	21Cr-6Ni-9Mn	Forgings	SA-182	FXM-11	S21904	...	...	90
40	21Cr-6Ni-9Mn	Smls. & wld. pipe	SA-312	TPXM-11	S21904	...	...	90
41	21Cr-6Ni-9Mn	Plate	SA-666	XM-11	S21904	...	...	90
42	21Cr-6Ni-9Mn	Forgings	SA-965	FXM-11	S21904	...	...	90

2011a SECTION II, PART D (CUSTOMARY)

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
2	75.0	72.9	68.6	66.7	66.2	66.1	66.1	65.9	65.5	64.9	64.0	62.7	61.2	59.3
3	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
4	75.0	72.9	68.6	66.7	66.2	66.1	66.1	65.9	65.5	64.9	64.0	62.7	61.2	59.3
5	75.0	75.0	72.9	71.9	71.8	71.8	71.8	71.8	71.5	70.8	69.7	68.3	66.5	64.3
6	75.0	72.9	68.6	66.7	66.2	66.1	66.1	65.9	65.5	64.9	64.0	62.7	61.2	59.3
7	78.0	74.6	68.6	...	...	...	...	...	...	...	...	...	...	...
8	78.0	74.6	68.6	...	...	...	...	...	...	...	...	...	...	...
9	78.0	74.6	68.6	...	...	...	...	...	...	...	...	...	...	...
10	78.0	74.6	68.6	...	...	...	...	...	...	...	...	...	...	...
11	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
12	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
13	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
14	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
15	80.0	79.6	76.0	73.6	...	...	...	...	...	...	...	...	...	...
16	80.0	79.6	76.0	73.6	...	...	...	...	...	...	...	...	...	...
17	80.0	79.6	76.0	73.6	...	...	...	...	...	...	...	...	...	...
18	80.0	79.6	76.0	73.6	...	...	...	...	...	...	...	...	...	...
19	70.0	66.4	62.1	60.1	59.4	59.3	59.2	59.1	58.8	58.4	57.7	56.8	55.6	54.0
20	95.0	93.7	88.4	85.1	83.2	82.2	81.8	81.3	80.7	79.9	78.8	77.3	75.4	73.0
21	100.0	98.6	93.0	89.6	87.6	86.5	86.1	85.6	84.9	84.1	82.9	81.4	79.4	76.8
22	70.0	69.9	68.2	67.7	67.4	66.6	66.0	65.3	64.5	63.7	62.8	61.9	61.0	60.0
23	75.0	72.8	68.8	66.8	66.1	66.0	66.0	66.0	65.9	65.5	65.0	64.0	62.7	60.8
24	75.0	72.7	68.5	66.6	66.1	66.1	66.1	65.9	65.6	64.9	64.0	62.8	61.2	59.2
25	75.0	72.7	68.5	66.6	66.1	66.1	66.1	65.9	65.6	64.9	64.0	62.8	61.2	59.2
26	75.0	72.7	68.5	66.6	66.1	66.1	66.1	65.9	65.6	64.9	64.0	62.8	61.2	59.2
27	75.0	72.7	68.5	66.6	66.1	66.1	66.1	65.9	65.6	64.9	64.0	62.8	61.2	59.2
28	75.0	72.7	68.5	66.6	66.1	66.1	66.1	65.9	65.6	64.9	64.0	62.8	61.2	59.2
29	75.0	72.7	68.5	66.6	66.1	66.1	66.1	65.9	65.6	64.9	64.0	62.8	61.2	59.2
30	75.0	72.7	68.5	66.6	66.1	66.1	66.1	65.9	65.6	64.9	64.0	62.8	61.2	59.2
31	75.0	72.7	68.5	66.6	66.1	66.1	66.1	65.9	65.6	64.9	64.0	62.8	61.2	59.2
32	75.0	71.0	66.2	64.0	63.4	63.4	63.4	63.4	63.3	62.8	62.0	60.8	59.3	57.4
33	80.0	80.0	76.0	72.5	70.0	68.4	68.0	67.7	67.4	67.0	66.4	...	...	...
34	94.0	94.0	89.4	85.2	82.2	80.4	79.9	79.5	79.2	78.7	78.0	...	...	...
35	94.0	94.0	89.4	85.2	82.2	80.4	79.9	79.5	79.2	78.7	78.0	...	...	...
36	94.0	94.0	89.4	85.2	82.2	80.4	79.9	79.5	79.2	78.7	78.0	...	...	...
37	94.0	94.0	89.4	85.2	82.2	80.4	79.9	79.5	79.2	78.7	78.0	...	...	...
38	100.0	100.0	95.1	90.6	87.5	85.6	85.0	84.6	84.2	83.3	83.0	...	...	...
39	90.0	90.0	84.1	79.7	76.9	75.3	74.6	74.0	73.2	72.3	71.1	69.6	67.8	65.7
40	90.0	90.0	84.1	79.7	76.9	75.3	74.6	74.0	73.2	72.3	71.1	69.6	67.8	65.7
41	90.0	90.0	84.1	79.7	76.9	75.3	74.6	74.0	73.2	72.3	71.1	69.6	67.8	65.7
42	90.0	90.0	84.1	79.7	76.9	75.3	74.6	74.0	73.2	72.3	71.1	69.6	67.8	65.7

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	21Cr-11Ni-N	Forgings	SA-182	F45	S30815	...	...	87
2	21Cr-11Ni-N	Smls. tube	SA-213	...	S30815	...	...	87
3	21Cr-11Ni-N	Plate	SA-240	...	S30815	...	...	87
4	21Cr-11Ni-N	Wld. tube	SA-249	...	S30815	...	...	87
5	21Cr-11Ni-N	Smls. & wld. pipe	SA-312	...	S30815	...	...	87
6	21Cr-11Ni-N	Bar	SA-479	...	S30815	...	...	87
7	22Cr-5Ni-3Mo-N	Forgings	SA-182	F51	S31803	...	...	90
8	22Cr-5Ni-3Mo-N	Plate	SA-240	...	S31803	...	...	90
9	22Cr-5Ni-3Mo-N	Bar	SA-479	...	S31803	...	...	90
10	22Cr-5Ni-3Mo-N	Smls. & wld. tube	SA-789	...	S31803	...	...	90
11	22Cr-5Ni-3Mo-N	Smls. & wld. pipe	SA-790	...	S31803	...	...	90
12	22Cr-5Ni-3Mo-N	Smls. & wld. fittings	SA-815	...	S31803	...	...	90
13	22Cr-13Ni-5Mn	Castings	SA-351	CG6MMN	J93790	...	...	85
14	22Cr-13Ni-5Mn	Forgings	SA-182	FXM-19	S20910	...	...	100
15	22Cr-13Ni-5Mn	Bolting	SA-193	B8R	S20910	Annealed	...	100
16	22Cr-13Ni-5Mn	Bolting	SA-193	B8RA	S20910	Annealed	...	100
17	22Cr-13Ni-5Mn	Smls. tube	SA-213	XM-19	S20910	...	...	100
18	22Cr-13Ni-5Mn	Plate	SA-240	XM-19	S20910	...	...	100
19	22Cr-13Ni-5Mn	Wld. tube	SA-249	TPXM-19	S20910	...	...	100
20	22Cr-13Ni-5Mn	Smls. & wld. pipe	SA-312	TPXM-19	S20910	...	...	100
21	22Cr-13Ni-5Mn	Wld. pipe	SA-358	XM-19	S20910	1	...	100
22	22Cr-13Ni-5Mn	Smls. & wld. fittings	SA-403	XM-19	S20910	...	...	100
23	22Cr-13Ni-5Mn	Bar	SA-479	XM-19	S20910	Annealed	...	100
24	22Cr-13Ni-5Mn	Bar	SA-479	XM-19	S20910	Hot rolled	$3 < t \leq 8$	100
25	22Cr-13Ni-5Mn	Wld. pipe	SA-813	TPXM-19	S20910	...	...	100
26	22Cr-13Ni-5Mn	Wld. pipe	SA-814	TPXM-19	S20910	...	...	100
27	22Cr-13Ni-5Mn	Forgings	SA-965	FXM-19	S20910	...	...	100
28	22Cr-13Ni-5Mn	Bar	SA-479	XM-19	S20910	Hot rolled	$2 < t \leq 3$	115
29	22Cr-13Ni-5Mn	Bar	SA-479	XM-19	S20910	Hot rolled	≤ 2	135
(10) 30	23Cr-4Ni-Mo-Cu-N	Plate	SA-240	...	S32304	...	...	87
31	23Cr-4Ni-Mo-Cu-N	Smls. & wld. tube	SA-789	...	S32304	...	> 1	87
32	23Cr-4Ni-Mo-Cu-N	Smls. & wld. pipe	SA-790	...	S32304	...	...	87
33	23Cr-4Ni-Mo-Cu-N	Smls. & wld. tube	SA-789	...	S32304	...	≤ 1	100
34	23Cr-12Ni	Smls. & wld. fittings	SA-403	309	S30900	...	...	75
35	23Cr-12Ni	Smls. tube	SA-213	TP309S	S30908	...	...	75
36	23Cr-12Ni	Plate	SA-240	309S	S30908	...	...	75
37	23Cr-12Ni	Wld. tube	SA-249	TP309S	S30908	...	...	75
38	23Cr-12Ni	Smls. & wld. pipe	SA-312	TP309S	S30908	...	...	75
39	23Cr-12Ni	Wld. pipe	SA-358	309S	S30908	1	...	75
40	23Cr-12Ni	Bar	SA-479	309S	S30908	...	...	75
41	23Cr-12Ni	Wld. pipe	SA-813	TP309S	S30908	...	...	75
42	23Cr-12Ni	Wld. pipe	SA-814	TP309S	S30908	...	...	75
43	23Cr-12Ni	Bar	SA/JIS G4303	SUS309S	...	...	...	75

2011a SECTION II, PART D (CUSTOMARY)

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	87.0	86.4	81.6	78.5	76.4	74.8	74.1	73.5	72.8	72.0	71.1	70.1	68.9	67.5
2	87.0	86.4	81.6	78.5	76.4	74.8	74.1	73.5	72.8	72.0	71.1	70.1	68.9	67.5
3	87.0	86.4	81.6	78.5	76.4	74.8	74.1	73.5	72.8	72.0	71.1	70.1	68.9	67.5
4	87.0	86.4	81.6	78.5	76.4	74.8	74.1	73.5	72.8	72.0	71.1	70.1	68.9	67.5
5	87.0	86.4	81.6	78.5	76.4	74.8	74.1	73.5	72.8	72.0	71.1	70.1	68.9	67.5
6	87.0	86.4	81.6	78.5	76.4	74.8	74.1	73.5	72.8	72.0	71.1	70.1	68.9	67.5
7	90.0	90.0	86.8	83.5	81.6	80.7	80.5	...	...	...	...	...	...	...
8	90.0	90.0	86.8	83.5	81.6	80.7	80.5	...	...	...	...	...	...	...
9	90.0	90.0	86.8	83.5	81.6	80.7	80.5	...	...	...	...	...	...	...
10	90.0	90.0	86.8	83.5	81.6	80.7	80.5	...	...	...	...	...	...	...
11	90.0	90.0	86.8	83.5	81.6	80.7	80.5	...	...	...	...	...	...	...
12	90.0	90.0	86.8	83.5	81.6	80.7	80.5	...	...	...	...	...	...	...
13	85.0	84.6	80.1	77.3	75.6	74.5	74.0	73.5	72.9	72.1	71.2	70.1	68.7	67.0
14	100.0	99.4	94.2	91.1	89.1	87.7	87.0	86.4	85.6	84.8	83.8	82.6	81.3	79.7
15	100.0	99.4	94.2	91.1	89.1	87.7	87.0	86.4	85.6	84.8	83.8	82.6	81.3	79.7
16	100.0	99.4	94.2	91.1	89.1	87.7	87.0	86.4	85.6	84.8	83.8	82.6	81.3	79.7
17	100.0	99.4	94.2	91.1	89.1	87.7	87.0	86.4	85.6	84.8	83.8	82.6	81.3	79.7
18	100.0	99.4	94.2	91.1	89.1	87.7	87.0	86.4	85.6	84.8	83.8	82.6	81.3	79.7
19	100.0	99.4	94.2	91.1	89.1	87.7	87.0	86.4	85.6	84.8	83.8	82.6	81.3	79.7
20	100.0	99.4	94.2	91.1	89.1	87.7	87.0	86.4	85.6	84.8	83.8	82.6	81.3	79.7
21	100.0	99.4	94.2	91.1	89.1	87.7	87.0	86.4	85.6	84.8	83.8	82.6	81.3	79.7
22	100.0	99.4	94.2	91.1	89.1	87.7	87.0	86.4	85.6	84.8	83.8	82.6	81.3	79.7
23	100.0	99.4	94.2	91.1	89.1	87.7	87.0	86.4	85.6	84.8	83.8	82.6	81.3	79.7
24	100.0	99.4	94.2	91.1	89.1	87.7	87.0	86.4	85.6	84.8	83.8	82.6	81.3	79.7
25	100.0	99.4	94.2	91.1	89.1	87.7	87.0	86.4	85.6	84.8	83.8	82.6	81.3	79.7
26	100.0	99.4	94.2	91.1	89.1	87.7	87.0	86.4	85.6	84.8	83.8	82.6	81.3	79.7
27	100.0	99.4	94.2	91.1	89.1	87.7	87.0	86.4	85.6	84.8	83.8	82.6	81.3	79.7
28	115.0	114.3	108.4	104.7	102.5	100.8	100.1	99.3	98.4	97.5	96.3	95.0	93.5	91.7
29	135.0	134.1	127.2	123.0	120.3	118.4	117.5	116.6	115.6	114.4	113.1	111.5	109.7	107.6
30	87.0	83.9	78.7	76.0	74.6	73.5	72.9	72.1	71.2	70.3	...	...	...	...
31	87.0	83.9	78.7	76.0	74.6	73.5	72.9	72.1	71.2	70.3	...	...	...	...
32	87.0	83.9	78.7	76.0	74.6	73.5	72.9	72.1	71.2	70.3	...	...	...	...
33	100.0	96.5	90.6	87.6	86.1	84.9	84.2	83.4	...	...	...	...	...	...
34	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
35	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
36	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
37	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
38	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
39	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
40	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
41	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
42	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
43	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2

(10)

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	23Cr-12Ni	Smls. tube	SA-213	TP309H	S30909	...	...	75
2	23Cr-12Ni	Plate	SA-240	309H	S30909	...	...	75
3	23Cr-12Ni	Wld. tube	SA-249	TP309H	S30909	...	...	75
4	23Cr-12Ni	Smls. & wld. pipe	SA-312	TP309H	S30909	...	...	75
5	23Cr-12Ni	Bar	SA-479	309H	S30909	...	...	75
6	23Cr-12Ni-Cb	Smls. tube	SA-213	TP309Cb	S30940	...	...	75
7	23Cr-12Ni-Cb	Plate	SA-240	309Cb	S30940	...	...	75
8	23Cr-12Ni-Cb	Wld. tube	SA-249	TP309Cb	S30940	...	...	75
9	23Cr-12Ni-Cb	Smls. & wld. pipe	SA-312	TP309Cb	S30940	...	...	75
10	23Cr-12Ni-Cb	Bar	SA-479	309Cb	S30940	...	...	75
11	23Cr-12Ni-Cb	Wld. pipe	SA-813	TP309Cb	S30940	...	...	75
12	23Cr-12Ni-Cb	Wld. pipe	SA-814	TP309Cb	S30940	...	...	75
13	24Cr-10Ni-4Mo-N	Castings	SA-995	2A	J93345	...	...	95
14	25Cr-4Ni-4Mo-Ti	Plate	SA-240	...	S44635	...	...	90
15	25Cr-4Ni-4Mo-Ti	Wld. tube	SA-268	...	S44635	...	...	90
16	25Cr-5Ni-3Mo-2Cu	Castings	SA-995	1B	J93372	...	...	100
17	25Cr-5Ni-3Mo-2Cu	Plate	SA-240	...	S32550	...	...	110
18	25Cr-5Ni-3Mo-2Cu	Bar	SA-479	...	S32550	...	...	110
19	25Cr-5Ni-3Mo-2Cu	Smls. & wld. tube	SA-789	...	S32550	...	...	110
20	25Cr-5Ni-3Mo-2Cu	Smls. & wld. pipe	SA-790	...	S32550	...	...	110
21	25Cr-6Ni-Mo-N	Plate	SA-240	...	S31200	...	...	100
22	25Cr-6.5Ni-3Mo-N	Smls. & wld. tube	SA-789	...	S31260	...	...	100
23	25Cr-6.5Ni-3Mo-N	Smls. & wld. pipe	SA-790	...	S31260	...	...	100
24	25Cr-6.5Ni-3Mo-N	Plate	SA-240	...	S31260	...	...	100
25	25Cr-7Ni-3Mo-W-Cu-N	Forgings	SA-182	F54	S39274	...	...	116
26	25Cr-7Ni-3Mo-W-Cu-N	Smls. & wld. tube	SA-789	...	S39274	...	...	116
27	25Cr-7Ni-3Mo-W-Cu-N	Smls. & wld. pipe	SA-790	...	S39274	...	...	116
28	25Cr-7Ni-4Mo-N	Forgings	SA-182	F53	S32750	...	...	116
29	25Cr-7Ni-4Mo-N	Plate	SA-240	...	S32750	...	...	116
30	25Cr-7Ni-4Mo-N	Smls. & wld. tube	SA-789	...	S32750	...	≤ 1	116
31	25Cr-7Ni-4Mo-N	Smls. & wld. pipe	SA-790	...	S32750	...	≤ 1	116
32	25Cr-12Ni	Castings	SA-351	CH8	J93400	...	...	65
33	25Cr-12Ni	Cast pipe	SA-451	CPH8	J93400	...	...	65
34	25Cr-12Ni	Castings	SA-351	CH20	J93402	...	...	70
35	25Cr-12Ni	Cast pipe	SA-451	CPH20	J93402	...	...	70
36	25Cr-20Ni	Castings	SA-351	CK20	J94202	...	...	65
37	25Cr-20Ni	Cast pipe	SA-451	CPK20	J94202	...	...	65
38	25Cr-20Ni	Forgings	SA-182	F310	S31000	...	≤ 5	75
39	25Cr-20Ni	Forgings	SA-965	F310	S31000	...	...	75
40	25Cr-20Ni	Smls. tube	SA-213	TP310S	S31008	...	...	75
41	25Cr-20Ni	Plate	SA-240	310S	S31008	...	...	75
42	25Cr-20Ni	Wld. tube	SA-249	TP310S	S31008	...	...	75
43	25Cr-20Ni	Smls. & wld. pipe	SA-312	TP310S	S31008	...	...	75

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
2	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
3	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
4	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
5	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
6	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
7	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
8	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
9	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
10	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
11	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
12	75.0	75.0	74.7	73.0	71.6	70.2	69.3	68.3	67.2	65.8	64.2	62.5	60.4	58.2
13	95.0	94.9	87.8	84.6	84.6	84.6	84.6	81.3	...	...	...	...	...	...
14	90.0	87.1	82.1	78.8	77.0	76.3	75.7	...	...	...	...	...	...	...
15	90.0	87.1	82.1	78.8	77.0	76.3	75.7	...	...	...	...	...	...	...
16	100.0	...	...	...	...	...	...	...	...	...	...	...	...	...
17	110.0	109.6	103.4	100.1	98.7	...	...	...	...	...	...	...	...	...
18	110.0	109.6	103.4	100.1	98.7	...	...	...	...	...	...	...	...	...
19	110.0	109.6	103.4	100.1	98.7	...	...	...	...	...	...	...	...	...
20	110.0	109.6	103.4	100.1	98.7	...	...	...	...	...	...	...	...	...
21	100.0	100.0	94.8	92.0	91.5	91.5	...	...	...	...	...	...	...	...
22	100.0	99.9	94.9	92.5	92.2	92.2	92.2	...	...	...	...	...	...	...
23	100.0	99.9	94.9	92.5	92.2	92.2	92.2	...	...	...	...	...	...	...
24	100.0	99.9	94.9	92.5	92.2	92.2	92.2	...	...	...	...	...	...	...
25	116.0	116.0	110.5	109.9	109.9	109.9	109.9	109.9	109.9	...	...	...	...	...
26	116.0	116.0	110.5	109.9	109.9	109.9	109.9	109.9	109.9	...	...	...	...	...
27	116.0	116.0	110.5	109.9	109.9	109.9	109.9	109.9	109.9	...	...	...	...	...
28	116.0	115.5	109.1	105.4	103.6	103.0	...	...	...	...	...	...	...	...
29	116.0	115.5	109.1	105.4	103.6	103.0	...	...	...	...	...	...	...	...
30	116.0	115.5	109.1	105.4	103.6	103.0	...	...	...	...	...	...	...	...
31	116.0	115.5	109.1	105.4	103.6	103.0	...	...	...	...	...	...	...	...
32	65.0	59.5	55.4	53.9	53.8	53.8	53.7	53.3	52.6	51.6	50.2	48.5	46.3	43.8
33	65.0	59.5	55.4	53.9	53.8	53.8	53.7	53.3	52.6	51.6	50.2	48.5	46.3	43.8
34	70.0	64.0	59.6	58.1	57.9	57.9	57.8	57.4	56.7	55.6	54.1	52.2	49.9	47.2
35	70.0	64.0	59.6	58.1	57.9	57.9	57.8	57.4	56.7	55.6	54.1	52.2	49.9	47.2
36	65.0	59.5	55.4	53.9	53.8	53.8	53.7	53.3	52.6	51.6	50.2	48.5	46.3	43.8
37	65.0	59.5	55.4	53.9	53.8	53.8	53.7	53.3	52.6	51.6	50.2	48.5	46.3	43.8
38	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
39	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
40	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
41	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
42	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
43	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Ferrous Materials (Cont'd)								
1	25Cr–20Ni	Wld. pipe	SA-358	310S	S31008	1	...	75
2	25Cr–20Ni	Smls. & wld. fittings	SA-403	310S	S31008	...	...	75
3	25Cr–20Ni	Bar	SA-479	310S	S31008	...	...	75
4	25Cr–20Ni	Wld. pipe	SA-813	TP310S	S31008	...	...	75
5	25Cr–20Ni	Wld. pipe	SA-814	TP310S	S31008	...	...	75
6	25Cr–20Ni	Bar	SA/JIS G4303	SUS310S	...	...	...	75
7	25Cr–20Ni	Smls. tube	SA-213	TP310H	S31009	...	...	75
8	25Cr–20Ni	Plate	SA-240	310H	S31009	...	...	75
9	25Cr–20Ni	Wld. tube	SA-249	TP310H	S31009	...	...	75
10	25Cr–20Ni	Smls. & wld. pipe	SA-312	TP310H	S31009	...	...	75
11	25Cr–20Ni	Bar	SA-479	310H	S31009	...	...	75
12	25Cr–20Ni–Cb	Smls. tube	SA-213	TP310Cb	S31040	...	...	75
13	25Cr–20Ni–Cb	Plate	SA-240	310Cb	S31040	...	...	75
14	25Cr–20Ni–Cb	Wld. tube	SA-249	TP310Cb	S31040	...	...	75
15	25Cr–20Ni–Cb	Smls. & wld. pipe	SA-312	TP310Cb	S31040	...	...	75
16	25Cr–20Ni–Cb	Bar	SA-479	310Cb	S31040	...	...	75
17	25Cr–20Ni–Cb	Wld. pipe	SA-813	TP310Cb	S31040	...	...	75
18	25Cr–20Ni–Cb	Wld. pipe	SA-814	TP310Cb	S31040	...	...	75
(10) 19	25Cr–20Ni–Cb–N	Smls. tube	SA-213	TP310HCbN	S31042	...	...	95
20	25Cr–22Ni–2Mo–N	Forgings	SA-182	F310MoLN	S31050	...	...	78
21	25Cr–22Ni–2Mo–N	Smls. tube	SA-213	TP310MoLN	S31050	...	0.250 < $t \leq 1.250$	78
22	25Cr–22Ni–2Mo–N	Wld. tube	SA-249	TP310MoLN	S31050	...	0.250 < $t \leq 1.250$	78
23	25Cr–22Ni–2Mo–N	Wld. pipe	SA-312	TP310MoLN	S31050	...	0.250 < $t \leq 1.250$	78
24	25Cr–22Ni–2Mo–N	Plate	SA-240	310MoLN	S31050	...	...	80
25	25Cr–22Ni–2Mo–N	Smls. tube	SA-213	TP310MoLN	S31050	...	≤ 0.250 , wall	84
26	25Cr–22Ni–2Mo–N	Wld. tube	SA-249	TP310MoLN	S31050	...	≤ 0.250 , wall	84
27	25Cr–22Ni–2Mo–N	Wld. pipe	SA-312	TP310MoLN	S31050	...	≤ 0.250 , wall	84
(10) 28	26Cr–4Ni–Mo	Plate	SA-240	329	S32900	...	...	90
(10) 29	26Cr–4Ni–Mo	Smls. & wld. tube	SA-789	...	S32900	...	...	90
(10) 30	26Cr–4Ni–Mo	Smls. & wld. pipe	SA-790	...	S32900	...	...	90
(10) 31	26Cr–4Ni–Mo–N	Plate	SA-240	...	S32950	...	...	100
(10) 32	26Cr–4Ni–Mo–N	Smls. & wld. tube	SA-789	...	S32950	...	...	100
(10) 33	26Cr–4Ni–Mo–N	Smls. & wld. pipe	SA-790	...	S32950	...	...	100
34	29Cr–6.5Ni–2Mo–N	Plate, sheet, strip	SA-240	...	S32906	...	≥ 0.40	109
35	29Cr–6.5Ni–2Mo–N	Bar	SA-479	...	S32906	...	...	109
36	29Cr–6.5Ni–2Mo–N	Smls. tube	SA-789	...	S32906	...	≥ 0.40	109
37	29Cr–6.5Ni–2Mo–N	Smls. pipe	SA-790	...	S32906	...	≥ 0.40	109
38	29Cr–6.5Ni–2Mo–N	Plate, sheet, strip	SA-240	...	S32906	...	< 0.40	116
39	29Cr–6.5Ni–2Mo–N	Smls. tube	SA-789	...	S32906	...	< 0.40	116
40	29Cr–6.5Ni–2Mo–N	Smls. pipe	SA-790	...	S32906	...	< 0.40	116

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)													
1	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
2	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
3	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
4	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
5	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
6	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
7	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
8	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
9	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
10	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
11	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
12	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
13	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
14	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
15	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
16	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
17	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
18	75.0	74.2	70.8	69.6	69.5	69.5	69.5	69.3	68.8	68.0	66.9	65.5	63.8	61.6
19	95.0	94.0	89.0	86.0	84.5	83.8	83.6	83.4	83.0	82.6	82.0	81.1	80.0	78.6 (10)
20	78.0	77.0	72.9	70.1	68.1	66.6	66.0	65.4	64.9	64.3	63.6	62.8	61.5	59.7
21	78.0	77.0	72.9	70.1	68.1	66.6	66.0	65.4	64.9	64.3	63.6	62.8	61.5	59.7
22	78.0	77.0	72.9	70.1	68.1	66.6	66.0	65.4	64.9	64.3	63.6	62.8	61.5	59.7
23	78.0	77.0	72.9	70.1	68.1	66.6	66.0	65.4	64.9	64.3	63.6	62.8	61.5	59.7
24	80.0	79.0	74.8	71.9	69.8	68.3	67.7	67.1	66.5	66.0	65.3	64.4	63.1	61.2
25	84.0	83.0	78.5	75.5	73.3	71.7	71.0	70.4	69.9	69.3	68.5	67.6	66.2	64.3
26	84.0	83.0	78.5	75.5	73.3	71.7	71.0	70.4	69.9	69.3	68.5	67.6	66.2	64.3
27	84.0	83.0	78.5	75.5	73.3	71.7	71.0	70.4	69.9	69.3	68.5	67.6	66.2	64.3
28	90.0	90.0	86.7	84.9	84.9	84.9	84.9	84.9	...	...	...	...	...	... (10)
29	90.0	90.0	86.7	84.9	84.9	84.9	84.9	84.9	...	...	...	...	...	... (10)
30	90.0	90.0	86.7	84.9	84.9	84.9	84.9	84.9	...	...	...	...	...	... (10)
31	100.0	99.7	94.6	92.5	92.5	92.5	92.5	92.5	...	...	...	...	...	... (10)
32	100.0	99.7	94.6	92.5	92.5	92.5	92.5	92.5	...	...	...	...	...	... (10)
33	100.0	99.7	94.6	92.5	92.5	92.5	92.5	92.5	...	...	...	...	...	... (10)
34	109.0	108.9	103.6	100.5	99.1	99.1	...	...	...	...	...	...	...	...
35	109.0	108.9	103.6	100.5	99.1	99.1	...	...	...	...	...	...	...	...
36	109.0	108.9	103.6	100.5	99.1	99.1	...	...	...	...	...	...	...	...
37	109.0	108.9	103.6	100.5	99.1	99.1	...	...	...	...	...	...	...	...
38	116.0	115.9	110.3	106.9	105.5	105.5	...	...	...	...	...	...	...	...
39	116.0	115.9	110.3	106.9	105.5	105.5	...	...	...	...	...	...	...	...
40	116.0	115.9	110.3	106.9	105.5	105.5	...	...	...	...	...	...	...	...

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Nonferrous Materials								
1	...	Rod	SB-187	...	C10200	060	...	28
2	...	Smls. tube	SB-75	...	C10200	060	...	30
3	...	Smls. pipe	SB-42	...	C10200	061	$\frac{1}{8} < \text{NPS} \leq 2$	30
4	...	Plate, sheet, strip	SB-152	...	C10200	H00	...	30
5	...	Plate, sheet, strip	SB-152	...	C10200	H01	...	30
6	...	Plate, sheet, strip	SB-152	...	C10200	H02	...	30
7	...	Plate, sheet, strip	SB-152	...	C10200	H03	...	30
8	...	Plate, sheet, strip	SB-152	...	C10200	H04	...	30
9	...	Plate, sheet, strip	SB-152	...	C10200	025	...	30
10	...	Smls. pipe	SB-42	...	C10200	H55	$2 < \text{NPS} \leq 12$	36
11	...	Smls. tube	SB-75	...	C10200	H55	...	36
12	...	Smls. cond. tube	SB-111	...	C10200	H55	< 3	36
13	...	Smls. U-bend tube	SB-395	...	C10200	H55	...	36
14	...	Smls. pipe	SB-42	...	C10200	H80	$\frac{1}{8} < \text{NPS} \leq 2$	45
15	...	Smls. tube	SB-75	...	C10200	H80	< 4	45
16	...	Smls. cond. tube	SB-111	...	C10200	H80	< 3	45
17	...	Plate, sheet, strip	SB-152	...	C10400	H00	...	30
18	...	Plate, sheet, strip	SB-152	...	C10400	H01	...	30
19	...	Plate, sheet, strip	SB-152	...	C10400	H02	...	30
20	...	Plate, sheet, strip	SB-152	...	C10400	H03	...	30
21	...	Plate, sheet, strip	SB-152	...	C10400	H04	...	30
22	...	Plate, sheet, strip	SB-152	...	C10400	025	...	30
23	...	Plate, sheet, strip	SB-152	...	C10500	H00	...	30
24	...	Plate, sheet, strip	SB-152	...	C10500	H01	...	30
25	...	Plate, sheet, strip	SB-152	...	C10500	H02	...	30
26	...	Plate, sheet, strip	SB-152	...	C10500	H03	...	30
27	...	Plate, sheet, strip	SB-152	...	C10500	H04	...	30
28	...	Plate, sheet, strip	SB-152	...	C10500	025	...	30
29	...	Plate, sheet, strip	SB-152	...	C10700	H00	...	30
30	...	Plate, sheet, strip	SB-152	...	C10700	H01	...	30
31	...	Plate, sheet, strip	SB-152	...	C10700	H02	...	30
32	...	Plate, sheet, strip	SB-152	...	C10700	H03	...	30
33	...	Plate, sheet, strip	SB-152	...	C10700	H04	...	30
34	...	Plate, sheet, strip	SB-152	...	C10700	025	...	30
35	...	Bar, rod	SB-187	...	C11000	H04	...	28
36	...	Bar, rod	SB-187	...	C11000	060	...	28
37	...	Plate, sheet, strip, bar	SB-152	...	C11000	H00	≤ 2	30
38	...	Plate, sheet, strip, bar	SB-152	...	C11000	H01	≤ 2	30
39	...	Plate, sheet, strip, bar	SB-152	...	C11000	H02	≤ 2	30
40	...	Plate, sheet, strip, bar	SB-152	...	C11000	H03	≤ 2	30
41	...	Plate, sheet, strip, bar	SB-152	...	C11000	H04	≤ 2	30
42	...	Plate, sheet, strip, bar	SB-152	...	C11000	025	≤ 2	30
43	...	Smls. tube	SB-75	...	C12000	050	...	30
44	...	Smls. tube	SB-75	...	C12000	060	...	30
45	...	Smls. pipe	SB-42	...	C12000	061	$\frac{1}{8} < \text{NPS} \leq 2$	30

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials													
1	28.0	25.4	23.4	22.1	...	...	...	...	...	...	...	...	...	...
2	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
3	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
4	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
5	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
6	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
7	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
8	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
9	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
10	36.0	36.0	34.9	32.9	...	...	...	...	...	...	...	...	...	...
11	36.0	36.0	34.9	32.9	...	...	...	...	...	...	...	...	...	...
12	36.0	36.0	34.9	32.9	...	...	...	...	...	...	...	...	...	...
13	36.0	36.0	34.9	32.9	...	...	...	...	...	...	...	...	...	...
14	45.0	45.0	43.9	38.2	...	...	...	...	...	...	...	...	...	...
15	45.0	45.0	43.9	38.2	...	...	...	...	...	...	...	...	...	...
16	45.0	45.0	43.9	38.2	...	...	...	...	...	...	...	...	...	...
17	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
18	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
19	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
20	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
21	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
22	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
23	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
24	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
25	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
26	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
27	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
28	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
29	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
30	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
31	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
32	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
33	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
34	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
35	28.0	25.4	23.4	22.1	...	...	...	...	...	...	...	...	...	...
36	28.0	25.4	23.4	22.1	...	...	...	...	...	...	...	...	...	...
37	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
38	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
39	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
40	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
41	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
42	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
43	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
44	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
45	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Nonferrous Materials (Cont'd)								
1	...	Smls. pipe	SB-42	...	C12000	H55	$2 < NPS \leq 12$	36
2	...	Smls. tube	SB-75	...	C12000	H55	...	36
3	...	Smls. cond. tube	SB-111	...	C12000	H55	< 3	36
4	...	Smls. U-bend tube	SB-395	...	C12000	H55	< 2	36
5	...	Smls. pipe	SB-42	...	C12000	H80	$\frac{1}{8} < NPS \leq 2$	45
6	...	Smls. tube	SB-75	...	C12000	H80	...	45
7	...	Smls. cond. tube	SB-111	...	C12000	H80	< 3	45
8	...	Smls. tube	SB-75	...	C12200	O50	...	30
9	...	Smls. tube	SB-75	...	C12200	O60	...	30
10	...	Smls. pipe	SB-42	...	C12200	O61	$\frac{1}{8} < t \leq 3$	30
11	...	Finned tube	SB-359	...	C12200	O61	...	30
12	...	Plate, sheet, strip	SB-152	...	C12200	H00	...	30
13	...	Plate, sheet, strip	SB-152	...	C12200	H01	...	30
14	...	Plate, sheet, strip	SB-152	...	C12200	H02	...	30
15	...	Plate, sheet, strip	SB-152	...	C12200	H03	...	30
16	...	Plate, sheet, strip	SB-152	...	C12200	H04	...	30
17	...	Plate, sheet, strip	SB-152	...	C12200	O25	...	30
18	...	Wld. cond. tube	SB-543	...	C12200	Light cold worked	...	32
19	...	Smls. pipe	SB-42	...	C12200	H55	$2 < t \leq 12$	36
20	...	Smls. tube	SB-75	...	C12200	H55	...	36
21	...	Smls. cond. tube	SB-111	...	C12200	H55	< 3	36
(a) 22	...	Finned tube	SB-359	...	C12200	H55	...	36
23	...	Smls. U-bend tube	SB-395	...	C12200	H55	< 2	36
24	...	Smls. pipe	SB-42	...	C12200	H80	$\frac{1}{8} < t \leq 2$	45
25	...	Smls. cond. tube	SB-75	...	C12200	H80	< 4	45
26	...	Smls. tube	SB-111	...	C12200	H80	< 3	45
(10) 27	...	Plate, sheet, strip, bar	SB-152	...	C12300	H00	...	30
(10) 28	...	Plate, sheet, strip, bar	SB-152	...	C12300	H01	...	30
(10) 29	...	Plate, sheet, strip, bar	SB-152	...	C12300	H02	...	30
(10) 30	...	Plate, sheet, strip, bar	SB-152	...	C12300	H03	...	30
(10) 31	...	Plate, sheet, strip, bar	SB-152	...	C12300	H04	...	30
32	...	Plate, sheet, strip, bar	SB-152	...	C12300	O25	...	30
33	...	Plate, sheet, strip	SB-152	...	C14200	O25	...	30
34	...	Smls. cond. tube	SB-111	...	C14200	H55	< 3	36
35	...	Smls. U-bend tube	SB-395	...	C14200	H55	...	36
36	...	Smls. cond. tube	SB-111	...	C14200	H80	< 3	45
37	...	Smls. cond. tube	SB-111	...	C19200	O61	< 3	38
38	...	Smls. U-bend tube	SB-395	...	C19200	O61	...	38
39	...	Wld. cond. tube	SB-543	...	C19400	Annealed	...	45
40	...	Wld. cond. tube	SB-543	...	C19400	Light cold worked	...	45
41	...	Smls. cond. tube	SB-111	...	C60800	O61	...	50
42	...	Smls. U-bend tube	SB-395	...	C60800	O61	...	50

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)													
1	36.0	36.0	34.9	32.9	...	...	...	...	...	...	...	...	...	...
2	36.0	36.0	34.9	32.9	...	...	...	...	...	...	...	...	...	...
3	36.0	36.0	34.9	32.9	...	...	...	...	...	...	...	...	...	...
4	36.0	36.0	34.9	32.9	...	...	...	...	...	...	...	...	...	...
5	45.0	45.0	43.9	38.2	...	...	...	...	...	...	...	...	...	...
6	45.0	45.0	43.9	38.2	...	...	...	...	...	...	...	...	...	...
7	45.0	45.0	43.9	38.2	...	...	...	...	...	...	...	...	...	...
8	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
9	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
10	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
11	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
12	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
13	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
14	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
15	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
16	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
17	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
18	32.0	32.0	31.0	29.3	...	...	...	...	...	...	...	...	...	...
19	36.0	36.0	34.9	32.9	...	...	...	...	...	...	...	...	...	...
20	36.0	36.0	34.9	32.9	...	...	...	...	...	...	...	...	...	...
21	36.0	36.0	34.9	32.9	...	...	...	...	...	...	...	...	...	...
22	36.0	36.0	34.9	32.9	...	...	...	...	...	...	...	...	...	...
23	36.0	36.0	34.9	32.9	...	...	...	...	...	...	...	...	...	...
24	45.0	45.0	43.9	38.2	...	...	...	...	...	...	...	...	...	...
25	45.0	45.0	43.9	38.2	...	...	...	...	...	...	...	...	...	...
26	45.0	45.0	43.9	38.2	...	...	...	...	...	...	...	...	...	...
27	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
28	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
29	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
30	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
31	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
32	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
33	30.0	27.2	25.1	23.7	...	...	...	...	...	...	...	...	...	...
34	36.0	36.0	34.9	32.9	...	...	...	...	...	...	...	...	...	...
35	36.0	36.0	34.9	32.9	...	...	...	...	...	...	...	...	...	...
36	45.0	45.0	43.9	38.2	...	...	...	...	...	...	...	...	...	...
37	38.0	35.9	32.6	29.7	...	...	...	...	...	...	...	...	...	...
38	38.0	35.9	32.6	29.7	...	...	...	...	...	...	...	...	...	...
39	45.0	45.0	41.7	38.6	...	...	...	...	...	...	...	...	...	...
40	45.0	45.0	41.7	38.6	...	...	...	...	...	...	...	...	...	...
41	50.0	50.0	50.0	47.3	38.5	...	...	...	...	...	...	...	...	...
42	50.0	50.0	50.0	47.3	38.5	...	...	...	...	...	...	...	...	...

(a)

(10)

(10)

(10)

(10)

(10)

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Nonferrous Materials (Cont'd)								
1	...	Plate, sheet	SB-169	...	C61400	025 or 060	$2 < t \leq 5$	65
2	...	Plate	SB-171	...	C61400	025	$2 < t \leq 5$	65
3	...	Plate, sheet	SB-169	...	C61400	025 or 060	$\frac{1}{2} < t \leq 2$	70
4	...	Plate	SB-171	...	C61400	025	≤ 2	70
5	...	Plate, sheet	SB-169	...	C61400	025 or 060	$\leq \frac{1}{2}$	72
6	...	Plate	SB-171	...	C63000	025	$3.5 < t \leq 5$	80
7	...	Plate	SB-171	...	C63000	025	$2 < t \leq 3.5$	85
8	...	Plate	SB-171	...	C63000	025	≤ 2	90
9	...	Forgings	SB-283	...	C64200	M10	$> 1\frac{1}{2}$	68
10	...	Forgings	SB-283	...	C64200	M10	$\leq 1\frac{1}{2}$	70
11	...	Plate, sheet	SB-96	...	C65500	061	≤ 2	50
12	...	Smls. pipe & tube	SB-466	...	C70600	060	...	38
13	...	Wld. pipe	SB-467	...	C70600	W061	$> 4\frac{1}{2}$	38
14	...	Bar, rod	SB-151	...	C70600	060	...	38
15	...	Plate	SB-171	...	C70600	M20	...	40
16	...	Plate, sheet	SB-171	...	C70600	M20	≤ 2.5	40
17	...	Plate	SB-171	...	C70600	025	...	40
18	...	Plate, sheet	SB-171	...	C70600	025	≤ 2.5	40
19	...	Smls. cond. tube	SB-111	...	C70600	061	...	40
20	...	Finned tube	SB-359	...	C70600	061	...	40
21	...	Smls. U-bend tube	SB-395	...	C70600	061	...	40
22	...	Wld. pipe	SB-467	...	C70600	W061	$\leq 4\frac{1}{2}$	40
23	...	Wld. tube	SB-543	...	C70600	W061	...	40
24	...	Finned wld. tube	SB-956	...	C70600	W061	...	40
25	...	Wld. pipe	SB-467	...	C70600	W061	$\leq 4\frac{1}{2}$	45
26	...	Smls. tube	SB-111	...	C70600	H55	...	45
27	...	Wld. tube	SB-543	...	C70600	WC55	...	45
28	...	Finned wld. tube	SB-956	...	C70600	WC55	...	45
29	...	Wld. pipe	SB-467	...	C70600	Wld. fr. cold rld. strip	$\leq 4\frac{1}{2}$	54
30	...	Plate, sheet	SB-171	...	C71500	025	$2.5 < t \leq 5$	45
31	...	Plate, sheet	SB-171	...	C71500	025	≤ 2.5	50
32	...	Smls. cond. tube	SB-111	...	C71500	061	...	52
33	...	Wld. tube	SB-543	...	C71500	W061	...	52
34	...	Finned wld. tube	SB-956	...	C71500	W061	...	52
35	...	Smls. cond. tube	SB-111	...	C71500	HR50	...	72
36	...	Castings	SB-148	...	C95200	M01	...	65
37	...	Castings	SB-271	...	C95200	M02	...	65
38	...	Castings	SB-505	...	C95200	M07	...	68
39	...	Castings	SB-148	...	C95400	M01	...	75
40	...	Castings	SB-271	...	C95400	M02	...	75
41	99Ni	Plate, sheet, strip	SB-162	...	N02200	As rolled	...	55
42	99Ni	Smls. pipe & tube	SB-161	...	N02200	Stress rel.	...	65
43	99Ni	Smls. tube	SB-163	...	N02200	Stress rel.	...	65

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)													
1	65.0	65.0	65.0	63.7	59.4	...	...	...	...	...	...	...	...	...
2	65.0	65.0	65.0	63.7	59.4	...	...	...	...	...	...	...	...	...
3	70.0	70.0	70.0	68.6	63.9	...	...	...	...	...	...	...	...	...
4	70.0	70.0	70.0	68.6	63.9	...	...	...	...	...	...	...	...	...
5	72.0	72.0	72.0	70.6	65.8	...	...	...	...	...	...	...	...	...
6	80.0	80.0	80.0	80.0	78.9	64.0	48.4	25.4	...	...	...	...	...	...
7	85.0	85.0	85.0	85.0	83.9	68.0	51.4	27.0	...	...	...	...	...	...
8	90.0	90.0	90.0	90.0	88.8	72.0	54.4	28.6	...	...	...	...	...	...
9	68.0	...	...	...	...	...	...	...	...	...	...	...	...	...
10	70.0	...	...	...	...	...	...	...	...	...	...	...	...	...
11	50.0	50.0	50.0	47.0	43.3	...	...	...	...	...	...	...	...	...
12	38.0	37.6	34.7	32.6	31.4	30.9	...	...	...	...	...	...	...	...
13	38.0	37.6	34.7	32.6	31.4	30.9	...	...	...	...	...	...	...	...
14	38.0	37.6	34.7	32.6	31.4	30.9	...	...	...	...	...	...	...	...
15	40.0	39.6	36.5	34.3	33.0	32.6	...	...	...	...	...	...	...	...
16	40.0	39.6	36.5	34.3	33.0	32.6	...	...	...	...	...	...	...	...
17	40.0	39.6	36.5	34.3	33.0	32.6	...	...	...	...	...	...	...	...
18	40.0	39.6	36.5	34.3	33.0	32.6	...	...	...	...	...	...	...	...
19	40.0	39.6	36.5	34.3	33.0	32.6	...	...	...	...	...	...	...	...
20	40.0	39.6	36.5	34.3	33.0	32.6	...	...	...	...	...	...	...	...
21	40.0	39.6	36.5	34.3	33.0	32.6	...	...	...	...	...	...	...	...
22	40.0	39.6	36.5	34.3	33.0	32.6	...	...	...	...	...	...	...	...
23	40.0	39.6	36.5	34.3	33.0	32.6	...	...	...	...	...	...	...	...
24	40.0	39.6	36.5	34.3	33.0	32.6	...	...	...	...	...	...	...	...
25	45.0	44.5	41.1	38.6	37.1	36.6	...	...	...	...	...	...	...	...
26	45.0	44.5	41.1	38.6	37.1	36.6	...	...	...	...	...	...	...	...
27	45.0	44.5	41.1	38.6	37.1	36.6	...	...	...	...	...	...	...	...
28	45.0	44.5	41.1	38.6	37.1	36.6	...	...	...	...	...	...	...	...
29	54.0	53.4	49.3	46.3	44.6	44.0	...	...	...	...	...	...	...	...
30	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	...	...	...	...	...	...
31	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	...	...	...	...	...	...
32	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	...	...	...	...	...	...
33	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	...	...	...	...	...	...
34	52.0	52.0	52.0	52.0	52.0	52.0	52.0	52.0	...	...	...	...	...	...
35	72.0	72.0	72.0	68.9	66.1	64.6	64.0	62.8	60.2	...	...	...	...	...
36	65.0	65.0	65.0	62.1	56.5	48.6	...	...	...	...	...	...	...	...
37	65.0	65.0	65.0	62.1	56.5	48.6	...	...	...	...	...	...	...	...
38	68.0	68.0	68.0	65.0	59.2	50.9	...	...	...	...	...	...	...	...
39	75.0	75.0	75.0	75.0	75.0	...	...	...	...	...	...	...	...	...
40	75.0	75.0	75.0	75.0	75.0	...	...	...	...	...	...	...	...	...
41	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	...	...	...
42	65.0	65.0	65.0	65.0	64.1	61.8	59.8	...	...	...	...	...	...	...
43	65.0	65.0	65.0	65.0	64.1	61.8	59.8	...	...	...	...	...	...	...

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Nonferrous Materials (Cont'd)								
1	99Ni–Low C	Smls. pipe & tube	SB-161	...	N02201	Annealed	> 5 O.D.	50
2	99Ni–Low C	Smls. & wld. fittings	SB-366	...	N02201	Annealed	...	50
3	99Ni–Low C	Bar, rod	SB-160	...	N02201	Hot rolled/ann.	...	50
4	99Ni–Low C	Smls. pipe & tube	SB-161	...	N02201	Annealed	≤ 5 O.D.	50
5	99Ni–Low C	Smls. tube	SB-163	...	N02201	Annealed	...	50
6	99Ni–Low C	Plate, sheet, strip	SB-162	...	N02201	Hot rolled/ann.	...	50
7	67Ni–30Cu	Bar	SB-164	...	N04400	Annealed	...	70
8	67Ni–30Cu	Smls. pipe & tube	SB-165	...	N04400	Annealed	> 5 O.D.	70
9	67Ni–30Cu	Forgings	SB-564	...	N04400	Annealed	...	70
10	67Ni–30Cu	Plate	SB-127	...	N04400	Annealed	...	70
11	67Ni–30Cu	Smls. tube	SB-163	...	N04400	Annealed	≤ 3	70
12	67Ni–30Cu	Smls. pipe & tube	SB-165	...	N04400	Annealed	≤ 5 O.D.	70
13	67Ni–30Cu	Smls. & wld. fittings	SB-366	...	N04400	Annealed	...	70
14	67Ni–30Cu	Bar	SB-164	...	N04400	Hot worked	...	75
15	67Ni–30Cu	Plate	SB-127	...	N04400	As rolled	...	75
16	67Ni–30Cu	Bar, rod	SB-164	...	N04400	Hot worked	...	75
17	67Ni–30Cu	Smls. tube	SB-163	...	N04400	Stress rel.	...	85
18	67Ni–30Cu	Smls. pipe & tube	SB-165	...	N04400	Stress rel.	...	85
19	67Ni–30Cu–S	Bar	SB-164	...	N04405	Annealed	...	70
20	67Ni–30Cu–S	Bar	SB-164	...	N04405	Hot worked	...	75
21	67Ni–28Cu–3Al	Bolting	SF-468	...	N05500	Ann./aged	0.250–1.500	130
22	47Ni–22Cr–9Mo–18Fe	Plate	SB-435	...	N06002	Annealed	> $\frac{3}{16}$	95
23	47Ni–22Cr–9Mo–18Fe	Sheet	SB-435	...	N06002	Solution ann.	≤ $\frac{3}{16}$	95
24	47Ni–22Cr–9Mo–18Fe	Rod	SB-572	...	N06002	Annealed	...	95
25	47Ni–22Cr–9Mo–18Fe	Smls. & wld. fittings	SB-366	...	N06002	Annealed	...	100
26	47Ni–22Cr–9Mo–18Fe	Sheet	SB-435	...	N06002	Annealed	$\frac{1}{16} < t \leq \frac{3}{16}$	100
27	47Ni–22Cr–9Mo–18Fe	Wld. pipe	SB-619	...	N06002	Solution ann.	...	100
28	47Ni–22Cr–9Mo–18Fe	Smls. pipe & tube	SB-622	...	N06002	Solution ann.	...	100
29	47Ni–22Cr–9Mo–18Fe	Wld. tube	SB-626	...	N06002	Solution ann.	...	100
30	47Ni–22Cr–19Fe–6Mo	Rod	SB-581	...	N06007	Solution ann.	> $\frac{3}{4}$	85
31	47Ni–22Cr–19Fe–6Mo	Plate, sheet, strip	SB-582	...	N06007	Solution ann.	> $\frac{3}{4}$	85
32	47Ni–22Cr–19Fe–6Mo	Smls. & wld. fittings	SB-366	...	N06007	Annealed	...	90
33	47Ni–22Cr–19Fe–6Mo	Rod	SB-581	...	N06007	Solution ann.	≤ $\frac{3}{4}$	90
34	47Ni–22Cr–19Fe–6Mo	Plate, sheet, strip	SB-582	...	N06007	Solution ann.	≤ $\frac{3}{4}$	90
35	47Ni–22Cr–19Fe–6Mo	Wld. pipe	SB-619	...	N06007	Solution ann.	...	90
36	47Ni–22Cr–19Fe–6Mo	Smls. pipe & tube	SB-622	...	N06007	Solution ann.	...	90
37	47Ni–22Cr–19Fe–6Mo	Wld. tube	SB-626	...	N06007	Solution ann.	...	90
38	55Ni–21Cr–13.5Mo	Smls. & wld. fittings	SB-366	...	N06022	Solution ann.	...	100
39	55Ni–21Cr–13.5Mo	Forgings	SB-462	...	N06022	Solution ann.	...	100
40	55Ni–21Cr–13.5Mo	Forgings	SB-564	...	N06022	Solution ann.	...	100
41	55Ni–21Cr–13.5Mo	Rod	SB-574	...	N06022	Solution ann.	...	100
42	55Ni–21Cr–13.5Mo	Plate, sheet, strip	SB-575	...	N06022	Solution ann.	...	100
43	55Ni–21Cr–13.5Mo	Wld. pipe	SB-619	...	N06022	Solution ann.	...	100
44	55Ni–21Cr–13.5Mo	Smls. pipe & tube	SB-622	...	N06022	Solution ann.	...	100
45	55Ni–21Cr–13.5Mo	Wld. tube	SB-626	...	N06022	Solution ann.	...	100

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)													
1	50.0	50.0	50.0	49.8	47.8	45.6	44.4	43.2	42.2	41.3	40.5	40.0	39.6	39.5
2	50.0	50.0	50.0	49.8	47.8	45.6	44.4	43.2	42.2	41.3	40.5	40.0	39.6	39.5
3	50.0	50.0	50.0	49.8	47.8	45.6	44.4	43.2	42.2	41.3	40.5	40.0	39.6	39.5
4	50.0	50.0	50.0	49.8	47.8	45.6	44.4	43.2	42.2	41.3	40.5	40.0	39.6	39.5
5	50.0	50.0	50.0	49.8	47.8	45.6	44.4	43.2	42.2	41.3	40.5	40.0	39.6	39.5
6	50.0	50.0	50.0	49.8	47.8	45.6	44.4	43.2	42.2	41.3	40.5	40.0	39.6	39.5
7	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.7	67.3	64.1	60.3	56.4	52.9	50.5
8	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.7	67.3	64.1	60.3	56.4	52.9	50.5
9	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.7	67.3	64.1	60.3	56.4	52.9	50.5
10	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.7	67.3	64.1	60.3	56.4	52.9	50.5
11	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.7	67.3	64.1	60.3	56.4	52.9	50.5
12	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.7	67.3	64.1	60.3	56.4	52.9	50.5
13	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.7	67.3	64.1	60.3	56.4	52.9	50.5
14	75.0	75.0	75.0	75.0	75.0	75.0	74.9	72.3	69.0	65.1	60.8	56.6	53.1	50.8
15	75.0	75.0	75.0	75.0	75.0	75.0	74.9	72.3	69.0	65.1	60.8	56.6	53.1	50.8
16	75.0	75.0	75.0	75.0	75.0	75.0	74.9	72.3	69.0	65.1	60.8	56.6	53.1	50.8
17	85.0	85.0	85.0	84.9	84.9	83.7	82.2	79.9	76.8	72.9	68.6	64.2	60.2	57.5
18	85.0	85.0	85.0	84.9	84.9	83.7	82.2	79.9	76.8	72.9	68.6	64.2	60.2	57.5
19	70.0	70.0	70.0	70.0	70.0	70.0	70.0	69.7	67.3	64.1	60.3	56.4	52.9	50.5
20	75.0	75.0	75.0	75.0	75.0	75.0	74.9	72.3	69.0	65.1	60.8	56.6	53.1	50.8
21	130.0	130.0	130.0	130.0	130.0	129.7	128.1	126.3	...	...	...	...	...	...
22	95.0	95.0	93.8	91.4	89.0	86.4	85.1	83.7	82.5	81.3	80.2	79.3	78.6	78.1
23	95.0	95.0	93.8	91.4	89.0	86.4	85.1	83.7	82.5	81.3	80.2	79.3	78.6	78.1
24	95.0	95.0	93.8	91.4	89.0	86.4	85.1	83.7	82.5	81.3	80.2	79.3	78.6	78.1
25	100.0	100.0	98.8	96.3	93.7	91.0	89.6	88.2	86.8	85.6	84.5	83.5	82.8	82.2
26	100.0	100.0	98.8	96.3	93.7	91.0	89.6	88.2	86.8	85.6	84.5	83.5	82.8	82.2
27	100.0	100.0	98.8	96.3	93.7	91.0	89.6	88.2	86.8	85.6	84.5	83.5	82.8	82.2
28	100.0	100.0	98.8	96.3	93.7	91.0	89.6	88.2	86.8	85.6	84.5	83.5	82.8	82.2
29	100.0	100.0	98.8	96.3	93.7	91.0	89.6	88.2	86.8	85.6	84.5	83.5	82.8	82.2
30	85.0	85.0	83.7	82.7	81.4	79.8	79.0	78.3	77.7	77.2	76.5	75.7	74.1	71.5
31	85.0	85.0	83.7	82.7	81.4	79.8	79.0	78.3	77.7	77.2	76.5	75.7	74.1	71.5
32	90.0	90.0	88.6	87.6	86.2	84.5	83.7	82.9	82.3	81.7	81.1	80.1	78.5	75.7
33	90.0	90.0	88.6	87.6	86.2	84.5	83.7	82.9	82.3	81.7	81.1	80.1	78.5	75.7
34	90.0	90.0	88.6	87.6	86.2	84.5	83.7	82.9	82.3	81.7	81.1	80.1	78.5	75.7
35	90.0	90.0	88.6	87.6	86.2	84.5	83.7	82.9	82.3	81.7	81.1	80.1	78.5	75.7
36	90.0	90.0	88.6	87.6	86.2	84.5	83.7	82.9	82.3	81.7	81.1	80.1	78.5	75.7
37	90.0	90.0	88.6	87.6	86.2	84.5	83.7	82.9	82.3	81.7	81.1	80.1	78.5	75.7
38	100.0	100.0	98.5	95.3	92.9	91.1	90.4	89.7	89.1	88.4	87.8	87.1	86.3	85.4
39	100.0	100.0	98.5	95.3	92.9	91.1	90.4	89.7	89.1	88.4	87.8	87.1	86.3	85.4
40	100.0	100.0	98.5	95.3	92.9	91.1	90.4	89.7	89.1	88.4	87.8	87.1	86.3	85.4
41	100.0	100.0	98.5	95.3	92.9	91.1	90.4	89.7	89.1	88.4	87.8	87.1	86.3	85.4
42	100.0	100.0	98.5	95.3	92.9	91.1	90.4	89.7	89.1	88.4	87.8	87.1	86.3	85.4
43	100.0	100.0	98.5	95.3	92.9	91.1	90.4	89.7	89.1	88.4	87.8	87.1	86.3	85.4
44	100.0	100.0	98.5	95.3	92.9	91.1	90.4	89.7	89.1	88.4	87.8	87.1	86.3	85.4
45	100.0	100.0	98.5	95.3	92.9	91.1	90.4	89.7	89.1	88.4	87.8	87.1	86.3	85.4

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Nonferrous Materials (Cont'd)								
1	40Ni-29Cr-15Fe-5Mo	Smls. & wld. fittings	SB-366	...	N06030	Solution ann.	...	85
2	40Ni-29Cr-15Fe-5Mo	Forgings	SB-462	...	N06030	Solution ann.	...	85
3	40Ni-29Cr-15Fe-5Mo	Rod	SB-581	...	N06030	Solution ann.	...	85
4	40Ni-29Cr-15Fe-5Mo	Plate, sheet, strip	SB-582	...	N06030	Solution ann.	...	85
5	40Ni-29Cr-15Fe-5Mo	Wld. pipe	SB-619	...	N06030	Solution ann.	...	85
6	40Ni-29Cr-15Fe-5Mo	Smls. pipe & tube	SB-622	...	N06030	Solution ann.	...	85
7	40Ni-29Cr-15Fe-5Mo	Wld. tube	SB-626	...	N06030	Solution ann.	...	85
8	58Ni-33Cr-8Mo	Smls. & wld. fittings	SB-366	...	N06035	Solution ann.	...	85
9	58Ni-33Cr-8Mo	Forgings	SB-462	...	N06035	Solution ann.	...	85
10	58Ni-33Cr-8Mo	Forgings	SB-564	...	N06035	Solution ann.	...	85
11	58Ni-33Cr-8Mo	Rod	SB-574	...	N06035	Solution ann.	...	85
12	58Ni-33Cr-8Mo	Plate, sheet, strip	SB-575	...	N06035	Solution ann.	...	85
13	58Ni-33Cr-8Mo	Wld. pipe	SB-619	...	N06035	Solution ann.	...	85
14	58Ni-33Cr-8Mo	Smls. pipe & tube	SB-622	...	N06035	Solution ann.	...	85
15	58Ni-33Cr-8Mo	Wld. tube	SB-626	...	N06035	Solution ann.	...	85
16	46Ni-27Cr-23Fe-2.75Si	Rod	SB-166	...	N06045	...	...	90
17	46Ni-27Cr-23Fe-2.75Si	Smls. pipe & tube	SB-167	...	N06045	...	...	90
18	46Ni-27Cr-23Fe-2.75Si	Plate, sheet, strip	SB-168	...	N06045	...	...	90
19	46Ni-27Cr-23Fe-2.75Si	Smls. & wld. fittings	SB-366	...	N06045	...	...	90
20	46Ni-27Cr-23Fe-2.75Si	Wld. tube	SB-516	...	N06045	...	...	90
21	46Ni-27Cr-23Fe-2.75Si	Wld. pipe	SB-517	...	N06045	...	...	90
22	46Ni-27Cr-23Fe-2.75Si	Forgings	SB-564	...	N06045	...	...	90
23	59Ni-23Cr-16Mo	Fittings	SB-366	CR5923	N06059	Annealed	...	100
24	59Ni-23Cr-16Mo	Fittings	SB-366	WP5923	N06059	Annealed	...	100
25	59Ni-23Cr-16Mo	Wld. fittings	SB-366	WP5923W	N06059	Annealed	...	100
26	59Ni-23Cr-16Mo	Fittings	SB-366	WP5923WX	N06059	Annealed	...	100
27	59Ni-23Cr-16Mo	Forgings	SB-564	...	N06059	Solution ann.	...	100
28	59Ni-23Cr-16Mo	Rod	SB-574	...	N06059	Solution ann.	...	100
29	59Ni-23Cr-16Mo	Plate, sheet, strip	SB-575	...	N06059	Solution ann.	...	100
30	59Ni-23Cr-16Mo	Wld. pipe	SB-619	...	N06059	Solution ann.	...	100
31	59Ni-23Cr-16Mo	Smls. pipe & tube	SB-622	...	N06059	Solution ann.	...	100
32	59Ni-23Cr-16Mo	Wld. tube	SB-626	...	N06059	Solution ann.	...	100
33	59Ni-23Cr-16Mo-1.6Cu	Fittings	SB-366	...	N06200	Solution ann.	...	100
34	59Ni-23Cr-16Mo-1.6Cu	Forgings	SB-462	...	N06200	Solution ann.	...	100
35	59Ni-23Cr-16Mo-1.6Cu	Forgings	SB-564	...	N06200	Solution ann.	...	100
36	59Ni-23Cr-16Mo-1.6Cu	Rod	SB-574	...	N06200	Solution ann.	...	100
37	59Ni-23Cr-16Mo-1.6Cu	Plate, sheet, strip	SB-575	...	N06200	Solution ann.	...	100
38	59Ni-23Cr-16Mo-1.6Cu	Wld. pipe	SB-619	...	N06200	Solution ann.	...	100
39	59Ni-23Cr-16Mo-1.6Cu	Smls. pipe & tube	SB-622	...	N06200	Solution ann.	...	100
40	59Ni-23Cr-16Mo-1.6Cu	Wld. tube	SB-626	...	N06200	Solution ann.	...	100
41	60Ni-19Cr-19Mo-1.8Ta	Smls. & wld. fittings	SB-366	...	N06210	Solution ann.	...	100
42	60Ni-19Cr-19Mo-1.8Ta	Forgings	SB-564	...	N06210	Solution ann.	...	100
43	60Ni-19Cr-19Mo-1.8Ta	Rod	SB-574	...	N06210	Solution ann.	...	100
44	60Ni-19Cr-19Mo-1.8Ta	Plate, sheet, strip	SB-575	...	N06210	Solution ann.	...	100

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)													
1	85.0	85.0	81.5	78.8	76.7	75.0	74.3	73.6	73.0	72.4	71.7	70.9	69.9	68.5
2	85.0	85.0	81.5	78.8	76.7	75.0	74.3	73.6	73.0	72.4	71.7	70.9	69.9	68.5
3	85.0	85.0	81.5	78.8	76.7	75.0	74.3	73.6	73.0	72.4	71.7	70.9	69.9	68.5
4	85.0	85.0	81.5	78.8	76.7	75.0	74.3	73.6	73.0	72.4	71.7	70.9	69.9	68.5
5	85.0	85.0	81.5	78.8	76.7	75.0	74.3	73.6	73.0	72.4	71.7	70.9	69.9	68.5
6	85.0	85.0	81.5	78.8	76.7	75.0	74.3	73.6	73.0	72.4	71.7	70.9	69.9	68.5
7	85.0	85.0	81.5	78.8	76.7	75.0	74.3	73.6	73.0	72.4	71.7	70.9	69.9	68.5
8	85.0	85.0	83.7	79.6	76.7	74.8	74.0	73.3	72.6	71.8	70.9	69.8	68.6	67.2
9	85.0	85.0	83.7	79.6	76.7	74.8	74.0	73.3	72.6	71.8	70.9	69.8	68.6	67.2
10	85.0	85.0	83.7	79.6	76.7	74.8	74.0	73.3	72.6	71.8	70.9	69.8	68.6	67.2
11	85.0	85.0	83.7	79.6	76.7	74.8	74.0	73.3	72.6	71.8	70.9	69.8	68.6	67.2
12	85.0	85.0	83.7	79.6	76.7	74.8	74.0	73.3	72.6	71.8	70.9	69.8	68.6	67.2
13	85.0	85.0	83.7	79.6	76.7	74.8	74.0	73.3	72.6	71.8	70.9	69.8	68.6	67.2
14	85.0	85.0	83.7	79.6	76.7	74.8	74.0	73.3	72.6	71.8	70.9	69.8	68.6	67.2
15	85.0	85.0	83.7	79.6	76.7	74.8	74.0	73.3	72.6	71.8	70.9	69.8	68.6	67.2
16	90.0	90.0	87.1	82.3	79.1	77.2	76.6	76.0	75.4	74.8	74.0	72.9	71.6	70.1
17	90.0	90.0	87.1	82.3	79.1	77.2	76.6	76.0	75.4	74.8	74.0	72.9	71.6	70.1
18	90.0	90.0	87.1	82.3	79.1	77.2	76.6	76.0	75.4	74.8	74.0	72.9	71.6	70.1
19	90.0	90.0	87.1	82.3	79.1	77.2	76.6	76.0	75.4	74.8	74.0	72.9	71.6	70.1
20	90.0	90.0	87.1	82.3	79.1	77.2	76.6	76.0	75.4	74.8	74.0	72.9	71.6	70.1
21	90.0	90.0	87.1	82.3	79.1	77.2	76.6	76.0	75.4	74.8	74.0	72.9	71.6	70.1
22	90.0	90.0	87.1	82.3	79.1	77.2	76.6	76.0	75.4	74.8	74.0	72.9	71.6	70.1
23	100.0	100.0	100.0	97.9	94.4	91.2	89.7	88.3	87.1	86.1	85.3	84.7	84.2	83.8
24	100.0	100.0	100.0	97.9	94.4	91.2	89.7	88.3	87.1	86.1	85.3	84.7	84.2	83.8
25	100.0	100.0	100.0	97.9	94.4	91.2	89.7	88.3	87.1	86.1	85.3	84.7	84.2	83.8
26	100.0	100.0	100.0	97.9	94.4	91.2	89.7	88.3	87.1	86.1	85.3	84.7	84.2	83.8
27	100.0	100.0	100.0	97.9	94.4	91.2	89.7	88.3	87.1	86.1	85.3	84.7	84.2	83.8
28	100.0	100.0	100.0	97.9	94.4	91.2	89.7	88.3	87.1	86.1	85.3	84.7	84.2	83.8
29	100.0	100.0	100.0	97.9	94.4	91.2	89.7	88.3	87.1	86.1	85.3	84.7	84.2	83.8
30	100.0	100.0	100.0	97.9	94.4	91.2	89.7	88.3	87.1	86.1	85.3	84.7	84.2	83.8
31	100.0	100.0	100.0	97.9	94.4	91.2	89.7	88.3	87.1	86.1	85.3	84.7	84.2	83.8
32	100.0	100.0	100.0	97.9	94.4	91.2	89.7	88.3	87.1	86.1	85.3	84.7	84.2	83.8
33	100.0	100.0	100.0	96.7	93.7	91.7	91.0	90.2	89.3	88.3	87.2	86.0	84.9	84.1
34	100.0	100.0	100.0	96.7	93.7	91.7	91.0	90.2	89.3	88.3	87.2	86.0	84.9	84.1
35	100.0	100.0	100.0	96.7	93.7	91.7	91.0	90.2	89.3	88.3	87.2	86.0	84.9	84.1
36	100.0	100.0	100.0	96.7	93.7	91.7	91.0	90.2	89.3	88.3	87.2	86.0	84.9	84.1
37	100.0	100.0	100.0	96.7	93.7	91.7	91.0	90.2	89.3	88.3	87.2	86.0	84.9	84.1
38	100.0	100.0	100.0	96.7	93.7	91.7	91.0	90.2	89.3	88.3	87.2	86.0	84.9	84.1
39	100.0	100.0	100.0	96.7	93.7	91.7	91.0	90.2	89.3	88.3	87.2	86.0	84.9	84.1
40	100.0	100.0	100.0	96.7	93.7	91.7	91.0	90.2	89.3	88.3	87.2	86.0	84.9	84.1
41	100.0	100.0	99.8	96.7	94.2	92.2	91.4	90.7	90.0	89.4	88.9	88.4	87.8	87.3
42	100.0	100.0	99.8	96.7	94.2	92.2	91.4	90.7	90.0	89.4	88.9	88.4	87.8	87.3
43	100.0	100.0	99.8	96.7	94.2	92.2	91.4	90.7	90.0	89.4	88.9	88.4	87.8	87.3
44	100.0	100.0	99.8	96.7	94.2	92.2	91.4	90.7	90.0	89.4	88.9	88.4	87.8	87.3

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Nonferrous Materials (Cont'd)								
1	60Ni-19Cr-19Mo-1.8Ta	Wld. pipe	SB-619	...	N06210	Solution ann.	...	100
2	60Ni-19Cr-19Mo-1.8Ta	Smls. pipe & tube	SB-622	...	N06210	Solution ann.	...	100
3	60Ni-19Cr-19Mo-1.8Ta	Wld. tube	SB-626	...	N06210	Solution ann.	...	100
4	57Ni-22Cr-14W-2Mo-La	Plate, sheet, strip	SB-435	...	N06230	Solution ann.	...	110
5	57Ni-22Cr-14W-2Mo-La	Forgings	SB-564	...	N06230	Solution ann.	...	110
6	57Ni-22Cr-14W-2Mo-La	Bar	SB-572	...	N06230	Solution ann.	...	110
7	57Ni-22Cr-14W-2Mo-La	Wld. pipe	SB-619	...	N06230	Solution ann.	...	110
8	57Ni-22Cr-14W-2Mo-La	Smls. pipe & tube	SB-622	...	N06230	Solution ann.	...	110
9	57Ni-22Cr-14W-2Mo-La	Wld. tube	SB-626	...	N06230	Solution ann.	...	110
10	61Ni-16Mo-16Cr	Smls. & wld. fittings	SB-366	...	N06455	Annealed	...	100
11	61Ni-16Mo-16Cr	Rod	SB-574	...	N06455	Solution ann.	...	100
12	61Ni-16Mo-16Cr	Plate, sheet, strip	SB-575	...	N06455	Solution ann.	...	100
13	61Ni-16Mo-16Cr	Wld. pipe	SB-619	...	N06455	Solution ann.	...	100
14	61Ni-16Mo-16Cr	Smls. pipe & tube	SB-622	...	N06455	Solution ann.	...	100
15	61Ni-16Mo-16Cr	Wld. tube	SB-626	...	N06455	Solution ann.	...	100
16	72Ni-15Cr-8Fe	Smls. pipe & tube	SB-167	...	N06600	Hot fin./ann.	> 5	75
17	72Ni-15Cr-8Fe	Smls. pipe & tube	SB-167	...	N06600	Hot fin./ann.	> 5	80
18	72Ni-15Cr-8Fe	Smls. & wld. fittings	SB-366	...	N06600	Annealed	...	80
19	72Ni-15Cr-8Fe	Smls. pipe & tube	SB-167	...	N06600	Cold drawn/ann.	> 5	80
20	72Ni-15Cr-8Fe	Smls. pipe & tube	SB-167	...	N06600	Hot fin./ann.	≤ 5	80
21	72Ni-15Cr-8Fe	Smls. tube	SB-163	...	N06600	Annealed	≤ 3	80
22	72Ni-15Cr-8Fe	Bar	SB-166	...	N06600	Annealed	...	80
23	72Ni-15Cr-8Fe	Plate	SB-168	...	N06600	Annealed	...	80
24	72Ni-15Cr-8Fe	Wld. tube	SB-516	...	N06600	Annealed	...	80
25	72Ni-15Cr-8Fe	Forgings	SB-564	...	N06600	...	...	80
26	72Ni-15Cr-8Fe	Pipe, tube	SB-167	...	N06600	Cold drawn/ann.	≤ 5	80
27	72Ni-15Cr-8Fe	Wld. pipe	SB-517	...	N06600	Cold drawn/ann.	...	80
28	72Ni-15Cr-8Fe	Bar, rod	SB-166	...	N06600	Hot fin.	...	85
29	72Ni-15Cr-8Fe	Plate, sheet, strip	SB-168	...	N06600	Hot rolled	...	85
30	60Ni-23Cr-Fe	Smls. tube	SB-163	...	N06601	Annealed	≤ 3 O.D.	80
31	60Ni-23Cr-Fe	Bar	SB-166	...	N06601	Annealed	...	80
32	60Ni-23Cr-Fe	Smls. pipe & tube	SB-167	...	N06601	Annealed	...	80
33	60Ni-23Cr-Fe	Plate, sheet, strip	SB-168	...	N06601	Annealed	...	80
34	52Ni-22Cr-13Co-9Mo	Bar, rod	SB-166	...	N06617	Annealed	...	95
35	52Ni-22Cr-13Co-9Mo	Smls. pipe & tube	SB-167	...	N06617	Annealed	...	95
36	52Ni-22Cr-13Co-9Mo	Plate, sheet, strip	SB-168	...	N06617	Annealed	...	95
37	52Ni-22Cr-13Co-9Mo	Forgings	SB-564	...	N06617	Annealed	...	95
38	60Ni-22Cr-9Mo-3.5Cb	Plate, sheet, strip	SB-443	2	N06625	Solution ann.	...	100
39	60Ni-22Cr-9Mo-3.5Cb	Smls. pipe & tube	SB-444	2	N06625	Solution ann.	...	100
40	60Ni-22Cr-9Mo-3.5Cb	Bar	SB-446	2	N06625	Solution ann.	...	100
41	60Ni-22Cr-9Mo-3.5Cb	Smls. & wld. fittings	SB-366	...	N06625	Annealed	...	110
42	60Ni-22Cr-9Mo-3.5Cb	Bar	SB-446	1	N06625	Annealed	4 < t ≤ 10	110
43	60Ni-22Cr-9Mo-3.5Cb	Forgings	SB-564	...	N06625	Annealed	4 < t ≤ 10	110

2011a SECTION II, PART D (CUSTOMARY)

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)													
1	100.0	100.0	99.8	96.7	94.2	92.2	91.4	90.7	90.0	89.4	88.9	88.4	87.8	87.3
2	100.0	100.0	99.8	96.7	94.2	92.2	91.4	90.7	90.0	89.4	88.9	88.4	87.8	87.3
3	100.0	100.0	99.8	96.7	94.2	92.2	91.4	90.7	90.0	89.4	88.9	88.4	87.8	87.3
4	110.0	110.0	110.0	107.7	104.8	102.9	102.3	101.9	101.5	101.3	101.0	100.7	100.4	99.8
5	110.0	110.0	110.0	107.7	104.8	102.9	102.3	101.9	101.5	101.3	101.0	100.7	100.4	99.8
6	110.0	110.0	110.0	107.7	104.8	102.9	102.3	101.9	101.5	101.3	101.0	100.7	100.4	99.8
7	110.0	110.0	110.0	107.7	104.8	102.9	102.3	101.9	101.5	101.3	101.0	100.7	100.4	99.8
8	110.0	110.0	110.0	107.7	104.8	102.9	102.3	101.9	101.5	101.3	101.0	100.7	100.4	99.8
9	110.0	110.0	110.0	107.7	104.8	102.9	102.3	101.9	101.5	101.3	101.0	100.7	100.4	99.8
10	100.0	100.0	100.0	100.0	98.9	97.7	97.1	96.3	95.4	94.5	93.5	92.6	92.0	92.0
11	100.0	100.0	100.0	100.0	98.9	97.7	97.1	96.3	95.4	94.5	93.5	92.6	92.0	92.0
12	100.0	100.0	100.0	100.0	98.9	97.7	97.1	96.3	95.4	94.5	93.5	92.6	92.0	92.0
13	100.0	100.0	100.0	100.0	98.9	97.7	97.1	96.3	95.4	94.5	93.5	92.6	92.0	92.0
14	100.0	100.0	100.0	100.0	98.9	97.7	97.1	96.3	95.4	94.5	93.5	92.6	92.0	92.0
15	100.0	100.0	100.0	100.0	98.9	97.7	97.1	96.3	95.4	94.5	93.5	92.6	92.0	92.0
16	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	73.4	70.6	...	...
17	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	78.3	75.3	...	...
18	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	78.3	75.3	...	...
19	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	78.3	75.3	...	...
20	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	78.3	75.3	...	...
21	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	78.3	75.3	...	...
22	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	78.3	75.3	...	...
23	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	78.3	75.3	...	...
24	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	78.3	75.3	...	...
25	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	78.3	75.3	...	...
26	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	78.3	75.3	...	...
27	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	78.3	75.3	...	...
28	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0	...	...
29	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0	85.0	...	...
30	80.0	80.0	80.0	80.0	80.0	80.0	80.0	79.7	79.2	78.6	77.8	76.7	75.5	73.9
31	80.0	80.0	80.0	80.0	80.0	80.0	80.0	79.7	79.2	78.6	77.8	76.7	75.5	73.9
32	80.0	80.0	80.0	80.0	80.0	80.0	80.0	79.7	79.2	78.6	77.8	76.7	75.5	73.9
33	80.0	80.0	80.0	80.0	80.0	80.0	80.0	79.7	79.2	78.6	77.8	76.7	75.5	73.9
34	95.0	95.0	95.0	95.0	95.0	93.2	92.3	91.4	90.6	89.9	89.2	88.5	87.8	87.1
35	95.0	95.0	95.0	95.0	95.0	93.2	92.3	91.4	90.6	89.9	89.2	88.5	87.8	87.1
36	95.0	95.0	95.0	95.0	95.0	93.2	92.3	91.4	90.6	89.9	89.2	88.5	87.8	87.1
37	95.0	95.0	95.0	95.0	95.0	93.2	92.3	91.4	90.6	89.9	89.2	88.5	87.8	87.1
38	100.0	100.0	100.0	100.0	99.7	98.1	97.6	97.3	97.1	96.9	96.7	96.2	95.5	94.5
39	100.0	100.0	100.0	100.0	99.7	98.1	97.6	97.3	97.1	96.9	96.7	96.2	95.5	94.5
40	100.0	100.0	100.0	100.0	99.7	98.1	97.6	97.3	97.1	96.9	96.7	96.2	95.5	94.5
41	110.0	110.0	110.0	107.7	105.6	103.8	102.9	102.0	101.0	100.1	99.2	98.2	97.1	95.9
42	110.0	110.0	110.0	107.7	105.6	103.8	102.9	102.0	101.0	100.1	99.2	98.2	97.1	95.9
43	110.0	110.0	110.0	107.7	105.6	103.8	102.9	102.0	101.0	100.1	99.2	98.2	97.1	95.9

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Nonferrous Materials (Cont'd)								
1	60Ni-22Cr-9Mo-3.5Cb	Plate, sheet, strip	SB-443	1	N06625	Annealed	...	110
2	60Ni-22Cr-9Mo-3.5Cb	Plate, sheet, strip	SB-443	1	N06625	Annealed	...	120
3	60Ni-22Cr-9Mo-3.5Cb	Smls. pipe	SB-444	1	N06625	Annealed	...	120
4	60Ni-22Cr-9Mo-3.5Cb	Bar	SB-446	1	N06625	Annealed	≤ 4	120
5	60Ni-22Cr-9Mo-3.5Cb	Forgings	SB-564	...	N06625	Annealed	≤ 4	120
6	60Ni-22Cr-9Mo-3.5Cb	Wld. tube	SB-704	...	N06625	Annealed	...	120
7	60Ni-22Cr-9Mo-3.5Cb	Wld. pipe	SB-705	...	N06625	Annealed	...	120
8	Ni-Cr-Mo-W	Forgings	SB-564	...	N06686	Solution ann.	...	100
9	Ni-Cr-Mo-W	Rod	SB-574	...	N06686	Solution ann.	...	100
10	Ni-Cr-Mo-W	Plate, sheet, strip	SB-575	...	N06686	Solution ann.	...	100
11	Ni-Cr-Mo-W	Wld. pipe	SB-619	...	N06686	Solution ann.	...	100
12	Ni-Cr-Mo-W	Smls. pipe & tube	SB-622	...	N06686	Solution ann.	...	100
13	Ni-Cr-Mo-W	Wld. tube	SB-626	...	N06686	Solution ann.	...	100
14	58Ni-29Cr-9Fe	Smls. tube	SB-163	...	N06690	Annealed	...	85
15	58Ni-29Cr-9Fe	Bar, rod	SB-166	...	N06690	Annealed	...	85
16	58Ni-29Cr-9Fe	Smls. pipe & tube	SB-167	...	N06690	Annealed	...	85
17	58Ni-29Cr-9Fe	Plate, sheet, strip	SB-168	...	N06690	Annealed	...	85
18	58Ni-29Cr-9Fe	Forgings	SB-564	...	N06690	Annealed	...	85
19	49Ni-25Cr-18Fe-6Mo	Plate, sheet, strip	SB-582	...	N06975	Solution ann.	...	85
20	49Ni-25Cr-18Fe-6Mo	Wld. pipe	SB-619	...	N06975	Solution ann.	...	85
21	49Ni-25Cr-18Fe-6Mo	Smls. pipe & tube	SB-622	...	N06975	Solution ann.	...	85
22	49Ni-25Cr-18Fe-6Mo	Wld. tube	SB-626	...	N06975	Solution ann.	...	85
23	47Ni-22Cr-20Fe-7Mo	Rod	SB-581	...	N06985	Annealed	> $\frac{3}{4}$	85
24	47Ni-22Cr-20Fe-7Mo	Plate, sheet, strip	SB-582	...	N06985	Annealed	> $\frac{3}{4}$	85
25	47Ni-22Cr-20Fe-7Mo	Smls. & wld. fittings	SB-366	...	N06985	Annealed	...	90
26	47Ni-22Cr-20Fe-7Mo	Rod	SB-581	...	N06985	Annealed	≤ $\frac{3}{4}$	90
27	47Ni-22Cr-20Fe-7Mo	Plate, sheet, strip	SB-582	...	N06985	Annealed	≤ $\frac{3}{4}$	90
28	47Ni-22Cr-20Fe-7Mo	Wld. pipe	SB-619	...	N06985	Annealed	...	90
29	47Ni-22Cr-20Fe-7Mo	Smls. pipe & tube	SB-622	...	N06985	Annealed	...	90
30	47Ni-22Cr-20Fe-7Mo	Wld. tube	SB-626	...	N06985	Annealed	...	90
31	35Ni-35Fe-20Cr-Cb	Forgings	SB-462	...	N08020	Annealed	...	80
32	35Ni-35Fe-20Cr-Cb	Plate	SB-463	...	N08020	Annealed	...	80
33	35Ni-35Fe-20Cr-Cb	Bar	SB-473	...	N08020	Annealed	...	80
34	35Ni-35Fe-20Cr-Cb	Smls. pipe & tube	SB-729	...	N08020	Annealed	...	80
35	35Ni-35Fe-20Cr-Cb	Wld. pipe	SB-464	...	N08020	Wld. ann.	...	80
36	35Ni-35Fe-20Cr-Cb	Wld. tube	SB-468	...	N08020	Wld. ann.	...	80
37	35Ni-35Fe-20Cr-Cb	Smls. & wld. fittings	SB-366	...	N08020	Annealed	...	85
38	37Ni-33Fe-23Cr-4Mo-Cu	Plate, sheet, strip	SB-463	...	N08024	Annealed	...	80
39	37Ni-33Fe-23Cr-4Mo-Cu	Wld. pipe	SB-464	...	N08024	Wld. ann.	...	80
40	37Ni-33Fe-23Cr-4Mo-Cu	Wld. tube	SB-468	...	N08024	Wld. ann.	...	80
41	35Ni-30Fe-24Cr-6Mo-Cu	Plate, sheet, strip	SB-463	...	N08026	Annealed	...	80
42	35Ni-30Fe-24Cr-6Mo-Cu	Wld. pipe	SB-464	...	N08026	Wld. ann.	...	80
43	35Ni-30Fe-24Cr-6Mo-Cu	Wld. tube	SB-468	...	N08026	Wld. ann.	...	80
44	31Ni-31Fe-29Cr-Mo	Smls. tube	SB-668	...	N08028	Annealed	...	73
45	31Ni-31Fe-29Cr-Mo	Plate, sheet, strip	SB-709	...	N08028	Annealed	...	73

2011a SECTION II, PART D (CUSTOMARY)

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)													
1	110.0	110.0	110.0	107.7	105.6	103.8	102.9	102.0	101.0	100.1	99.2	98.2	97.1	95.9
2	120.0	120.0	120.0	117.4	115.3	113.2	112.2	111.2	110.2	109.2	108.2	107.1	105.9	104.7
3	120.0	120.0	120.0	117.4	115.3	113.2	112.2	111.2	110.2	109.2	108.2	107.1	105.9	104.7
4	120.0	120.0	120.0	117.4	115.3	113.2	112.2	111.2	110.2	109.2	108.2	107.1	105.9	104.7
5	120.0	120.0	120.0	117.4	115.3	113.2	112.2	111.2	110.2	109.2	108.2	107.1	105.9	104.7
6	120.0	120.0	120.0	117.4	115.3	113.2	112.2	111.2	110.2	109.2	108.2	107.1	105.9	104.7
7	120.0	120.0	120.0	117.4	115.3	113.2	112.2	111.2	110.2	109.2	108.2	107.1	105.9	104.7
8	100.0	100.0	98.8	95.3	92.7	90.8	89.9	89.1	88.2	87.1	85.9	84.5	82.8	80.9
9	100.0	100.0	98.8	95.3	92.7	90.8	89.9	89.1	88.2	87.1	85.9	84.5	82.8	80.9
10	100.0	100.0	98.8	95.3	92.7	90.8	89.9	89.1	88.2	87.1	85.9	84.5	82.8	80.9
11	100.0	100.0	98.8	95.3	92.7	90.8	89.9	89.1	88.2	87.1	85.9	84.5	82.8	80.9
12	100.0	100.0	98.8	95.3	92.7	90.8	89.9	89.1	88.2	87.1	85.9	84.5	82.8	80.9
13	100.0	100.0	98.8	95.3	92.7	90.8	89.9	89.1	88.2	87.1	85.9	84.5	82.8	80.9
14	85.0	85.0	84.0	82.0	80.8	80.2	80.0	79.8	79.6	79.3	78.7	78.0	76.9	75.3
15	85.0	85.0	84.0	82.0	80.8	80.2	80.0	79.8	79.6	79.3	78.7	78.0	76.9	75.3
16	85.0	85.0	84.0	82.0	80.8	80.2	80.0	79.8	79.6	79.3	78.7	78.0	76.9	75.3
17	85.0	85.0	84.0	82.0	80.8	80.2	80.0	79.8	79.6	79.3	78.7	78.0	76.9	75.3
18	85.0	85.0	84.0	82.0	80.8	80.2	80.0	79.8	79.6	79.3	78.7	78.0	76.9	75.3
19	85.0	85.0	85.0	83.5	81.7	80.3	79.7	79.1	78.5	78.0	77.3	76.6	75.7	74.4
20	85.0	85.0	85.0	83.5	81.7	80.3	79.7	79.1	78.5	78.0	77.3	76.6	75.7	74.4
21	85.0	85.0	85.0	83.5	81.7	80.3	79.7	79.1	78.5	78.0	77.3	76.6	75.7	74.4
22	85.0	85.0	85.0	83.5	81.7	80.3	79.7	79.1	78.5	78.0	77.3	76.6	75.7	74.4
23	85.0	85.0	83.8	80.4	77.9	76.2	75.6	75.0	74.4	73.8	73.0	72.1	70.9	69.5
24	85.0	85.0	83.8	80.4	77.9	76.2	75.6	75.0	74.4	73.8	73.0	72.1	70.9	69.5
25	90.0	90.0	88.7	85.1	82.5	80.7	80.0	79.4	78.8	78.1	77.3	76.3	75.1	73.6
26	90.0	90.0	88.7	85.1	82.5	80.7	80.0	79.4	78.8	78.1	77.3	76.3	75.1	73.6
27	90.0	90.0	88.7	85.1	82.5	80.7	80.0	79.4	78.8	78.1	77.3	76.3	75.1	73.6
28	90.0	90.0	88.7	85.1	82.5	80.7	80.0	79.4	78.8	78.1	77.3	76.3	75.1	73.6
29	90.0	90.0	88.7	85.1	82.5	80.7	80.0	79.4	78.8	78.1	77.3	76.3	75.1	73.6
30	90.0	90.0	88.7	85.1	82.5	80.7	80.0	79.4	78.8	78.1	77.3	76.3	75.1	73.6
31	80.0	80.0	79.2	77.6	77.3	77.3	77.0	76.7	76.3	76.3	...	...	...	...
32	80.0	80.0	79.2	77.6	77.3	77.3	77.0	76.7	76.3	76.3	...	...	...	...
33	80.0	80.0	79.2	77.6	77.3	77.3	77.0	76.7	76.3	76.3	...	...	...	...
34	80.0	80.0	79.2	77.6	77.3	77.3	77.0	76.7	76.3	76.3	...	...	...	...
35	80.0	80.0	79.2	77.6	77.3	77.3	77.0	76.7	76.3	76.3	...	...	...	...
36	80.0	80.0	79.2	77.6	77.3	77.3	77.0	76.7	76.3	76.3	...	...	...	...
37	85.0	85.0	84.1	82.4	82.2	82.1	81.9	81.5	81.1	81.1	...	...	...	...
38	80.0	80.0	79.0	76.8	74.8	72.9	72.1	71.4	70.8	70.3	69.9	69.5	69.2	68.6
39	80.0	80.0	79.0	76.8	74.8	72.9	72.1	71.4	70.8	70.3	69.9	69.5	69.2	68.6
40	80.0	80.0	79.0	76.8	74.8	72.9	72.1	71.4	70.8	70.3	69.9	69.5	69.2	68.6
41	80.0	80.0	78.6	76.2	74.1	72.1	71.1	70.1	69.1	68.1	67.2	66.4	65.7	65.0
42	80.0	80.0	78.6	76.2	74.1	72.1	71.1	70.1	69.1	68.1	67.2	66.4	65.7	65.0
43	80.0	80.0	78.6	76.2	74.1	72.1	71.1	70.1	69.1	68.1	67.2	66.4	65.7	65.0
44	73.0	73.0	70.4	67.6	65.4	63.6	62.9	62.1	61.4	60.7	59.9	59.0	58.1	57.1
45	73.0	73.0	70.4	67.6	65.4	63.6	62.9	62.1	61.4	60.7	59.9	59.0	58.1	57.1

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Nonferrous Materials (Cont'd)								
1	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Smls. & wld. fittings	SB-366	...	N08031	...	...	94
2	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Forgings	SB-564	...	N08031	...	...	94
3	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Rod	SB-581	...	N08031	...	...	94
4	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Wld. pipe	SB-619	...	N08031	...	...	94
5	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Smls. pipe & tube	SB-622	...	N08031	...	...	94
6	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Plate, sheet, strip	SB-625	...	N08031	...	...	94
7	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Wld. tube	SB-626	...	N08031	...	...	94
8	37Ni-33Fe-25Cr	Condenser tube	SB-163	...	N08120	Solution ann.	...	90
9	37Ni-33Fe-25Cr	Smls. & wld. fittings	SB-366	...	N08120	Solution ann.	...	90
10	37Ni-33Fe-25Cr	Smls. pipe & tube	SB-407	...	N08120	Solution ann.	...	90
11	37Ni-33Fe-25Cr	Bar, rod	SB-408	...	N08120	Solution ann.	...	90
12	37Ni-33Fe-25Cr	Plate, sheet, strip	SB-409	...	N08120	Solution ann.	...	90
13	37Ni-33Fe-25Cr	Wld. pipe	SB-514	...	N08120	Solution ann.	...	90
14	37Ni-33Fe-25Cr	Wld. tube	SB-515	...	N08120	Solution ann.	...	90
15	37Ni-33Fe-25Cr	Forgings	SB-564	...	N08120	Solution ann.	...	90
16	26Ni-43Fe-22Cr-5Mo	Wld. pipe	SB-619	...	N08320	Solution ann.	...	75
17	26Ni-43Fe-22Cr-5Mo	Plate, sheet, strip	SB-620	...	N08320	Solution ann.	...	75
18	26Ni-43Fe-22Cr-5Mo	Rod	SB-621	...	N08320	Solution ann.	...	75
19	26Ni-43Fe-22Cr-5Mo	Smls. pipe & tube	SB-622	...	N08320	Solution ann.	...	75
20	26Ni-43Fe-22Cr-5Mo	Wld. tube	SB-626	...	N08320	Solution ann.	...	75
21	35Ni-19Cr-1 $\frac{1}{4}$ Si	Bar	SB-511	...	N08330	...	...	70
22	35Ni-19Cr-1 $\frac{1}{4}$ Si	Pipe	SB-535	...	N08330	...	...	70
23	35Ni-19Cr-1 $\frac{1}{4}$ Si	Plate	SB-536	...	N08330	...	...	70
24	35Ni-19Cr-1 $\frac{1}{4}$ Si	Smls. & wld. fittings	SB-366	...	N08330	Annealed	...	70
25	35Ni-19Cr-1 $\frac{1}{4}$ Si	Smls. & wld. pipe	SB-535	...	N08330	Annealed	...	70
26	35Ni-19Cr-1 $\frac{1}{4}$ Si	Plate, sheet, strip	SB-536	...	N08330	Annealed	...	70
27	35Ni-19Cr-1 $\frac{1}{4}$ Si	Wld. pipe	SB-710	...	N08330	Annealed	...	70
28	46Fe-24Ni-21Cr-6Mo-Cu-N	Forgings	SB-462	...	N08367	Solution ann.	...	95
29	46Fe-24Ni-21Cr-6Mo-Cu-N	Forgings	SB-564	...	N08367	Solution ann.	...	95
30	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. pipe	SB-675	...	N08367	Solution ann.	$> \frac{3}{16}$	95
31	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. tube	SB-676	...	N08367	Solution ann.	$> \frac{3}{16}$	95
32	46Fe-24Ni-21Cr-6Mo-Cu-N	Plate, sheet, strip	SB-688	...	N08367	Solution ann.	$> \frac{3}{16}$	95
33	46Fe-24Ni-21Cr-6Mo-Cu-N	Smls. pipe & tube	SB-690	...	N08367	Solution ann.	$> \frac{3}{16}$	95
34	46Fe-24Ni-21Cr-6Mo-Cu-N	Bar, rod, wire	SB-691	...	N08367	Solution ann.	...	95
35	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. pipe	SB-804	...	N08367	Solution ann.	$> \frac{3}{16}$	95
36	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. pipe	SB-675	...	N08367	Solution ann.	$\leq \frac{3}{16}$	100
37	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. tube	SB-676	...	N08367	Solution ann.	$\leq \frac{3}{16}$	100
38	46Fe-24Ni-21Cr-6Mo-Cu-N	Plate, sheet, strip	SB-688	...	N08367	Solution ann.	$\leq \frac{3}{16}$	100
39	46Fe-24Ni-21Cr-6Mo-Cu-N	Smls. pipe & tube	SB-690	...	N08367	Solution ann.	$\leq \frac{3}{16}$	100
40	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. pipe	SB-804	...	N08367	Solution ann.	$\leq \frac{3}{16}$	100
41	46Fe-24Ni-21Cr-6Mo-Cu-N	Castings	SA-351	CN3MN	J94651	Solution ann.	...	80
42	25Ni-47Fe-21Cr-5Mo	Plate, sheet, strip	SB-599	...	N08700	Solution ann.	...	80
43	25Ni-47Fe-21Cr-5Mo	Bar, wire	SB-672	...	N08700	Solution ann.	...	80
44	32Ni-45Fe-20Cr-Cb	Castings	SA-351	CT15C	...	As cast	...	63

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)													
1	94.0	94.0	90.5	85.8	81.6	78.1	76.7	75.6	74.7	74.0	73.2	72.2	...	...
2	94.0	94.0	90.5	85.8	81.6	78.1	76.7	75.6	74.7	74.0	73.2	72.2	...	...
3	94.0	94.0	90.5	85.8	81.6	78.1	76.7	75.6	74.7	74.0	73.2	72.2	...	...
4	94.0	94.0	90.5	85.8	81.6	78.1	76.7	75.6	74.7	74.0	73.2	72.2	...	...
5	94.0	94.0	90.5	85.8	81.6	78.1	76.7	75.6	74.7	74.0	73.2	72.2	...	...
6	94.0	94.0	90.5	85.8	81.6	78.1	76.7	75.6	74.7	74.0	73.2	72.2	...	...
7	94.0	94.0	90.5	85.8	81.6	78.1	76.7	75.6	74.7	74.0	73.2	72.2	...	...
8	90.0	90.0	87.5	84.7	83.1	82.2	82.0	81.8	81.6	81.3	80.9	80.3	79.5	78.3
9	90.0	90.0	87.5	84.7	83.1	82.2	82.0	81.8	81.6	81.3	80.9	80.3	79.5	78.3
10	90.0	90.0	87.5	84.7	83.1	82.2	82.0	81.8	81.6	81.3	80.9	80.3	79.5	78.3
11	90.0	90.0	87.5	84.7	83.1	82.2	82.0	81.8	81.6	81.3	80.9	80.3	79.5	78.3
12	90.0	90.0	87.5	84.7	83.1	82.2	82.0	81.8	81.6	81.3	80.9	80.3	79.5	78.3
13	90.0	90.0	87.5	84.7	83.1	82.2	82.0	81.8	81.6	81.3	80.9	80.3	79.5	78.3
14	90.0	90.0	87.5	84.7	83.1	82.2	82.0	81.8	81.6	81.3	80.9	80.3	79.5	78.3
15	90.0	90.0	87.5	84.7	83.1	82.2	82.0	81.8	81.6	81.3	80.9	80.3	79.5	78.3
16	75.0	75.0	74.2	71.7	70.4	70.0	69.9	69.9	69.8	69.5	...	...	...	...
17	75.0	75.0	74.2	71.7	70.4	70.0	69.9	69.9	69.8	69.5	...	...	...	...
18	75.0	75.0	74.2	71.7	70.4	70.0	69.9	69.9	69.8	69.5	...	...	...	...
19	75.0	75.0	74.2	71.7	70.4	70.0	69.9	69.9	69.8	69.5	...	...	...	...
20	75.0	75.0	74.2	71.7	70.4	70.0	69.9	69.9	69.8	69.5	...	...	...	...
21	70.0	70.0	70.0	68.6	68.0	68.0	68.0	68.0	68.0	68.0	68.0	67.9	66.7	64.9
22	70.0	70.0	70.0	68.6	68.0	68.0	68.0	68.0	68.0	68.0	68.0	67.9	66.7	64.9
23	70.0	70.0	70.0	68.6	68.0	68.0	68.0	68.0	68.0	68.0	68.0	67.9	66.7	64.9
24	70.0	70.0	70.0	68.6	68.0	68.0	68.0	68.0	68.0	68.0	68.0	67.9	66.7	64.9
25	70.0	70.0	70.0	68.6	68.0	68.0	68.0	68.0	68.0	68.0	68.0	67.9	66.7	64.9
26	70.0	70.0	70.0	68.6	68.0	68.0	68.0	68.0	68.0	68.0	68.0	67.9	66.7	64.9
27	70.0	70.0	70.0	68.6	68.0	68.0	68.0	68.0	68.0	68.0	68.0	67.9	66.7	64.9
28	95.0	95.0	89.8	85.9	83.3	81.5	80.8	80.2	79.7	79.2	78.7	78.0	...	...
29	95.0	95.0	89.8	85.9	83.3	81.5	80.8	80.2	79.7	79.2	78.7	78.0	...	...
30	95.0	95.0	89.8	85.9	83.3	81.5	80.8	80.2	79.7	79.2	78.7	78.0	...	...
31	95.0	95.0	89.8	85.9	83.3	81.5	80.8	80.2	79.7	79.2	78.7	78.0	...	...
32	95.0	95.0	89.8	85.9	83.3	81.5	80.8	80.2	79.7	79.2	78.7	78.0	...	...
33	95.0	95.0	89.8	85.9	83.3	81.5	80.8	80.2	79.7	79.2	78.7	78.0	...	...
34	95.0	95.0	89.8	85.9	83.3	81.5	80.8	80.2	79.7	79.2	78.7	78.0	...	...
35	95.0	95.0	89.8	85.9	83.3	81.5	80.8	80.2	79.7	79.2	78.7	78.0	...	...
36	100.0	100.0	94.5	90.5	87.7	85.8	85.1	84.4	83.9	83.4	82.8	82.2	...	...
37	100.0	100.0	94.5	90.5	87.7	85.8	85.1	84.4	83.9	83.4	82.8	82.2	...	...
38	100.0	100.0	94.5	90.5	87.7	85.8	85.1	84.4	83.9	83.4	82.8	82.2	...	...
39	100.0	100.0	94.5	90.5	87.7	85.8	85.1	84.4	83.9	83.4	82.8	82.2	...	...
40	100.0	100.0	94.5	90.5	87.7	85.8	85.1	84.4	83.9	83.4	82.8	82.2	...	...
41	80.0	75.5	69.6	65.7	63.0	60.8	59.8	58.9	58.0	57.2	56.5	55.9	55.3	54.8
42	80.0	80.0	79.2	77.2	75.2	75.0	74.8	...	...	...	...	...	...	...
43	80.0	80.0	79.2	77.2	75.2	75.0	74.8	...	...	...	...	...	...	...
44	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	...	...	...

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Nonferrous Materials (Cont'd)								
1	33Ni-42Fe-21Cr	Smls. tube	SB-163	...	N08800	Annealed	...	75
2	33Ni-42Fe-21Cr	Smls. & wld. fittings	SB-366	...	N08800	Annealed	...	75
3	33Ni-42Fe-21Cr	Smls. pipe & tube	SB-407	...	N08800	Annealed	...	75
4	33Ni-42Fe-21Cr	Bar	SB-408	...	N08800	Annealed	...	75
5	33Ni-42Fe-21Cr	Plate	SB-409	...	N08800	Annealed	...	75
6	33Ni-42Fe-21Cr	Wld. pipe	SB-514	...	N08800	Annealed	...	75
7	33Ni-42Fe-21Cr	Wld. tube	SB-515	...	N08800	Annealed	...	75
8	33Ni-42Fe-21Cr	Forgings	SB-564	...	N08800	Annealed	...	75
9	33Ni-42Fe-21Cr	Smls. tube	SB-163	...	N08800	Cold worked	...	83
10	32Ni-44Fe-21Cr	Smls. tube	SB-163	...	N08801	Ann./stabilized	...	65
11	32Ni-44Fe-21Cr	Smls. pipe & tube	SB-407	...	N08801	Ann./stabilized	...	65
12	33Ni-42Fe-21Cr	Smls. tube	SB-163	...	N08810	Annealed	...	65
13	33Ni-42Fe-21Cr	Smls. pipe & tube	SB-407	...	N08810	Annealed	...	65
14	33Ni-42Fe-21Cr	Bar	SB-408	...	N08810	Annealed	...	65
15	33Ni-42Fe-21Cr	Plate	SB-409	...	N08810	Annealed	...	65
16	33Ni-42Fe-21Cr	Wld. pipe	SB-514	...	N08810	Annealed	...	65
17	33Ni-42Fe-21Cr	Wld. tube	SB-515	...	N08810	Annealed	...	65
18	33Ni-42Fe-21Cr	Forgings	SB-564	...	N08810	Annealed	...	65
19	42Ni-21.5Cr-3Mo-2.3Cu	Smls. tube	SB-163	...	N08825	Annealed	...	85
20	42Ni-21.5Cr-3Mo-2.3Cu	Smls. & wld. fittings	SB-366	...	N08825	Annealed	...	85
21	42Ni-21.5Cr-3Mo-2.3Cu	Smls. pipe & tube	SB-423	...	N08825	Cold worked/ann.	...	85
22	42Ni-21.5Cr-3Mo-2.3Cu	Plate	SB-424	...	N08825	Annealed	...	85
23	42Ni-21.5Cr-3Mo-2.3Cu	Bar, rod	SB-425	...	N08825	Annealed	...	85
24	42Ni-21.5Cr-3Mo-2.3Cu	Forgings	SB-564	...	N08825	Annealed	...	85
25	42Ni-21.5Cr-3Mo-2.3Cu	Wld. tube	SB-704	...	N08825	Annealed	...	85
26	42Ni-21.5Cr-3Mo-2.3Cu	Wld. pipe	SB-705	...	N08825	Annealed	...	85
27	44Fe-25Ni-21Cr-Mo	Fittings	SB-366	...	N08904	Annealed	...	71
28	44Fe-25Ni-21Cr-Mo	Plate, sheet, strip	SB-625	...	N08904	Annealed	...	71
29	44Fe-25Ni-21Cr-Mo	Bar, wire	SB-649	...	N08904	Annealed	...	71
30	44Fe-25Ni-21Cr-Mo	Wld. pipe	SB-673	...	N08904	Annealed	...	71
31	44Fe-25Ni-21Cr-Mo	Wld. tube	SB-674	...	N08904	Annealed	...	71
32	44Fe-25Ni-21Cr-Mo	Smls. pipe & tube	SB-677	...	N08904	Annealed	...	71
33	25Ni-20Cr-6Mo-Cu-N	Plate, sheet, strip	SB-625	...	N08925	Annealed	...	87
34	25Ni-20Cr-6Mo-Cu-N	Bar, wire	SB-649	...	N08925	Annealed	...	87
35	25Ni-20Cr-6Mo-Cu-N	Wld. pipe	SB-673	...	N08925	Annealed	...	87
36	25Ni-20Cr-6Mo-Cu-N	Wld. tube	SB-674	...	N08925	Annealed	...	87
37	25Ni-20Cr-6Mo-Cu-N	Smls. pipe & tube	SB-677	...	N08925	Annealed	...	87
38	62Ni-28Mo-5Fe	Plate	SB-333	...	N10001	Annealed	...	100
39	62Ni-28Mo-5Fe	Smls. & wld. fittings	SB-366	...	N10001	Annealed	...	100
40	62Ni-28Mo-5Fe	Wld. pipe	SB-619	...	N10001	Solution ann.	...	100
41	62Ni-28Mo-5Fe	Smls. pipe & tube	SB-622	...	N10001	Solution ann.	...	100
42	62Ni-28Mo-5Fe	Wld. tube	SB-626	...	N10001	Solution ann.	...	100
43	62Ni-28Mo-5Fe	Rod	SB-335	...	N10001	Annealed	...	100
44	62Ni-28Mo-5Fe	Sheet, strip	SB-333	...	N10001	Annealed	...	115

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)													
1	75.0	75.0	75.0	75.0	74.7	74.6	74.6	74.5	74.2	73.9	73.3	72.5	71.4	70.0
2	75.0	75.0	75.0	75.0	74.7	74.6	74.6	74.5	74.2	73.9	73.3	72.5	71.4	70.0
3	75.0	75.0	75.0	75.0	74.7	74.6	74.6	74.5	74.2	73.9	73.3	72.5	71.4	70.0
4	75.0	75.0	75.0	75.0	74.7	74.6	74.6	74.5	74.2	73.9	73.3	72.5	71.4	70.0
5	75.0	75.0	75.0	75.0	74.7	74.6	74.6	74.5	74.2	73.9	73.3	72.5	71.4	70.0
6	75.0	75.0	75.0	75.0	74.7	74.6	74.6	74.5	74.2	73.9	73.3	72.5	71.4	70.0
7	75.0	75.0	75.0	75.0	74.7	74.6	74.6	74.5	74.2	73.9	73.3	72.5	71.4	70.0
8	75.0	75.0	75.0	75.0	74.7	74.6	74.6	74.5	74.2	73.9	73.3	72.5	71.4	70.0
9	83.0	83.0	83.0	82.5	80.7	80.0	79.9	...	...	...	...	...	...	...
10	65.0	65.0	65.0	64.6	64.0	63.8	63.8	63.8	63.8	63.8	63.8	63.6	63.1	62.3
11	65.0	65.0	65.0	64.6	64.0	63.8	63.8	63.8	63.8	63.8	63.8	63.6	63.1	62.3
12	65.0	65.0	65.0	64.6	64.0	63.8	63.8	63.8	63.8	63.8	63.8	63.6	63.1	62.3
13	65.0	65.0	65.0	64.6	64.0	63.8	63.8	63.8	63.8	63.8	63.8	63.6	63.1	62.3
14	65.0	65.0	65.0	64.6	64.0	63.8	63.8	63.8	63.8	63.8	63.8	63.6	63.1	62.3
15	65.0	65.0	65.0	64.6	64.0	63.8	63.8	63.8	63.8	63.8	63.8	63.6	63.1	62.3
16	65.0	65.0	65.0	64.6	64.0	63.8	63.8	63.8	63.8	63.8	63.8	63.6	63.1	62.3
17	65.0	65.0	65.0	64.6	64.0	63.8	63.8	63.8	63.8	63.8	63.8	63.6	63.1	62.3
18	65.0	65.0	65.0	64.6	64.0	63.8	63.8	63.8	63.8	63.8	63.8	63.6	63.1	62.3
19	85.0	85.0	85.0	85.0	85.0	85.0	84.6	84.2	83.7	83.1	82.4	81.5	80.4	79.0
20	85.0	85.0	85.0	85.0	85.0	85.0	84.6	84.2	83.7	83.1	82.4	81.5	80.4	79.0
21	85.0	85.0	85.0	85.0	85.0	85.0	84.6	84.2	83.7	83.1	82.4	81.5	80.4	79.0
22	85.0	85.0	85.0	85.0	85.0	85.0	84.6	84.2	83.7	83.1	82.4	81.5	80.4	79.0
23	85.0	85.0	85.0	85.0	85.0	85.0	84.6	84.2	83.7	83.1	82.4	81.5	80.4	79.0
24	85.0	85.0	85.0	85.0	85.0	85.0	84.6	84.2	83.7	83.1	82.4	81.5	80.4	79.0
25	85.0	85.0	85.0	85.0	85.0	85.0	84.6	84.2	83.7	83.1	82.4	81.5	80.4	79.0
26	85.0	85.0	85.0	85.0	85.0	85.0	84.6	84.2	83.7	83.1	82.4	81.5	80.4	79.0
27	71.0	71.0	67.8	65.4	63.6	62.2	61.6	61.0	60.5	...	...	...	...	...
28	71.0	71.0	67.8	65.4	63.6	62.2	61.6	61.0	60.5	...	...	...	...	...
29	71.0	71.0	67.8	65.4	63.6	62.2	61.6	61.0	60.5	...	...	...	...	...
30	71.0	71.0	67.8	65.4	63.6	62.2	61.6	61.0	60.5	...	...	...	...	...
31	71.0	71.0	67.8	65.4	63.6	62.2	61.6	61.0	60.5	...	...	...	...	...
32	71.0	71.0	67.8	65.4	63.6	62.2	61.6	61.0	60.5	...	...	...	...	...
33	87.0	87.0	83.8	80.4	77.4	74.9	73.8	72.7	71.5	70.2	...	...	...	...
34	87.0	87.0	83.8	80.4	77.4	74.9	73.8	72.7	71.5	70.2	...	...	...	...
35	87.0	87.0	83.8	80.4	77.4	74.9	73.8	72.7	71.5	70.2	...	...	...	...
36	87.0	87.0	83.8	80.4	77.4	74.9	73.8	72.7	71.5	70.2	...	...	...	...
37	87.0	87.0	83.8	80.4	77.4	74.9	73.8	72.7	71.5	70.2	...	...	...	...
38	100.0	100.0	100.0	98.4	97.4	96.8	96.4	96.0	95.6	95.2	...	...	...	...
39	100.0	100.0	100.0	98.4	97.4	96.8	96.4	96.0	95.6	95.2	...	...	...	...
40	100.0	100.0	100.0	98.4	97.4	96.8	96.4	96.0	95.6	95.2	...	...	...	...
41	100.0	100.0	100.0	98.4	97.4	96.8	96.4	96.0	95.6	95.2	...	...	...	...
42	100.0	100.0	100.0	98.4	97.4	96.8	96.4	96.0	95.6	95.2	...	...	...	...
43	100.0	100.0	100.0	98.4	97.4	96.8	96.4	96.0	95.6	95.2	...	...	...	...
44	115.0	115.0	115.0	113.1	112.0	111.3	110.9	110.4	109.9	109.5	...	...	...	...

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Nonferrous Materials (Cont'd)								
1	70Ni-16Mo-7Cr-5Fe	Smls. & wld. fittings	SB-366	...	N10003	Annealed	...	100
2	70Ni-16Mo-7Cr-5Fe	Plate, sheet, strip	SB-434	...	N10003	Annealed	...	100
3	70Ni-16Mo-7Cr-5Fe	Rod	SB-573	...	N10003	Annealed	...	100
4	62Ni-25Mo-8Cr-2Fe	Smls. & wld. fittings	SB-366	...	N10242	Annealed	...	105
5	62Ni-25Mo-8Cr-2Fe	Plate, sheet, strip	SB-434	...	N10242	Annealed	...	105
6	62Ni-25Mo-8Cr-2Fe	Forgings	SB-564	...	N10242	Annealed	...	105
7	62Ni-25Mo-8Cr-2Fe	Rod	SB-573	...	N10242	Annealed	...	105
8	62Ni-25Mo-8Cr-2Fe	Wld. pipe	SB-619	...	N10242	Solution ann.	...	105
9	62Ni-25Mo-8Cr-2Fe	Smls. pipe & tube	SB-622	...	N10242	Solution ann.	...	105
10	62Ni-25Mo-8Cr-2Fe	Wld. tube	SB-626	...	N10242	Solution ann.	...	105
11	54Ni-16Mo-15Cr	Smls. & wld. fittings	SB-366	...	N10276	Solution ann.	...	100
12	54Ni-16Mo-15Cr	Forgings	SB-462	...	N10276	Solution ann.	...	100
13	54Ni-16Mo-15Cr	Forgings	SB-564	...	N10276	Solution ann.	...	100
14	54Ni-16Mo-15Cr	Rod	SB-574	...	N10276	Solution ann.	...	100
15	54Ni-16Mo-15Cr	Plate, sheet, strip	SB-575	...	N10276	Solution ann.	...	100
16	54Ni-16Mo-15Cr	Wld. pipe	SB-619	...	N10276	Solution ann.	...	100
17	54Ni-16Mo-15Cr	Smls. pipe & tube	SB-622	...	N10276	Solution ann.	...	100
18	54Ni-16Mo-15Cr	Wld. tube	SB-626	...	N10276	Solution ann.	...	100
19	Ni-28Mo-3Fe-1.3Cr-0.25Al	Plate, sheet, strip	SB-333	...	N10629	...	...	110
20	Ni-28Mo-3Fe-1.3Cr-0.25Al	Rod	SB-335	...	N10629	...	...	110
21	Ni-28Mo-3Fe-1.3Cr-0.25Al	Smls. & wld. fittings	SB-366	...	N10629	...	...	110
22	Ni-28Mo-3Fe-1.3Cr-0.25Al	Forgings	SB-564	...	N10629	...	...	110
23	Ni-28Mo-3Fe-1.3Cr-0.25Al	Wld. pipe	SB-619	...	N10629	...	...	110
24	Ni-28Mo-3Fe-1.3Cr-0.25Al	Smls. pipe & tube	SB-622	...	N10629	...	...	110
25	Ni-28Mo-3Fe-1.3Cr-0.25Al	Wld. tube	SB-626	...	N10629	...	...	110
26	65Ni-28Mo-2Fe	Smls. & wld. fittings	SB-366	...	N10665	Annealed	...	110
27	65Ni-28Mo-2Fe	Wld. pipe	SB-619	...	N10665	Annealed	...	110
28	65Ni-28Mo-2Fe	Wld. tube	SB-626	...	N10665	Annealed	...	110
29	65Ni-28Mo-2Fe	Plate, sheet, strip	SB-333	...	N10665	Solution ann.	...	110
30	65Ni-28Mo-2Fe	Rod	SB-335	...	N10665	Solution ann.	...	110
31	65Ni-28Mo-2Fe	Forgings	SB-462	...	N10665	Solution ann.	...	110
32	65Ni-28Mo-2Fe	Forgings	SB-564	...	N10665	Solution ann.	...	110
33	65Ni-28Mo-2Fe	Wld. pipe	SB-619	...	N10665	Solution ann.	...	110
34	65Ni-28Mo-2Fe	Smls. pipe & tube	SB-622	...	N10665	Solution ann.	...	110
35	65Ni-28Mo-2Fe	Wld. tube	SB-626	...	N10665	Solution ann.	...	110
36	65Ni-29.5Mo-2Fe-2Cr	Plate, sheet, strip	SB-333	...	N10675	Solution ann.	...	110
37	65Ni-29.5Mo-2Fe-2Cr	Rod	SB-335	...	N10675	Solution ann.	...	110
38	65Ni-29.5Mo-2Fe-2Cr	Smls. & wld. fittings	SB-366	...	N10675	Solution ann.	...	110
39	65Ni-29.5Mo-2Fe-2Cr	Forgings	SB-462	...	N10675	Solution ann.	...	110
40	65Ni-29.5Mo-2Fe-2Cr	Forgings	SB-564	...	N10675	Solution ann.	...	110
41	65Ni-29.5Mo-2Fe-2Cr	Wld. pipe	SB-619	...	N10675	Solution ann.	...	110
42	65Ni-29.5Mo-2Fe-2Cr	Smls. pipe & tube	SB-622	...	N10675	Solution ann.	...	110
43	65Ni-29.5Mo-2Fe-2Cr	Wld. tube	SB-626	...	N10675	Solution ann.	...	110

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)													
1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	...	...	...	...
2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	...	...	...	...
3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	...	...	...	...
4	105.0	105.0	105.0	105.0	105.0	104.4	104.2	103.9	103.7	103.5	103.3	103.2	103.1	103.1
5	105.0	105.0	105.0	105.0	105.0	104.4	104.2	103.9	103.7	103.5	103.3	103.2	103.1	103.1
6	105.0	105.0	105.0	105.0	105.0	104.4	104.2	103.9	103.7	103.5	103.3	103.2	103.1	103.1
7	105.0	105.0	105.0	105.0	105.0	104.4	104.2	103.9	103.7	103.5	103.3	103.2	103.1	103.1
8	105.0	105.0	105.0	105.0	105.0	104.4	104.2	103.9	103.7	103.5	103.3	103.2	103.1	103.1
9	105.0	105.0	105.0	105.0	105.0	104.4	104.2	103.9	103.7	103.5	103.3	103.2	103.1	103.1
10	105.0	105.0	105.0	105.0	105.0	104.4	104.2	103.9	103.7	103.5	103.3	103.2	103.1	103.1
11	100.0	100.0	100.0	97.7	95.7	93.9	93.1	92.4	91.7	90.9	90.2	89.4	88.5	87.6
12	100.0	100.0	100.0	97.7	95.7	93.9	93.1	92.4	91.7	90.9	90.2	89.4	88.5	87.6
13	100.0	100.0	100.0	97.7	95.7	93.9	93.1	92.4	91.7	90.9	90.2	89.4	88.5	87.6
14	100.0	100.0	100.0	97.7	95.7	93.9	93.1	92.4	91.7	90.9	90.2	89.4	88.5	87.6
15	100.0	100.0	100.0	97.7	95.7	93.9	93.1	92.4	91.7	90.9	90.2	89.4	88.5	87.6
16	100.0	100.0	100.0	97.7	95.7	93.9	93.1	92.4	91.7	90.9	90.2	89.4	88.5	87.6
17	100.0	100.0	100.0	97.7	95.7	93.9	93.1	92.4	91.7	90.9	90.2	89.4	88.5	87.6
18	100.0	100.0	100.0	97.7	95.7	93.9	93.1	92.4	91.7	90.9	90.2	89.4	88.5	87.6
19	110.0	110.0	110.0	110.0	108.7	107.1	106.4	105.8	105.2	104.7	104.2	103.8	103.0	...
20	110.0	110.0	110.0	110.0	108.7	107.1	106.4	105.8	105.2	104.7	104.2	103.8	103.0	...
21	110.0	110.0	110.0	110.0	108.7	107.1	106.4	105.8	105.2	104.7	104.2	103.8	103.0	...
22	110.0	110.0	110.0	110.0	108.7	107.1	106.4	105.8	105.2	104.7	104.2	103.8	103.0	...
23	110.0	110.0	110.0	110.0	108.7	107.1	106.4	105.8	105.2	104.7	104.2	103.8	103.0	...
24	110.0	110.0	110.0	110.0	108.7	107.1	106.4	105.8	105.2	104.7	104.2	103.8	103.0	...
25	110.0	110.0	110.0	110.0	108.7	107.1	106.4	105.8	105.2	104.7	104.2	103.8	103.0	...
26	110.0	110.0	110.0	110.0	110.0	109.2	108.7	108.1	107.6	107.0	106.5	105.9	105.5	105.3
27	110.0	110.0	110.0	110.0	110.0	109.2	108.7	108.1	107.6	107.0	106.5	105.9	105.5	105.3
28	110.0	110.0	110.0	110.0	110.0	109.2	108.7	108.1	107.6	107.0	106.5	105.9	105.5	105.3
29	110.0	110.0	110.0	110.0	110.0	109.2	108.7	108.1	107.6	107.0	106.5	105.9	105.5	105.3
30	110.0	110.0	110.0	110.0	110.0	109.2	108.7	108.1	107.6	107.0	106.5	105.9	105.5	105.3
31	110.0	110.0	110.0	110.0	110.0	109.2	108.7	108.1	107.6	107.0	106.5	105.9	105.5	105.3
32	110.0	110.0	110.0	110.0	110.0	109.2	108.7	108.1	107.6	107.0	106.5	105.9	105.5	105.3
33	110.0	110.0	110.0	110.0	110.0	109.2	108.7	108.1	107.6	107.0	106.5	105.9	105.5	105.3
34	110.0	110.0	110.0	110.0	110.0	109.2	108.7	108.1	107.6	107.0	106.5	105.9	105.5	105.3
35	110.0	110.0	110.0	110.0	110.0	109.2	108.7	108.1	107.6	107.0	106.5	105.9	105.5	105.3
36	110.0	110.0	110.0	110.0	108.7	107.1	106.4	105.8	105.2	104.7	104.2	103.8	103.3	102.8
37	110.0	110.0	110.0	110.0	108.7	107.1	106.4	105.8	105.2	104.7	104.2	103.8	103.3	102.8
38	110.0	110.0	110.0	110.0	108.7	107.1	106.4	105.8	105.2	104.7	104.2	103.8	103.3	102.8
39	110.0	110.0	110.0	110.0	108.7	107.1	106.4	105.8	105.2	104.7	104.2	103.8	103.3	102.8
40	110.0	110.0	110.0	110.0	108.7	107.1	106.4	105.8	105.2	104.7	104.2	103.8	103.3	102.8
41	110.0	110.0	110.0	110.0	108.7	107.1	106.4	105.8	105.2	104.7	104.2	103.8	103.3	102.8
42	110.0	110.0	110.0	110.0	108.7	107.1	106.4	105.8	105.2	104.7	104.2	103.8	103.3	102.8
43	110.0	110.0	110.0	110.0	108.7	107.1	106.4	105.8	105.2	104.7	104.2	103.8	103.3	102.8

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Nonferrous Materials (Cont'd)								
1	37Ni-30Co-28Cr-2.7Si	Plate, sheet, strip	SB-435	...	N12160	Solution ann.	...	90
2	37Ni-30Co-28Cr-2.7Si	Forgings	SB-564	...	N12160	Solution ann.	...	90
3	37Ni-30Co-28Cr-2.7Si	Rod	SB-572	...	N12160	Solution ann.	...	90
4	37Ni-30Co-28Cr-2.7Si	Wld. pipe	SB-619	...	N12160	Solution ann.	...	90
5	37Ni-30Co-28Cr-2.7Si	Smls. pipe & tube	SB-622	...	N12160	Solution ann.	...	90
6	37Ni-30Co-28Cr-2.7Si	Wld. tube	SB-626	...	N12160	Solution ann.	...	90
7	33Cr-31Ni-32Fe-1.5Mo-0.6Cu-N	Smls. & wld. fittings	SB-366	...	R20033	...	...	109
8	33Cr-31Ni-32Fe-1.5Mo-0.6Cu-N	Forgings	SB-564	...	R20033	...	...	109
9	33Cr-31Ni-32Fe-1.5Mo-0.6Cu-N	Wld. pipe	SB-619	...	R20033	...	...	109
10	33Cr-31Ni-32Fe-1.5Mo-0.6Cu-N	Smls. pipe & tube	SB-622	...	R20033	...	...	109
11	33Cr-31Ni-32Fe-1.5Mo-0.6Cu-N	Plate, sheet, strip	SB-625	...	R20033	...	...	109
12	33Cr-31Ni-32Fe-1.5Mo-0.6Cu-N	Wld. tube	SB-626	...	R20033	...	...	109
13	33Cr-31Ni-32Fe-1.5Mo-0.6Cu-N	Rod	SB-649	...	R20033	...	...	109
14	21Ni-30Fe-22Cr-18Co-3Mo-3W	Plate, sheet, strip	SB-435	...	R30556	Annealed	...	100
15	21Ni-30Fe-22Cr-18Co-3Mo-3W	Rod	SB-572	...	R30556	Annealed	...	100
16	21Ni-30Fe-22Cr-18Co-3Mo-3W	Wld. pipe	SB-619	...	R30556	Annealed	...	100
17	21Ni-30Fe-22Cr-18Co-3Mo-3W	Smls. pipe & tube	SB-622	...	R30556	Annealed	...	100
18	21Ni-30Fe-22Cr-18Co-3Mo-3W	Wld. tube	SB-626	...	R30556	Annealed	...	100
19	Co-26Cr-9Ni-5Mo-3Fe-2W	Rod	SB-815	...	R31233	Solution ann.	...	130
20	Co-26Cr-9Ni-5Mo-3Fe-2W	Plate, sheet, strip	SB-818	...	R31233	Solution ann.	...	130
21	Ti	Plate, sheet, strip	SB-265	1	R50250	Annealed	...	35
22	Ti	Smls. & wld. tube	SB-338	1	R50250	Annealed	...	35
23	Ti	Bar, billet	SB-348	1	R50250	Annealed	...	35
24	Ti	Smls. & wld. fittings	SB-363	WPT1	R50250	Annealed	...	35
25	Ti	Forgings	SB-381	F-1	R50250	Annealed	...	35
26	Ti	Smls. pipe	SB-861	1	R50250	Annealed	...	35
27	Ti	Wld. pipe	SB-862	1	R50250	Annealed	...	35
28	Ti	Castings	SB-367	C-2	R50400	...	...	50
29	Ti	Forgings	SB-381	F-2	R50400	Annealed	...	50
30	Ti	Plate, sheet, strip	SB-265	2H	R50400	Annealed	...	58
31	Ti	Smls. & wld. tube	SB-338	2H	R50400	Annealed	...	58
32	Ti	Bar, billet	SB-348	2H	R50400	Annealed	...	58
33	Ti	Smls. fittings	SB-363	WPT2H	R50400	Annealed	...	58
34	Ti	Wld. fittings	SB-363	WPT2HW	R50400	Annealed	...	58
35	Ti	Forgings	SB-381	F-2H	R50400	Annealed	...	58
36	Ti	Smls. pipe	SB-861	2H	R50400	Annealed	...	58
37	Ti	Wld. pipe	SB-862	2H	R50400	Annealed	...	58
38	Ti	Castings	SB-367	C-3	R50550	...	...	65
39	Ti	Plate, sheet, strip	SB-265	3	R50550	Annealed	...	65
40	Ti	Smls. & wld. tube	SB-338	3	R50550	Annealed	...	65
41	Ti	Bar, billet	SB-348	3	R50550	Annealed	...	65
42	Ti	Smls. & wld. fittings	SB-363	WPT3	R50550	Annealed	...	65
43	Ti	Forgings	SB-381	F-3	R50550	Annealed	...	65
44	Ti	Smls. pipe	SB-861	3	R50550	Annealed	...	65
45	Ti	Wld. pipe	SB-862	3	R50550	Annealed	...	65

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)													
1	90.0	90.0	90.0	87.8	85.5	83.3	82.2	81.1	80.0	78.9	77.8	76.6	75.4	74.1
2	90.0	90.0	90.0	87.8	85.5	83.3	82.2	81.1	80.0	78.9	77.8	76.6	75.4	74.1
3	90.0	90.0	90.0	87.8	85.5	83.3	82.2	81.1	80.0	78.9	77.8	76.6	75.4	74.1
4	90.0	90.0	90.0	87.8	85.5	83.3	82.2	81.1	80.0	78.9	77.8	76.6	75.4	74.1
5	90.0	90.0	90.0	87.8	85.5	83.3	82.2	81.1	80.0	78.9	77.8	76.6	75.4	74.1
6	90.0	90.0	90.0	87.8	85.5	83.3	82.2	81.1	80.0	78.9	77.8	76.6	75.4	74.1
7	109.0	109.0	103.2	97.8	93.7	90.6	89.3	88.2	87.1	86.0	84.9	83.5	...	...
8	109.0	109.0	103.2	97.8	93.7	90.6	89.3	88.2	87.1	86.0	84.9	83.5	...	...
9	109.0	109.0	103.2	97.8	93.7	90.6	89.3	88.2	87.1	86.0	84.9	83.5	...	...
10	109.0	109.0	103.2	97.8	93.7	90.6	89.3	88.2	87.1	86.0	84.9	83.5	...	...
11	109.0	109.0	103.2	97.8	93.7	90.6	89.3	88.2	87.1	86.0	84.9	83.5	...	...
12	109.0	109.0	103.2	97.8	93.7	90.6	89.3	88.2	87.1	86.0	84.9	83.5	...	...
13	109.0	109.0	103.2	97.8	93.7	90.6	89.3	88.2	87.1	86.0	84.9	83.5	...	...
14	100.0	100.0	97.9	94.7	92.5	91.1	90.5	90.1	89.7	89.3	88.8	88.2	87.5	86.6
15	100.0	100.0	97.9	94.7	92.5	91.1	90.5	90.1	89.7	89.3	88.8	88.2	87.5	86.6
16	100.0	100.0	97.9	94.7	92.5	91.1	90.5	90.1	89.7	89.3	88.8	88.2	87.5	86.6
17	100.0	100.0	97.9	94.7	92.5	91.1	90.5	90.1	89.7	89.3	88.8	88.2	87.5	86.6
18	100.0	100.0	97.9	94.7	92.5	91.1	90.5	90.1	89.7	89.3	88.8	88.2	87.5	86.6
19	130.0	130.0	130.0	130.0	130.0	130.0	130.0	128.3	126.6	125.2	124.1	123.0	121.9	120.4
20	130.0	130.0	130.0	130.0	130.0	130.0	130.0	128.3	126.6	125.2	124.1	123.0	121.9	120.4
21	35.0	28.9	23.1	19.3	16.3	12.5	...	...	...	...	...	...	...	...
22	35.0	28.9	23.1	19.3	16.3	12.5	...	...	...	...	...	...	...	...
23	35.0	28.9	23.1	19.3	16.3	12.5	...	...	...	...	...	...	...	...
24	35.0	28.9	23.1	19.3	16.3	12.5	...	...	...	...	...	...	...	...
25	35.0	28.9	23.1	19.3	16.3	12.5	...	...	...	...	...	...	...	...
26	35.0	28.9	23.1	19.3	16.3	12.5	...	...	...	...	...	...	...	...
27	35.0	28.9	23.1	19.3	16.3	12.5	...	...	...	...	...	...	...	...
28	50.0	41.3	34.1	28.4	23.8	...	...	...	...	...	...	...	...	...
29	50.0	43.6	36.2	30.9	26.6	22.8	...	...	...	...	...	...	...	...
30	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
31	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
32	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
33	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
34	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
35	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
36	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
37	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
38	65.0	55.2	44.6	36.2	29.8	...	...	...	...	...	...	...	...	...
39	65.0	55.2	44.6	36.2	29.8	25.8	...	...	...	...	...	...	...	...
40	65.0	55.2	44.6	36.2	29.8	25.8	...	...	...	...	...	...	...	...
41	65.0	55.2	44.6	36.2	29.8	25.8	...	...	...	...	...	...	...	...
42	65.0	55.2	44.6	36.2	29.8	25.8	...	...	...	...	...	...	...	...
43	65.0	55.2	44.6	36.2	29.8	25.8	...	...	...	...	...	...	...	...
44	65.0	55.2	44.6	36.2	29.8	25.8	...	...	...	...	...	...	...	...
45	65.0	55.2	44.6	36.2	29.8	25.8	...	...	...	...	...	...	...	...

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Nonferrous Materials (Cont'd)								
1	Ti–Pd	Plate, sheet, strip	SB-265	11	R52250	Annealed	...	35
2	Ti–Pd	Plate, sheet, strip	SB-265	17	R52252	Annealed	...	35
3	Ti–Ru	Plate, sheet, strip	SB-265	27	R52254	Annealed	...	35
4	Ti–Pd	Plate, sheet, strip	SB-265	7	R52400	Annealed	...	50
5	Ti–0.15Pd	Plate, sheet, strip	SB-265	7H	R52400	Annealed	...	58
6	Ti–0.15Pd	Smls. & wld. tube	SB-338	7H	R52400	Annealed	...	58
7	Ti–0.15Pd	Bar, billet	SB-348	7H	R52400	Annealed	...	58
8	Ti–0.15Pd	Smls. fittings	SB-363	WPT7H	R52400	Annealed	...	58
9	Ti–0.15Pd	Wld. fittings	SB-363	WPT7HW	R52400	Annealed	...	58
10	Ti–0.15Pd	Forgings	SB-381	F-7H	R52400	Annealed	...	58
11	Ti–0.15Pd	Smls. pipe	SB-861	7H	R52400	Annealed	...	58
12	Ti–0.15Pd	Wld. pipe	SB-862	7H	R52400	Annealed	...	58
13	Ti–Pd	Plate, sheet, strip	SB-265	16	R52402	Annealed	...	50
14	Ti–Pd	Bar, billet	SB-348	16	R52402	Annealed	...	50
15	Ti–Pd	Forgings	SB-381	F-16	R52402	Annealed	...	50
16	Ti–0.05Pd	Plate, sheet, strip	SB-265	16H	R52402	Annealed	...	58
17	Ti–0.05Pd	Smls. & wld. tube	SB-338	16H	R52402	Annealed	...	58
18	Ti–0.05Pd	Bar, billet	SB-348	16H	R52402	Annealed	...	58
19	Ti–0.05Pd	Smls. fittings	SB-363	WPT16H	R52402	Annealed	...	58
20	Ti–0.05Pd	Wld. fittings	SB-363	WPT16HW	R52402	Annealed	...	58
21	Ti–0.05Pd	Forgings	SB-381	F-16H	R52402	Annealed	...	58
22	Ti–0.05Pd	Smls. pipe	SB-861	16H	R52402	Annealed	...	58
23	Ti–0.05Pd	Wld. pipe	SB-862	16H	R52402	Annealed	...	58
24	Ti–Ru	Plate, sheet, strip	SB-265	26	R52404	Annealed	...	50
25	Ti–Ru	Smls. & wld. tube	SB-338	26	R52404	Annealed	...	50
26	Ti–Ru	Bar, billet	SB-348	26	R52404	Annealed	...	50
27	Ti–Ru	Smls. fittings	SB-363	WPT26	R52404	Annealed	...	50
28	Ti–Ru	Wld. fittings	SB-363	WPT26W	R52404	Annealed	...	50
29	Ti–Ru	Forgings	SB-381	F-26	R52404	Annealed	...	50
30	Ti–Ru	Smls. pipe	SB-861	26	R52404	Annealed	...	50
31	Ti–Ru	Wld. pipe	SB-862	26	R52404	Annealed	...	50
32	Ti–0.10Ru	Plate, sheet, strip	SB-265	26H	R52404	Annealed	...	58
33	Ti–0.10Ru	Smls. & wld. tube	SB-338	26H	R52404	Annealed	...	58
34	Ti–0.10Ru	Bar, billet	SB-348	26H	R52404	Annealed	...	58
35	Ti–0.10Ru	Smls. fittings	SB-363	WPT26H	R52404	Annealed	...	58
36	Ti–0.10Ru	Wld. fittings	SB-363	WPT26HW	R52404	Annealed	...	58
37	Ti–0.10Ru	Forgings	SB-381	F-26H	R52404	Annealed	...	58
38	Ti–0.10Ru	Smls. pipe	SB-861	26H	R52404	Annealed	...	58
39	Ti–0.10Ru	Wld. pipe	SB-862	26H	R52404	Annealed	...	58
40	Ti–0.3Mo–0.8Ni	Forgings	SB-381	F-12	R53400	Annealed	...	70
41	Ti–3Al–2.5V	Plate, sheet, strip	SB-265	9	R56320	Annealed	...	90
42	Ti–3Al–2.5V	Smls. & wld. tube	SB-338	9	R56320	Annealed	...	90
43	Ti–3Al–2.5V	Bar, billet	SB-348	9	R56320	Annealed	...	90

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)													
1	35.0	28.9	23.1	19.3	16.3	12.5	...	...	...	...	...	...	...	...
2	35.0	29.2	23.2	19.2	16.4	12.4	...	...	...	...	...	...	...	...
3	35.0	28.9	23.1	19.3	16.3	12.5	...	...	...	...	...	...	...	...
4	50.0	43.6	36.2	30.9	26.6	22.8	...	...	...	...	...	...	...	...
5	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
6	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
7	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
8	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
9	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
10	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
11	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
12	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
13	50.0	43.6	36.0	30.8	26.4	22.8	...	...	...	...	...	...	...	...
14	50.0	43.6	36.0	30.8	26.4	22.8	...	...	...	...	...	...	...	...
15	50.0	43.6	36.0	30.8	26.4	22.8	...	...	...	...	...	...	...	...
16	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
17	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
18	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
19	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
20	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
21	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
22	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
23	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
24	50.0	43.6	36.0	30.8	26.4	22.8	...	...	...	...	...	...	...	...
25	50.0	43.6	36.0	30.8	26.4	22.8	...	...	...	...	...	...	...	...
26	50.0	43.6	36.0	30.8	26.4	22.8	...	...	...	...	...	...	...	...
27	50.0	43.6	36.0	30.8	26.4	22.8	...	...	...	...	...	...	...	...
28	50.0	43.6	36.0	30.8	26.4	22.8	...	...	...	...	...	...	...	...
29	50.0	43.6	36.0	30.8	26.4	22.8	...	...	...	...	...	...	...	...
30	50.0	43.6	36.0	30.8	26.4	22.8	...	...	...	...	...	...	...	...
31	50.0	43.6	36.0	30.8	26.4	22.8	...	...	...	...	...	...	...	...
32	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
33	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
34	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
35	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
36	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
37	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
38	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
39	58.0	45.9	38.2	32.6	28.1	...	...	...	...	...	...	...	...	...
40	70.0	65.4	56.8	50.0	45.7	43.2	...	...	...	...	...	...	...	...
41	90.0	86.6	79.1	70.5	63.4	60.3	...	...	...	...	...	...	...	...
42	90.0	86.6	79.1	70.5	63.4	60.3	...	...	...	...	...	...	...	...
43	90.0	86.6	79.1	70.5	63.4	60.3	...	...	...	...	...	...	...	...

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 Designation/ UNS No.	Class/Condition/ Temper	Size/Thickness, in.	Min. Tensile Strength, ksi
Nonferrous Materials (Cont'd)								
1	Ti-3Al-2.5V	Smls. fittings	SB-363	WPT9	R56320	Annealed	...	90
2	Ti-3Al-2.5V	Wld. fittings	SB-363	WPT9W	R56320	Annealed	...	90
3	Ti-3Al-2.5V	Forgings	SB-381	F-9	R56320	Annealed	...	90
4	Ti-3Al-2.5V	Smls. pipe	SB-861	9	R56320	Annealed	...	90
5	Ti-3Al-2.5V	Wld. pipe	SB-862	9	R56320	Annealed	...	90
(10)	6	Ti-3Al-2.5V-0.1Ru	Plate, sheet, strip	SB-265	28	R56323	Annealed	90
(10)	7	Ti-3Al-2.5V-0.1Ru	Smls. & wld. tube	SB-338	28	R56323	Annealed	90
(10)	8	Ti-3Al-2.5V-0.1Ru	Bar, billet	SB-348	28	R56323	Annealed	90
(10)	9	Ti-3Al-2.5V-0.1Ru	Smls. fittings	SB-363	WPT28	R56323	Annealed	90
(10)	10	Ti-3Al-2.5V-0.1Ru	Wld. fittings	SB-363	WPT28W	R56323	Annealed	90
(10)	11	Ti-3Al-2.5V-0.1Ru	Forgings	SB-381	F-28	R56323	Annealed	90
(10)	12	Ti-3Al-2.5V-0.1Ru	Smls. pipe	SB-861	28	R56323	Annealed	90
(10)	13	Ti-3Al-2.5V-0.1Ru	Wld. pipe	SB-862	28	R56323	Annealed	90
14	99.2Zr	Forgings	SB-493	...	R60702	Annealed	...	55
15	99.2Zr	Smls. tube	SB-523	...	R60702	Annealed	...	55
16	99.2Zr	Wld. tube	SB-523	...	R60702	Annealed	...	55
17	99.2Zr	Bar, wire	SB-550	...	R60702	Annealed	...	55
18	99.2Zr	Plate, sheet, strip	SB-551	...	R60702	Annealed	...	55
19	99.2Zr	Smls. fittings	SB-653	PZ-2	R60702	Annealed	...	55
20	99.2Zr	Wld. fittings	SB-653	PZ-2W	R60702	Annealed	...	55
21	99.2Zr	Smls. & wld. pipe	SB-658	...	R60702	Annealed	...	55

TABLE U (CONT'D)
TENSILE STRENGTH VALUES S_u FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Tensile Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding													
	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)													
1	90.0	86.6	79.1	70.5	63.4	60.3	...	...	...	...	...	...	...	...
2	90.0	86.6	79.1	70.5	63.4	60.3	...	...	...	...	...	...	...	...
3	90.0	86.6	79.1	70.5	63.4	60.3	...	...	...	...	...	...	...	...
4	90.0	86.6	79.1	70.5	63.4	60.3	...	...	...	...	...	...	...	...
5	90.0	86.6	79.1	70.5	63.4	60.3	...	...	...	...	...	...	...	...
6	90.0	86.6	79.1	70.5	63.4	60.3	...	...	...	...	...	...	...	...
7	90.0	86.6	79.1	70.5	63.4	60.3	...	...	...	...	...	...	...	...
8	90.0	86.6	79.1	70.5	63.4	60.3	...	...	...	...	...	...	...	...
9	90.0	86.6	79.1	70.5	63.4	60.3	...	...	...	...	...	...	...	...
10	90.0	86.6	79.1	70.5	63.4	60.3	...	...	...	...	...	...	...	...
11	90.0	86.6	79.1	70.5	63.4	60.3	...	...	...	...	...	...	...	...
12	90.0	86.6	79.1	70.5	63.4	60.3	...	...	...	...	...	...	...	...
13	90.0	86.6	79.1	70.5	63.4	60.3	...	...	...	...	...	...	...	...
14	55.0	47.9	39.0	31.9	26.6	23.1	21.8	20.8	19.9	19.2	...	...	...	...
15	55.0	47.9	39.0	31.9	26.6	23.1	21.8	20.8	19.9	19.2	...	...	...	...
16	55.0	47.9	39.0	31.9	26.6	23.1	21.8	20.8	19.9	19.2	...	...	...	...
17	55.0	47.9	39.0	31.9	26.6	23.1	21.8	20.8	19.9	19.2	...	...	...	...
18	55.0	47.9	39.0	31.9	26.6	23.1	21.8	20.8	19.9	19.2	...	...	...	...
19	55.0	47.9	39.0	31.9	26.6	23.1	21.8	20.8	19.9	19.2	...	...	...	...
20	55.0	47.9	39.0	31.9	26.6	23.1	21.8	20.8	19.9	19.2	...	...	...	...
21	55.0	47.9	39.0	31.9	26.6	23.1	21.8	20.8	19.9	19.2	...	...	...	...

NOTES TO TABLE U

GENERAL NOTES

- (a) The following abbreviations are used: ann., annealed; cond., condenser; fin., finished; fr., from; rel., relieved; rld., rolled; Smls., Seamless; Sol., Solution; 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, or VIII 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.

TABLE U-2
SECTION VIII, DIVISION 3 TENSILE STRENGTH VALUES S_u FOR FERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	UNS No.	Temper	Diameter, in.	Specified Minimum Tensile, ksi	Notes
1	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-231	...	...	Oil	0.020	300	(1)
2	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-232	...	...	Oil	0.020	300	(1)
3	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-231	...	...	Oil	0.032	290	(1)
4	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-232	...	...	Oil	0.032	290	(1)
5	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-231	...	...	Oil	0.041	280	(1)
6	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-232	...	...	Oil	0.041	280	(1)
7	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-231	...	...	Oil	0.054	270	(1)
8	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-232	...	...	Oil	0.054	270	(1)
9	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-231	...	...	Oil	0.062	265	(1)
10	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-232	...	...	Oil	0.062	265	(1)
11	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-231	...	...	Oil	0.080	255	(2)
12	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-232	...	...	Oil	0.080	255	(2)
13	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-231	...	...	Oil	0.105	245	(2)
14	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-232	...	...	Oil	0.105	245	(2)
15	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-231	...	...	Oil	0.135	235	(2)
16	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-232	...	...	Oil	0.135	235	(2)
17	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-231	...	...	Oil	0.162	225	(2)
18	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-232	...	...	Oil	0.162	225	(2)
19	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-231	...	...	Oil	0.192	220	(2)
20	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-232	...	...	Oil	0.192	220	(2)
21	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-231	...	...	Oil	0.244	210	(2)
22	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-232	...	...	Oil	0.244	210	(2)
23	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-231	...	...	Oil	0.283	205	(2)
24	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-232	...	...	Oil	0.283	205	(2)
25	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-231	...	...	Oil	0.312	203	(2)
26	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-232	...	...	Oil	0.312	203	(2)
27	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-231	...	...	Oil	0.375	200	(2)
28	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-232	...	...	Oil	0.375	200	(2)
29	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-231	...	...	Oil	0.438	195	(2)
30	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-232	...	...	Oil	0.438	195	(2)
31	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-231	...	...	Oil	0.500	190	(2)
32	1Cr- $\frac{1}{4}$ Si-V	Wire	SA-232	...	...	Oil	0.500	190	(2)

GENERAL NOTES

- (a) These wire materials are suitable only for use in special closure parts designed in accordance with Article KD-6 of Section VIII, Division 3, for which it is impractical or impossible to obtain yield strength data. The materials shall not be used for fabrication of other pressure retaining components, such as bolting, wire wound vessels, or wire wound frames.
- (b) The wire may be reshaped for final use from a round to some other cross section, provided the processing does not adversely affect the tensile strength of the material.
- (c) Tensile strength values for intermediate diameters may be interpolated. The values at intermediate diameters shall be rounded to the same number of decimal places as the value at the lesser diameter 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.
- (d) These materials are not intended for use over 100°F.

NOTES

- (1) Material of this diameter shall have a maximum tensile strength not in excess of 25 ksi above the specified minimum.
- (2) Material of this diameter shall have a maximum tensile strength not in excess of 20 ksi above the specified minimum.

TABLE Y-1
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Nominal Composition	Product Form	Spec No.	Type/Grade	Alloy Designation/ 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	...	...
5	Carbon steel	Plate	SA-283	A	...	...
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	Carbon steel	Plate	SA-283	B	...	...
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	...
(10) 27	Carbon steel	Plate	SA/EN 10028-3	P275NH	...	...
(10) 28	Carbon steel	Plate	SA/EN 10028-3	P275NH	...	...
29	Carbon steel	Plate	SA/EN 10028-3	P275NH	...	...
30	Carbon steel	Bar	SA-675	55	...	...
31	Carbon steel	Wld. pipe	SA-134	A283C	K02401	...
32	Carbon steel	Plate	SA-283	C	K02401	...
33	Carbon steel	Plate	SA-285	C	K02801	...
34	Carbon steel	Smls. & wld. pipe	SA-333	I	K03008	...
35	Carbon steel	Smls. & wld. tube	SA-334	I	K03008	...
36	Carbon steel	Plate	SA-516	55	K01800	...
37	Carbon steel	Smls. pipe	SA-524	II	K02104	...
38	Carbon steel	Wld. pipe	SA-671	CA55	K02801	...
39	Carbon steel	Wld. pipe	SA-671	CE55	K02202	...
40	Carbon steel	Wld. pipe	SA-672	A55	K02801	...
41	Carbon steel	Wld. pipe	SA-672	B55	K02001	...
42	Carbon steel	Wld. pipe	SA-672	C55	K01800	...
43	Carbon steel	Wld. pipe	SA-672	E55	K02202	...
44	Carbon steel	Sheet	SA-414	C	K02503	...

TABLE Y-1
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials				
1	...	40	20	...
2	...	40	20	...
3	...	45	22.5	...
4	...	45	24	...
5	...	45	24	...
6	...	45	24	...
7	...	45	24	...
8	...	45	25	...
9	...	47	26	...
10	...	47	26	...
11	...	47	26	...
12	...	47	26	...
13	...	47	26	...
14	...	47	26	...
15	...	48	30	...
16	...	48	30	...
17	...	48	30	...
18	...	48	30	...
19	...	48	30	...
20	...	48	30	...
21	...	50	25	...
22	...	50	27	...
23	...	50	27	...
24	...	50	27	...
25	...	50	27	...
26	...	50	30	...
27	$6 < t \leq 10$	51	31	... (10)
28	$4 < t \leq 6$	52	32.5	... (10)
29	$2 < t \leq 4$	53.5	34	...
30	...	55	27.5	...
31	...	55	30	...
32	...	55	30	...
33	...	55	30	...
34	...	55	30	...
35	...	55	30	...
36	...	55	30	...
37	...	55	30	...
38	...	55	30	...
39	...	55	30	...
40	...	55	30	...
41	...	55	30	...
42	...	55	30	...
43	...	55	30	...
44	...	55	33	...

TABLE Y-1
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials								
1	20.0	18.8	18.3	18.0	17.7	...	17.1	...	16.3
2	20.0	18.8	18.3	18.0	17.7	...	17.1	...	16.3
3	22.5	21.1	20.6	20.2	19.9	...	19.2	...	18.3
4	24.0	22.6	22.0	21.6	21.2	...	20.5	...	19.6
5	24.0	22.6	22.0	21.6	21.2	...	20.5	...	19.6
6	24.0	22.6	22.0	21.6	21.2	...	20.5	...	19.6
7	24.0	22.6	22.0	21.6	21.2	...	20.5	...	19.6
8	25.0	23.5	22.9	22.5	22.1	...	21.4	...	20.4
9	26.0	24.4	23.8	23.4	23.0	...	22.2	...	21.2
10	26.0	24.4	23.8	23.4	23.0	...	22.2	...	21.2
11	26.0	24.4	23.8	23.4	23.0	...	22.2	...	21.2
12	26.0	24.4	23.8	23.4	23.0	...	22.2	...	21.2
13	26.0	24.4	23.8	23.4	23.0	...	22.2	...	21.2
14	26.0	24.4	23.8	23.4	23.0	...	22.2	...	21.2
15	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
16	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
17	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
18	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
19	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
20	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
21	25.0	23.5	22.9	22.5	22.1	...	21.4	...	20.4
22	27.0	25.4	24.7	24.3	23.9	...	23.1	...	22.0
23	27.0	25.4	24.7	24.3	23.9	...	23.1	...	22.0
24	27.0	25.4	24.7	24.3	23.9	...	23.1	...	22.0
25	27.0	25.4	24.7	24.3	23.9	...	23.1	...	22.0
26	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
(10) 27	31.0	29.3	28.6	...	27.6	...	26.6	...	25.4
(10) 28	32.5	30.7	29.9	...	28.9	...	27.9	...	26.6
29	34.0	32.0	31.1	...	30.1	...	29.1	...	...
30	27.5	25.8	25.2	24.7	24.3	...	23.5	...	22.4
31	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
32	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
33	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
34	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
35	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
36	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
37	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
38	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
39	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
40	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
41	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
42	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
43	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
44	33.0	31.0	30.2	29.7	29.2	...	28.2	...	26.9

TABLE Y-1
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials									
1	...	15.3	14.8	14.3	13.8	13.4	13.0	12.6	12.3	11.9
2	...	15.3	14.8	14.3	13.8	13.4	13.0	12.6	12.3	11.9
3	...	17.2	16.7	16.1	15.6	15.1	14.6	14.2	13.8	13.4
4	...	18.4	17.8	17.2	16.6	16.1	15.6	15.2	14.7	14.3
5	...	18.4	17.8	17.2	16.6	16.1	15.6	15.2	14.7	14.3
6	...	18.4	17.8	17.2	16.6	16.1	15.6	15.2	14.7	14.3
7	...	18.4	17.8	17.2	16.6	16.1	15.6	15.2	14.7	14.3
8	...	19.2	18.5	17.9	17.3	16.8	16.3	15.8	15.4	14.9
9	...	19.9	19.3	18.6	18.0	17.4	16.9	16.4	16.0	15.5
10	...	19.9	19.3	18.6	18.0	17.4	16.9	16.4	16.0	15.5
11	...	19.9	19.3	18.6	18.0	17.4	16.9	16.4	16.0	15.5
12	...	19.9	19.3	18.6	18.0	17.4	16.9	16.4	16.0	15.5
13	...	19.9	19.3	18.6	18.0	17.4	16.9	16.4	16.0	15.5
14	...	19.9	19.3	18.6	18.0	17.4	16.9	16.4	16.0	15.5
15	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
16	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
17	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
18	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
19	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
20	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
21	...	19.2	18.5	17.9	17.3	16.8	16.3	15.8	15.4	14.9
22	...	20.7	20.0	19.3	18.7	18.1	17.6	17.1	16.6	16.0
23	...	20.7	20.0	19.3	18.7	18.1	17.6	17.1	16.6	16.0
24	...	20.7	20.0	19.3	18.7	18.1	17.6	17.1	16.6	16.0
25	...	20.7	20.0	19.3	18.7	18.1	17.6	17.1	16.6	16.0
26	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
27	...	23.9	23.1	22.3	21.6	20.9	20.3	19.7	19.2	18.5 (10)
28	...	25.0	24.2	23.4	22.6	21.9	21.2	20.6	20.0	19.4 (10)
29
30	...	21.1	20.4	19.7	19.0	18.4	17.9	17.4	16.9	16.3
31	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
32	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
33	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
34	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
35	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
36	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
37	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
38	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
39	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
40	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
41	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
42	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
43	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
44	...	25.3	24.5	23.6	22.8	22.1	21.5	20.9	20.3	19.6

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	Carbon steel	Plate	SA/EN 10028-3	P275NH	...	...
2	Carbon steel	Plate, sheet, bar	SA-36	...	K02600	...
3	Carbon steel	Plate, sheet	SA-662	A	K01701	...
4	Carbon steel	Forgings	SA-181	...	K03502	60
5	Carbon steel	Castings	SA-216	WCA	J02502	...
6	Carbon steel	Forgings	SA-266	1	K03506	...
7	Carbon steel	Forgings	SA-350	LF1	K03009	1
8	Carbon steel	Castings	SA-352	LCA	J02504	...
9	Carbon steel	Cast pipe	SA-660	WCA	J02504	...
10	Carbon steel	Bar	SA-675	60	...	...
11	Carbon steel	Forgings	SA-765	I	K03046	...
12	Carbon steel	Plate	SA-515	60	K02401	...
13	Carbon steel	Plate	SA-516	60	K02100	...
14	Carbon steel	Wld. pipe	SA-671	CB60	K02401	...
15	Carbon steel	Wld. pipe	SA-671	CC60	K02100	...
16	Carbon steel	Wld. pipe	SA-671	CE60	K02402	...
17	Carbon steel	Wld. pipe	SA-672	B60	K02401	...
18	Carbon steel	Wld. pipe	SA-672	C60	K02100	...
19	Carbon steel	Wld. pipe	SA-672	E60	K02402	...
20	Carbon steel	Wld. pipe	SA-134	A283D	K02702	...
21	Carbon steel	Plate	SA-283	D	K02702	...
22	Carbon steel	Wld. pipe	SA-53	E/B	K03005	...
23	Carbon steel	Smls. pipe	SA-53	S/B	K03005	...
24	Carbon steel	Smls. pipe	SA-106	B	K03006	...
25	Carbon steel	Wld. pipe	SA-135	B	...	...
26	Carbon steel	Smls. & wld. fittings	SA-234	WPB	K03006	...
27	Carbon steel	Smls. & wld. pipe	SA-333	6	K03006	...
28	Carbon steel	Smls. & wld. tube	SA-334	6	K03006	...
29	Carbon steel	Forged pipe	SA-369	FPB	K03006	...
30	Carbon steel	Forgings	SA-372	A	K03002	...
31	Carbon steel	Sheet	SA-414	D	K02505	...
32	Carbon steel	Smls. & wld. fittings	SA-420	WPL6	...	...
33	Carbon steel	Smls. pipe	SA-524	I	K02104	...
34	Carbon steel	Bar	SA-695	B/35	K03504	...
35	Carbon steel	Bar	SA-696	B	K03200	...
36	Carbon steel	Forgings	SA-727	...	K02506	...
37	Carbon steel	Wld. tube	SA-178	C	K03503	...
38	Carbon steel	Smls. tube	SA-210	A-1	K02707	...
39	Carbon steel	Smls. tube	SA-556	B2	K02707	...
40	Carbon steel	Wld. tube	SA-557	B2	K03007	...
41	Carbon steel	Plate, bar	SA/CSA-G40.21	38W	...	...
42	Carbon steel	Plate	SA/EN 10028-2	P295GH	...	...
(a) 43	Carbon steel	Plate	SA/AS 1548	PT430	...	...
(a) 44	Carbon steel	Plate	SA/AS 1548	PT430	...	...
(a) 45	Carbon steel	Plate	SA/AS 1548	PT430	...	...
(a) 46	Carbon steel	Plate	SA/AS 1548	PT430	...	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	≤ 2	56.5	38.5	...
2	...	58	36	...
3	...	58	40	...
4	...	60	30	...
5	...	60	30	...
6	...	60	30	...
7	...	60	30	...
8	...	60	30	...
9	...	60	30	...
10	...	60	30	...
11	...	60	30	...
12	...	60	32	...
13	...	60	32	...
14	...	60	32	...
15	...	60	32	...
16	...	60	32	...
17	...	60	32	...
18	...	60	32	...
19	...	60	32	...
20	...	60	33	...
21	...	60	33	...
22	...	60	35	...
23	...	60	35	...
24	...	60	35	...
25	...	60	35	...
26	...	60	35	...
27	...	60	35	...
28	...	60	35	...
29	...	60	35	...
30	...	60	35	...
31	...	60	35	...
32	...	60	35	...
33	...	60	35	...
34	...	60	35	...
35	...	60	35	...
36	...	60	36	...
37	...	60	37	...
38	...	60	37	...
39	...	60	37	...
40	...	60	37	...
41	...	60	38	...
42	$6 < t \leq 10$	62.5	32	...
43	$3\frac{1}{4} < t \leq 6$	62.5	36.5	... (a)
44	$1\frac{1}{2} < t \leq 3\frac{1}{4}$	62.5	39	... (a)
45	$\frac{5}{8} < t \leq 1\frac{1}{2}$	62.5	40.5	... (a)
46	$\leq \frac{5}{8}$	62.5	43.5	... (a)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	38.5	36.2	35.3	...	34.1	...	32.9	...	...
2	36.0	33.8	33.0	32.4	31.8	...	30.8	...	29.3
3	40.0	37.6	36.6	36.0	35.4	...	34.2	...	32.6
4	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
5	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
6	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
7	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
8	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
9	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
10	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
11	30.0	28.2	27.5	27.0	26.5	...	25.6	...	24.4
12	32.0	30.1	29.3	28.8	28.3	...	27.3	...	26.1
13	32.0	30.1	29.3	28.8	28.3	...	27.3	...	26.1
14	32.0	30.1	29.3	28.8	28.3	...	27.3	...	26.1
15	32.0	30.1	29.3	28.8	28.3	...	27.3	...	26.1
16	32.0	30.1	29.3	28.8	28.3	...	27.3	...	26.1
17	32.0	30.1	29.3	28.8	28.3	...	27.3	...	26.1
18	32.0	30.1	29.3	28.8	28.3	...	27.3	...	26.1
19	32.0	30.1	29.3	28.8	28.3	...	27.3	...	26.1
20	33.0	31.0	30.2	29.7	29.2	...	28.2	...	26.9
21	33.0	31.0	30.2	29.7	29.2	...	28.2	...	26.9
22	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
23	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
24	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
25	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
26	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
27	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
28	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
29	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
30	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
31	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
32	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
33	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
34	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
35	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
36	36.0	33.8	33.0	32.4	31.8	...	30.8	...	29.3
37	37.0	34.8	33.9	33.3	32.7	...	31.6	...	30.2
38	37.0	34.8	33.9	33.3	32.7	...	31.6	...	30.2
39	37.0	34.8	33.9	33.3	32.7	...	31.6	...	30.2
40	37.0	34.8	33.9	33.3	32.7	...	31.6	...	30.2
41	38.0	35.7	34.8	34.2	33.6	...	32.5	...	31.0
42	32.0	30.1	29.3	28.8	28.3	...	27.3	...	26.1
(a) 43	36.5	...	33.4	...	32.3	...	31.2	...	29.7
(a) 44	39.0	...	35.7	...	34.5	...	33.3	...	31.8
(a) 45	40.5	...	37.1	...	35.8	...	34.6	...	33.0
(a) 46	43.5	...	39.9	...	38.5	...	37.2	...	35.4

2011a SECTION II, PART D (CUSTOMARY)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1
2	...	27.6	26.7	25.8	24.9	24.1	23.4	22.8	22.1	21.4
3	...	30.7	29.6	28.6	27.7	26.8	26.0	25.3	24.6	23.8
4	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
5	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
6	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
7	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
8	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
9	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
10	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
11	...	23.0	22.2	21.5	20.8	20.1	19.5	19.0	18.4	17.8
12	...	24.5	23.7	22.9	22.2	21.5	20.8	20.2	19.7	19.0
13	...	24.5	23.7	22.9	22.2	21.5	20.8	20.2	19.7	19.0
14	...	24.5	23.7	22.9	22.2	21.5	20.8	20.2	19.7	19.0
15	...	24.5	23.7	22.9	22.2	21.5	20.8	20.2	19.7	19.0
16	...	24.5	23.7	22.9	22.2	21.5	20.8	20.2	19.7	19.0
17	...	24.5	23.7	22.9	22.2	21.5	20.8	20.2	19.7	19.0
18	...	24.5	23.7	22.9	22.2	21.5	20.8	20.2	19.7	19.0
19	...	24.5	23.7	22.9	22.2	21.5	20.8	20.2	19.7	19.0
20	...	25.3	24.5	23.6	22.8	22.1	21.5	20.9	20.3	19.6
21	...	25.3	24.5	23.6	22.8	22.1	21.5	20.9	20.3	19.6
22	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
23	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
24	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
25	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
26	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
27	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
28	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
29	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
30	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
31	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
32	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
33	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
34	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
35	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
36	...	27.6	26.7	25.8	24.9	24.1	23.4	22.8	22.1	21.4
37	...	28.4	27.4	26.5	25.6	24.8	24.1	23.4	22.7	22.0
38	...	28.4	27.4	26.5	25.6	24.8	24.1	23.4	22.7	22.0
39	...	28.4	27.4	26.5	25.6	24.8	24.1	23.4	22.7	22.0
40	...	28.4	27.4	26.5	25.6	24.8	24.1	23.4	22.7	22.0
41	...	29.1	28.2	27.2	26.3	25.5	24.7	24.0	23.3	21.4
42	...	24.5	23.7	22.9	22.2	21.5	20.8	20.2	19.7	19.0
43	...	28.0	27.1	26.1	25.3	24.5	23.7	23.1	22.4	21.7 (a)
44	...	29.9	28.9	27.9	27.0	26.1	25.4	24.7	24.0	23.2 (a)
45	...	31.0	30.0	29.0	28.0	27.1	26.3	25.6	24.9	24.1 (a)
46	...	33.3	32.2	31.1	30.1	29.2	28.3	27.5	26.7	25.9 (a)

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	Carbon steel	Plate	SA/EN 10028-2	P295GH	...	...
2	Carbon steel	Bar	SA-675	65	...	...
3	Carbon steel	Castings	SA-352	LCB	J03003	...
4	Carbon steel	Plate	SA-515	65	K02800	...
5	Carbon steel	Plate	SA-516	65	K02403	...
6	Carbon steel	Wld. pipe	SA-671	CB65	K02800	...
7	Carbon steel	Wld. pipe	SA-671	CC65	K02403	...
8	Carbon steel	Wld. pipe	SA-672	B65	K02800	...
9	Carbon steel	Wld. pipe	SA-672	C65	K02403	...
10	Carbon steel	Sheet	SA-414	E	K02704	...
11	Carbon steel	Plate	SA-662	B	K02203	...
12	Carbon steel	Plate	SA/GB 6654	16MnR	...	...
13	Carbon steel	Plate	SA-537	...	K12437	1
14	Carbon steel	Wld. pipe	SA-691	CMSH-70	K12437	...
15	Carbon steel	Plate	SA/EN 10028-2	P295GH	...	...
(a) 16	Carbon steel	Plate	SA/AS 1548	PT460	...	...
(a) 17	Carbon steel	Plate	SA/AS 1548	PT460	...	...
18	Carbon steel	Plate	SA/EN 10028-2	P295GH	...	...
19	Carbon steel	Plate	SA/EN 10028-2	P295GH	...	...
(a) 20	Carbon steel	Plate	SA/AS 1548	PT460	...	...
21	Carbon steel	Plate	SA/EN 10028-2	P295GH	...	...
(a) 22	Carbon steel	Plate	SA/AS 1548	PT460	...	...
23	Carbon steel	Plate	SA/GB 6654	16MnR	...	...
24	Carbon steel	Plate	SA/GB 6654	16MnR	...	...
25	Carbon steel	Plate	SA-455	...	K03300	...
26	Carbon steel	Bar	SA-675	70	...	...
27	Carbon steel	Forgings	SA-105	...	K03504	...
28	Carbon steel	Forgings	SA-181	...	K03502	70
29	Carbon steel	Castings	SA-216	WCB	J03002	...
30	Carbon steel	Forgings	SA-266	2	K03506	...
31	Carbon steel	Forgings	SA-266	4	K03017	...
32	Carbon steel	Forgings	SA-350	LF2	K03011	...
33	Carbon steel	Forgings	SA-508	1	K13502	...
34	Carbon steel	Forgings	SA-508	1A	K13502	...
35	Carbon steel	Forgings	SA-541	1	K03506	...
36	Carbon steel	Forgings	SA-541	1A	K03020	...
37	Carbon steel	Cast pipe	SA-660	WCB	J03003	...
38	Carbon steel	Forgings	SA-765	II	K03047	...
39	Carbon steel	Plate	SA-515	70	K03101	...
40	Carbon steel	Plate	SA-516	70	K02700	...
41	Carbon steel	Wld. pipe	SA-671	CB70	K03101	...
42	Carbon steel	Wld. pipe	SA-671	CC70	K02700	...
43	Carbon steel	Wld. pipe	SA-672	B70	K03101	...
44	Carbon steel	Wld. pipe	SA-672	C70	K02700	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	$4 < t \leq 6$	64	34	...
2	...	65	32.5	...
3	...	65	35	...
4	...	65	35	...
5	...	65	35	...
6	...	65	35	...
7	...	65	35	...
8	...	65	35	...
9	...	65	35	...
10	...	65	38	...
11	...	65	40	...
12	$4 < t \leq 5$	65	40	...
13	$2\frac{1}{2} < t \leq 4$	65	45	...
14	$2\frac{1}{2} < t \leq 4$	65	45	...
15	$2\frac{1}{4} < t \leq 4$	66.5	37.5	...
16	$3\frac{1}{4} < t \leq 6$	66.5	38.5	... (a)
17	$1\frac{1}{2} < t \leq 3\frac{1}{4}$	66.5	40	... (a)
18	$1\frac{1}{2} < t \leq 2\frac{1}{4}$	66.5	41.5	...
19	$\frac{5}{8} < t \leq 1\frac{1}{2}$	66.5	42	...
20	$\frac{5}{8} < t \leq 1\frac{1}{2}$	66.5	43	... (a)
21	$\leq \frac{5}{8}$	66.5	43	...
22	$\leq \frac{5}{8}$	66.5	44	... (a)
23	$2.4 < t \leq 4$	67	41	...
24	$1.5 < t \leq 2.4$	68	44	...
25	$0.58 < t \leq \frac{3}{4}$	70	35	...
26	...	70	35	...
27	...	70	36	...
28	...	70	36	...
29	...	70	36	...
30	...	70	36	...
31	...	70	36	...
32	...	70	36	...
33	...	70	36	...
34	...	70	36	...
35	...	70	36	...
36	...	70	36	...
37	...	70	36	...
38	...	70	36	...
39	...	70	38	...
40	...	70	38	...
41	...	70	38	...
42	...	70	38	...
43	...	70	38	...
44	...	70	38	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	34.0	32.0	31.1	30.6	30.1	...	29.1	...	27.7
2	32.5	30.5	29.8	29.2	28.8	...	27.8	...	26.5
3	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
4	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
5	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
6	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
7	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
8	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
9	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
10	38.0	35.7	34.8	34.2	33.6	...	32.5	...	31.0
11	40.0	37.6	36.6	36.0	35.4	...	34.2	...	32.6
12	39.9	...	36.5	...	35.3	...	34.1	...	32.5
13	45.0	42.3	41.2	40.5	39.8	...	38.4	...	36.7
14	45.0	42.3	41.2	40.5	39.8	...	38.4	...	36.7
15	37.5	35.2	34.4	33.7	33.2	...	32.0	...	30.6
(a) 16	38.5	...	35.3	...	34.1	...	32.9	...	31.4
(a) 17	40.0	...	36.6	...	35.4	...	34.2	...	32.6
18	41.5	39.0	38.0	37.3	36.7	...	35.5	...	33.8
19	42.0	39.5	38.5	37.8	37.2	...	35.9	...	34.2
(a) 20	43.0	...	39.4	...	38.0	...	36.7	...	35.0
21	43.0	40.4	39.4	38.7	38.0	...	36.7	...	35.0
(a) 22	44.0	...	40.3	...	38.9	...	37.6	...	35.9
23	41.3	...	37.9	...	36.6	...	35.3	...	33.7
24	44.2	...	40.5	...	39.1	...	37.8	...	36.0
25	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
26	35.0	32.9	32.1	31.5	31.0	...	29.9	...	28.5
27	36.0	33.8	33.0	32.4	31.8	...	30.8	...	29.3
28	36.0	33.8	33.0	32.4	31.8	...	30.8	...	29.3
29	36.0	33.8	33.0	32.4	31.8	...	30.8	...	29.3
30	36.0	33.8	33.0	32.4	31.8	...	30.8	...	29.3
31	36.0	33.8	33.0	32.4	31.8	...	30.8	...	29.3
32	36.0	33.8	33.0	32.4	31.8	...	30.8	...	29.3
33	36.0	33.8	33.0	32.4	31.8	...	30.8	...	29.3
34	36.0	33.8	33.0	32.4	31.8	...	30.8	...	29.3
35	36.0	33.8	33.0	32.4	31.8	...	30.8	...	29.3
36	36.0	33.8	33.0	32.4	31.8	...	30.8	...	29.3
37	36.0	33.8	33.0	32.4	31.8	...	30.8	...	29.3
38	36.0	33.8	33.0	32.4	31.8	...	30.8	...	29.3
39	38.0	35.7	34.8	34.2	33.6	...	32.5	...	31.0
40	38.0	35.7	34.8	34.2	33.6	...	32.5	...	31.0
41	38.0	35.7	34.8	34.2	33.6	...	32.5	...	31.0
42	38.0	35.7	34.8	34.2	33.6	...	32.5	...	31.0
43	38.0	35.7	34.8	34.2	33.6	...	32.5	...	31.0
44	38.0	35.7	34.8	34.2	33.6	...	32.5	...	31.0

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	26.1	25.2	24.3	23.5	22.8	22.1	21.5	20.9	20.2
2	...	24.9	24.1	23.3	22.5	21.8	21.1	20.5	20.0	19.3
3	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
4	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
5	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
6	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
7	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
8	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
9	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
10	...	29.1	28.2	27.2	26.3	25.5	24.7	24.0	23.3	22.6
11	...	30.7	29.6	28.6	27.7	26.8	26.0	25.3	24.6	23.8
12
13	...	34.5	33.4	32.2	31.2	30.2	29.3	28.4	27.6	26.7
14	...	34.5	33.4	32.2	31.2	30.2	29.3	28.4	27.6	26.7
15	...	28.7	27.8	26.9	26.0	25.1	24.4	23.7	23.0	22.3
16	...	29.5	28.5	27.6	26.7	25.8	25.0	24.3	23.6	22.9 (a)
17	...	30.7	29.6	28.6	27.7	26.8	26.0	25.3	24.6	23.8 (a)
18	...	31.8	30.8	29.7	28.7	27.8	27.0	26.2	25.5	24.7
19	...	32.2	31.1	30.1	29.1	28.2	27.3	26.5	25.8	25.0
20	...	33.0	31.9	30.8	29.8	28.8	28.0	27.2	26.4	25.6 (a)
21	...	33.0	31.9	30.8	29.8	28.8	28.0	27.2	26.4	25.6
22	...	33.7	32.6	31.5	30.5	29.5	28.6	27.8	27.0	26.2 (a)
23
24
25	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
26	...	26.8	25.9	25.1	24.2	23.5	22.8	22.1	21.5	20.8
27	...	27.6	26.7	25.8	24.9	24.1	23.4	22.8	22.1	21.4
28	...	27.6	26.7	25.8	24.9	24.1	23.4	22.8	22.1	21.4
29	...	27.6	26.7	25.8	24.9	24.1	23.4	22.8	22.1	21.4
30	...	27.6	26.7	25.8	24.9	24.1	23.4	22.8	22.1	21.4
31	...	27.6	26.7	25.8	24.9	24.1	23.4	22.8	22.1	21.4
32	...	27.6	26.7	25.8	24.9	24.1	23.4	22.8	22.1	21.4
33	...	27.6	26.7	25.8	24.9	24.1	23.4	22.8	22.1	21.4
34	...	27.6	26.7	25.8	24.9	24.1	23.4	22.8	22.1	21.4
35	...	27.6	26.7	25.8	24.9	24.1	23.4	22.8	22.1	21.4
36	...	27.6	26.7	25.8	24.9	24.1	23.4	22.8	22.1	21.4
37	...	27.6	26.7	25.8	24.9	24.1	23.4	22.8	22.1	21.4
38	...	27.6	26.7	25.8	24.9	24.1	23.4	22.8	22.1	21.4
39	...	29.1	28.2	27.2	26.3	25.5	24.7	24.0	23.3	22.6
40	...	29.1	28.2	27.2	26.3	25.5	24.7	24.0	23.3	22.6
41	...	29.1	28.2	27.2	26.3	25.5	24.7	24.0	23.3	22.6
42	...	29.1	28.2	27.2	26.3	25.5	24.7	24.0	23.3	22.6
43	...	29.1	28.2	27.2	26.3	25.5	24.7	24.0	23.3	22.6
44	...	29.1	28.2	27.2	26.3	25.5	24.7	24.0	23.3	22.6

2011a SECTION II, PART D (CUSTOMARY)

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	Carbon steel	Smls. pipe	SA-106	C	K03501	...
2	Carbon steel	Wld. tube	SA-178	D	...	...
3	Carbon steel	Smls. tube	SA-210	C	K03501	...
4	Carbon steel	Castings	SA-216	WCC	J02503	...
5	Carbon steel	Smls. & wld. fittings	SA-234	WPC	K03501	...
6	Carbon steel	Castings	SA-352	LCC	J02505	...
7	Carbon steel	Castings	SA-487	16	...	A
8	Carbon steel	Plate	SA-537	...	K12437	3
9	Carbon steel	Smls. tube	SA-556	C2	K03006	...
10	Carbon steel	Tube	SA-557	C2	K03505	...
11	Carbon steel	Cast pipe	SA-660	WCC	J02505	...
12	Carbon steel	Bar	SA-695	B/40	K03504	...
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	...
(a) 22	Carbon steel	Plate	SA-841	A	...	1
(a) 23	...	...	...	...	...	...
(a) 24	...	...	...	...	...	...
(a) 25	...	...	...	...	...	...
(a) 26	...	...	...	...	...	...
27	Carbon steel	Plate	SA/GB 6654	16MnR	...	...
28	Carbon steel	Plate	SA-455	...	K03300	...
29	Carbon steel	Plate	SA/GB 6654	16MnR	...	...
30	Carbon steel	Forgings	SA-266	3	K05001	...
31	Carbon steel	Plate	SA-455	...	K03300	...
(10) 32	Carbon steel	Plate	SA-299	A	K02803	...
33	Carbon steel	Wld. pipe	SA-671	CK75	K02803	...
34	Carbon steel	Wld. pipe	SA-672	N75	K02803	...
35	Carbon steel	Wld. pipe	SA-691	CMS-75	K02803	...
(10) 36	Carbon steel	Plate	SA-299	A	K02803	...
37	Carbon steel	Wld. pipe	SA-691	CMS-75	K02803	...
38	Carbon steel	Forgings	SA-372	B	K04001	...
39	Carbon steel	Sheet	SA-414	G	K03103	...
40	Carbon steel	Plate	SA-738	A	K12447	...
41	Carbon steel	Plate	SA-537	...	K12437	3
42	Carbon steel	Plate	SA-537	...	K12437	2
43	Carbon steel	Wld. pipe	SA-691	CMSH-80	K12437	...
44	Carbon steel	Plate	SA-738	C	K02008	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	70	40	...
2	...	70	40	...
3	...	70	40	...
4	...	70	40	...
5	...	70	40	...
6	...	70	40	...
7	...	70	40	...
8	$4 < t \leq 6$	70	40	...
9	...	70	40	...
10	...	70	40	...
11	...	70	40	...
12	...	70	40	...
13	...	70	40	...
14	...	70	42	...
15	...	70	43	...
16	$4 < t \leq 6$	70	46	...
17	$4 < t \leq 6$	70	46	...
18	$\leq 2\frac{1}{2}$	70	50	...
19	$\leq 2\frac{1}{2}$	70	50	...
20	$\leq 2\frac{1}{2}$	70	50	...
21	$\leq 2\frac{1}{2}$	70	50	...
22	$\leq 2\frac{1}{2}$	70	50	... (a)
23	...	...	...	... (a)
24	...	...	...	... (a)
25	...	...	...	... (a)
26	...	...	...	... (a)
27	$0.65 < t \leq 1.5$	71	47.1	...
28	$\frac{3}{8} < t \leq \frac{5}{8}$	73	37	...
29	$0.25 < t \leq 0.65$	74	50	...
30	...	75	37.5	...
31	$\leq \frac{3}{8}$	75	38	...
32	> 1	75	40	... (10)
33	> 1	75	40	...
34	> 1	75	40	...
35	> 1	75	40	...
36	≤ 1	75	42	... (10)
37	≤ 1	75	42	...
38	...	75	45	...
39	...	75	45	...
40	...	75	45	...
41	$2\frac{1}{2} < t \leq 4$	75	50	...
42	$2\frac{1}{2} < t \leq 4$	75	55	...
43	$2\frac{1}{2} < t \leq 4$	75	55	...
44	$2\frac{1}{2} < t \leq 4$	75	55	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	40.0	37.6	36.6	36.0	35.4	...	34.2	...	32.6
2	40.0	37.6	36.6	36.0	35.4	...	34.2	...	32.6
3	40.0	37.6	36.6	36.0	35.4	...	34.2	...	32.6
4	40.0	37.6	36.6	36.0	35.4	...	34.2	...	32.6
5	40.0	37.6	36.6	36.0	35.4	...	34.2	...	32.6
6	40.0	37.6	36.6	36.0	35.4	...	34.2	...	32.6
7	40.0	37.2	35.7	34.4	33.4	...	31.8	...	30.5
8	40.0	37.1	35.3	33.8	32.4	...	30.0	...	28.3
9	40.0	37.6	36.6	36.0	35.4	...	34.2	...	32.6
10	40.0	37.6	36.6	36.0	35.4	...	34.2	...	32.6
11	40.0	37.6	36.6	36.0	35.4	...	34.2	...	32.6
12	40.0	37.6	36.6	36.0	35.4	...	34.2	...	32.6
13	40.0	37.6	36.6	36.0	35.4	...	34.2	...	32.6
14	42.0	39.5	38.5	37.8	37.2	...	35.9	...	34.2
15	43.0	40.4	39.4	38.7	38.0	...	36.7	...	35.0
16	46.0	42.6	40.6	38.8	37.2	...	34.6	...	32.5
17	46.0	42.6	40.6	38.8	37.2	...	34.6	...	32.5
18	50.0	46.3	44.2	42.2	40.5	...	37.6	...	35.4
19	50.0	46.3	44.2	42.2	40.5	...	37.6	...	35.4
20	50.0	46.3	44.2	42.2	40.5	...	37.6	...	35.4
21	50.0	46.3	44.2	42.2	40.5	...	37.6	...	35.4
(a) 22	50.0	...	46.1	...	43.8	...	42.3	...	41.3
(a) 23	...	...	...	...	...	...	...	...	...
(a) 24	...	...	...	...	...	...	...	...	...
(a) 25	...	...	...	...	...	...	...	...	...
(a) 26	...	...	...	...	...	...	...	...	...
27	47.1	...	43.2	...	41.7	...	40.3	...	38.4
28	37.0	34.8	33.9	33.3	32.7	...	31.6	...	30.2
29	50.0	...	45.8	...	44.3	...	42.8	...	40.8
30	37.5	35.2	34.4	33.7	33.2	...	32.0	...	30.6
31	38.0	35.7	34.8	34.2	33.6	...	32.5	...	31.0
(10) 32	40.0	37.6	36.6	36.0	35.4	...	34.2	...	32.6
33	40.0	37.6	36.6	36.0	35.4	...	34.2	...	32.6
34	40.0	37.6	36.6	36.0	35.4	...	34.2	...	32.6
35	40.0	37.6	36.6	36.0	35.4	...	34.2	...	32.6
(10) 36	42.0	39.5	38.5	37.8	37.2	...	35.9	...	34.2
37	42.0	39.5	38.5	37.8	37.2	...	35.9	...	34.2
38	45.0	42.3	41.2	40.5	39.8	...	38.4	...	36.7
39	45.0	42.3	41.2	40.5	39.8	...	38.4	...	36.7
40	45.0	42.3	41.2	40.5	39.8	...	38.4	...	36.7
41	50.0	46.3	44.2	42.2	40.5	...	37.6	...	35.4
42	55.0	51.0	48.6	46.4	44.5	...	41.3	...	38.9
43	55.0	51.0	48.6	46.4	44.5	...	41.3	...	38.9
44	55.0	51.0	48.6	46.4	44.5	...	41.3	...	38.9

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	30.7	29.6	28.6	27.7	26.8	26.0	25.3	24.6	23.8
2	...	30.7	29.6	28.6	27.7	26.8	26.0	25.3	24.6	23.8
3	...	30.7	29.6	28.6	27.7	26.8	26.0	25.3	24.6	23.8
4	...	30.7	29.6	28.6	27.7	26.8	26.0	25.3	24.6	23.8
5	...	30.7	29.6	28.6	27.7	26.8	26.0	25.3	24.6	23.8
6	...	30.7	29.6	28.6	27.7	26.8	26.0	25.3	24.6	23.8
7	...	29.3	28.7	28.0	27.1	26.2	...	...	...	...
8	...	27.0	26.4	25.8	25.2	24.4	...	...	...	...
9	...	30.7	29.6	28.6	27.7	26.8	26.0	25.3	24.6	23.8
10	...	30.7	29.6	28.6	27.7	26.8	26.0	25.3	24.6	23.8
11	...	30.7	29.6	28.6	27.7	26.8	26.0	25.3	24.6	23.8
12	...	30.7	29.6	28.6	27.7	26.8	26.0	25.3	24.6	23.8
13	...	30.7	29.6	28.6	27.7	26.8	26.0	25.3	24.6	23.8
14	...	32.2	31.1	30.1	29.1	28.2	27.3	26.5	25.8	25.0
15	...	33.0	31.9	30.8	29.8	28.8	28.0	27.2	26.4	25.6
16	...	31.0	30.3	29.7	28.9	28.1	...	...	...	...
17	...	31.0	30.3	29.7	28.9	28.1	...	...	...	...
18	...	33.7	33.0	32.3	31.5	30.5	...	...	...	...
19	...	33.7	33.0	32.3	31.5	30.5	...	...	...	...
20	...	33.7	33.0	32.3	31.5	30.5	...	...	...	...
21	...	33.7	33.0	32.3	31.5	30.5	...	...	...	...
22	...	40.1	39.3	38.1	36.7	34.9	...	...	...	...
23
24
25
26
27
28	...	28.4	27.4	26.5	25.6	24.8	24.1	23.4	22.7	22.0
29
30	...	28.7	27.8	26.9	26.0	25.1	24.4	23.7	23.0	22.3
31	...	29.1	28.2	27.2	26.3	25.5	24.7	24.0	23.3	22.6
32	...	30.7	29.6	28.6	27.7	26.8	26.0	25.3	24.6	23.8
33	...	30.7	29.6	28.6	27.7	26.8	26.0	25.3	24.6	23.8
34	...	30.7	29.6	28.6	27.7	26.8	26.0	25.3	24.6	23.8
35	...	30.7	29.6	28.6	27.7	26.8	26.0	25.3	24.6	23.8
36	...	32.2	31.1	30.1	29.1	28.2	27.3	26.5	25.8	25.0
37	...	32.2	31.1	30.1	29.1	28.2	27.3	26.5	25.8	25.0
38	...	34.5	33.4	32.2	31.2	30.2	29.3	28.4	27.6	26.7
39	...	34.5	33.4	32.2	31.2	30.2	29.3	28.4	27.6	26.7
40	...	34.5	33.4	32.2	31.2	30.2	29.3	28.4	27.6	26.7
41	...	33.7	33.0	32.3	31.5	30.5	...	...	...	...
42	...	37.1	36.3	35.5	34.6	33.5	...	...	...	...
43	...	37.1	36.3	35.5	34.6	33.5	...	...	...	...
44	...	37.1	36.3	35.5	34.6	33.5	...	...	...	...

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
(10)	1	Carbon steel	Plate	SA-299	B	K02803 ...
(10)	2	Carbon steel	Plate	SA-299	B	K02803 ...
	3	Carbon steel	Forgings	SA-765	IV	K02009 ...
	4	Carbon steel	Plate	SA-537	...	K12437 3
	5	Carbon steel	Plate	SA-537	...	K12437 2
	6	Carbon steel	Wld. pipe	SA-671	CD80	K12437 ...
	7	Carbon steel	Wld. pipe	SA-672	D80	K12437 ...
	8	Carbon steel	Wld. pipe	SA-691	CMSH-80	K12437 ...
	9	Carbon steel	Plate	SA-738	C	K02008 ...
(a)	10	Carbon steel	Plate	SA-841	B	... 2
	11	Carbon steel	Plate	SA-612	...	K02900 ...
	12	Carbon steel	Plate	SA-612	...	K02900 ...
	13	Carbon steel	Plate	SA-738	B	K12007 ...
	14	Carbon steel	Forgings	SA-372	C	K04801 ...
	15	Carbon steel	Bolting	SA-449	...	K04200 ...
	16	Carbon steel	Plate	SA-724	A	K11831 ...
	17	Carbon steel	Plate	SA-724	C	K12037 ...
	18	Carbon steel	Plate	SA-724	B	K12031 ...
	19	Carbon steel	Bolting	SA-325	...	... ...
	20	Carbon steel	Bolting	SA-325	1	K02706 ...
	21	Carbon steel	Bolting	SA-449	...	K04200 ...
	22	Carbon steel	Bolting	SA-354	BC	K04100 ...
	23	Carbon steel	Bolting	SA-325	1	K02706 ...
	24	Carbon steel	Bolting	SA-449	...	K04200 ...
	25	Carbon steel	Bolting	SA-354	BC	K04100 ...
	26	Carbon steel	Bolting	SA-354	BD	K04100 ...
	27	Carbon steel	Bolting	SA-354	BD	K04100 ...
	28	Carbon steel	Flat wire	SA-905	...	... 2
	29	Carbon steel	Flat wire	SA-905	...	... 2
	30	Carbon steel	Flat wire	SA-905	...	... 2
	31	Carbon steel	Flat wire	SA-905	...	... 2
	32	Carbon steel	Flat wire	SA-905	...	... 2
	33	Carbon steel	Flat wire	SA-905	...	... 1
	34	Carbon steel	Flat wire	SA-905	...	... 1
	35	Carbon steel	Flat wire	SA-905	...	... 1
	36	Carbon steel	Flat wire	SA-905	...	... 1
	37	Carbon steel	Flat wire	SA-905	...	... 1
	38	C-Mn-Si-Cb	Plate	SA-737	B	K12001 ...
(a)	39	C-Mn-Si-Cb	Plate	SA/AS 1548	PT490	... ...
(a)	40	C-Mn-Si-Cb	Plate	SA/AS 1548	PT490	... ...
(a)	41	C-Mn-Si-Cb	Plate	SA/AS 1548	PT490	... ...
(a)	42	C-Mn-Si-Cb	Plate	SA/AS 1548	PT490	... ...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	> 1	80	45	... (10)
2	≤ 1	80	47	... (10)
3	...	80	50	...
4	$\leq 2\frac{1}{2}$	80	55	...
5	$\leq 2\frac{1}{2}$	80	60	...
6	$\leq 2\frac{1}{2}$	80	60	...
7	$\leq 2\frac{1}{2}$	80	60	...
8	$\leq 2\frac{1}{2}$	80	60	...
9	$\leq 2\frac{1}{2}$	80	60	...
10	$\leq 2\frac{1}{2}$	80	60	... (a)
11	$\frac{1}{2} < t \leq 1$	81	50	...
12	$\leq \frac{1}{2}$	83	50	...
13	...	85	60	...
14	...	90	55	...
15	$1\frac{1}{2} < t \leq 3$	90	58	...
16	...	90	70	...
17	...	90	70	...
18	...	95	75	...
19	...	105	81	...
20	$1\frac{1}{8} < t \leq 1\frac{1}{2}$	105	81	...
21	$1 < t < 1\frac{1}{2}$	105	81	...
22	$2\frac{1}{2} < t \leq 4$	115	99	...
23	$\frac{1}{2} < t \leq 1$	120	92	...
24	≤ 1	120	92	...
25	$\frac{1}{4} < t \leq 2\frac{1}{2}$	125	109	...
26	$2\frac{1}{2} < t \leq 4$	140	115	...
27	$\frac{1}{4} < t \leq 2\frac{1}{2}$	150	130	...
28	0.059	246	210	(1)(2)
29	0.051	250	214	(1)(2)
30	0.040	256	221	(1)(2)
31	0.030	262	226	(1)(2)
32	0.020	268	232	(1)(2)
33	0.059	275	239	(1)(2)
34	0.051	280	243	(1)(2)
35	0.040	285	250	(1)(2)
36	0.030	290	255	(1)(2)
37	0.020	296	260	(1)(2)
38	...	70	50	...
39	$3\frac{1}{4} < t \leq 6$	71	46.5	... (a)
40	$1\frac{1}{2} < t \leq 3\frac{1}{4}$	71	48	... (a)
41	$\frac{5}{8} < t \leq 1\frac{1}{2}$	71	49.5	... (a)
42	$\leq \frac{5}{8}$	71	52	... (a)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
(10) 1	45.0	...	41.2	...	39.8	...	38.4	...	36.7
(10) 2	47.0	...	43.1	...	41.6	...	40.2	...	38.3
3	50.0	47.6	45.8	44.5	43.5	...	41.4	...	39.7
4	55.0	51.0	48.6	46.4	44.5	...	41.3	...	38.9
5	60.0	55.6	53.0	50.7	48.6	...	45.1	...	42.4
6	60.0	55.6	53.0	50.7	48.6	...	45.1	...	42.4
7	60.0	55.6	53.0	50.7	48.6	...	45.1	...	42.4
8	60.0	55.6	53.0	50.7	48.6	...	45.1	...	42.4
9	60.0	55.6	53.0	50.7	48.6	...	45.1	...	42.4
(a) 10	60.0	...	55.3	...	52.8	...	50.7	...	49.6
11	50.0	...	44.1	...	40.6	...	37.5	...	35.3
12	50.0	...	44.1	...	40.6	...	37.5	...	35.3
13	60.0	56.9	55.2	53.6	52.3	...	49.9	...	48.0
14	55.0	51.7	50.4	49.4	48.7	...	47.0	...	44.8
15	58.0	...	53.1	...	51.3	...	49.6	...	47.3
16	70.0	64.9	61.8	59.1	56.7	...	52.6	...	49.5
17	70.0	64.9	61.8	59.1	56.7	...	52.6	...	49.5
18	75.0	69.5	66.3	63.3	60.7	...	56.3	...	53.1
19	81.0	...	71.6	...	65.6	...	60.8	...	57.3
20	81.0	...	71.6	...	65.6	...	60.8	...	57.3
21	81.0	...	71.6	...	65.6	...	60.8	...	57.3
22	99.0	...	90.7	...	87.6	...	84.6	...	80.7
23	92.0	...	81.3	...	74.5	...	69.1	...	65.1
24	92.0	...	81.3	...	74.5	...	69.1	...	65.1
25	109.0	...	99.9	...	96.4	...	93.1	...	88.8
26	115.0	...	105.4	...	101.7	...	98.3	...	93.7
27	130.0	...	119.1	...	115.0	...	111.0	...	105.9
28	210.0	...	...	...	...	...	...	...	...
29	214.0	...	...	...	...	...	...	...	...
30	221.0	...	...	...	...	...	...	...	...
31	226.0	...	...	...	...	...	...	...	...
32	232.0	...	...	...	...	...	...	...	...
33	239.0	...	224.0	...	...	...	...	...	...
34	243.0	...	228.0	...	...	...	...	...	...
35	250.0	...	234.0	...	...	...	...	...	...
36	255.0	...	239.0	...	...	...	...	...	...
37	260.0	...	244.0	...	...	...	...	...	...
38	50.0	47.9	45.8	43.6	41.4	...	37.7	...	35.3
(a) 39	46.5	...	42.6	...	38.5	...	35.0	...	32.8
(a) 40	48.0	...	44.0	...	39.7	...	36.2	...	33.9
(a) 41	49.5	...	45.4	...	41.0	...	37.3	...	34.9
(a) 42	52.0	...	47.7	...	43.0	...	39.2	...	36.7

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	34.5	33.4	32.2	31.2	30.2	29.3	28.4	27.6	26.7 (10)
2	...	36.0	34.8	33.7	32.5	31.5	30.6	29.7	28.9	27.9 (10)
3	...	38.2	37.7	37.1	...	...	...	...	...	...
4	...	37.1	36.3	35.5	34.6	33.5	...	...	...	...
5	...	40.5	39.6	38.7	37.7	36.6	...	...	...	...
6	...	40.5	39.6	38.7	37.7	36.6	...	...	...	...
7	...	40.5	39.6	38.7	37.7	36.6	...	...	...	...
8	...	40.5	39.6	38.7	37.7	36.6	...	...	...	...
9	...	40.5	39.6	38.7	37.7	36.6	...	...	...	...
10	...	48.2	47.1	45.7	44.0	41.9	...	...	...	...
11	...	33.9	33.0	32.1	...	...	...	...	...	...
12	...	33.9	33.0	32.1	...	...	...	...	...	...
13	...	46.3	45.4	44.5	43.5	42.4	...	...	...	...
14	...	42.2	40.8	39.4	38.1	36.9	35.8	34.8	33.8	32.7
15	...	44.5	43.0	41.5	40.2	38.9	37.7	36.7	...	...
16	...	47.2	46.2	45.2	44.0	42.7	...	...	...	...
17	...	47.2	46.2	45.2	44.0	42.7	...	...	...	...
18	...	50.6	49.5	48.4	47.2	45.7	...	...	...	...
19	...	54.6	53.4	52.3	51.0	49.4	47.4	44.8	41.4	36.9
20	...	54.6	53.4	52.3	51.0	49.4	47.4	44.8	41.4	36.9
21	...	54.6	53.4	52.3	51.0	49.4	47.4	44.8	41.4	36.9
22	...	75.9	73.4	70.9	68.5	66.4	64.4	62.6	60.8	58.8
23	...	62.0	60.7	59.3	57.9	56.1	53.9	50.9	47.0	41.9
24	...	62.0	60.7	59.3	57.9	56.1	53.9	50.9	47.0	41.9
25	...	83.6	80.8	78.1	75.5	73.1	70.9	68.9	66.9	64.8
26	...	88.2	85.2	82.3	79.6	77.1	74.8	72.7	70.6	68.4
27	...	99.6	96.2	93.0	89.8	87.0	84.3	81.9	79.5	76.9
28
29
30
31
32
33
34
35
36
37
38	...	33.9	33.4	32.9	32.2	31.2	29.9	28.1	25.9	25.9
39	...	31.6	31.1	30.6	29.9	29.0	27.8	26.1	24.1	21.6 (a)
40	...	32.6	32.1	31.6	30.9	30.0	28.7	27.0	24.8	22.3 (a)
41	...	33.6	33.1	32.6	31.9	30.9	29.6	27.8	25.6	22.0 (a)
42	...	35.3	34.8	34.2	33.5	32.5	31.1	29.2	26.9	24.1 (a)

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	C-Mn-Si-V	Plate	SA-737	C	K12202	...
2	C-Mn-Si-V-Cb	Plate	SA-656	T3	...	...
3	C-Mn-Si-V-Cb	Plate	SA-656	T7	...	...
4	C-Mn-Si-V-Cb	Plate	SA-656	T3	...	...
5	C-Mn-Si-V-Cb	Plate	SA-656	T7	...	...
6	C-Mn-Si-V-Cb	Plate	SA-656	T3	...	...
7	C-Mn-Si-V-Cb	Plate	SA-656	T7	...	...
8	C-Mn-Si-V-Cb	Plate	SA-656	T3	...	...
9	C-Mn-Si-V-Cb	Plate	SA-656	T7	...	...
10	C-Mn-Ti	Plate, sheet	SA-562	...	K11224	...
11	C-Si-Ti	Forgings	SA-836	...	...	1
12	C- $\frac{1}{4}$ Mo	Bolting	SA-320	L7A	G40370	...
13	C- $\frac{1}{4}$ Mo	Bolting	SA-574	4037	G40370	...
14	C- $\frac{1}{4}$ Mo	Bolting	SA-574	4042	G40420	...
15	C- $\frac{1}{4}$ Mo	Bolting	SA-574	4140	G41400	...
16	C- $\frac{1}{4}$ Mo	Bolting	SA-574	4037	G40370	...
17	C- $\frac{1}{4}$ Mo	Bolting	SA-574	4042	G40420	...
18	C- $\frac{1}{2}$ Mo	Smls. tube	SA-209	T1b	K11422	...
19	C- $\frac{1}{2}$ Mo	Wld. tube	SA-250	T1b	K11422	...
20	C- $\frac{1}{2}$ Mo	Smls. tube	SA-209	T1	K11522	...
21	C- $\frac{1}{2}$ Mo	Smls. & wld. fittings	SA-234	WP1	K12821	...
22	C- $\frac{1}{2}$ Mo	Wld. tube	SA-250	T1	K11522	...
23	C- $\frac{1}{2}$ Mo	Smls. pipe	SA-335	P1	K11522	...
24	C- $\frac{1}{2}$ Mo	Forged pipe	SA-369	FP1	K11522	...
25	C- $\frac{1}{2}$ Mo	Smls. tube	SA-209	T1a	K12023	...
26	C- $\frac{1}{2}$ Mo	Wld. tube	SA-250	T1a	K12023	...
27	C- $\frac{1}{2}$ Mo	Castings	SA-217	WC1	J12524	...
28	C- $\frac{1}{2}$ Mo	Castings	SA-352	LC1	J12522	...
29	C- $\frac{1}{2}$ Mo	Cast pipe	SA-426	CP1	J12521	...
30	C- $\frac{1}{2}$ Mo	Plate	SA-204	A	K11820	...
31	C- $\frac{1}{2}$ Mo	Wld. pipe	SA-672	L65	K11820	...
32	C- $\frac{1}{2}$ Mo	Wld. pipe	SA-691	CM-65	K11820	...
33	C- $\frac{1}{2}$ Mo	Forgings	SA-182	F1	K12822	...
34	C- $\frac{1}{2}$ Mo	Plate	SA-204	B	K12020	...
35	C- $\frac{1}{2}$ Mo	Forgings	SA-336	F1	K12520	...
36	C- $\frac{1}{2}$ Mo	Wld. pipe	SA-672	L70	K12020	...
37	C- $\frac{1}{2}$ Mo	Wld. pipe	SA-691	CM-70	K12020	...
38	C- $\frac{1}{2}$ Mo	Plate	SA-204	C	K12320	...
39	C- $\frac{1}{2}$ Mo	Wld. pipe	SA-672	L75	K12320	...
40	C- $\frac{1}{2}$ Mo	Wld. pipe	SA-691	CM-75	K12320	...
41	$\frac{1}{2}$ Cr- $\frac{1}{5}$ Mo	Forgings	SA-372	G	K13049	70
42	$\frac{1}{2}$ Cr- $\frac{1}{5}$ Mo	Forgings	SA-372	H	K13547	70
43	$\frac{1}{2}$ Cr- $\frac{1}{5}$ Mo-V	Plate	SA-517	B	K11630	...
44	$\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-Si	Plate	SA-517	A	K11856	...
45	$\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-Si	Forgings	SA-592	A	K11856	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	80	60	...
2	≤ 2	60	50	...
3	≤ 2	60	50	...
4	$\leq 1\frac{1}{2}$	70	60	...
5	$\leq 1\frac{1}{2}$	70	60	...
6	≤ 1	80	70	...
7	≤ 1	80	70	...
8	$\leq \frac{3}{4}$	90	80	...
9	$\leq \frac{3}{4}$	90	80	...
10	...	55	30	...
11	...	55	25	...
12	$\leq 2\frac{1}{2}$	125	105	...
13	$\geq \frac{5}{8}$	170	135	...
14	$\geq \frac{5}{8}$	170	135	...
15	$\geq \frac{5}{8}$	170	135	...
16	$\leq \frac{1}{2}$	180	140	...
17	$\leq \frac{1}{2}$	180	140	...
18	...	53	28	...
19	...	53	28	...
20	...	55	30	...
21	...	55	30	...
22	...	55	30	...
23	...	55	30	...
24	...	55	30	...
25	...	60	32	...
26	...	60	32	...
27	...	65	35	...
28	...	65	35	...
29	...	65	35	...
30	...	65	37	...
31	...	65	37	...
32	...	65	37	...
33	...	70	40	...
34	...	70	40	...
35	...	70	40	...
36	...	70	40	...
37	...	70	40	...
38	...	75	43	...
39	...	75	43	...
40	...	75	43	...
41	...	120	70	...
42	...	120	70	...
43	$\leq 1\frac{1}{4}$	115	100	...
44	$\leq 1\frac{1}{4}$	115	100	...
45	$\leq 2\frac{1}{2}$	115	100	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	60.0	57.5	55.0	52.3	49.7	...	45.2	...	42.3
2	50.0	...	45.8	...	41.4	...	37.7	...	35.3
3	50.0	...	45.8	...	41.4	...	37.7	...	35.3
4	60.0	...	55.0	...	49.7	...	45.2	...	42.3
5	60.0	...	55.0	...	49.7	...	45.2	...	42.3
6	70.0	...	64.2	...	57.9	...	52.7	...	49.4
7	70.0	...	64.2	...	57.9	...	52.7	...	49.4
8	80.0	...	73.4	...	66.2	...	60.3	...	56.5
9	80.0	...	73.4	...	66.2	...	60.3	...	56.5
10	30.0	27.3	25.8	24.7	24.0	...	23.4	...	23.4
11	25.0	22.7	21.5	20.6	20.0	...	19.5	...	19.5
12	105.0	...	96.2	...	92.9	...	89.7	...	85.6
13	135.0	...	126.9	...	121.7	...	117.6	...	114.0
14	135.0	...	126.9	...	121.7	...	117.6	...	114.0
15	135.0	...	126.9	...	121.7	...	117.6	...	114.0
16	140.0	...	131.6	...	126.2	...	121.9	...	118.2
17	140.0	...	131.6	...	126.2	...	121.9	...	118.2
18	28.0	26.9	26.3	25.8	25.2	...	24.4	...	23.6
19	28.0	26.9	26.3	25.8	25.2	...	24.4	...	23.6
20	30.0	28.9	28.2	27.6	27.1	...	26.1	...	25.3
21	30.0	28.9	28.2	27.6	27.1	...	26.1	...	25.3
22	30.0	28.9	28.2	27.6	27.1	...	26.1	...	25.3
23	30.0	28.9	28.2	27.6	27.1	...	26.1	...	25.3
24	30.0	28.9	28.2	27.6	27.1	...	26.1	...	25.3
25	32.0	30.8	30.1	29.4	28.9	...	27.9	...	27.0
26	32.0	30.8	30.1	29.4	28.9	...	27.9	...	27.0
27	35.0	33.7	32.9	32.2	31.6	...	30.5	...	29.5
28	35.0	33.7	32.9	32.2	31.6	...	30.5	...	29.5
29	35.0	33.7	32.9	32.2	31.6	...	30.5	...	29.5
30	37.0	35.6	34.8	34.0	33.4	...	32.2	...	31.2
31	37.0	35.6	34.8	34.0	33.4	...	32.2	...	31.2
32	37.0	35.6	34.8	34.0	33.4	...	32.2	...	31.2
33	40.0	38.5	37.6	36.8	36.1	...	34.8	...	33.8
34	40.0	38.5	37.6	36.8	36.1	...	34.8	...	33.8
35	40.0	38.5	37.6	36.8	36.1	...	34.8	...	33.8
36	40.0	38.5	37.6	36.8	36.1	...	34.8	...	33.8
37	40.0	38.5	37.6	36.8	36.1	...	34.8	...	33.8
38	43.0	41.4	40.4	39.6	38.8	...	37.4	...	36.3
39	43.0	41.4	40.4	39.6	38.8	...	37.4	...	36.3
40	43.0	41.4	40.4	39.6	38.8	...	37.4	...	36.3
41	70.0	66.9	65.2	63.9	62.8	...	60.9	...	59.1
42	70.0	66.9	65.2	63.9	62.8	...	60.9	...	59.1
43	100.0	97.2	95.5	93.9	92.4	...	89.9	...	87.6
44	100.0	97.2	95.5	93.9	92.4	...	89.9	...	87.6
45	100.0	97.2	95.5	93.9	92.4	...	89.9	...	87.6

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	40.7	40.1	39.5	38.6	37.5	35.9	33.7	31.0	31.0
2	...	33.9	33.4	...	...	...	...	...	...	...
3	...	33.9	33.4	...	...	...	...	...	...	...
4	...	40.7	40.1	...	...	...	...	...	...	...
5	...	40.7	40.1	...	...	...	...	...	...	...
6	...	47.5	46.8	...	...	...	...	...	...	...
7	...	47.5	46.8	...	...	...	...	...	...	...
8	...	54.3	53.5	...	...	...	...	...	...	...
9	...	54.3	53.5	...	...	...	...	...	...	...
10	...	23.4	23.4	23.3	22.9	...	...	...	...	...
11	...	19.5	19.5	19.4	19.1	...	...	...	...	...
12	...	80.5	77.8	75.2	72.7	70.4	68.3	66.4	64.5	62.4
13	...	110.4	108.4	106.2	103.7	100.9	97.7	94.1	90.0	85.5
14	...	110.4	108.4	106.2	103.7	100.9	97.7	94.1	90.0	85.5
15	...	110.4	108.4	106.2	103.7	100.9	97.7	94.1	90.0	85.5
16	...	114.5	112.4	110.1	107.6	104.6	101.3	97.5	93.3	88.6
17	...	114.5	112.4	110.1	107.6	104.6	101.3	97.5	93.3	88.6
18	...	22.9	22.5	22.0	21.5	20.9	20.3	19.5	18.7	17.7
19	...	22.9	22.5	22.0	21.5	20.9	20.3	19.5	18.7	17.7
20	...	24.5	24.1	23.6	23.1	22.4	21.7	20.9	20.0	19.0
21	...	24.5	24.1	23.6	23.1	22.4	21.7	20.9	20.0	19.0
22	...	24.5	24.1	23.6	23.1	22.4	21.7	20.9	20.0	19.0
23	...	24.5	24.1	23.6	23.1	22.4	21.7	20.9	20.0	19.0
24	...	24.5	24.1	23.6	23.1	22.4	21.7	20.9	20.0	19.0
25	...	26.2	25.7	25.2	24.6	23.9	23.2	22.3	21.3	20.3
26	...	26.2	25.7	25.2	24.6	23.9	23.2	22.3	21.3	20.3
27	...	28.6	28.1	27.5	26.9	26.2	25.3	24.4	23.3	22.2
28	...	28.6	28.1	27.5	26.9	26.2	25.3	24.4	23.3	22.2
29	...	28.6	28.1	27.5	26.9	26.2	25.3	24.4	23.3	22.2
30	...	30.2	29.7	29.1	28.4	27.7	26.8	25.8	24.7	23.4
31	...	30.2	29.7	29.1	28.4	27.7	26.8	25.8	24.7	23.4
32	...	30.2	29.7	29.1	28.4	27.7	26.8	25.8	24.7	23.4
33	...	32.7	32.1	31.5	30.7	29.9	28.9	27.9	26.7	25.3
34	...	32.7	32.1	31.5	30.7	29.9	28.9	27.9	26.7	25.3
35	...	32.7	32.1	31.5	30.7	29.9	28.9	27.9	26.7	25.3
36	...	32.7	32.1	31.5	30.7	29.9	28.9	27.9	26.7	25.3
37	...	32.7	32.1	31.5	30.7	29.9	28.9	27.9	26.7	25.3
38	...	35.2	34.5	33.8	33.0	32.1	31.1	30.0	28.7	27.2
39	...	35.2	34.5	33.8	33.0	32.1	31.1	30.0	28.7	27.2
40	...	35.2	34.5	33.8	33.0	32.1	31.1	30.0	28.7	27.2
41	...	56.8	55.4	53.7	51.7	49.2	46.3	42.8	38.7	33.9
42	...	56.8	55.4	53.7	51.7	49.2	46.3	42.8	38.7	33.9
43	...	85.5	84.3	83.0	81.4	79.5	77.1	74.2	70.5	66.1
44	...	85.5	84.3	83.0	81.4	79.5	77.1	74.2	70.5	66.1
45	...	85.5	84.3	83.0	81.4	79.5	77.1	74.2	70.5	66.1

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Smls. pipe	SA-335	P2	K11547	...
2	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Forged pipe	SA-369	FP2	K11547	...
3	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Plate	SA-387	2	K12143	1
4	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Wld. pipe	SA-691	$\frac{1}{2}\text{CR}$	K12143	...
5	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Smls. tube	SA-213	T2	K11547	...
6	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Cast pipe	SA-426	CP2	J11547	...
7	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Forgings	SA-182	F2	K12122	...
8	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Plate	SA-387	2	K12143	2
9	$\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Wld. pipe	SA-691	$\frac{1}{2}\text{CR}$	K12143	...
10	$\frac{1}{2}\text{Cr}-1\frac{1}{4}\text{Mn}-\text{Si}$	Plate	SA-202	A	K11742	...
11	$\frac{1}{2}\text{Cr}-1\frac{1}{4}\text{Mn}-\text{Si}$	Plate	SA-202	B	K12542	...
12	$\frac{3}{4}\text{Cr}-\frac{1}{2}\text{Ni}-\text{Cu}$	Wld. tube	SA-423	1	K11535	...
13	$\frac{3}{4}\text{Cr}-\frac{3}{4}\text{Ni}-\text{Cu}-\text{Al}$	Pipe	SA-333	4	K11267	...
14	$1\text{Cr}-\frac{1}{5}\text{Mo}$	Bolting	SA-193	B7	G41400	...
15	$1\text{Cr}-\frac{1}{5}\text{Mo}$	Bolting	SA-193	B7M	G41400	...
16	$1\text{Cr}-\frac{1}{5}\text{Mo}$	Bolting	SA-320	L7M	G41400	...
17	$1\text{Cr}-\frac{1}{5}\text{Mo}$	Bolting	SA-193	B7	G41400	...
18	$1\text{Cr}-\frac{1}{5}\text{Mo}$	Forgings	SA-372	E	K13047	70
19	$1\text{Cr}-\frac{1}{5}\text{Mo}$	Forgings	SA-372	F	G41350	70
20	$1\text{Cr}-\frac{1}{5}\text{Mo}$	Forgings	SA-372	J	K13548	70
21	$1\text{Cr}-\frac{1}{5}\text{Mo}$	Bolting	SA-193	B7	G41400	...
22	$1\text{Cr}-\frac{1}{5}\text{Mo}$	Bolting	SA-320	L7	G41400	...
23	$1\text{Cr}-\frac{1}{5}\text{Mo}$	Forgings	SA-372	J	G41370	110
24	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Plate	SA-387	12	K11757	1
25	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Wld. pipe	SA-691	1CR	K11757	...
26	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Cast pipe	SA-426	CP12	J11562	...
27	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Forgings	SA-182	F12	K11562	1
28	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Smls. tube	SA-213	T12	K11562	...
29	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Smls. & wld. fittings	SA-234	WP12	K12062	1
30	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Smls. pipe	SA-335	P12	K11562	...
31	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Forged pipe	SA-369	FP12	K11562	...
32	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Plate	SA-387	12	K11757	2
33	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Wld. pipe	SA-691	1CR	K11757	...
34	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Forgings	SA-182	F12	K11564	2
35	$1\text{Cr}-\frac{1}{2}\text{Mo}$	Forgings	SA-336	F12	K11564	...
36	$1\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Bolting	SA-193	B16	K14072	...
37	$1\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Bolting	SA-193	B16	K14072	...
38	$1\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Bolting	SA-540	B21	K14073	5
39	$1\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Bolting	SA-540	B21	K14073	5
40	$1\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Bolting	SA-193	B16	K14072	...
41	$1\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Bolting	SA-540	B21	K14073	4
42	$1\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Bolting	SA-540	B21	K14073	3
43	$1\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Bolting	SA-540	B21	K14073	2
44	$1\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Bolting	SA-540	B21	K14073	1
45	$1\text{Cr}-\text{V}$	Smls. tube	SA-213	T17	K12047	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	55	30	...
2	...	55	30	...
3	...	55	33	...
4	...	55	33	...
5	...	60	30	...
6	...	60	30	...
7	...	70	40	...
8	...	70	45	...
9	...	70	45	...
10	...	75	45	...
11	...	85	47	...
12	...	60	37	...
13	...	60	35	...
14	$4 < t \leq 7$	100	75	...
15	$\leq 2\frac{1}{2}$	100	80	...
16	$\leq 2\frac{1}{2}$	100	80	...
17	$2\frac{1}{2} < t \leq 4$	115	95	...
18	...	120	70	...
19	...	120	70	...
20	...	120	70	...
21	$\leq 2\frac{1}{2}$	125	105	...
22	$\leq 2\frac{1}{2}$	125	105	...
23	...	135	110	...
24	...	55	33	...
25	...	55	33	...
26	...	60	30	...
27	...	60	32	...
28	...	60	32	...
29	...	60	32	...
30	...	60	32	...
31	...	60	32	...
32	...	65	40	...
33	...	65	40	...
34	...	70	40	...
35	...	70	40	...
36	$4 < t \leq 7$	100	85	...
37	$2\frac{1}{2} < t \leq 4$	110	95	...
38	$2 < t \leq 8$	115	100	...
39	≤ 2	120	105	...
40	$\leq 2\frac{1}{2}$	125	105	...
41	≤ 6	135	120	...
42	≤ 6	145	130	...
43	≤ 4	155	140	...
44	≤ 4	165	150	...
45	...	60	30	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	30.0	28.9	28.2	27.6	27.1	...	26.1	...	25.3
2	30.0	28.9	28.2	27.6	27.1	...	26.1	...	25.3
3	33.0	31.8	31.0	30.4	29.8	...	28.7	...	27.9
4	33.0	31.8	31.0	30.4	29.8	...	28.7	...	27.9
5	30.0	28.9	28.2	27.6	27.1	...	26.1	...	25.3
6	30.0	28.9	28.2	27.6	27.1	...	26.1	...	25.3
7	40.0	38.5	37.6	36.8	36.1	...	34.8	...	33.8
8	45.0	43.3	42.3	41.4	40.6	...	39.2	...	38.0
9	45.0	43.3	42.3	41.4	40.6	...	39.2	...	38.0
10	45.0	42.3	41.2	40.4	39.8	...	38.4	...	36.5
11	47.0	44.2	43.0	42.2	41.6	...	40.1	...	38.1
12	37.0	35.0	34.1	33.5	33.0	...	32.3	...	31.6
13	35.0	33.1	32.3	31.7	31.3	...	30.6	...	29.9
14	75.0	...	69.9	...	67.2	...	65.3	...	63.2
15	80.0	...	74.6	...	71.7	...	69.7	...	67.4
16	80.0	...	74.6	...	71.7	...	69.7	...	67.4
17	95.0	...	88.5	...	85.1	...	82.7	...	80.1
18	70.0	66.9	65.2	63.9	62.8	...	60.9	...	59.1
19	70.0	66.9	65.2	63.9	62.8	...	60.9	...	59.1
20	70.0	66.9	65.2	63.9	62.8	...	60.9	...	59.1
21	105.0	...	98.0	...	94.1	...	91.5	...	88.5
22	105.0	...	98.0	...	94.1	...	91.5	...	88.5
23	110.0	105.1	102.5	100.4	98.6	...	95.6	...	92.8
24	33.0	31.0	29.8	28.9	28.1	...	26.8	...	25.9
25	33.0	31.0	29.8	28.9	28.1	...	26.8	...	25.9
26	30.0	28.1	27.1	26.2	25.5	...	24.4	...	23.5
27	32.0	30.0	28.9	28.0	27.2	...	26.0	...	25.1
28	32.0	30.0	28.9	28.0	27.2	...	26.0	...	25.1
29	32.0	30.0	28.9	28.0	27.2	...	26.0	...	25.1
30	32.0	30.0	28.9	28.0	27.2	...	26.0	...	25.1
31	32.0	30.0	28.9	28.0	27.2	...	26.0	...	25.1
32	40.0	37.5	36.2	35.0	34.0	...	32.5	...	31.4
33	40.0	37.5	36.2	35.0	34.0	...	32.5	...	31.4
34	40.0	37.5	36.2	35.0	34.0	...	32.5	...	31.4
35	40.0	37.5	36.2	35.0	34.0	...	32.5	...	31.4
36	85.0	...	82.0	...	79.9	...	77.8	...	75.7
37	95.0	...	91.7	...	89.3	...	86.9	...	84.6
38	100.0	...	96.7	...	93.8	...	91.5	...	89.0
39	105.0	...	101.3	...	98.7	...	96.1	...	93.5
40	105.0	...	101.3	...	98.7	...	96.1	...	93.5
41	120.0	...	116.0	...	112.6	...	109.8	...	106.8
42	130.0	...	125.7	...	121.9	...	119.0	...	115.7
43	140.0	...	135.4	...	131.3	...	128.1	...	124.6
44	150.0	...	145.1	...	140.7	...	137.3	...	133.5
45	30.0	28.5	27.7	27.0	26.3	...	25.3	...	24.4

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	24.5	24.1	23.6	23.1	22.4	21.7	20.9	20.0	19.0
2	...	24.5	24.1	23.6	23.1	22.4	21.7	20.9	20.0	19.0
3	...	27.0	26.5	26.0	25.4	24.7	23.9	23.0	22.0	20.9
4	...	27.0	26.5	26.0	25.4	24.7	23.9	23.0	22.0	20.9
5	...	24.5	24.1	23.6	23.1	22.4	21.7	20.9	20.0	19.0
6	...	24.5	24.1	23.6	23.1	22.4	21.7	20.9	20.0	19.0
7	...	32.7	32.1	31.5	30.7	29.9	28.9	27.9	26.7	25.3
8	...	36.8	36.1	35.4	34.6	33.6	32.6	31.4	30.0	28.5
9	...	36.8	36.1	35.4	34.6	33.6	32.6	31.4	30.0	28.5
10	...	33.8	32.1	30.3	28.4	26.4	24.4	22.4	20.5	18.8
11	...	35.3	33.6	31.7	29.7	27.6	25.5	23.4	21.5	19.6
12	...	30.9	30.5	30.0	29.5	28.8	28.0	27.0	25.6	23.7
13	...	29.2	28.8	28.4	27.9	27.3	26.5	25.5	24.2	22.4
14	...	60.9	59.3	57.6	55.4	52.8	49.7	45.8	41.5	36.4
15	...	65.0	63.2	61.4	59.1	56.3	53.0	48.8	44.2	38.8
16	...	65.0	63.2	61.4	59.1	56.3	53.0	48.8	44.2	38.8
17	...	77.1	75.1	73.0	70.2	66.9	62.9	58.0	52.5	46.1
18	...	56.8	55.4	53.7	51.7	49.2	46.3	42.8	38.7	33.9
19	...	56.8	55.4	53.7	51.7	49.2	46.3	42.8	38.7	33.9
20	...	56.8	55.4	53.7	51.7	49.2	46.3	42.8	38.7	33.9
21	...	85.3	83.0	80.6	77.6	73.9	69.5	64.1	58.1	50.9
22	...	85.3	83.0	80.6	77.6	73.9	69.5	64.1	58.1	50.9
23	...	89.3	87.1	84.4	81.2	77.4	72.7	67.3	60.8	53.3
24	...	25.1	24.8	24.4	24.0	23.6	23.1	22.5	21.7	20.9
25	...	25.1	24.8	24.4	24.0	23.6	23.1	22.5	21.7	20.9
26	...	22.9	22.5	22.2	21.9	21.4	21.0	20.4	19.8	19.0
27	...	24.4	24.0	23.7	23.3	22.9	22.4	21.8	21.1	20.2
28	...	24.4	24.0	23.7	23.3	22.9	22.4	21.8	21.1	20.2
29	...	24.4	24.0	23.7	23.3	22.9	22.4	21.8	21.1	20.2
30	...	24.4	24.0	23.7	23.3	22.9	22.4	21.8	21.1	20.2
31	...	24.4	24.0	23.7	23.3	22.9	22.4	21.8	21.1	20.2
32	...	30.5	30.1	29.6	29.1	28.6	28.0	27.2	26.3	25.3
33	...	30.5	30.1	29.6	29.1	28.6	28.0	27.2	26.3	25.3
34	...	30.5	30.1	29.6	29.1	28.6	28.0	27.2	26.3	25.3
35	...	30.5	30.1	29.6	29.1	28.6	28.0	27.2	26.3	25.3
36	...	73.5	72.3	71.0	69.6	67.9	65.9	63.6	60.8	57.4
37	...	82.1	80.8	79.4	77.7	75.9	73.7	71.1	68.0	64.2
38	...	86.5	85.2	83.6	81.9	79.8	77.4	74.7	71.6	67.8
39	...	90.8	89.3	87.7	85.9	83.9	81.5	78.6	75.2	71.0
40	...	90.8	89.3	87.7	85.9	83.9	81.5	78.6	75.2	71.0
41	...	103.8	102.2	100.3	98.3	95.8	92.9	89.6	85.9	81.4
42	...	112.5	110.8	108.7	106.5	103.7	100.6	97.1	93.1	88.1
43	...	121.1	119.3	117.0	114.7	111.7	108.4	104.6	100.2	94.9
44	...	129.8	127.8	125.4	122.9	119.7	116.1	112.1	107.4	101.7
45	...	23.5	23.1	22.6	22.2	21.6	21.0	20.4	19.6	18.8

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}$	Castings	SA-217	WC6	J12072	...
2	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}$	Cast pipe	SA-426	CP11	J12072	...
3	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}$	Bar	SA-739	B11	K11797	...
4	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Si}$	Forgings	SA-182	F11	K11597	1
5	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Si}$	Smls. tube	SA-213	T11	K11597	...
6	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Si}$	Smls. & wld. fittings	SA-234	WP11	...	1
7	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Si}$	Smls. pipe	SA-335	P11	K11597	...
8	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Si}$	Forgings	SA-336	F11	K11597	1
9	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Si}$	Forged pipe	SA-369	FP11	K11597	...
10	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Si}$	Plate	SA-387	11	K11789	1
11	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Si}$	Wld. pipe	SA-691	$1\frac{1}{4}\text{CR}$	K11789	...
12	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Si}$	Forgings	SA-182	F11	K11572	2
13	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Si}$	Forgings	SA-336	F11	K11572	2
14	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Si}$	Forgings	SA-336	F11	K11572	3
15	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Si}$	Plate	SA-387	11	K11789	2
16	$1\frac{1}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Si}$	Wld. pipe	SA-691	$1\frac{1}{4}\text{CR}$	K11789	...
17	$1\frac{3}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Cu}$	Forgings	SA-592	E	K11695	...
18	$1\frac{3}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Cu}$	Forgings	SA-592	E	K11695	...
19	$1\frac{3}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Ti}$	Plate	SA-517	E	K21604	...
20	$1\frac{3}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{Ti}$	Plate	SA-517	E	K21604	...
21	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Forgings	SA-182	F22	K21590	1
22	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Smls. tube	SA-213	T22	K21590	...
23	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Smls. & wld. fittings	SA-234	WP22	K21590	1
24	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Smls. pipe	SA-335	P22	K21590	...
25	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Forgings	SA-336	F22	K21590	1
26	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Forged pipe	SA-369	FP22	K21590	...
27	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Plate	SA-387	22	K21590	1
28	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Wld. pipe	SA-691	$2\frac{1}{4}\text{CR}$	K21590	...
29	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Castings	SA-217	WC9	J21890	...
30	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Cast pipe	SA-426	CP22	J21890	...
31	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Forgings	SA-182	F22	K21590	3
32	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Forgings	SA-336	F22	K21590	3
33	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Plate	SA-387	22	K21590	2
34	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Wld. pipe	SA-691	$2\frac{1}{4}\text{CR}$	K21590	...
35	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Bar	SA-739	B22	K21390	...
36	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Castings	SA-487	8	J22091	A
37	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Forgings	SA-508	22	K21590	3
38	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Forgings	SA-541	22	K21390	3
39	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Plate	SA-542	B	K21590	4
40	$2\frac{1}{4}\text{Cr}-1\text{Mo}$	Forgings	SA-541	22	K21390	4
41	$2\frac{1}{4}\text{Cr}-1\text{Mo}-\text{V}$	Forgings	SA-182	F22V	K31835	...
42	$2\frac{1}{4}\text{Cr}-1\text{Mo}-\text{V}$	Forgings	SA-336	F22V	K31835	...
43	$2\frac{1}{4}\text{Cr}-1\text{Mo}-\text{V}$	Forgings	SA-541	22V	K31835	...
44	$2\frac{1}{4}\text{Cr}-1\text{Mo}-\text{V}$	Plate	SA-542	D	K31835	4a
45	$2\frac{1}{4}\text{Cr}-1\text{Mo}-\text{V}$	Plate	SA-832	22V	K31835	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	70	40	...
2	...	70	40	...
3	...	70	45	...
4	...	60	30	...
5	...	60	30	...
6	...	60	30	...
7	...	60	30	...
8	...	60	30	...
9	...	60	30	...
10	...	60	35	...
11	...	60	35	...
12	...	70	40	...
13	...	70	40	...
14	...	75	45	...
15	...	75	45	...
16	...	75	45	...
17	$2\frac{1}{2} < t \leq 4$	105	90	...
18	$\leq 2\frac{1}{2}$	115	100	...
19	$2\frac{1}{2} < t \leq 6$	105	90	...
20	$\leq 2\frac{1}{2}$	115	100	...
21	...	60	30	...
22	...	60	30	...
23	...	60	30	...
24	...	60	30	...
25	...	60	30	...
26	...	60	30	...
27	...	60	30	...
28	...	60	30	...
29	...	70	40	...
30	...	70	40	...
31	...	75	45	...
32	...	75	45	...
33	...	75	45	...
34	...	75	45	...
35	...	75	45	...
36	...	85	55	...
37	...	85	55	...
38	...	85	55	...
39	...	85	55	...
40	...	105	85	...
41	...	85	60	...
42	...	85	60	...
43	...	85	60	...
44	...	85	60	...
45	...	85	60	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	40.0	38.0	36.9	36.0	35.1	...	33.7	...	32.5
2	40.0	38.0	36.9	36.0	35.1	...	33.7	...	32.5
3	45.0	42.8	41.5	40.5	39.5	...	37.9	...	36.5
4	30.0	28.5	27.7	27.0	26.3	...	25.3	...	24.4
5	30.0	28.5	27.7	27.0	26.3	...	25.3	...	24.4
6	30.0	28.5	27.7	27.0	26.3	...	25.3	...	24.4
7	30.0	28.5	27.7	27.0	26.3	...	25.3	...	24.4
8	30.0	28.5	27.7	27.0	26.3	...	25.3	...	24.4
9	30.0	28.5	27.7	27.0	26.3	...	25.3	...	24.4
10	35.0	33.3	32.3	31.5	30.7	...	29.5	...	28.4
11	35.0	33.3	32.3	31.5	30.7	...	29.5	...	28.4
12	40.0	38.0	36.9	36.0	35.1	...	33.7	...	32.5
13	40.0	38.0	36.9	36.0	35.1	...	33.7	...	32.5
14	45.0	42.8	41.5	40.5	39.5	...	37.9	...	36.5
15	45.0	42.8	41.5	40.5	39.5	...	37.9	...	36.5
16	45.0	42.8	41.5	40.5	39.5	...	37.9	...	36.5
17	90.0	87.5	86.0	84.5	83.2	...	81.0	...	79.2
18	100.0	97.2	95.5	93.9	92.5	...	90.0	...	88.0
19	90.0	87.5	86.0	84.5	83.2	...	81.0	...	79.2
20	100.0	97.2	95.5	93.9	92.5	...	90.0	...	88.0
21	30.0	28.6	28.0	27.6	27.2	...	26.9	...	26.9
22	30.0	28.6	28.0	27.6	27.2	...	26.9	...	26.9
23	30.0	28.6	28.0	27.6	27.2	...	26.9	...	26.9
24	30.0	28.6	28.0	27.6	27.2	...	26.9	...	26.9
25	30.0	28.6	28.0	27.6	27.2	...	26.9	...	26.9
26	30.0	28.6	28.0	27.6	27.2	...	26.9	...	26.9
27	30.0	28.6	28.0	27.6	27.2	...	26.9	...	26.9
28	30.0	28.6	28.0	27.6	27.2	...	26.9	...	26.9
29	40.0	37.9	37.0	36.3	35.8	...	35.1	...	34.4
30	40.0	37.9	37.0	36.3	35.8	...	35.1	...	34.4
31	45.0	42.5	41.2	40.2	39.4	...	38.1	...	37.3
32	45.0	42.5	41.2	40.2	39.4	...	38.1	...	37.3
33	45.0	42.5	41.2	40.2	39.4	...	38.1	...	37.3
34	45.0	42.5	41.2	40.2	39.4	...	38.1	...	37.3
35	45.0	42.5	41.2	40.2	39.4	...	38.1	...	37.3
36	55.0	52.1	50.8	49.9	49.2	...	48.2	...	47.4
37	55.0	...	53.1	...	51.8	...	50.6	...	49.5
38	55.0	...	53.1	...	51.8	...	50.6	...	49.5
39	55.0	...	53.1	...	51.8	...	50.6	...	49.5
40	85.0	...	81.6	...	79.6	...	78.0	...	76.7
41	60.0	...	59.5	...	58.6	...	57.4	...	56.0
42	60.0	...	59.5	...	58.6	...	57.4	...	56.0
43	60.0	...	59.5	...	58.6	...	57.4	...	56.0
44	60.0	...	59.5	...	58.6	...	57.4	...	56.0
45	60.0	...	59.5	...	58.6	...	57.4	...	56.0

2011a SECTION II, PART D (CUSTOMARY)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	31.4	30.8	30.2	29.6	28.8	28.1	27.2	26.2	25.0
2	...	31.4	30.8	30.2	29.6	28.8	28.1	27.2	26.2	25.0
3	...	35.3	34.6	34.0	33.2	32.5	31.6	30.6	29.4	28.2
4	...	23.5	23.1	22.6	22.2	21.6	21.0	20.4	19.6	18.8
5	...	23.5	23.1	22.6	22.2	21.6	21.0	20.4	19.6	18.8
6	...	23.5	23.1	22.6	22.2	21.6	21.0	20.4	19.6	18.8
7	...	23.5	23.1	22.6	22.2	21.6	21.0	20.4	19.6	18.8
8	...	23.5	23.1	22.6	22.2	21.6	21.0	20.4	19.6	18.8
9	...	23.5	23.1	22.6	22.2	21.6	21.0	20.4	19.6	18.8
10	...	27.4	26.9	26.4	25.9	25.2	24.5	23.8	22.9	21.9
11	...	27.4	26.9	26.4	25.9	25.2	24.5	23.8	22.9	21.9
12	...	31.4	30.8	30.2	29.6	28.8	28.1	27.2	26.2	25.0
13	...	31.4	30.8	30.2	29.6	28.8	28.1	27.2	26.2	25.0
14	...	35.3	34.6	34.0	33.2	32.5	31.6	30.6	29.4	28.2
15	...	35.3	34.6	34.0	33.2	32.5	31.6	30.6	29.4	28.2
16	...	35.3	34.6	34.0	33.2	32.5	31.6	30.6	29.4	28.2
17	...	77.7	77.0	76.3	75.6	74.7	73.7	72.5	71.0	69.2
18	...	86.3	85.6	84.8	84.0	83.0	81.9	80.5	78.9	76.8
19	...	77.7	77.0	76.3	75.6	74.7	73.7	72.5	71.0	69.2
20	...	86.3	85.6	84.8	84.0	83.0	81.9	80.5	78.9	76.8
21	...	26.9	26.9	26.9	26.8	26.6	26.2	25.6	24.8	23.7
22	...	26.9	26.9	26.9	26.8	26.6	26.2	25.6	24.8	23.7
23	...	26.9	26.9	26.9	26.8	26.6	26.2	25.6	24.8	23.7
24	...	26.9	26.9	26.9	26.8	26.6	26.2	25.6	24.8	23.7
25	...	26.9	26.9	26.9	26.8	26.6	26.2	25.6	24.8	23.7
26	...	26.9	26.9	26.9	26.8	26.6	26.2	25.6	24.8	23.7
27	...	26.9	26.9	26.9	26.8	26.6	26.2	25.6	24.8	23.7
28	...	26.9	26.9	26.9	26.8	26.6	26.2	25.6	24.8	23.7
29	...	33.7	33.3	32.9	32.4	31.8	31.1	30.2	29.1	27.6
30	...	33.7	33.3	32.9	32.4	31.8	31.1	30.2	29.1	27.6
31	...	36.5	36.1	35.6	35.0	34.3	33.5	32.4	31.2	29.7
32	...	36.5	36.1	35.6	35.0	34.3	33.5	32.4	31.2	29.7
33	...	36.5	36.1	35.6	35.0	34.3	33.5	32.4	31.2	29.7
34	...	36.5	36.1	35.6	35.0	34.3	33.5	32.4	31.2	29.7
35	...	36.5	36.1	35.6	35.0	34.3	33.5	32.4	31.2	29.7
36	...	46.4	45.9	45.3	44.6	43.8	42.8	41.6	40.0	38.0
37	...	48.2	47.5	46.8	46.0	45.2	44.2	...	...	...
38	...	48.2	47.5	46.8	46.0	45.2	44.2	...	...	...
39	...	48.2	47.5	46.8	46.0	45.2	44.2	...	...	...
40	...	75.2	74.4	73.4	72.3	71.0	69.4	67.6	65.4	63.0
41	...	54.2	53.3	52.3	51.2	50.1	49.0	47.8	...	...
42	...	54.2	53.3	52.3	51.2	50.1	49.0	47.8	...	...
43	...	54.2	53.3	52.3	51.2	50.1	49.0	47.8	...	...
44	...	54.2	53.3	52.3	51.2	50.1	49.0	47.8	...	...
45	...	54.2	53.3	52.3	51.2	50.1	49.0	47.8	...	...

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	3Cr-1Mo	Smls. tube	SA-213	T21	K31545	...
2	3Cr-1Mo	Smls. pipe	SA-335	P21	K31545	...
3	3Cr-1Mo	Forgings	SA-336	F21	K31545	1
4	3Cr-1Mo	Forged pipe	SA-369	FP21	K31545	...
5	3Cr-1Mo	Plate	SA-387	21	K31545	1
6	3Cr-1Mo	Cast pipe	SA-426	CP21	J31545	...
7	3Cr-1Mo	Forgings	SA-182	F21	K31545	...
8	3Cr-1Mo	Forgings	SA-336	F21	K31545	3
9	3Cr-1Mo	Plate	SA-387	21	K31545	2
10	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Forgings	SA-182	F3V	K31830	...
11	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Forgings	SA-336	F3V	K31830	...
12	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Forgings	SA-508	3V	K31830	...
13	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Forgings	SA-541	3V	K31830	...
14	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Plate	SA-542	C	K31830	4a
15	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B	Plate	SA-832	21V	K31830	...
16	3Cr-1Mo- $\frac{1}{4}$ V-Cb-Ca	Forgings	SA-182	F3VCb	...	...
17	3Cr-1Mo- $\frac{1}{4}$ V-Cb-Ca	Forgings	SA-336	F3VCb	...	...
18	3Cr-1Mo- $\frac{1}{4}$ V-Cb-Ca	Forgings	SA-508	3VCb	...	...
19	3Cr-1Mo- $\frac{1}{4}$ V-Cb-Ca	Forgings	SA-541	3VCb	...	...
20	3Cr-1Mo- $\frac{1}{4}$ V-Cb-Ca	Plate	SA-542	E	...	4a
21	3Cr-1Mo- $\frac{1}{4}$ V-Cb-Ca	Plate	SA-832	23V	...	...
22	5Cr- $\frac{1}{2}$ Mo	Smls. tube	SA-213	T5	K41545	...
23	5Cr- $\frac{1}{2}$ Mo	Smls. & wld. fittings	SA-234	WP5	K41545	...
24	5Cr- $\frac{1}{2}$ Mo	Smls. pipe	SA-335	P5	K41545	...
25	5Cr- $\frac{1}{2}$ Mo	Forged pipe	SA-369	FP5	K41545	...
26	5Cr- $\frac{1}{2}$ Mo	Plate	SA-387	5	K41545	1
27	5Cr- $\frac{1}{2}$ Mo	Wld. pipe	SA-691	5CR	K41545	...
28	5Cr- $\frac{1}{2}$ Mo	Forgings	SA-336	F5	K41545	...
29	5Cr- $\frac{1}{2}$ Mo	Forgings	SA-182	F5	K41545	...
30	5Cr- $\frac{1}{2}$ Mo	Plate	SA-387	5	K41545	2
31	5Cr- $\frac{1}{2}$ Mo	Forgings	SA-336	F5A	K42544	...
32	5Cr- $\frac{1}{2}$ Mo	Castings	SA-217	C5	J42045	...
33	5Cr- $\frac{1}{2}$ Mo	Cast pipe	SA-426	CP5	J42045	...
34	5Cr- $\frac{1}{2}$ Mo	Forgings	SA-182	F5a	K42544	...
35	5Cr- $\frac{1}{2}$ Mo	Bolting	SA-193	B5	K50100	...
36	5Cr- $\frac{1}{2}$ Mo-Si	Smls. tube	SA-213	T5b	K51545	...
37	5Cr- $\frac{1}{2}$ Mo-Si	Smls. pipe	SA-335	P5b	K51545	...
38	5Cr- $\frac{1}{2}$ Mo-Ti	Smls. tube	SA-213	T5c	K41245	...
39	5Cr- $\frac{1}{2}$ Mo-Ti	Smls. pipe	SA-335	P5c	K41245	...
40	9Cr-1Mo	Smls. tube	SA-213	T9	K90941	...
41	9Cr-1Mo	Fittings	SA-234	WP9	K90941	...
42	9Cr-1Mo	Smls. pipe	SA-335	P9	K90941	...
43	9Cr-1Mo	Forged pipe	SA-369	FP9	K90941	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	60	30	...
2	...	60	30	...
3	...	60	30	...
4	...	60	30	...
5	...	60	30	...
6	...	60	30	...
7	...	75	45	...
8	...	75	45	...
9	...	75	45	...
10	...	85	60	...
11	...	85	60	...
12	...	85	60	...
13	...	85	60	...
14	...	85	60	...
15	...	85	60	...
16	...	85	60	...
17	...	85	60	...
18	...	85	60	...
19	...	85	60	...
20	...	85	60	...
21	...	85	60	...
22	...	60	30	...
23	...	60	30	...
24	...	60	30	...
25	...	60	30	...
26	...	60	30	...
27	...	60	30	...
28	...	60	36	...
29	...	70	40	...
30	...	75	45	...
31	...	80	50	...
32	...	90	60	...
33	...	90	60	...
34	...	90	65	...
35	≤ 4	100	80	...
36	...	60	30	...
37	...	60	30	...
38	...	60	30	...
39	...	60	30	...
40	...	60	30	...
41	...	60	30	...
42	...	60	30	...
43	...	60	30	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	30.0	28.6	28.0	27.6	27.2	...	26.9	...	26.9
2	30.0	28.6	28.0	27.6	27.2	...	26.9	...	26.9
3	30.0	28.6	28.0	27.6	27.2	...	26.9	...	26.9
4	30.0	28.6	28.0	27.6	27.2	...	26.9	...	26.9
5	30.0	28.6	28.0	27.6	27.2	...	26.9	...	26.9
6	30.0	28.6	28.0	27.6	27.2	...	26.9	...	26.9
7	45.0	42.5	41.2	40.2	39.4	...	38.1	...	37.3
8	45.0	42.5	41.2	40.2	39.4	...	38.1	...	37.3
9	45.0	42.5	41.2	40.2	39.4	...	38.1	...	37.3
10	60.0	57.4	56.0	54.8	53.8	...	52.6	...	52.0
11	60.0	57.4	56.0	54.8	53.8	...	52.6	...	52.0
12	60.0	57.4	56.0	54.8	53.8	...	52.6	...	52.0
13	60.0	57.4	56.0	54.8	53.8	...	52.6	...	52.0
14	60.0	57.4	56.0	54.8	53.8	...	52.6	...	52.0
15	60.0	57.4	56.0	54.8	53.8	...	52.6	...	52.0
16	60.0	57.4	56.0	54.8	53.8	...	52.6	...	52.0
17	60.0	57.4	56.0	54.8	53.8	...	52.6	...	52.0
18	60.0	57.4	56.0	54.8	53.8	...	52.6	...	52.0
19	60.0	57.4	56.0	54.8	53.8	...	52.6	...	52.0
20	60.0	57.4	56.0	54.8	53.8	...	52.6	...	52.0
21	60.0	57.4	56.0	54.8	53.8	...	52.6	...	52.0
22	30.0	28.0	27.1	26.5	26.1	...	25.8	...	25.6
23	30.0	28.0	27.1	26.5	26.1	...	25.8	...	25.6
24	30.0	28.0	27.1	26.5	26.1	...	25.8	...	25.6
25	30.0	28.0	27.1	26.5	26.1	...	25.8	...	25.6
26	30.0	28.0	27.1	26.5	26.1	...	25.8	...	25.6
27	30.0	28.0	27.1	26.5	26.1	...	25.8	...	25.6
28	36.0	33.6	32.5	31.8	31.4	...	30.9	...	30.7
29	40.0	37.3	36.2	35.4	34.8	...	34.4	...	34.1
30	45.0	42.0	40.7	39.8	39.2	...	38.7	...	38.4
31	50.0	46.7	45.2	44.2	43.6	...	42.9	...	42.6
32	60.0	56.0	54.2	53.0	52.3	...	51.5	...	51.2
33	60.0	56.0	54.2	53.0	52.3	...	51.5	...	51.2
34	65.0	60.7	58.8	57.5	56.6	...	55.8	...	55.4
35	80.0	...	71.1	...	68.9	...	68.7	...	68.7
36	30.0	28.0	27.1	26.5	26.1	...	25.8	...	25.6
37	30.0	28.0	27.1	26.5	26.1	...	25.8	...	25.6
38	30.0	28.0	27.1	26.5	26.1	...	25.8	...	25.6
39	30.0	28.0	27.1	26.5	26.1	...	25.8	...	25.6
40	30.0	28.0	27.1	26.5	26.1	...	25.8	...	25.6
41	30.0	28.0	27.1	26.5	26.1	...	25.8	...	25.6
42	30.0	28.0	27.1	26.5	26.1	...	25.8	...	25.6
43	30.0	28.0	27.1	26.5	26.1	...	25.8	...	25.6

2011a SECTION II, PART D (CUSTOMARY)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	26.9	26.9	26.9	26.8	26.6	26.2	25.6	24.8	23.7
2	...	26.9	26.9	26.9	26.8	26.6	26.2	25.6	24.8	23.7
3	...	26.9	26.9	26.9	26.8	26.6	26.2	25.6	24.8	23.7
4	...	26.9	26.9	26.9	26.8	26.6	26.2	25.6	24.8	23.7
5	...	26.9	26.9	26.9	26.8	26.6	26.2	25.6	24.8	23.7
6	...	26.9	26.9	26.9	26.8	26.6	26.2	25.6	24.8	23.7
7	...	36.5	36.1	35.6	35.0	34.3	33.5	32.4	31.2	29.7
8	...	36.5	36.1	35.6	35.0	34.3	33.5	32.4	31.2	29.7
9	...	36.5	36.1	35.6	35.0	34.3	33.5	32.4	31.2	29.7
10	...	51.7	51.4	51.2	50.8	50.3	49.5	48.5	...	...
11	...	51.7	51.4	51.2	50.8	50.3	49.5	48.5	...	...
12	...	51.7	51.4	51.2	50.8	50.3	49.5	48.5	...	...
13	...	51.7	51.4	51.2	50.8	50.3	49.5	48.5	...	...
14	...	51.7	51.4	51.2	50.8	50.3	49.5	48.5	...	...
15	...	51.7	51.4	51.2	50.8	50.3	49.5	48.5	...	...
16	...	51.7	51.4	51.2	50.8	50.3	49.5	48.5	...	...
17	...	51.7	51.4	51.2	50.8	50.3	49.5	48.5	...	...
18	...	51.7	51.4	51.2	50.8	50.3	49.5	48.5	...	...
19	...	51.7	51.4	51.2	50.8	50.3	49.5	48.5	...	...
20	...	51.7	51.4	51.2	50.8	50.3	49.5	48.5	...	...
21	...	51.7	51.4	51.2	50.8	50.3	49.5	48.5	...	...
22	...	25.2	24.9	24.5	23.9	23.1	22.2	21.1	19.8	18.5
23	...	25.2	24.9	24.5	23.9	23.1	22.2	21.1	19.8	18.5
24	...	25.2	24.9	24.5	23.9	23.1	22.2	21.1	19.8	18.5
25	...	25.2	24.9	24.5	23.9	23.1	22.2	21.1	19.8	18.5
26	...	25.2	24.9	24.5	23.9	23.1	22.2	21.1	19.8	18.5
27	...	25.2	24.9	24.5	23.9	23.1	22.2	21.1	19.8	18.5
28	...	30.3	29.9	29.3	28.6	27.7	26.6	25.3	23.8	22.2
29	...	33.6	33.2	32.6	31.8	30.8	29.6	28.1	26.5	24.6
30	...	37.8	37.4	36.7	35.8	34.6	33.3	31.6	29.8	27.7
31	...	42.0	41.5	40.8	39.8	38.5	36.9	35.1	33.1	30.8
32	...	50.5	49.8	48.9	47.7	46.2	44.3	42.2	39.7	36.9
33	...	50.5	49.8	48.9	47.7	46.2	44.3	42.2	39.7	36.9
34	...	54.7	54.0	53.0	51.7	50.0	48.0	45.7	43.0	40.0
35	...	68.6	67.9	66.7	65.1	62.9	60.3	57.1	53.6	49.7
36	...	25.2	24.9	24.5	23.9	23.1	22.2	21.1	19.8	18.5
37	...	25.2	24.9	24.5	23.9	23.1	22.2	21.1	19.8	18.5
38	...	25.2	24.9	24.5	23.9	23.1	22.2	21.1	19.8	18.5
39	...	25.2	24.9	24.5	23.9	23.1	22.2	21.1	19.8	18.5
40	...	25.2	24.9	24.5	23.9	23.1	22.2	21.1	19.8	18.5
41	...	25.2	24.9	24.5	23.9	23.1	22.2	21.1	19.8	18.5
42	...	25.2	24.9	24.5	23.9	23.1	22.2	21.1	19.8	18.5
43	...	25.2	24.9	24.5	23.9	23.1	22.2	21.1	19.8	18.5

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	9Cr-1Mo	Forgings	SA-182	F9	K90941	...
2	9Cr-1Mo	Forgings	SA-336	F9	K90941	...
3	9Cr-1Mo	Castings	SA-217	C12	J82090	...
4	9Cr-1Mo	Cast pipe	SA-426	CP9	J82090	...
5	9Cr-1Mo-V	Forgings	SA-182	F91	K90901	...
6	9Cr-1Mo-V	Smls. tube	SA-213	T91	K90901	...
7	9Cr-1Mo-V	Fittings	SA-234	WP91	K90901	...
8	9Cr-1Mo-V	Smls. pipe	SA-335	P91	K90901	...
9	9Cr-1Mo-V	Forgings	SA-336	F91	K90901	...
10	9Cr-1Mo-V	Forged pipe	SA-369	FP91	K90901	...
11	9Cr-1Mo-V	Plate	SA-387	91	K90901	2
12	11Cr-Ti	Plate	SA-240	...	S40910	...
13	11Cr-Ti	Plate	SA-240	...	S40920	...
14	11Cr-Ti	Plate	SA-240	...	S40930	...
15	11Cr-Ti	Smls. & wld. tube	SA-268	TP409	S40900	...
16	12Cr	Plate	SA-1010	40	S41003	...
17	12Cr	Bar	SA-479	403	S40300	A
18	12Cr	Bar	SA-479	403	S40300	1
19	12Cr	Plate	SA-1010	50	S41003	...
20	12Cr-Al	Plate	SA-240	405	S40500	...
21	12Cr-Al	Bar	SA-479	405	S40500	...
22	12Cr-Al	Bar	SA/JIS G4303	SUS405	...	...
23	12Cr-Al	Smls. & wld. tube	SA-268	TP405	S40500	...
24	12Cr-9Ni-2Cu-1Ti	Bar	SA-564	XM-16	S45500	H1000
25	12Cr-9Ni-2Cu-1Ti	Forgings	SA-705	XM-16	S45500	H1000
26	12Cr-9Ni-2Cu-1Ti	Bar	SA-564	XM-16	S45500	H950
27	12Cr-9Ni-2Cu-1Ti	Forgings	SA-705	XM-16	S45500	H950
28	12Cr-9Ni-2Cu-1Ti	Bar	SA-564	XM-16	S45500	H900
29	12Cr-9Ni-2Cu-1Ti	Forgings	SA-705	XM-16	S45500	H900
30	12Cr-Ti	Smls. & wld. tube	SA-268	...	S40800	...
31	13Cr	Plate	SA-240	410S	S41008	...
32	13Cr	Smls. & wld. tube	SA-268	TP410	S41000	...
33	13Cr	Plate	SA-240	410	S41000	...
34	13Cr	Forgings	SA-182	F6a	S41000	1
35	13Cr	Bar	SA-479	410	S41000	...
36	13Cr	Bar	SA-479	410	S41000	A
37	13Cr	Bar	SA-479	410	S41000	1
38	13Cr	Forgings	SA-182	F6a	S41000	2
39	13Cr	Castings	SA-217	CA15	J91150	...
40	13Cr	Cast pipe	SA-426	CPCA15	J91150	...
41	13Cr	Bolting	SA-193	B6	S41000	...
42	13Cr-4Ni	Castings	SA-487	CA6NM	J91540	A
43	13Cr-4Ni	Forgings	SA-182	F6NM	S41500	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	85	55	...
2	...	85	55	...
3	...	90	60	...
4	...	90	60	...
5	...	85	60	...
6	...	85	60	...
7	...	85	60	...
8	...	85	60	...
9	...	85	60	...
10	...	85	60	...
11	...	85	60	...
12	...	55	25	...
13	...	55	25	...
14	...	55	25	...
15	...	55	25	...
16	$\leq \frac{3}{4}$	66	40	...
17	...	70	40	...
18	...	70	40	...
19	$\leq \frac{3}{4}$	70	50	...
20	...	60	25	...
21	...	60	25	...
22	...	60	25	...
23	...	60	30	...
24	...	205	185	(3)
25	$\geq \frac{1}{2}$	205	185	(3)(4)
26	...	220	205	(3)
27	$\geq \frac{1}{2}$	220	205	(3)(4)
28	...	235	220	(3)
29	$\geq \frac{1}{2}$	235	220	(3)(4)
30	...	55	30	...
31	...	60	30	...
32	...	60	30	...
33	...	65	30	...
34	...	70	40	...
35	...	70	40	...
36	...	70	40	...
37	...	70	40	...
38	...	85	55	...
39	...	90	65	...
40	...	90	65	...
41	≤ 4	110	85	...
42	...	110	80	...
43	...	115	90	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	55.0	51.3	49.7	48.6	47.9	...	47.2	...	46.9
2	55.0	51.3	49.7	48.6	47.9	...	47.2	...	46.9
3	60.0	56.0	54.2	53.0	52.3	...	51.5	...	51.2
4	60.0	56.0	54.2	53.0	52.3	...	51.5	...	51.2
5	60.0	57.1	55.9	55.2	54.8	...	54.7	...	54.7
6	60.0	57.1	55.9	55.2	54.8	...	54.7	...	54.7
7	60.0	57.1	55.9	55.2	54.8	...	54.7	...	54.7
8	60.0	57.1	55.9	55.2	54.8	...	54.7	...	54.7
9	60.0	57.1	55.9	55.2	54.8	...	54.7	...	54.7
10	60.0	57.1	55.9	55.2	54.8	...	54.7	...	54.7
11	60.0	57.1	55.9	55.2	54.8	...	54.7	...	54.7
12	25.0	23.0	21.7	20.6	19.6	...	18.1	...	17.3
13	25.0	23.0	21.7	20.6	19.6	...	18.1	...	17.3
14	25.0	23.0	21.7	20.6	19.6	...	18.1	...	17.3
15	25.0	23.0	21.7	20.6	19.6	...	18.1	...	17.3
16	40.0	...	40.0	...	36.7	...	33.9	...	32.3
17	40.0	37.8	36.8	36.0	35.5	...	34.9	...	34.4
18	40.0	37.8	36.8	36.0	35.5	...	34.9	...	34.4
19	50.0	...	50.0	...	45.9	...	42.4	...	40.3
20	25.0	23.6	23.0	22.5	22.2	...	21.8	...	21.5
21	25.0	23.6	23.0	22.5	22.2	...	21.8	...	21.5
22	25.0	23.6	23.0	22.5	22.2	...	21.8	...	21.5
23	30.0	28.4	27.6	27.0	26.6	...	26.2	...	25.8
24	185.0	...	...	...	...	...	...	...	...
25	185.0	...	...	...	...	...	...	...	...
26	205.0	...	...	...	...	...	...	...	...
27	205.0	...	...	...	...	...	...	...	...
28	220.0	...	...	...	...	...	...	...	...
29	220.0	...	...	...	...	...	...	...	...
30	30.0	28.4	27.6	27.0	26.6	...	26.2	...	25.8
31	30.0	28.4	27.6	27.0	26.6	...	26.2	...	25.8
32	30.0	28.4	27.6	27.0	26.6	...	26.2	...	25.8
33	30.0	28.4	27.6	27.0	26.6	...	26.2	...	25.8
34	40.0	37.8	36.8	36.0	35.5	...	34.9	...	34.4
35	40.0	37.8	36.8	36.0	35.5	...	34.9	...	34.4
36	40.0	37.8	36.8	36.0	35.5	...	34.9	...	34.4
37	40.0	37.8	36.8	36.0	35.5	...	34.9	...	34.4
38	55.0	52.0	50.6	49.6	48.8	...	48.0	...	47.3
39	65.0	61.4	59.8	58.6	57.7	...	56.7	...	55.9
40	65.0	61.4	59.8	58.6	57.7	...	56.7	...	55.9
41	85.0	...	78.0	...	75.0	...	73.6	...	72.8
42	80.0	76.9	75.3	73.9	72.9	...	71.3	...	70.3
43	90.0	87.7	86.5	85.5	84.6	...	82.8	...	80.8

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	46.2	45.7	44.8	43.7	42.3	40.6	38.6	36.4	33.9
2	...	46.2	45.7	44.8	43.7	42.3	40.6	38.6	36.4	33.9
3	...	50.5	49.8	48.9	47.7	46.2	44.3	42.2	39.7	36.9
4	...	50.5	49.8	48.9	47.7	46.2	44.3	42.2	39.7	36.9
5	...	54.5	54.0	53.2	52.0	50.4	48.5	46.1	43.4	40.2
6	...	54.5	54.0	53.2	52.0	50.4	48.5	46.1	43.4	40.2
7	...	54.5	54.0	53.2	52.0	50.4	48.5	46.1	43.4	40.2
8	...	54.5	54.0	53.2	52.0	50.4	48.5	46.1	43.4	40.2
9	...	54.5	54.0	53.2	52.0	50.4	48.5	46.1	43.4	40.2
10	...	54.5	54.0	53.2	52.0	50.4	48.5	46.1	43.4	40.2
11	...	54.5	54.0	53.2	52.0	50.4	48.5	46.1	43.4	40.2
12	...	17.0	16.9	16.9	16.8	16.6	16.3	15.9	15.3	14.5
13	...	17.0	16.9	16.9	16.8	16.6	16.3	15.9	15.3	14.5
14	...	17.0	16.9	16.9	16.8	16.6	16.3	15.9	15.3	14.5
15	...	17.0	16.9	16.9	16.8	16.6	16.3	15.9	15.3	14.5
16	...	31.1	30.4	29.4	28.1	26.5	24.7	22.9	21.5	21.2
17	...	33.7	33.1	32.4	31.4	30.2	28.8	27.1	25.2	23.0
18	...	33.7	33.1	32.4	31.4	30.2	28.8	27.1	25.2	23.0
19	...	38.9	38.0	36.8	35.1	33.1	30.9	28.6	26.9	26.5
20	...	21.0	20.7	20.2	19.6	18.9	18.0	16.9	15.7	14.4
21	...	21.0	20.7	20.2	19.6	18.9	18.0	16.9	15.7	14.4
22	...	21.0	20.7	20.2	19.6	18.9	18.0	16.9	15.7	14.4
23	...	25.3	24.8	24.3	23.6	22.7	21.6	20.3	18.9	17.2
24
25
26
27
28
29
30	...	25.3	24.8	24.3	23.6	22.7	21.6	20.3	18.9	17.2
31	...	25.3	24.8	24.3	23.6	22.7	21.6	20.3	18.9	17.2
32	...	25.3	24.8	24.3	23.6	22.7	21.6	20.3	18.9	17.2
33	...	25.3	24.8	24.3	23.6	22.7	21.6	20.3	18.9	17.2
34	...	33.7	33.1	32.4	31.4	30.2	28.8	27.1	25.2	23.0
35	...	33.7	33.1	32.4	31.4	30.2	28.8	27.1	25.2	23.0
36	...	33.7	33.1	32.4	...	...	...	...	...	...
37	...	33.7	33.1	32.4	...	...	...	...	...	...
38	...	46.3	45.5	44.5	43.2	41.6	39.6	37.3	34.6	31.6
39	...	54.7	53.8	52.6	51.0	49.1	46.8	44.0	40.9	37.3
40	...	54.7	53.8	52.6	...	...	...	...	...	...
41	...	71.7	70.7	69.4	67.6	65.2	62.3	58.7	54.6	49.9
42	...	69.1	68.2	67.0	65.4	63.4	...	...	...	...
43	...	78.5	77.2	75.7	...	...	...	...	...	...

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	13Cr-8Ni-2Mo	Bar	SA-564	XM-13	S13800	H1150M
2	13Cr-8Ni-2Mo	Forgings	SA-705	XM-13	S13800	H1150M
3	13Cr-8Ni-2Mo	Bar	SA-564	XM-13	S13800	H1150
4	13Cr-8Ni-2Mo	Forgings	SA-705	XM-13	S13800	H1150
5	13Cr-8Ni-2Mo	Bar	SA-564	XM-13	S13800	H1100
6	13Cr-8Ni-2Mo	Forgings	SA-705	XM-13	S13800	H1100
7	13Cr-8Ni-2Mo	Bar	SA-564	XM-13	S13800	H1050
8	13Cr-8Ni-2Mo	Forgings	SA-705	XM-13	S13800	H1050
9	13Cr-8Ni-2Mo	Bar	SA-564	XM-13	S13800	H1025
10	13Cr-8Ni-2Mo	Forgings	SA-705	XM-13	S13800	H1025
11	13Cr-8Ni-2Mo	Bar	SA-564	XM-13	S13800	H1000
12	13Cr-8Ni-2Mo	Forgings	SA-705	XM-13	S13800	H1000
13	13Cr-8Ni-2Mo	Bar	SA-564	XM-13	S13800	H950
14	13Cr-8Ni-2Mo	Forgings	SA-705	XM-13	S13800	H950
15	15Cr	Smls. & wld. tube	SA-268	TP429	S42900	...
16	15Cr	Plate	SA-240	429	S42900	...
17	15Cr-5Ni-3Cu	Bar	SA-564	XM-12	S15500	H1150M
18	15Cr-5Ni-3Cu	Forgings	SA-705	XM-12	S15500	H1150M
19	15Cr-5Ni-3Cu	Bar	SA-564	XM-12	S15500	H1150
20	15Cr-5Ni-3Cu	Forgings	SA-705	XM-12	S15500	H1150
21	15Cr-5Ni-3Cu	Bar	SA-564	XM-12	S15500	H1100
22	15Cr-5Ni-3Cu	Forgings	SA-705	XM-12	S15500	H1100
23	15Cr-5Ni-3Cu	Bar	SA-564	XM-12	S15500	H1075
24	15Cr-5Ni-3Cu	Forgings	SA-705	XM-12	S15500	H1075
25	15Cr-5Ni-3Cu	Bar	SA-564	XM-12	S15500	H1025
26	15Cr-5Ni-3Cu	Forgings	SA-705	XM-12	S15500	H1025
27	15Cr-5Ni-3Cu	Bar	SA-564	XM-12	S15500	H925
28	15Cr-5Ni-3Cu	Forgings	SA-705	XM-12	S15500	H925
29	15Cr-5Ni-3Cu	Bar	SA-564	XM-12	S15500	H900
30	15Cr-5Ni-3Cu	Forgings	SA-705	XM-12	S15500	H900
31	15Cr-6Ni-Cu-Mo	Bar	SA-564	XM-25	S45000	H1150
32	15Cr-6Ni-Cu-Mo	Forgings	SA-705	XM-25	S45000	H1150
33	15Cr-6Ni-Cu-Mo	Bar	SA-564	XM-25	S45000	H1100
34	15Cr-6Ni-Cu-Mo	Forgings	SA-705	XM-25	S45000	H1100
35	15Cr-6Ni-Cu-Mo	Bar	SA-564	XM-25	S45000	H1050
36	15Cr-6Ni-Cu-Mo	Forgings	SA-705	XM-25	S45000	H1050
37	15Cr-6Ni-Cu-Mo	Bar	SA-564	XM-25	S45000	H1025
38	15Cr-6Ni-Cu-Mo	Forgings	SA-705	XM-25	S45000	H1025
39	15Cr-6Ni-Cu-Mo	Bar	SA-564	XM-25	S45000	H1000
40	15Cr-6Ni-Cu-Mo	Forgings	SA-705	XM-25	S45000	H1000
41	15Cr-6Ni-Cu-Mo	Bar	SA-564	XM-25	S45000	H950
42	15Cr-6Ni-Cu-Mo	Forgings	SA-705	XM-25	S45000	H950
43	15Cr-6Ni-Cu-Mo	Bar	SA-564	XM-25	S45000	H900
44	15Cr-6Ni-Cu-Mo	Forgings	SA-705	XM-25	S45000	H900

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	125	85	...
2	...	125	85	...
3	...	135	90	...
4	...	135	90	...
5	...	150	135	...
6	...	150	135	...
7	...	175	165	(3)
8	...	175	165	(3)
9	...	185	175	(3)
10	...	185	175	(3)
11	...	205	190	(3)
12	...	205	190	(3)
13	...	220	205	(3)
14	...	220	205	(3)
15	...	60	35	...
16	...	65	30	...
17	...	115	75	...
18	...	115	75	...
19	...	135	105	...
20	...	135	105	...
21	...	140	115	(5)
22	...	140	115	(5)
23	...	145	125	...
24	...	145	125	...
25	...	155	145	(3)
26	...	155	145	(3)
27	...	170	155	(3)
28	...	170	155	(3)
29	...	190	170	(3)
30	...	190	170	(3)
31	...	125	75	...
32	$\geq \frac{1}{2}$	125	75	...
33	...	130	105	...
34	$\geq \frac{1}{2}$	130	105	...
35	...	145	135	...
36	$\geq \frac{1}{2}$	145	135	...
37	...	150	140	(3)
38	$\geq \frac{1}{2}$	150	140	(3)
39	...	160	150	(3)
40	$\geq \frac{1}{2}$	160	150	(3)
41	...	170	160	(3)
42	$\geq \frac{1}{2}$	170	160	(3)
43	...	180	170	(3)
44	$\geq \frac{1}{2}$	180	170	(3)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	85.0	...	...	...	...	...	...	...	...
2	85.0	...	...	...	...	...	...	...	...
3	90.0	...	...	...	...	...	...	...	...
4	90.0	...	...	...	...	...	...	...	...
5	135.0	...	...	...	...	...	...	...	...
6	135.0	...	...	...	...	...	...	...	...
7	165.0	...	...	...	...	...	...	...	...
8	165.0	...	...	...	...	...	...	...	...
9	175.0	...	...	...	...	...	...	...	...
10	175.0	...	...	...	...	...	...	...	...
11	190.0	...	...	...	...	...	...	...	...
12	190.0	...	...	...	...	...	...	...	...
13	205.0	...	...	...	...	...	...	...	...
14	205.0	...	...	...	...	...	...	...	...
15	35.0	33.1	32.2	31.5	31.1	...	30.5	...	30.1
16	30.0	28.4	27.6	27.0	26.6	...	26.2	...	25.8
17	75.0	...	...	...	...	...	...	...	...
18	75.0	...	...	...	...	...	...	...	...
19	105.0	...	...	...	...	...	...	...	...
20	105.0	...	...	...	...	...	...	...	...
21	115.0	...	107.1	...	103.2	...	100.5	...	98.1
22	115.0	...	107.1	...	103.2	...	100.5	...	98.1
23	125.0	...	...	...	...	...	...	...	...
24	125.0	...	...	...	...	...	...	...	...
25	145.0	...	...	...	...	...	...	...	...
26	145.0	...	...	...	...	...	...	...	...
27	155.0	...	...	...	...	...	...	...	...
28	155.0	...	...	...	...	...	...	...	...
29	170.0	...	...	...	...	...	...	...	...
30	170.0	...	...	...	...	...	...	...	...
31	75.0	...	...	...	...	...	...	...	...
32	75.0	...	...	...	...	...	...	...	...
33	105.0	...	...	...	...	...	...	...	...
34	105.0	...	...	...	...	...	...	...	...
35	135.0	...	...	...	...	...	...	...	...
36	135.0	...	...	...	...	...	...	...	...
37	140.0	...	...	...	...	...	...	...	...
38	140.0	...	...	...	...	...	...	...	...
39	150.0	...	...	...	...	...	...	...	...
40	150.0	...	...	...	...	...	...	...	...
41	160.0	...	...	...	...	...	...	...	...
42	160.0	...	...	...	...	...	...	...	...
43	170.0	...	...	...	...	...	...	...	...
44	170.0	...	...	...	...	...	...	...	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15	...	29.5	29.0	28.3	27.5	26.4	25.2	23.7	22.0	20.1
16	...	25.3	24.8	24.3	23.6	22.7	21.6	20.3	18.9	17.2
17
18
19
20
21	96.8	...	...	...	...	...	...	...	...	...
22	96.8	...	...	...	...	...	...	...	...	...
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	17Cr	Smls. & wld. tube	SA-268	TP430	S43000	...
2	17Cr	Plate	SA-240	430	S43000	...
3	17Cr	Bar	SA-479	430	S43000	...
4	17Cr-4Ni-4Cu	Forgings	SA-705	630	S17400	H1150M
5	17Cr-4Ni-4Cu	Bar	SA-564	630	S17400	H1150
6	17Cr-4Ni-4Cu	Plate	SA-693	630	S17400	H1150
7	17Cr-4Ni-4Cu	Forgings	SA-705	630	S17400	H1150
8	17Cr-4Ni-4Cu	Bar	SA-564	630	S17400	H1100
9	17Cr-4Ni-4Cu	Plate	SA-693	630	S17400	H1100
10	17Cr-4Ni-4Cu	Forgings	SA-705	630	S17400	H1100
11	17Cr-4Ni-4Cu	Bar	SA-564	630	S17400	H1075
12	17Cr-4Ni-4Cu	Plate	SA-693	630	S17400	H1075
13	17Cr-4Ni-4Cu	Forgings	SA-705	630	S17400	H1075
14	17Cr-4Ni-4Cu	Bar	SA-564	630	S17400	H1025
15	17Cr-4Ni-4Cu	Forgings	SA-705	630	S17400	H1025
16	17Cr-4Ni-4Cu	Forgings	SA-705	630	S17400	H925
17	17Cr-4Ni-4Cu	Forgings	SA-705	630	S17400	H900
(10) 18	...	...	...	...	...	...
(10) 19	...	...	...	...	...	...
(10) 20	...	...	...	...	...	...
(10) 21	...	...	...	...	...	...
(10) 22	...	...	...	...	...	...
(10) 23	17Cr-7Ni-1Al	Forgings	SA-705	631	S17700	TH1050
(10) 24	17Cr-7Ni-1Al	Forgings	SA-705	631	S17700	RH950
25	18Cr-2Mo	Plate	SA-240	...	S44400	...
26	18Cr-2Mo	Smls. & wld. tube	SA-268	...	S44400	...
27	18Cr-Ti	Smls. & wld. tube	SA-268	TP439	S43035	...
28	18Cr-Ti	Wld. tube	SA-803	TP439	S43035	...
29	18Cr-Ti	Smls. & wld. pipe	SA-731	TP439	S43035	...
30	18Cr-Ti	Smls. & wld. tube	SA-268	TP430 Ti	S43036	...
31	18Cr-Ti	Bar	SA-479	439	S43035	...
32	26Cr-3Ni-3Mo	Plate	SA-240	26-3-3	S44660	...
33	26Cr-3Ni-3Mo	Smls. & wld. tube	SA-268	26-3-3	S44660	...
34	26Cr-3Ni-3Mo	Wld. tube	SA-803	26-3-3	S44660	...
(10) 35	...	...	...	...	...	...
(10) 36	...	...	...	...	...	...
(10) 37	...	...	...	...	...	...
(10) 38	...	...	...	...	...	...
(10) 39	...	...	...	...	...	...
(10) 40	...	...	...	...	...	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	60	35	...
2	...	65	30	...
3	...	70	40	...
4	...	115	75	(5)
5	...	135	105	...
6	...	135	105	...
7	...	135	105	...
8	...	140	115	...
9	...	140	115	...
10	...	140	115	...
11	...	145	125	...
12	...	145	125	...
13	...	145	125	...
14	...	155	145	(3)(5)
15	...	155	145	(3)(5)
16	...	170	155	(3)
17	...	190	170	(3)
18 (10)
19 (10)
20 (10)
21 (10)
22 (10)
23	...	170	140	(3) (10)
24	...	185	150	(3) (10)
25	...	60	40	...
26	...	60	40	...
27	...	60	30	...
28	...	60	30	...
29	...	60	30	...
30	...	60	35	...
31	...	70	40	...
32	$\leq \frac{2}{10}$	85	65	...
33	$\leq \frac{2}{10}$	85	65	...
34	$\leq \frac{2}{10}$	85	65	...
35 (10)
36 (10)
37 (10)
38 (10)
39 (10)
40 (10)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	35.0	33.1	32.2	31.5	31.1	...	30.5	...	30.1
2	30.0	28.4	27.6	27.0	26.6	...	26.2	...	25.8
3	40.0	37.8	36.8	36.0	35.5	...	34.9	...	34.4
4	75.0	...	...	...	...	...	...	...	...
5	105.0	99.7	97.1	94.9	93.0	...	89.7	...	87.0
6	105.0	99.7	97.1	94.9	93.0	...	89.7	...	87.0
7	105.0	99.7	97.1	94.9	93.0	...	89.7	...	87.0
8	115.0	109.2	106.3	103.9	101.8	...	98.3	...	95.2
9	115.0	109.2	106.3	103.9	101.8	...	98.3	...	95.2
10	115.0	109.2	106.3	103.9	101.8	...	98.3	...	95.2
11	125.0	118.7	115.6	113.0	110.7	...	106.8	...	103.5
12	125.0	118.7	115.6	113.0	110.7	...	106.8	...	103.5
13	125.0	118.7	115.6	113.0	110.7	...	106.8	...	103.5
14	145.0	...	134.1	...	128.4	...	123.9	...	120.1
15	145.0	137.7	134.1	131.0	128.4	...	123.9	...	120.1
16	155.0	147.2	143.3	140.1	137.3	...	132.4	...	128.4
17	170.0	161.5	157.2	153.6	150.5	...	145.2	...	140.8
(10) 18	...	...	...	...	...	...	...	...	...
(10) 19	...	...	...	...	...	...	...	...	...
(10) 20	...	...	...	...	...	...	...	...	...
(10) 21	...	...	...	...	...	...	...	...	...
(10) 22	...	...	...	...	...	...	...	...	...
(10) 23	140.0	...	...	...	...	...	...	...	...
(10) 24	150.0	...	...	...	...	...	...	...	...
25	40.0	36.5	34.8	33.5	32.4	...	30.8	...	29.4
26	40.0	36.5	34.8	33.5	32.4	...	30.8	...	29.4
27	30.0	27.4	25.9	24.6	23.5	...	21.9	...	20.9
28	30.0	27.4	25.9	24.6	23.5	...	21.9	...	20.9
29	30.0	27.4	25.9	24.6	23.5	...	21.9	...	20.9
30	35.0	...	30.2	...	27.4	...	25.5	...	24.4
31	40.0	36.5	34.6	32.8	31.3	...	29.1	...	27.9
32	65.0	60.6	58.3	56.4	54.7	...	52.3	...	50.6
33	65.0	60.6	58.3	56.4	54.7	...	52.3	...	50.6
34	65.0	60.6	58.3	56.4	54.7	...	52.3	...	50.6
(10) 35	...	...	...	...	...	...	...	...	...
(10) 36	...	...	...	...	...	...	...	...	...
(10) 37	...	...	...	...	...	...	...	...	...
(10) 38	...	...	...	...	...	...	...	...	...
(10) 39	...	...	...	...	...	...	...	...	...
(10) 40	...	...	...	...	...	...	...	...	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	29.5	29.0	28.3	27.5	26.4	25.2	23.7	22.0	20.1
2	...	25.3	24.8	24.3	23.6	22.7	21.6	20.3	18.9	17.2
3	...	33.7	33.1	32.4	31.4	30.2	28.8	27.1	25.2	23.0
4
5	...	84.7	83.6	82.5	81.1	79.4	76.9	73.2	67.9	60.2
6	...	84.7	83.6	82.5	81.1	79.4	76.9	73.2	67.9	60.2
7	...	84.7	83.6	82.5	81.1	79.4	76.9	73.2	67.9	60.2
8	...	92.7	91.5	90.3	88.9	86.9	84.2	80.2	74.4	66.0
9	...	92.7	91.5	90.3	88.9	86.9	84.2	80.2	74.4	66.0
10	...	92.7	91.5	90.3	88.9	86.9	84.2	80.2	74.4	66.0
11	...	100.8	99.5	98.2	96.6	94.5	91.5	87.2	80.8	71.7
12	...	100.8	99.5	98.2	96.6	94.5	91.5	87.2	80.8	71.7
13	...	100.8	99.5	98.2	96.6	94.5	91.5	87.2	80.8	71.7
14	118.4	...	...	...	...	...	...	...	...	...
15	118.4	116.9	115.4	113.9	...	...	...	...	...	...
16	...	125.0	123.4	121.7	...	...	...	...	...	...
17	...	137.1	135.3	133.5	...	...	...	...	...	...
18
19	(10)
20	(10)
21	(10)
22	(10)
23	(10)
24	(10)
25	...	28.0	27.3	26.6	25.9	25.1	24.2	23.2	22.1	20.7
26	...	28.0	27.3	26.6	25.9	25.1	24.2	23.2	22.1	20.7
27	...	20.5	20.3	20.2	20.1	19.8	19.4	18.8	17.9	16.6
28	...	20.5	20.3	20.2	20.1	19.8	19.4	18.8	17.9	16.6
29	...	20.5	20.3	20.2	20.1	19.8	19.4	18.8	17.9	16.6
30	...	23.9	23.7	23.6	23.4	23.1	22.6	21.9	20.9	...
31	...	27.3	27.1	26.9	26.7	26.4	25.9	25.0	23.8	22.2
32	...	49.7	49.5	49.3	...	...	...	...	...	...
33	...	49.7	49.5	49.3	...	...	...	...	...	...
34	...	49.7	49.5	49.3	...	...	...	...	...	...
35	(10)
36	(10)
37	(10)
38	(10)
39	(10)
40	(10)

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	27Cr	Smls. tube	SA-268	TP446-1	S44600	...
2	27Cr-1Mo	Forgings	SA-182	FXM-27Cb	S44627	...
3	27Cr-1Mo	Plate	SA-240	XM-27	S44627	...
4	27Cr-1Mo	Smls. & wld. tube	SA-268	TPXM-27	S44627	...
5	27Cr-1Mo	Bar	SA-479	XM-27	S44627	...
6	27Cr-1Mo	Smls. & wld. pipe	SA-731	TPXM-27	S44627	...
7	27Cr-1Mo-Ti	Smls. & wld. pipe	SA-731	TPXM-33	S44626	...
8	27Cr-1Mo-Ti	Plate	SA-240	XM-33	S44626	...
9	27Cr-1Mo-Ti	Smls. & wld. tube	SA-268	TPXM-33	S44626	...
10	29Cr-4Mo	Bar	SA-479	...	S44700	...
11	29Cr-4Mo	Plate	SA-240	...	S44700	...
12	29Cr-4Mo	Smls. & wld. tube	SA-268	29-4	S44700	...
13	29Cr-4Mo-2Ni	Bar	SA-479	...	S44800	...
14	29Cr-4Mo-2Ni	Plate	SA-240	...	S44800	...
15	29Cr-4Mo-2Ni	Smls. & wld. tube	SA-268	29-4-2	S44800	...
16	29Cr-4Mo-Ti	Smls. & wld. tube	SA-268	...	S44735	...
17	Mn- $\frac{1}{4}$ Mo	Forgings	SA-372	D	K14508	...
18	Mn- $\frac{1}{4}$ Mo-V	Castings	SA-487	2	J13005	A
19	Mn- $\frac{1}{4}$ Mo-V	Castings	SA-487	2	J13005	B
20	Mn- $\frac{1}{2}$ Mo	Plate	SA-302	A	K12021	...
21	Mn- $\frac{1}{2}$ Mo	Wld. pipe	SA-672	H75	K12021	...
22	Mn- $\frac{1}{2}$ Mo	Plate	SA-302	B	K12022	...
23	Mn- $\frac{1}{2}$ Mo	Plate	SA-533	A	K12521	1
24	Mn- $\frac{1}{2}$ Mo	Plate	SA-533	A	K12521	2
25	Mn- $\frac{1}{2}$ Mo	Plate	SA-533	A	K12521	3
26	Mn- $\frac{1}{2}$ Mo- $\frac{1}{4}$ Ni	Plate	SA-533	D	K12529	1
27	Mn- $\frac{1}{2}$ Mo- $\frac{1}{4}$ Ni	Plate	SA-533	D	K12529	2
28	Mn- $\frac{1}{2}$ Mo- $\frac{1}{4}$ Ni	Plate	SA-533	D	K12529	3
29	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Plate	SA-302	C	K12039	...
30	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Plate	SA-533	B	K12539	1
31	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Wld. pipe	SA-672	H80	K12039	...
32	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Wld. pipe	SA-672	J80	K12539	...
33	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Plate	SA-533	B	K12539	2
34	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Wld. pipe	SA-672	J90	K12539	...
35	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Plate	SA-533	B	K12539	3
36	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni	Wld. pipe	SA-672	J100	K12539	...
37	Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni	Plate	SA-302	D	K12054	...
38	Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni	Plate	SA-533	C	K12554	1
39	Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni	Plate	SA-533	C	K12554	2
40	Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni	Plate	SA-533	C	K12554	3
41	Mn- $\frac{1}{2}$ Ni-V	Plate	SA-225	C	K12524	...
42	Mn-V	Castings	SA-487	1	J13002	A
43	Mn-V	Castings	SA-487	1	J13002	B
44	1 $\frac{1}{2}$ Si- $\frac{1}{2}$ Mo	Smls. pipe	SA-335	P15	K11578	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	70	40	...
2	...	60	35	...
3	...	65	40	...
4	...	65	40	...
5	...	65	40	...
6	...	65	40	...
7	...	65	40	...
8	...	68	45	...
9	...	68	45	...
10	...	70	55	...
11	...	80	60	...
12	...	80	60	...
13	...	70	55	...
14	...	80	60	...
15	...	80	60	...
16	...	75	60	...
17	...	105	65	...
18	...	85	53	...
19	...	90	65	...
20	...	75	45	...
21	...	75	45	...
22	...	80	50	...
23	...	80	50	...
24	...	90	70	...
25	...	100	83	...
26	...	80	50	...
27	...	90	70	...
28	...	100	83	...
29	...	80	50	...
30	...	80	50	...
31	...	80	50	...
32	...	80	50	...
33	...	90	70	...
34	...	90	70	...
35	...	100	83	...
36	...	100	83	...
37	...	80	50	...
38	...	80	50	...
39	...	90	70	...
40	...	100	83	...
41	...	105	70	...
42	...	85	55	...
43	...	90	65	...
44	...	60	30	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	40.0	36.5	34.6	32.8	31.3	...	29.1	...	27.9
2	35.0	32.1	30.3	28.8	27.6	...	25.7	...	24.8
3	40.0	36.6	34.5	32.8	31.3	...	29.3	...	28.3
4	40.0	36.6	34.5	32.8	31.3	...	29.3	...	28.3
5	40.0	36.6	34.5	32.8	31.3	...	29.3	...	28.3
6	40.0	36.6	34.5	32.8	31.3	...	29.3	...	28.3
7	40.0	36.9	35.1	33.4	31.9	...	29.4	...	27.7
8	45.0	41.5	39.5	37.6	35.9	...	33.1	...	31.1
9	45.0	41.5	39.5	37.6	35.9	...	33.1	...	31.1
10	55.0	50.8	48.4	46.4	44.7	...	42.6	...	41.6
11	60.0	55.4	52.8	50.6	48.8	...	46.4	...	45.4
12	60.0	55.4	52.8	50.6	48.8	...	46.4	...	45.4
13	55.0	49.0	45.8	43.0	40.7	...	36.9	...	34.3
14	60.0	53.4	49.9	47.0	44.4	...	40.2	...	37.4
15	60.0	53.4	49.9	47.0	44.4	...	40.2	...	37.4
16	60.0	53.4	49.9	47.0	44.4	...	40.2	...	37.4
17	65.0	62.8	61.5	60.4	59.6	...	58.6	...	58.2
18	53.0	51.2	50.4	49.4	48.2	...	45.2	...	42.4
19	65.0	62.8	61.8	60.6	59.1	...	55.4	...	52.0
20	45.0	43.3	42.3	41.6	40.9	...	39.8	...	38.8
21	45.0	43.3	42.3	41.6	40.9	...	39.8	...	38.8
22	50.0	48.1	47.0	46.2	45.5	...	44.2	...	43.2
23	50.0	48.1	47.0	46.2	45.5	...	44.2	...	43.2
24	70.0	67.3	65.9	64.7	63.7	...	61.9	...	60.4
25	83.0	79.8	78.1	76.7	75.5	...	73.4	...	71.6
26	50.0	48.1	47.0	46.2	45.5	...	44.2	...	43.2
27	70.0	67.3	65.9	64.7	63.7	...	61.9	...	60.4
28	83.0	79.8	78.1	76.7	75.5	...	73.4	...	71.6
29	50.0	48.1	47.0	46.2	45.5	...	44.2	...	43.2
30	50.0	48.1	47.0	46.2	45.5	...	44.2	...	43.2
31	50.0	48.1	47.0	46.2	45.5	...	44.2	...	43.2
32	50.0	48.1	47.0	46.2	45.5	...	44.2	...	43.2
33	70.0	67.3	65.9	64.7	63.7	...	61.9	...	60.4
34	70.0	67.3	65.9	64.7	63.7	...	61.9	...	60.4
35	83.0	79.8	78.1	76.7	75.5	...	73.4	...	71.6
36	83.0	79.8	78.1	76.7	75.5	...	73.4	...	71.6
37	50.0	48.1	47.0	46.2	45.5	...	44.2	...	43.2
38	50.0	48.1	47.0	46.2	45.5	...	44.2	...	43.2
39	70.0	67.3	65.9	64.7	63.7	...	61.9	...	60.4
40	83.0	79.8	78.1	76.7	75.5	...	73.4	...	71.6
41	70.0	64.9	63.7	63.1	62.4	...	59.8	...	56.0
42	55.0	...	...	...	...	...	...	...	...
43	65.0	...	...	...	...	...	...	...	...
44	30.0	28.8	28.2	27.7	27.3	...	26.5	...	25.9

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	27.3	27.1	26.9	26.7	26.4	25.9	25.0	23.8	22.2
2	...	24.6	24.6	...	...	...	...	...	...	...
3	...	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
4	...	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
5	...	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
6	...	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
7	...	26.7	26.4	26.4	...	...	...	...	...	...
8	...	30.0	29.7	29.6	...	...	...	...	...	...
9	...	30.0	29.7	29.6	...	...	...	...	...	...
10	...	41.3	41.1	40.6	39.7	...	...	...	...	...
11	...	45.0	44.8	44.3	43.3	...	...	...	...	...
12	...	45.0	44.8	44.3	43.3	...	...	...	...	...
13	...	32.9	32.6	32.4	32.1	...	...	...	...	...
14	...	35.9	35.6	35.3	35.0	...	...	...	...	...
15	...	35.9	35.6	35.3	35.0	...	...	...	...	...
16	...	35.9	35.6	35.3	35.0	...	...	...	...	...
17	...	57.6	57.0	56.0	54.7	53.0	50.9	48.5	45.8	43.1
18	...	40.9	40.5	39.8	...	...	...	...	...	...
19	...	50.2	49.7	48.8	...	...	...	...	...	...
20	...	37.9	37.3	36.7	35.8	34.8	33.3	31.4	28.9	25.5
21	...	37.9	37.3	36.7	35.8	34.8	33.3	31.4	28.9	25.5
22	...	42.1	41.5	40.7	39.8	38.6	37.0	34.9	32.1	28.4
23	...	42.1	41.5	40.7	39.8	38.6	37.0	34.9	32.1	28.4
24	...	58.9	58.0	57.0	55.7	54.1	51.9	48.9	45.0	39.7
25	...	69.8	68.8	67.6	66.1	64.1	61.5	58.0	53.3	47.1
26	...	42.1	41.5	40.7	39.8	38.6	37.0	34.9	32.1	28.4
27	...	58.9	58.0	57.0	55.7	54.1	51.9	48.9	45.0	39.7
28	...	69.8	68.8	67.6	66.1	64.1	61.5	58.0	53.3	47.1
29	...	42.1	41.5	40.7	39.8	38.6	37.0	34.9	32.1	28.4
30	...	42.1	41.5	40.7	39.8	38.6	37.0	34.9	32.1	28.4
31	...	42.1	41.5	40.7	39.8	38.6	37.0	34.9	32.1	28.4
32	...	42.1	41.5	40.7	39.8	38.6	37.0	34.9	32.1	28.4
33	...	58.9	58.0	57.0	55.7	54.1	51.9	48.9	45.0	39.7
34	...	58.9	58.0	57.0	55.7	54.1	51.9	48.9	45.0	39.7
35	...	69.8	68.8	67.6	66.1	64.1	61.5	58.0	53.3	47.1
36	...	69.8	68.8	67.6	66.1	64.1	61.5	58.0	53.3	47.1
37	...	42.1	41.5	40.7	39.8	38.6	37.0	34.9	32.1	28.4
38	...	42.1	41.5	40.7	39.8	38.6	37.0	34.9	32.1	28.4
39	...	58.9	58.0	57.0	55.7	54.1	51.9	48.9	45.0	39.7
40	...	69.8	68.8	67.6	66.1	64.1	61.5	58.0	53.3	47.1
41	...	52.4	51.0	49.9	48.7	46.7	...	...	...	...
42
43
44	...	25.2	24.9	24.4	23.9	23.2	22.2	21.0	19.3	17.0

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	$\frac{1}{2}\text{Ni}-\frac{1}{2}\text{Cr}-\frac{1}{4}\text{Mo}-\text{V}$	Castings	SA-487	4	J13047	A
2	$\frac{1}{2}\text{Ni}-\frac{1}{2}\text{Cr}-\frac{1}{4}\text{Mo}-\text{V}$	Castings	SA-487	4	J13047	B
3	$\frac{1}{2}\text{Ni}-\frac{1}{2}\text{Cr}-\frac{1}{4}\text{Mo}-\text{V}$	Castings	SA-487	4	J13047	E
4	$\frac{1}{2}\text{Ni}-\frac{1}{2}\text{Mo}-\text{V}$	Forgings	SA-541	3	K12045	1
5	$\frac{1}{2}\text{Ni}-\frac{1}{2}\text{Mo}-\text{V}$	Forgings	SA-541	3	K12045	2
6	$\frac{3}{4}\text{Ni}-\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Forgings	SA-592	F	K11576	...
7	$\frac{3}{4}\text{Ni}-\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Plate	SA-517	F	K11576	...
8	$\frac{3}{4}\text{Ni}-\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Forgings	SA-592	F	K11576	...
9	$\frac{3}{4}\text{Ni}-\frac{1}{2}\text{Cu}-\text{Mo}$	Smls. & wld. tube	SA-423	2	K11540	...
10	$\frac{3}{4}\text{Ni}-\frac{1}{2}\text{Mo}-\frac{1}{3}\text{Cr}-\text{V}$	Forgings	SA-508	2	K12766	1
11	$\frac{3}{4}\text{Ni}-\frac{1}{2}\text{Mo}-\frac{1}{3}\text{Cr}-\text{V}$	Forgings	SA-541	2	K12765	1
12	$\frac{3}{4}\text{Ni}-\frac{1}{2}\text{Mo}-\frac{1}{3}\text{Cr}-\text{V}$	Forgings	SA-508	2	K12766	2
13	$\frac{3}{4}\text{Ni}-\frac{1}{2}\text{Mo}-\frac{1}{3}\text{Cr}-\text{V}$	Forgings	SA-541	2	K12765	2
14	$\frac{3}{4}\text{Ni}-\frac{1}{2}\text{Mo}-\text{Cr}-\text{V}$	Forgings	SA-508	3	K12042	1
15	$\frac{3}{4}\text{Ni}-\frac{1}{2}\text{Mo}-\text{Cr}-\text{V}$	Forgings	SA-508	3	K12042	2
16	$\frac{3}{4}\text{Ni}-1\text{Cu}-\frac{3}{4}\text{Cr}$	Plate	SA-736	A	K12042	2
17	$\frac{3}{4}\text{Ni}-1\text{Cu}-\frac{3}{4}\text{Cr}$	Plate	SA-736	A	K12042	2
18	$\frac{3}{4}\text{Ni}-1\text{Cu}-\frac{3}{4}\text{Cr}$	Plate	SA-736	A	K12042	2
19	$\frac{3}{4}\text{Ni}-1\text{Cu}-\frac{3}{4}\text{Cr}$	Plate	SA-736	A	K12042	3
20	$\frac{3}{4}\text{Ni}-1\text{Cu}-\frac{3}{4}\text{Cr}$	Plate	SA-736	A	K12042	3
21	$\frac{3}{4}\text{Ni}-1\text{Cu}-\frac{3}{4}\text{Cr}$	Plate	SA-736	A	K12042	1
22	$\frac{3}{4}\text{Ni}-1\text{Mo}-\frac{3}{4}\text{Cr}$	Castings	SA-217	WC5	J22000	...
23	$1\text{Ni}-\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}$	Castings	SA-217	WC4	J12082	...
24	$1\frac{1}{4}\text{Ni}-1\text{Cr}-\frac{1}{2}\text{Mo}$	Plate	SA-517	P	K21650	...
25	$1\frac{1}{4}\text{Ni}-1\text{Cr}-\frac{1}{2}\text{Mo}$	Plate	SA-517	P	K21650	...
26	$1\frac{1}{2}\text{Ni}$	Forgings	SA-350	LF5	K13050	1
27	$1\frac{1}{2}\text{Ni}$	Forgings	SA-350	LF5	K13050	2
28	$1\frac{3}{4}\text{Ni}-\frac{3}{4}\text{Cr}-\frac{1}{4}\text{Mo}$	Bolting	SA-320	L43	G43400	...
29	$1\frac{3}{4}\text{Ni}-\frac{3}{4}\text{Cr}-\frac{1}{4}\text{Mo}$	Forgings	SA-372	L	K24055	...
30	$1\frac{3}{4}\text{Ni}-\frac{3}{4}\text{Cr}-\frac{1}{4}\text{Mo}$	Bolting	SA-574	4340	G43400	...
31	$1\frac{3}{4}\text{Ni}-\frac{3}{4}\text{Cr}-\frac{1}{4}\text{Mo}$	Bolting	SA-574	4340	G43400	...
32	$2\text{Ni}-\frac{3}{4}\text{Cr}-\frac{1}{4}\text{Mo}$	Bolting	SA-540	B23	H43400	5
33	$2\text{Ni}-\frac{3}{4}\text{Cr}-\frac{1}{4}\text{Mo}$	Bolting	SA-540	B23	H43400	5
34	$2\text{Ni}-\frac{3}{4}\text{Cr}-\frac{1}{4}\text{Mo}$	Bolting	SA-540	B23	H43400	4
35	$2\text{Ni}-\frac{3}{4}\text{Cr}-\frac{1}{4}\text{Mo}$	Bolting	SA-540	B23	H43400	3
36	$2\text{Ni}-\frac{3}{4}\text{Cr}-\frac{1}{4}\text{Mo}$	Bolting	SA-540	B23	H43400	2
37	$2\text{Ni}-\frac{3}{4}\text{Cr}-\frac{1}{4}\text{Mo}$	Bolting	SA-540	B23	H43400	1
38	$2\text{Ni}-\frac{3}{4}\text{Cr}-\frac{1}{3}\text{Mo}$	Bolting	SA-540	B24	K24064	5
39	$2\text{Ni}-\frac{3}{4}\text{Cr}-\frac{1}{3}\text{Mo}$	Bolting	SA-540	B24	K24064	5
40	$2\text{Ni}-\frac{3}{4}\text{Cr}-\frac{1}{3}\text{Mo}$	Bolting	SA-540	B24	K24064	4
41	$2\text{Ni}-\frac{3}{4}\text{Cr}-\frac{1}{3}\text{Mo}$	Bolting	SA-540	B24	K24064	3
42	$2\text{Ni}-\frac{3}{4}\text{Cr}-\frac{1}{3}\text{Mo}$	Bolting	SA-540	B24	K24064	2
43	$2\text{Ni}-\frac{3}{4}\text{Cr}-\frac{1}{3}\text{Mo}$	Bolting	SA-540	B24	K24064	1

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	90	60	...
2	...	105	85	...
3	...	115	95	...
4	...	80	50	...
5	...	90	65	...
6	$2\frac{1}{2} < t \leq 4$	105	90	...
7	$\leq 2\frac{1}{2}$	115	100	...
8	$\leq 2\frac{1}{2}$	115	100	...
9	...	60	37	...
10	...	80	50	...
11	...	80	50	...
12	...	90	65	...
13	...	90	65	...
14	...	80	50	...
15	...	90	65	...
16	$2 < t \leq 4$	65	55	...
17	$1 < t \leq 2$	72	60	...
18	≤ 1	72	65	...
19	$2 < t \leq 4$	75	65	...
20	≤ 2	85	75	...
21	$\leq \frac{3}{4}$	90	80	...
22	...	70	40	...
23	...	70	40	...
24	$2\frac{1}{2} < t \leq 4$	105	90	...
25	$\leq 2\frac{1}{2}$	115	100	...
26	...	60	30	...
27	...	70	37.5	...
28	≤ 4	125	105	...
29	...	155	135	...
30	$\geq \frac{5}{8}$	170	135	...
31	$\leq \frac{1}{2}$	180	140	...
32	$6 < t \leq 9\frac{1}{2}$	115	100	...
33	≤ 6	120	105	...
34	$\leq 9\frac{1}{2}$	135	120	...
35	$\leq 9\frac{1}{2}$	145	130	...
36	$\leq 9\frac{1}{2}$	155	140	...
37	≤ 8	165	150	...
38	...	115	100	...
39	...	120	105	...
40	...	135	120	...
41	...	145	130	...
42	...	155	140	...
43	...	165	150	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	60.0	58.7	57.0	55.5	54.4	...	53.3	...	51.9
2	85.0	83.1	80.7	78.6	77.1	...	75.5	...	73.6
3	95.0	92.9	90.2	87.9	86.2	...	84.4	...	82.2
4	50.0	48.1	47.0	46.2	45.5	...	44.2	...	43.2
5	65.0	63.0	61.9	60.9	60.2	...	58.9	...	58.0
6	90.0	87.5	86.0	84.5	83.2	...	80.9	...	78.9
7	100.0	97.2	95.5	93.9	92.4	...	89.9	...	87.6
8	100.0	97.2	95.5	93.9	92.4	...	89.9	...	87.6
9	37.0	...	...	...	...	...	...	...	...
10	50.0	48.1	47.0	46.2	45.5	...	44.2	...	43.2
11	50.0	48.1	47.0	46.2	45.5	...	44.2	...	43.2
12	65.0	62.5	61.2	60.1	59.1	...	57.5	...	56.1
13	65.0	62.5	61.2	60.1	59.1	...	57.5	...	56.1
14	50.0	48.1	47.0	46.2	45.5	...	44.2	...	43.2
15	65.0	62.5	61.2	60.1	59.1	...	57.5	...	56.1
16	55.0	...	51.8	...	49.6	...	48.1	...	46.5
17	60.0	...	56.5	...	54.1	...	52.4	...	50.7
18	65.0	...	61.1	...	58.6	...	56.8	...	54.9
19	65.0	...	61.1	...	58.6	...	56.8	...	54.9
20	75.0	...	70.6	...	67.6	...	65.6	...	63.4
21	80.0	...	75.3	...	72.6	...	69.4	...	67.6
22	40.0	38.4	37.6	37.0	36.4	...	35.4	...	34.5
23	40.0	38.4	37.6	37.0	36.4	...	35.4	...	34.5
24	90.0	87.5	86.0	84.5	83.2	...	80.9	...	78.9
25	100.0	97.2	95.5	93.9	92.4	...	89.9	...	87.6
26	30.0	...	...	...	...	...	...	...	...
27	37.5	...	...	...	...	...	...	...	...
28	105.0	...	99.0	...	95.7	...	91.8	...	88.5
29	135.0	132.1	129.7	127.7	126.2	125.0	124.0	123.2	122.4
30	135.0	...	129.6	...	126.3	...	124.1	...	122.4
31	140.0	...	134.4	...	131.0	...	128.7	...	126.9
32	100.0	...	96.0	...	93.5	...	91.9	...	90.6
33	105.0	...	100.8	...	98.2	...	96.5	...	95.2
34	120.0	...	115.2	...	112.2	...	110.3	...	108.8
35	130.0	...	124.8	...	121.6	...	119.5	...	117.8
36	140.0	...	134.4	...	131.0	...	128.7	...	126.9
37	150.0	...	144.0	...	140.3	...	137.9	...	136.0
38	100.0	...	96.0	...	93.5	...	91.9	...	90.6
39	105.0	...	100.8	...	98.2	...	96.5	...	95.2
40	120.0	...	115.2	...	112.2	...	110.3	...	108.8
41	130.0	...	124.8	...	121.6	...	119.5	...	117.8
42	140.0	...	134.4	...	131.0	...	128.7	...	126.9
43	150.0	...	144.0	...	140.3	...	137.9	...	136.0

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	48.6	46.5	44.8	...	...	...	...	...	...
2	...	68.9	65.8	63.4	...	...	...	...	...	...
3	...	77.0	73.6	70.9	...	...	...	...	...	...
4	...	42.1	41.5	40.7	39.8	38.6	37.0	34.9	32.1	28.4
5	...	57.1	56.6	56.0	55.3	54.4	53.4	52.1	50.5	48.6
6	...	76.9	75.9	74.7	73.3	71.5	69.4	66.8	63.5	59.5
7	...	85.5	84.3	83.0	81.4	79.5	77.1	74.2	70.5	66.1
8	...	85.5	84.3	83.0	81.4	79.5	77.1	74.2	70.5	66.1
9
10	...	42.1	41.5	40.7	39.8	38.6	37.0	34.9	32.1	28.4
11	...	42.1	41.5	40.7	39.8	38.6	37.0	34.9	32.1	28.4
12	...	54.7	53.9	52.9	51.8	50.2	48.2	45.4	41.7	36.9
13	...	54.7	53.9	52.9	51.8	50.2	48.2	45.4	41.7	36.9
14	...	42.1	41.5	40.7	39.8	38.6	37.0	34.9	32.1	28.4
15	...	54.7	53.9	52.9	51.8	50.2	48.2	45.4	41.7	36.9
16	...	45.0	44.1	...	...	...	...	...	...	...
17	...	49.1	48.1	...	...	...	...	...	...	...
18	...	53.2	52.1	...	...	...	...	...	...	...
19	...	53.2	52.1	...	...	...	...	...	...	...
20	...	61.4	60.2	...	...	...	...	...	...	...
21	...	65.5	64.2	...	...	...	...	...	...	...
22	...	33.7	33.2	32.6	31.8	30.9	29.6	27.9	25.7	22.7
23	...	33.7	33.2	32.6	31.8	30.9	29.6	27.9	25.7	22.7
24	...	76.9	75.9	74.7	73.3	71.5	69.4	66.8	63.5	59.5
25	...	85.5	84.3	83.0	81.4	79.5	77.1	74.2	70.5	66.1
26
27
28	...	84.3	82.1	79.2	...	...	...	...	...	...
29	121.4	120.0	118.3	116.1	113.3	110.1	106.4	102.5	98.7	95.2
30	...	120.0	118.3	116.1	113.4	110.1	106.4	102.5	98.6	95.2
31	...	124.5	122.7	120.4	117.6	114.2	110.4	106.3	102.3	98.7
32	...	88.9	87.6	86.0	84.0	81.6	78.8	75.9	73.1	70.5
33	...	93.4	92.0	90.3	88.2	85.6	82.8	79.7	76.7	74.0
34	...	106.7	105.2	103.2	100.8	97.9	94.6	91.1	87.7	84.6
35	...	115.6	113.9	111.8	109.2	106.0	102.5	98.7	95.0	91.6
36	...	124.5	122.7	120.4	117.6	114.2	110.4	106.3	102.3	98.7
37	...	133.4	131.4	129.0	126.0	122.3	118.3	113.9	109.6	105.7
38	...	88.9	87.6	86.0	84.0	81.6	78.8	75.9	73.1	70.5
39	...	93.4	92.0	90.3	88.2	85.6	82.8	79.7	76.7	74.0
40	...	106.7	105.2	103.2	100.8	97.9	94.6	91.1	87.7	84.6
41	...	115.6	113.9	111.8	109.2	106.0	102.5	98.7	95.0	91.6
42	...	124.5	122.7	120.4	117.6	114.2	110.4	106.3	102.3	98.7
43	...	133.4	131.4	129.0	126.0	122.3	118.3	113.9	109.6	105.7

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	2Ni-1Cu	Forgings	SA-182	FR	K22035	...
2	2Ni-1Cu	Fittings	SA-234	WPR	K22035	...
3	2Ni-1Cu	Smls. & wld. pipe	SA-333	9	K22035	...
4	2Ni-1Cu	Tube	SA-334	9	K22035	...
5	2Ni-1Cu	Forgings	SA-350	LF9	K22036	...
6	2Ni-1Cu	Smls. & wld. fittings	SA-420	WPL9	K22035	...
7	2Ni-1½Cr-¼Mo-V	Forgings	SA-723	1	K23550	1
8	2Ni-1½Cr-¼Mo-V	Forgings	SA-723	1	K23550	2
9	2Ni-1½Cr-¼Mo-V	Forgings	SA-723	1	K23550	2a
10	2Ni-1½Cr-¼Mo-V	Forgings	SA-723	1	K23550	3
11	2Ni-1½Cr-¼Mo-V	Forgings	SA-723	1	K23550	4
12	2Ni-1½Cr-¼Mo-V	Forgings	SA-723	1	K23550	5
13	2½Ni	Pipe	SA-333	7	K21903	...
14	2½Ni	Tube	SA-334	7	K21903	...
15	2½Ni	Plate	SA-203	A	K21703	...
16	2½Ni	Plate	SA-203	B	K22103	...
17	2½Ni	Castings	SA-352	LC2	J22500	...
18	2¾Ni-1½Cr-½Mo	Plate	SA-543	C	...	3
19	2¾Ni-1½Cr-½Mo	Plate	SA-543	C	...	1
20	2¾Ni-1½Cr-½Mo	Plate	SA-543	C	...	2
21	2¾Ni-1½Cr-½Mo-V	Forgings	SA-723	2	K34035	1
22	2¾Ni-1½Cr-½Mo-V	Forgings	SA-723	2	K34035	2
23	2¾Ni-1½Cr-½Mo-V	Forgings	SA-723	2	K34035	2a
24	2¾Ni-1½Cr-½Mo-V	Forgings	SA-723	2	K34035	3
25	2¾Ni-1½Cr-½Mo-V	Forgings	SA-723	2	K34035	4
26	2¾Ni-1½Cr-½Mo-V	Forgings	SA-723	2	K34035	5
27	3Ni-1¾Cr-½Mo	Plate	SA-543	B	K42339	3
28	3Ni-1¾Cr-½Mo	Forgings	SA-372	M	K42365	A
29	3Ni-1¾Cr-½Mo	Plate	SA-543	B	K42339	1
30	3Ni-1¾Cr-½Mo	Plate	SA-543	B	K42339	2
31	3Ni-1¾Cr-½Mo	Forgings	SA-372	M	K42365	B
32	3½Ni	Pipe	SA-333	3	K31918	...
33	3½Ni	Tube	SA-334	3	K31918	...
34	3½Ni	Fittings	SA-420	WPL3	...	...
35	3½Ni	Plate	SA-203	D	K31718	...
36	3½Ni	Forgings	SA-350	LF3	K32025	...
37	3½Ni	Forgings	SA-765	III	K32026	...
38	3½Ni	Plate	SA-203	E	K32018	...
39	3½Ni	Castings	SA-352	LC3	J31550	...
40	3½Ni	Plate	SA-203	F	...	...
41	3½Ni	Plate	SA-203	F	...	...
42	3½Ni-1¾Cr-½Mo-V	Forgings	SA-508	4N	K22375	3
43	3½Ni-1¾Cr-½Mo-V	Forgings	SA-541	4N	K42343	3
44	3½Ni-1¾Cr-½Mo-V	Forgings	SA-508	4N	K22375	1
45	3½Ni-1¾Cr-½Mo-V	Forgings	SA-541	5	K42348	1

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	63	46	...
2	...	63	46	...
3	...	63	46	...
4	...	63	46	...
5	...	63	46	...
6	...	63	46	...
7	...	115	100	...
8	...	135	120	...
9	...	145	130	...
10	...	155	140	...
11	...	175	160	...
12	...	190	180	...
13	...	65	35	...
14	...	65	35	...
15	...	65	37	...
16	...	70	40	...
17	...	70	40	...
18	...	90	70	...
19	...	105	85	...
20	...	115	100	...
21	...	115	100	...
22	...	135	120	...
23	...	145	130	...
24	...	155	140	...
25	...	175	160	...
26	...	190	180	...
27	...	90	70	...
28	...	105	85	...
29	...	105	85	...
30	...	115	100	...
31	...	120	100	...
32	...	65	35	...
33	...	65	35	...
34	...	65	35	...
35	...	65	37	...
36	...	70	37.5	...
37	...	70	37.5	...
38	...	70	40	...
39	...	70	40	...
40	> 2	75	50	...
41	≤ 2	80	55	...
42	...	90	70	...
43	...	90	70	...
44	...	105	85	...
45	...	105	85	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	46.0	...	...	...	...	...	...	...	...
2	46.0	...	...	...	...	...	...	...	...
3	46.0	...	...	...	...	...	...	...	...
4	46.0	...	...	...	...	...	...	...	...
5	46.0	...	...	...	...	...	...	...	...
6	46.0	...	...	...	...	...	...	...	...
7	100.0	97.5	96.0	94.6	93.5	...	91.9	...	90.6
8	120.0	117.0	115.2	113.6	112.2	...	110.3	...	108.8
9	130.0	...	125.0	...	122.0	...	120.0	...	118.0
10	140.0	136.5	134.4	132.5	131.0	...	128.7	...	126.9
11	160.0	156.0	153.6	151.4	149.7	...	147.1	...	145.0
12	180.0	175.5	172.8	170.4	168.4	...	165.5	...	163.2
13	35.0	32.9	32.1	31.4	30.9	...	29.9	...	28.4
14	35.0	32.9	32.1	31.4	30.9	...	29.9	...	28.4
15	37.0	34.8	33.9	33.2	32.7	...	31.6	...	30.0
16	40.0	37.6	36.6	35.9	35.4	...	34.2	...	32.5
17	40.0	37.6	36.6	35.9	35.4	...	34.2	...	32.5
18	70.0	67.3	65.9	64.8	63.9	...	62.5	...	61.4
19	85.0	81.8	80.1	78.7	77.5	...	75.8	...	74.5
20	100.0	96.2	94.2	92.5	91.2	...	89.2	...	87.7
21	100.0	97.5	96.0	94.6	93.5	...	91.9	...	90.6
22	120.0	117.0	115.2	113.6	112.2	...	110.3	...	108.8
23	130.0	...	125.0	...	122.0	...	120.0	...	118.0
24	140.0	136.5	134.4	132.5	131.0	...	128.7	...	126.9
25	160.0	156.0	153.6	151.4	149.7	...	147.1	...	145.0
26	180.0	175.5	172.8	170.4	168.4	...	165.5	...	163.2
27	70.0	67.3	65.9	64.8	63.9	...	62.5	...	61.4
28	85.0	81.8	80.1	78.7	77.5	76.6	75.8	75.2	74.5
29	85.0	81.8	80.1	78.7	77.5	...	75.8	...	74.5
30	100.0	96.2	94.2	92.5	91.2	...	89.2	...	87.7
31	100.0	96.2	94.2	92.5	91.2	90.1	89.2	88.4	87.7
32	35.0	32.9	32.1	31.4	30.9	...	29.9	...	28.4
33	35.0	32.9	32.1	31.4	30.9	...	29.9	...	28.4
34	35.0	32.9	32.1	31.4	30.9	...	29.9	...	28.4
35	37.0	34.8	33.9	33.2	32.7	...	31.6	...	30.0
36	37.5	35.3	34.3	33.7	33.2	...	32.0	...	30.4
37	37.5	35.3	34.3	33.7	33.2	...	32.0	...	30.4
38	40.0	37.6	36.6	35.9	35.4	...	34.2	...	32.5
39	40.0	37.6	36.6	35.9	35.4	...	34.2	...	32.5
40	50.0	47.0	45.8	44.9	44.2	...	42.7	...	40.6
41	55.0	51.7	50.4	49.4	48.6	...	47.0	...	44.6
42	70.0	67.3	65.9	64.8	63.9	...	62.5	...	61.4
43	70.0	...	65.9	...	63.9	...	62.5	...	61.4
44	85.0	81.8	80.1	78.7	77.5	...	75.8	...	74.5
45	85.0	...	80.1	...	77.5	...	75.8	...	74.5

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1
2
3
4
5
6
7	...	88.9	87.6	86.0	84.0	81.6	80.9	79.4	77.8	...
8	...	106.7	105.2	103.2	100.8	97.9	97.1	95.2	93.4	...
9	...	116.0	114.0	112.0	109.0	106.0	...	...	...	...
10	...	124.5	122.7	120.4	117.6	114.2	113.3	111.1	108.9	...
11	...	142.2	140.2	137.6	134.3	130.5	129.5	127.0	124.5	...
12	...	160.0	157.7	154.8	151.1	146.8	145.6	142.8	140.0	...
13	...	26.3	25.0	23.6	22.1	20.5	19.0	17.5	16.0	14.6
14	...	26.3	25.0	23.6	22.1	20.5	19.0	17.5	16.0	14.6
15	...	27.8	26.4	24.9	23.4	21.7	20.1	18.4	16.9	15.4
16	...	30.0	28.6	27.0	25.3	23.5	21.7	19.9	18.3	16.7
17	...	30.0	28.6	27.0	25.3	23.5	21.7	19.9	18.3	16.7
18	...	60.2	59.5	58.7	57.6	56.2	54.6	52.6	50.2	47.3
19	...	73.1	72.3	71.2	69.9	68.3	66.3	63.9	60.9	57.5
20	...	86.0	85.0	83.8	82.2	80.3	78.0	75.1	71.7	67.6
21	...	88.9	87.6	86.0	84.0	81.6	80.9	79.4	77.8	...
22	...	106.7	105.2	103.2	100.8	97.9	97.1	95.2	93.4	...
23	...	116.0	114.0	112.0	109.0	106.0	...	...	...	...
24	...	124.5	122.7	120.4	117.6	114.2	113.3	111.1	108.9	...
25	...	142.2	140.2	137.6	134.3	130.5	129.5	127.0	124.5	...
26	...	160.0	157.7	154.8	151.1	146.8	145.6	142.8	140.0	...
27	...	60.2	59.5	58.7	57.6	56.2	54.6	52.6	50.2	47.3
28	73.9	73.1	72.3	71.2	69.9	68.3	66.3	63.9	60.9	57.5
29	...	73.1	72.3	71.2	69.9	68.3	66.3	63.9	60.9	57.5
30	...	86.0	85.0	83.8	82.2	80.3	78.0	75.1	71.7	67.6
31	86.9	86.0	85.0	83.8	82.2	80.3	78.0	75.1	71.7	67.6
32	...	26.3	25.0	23.6	22.1	20.5	19.0	17.5	16.0	14.6
33	...	26.3	25.0	23.6	22.1	20.5	19.0	17.5	16.0	14.6
34	...	26.3	25.0	23.6	22.1	20.5	19.0	17.5	16.0	14.6
35	...	27.8	26.4	24.9	23.4	21.7	20.1	18.4	16.9	15.4
36	...	28.2	26.8	25.3	23.7	22.0	20.3	18.7	17.1	15.6
37	...	28.2	26.8	25.3	23.7	22.0	20.3	18.7	17.1	15.6
38	...	30.0	28.6	27.0	25.3	23.5	21.7	19.9	18.3	16.7
39	...	30.0	28.6	27.0	25.3	23.5	21.7	19.9	18.3	16.7
40	...	37.5	35.7	33.7	31.6	29.4	27.1	24.9	22.8	20.8
41	...	41.3	39.3	37.1	34.7	32.3	29.8	27.4	25.1	22.9
42	...	60.2	59.5	58.7	57.6	56.2	54.6	52.6	50.2	47.3
43	...	60.2	59.5	58.7	...	...	...	...	...	...
44	...	73.1	72.3	71.2	69.9	68.3	66.3	63.9	60.9	57.5
45	...	73.1	72.3	71.2	...	...	...	...	...	...

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	$3\frac{1}{2}\text{Ni}-1\frac{3}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Forgings	SA-508	4N	K22375	2
2	$3\frac{1}{2}\text{Ni}-1\frac{3}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Forgings	SA-541	4N	K42343	2
3	$3\frac{1}{2}\text{Ni}-1\frac{3}{4}\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Forgings	SA-541	5	K42348	2
4	$4\text{Ni}-1\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Forgings	SA-723	3	K44045	1
5	$4\text{Ni}-1\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Forgings	SA-723	3	K44045	2
6	$4\text{Ni}-1\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Forgings	SA-723	3	K44045	2a
7	$4\text{Ni}-1\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Forgings	SA-723	3	K44045	3
8	$4\text{Ni}-1\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Forgings	SA-723	3	K44045	4
9	$4\text{Ni}-1\frac{1}{2}\text{Cr}-\frac{1}{2}\text{Mo}-\text{V}$	Forgings	SA-723	3	K44045	5
(10) 10	$5\text{Ni}-\frac{1}{4}\text{Mo}$	Plate	SA-645	A	K41583	...
11	8Ni	Forgings	SA-522	II	K71340	...
12	8Ni	Plate	SA-553	II	K71340	...
13	9Ni	Smls. & wld. pipe	SA-333	8	K81340	...
14	9Ni	Smls. & wld. tube	SA-334	8	K81340	...
15	9Ni	Plate	SA-353	...	K81340	...
16	9Ni	Smls. & wld. fittings	SA-420	WPL8	K81340	...
17	9Ni	Forgings	SA-522	I	K81340	...
18	9Ni	Plate	SA-553	I	K81340	...
19	$25\text{Ni}-15\text{Cr}-2\text{Ti}$	Bolting	SA-453	660	S66286	A
20	$25\text{Ni}-15\text{Cr}-2\text{Ti}$	Bolting	SA-453	660	S66286	B
21	$25\text{Ni}-15\text{Cr}-2\text{Ti}$	Bar	SA-638	660	S66286	...
22	$27\text{Ni}-22\text{Cr}-7\text{Mo}-\text{Mn}-\text{Cu}-\text{N}$	Forgings	SA-182	...	S31277	...
23	$27\text{Ni}-22\text{Cr}-7\text{Mo}-\text{Mn}-\text{Cu}-\text{N}$	Smls. tube	SA-213	...	S31277	...
24	$27\text{Ni}-22\text{Cr}-7\text{Mo}-\text{Mn}-\text{Cu}-\text{N}$	Plate	SA-240	...	S31277	...
25	$27\text{Ni}-22\text{Cr}-7\text{Mo}-\text{Mn}-\text{Cu}-\text{N}$	Wld. tube	SA-249	...	S31277	...
(10) 26	...	...	...	...	...	...
(10) 27	...	...	...	...	...	...
28	$29\text{Ni}-20\text{Cr}-3\text{Cu}-2\text{Mo}$	Castings	SA-351	CN7M	J95150	...
29	$16\text{Cr}-4\text{Ni}-6\text{Mn}$	Plate	SA-240	201LN	S20153	...
30	$16\text{Cr}-9\text{Mn}-2\text{Ni}-\text{N}$	Plate	SA-240	204	S20400	...
31	$16\text{Cr}-12\text{Ni}-2\text{Mo}$	Forgings	SA-182	F316L	S31603	...
32	$16\text{Cr}-12\text{Ni}-2\text{Mo}$	Forgings	SA-965	F316L	S31603	...
33	$16\text{Cr}-12\text{Ni}-2\text{Mo}$	Forgings	SA-182	F316L	S31603	...
34	$16\text{Cr}-12\text{Ni}-2\text{Mo}$	Smls. tube	SA-213	TP316L	S31603	...
35	$16\text{Cr}-12\text{Ni}-2\text{Mo}$	Plate	SA-240	316L	S31603	...
36	$16\text{Cr}-12\text{Ni}-2\text{Mo}$	Wld. tube	SA-249	TP316L	S31603	...
37	$16\text{Cr}-12\text{Ni}-2\text{Mo}$	Smls. & wld. pipe	SA-312	TP316L	S31603	...
38	$16\text{Cr}-12\text{Ni}-2\text{Mo}$	Wld. pipe	SA-358	316L	S31603	1
39	$16\text{Cr}-12\text{Ni}-2\text{Mo}$	Smls. & wld. fittings	SA-403	316L	S31603	...
40	$16\text{Cr}-12\text{Ni}-2\text{Mo}$	Wld. pipe	SA-409	TP316L	S31603	...
41	$16\text{Cr}-12\text{Ni}-2\text{Mo}$	Bar	SA-479	316L	S31603	...
42	$16\text{Cr}-12\text{Ni}-2\text{Mo}$	Wld. tube	SA-688	TP316L	S31603	...
43	$16\text{Cr}-12\text{Ni}-2\text{Mo}$	Wld. pipe	SA-813	TP316L	S31603	...
44	$16\text{Cr}-12\text{Ni}-2\text{Mo}$	Wld. pipe	SA-814	TP316L	S31603	...
45	$16\text{Cr}-12\text{Ni}-2\text{Mo}$	Bar	SA/JIS G4303	SUS316L	...	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	115	100	...
2	...	115	100	...
3	...	115	100	...
4	...	115	100	...
5	...	135	120	...
6	...	145	130	...
7	...	155	140	...
8	...	175	160	...
9	...	190	180	...
10	...	95	65	... (10)
11	...	100	75	...
12	...	100	85	...
13	...	100	75	...
14	...	100	75	...
15	...	100	75	...
16	...	100	75	...
17	...	100	75	...
18	...	100	85	...
19	...	130	85	...
20	...	130	85	...
21	...	130	85	...
22	...	112	52	...
23	...	112	52	...
24	...	112	52	...
25	...	112	52	...
26 (10)
27 (10)
28	...	62	25	...
29	...	95	45	...
30	...	95	48	...
31	> 5	65	25	...
32	...	65	25	...
33	≤ 5	70	25	...
34	...	70	25	...
35	...	70	25	...
36	...	70	25	...
37	...	70	25	...
38	...	70	25	...
39	...	70	25	...
40	...	70	25	...
41	...	70	25	...
42	...	70	25	...
43	...	70	25	...
44	...	70	25	...
45	...	70	25	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	100.0	96.2	94.2	92.5	91.2	...	89.2	...	87.7
2	100.0	...	94.2	...	91.2	...	89.2	...	87.7
3	100.0	...	94.2	...	91.2	...	89.2	...	87.7
4	100.0	97.5	96.0	94.6	93.5	...	91.9	...	90.6
5	120.0	117.0	115.2	113.6	112.2	...	110.3	...	108.8
6	130.0	...	125.0	...	122.0	...	120.0	...	118.0
7	140.0	136.5	134.4	132.5	131.0	...	128.7	...	126.9
8	160.0	156.0	153.6	151.4	149.7	...	147.1	...	145.0
9	180.0	175.5	172.8	170.4	168.4	...	165.5	...	163.2
(10) 10	65.0	...	...	...	...	...	...	...	...
11	75.0	72.8	72.0	70.5	67.0	...	...	...	...
12	85.0	82.5	81.6	79.9	75.9	...	...	...	...
13	75.0	72.8	72.0	70.5	67.0	...	...	...	...
14	75.0	72.8	72.0	70.5	67.0	...	...	...	...
15	75.0	72.8	72.0	70.5	67.0	...	...	...	...
16	75.0	72.8	72.0	70.5	67.0	...	...	...	...
17	75.0	72.8	72.0	70.5	67.0	...	...	...	...
18	85.0	82.5	81.6	79.9	75.9	...	...	...	...
19	85.0	...	83.3	...	82.0	...	80.8	...	79.3
20	85.0	...	83.3	...	82.0	...	80.8	...	79.3
21	85.0	...	83.3	...	82.0	...	80.7	...	79.4
22	52.0	50.5	48.2	45.6	43.2	41.2	39.7	38.8	38.3
23	52.0	50.5	48.2	45.6	43.2	41.2	39.7	38.8	38.3
24	52.0	50.5	48.2	45.6	43.2	41.2	39.7	38.8	38.3
25	52.0	50.5	48.2	45.6	43.2	41.2	39.7	38.8	38.3
(10) 26	...	...	...	...	...	...	...	...	...
(10) 27	...	...	...	...	...	...	...	...	...
28	25.0	...	21.6	...	19.4	...	17.6	...	16.2
29	45.0	...	36.3	...	32.9	...	31.1	...	30.0
30	48.0	40.3	36.4	33.1	30.5	...	26.8	...	24.8
31	25.0	22.7	21.3	20.1	19.0	...	17.5	...	16.4
32	25.0	22.7	21.3	20.1	19.0	...	17.5	...	16.4
33	25.0	22.7	21.3	20.1	19.0	...	17.5	...	16.4
34	25.0	22.7	21.3	20.1	19.0	...	17.5	...	16.4
35	25.0	22.7	21.3	20.1	19.0	...	17.5	...	16.4
36	25.0	22.7	21.3	20.1	19.0	...	17.5	...	16.4
37	25.0	22.7	21.3	20.1	19.0	...	17.5	...	16.4
38	25.0	22.7	21.3	20.1	19.0	...	17.5	...	16.4
39	25.0	22.7	21.3	20.1	19.0	...	17.5	...	16.4
40	25.0	22.7	21.3	20.1	19.0	...	17.5	...	16.4
41	25.0	22.7	21.3	20.1	19.0	...	17.5	...	16.4
42	25.0	22.7	21.3	20.1	19.0	...	17.5	...	16.4
43	25.0	22.7	21.3	20.1	19.0	...	17.5	...	16.4
44	25.0	22.7	21.3	20.1	19.0	...	17.5	...	16.4
45	25.0	22.7	21.3	20.1	19.0	...	17.5	...	16.4

2011a SECTION II, PART D (CUSTOMARY)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	86.0	85.0	83.8	82.2	80.3	78.0	75.1	71.7	67.6
2	...	86.0	85.0	83.9	...	...	...	...	...	...
3	...	86.0	85.0	83.9	...	...	...	...	...	...
4	...	88.9	87.6	86.0	84.0	81.6	80.9	79.4	77.8	...
5	...	106.7	105.2	103.2	100.8	97.9	97.1	95.2	93.4	...
6	...	116.0	114.0	112.0	109.0	106.0	...	...	...	...
7	...	124.5	122.7	120.4	117.6	114.2	113.3	111.1	108.9	...
8	...	142.2	140.2	137.6	134.3	130.5	129.5	127.0	124.5	...
9	...	160.0	157.7	154.8	151.1	146.8	145.6	142.8	140.0	...
10	(10)
11
12
13
14
15
16
17
18
19	...	77.9	77.2	76.4	75.7	74.9	74.0	73.2	72.3	71.5
20	...	77.9	77.2	76.4	75.7	74.9	74.0	73.2	72.3	71.5
21	...	77.9	77.2	76.4	...	...	...	...	...	...
22	38.1	38.1	38.0	37.9	37.7	37.4	...	...	...	...
23	38.1	38.1	38.0	37.9	37.7	37.4	...	...	...	...
24	38.1	38.1	38.0	37.9	37.7	37.4	...	...	...	...
25	38.1	38.1	38.0	37.9	37.7	37.4	...	...	...	...
26	(10)
27	(10)
28	...	15.0	14.5	14.0	...	...	...	...	...	...
29	...	28.7	27.9	27.0	26.0	25.1	24.2	23.6	23.6	23.6
30	...	23.8	23.5	23.2	23.0	22.7	22.2	21.5	20.5	19.1
31	...	15.6	15.3	15.0	14.7	14.4	14.1	13.8	13.5	13.2
32	...	15.6	15.3	15.0	14.7	14.4	14.1	13.8	13.5	13.2
33	...	15.6	15.3	15.0	14.7	14.4	14.1	13.8	13.5	13.2
34	...	15.6	15.3	15.0	14.7	14.4	14.1	13.8	13.5	13.2
35	...	15.6	15.3	15.0	14.7	14.4	14.1	13.8	13.5	13.2
36	...	15.6	15.3	15.0	14.7	14.4	14.1	13.8	13.5	13.2
37	...	15.6	15.3	15.0	14.7	14.4	14.1	13.8	13.5	13.2
38	...	15.6	15.3	15.0	14.7	14.4	14.1	13.8	13.5	13.2
39	...	15.6	15.3	15.0	14.7	14.4	14.1	13.8	13.5	13.2
40	...	15.6	15.3	15.0	14.7	14.4	14.1	13.8	13.5	13.2
41	...	15.6	15.3	15.0	14.7	14.4	14.1	13.8	13.5	13.2
42	...	15.6	15.3	15.0	14.7	14.4	14.1	13.8	13.5	13.2
43	...	15.6	15.3	15.0	14.7	14.4	14.1	13.8	13.5	13.2
44	...	15.6	15.3	15.0	14.7	14.4	14.1	13.8	13.5	13.2
45	...	15.6	15.3	15.0	14.7	14.4	14.1	13.8	13.5	13.2

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	16Cr-12Ni-2Mo	Castings	SA-351	CF3M	J92800	...
2	16Cr-12Ni-2Mo	Cast pipe	SA-451	CPF3M	J92800	...
3	16Cr-12Ni-2Mo	Castings	SA-351	CF8M	J92900	...
4	16Cr-12Ni-2Mo	Cast pipe	SA-451	CPF8M	J92900	...
5	16Cr-12Ni-2Mo	Forgings	SA-182	F316	S31600	...
6	16Cr-12Ni-2Mo	Forgings	SA-965	F316	S31600	...
7	16Cr-12Ni-2Mo	Forgings	SA-182	F316	S31600	...
8	16Cr-12Ni-2Mo	Bolting	SA-193	B8M	S31600	1
9	16Cr-12Ni-2Mo	Smls. tube	SA-213	TP316	S31600	...
10	16Cr-12Ni-2Mo	Plate	SA-240	316	S31600	...
11	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316	S31600	...
12	16Cr-12Ni-2Mo	Smls. & wld. pipe	SA-312	TP316	S31600	...
13	16Cr-12Ni-2Mo	Bolting	SA-320	B8M	S31600	1
14	16Cr-12Ni-2Mo	Bolting	SA-320	B8MA	S31600	1A
15	16Cr-12Ni-2Mo	Wld. pipe	SA-358	316	S31600	1
16	16Cr-12Ni-2Mo	Smls. pipe	SA-376	TP316	S31600	...
17	16Cr-12Ni-2Mo	Smls. & wld. fittings	SA-403	316	S31600	...
18	16Cr-12Ni-2Mo	Wld. pipe	SA-409	TP316	S31600	...
19	16Cr-12Ni-2Mo	Bar	SA-479	316	S31600	...
20	16Cr-12Ni-2Mo	Wld. tube	SA-688	TP316	S31600	...
21	16Cr-12Ni-2Mo	Wld. pipe	SA-813	TP316	S31600	...
22	16Cr-12Ni-2Mo	Wld. pipe	SA-814	TP316	S31600	...
23	16Cr-12Ni-2Mo	Bar	SA/JIS G4303	SUS316	...	...
24	16Cr-12Ni-2Mo	Bar	SA-276	316	S31600	S
25	16Cr-12Ni-2Mo	Bolting	SA-193	B8M	S31600	2
26	16Cr-12Ni-2Mo	Bolting	SA-320	B8M	S31600	2
27	16Cr-12Ni-2Mo	Bolting	SA-193	B8M2	S31600	...
28	16Cr-12Ni-2Mo	Bar	SA-276	316	S31600	S
29	16Cr-12Ni-2Mo	Bar	SA-276	316	S31600	B
30	16Cr-12Ni-2Mo	Bolting	SA-193	B8M	S31600	2
31	16Cr-12Ni-2Mo	Bolting	SA-320	B8M	S31600	2
32	16Cr-12Ni-2Mo	Bolting	SA-193	B8M2	S31600	...
33	16Cr-12Ni-2Mo	Bar	SA-276	316	S31600	S
34	16Cr-12Ni-2Mo	Bar	SA-276	316	S31600	B
35	16Cr-12Ni-2Mo	Bolting	SA-193	B8M	S31600	2
36	16Cr-12Ni-2Mo	Bolting	SA-320	B8M	S31600	2
37	16Cr-12Ni-2Mo	Bar	SA-276	316	S31600	B
38	16Cr-12Ni-2Mo	Bolting	SA-193	B8M	S31600	2
39	16Cr-12Ni-2Mo	Bolting	SA-320	B8M	S31600	2
40	16Cr-12Ni-2Mo	Bar	SA-276	316	S31600	B
41	16Cr-12Ni-2Mo	Bar	SA-276	316	S31600	B
42	16Cr-12Ni-2Mo	Forgings	SA-182	F316H	S31609	...
43	16Cr-12Ni-2Mo	Forgings	SA-965	F316H	S31609	...
44	16Cr-12Ni-2Mo	Forgings	SA-182	F316H	S31609	...
45	16Cr-12Ni-2Mo	Smls. tube	SA-213	TP316H	S31609	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	70	30	...
2	...	70	30	...
3	...	70	30	...
4	...	70	30	...
5	> 5	70	30	...
6	...	70	30	...
7	≤ 5	75	30	...
8	...	75	30	...
9	...	75	30	...
10	...	75	30	...
11	...	75	30	...
12	...	75	30	...
13	...	75	30	...
14	...	75	30	...
15	...	75	30	...
16	...	75	30	...
17	...	75	30	...
18	...	75	30	...
19	...	75	30	...
20	...	75	30	...
21	...	75	30	...
22	...	75	30	...
23	...	75	30	...
24	$2\frac{1}{2} < t \leq 3$	80	55	(4)
25	$1\frac{1}{4} < t \leq 1\frac{1}{2}$	90	50	...
26	$1\frac{1}{4} < t \leq 1\frac{1}{2}$	90	50	...
27	$2 < t \leq 2\frac{1}{2}$	90	65	...
28	$2 < t \leq 2\frac{1}{2}$	90	65	(4)
29	$1\frac{1}{2} < t \leq 1\frac{3}{4}$	95	45	(4)
30	$1 < t \leq 1\frac{1}{4}$	95	65	...
31	$1 < t \leq 1\frac{1}{4}$	95	65	...
32	≤ 2	95	75	...
33	≤ 2	95	75	(4)
34	$1\frac{1}{4} < t \leq 1\frac{1}{2}$	100	50	(4)
35	$\frac{3}{4} < t \leq 1$	100	80	...
36	$\frac{3}{4} < t \leq 1$	100	80	...
37	$1 < t \leq 1\frac{1}{4}$	105	65	(4)
38	≤ $\frac{3}{4}$	110	95	...
39	≤ $\frac{3}{4}$	110	95	...
40	$\frac{3}{4} < t \leq 1$	115	80	(4)
41	≤ $\frac{3}{4}$	125	100	(4)
42	> 5	70	30	...
43	...	70	30	...
44	≤ 5	75	30	...
45	...	75	30	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	30.0	27.3	25.8	24.5	23.3	...	21.4	...	19.9
2	30.0	27.3	25.8	24.5	23.3	...	21.4	...	19.9
3	30.0	27.3	25.8	24.5	23.3	...	21.4	...	19.9
4	30.0	27.3	25.8	24.5	23.3	...	21.4	...	19.9
5	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
6	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
7	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
8	30.0	...	25.9	...	23.4	...	21.4	...	20.0
9	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
10	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
11	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
12	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
13	30.0	...	25.9	...	23.4	...	21.4	...	20.0
14	30.0	...	25.9	...	23.4	...	21.4	...	20.0
15	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
16	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
17	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
18	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
19	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
20	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
21	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
22	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
23	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
24	55.0	...	51.7	...	48.8	...	46.5	...	45.3
25	50.0	...	47.0	...	44.4	...	42.3	...	41.2
26	50.0	...	47.0	...	44.4	...	42.3	...	41.2
27	65.0	...	61.1	...	57.7	...	54.9	...	53.5
28	65.0	...	61.1	...	57.7	...	54.9	...	53.5
29	45.0	...	42.3	...	39.9	...	38.0	...	37.0
30	65.0	...	61.1	...	57.7	...	54.9	...	53.5
31	65.0	...	61.1	...	57.7	...	54.9	...	53.5
32	75.0	...	70.5	...	66.5	...	63.4	...	61.7
33	75.0	...	70.5	...	66.5	...	63.4	...	61.7
34	50.0	...	47.0	...	44.4	...	42.3	...	41.2
35	80.0	...	69.1	...	65.5	...	59.6	...	55.0
36	80.0	...	69.1	...	65.5	...	59.6	...	55.0
37	65.0	...	61.1	...	57.7	...	54.9	...	53.5
38	95.0	...	79.2	...	71.1	...	65.5	...	61.5
39	95.0	...	79.2	...	71.1	...	65.5	...	61.5
40	80.0	...	75.2	...	71.0	...	67.6	...	65.8
41	100.0	...	94.0	...	88.7	...	84.5	...	82.3
42	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
43	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
44	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
45	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0

2011a SECTION II, PART D (CUSTOMARY)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	18.8	18.4	18.1	17.8	17.6	17.4	17.3	17.1	17.0
2	...	18.8	18.4	18.1	17.8	17.6	17.4	17.3	17.1	17.0
3	...	18.8	18.4	18.1	17.8	17.6	17.4	17.3	17.1	17.0
4	...	18.8	18.4	18.1	17.8	17.6	17.4	17.3	17.1	17.0
5	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
6	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
7	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
8	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
9	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
10	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
11	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
12	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
13	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
14	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
15	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
16	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
17	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
18	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
19	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
20	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
21	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
22	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
23	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
24	...	44.4	...	...	...	...	...	...	...	...
25	...	40.4	39.9	39.3	38.8	38.3	37.7	37.2	36.7	36.0
26	...	40.4	39.9	39.3	38.8	38.3	37.7	37.2	36.7	36.0
27	...	52.5	51.8	51.0	50.4	49.7	49.0	48.4	47.6	46.8
28	...	52.5	...	...	...	...	...	...	...	...
29	...	36.3	...	...	...	...	...	...	...	...
30	...	52.5	51.8	51.0	50.4	49.7	49.0	48.4	47.6	46.8
31	...	52.5	51.8	51.0	50.4	49.7	49.0	48.4	47.6	46.8
32	...	60.5	59.8	58.9	58.1	57.4	56.6	55.8	55.0	54.0
33	...	60.5	...	...	...	...	...	...	...	...
34	...	40.4	...	...	...	...	...	...	...	...
35	...	51.7	49.3	48.4	47.7	47.1	46.6	46.1	45.7	45.3
36	...	51.7	49.3	48.4	47.7	47.1	46.6	46.1	45.7	45.3
37	...	52.5	...	...	...	...	...	...	...	...
38	...	58.3	57.0	55.7	54.5	53.4	52.3	51.3	50.2	49.2
39	...	58.3	57.0	55.7	54.5	53.4	52.3	51.3	50.2	49.2
40	...	64.6	...	...	...	...	...	...	...	...
41	...	80.7	...	...	...	...	...	...	...	...
42	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
43	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
44	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
45	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	16Cr-12Ni-2Mo	Plate	SA-240	316H	S31609	...
2	16Cr-12Ni-2Mo	Wld. tube	SA-249	TP316H	S31609	...
3	16Cr-12Ni-2Mo	Smls. & wld. pipe	SA-312	TP316H	S31609	...
4	16Cr-12Ni-2Mo	Wld. pipe	SA-358	316H	S31609	1
5	16Cr-12Ni-2Mo	Smls. pipe	SA-376	TP316H	S31609	...
6	16Cr-12Ni-2Mo	Smls. & wld. fittings	SA-403	316H	S31609	...
7	16Cr-12Ni-2Mo	Bar	SA-479	316H	S31609	...
8	16Cr-12Ni-2Mo	Wld. pipe	SA-813	TP316H	S31609	...
9	16Cr-12Ni-2Mo	Wld. pipe	SA-814	TP316H	S31609	...
10	16Cr-12Ni-2Mo	Plate	SA/EN 10028-7	X5CrNiMo17-12-2	...	...
11	16Cr-12Ni-2Mo-Cb	Plate	SA-240	316Cb	S31640	...
12	16Cr-12Ni-2Mo-N	Forgings	SA-182	F316LN	S31653	...
13	16Cr-12Ni-2Mo-N	Forgings	SA-965	F316LN	S31653	...
14	16Cr-12Ni-2Mo-N	Forgings	SA-182	F316LN	S31653	...
15	16Cr-12Ni-2Mo-N	Smls. tube	SA-213	TP316LN	S31653	...
16	16Cr-12Ni-2Mo-N	Plate	SA-240	316LN	S31653	...
17	16Cr-12Ni-2Mo-N	Wld. tube	SA-249	TP316LN	S31653	...
18	16Cr-12Ni-2Mo-N	Smls. & wld. pipe	SA-312	TP316LN	S31653	...
19	16Cr-12Ni-2Mo-N	Wld. pipe	SA-358	316LN	S31653	1
20	16Cr-12Ni-2Mo-N	Smls. pipe	SA-376	TP316LN	S31653	...
21	16Cr-12Ni-2Mo-N	Fittings	SA-403	316LN	S31653	...
22	16Cr-12Ni-2Mo-N	Bar	SA-479	316LN	S31653	...
23	16Cr-12Ni-2Mo-N	Wld. tube	SA-688	TP316LN	S31653	...
24	16Cr-12Ni-2Mo-N	Forgings	SA-182	F316N	S31651	...
25	16Cr-12Ni-2Mo-N	Smls. tube	SA-213	TP316N	S31651	...
26	16Cr-12Ni-2Mo-N	Plate	SA-240	316N	S31651	...
27	16Cr-12Ni-2Mo-N	Wld. tube	SA-249	TP316N	S31651	...
28	16Cr-12Ni-2Mo-N	Smls. & wld. pipe	SA-312	TP316N	S31651	...
29	16Cr-12Ni-2Mo-N	Wld. pipe	SA-358	316N	S31651	1
30	16Cr-12Ni-2Mo-N	Smls. pipe	SA-376	TP316N	S31651	...
31	16Cr-12Ni-2Mo-N	Smls. & wld. fittings	SA-403	316N	S31651	...
32	16Cr-12Ni-2Mo-N	Bar	SA-479	316N	S31651	...
33	16Cr-12Ni-2Mo-N	Wld. tube	SA-688	TP316N	S31651	...
34	16Cr-12Ni-2Mo-N	Wld. pipe	SA-813	TP316N	S31651	...
35	16Cr-12Ni-2Mo-N	Wld. pipe	SA-814	TP316N	S31651	...
36	16Cr-12Ni-2Mo-N	Forgings	SA-965	F316N	S31651	...
37	16Cr-12Ni-2Mo-Ti	Plate	SA-240	316Ti	S31635	...
(10) 38	17Cr-4Ni-6Mn	Plate	SA-240	201-1	S20100	...
(10) 39	17Cr-4Ni-6Mn	Plate	SA-666	201-1	S20100	...
(10) 40	17Cr-4Ni-6Mn	Plate	SA-240	201-2	S20100	...
(10) 41	17Cr-4Ni-6Mn	Plate	SA-666	201-2	S20100	...
(10) 42	17Cr-7Ni	Plate, sheet, strip	SA-240	301	S30100	...
43	17.5Cr-17.5Ni-5.3Si	Plate	SA-240	...	S30601	Solution ann.

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	75	30	...
2	...	75	30	...
3	...	75	30	...
4	...	75	30	...
5	...	75	30	...
6	...	75	30	...
7	...	75	30	...
8	...	75	30	...
9	...	75	30	...
10	≤ 3	75	32	...
11	...	75	30	...
12	> 5	70	30	...
13	...	70	30	...
14	≤ 5	75	30	...
15	...	75	30	...
16	...	75	30	...
17	...	75	30	...
18	...	75	30	...
19	...	75	30	...
20	...	75	30	...
21	...	75	30	...
22	...	75	30	...
23	...	75	30	...
24	...	80	35	...
25	...	80	35	...
26	...	80	35	...
27	...	80	35	...
28	...	80	35	...
29	...	80	35	...
30	...	80	35	...
31	...	80	35	...
32	...	80	35	...
33	...	80	35	...
34	...	80	35	...
35	...	80	35	...
36	...	80	35	...
37	...	75	30	...
38	...	75	38	... (10)
39	...	75	38	... (10)
40	...	95	45	... (10)
41	...	95	45	... (10)
42	...	75	30	... (10)
43	...	78	37	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
2	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
3	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
4	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
5	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
6	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
7	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
8	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
9	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
10	32.0	...	27.5	...	24.9	...	22.8	...	21.2
11	30.0	28.0	26.5	25.1	23.8	...	21.5	...	19.8
12	30.0	27.1	25.5	24.1	22.9	...	21.0	...	19.5
13	30.0	27.1	25.5	24.1	22.9	...	21.0	...	19.5
14	30.0	27.1	25.5	24.1	22.9	...	21.0	...	19.5
15	30.0	27.1	25.5	24.1	22.9	...	21.0	...	19.5
16	30.0	27.1	25.5	24.1	22.9	...	21.0	...	19.5
17	30.0	27.1	25.5	24.1	22.9	...	21.0	...	19.5
18	30.0	27.1	25.5	24.1	22.9	...	21.0	...	19.5
19	30.0	27.1	25.5	24.1	22.9	...	21.0	...	19.5
20	30.0	27.1	25.5	24.1	22.9	...	21.0	...	19.5
21	30.0	27.1	25.5	24.1	22.9	...	21.0	...	19.5
22	30.0	27.1	25.5	24.1	22.9	...	21.0	...	19.5
23	30.0	27.1	25.5	24.1	22.9	...	21.0	...	19.5
24	35.0	32.5	31.0	29.7	28.5	...	26.4	...	24.7
25	35.0	32.5	31.0	29.7	28.5	...	26.4	...	24.7
26	35.0	32.5	31.0	29.7	28.5	...	26.4	...	24.7
27	35.0	32.5	31.0	29.7	28.5	...	26.4	...	24.7
28	35.0	32.5	31.0	29.7	28.5	...	26.4	...	24.7
29	35.0	32.5	31.0	29.7	28.5	...	26.4	...	24.7
30	35.0	32.5	31.0	29.7	28.5	...	26.4	...	24.7
31	35.0	32.5	31.0	29.7	28.5	...	26.4	...	24.7
32	35.0	32.5	31.0	29.7	28.5	...	26.4	...	24.7
33	35.0	32.5	31.0	29.7	28.5	...	26.4	...	24.7
34	35.0	32.5	31.0	29.7	28.5	...	26.4	...	24.7
35	35.0	32.5	31.0	29.7	28.5	...	26.4	...	24.7
36	35.0	32.5	31.0	29.7	28.5	...	26.4	...	24.7
37	30.0	28.0	26.5	25.1	23.8	...	21.5	...	19.8
(10) 38	38.0	31.8	28.9	26.6	25.0	...	22.7	...	...
(10) 39	38.0	31.8	28.9	26.6	25.0	...	22.7	...	...
(10) 40	45.0	37.7	34.2	31.5	29.6	...	26.9	...	...
(10) 41	45.0	37.7	34.2	31.5	29.6	...	26.9	...	...
(10) 42	30.0	...	24.2	...	21.6	...	20.2	...	19.5
43	37.0	...	30.4	...	27.1	...	24.7	...	22.7

2011a SECTION II, PART D (CUSTOMARY)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
2	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
3	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
4	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
5	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
6	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
7	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
8	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
9	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
10	...	20.1	19.7	19.3	19.0	18.8	18.6	18.4	18.2	18.1
11	...	18.7	18.3	18.0	17.8	17.6	17.5	17.4	17.3	17.1
12	...	18.3	17.8	17.3	16.9	16.5	16.1	15.8	15.5	15.3
13	...	18.3	17.8	17.3	16.9	16.5	16.1	15.8	15.5	15.3
14	...	18.3	17.8	17.3	16.9	16.5	16.1	15.8	15.5	15.3
15	...	18.3	17.8	17.3	16.9	16.5	16.1	15.8	15.5	15.3
16	...	18.3	17.8	17.3	16.9	16.5	16.1	15.8	15.5	15.3
17	...	18.3	17.8	17.3	16.9	16.5	16.1	15.8	15.5	15.3
18	...	18.3	17.8	17.3	16.9	16.5	16.1	15.8	15.5	15.3
19	...	18.3	17.8	17.3	16.9	16.5	16.1	15.8	15.5	15.3
20	...	18.3	17.8	17.3	16.9	16.5	16.1	15.8	15.5	15.3
21	...	18.3	17.8	17.3	16.9	16.5	16.1	15.8	15.5	15.3
22	...	18.3	17.8	17.3	16.9	16.5	16.1	15.8	15.5	15.3
23	...	18.3	17.8	17.3	16.9	16.5	16.1	15.8	15.5	15.3
24	...	23.4	22.8	22.3	21.8	21.3	20.9	20.5	20.1	19.8
25	...	23.4	22.8	22.3	21.8	21.3	20.9	20.5	20.1	19.8
26	...	23.4	22.8	22.3	21.8	21.3	20.9	20.5	20.1	19.8
27	...	23.4	22.8	22.3	21.8	21.3	20.9	20.5	20.1	19.8
28	...	23.4	22.8	22.3	21.8	21.3	20.9	20.5	20.1	19.8
29	...	23.4	22.8	22.3	21.8	21.3	20.9	20.5	20.1	19.8
30	...	23.4	22.8	22.3	21.8	21.3	20.9	20.5	20.1	19.8
31	...	23.4	22.8	22.3	21.8	21.3	20.9	20.5	20.1	19.8
32	...	23.4	22.8	22.3	21.8	21.3	20.9	20.5	20.1	19.8
33	...	23.4	22.8	22.3	21.8	21.3	20.9	20.5	20.1	19.8
34	...	23.4	22.8	22.3	21.8	21.3	20.9	20.5	20.1	19.8
35	...	23.4	22.8	22.3	21.8	21.3	20.9	20.5	20.1	19.8
36	...	23.4	22.8	22.3	21.8	21.3	20.9	20.5	20.1	19.8
37	...	18.7	18.3	18.0	17.8	17.6	17.5	17.4	17.3	17.1
38
39
40
41
42	...	18.8	18.3	17.8	17.3	16.7	16.2	15.8	...	...
43

(10)
(10)
(10)
(10)
(10)

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	18Cr-3Ni-12Mn	Plate	SA-240	XM-29	S24000	...
2	18Cr-3Ni-12Mn	Wld. tube	SA-249	XM-29	S24000	...
3	18Cr-3Ni-12Mn	Wld. pipe	SA-312	XM-29	S24000	...
4	18Cr-3Ni-12Mn	Bar	SA-479	XM-29	S24000	...
5	18Cr-3Ni-12Mn	Wld. tube	SA-688	TPXM-29	S24000	...
6	18Cr-5Ni-3Mo	Smls. & wld. tube	SA-789	...	S31500	...
7	18Cr-5Ni-3Mo	Smls. & wld. pipe	SA-790	...	S31500	...
8	18Cr-8Ni	Forgings	SA-182	F304L	S30403	...
9	18Cr-8Ni	Forgings	SA-965	F304L	S30403	...
10	18Cr-8Ni	Forgings	SA-182	F304L	S30403	...
11	18Cr-8Ni	Smls. tube	SA-213	TP304L	S30403	...
12	18Cr-8Ni	Plate	SA-240	304L	S30403	...
13	18Cr-8Ni	Wld. tube	SA-249	TP304L	S30403	...
14	18Cr-8Ni	Smls. & wld. pipe	SA-312	TP304L	S30403	...
15	18Cr-8Ni	Wld. pipe	SA-358	304L	S30403	1
16	18Cr-8Ni	Smls. & wld. fittings	SA-403	304L	S30403	...
17	18Cr-8Ni	Wld. pipe	SA-409	TP304L	S30403	...
18	18Cr-8Ni	Bar	SA-479	304L	S30403	...
19	18Cr-8Ni	Wld. tube	SA-688	TP304L	S30403	...
20	18Cr-8Ni	Wld. pipe	SA-813	TP304L	S30403	...
21	18Cr-8Ni	Wld. pipe	SA-814	TP304L	S30403	...
22	18Cr-8Ni	Bar	SA/JIS G4303	SUS304L	...	...
23	18Cr-8Ni	Forgings	SA-182	F304	S30400	...
24	18Cr-8Ni	Forgings	SA-182	F304H	S30409	...
25	18Cr-8Ni	Castings	SA-351	CF3	J92500	...
26	18Cr-8Ni	Castings	SA-351	CF8	J92600	...
27	18Cr-8Ni	Smls. pipe	SA-376	TP304	S30400	...
28	18Cr-8Ni	Cast pipe	SA-451	CPF3	J92500	...
29	18Cr-8Ni	Cast pipe	SA-451	CPF8	J92600	...
30	18Cr-8Ni	Forgings	SA-965	F304	S30400	...
31	18Cr-8Ni	Forgings	SA-965	F304H	S30409	...
32	18Cr-8Ni	Forgings	SA-182	F304	S30400	...
33	18Cr-8Ni	Forgings	SA-182	F304H	S30409	...
34	18Cr-8Ni	Bolting	SA-193	B8	S30400	1
35	18Cr-8Ni	Smls. tube	SA-213	TP304	S30400	...
36	18Cr-8Ni	Smls. tube	SA-213	TP304H	S30409	...
37	18Cr-8Ni	Plate	SA-240	302	S30200	...
38	18Cr-8Ni	Plate	SA-240	304	S30400	...
39	18Cr-8Ni	Plate	SA-240	304H	S30409	...
40	18Cr-8Ni	Wld. tube	SA-249	TP304	S30400	...
41	18Cr-8Ni	Wld. tube	SA-249	TP304H	S30409	...
42	18Cr-8Ni	Smls. & wld. pipe	SA-312	TP304	S30400	...
43	18Cr-8Ni	Smls. & wld. pipe	SA-312	TP304H	S30409	...
44	18Cr-8Ni	Bolting	SA-320	B8	S30400	1
45	18Cr-8Ni	Bolting	SA-320	B8A	S30400	1A

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	100	55	...
2	...	100	55	...
3	...	100	55	...
4	...	100	55	...
5	...	100	55	...
6	...	92	64	...
7	...	92	64	...
8	> 5	65	25	...
9	...	65	25	...
10	≤ 5	70	25	...
11	...	70	25	...
12	...	70	25	...
13	...	70	25	...
14	...	70	25	...
15	...	70	25	...
16	...	70	25	...
17	...	70	25	...
18	...	70	25	...
19	...	70	25	...
20	...	70	25	...
21	...	70	25	...
22	...	70	25	...
23	> 5	70	30	...
24	> 5	70	30	...
25	...	70	30	...
26	...	70	30	...
27	...	70	30	...
28	...	70	30	...
29	...	70	30	...
30	...	70	30	...
31	...	70	30	...
32	≤ 5	75	30	...
33	≤ 5	75	30	...
34	...	75	30	...
35	...	75	30	...
36	...	75	30	...
37	...	75	30	...
38	...	75	30	...
39	...	75	30	...
40	...	75	30	...
41	...	75	30	...
42	...	75	30	...
43	...	75	30	...
44	...	75	30	...
45	...	75	30	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	55.0	48.3	44.2	40.6	37.5	...	32.9	...	30.2
2	55.0	48.3	44.2	40.6	37.5	...	32.9	...	30.2
3	55.0	48.3	44.2	40.6	37.5	...	32.9	...	30.2
4	55.0	48.3	44.2	40.6	37.5	...	32.9	...	30.2
5	55.0	48.3	44.2	40.6	37.5	...	32.9	...	30.2
6	64.0	55.6	52.3	50.2	49.0	...	47.7	...	46.6
7	64.0	55.6	52.3	50.2	49.0	...	47.7	...	46.6
8	25.0	22.7	21.4	20.2	19.2	...	17.5	...	16.4
9	25.0	22.7	21.4	20.2	19.2	...	17.5	...	16.4
10	25.0	22.7	21.4	20.2	19.2	...	17.5	...	16.4
11	25.0	22.7	21.4	20.2	19.2	...	17.5	...	16.4
12	25.0	22.7	21.4	20.2	19.2	...	17.5	...	16.4
13	25.0	22.7	21.4	20.2	19.2	...	17.5	...	16.4
14	25.0	22.7	21.4	20.2	19.2	...	17.5	...	16.4
15	25.0	22.7	21.4	20.2	19.2	...	17.5	...	16.4
16	25.0	22.7	21.4	20.2	19.2	...	17.5	...	16.4
17	25.0	22.7	21.4	20.2	19.2	...	17.5	...	16.4
18	25.0	22.7	21.4	20.2	19.2	...	17.5	...	16.4
19	25.0	22.7	21.4	20.2	19.2	...	17.5	...	16.4
20	25.0	22.7	21.4	20.2	19.2	...	17.5	...	16.4
21	25.0	22.7	21.4	20.2	19.2	...	17.5	...	16.4
22	25.0	22.7	21.4	20.2	19.2	...	17.5	...	16.4
23	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
24	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
25	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
26	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
27	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
28	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
29	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
30	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
31	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
32	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
33	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
34	30.0	...	25.0	...	22.4	...	20.7	...	19.4
35	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
36	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
37	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
38	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
39	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
40	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
41	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
42	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
43	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
44	30.0	...	25.0	...	22.4	...	20.7	...	19.4
45	30.0	...	25.0	...	22.4	...	20.7	...	19.4

2011a SECTION II, PART D (CUSTOMARY)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	28.7	28.2	27.8	27.3	26.6	25.9	25.1	24.2	23.4
2	...	28.7	28.2	27.8	27.3	26.6	25.9	25.1	24.2	23.4
3	...	28.7	28.2	27.8	27.3	26.6	25.9	25.1	24.2	23.4
4	...	28.7	28.2	27.8	27.3	26.6	25.9	25.1	24.2	23.4
5	...	28.7	28.2	27.8	27.3	26.6	25.9	25.1	24.2	23.4
6	...	45.2	44.4	43.6	42.8	42.3	...	...	...	...
7	...	45.2	44.4	43.6	42.8	42.3	...	...	...	...
8	...	15.5	15.2	15.0	14.7	14.5	14.3	14.0	13.7	13.3
9	...	15.5	15.2	15.0	14.7	14.5	14.3	14.0	13.7	13.3
10	...	15.5	15.2	15.0	14.7	14.5	14.3	14.0	13.7	13.3
11	...	15.5	15.2	15.0	14.7	14.5	14.3	14.0	13.7	13.3
12	...	15.5	15.2	15.0	14.7	14.5	14.3	14.0	13.7	13.3
13	...	15.5	15.2	15.0	14.7	14.5	14.3	14.0	13.7	13.3
14	...	15.5	15.2	15.0	14.7	14.5	14.3	14.0	13.7	13.3
15	...	15.5	15.2	15.0	14.7	14.5	14.3	14.0	13.7	13.3
16	...	15.5	15.2	15.0	14.7	14.5	14.3	14.0	13.7	13.3
17	...	15.5	15.2	15.0	14.7	14.5	14.3	14.0	13.7	13.3
18	...	15.5	15.2	15.0	14.7	14.5	14.3	14.0	13.7	13.3
19	...	15.5	15.2	15.0	14.7	14.5	14.3	14.0	13.7	13.3
20	...	15.5	15.2	15.0	14.7	14.5	14.3	14.0	13.7	13.3
21	...	15.5	15.2	15.0	14.7	14.5	14.3	14.0	13.7	13.3
22	...	15.5	15.2	15.0	14.7	14.5	14.3	14.0	13.7	13.3
23	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
24	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
25	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
26	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
27	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
28	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
29	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
30	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
31	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
32	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
33	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
34	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
35	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
36	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
37	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
38	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
39	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
40	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
41	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
42	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
43	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
44	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
45	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	18Cr-8Ni	Wld. pipe	SA-358	304	S30400	1
2	18Cr-8Ni	Wld. pipe	SA-358	304H	S30409	1
3	18Cr-8Ni	Wld. pipe	SA-358	304LN	S30453	1
4	18Cr-8Ni	Smls. pipe	SA-376	TP304	S30400	...
5	18Cr-8Ni	Smls. pipe	SA-376	TP304H	S30409	...
6	18Cr-8Ni	Smls. & wld. fittings	SA-403	304	S30400	...
7	18Cr-8Ni	Smls. & wld. fittings	SA-403	304H	S30409	...
8	18Cr-8Ni	Wld. pipe	SA-409	TP304	S30400	...
9	18Cr-8Ni	Bar	SA-479	302	S30200	...
10	18Cr-8Ni	Bar	SA-479	304	S30400	...
11	18Cr-8Ni	Bar	SA-479	304H	S30409	...
12	18Cr-8Ni	Wld. tube	SA-688	TP304	S30400	...
13	18Cr-8Ni	Wld. pipe	SA-813	TP304	S30400	...
14	18Cr-8Ni	Wld. pipe	SA-813	TP304H	S30409	...
15	18Cr-8Ni	Wld. pipe	SA-814	TP304	S30400	...
16	18Cr-8Ni	Wld. pipe	SA-814	TP304H	S30409	...
17	18Cr-8Ni	Bar	SA/JIS G4303	SUS302	...	...
18	18Cr-8Ni	Bar	SA/JIS G4303	SUS304	...	...
19	18Cr-8Ni	Plate	SA/EN 10028-7	X5CrNi18-10	...	...
20	18Cr-8Ni	Castings	SA-351	CF3A	J92500	...
21	18Cr-8Ni	Castings	SA-351	CF8A	J92600	...
22	18Cr-8Ni	Cast pipe	SA-451	CPF3A	J92500	...
23	18Cr-8Ni	Cast pipe	SA-451	CPF8A	J92600	...
24	18Cr-8Ni	Bolting	SA-320	B8	S30400	2
25	18Cr-8Ni	Bolting	SA-320	B8	S30400	2
26	18Cr-8Ni	Bolting	SA-320	B8	S30400	2
27	18Cr-8Ni	Bolting	SA-320	B8	S30400	2
28	18Cr-8Ni-N	Forgings	SA-182	F304LN	S30453	...
29	18Cr-8Ni-N	Forgings	SA-965	F304LN	S30453	...
30	18Cr-8Ni-N	Forgings	SA-182	F304LN	S30453	...
31	18Cr-8Ni-N	Bolting	SA-193	B8NA	S30451	1A
32	18Cr-8Ni-N	Smls. tube	SA-213	TP304LN	S30453	...
33	18Cr-8Ni-N	Plate	SA-240	304LN	S30453	...
34	18Cr-8Ni-N	Wld. tube	SA-249	TP304LN	S30453	...
35	18Cr-8Ni-N	Smls. & wld. pipe	SA-312	TP304LN	S30453	...
36	18Cr-8Ni-N	Smls. pipe	SA-376	TP304LN	S30453	...
37	18Cr-8Ni-N	Smls. & wld. fittings	SA-403	304LN	S30453	WP
38	18Cr-8Ni-N	Bar	SA-479	304LN	S30453	...
39	18Cr-8Ni-N	Wld. tube	SA-688	TP304LN	S30453	...
40	18Cr-8Ni-N	Wld. pipe	SA-813	TP304LN	S30453	...
41	18Cr-8Ni-N	Wld. pipe	SA-814	TP304LN	S30453	...
42	18Cr-8Ni-N	Forgings	SA-182	F304N	S30451	...
43	18Cr-8Ni-N	Smls. tube	SA-213	TP304N	S30451	...
44	18Cr-8Ni-N	Plate	SA-240	304N	S30451	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	75	30	...
2	...	75	30	...
3	...	75	30	...
4	...	75	30	...
5	...	75	30	...
6	...	75	30	...
7	...	75	30	...
8	...	75	30	...
9	...	75	30	...
10	...	75	30	...
11	...	75	30	...
12	...	75	30	...
13	...	75	30	...
14	...	75	30	...
15	...	75	30	...
16	...	75	30	...
17	...	75	30	...
18	...	75	30	...
19	≤ 3	75	31	...
20	...	77	35	...
21	...	77	35	...
22	...	77	35	...
23	...	77	35	...
24	$1\frac{1}{4} < t \leq 1\frac{1}{2}$	100	50	(6)
25	$1 < t \leq 1\frac{1}{4}$	105	65	(6)
26	$\frac{3}{4} < t \leq 1$	115	80	(6)
27	$\leq \frac{3}{4}$	125	100	(6)
28	> 5	70	30	...
29	...	70	30	...
30	≤ 5	75	30	...
31	...	75	30	...
32	...	75	30	...
33	...	75	30	...
34	...	75	30	...
35	...	75	30	...
36	...	75	30	...
37	...	75	30	...
38	...	75	30	...
39	...	75	30	...
40	...	75	30	...
41	...	75	30	...
42	...	80	35	...
43	...	80	35	...
44	...	80	35	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
2	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
3	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
4	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
5	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
6	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
7	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
8	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
9	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
10	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
11	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
12	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
13	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
14	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
15	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
16	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
17	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
18	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
19	31.0	...	25.4	...	22.8	...	21.0	...	19.7
20	35.0	31.2	29.2	27.5	26.2	...	24.1	...	22.6
21	35.0	31.2	29.2	27.5	26.2	...	24.1	...	22.6
22	35.0	31.2	29.2	27.5	26.2	...	24.1	...	22.6
23	35.0	31.2	29.2	27.5	26.2	...	24.1	...	22.6
24	50.0	...	...	...	...	...	...	...	...
25	65.0	...	...	...	...	...	...	...	...
26	80.0	...	...	...	...	...	...	...	...
27	100.0	...	...	...	...	...	...	...	...
28	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
29	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
30	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
31	30.0	...	25.0	...	22.4	...	20.7	...	19.4
32	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
33	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
34	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
35	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
36	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
37	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
38	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
39	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
40	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
41	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
42	35.0	30.9	28.6	26.7	25.0	...	22.6	...	21.0
43	35.0	30.9	28.6	26.7	25.0	...	22.6	...	21.0
44	35.0	30.9	28.6	26.7	25.0	...	22.6	...	21.0

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
2	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
3	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
4	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
5	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
6	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
7	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
8	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
9	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
10	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
11	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
12	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
13	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
14	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
15	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
16	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
17	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
18	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
19	...	18.7	18.3	17.9	17.5	17.1	16.8	16.4	16.1	15.8
20	...	21.5	21.0	20.5	20.1	19.7	19.3	18.9	18.5	18.1
21	...	21.5	21.0	20.5	20.1	19.7	19.3	18.9	18.5	18.1
22	...	21.5	21.0	20.5	20.1	19.7	19.3	18.9	18.5	18.1
23	...	21.5	21.0	20.5	20.1	19.7	19.3	18.9	18.5	18.1
24
25
26
27
28	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
29	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
30	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
31	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
32	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
33	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
34	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
35	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
36	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
37	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
38	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
39	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
40	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
41	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
42	...	19.9	19.5	19.1	18.8	18.5	18.1	17.7	17.3	16.9
43	...	19.9	19.5	19.1	18.8	18.5	18.1	17.7	17.3	16.9
44	...	19.9	19.5	19.1	18.8	18.5	18.1	17.7	17.3	16.9

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	18Cr-8Ni-N	Wld. tube	SA-249	TP304N	S30451	...
2	18Cr-8Ni-N	Smls. & wld. pipe	SA-312	TP304N	S30451	...
3	18Cr-8Ni-N	Wld. pipe	SA-358	304N	S30451	1
4	18Cr-8Ni-N	Smls. pipe	SA-376	TP304N	S30451	...
5	18Cr-8Ni-N	Smls. & wld. fittings	SA-403	304N	S30451	...
6	18Cr-8Ni-N	Bar	SA-479	304N	S30451	...
7	18Cr-8Ni-N	Wld. tube	SA-688	TP304N	S30451	...
8	18Cr-8Ni-N	Wld. pipe	SA-813	TP304N	S30451	...
9	18Cr-8Ni-N	Wld. pipe	SA-814	TP304N	S30451	...
10	18Cr-8Ni-N	Forgings	SA-965	F304N	S30451	...
11	18Cr-8Ni-S	Bolting	SA-320	B8F	S30323	1
12	18Cr-8Ni-S	Bolting	SA-320	B8FA	S30323	1A
13	18Cr-8Ni-Se	Bolting	SA-320	B8F	S30323	1
14	18Cr-8Ni-Se	Bolting	SA-320	B8FA	S30323	1A
15	18Cr-8Ni-4Si-N	Bar	SA-479	...	S21800	...
16	18Cr-10Ni-Cb	Forgings	SA-965	F348H	S34809	...
17	18Cr-10Ni-Cb	Castings	SA-351	CF8C	J92710	...
18	18Cr-10Ni-Cb	Cast pipe	SA-451	CPF8C	J92710	...
19	18Cr-10Ni-Cb	Forgings	SA-182	F347	S34700	...
20	18Cr-10Ni-Cb	Forgings	SA-965	F347	S34700	...
21	18Cr-10Ni-Cb	Forgings	SA-182	F347H	S34709	...
22	18Cr-10Ni-Cb	Forgings	SA-965	F347H	S34709	...
23	18Cr-10Ni-Cb	Forgings	SA-182	F348	S34800	...
24	18Cr-10Ni-Cb	Forgings	SA-965	F348	S34800	...
25	18Cr-10Ni-Cb	Forgings	SA-182	F348H	S34809	...
26	18Cr-10Ni-Cb	Forgings	SA-182	F347	S34700	...
27	18Cr-10Ni-Cb	Smls. tube	SA-213	TP347	S34700	...
28	18Cr-10Ni-Cb	Plate	SA-240	347	S34700	...
29	18Cr-10Ni-Cb	Wld. tube	SA-249	TP347	S34700	...
30	18Cr-10Ni-Cb	Smls. & wld. pipe	SA-312	TP347	S34700	...
31	18Cr-10Ni-Cb	Wld. pipe	SA-358	347	S34700	1
32	18Cr-10Ni-Cb	Smls. pipe	SA-376	TP347	S34700	...
33	18Cr-10Ni-Cb	Smls. & wld. fittings	SA-403	347	S34700	...
34	18Cr-10Ni-Cb	Wld. pipe	SA-409	TP347	S34700	...
35	18Cr-10Ni-Cb	Bar	SA-479	347	S34700	...
36	18Cr-10Ni-Cb	Wld. pipe	SA-813	TP347	S34700	...
37	18Cr-10Ni-Cb	Bar	SA/JIS G4303	SUS347	...	...
38	18Cr-10Ni-Cb	Forgings	SA-182	F347H	S34709	...
39	18Cr-10Ni-Cb	Smls. tube	SA-213	TP347H	S34709	...
40	18Cr-10Ni-Cb	Plate	SA-240	347H	S34709	...
41	18Cr-10Ni-Cb	Wld. tube	SA-249	TP347H	S34709	...
42	18Cr-10Ni-Cb	Smls. & wld. pipe	SA-312	TP347H	S34709	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	80	35	...
2	...	80	35	...
3	...	80	35	...
4	...	80	35	...
5	...	80	35	...
6	...	80	35	...
7	...	80	35	...
8	...	80	35	...
9	...	80	35	...
10	...	80	35	...
11	...	75	30	...
12	...	75	30	...
13	...	75	30	...
14	...	75	30	...
15	...	95	50	...
16	...	65	25	...
17	...	70	30	...
18	...	70	30	...
19	> 5	70	30	...
20	...	70	30	...
21	> 5	70	30	...
22	...	70	30	...
23	> 5	70	30	...
24	...	70	30	...
25	> 5	70	30	...
26	≤ 5	75	30	...
27	...	75	30	...
28	...	75	30	...
29	...	75	30	...
30	...	75	30	...
31	...	75	30	...
32	...	75	30	...
33	...	75	30	...
34	...	75	30	...
35	...	75	30	...
36	...	75	30	...
37	...	75	30	...
38	≤ 5	75	30	...
39	...	75	30	...
40	...	75	30	...
41	...	75	30	...
42	...	75	30	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	35.0	30.9	28.6	26.7	25.0	...	22.6	...	21.0
2	35.0	30.9	28.6	26.7	25.0	...	22.6	...	21.0
3	35.0	30.9	28.6	26.7	25.0	...	22.6	...	21.0
4	35.0	30.9	28.6	26.7	25.0	...	22.6	...	21.0
5	35.0	30.9	28.6	26.7	25.0	...	22.6	...	21.0
6	35.0	30.9	28.6	26.7	25.0	...	22.6	...	21.0
7	35.0	30.9	28.6	26.7	25.0	...	22.6	...	21.0
8	35.0	30.9	28.6	26.7	25.0	...	22.6	...	21.0
9	35.0	30.9	28.6	26.7	25.0	...	22.6	...	21.0
10	35.0	30.9	28.6	26.7	25.0	...	22.6	...	21.0
11	30.0	...	25.0	...	22.4	...	20.7	...	19.4
12	30.0	...	25.0	...	22.4	...	20.7	...	19.4
13	30.0	...	25.0	...	22.4	...	20.7	...	19.4
14	30.0	...	25.0	...	22.4	...	20.7	...	19.4
15	50.0	42.6	38.8	35.7	33.2	...	29.7	...	27.6
16	25.0	23.8	23.0	22.2	21.4	...	20.0	...	18.8
17	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
18	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
19	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
20	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
21	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
22	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
23	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
24	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
25	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
26	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
27	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
28	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
29	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
30	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
31	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
32	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
33	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
34	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
35	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
36	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
37	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
38	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
39	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
40	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
41	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
42	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6

2011a SECTION II, PART D (CUSTOMARY)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	19.9	19.5	19.1	18.8	18.5	18.1	17.7	17.3	16.9
2	...	19.9	19.5	19.1	18.8	18.5	18.1	17.7	17.3	16.9
3	...	19.9	19.5	19.1	18.8	18.5	18.1	17.7	17.3	16.9
4	...	19.9	19.5	19.1	18.8	18.5	18.1	17.7	17.3	16.9
5	...	19.9	19.5	19.1	18.8	18.5	18.1	17.7	17.3	16.9
6	...	19.9	19.5	19.1	18.8	18.5	18.1	17.7	17.3	16.9
7	...	19.9	19.5	19.1	18.8	18.5	18.1	17.7	17.3	16.9
8	...	19.9	19.5	19.1	18.8	18.5	18.1	17.7	17.3	16.9
9	...	19.9	19.5	19.1	18.8	18.5	18.1	17.7	17.3	16.9
10	...	19.9	19.5	19.1	18.8	18.5	18.1	17.7	17.3	16.9
11	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
12	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
13	...	18.4	18.0	17.6	17.2	16.9	...	...	...	...
14	...	18.4	18.0	17.6	17.2	16.9	...	...	...	...
15	...	26.4	25.9	25.6	25.4	25.2	25.0	24.9	24.9	24.9
16	...	17.9	17.6	17.3	17.1	17.0	16.9	16.8	16.8	16.7
17	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
18	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
19	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
20	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
21	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
22	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
23	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
24	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
25	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
26	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
27	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
28	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
29	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
30	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
31	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
32	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
33	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
34	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
35	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
36	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
37	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
38	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
39	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
40	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
41	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
42	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	18Cr-10Ni-Cb	Smls. pipe	SA-376	TP347H	S34709	...
2	18Cr-10Ni-Cb	Smls. & wld. fittings	SA-403	347H	S34709	...
3	18Cr-10Ni-Cb	Bar	SA-479	347H	S34709	...
4	18Cr-10Ni-Cb	Wld. pipe	SA-813	TP347H	S34709	...
5	18Cr-10Ni-Cb	Wld. pipe	SA-814	TP347H	S34709	...
(a) 6	18Cr-10Ni-Cb	Smls. tube	SA-213	TP347LN	S34751	...
(a) 7	18Cr-10Ni-Cb	Smls. pipe	SA-312	TP347LN	S34751	...
8	18Cr-10Ni-Cb	Forgings	SA-182	F348	S34800	...
9	18Cr-10Ni-Cb	Bolting	SA-193	B8C	S34700	1
10	18Cr-10Ni-Cb	Smls. tube	SA-213	TP348	S34800	...
11	18Cr-10Ni-Cb	Plate	SA-240	348	S34800	...
12	18Cr-10Ni-Cb	Wld. tube	SA-249	TP348	S34800	...
13	18Cr-10Ni-Cb	Smls. & wld. pipe	SA-312	TP348	S34800	...
14	18Cr-10Ni-Cb	Bolting	SA-320	B8C	S34700	1
15	18Cr-10Ni-Cb	Bolting	SA-320	B8CA	S34700	1A
16	18Cr-10Ni-Cb	Wld. pipe	SA-358	348	S34800	1
17	18Cr-10Ni-Cb	Smls. pipe	SA-376	TP348	S34800	...
18	18Cr-10Ni-Cb	Smls. & wld. fittings	SA-403	348	S34800	...
19	18Cr-10Ni-Cb	Wld. pipe	SA-409	TP348	S34800	...
20	18Cr-10Ni-Cb	Bar	SA-479	348	S34800	...
21	18Cr-10Ni-Cb	Wld. pipe	SA-813	TP348	S34800	...
22	18Cr-10Ni-Cb	Wld. pipe	SA-814	TP348	S34800	...
23	18Cr-10Ni-Cb	Forgings	SA-182	F348H	S34809	...
24	18Cr-10Ni-Cb	Smls. tube	SA-213	TP348H	S34809	...
25	18Cr-10Ni-Cb	Plate	SA-240	348H	S34809	...
26	18Cr-10Ni-Cb	Wld. tube	SA-249	TP348H	S34809	...
27	18Cr-10Ni-Cb	Smls. & wld. pipe	SA-312	TP348H	S34809	...
28	18Cr-10Ni-Cb	Smls. & wld. fittings	SA-403	348H	S34809	...
29	18Cr-10Ni-Cb	Bar	SA-479	348H	S34809	...
30	18Cr-10Ni-Cb	Wld. pipe	SA-813	TP348H	S34809	...
31	18Cr-10Ni-Cb	Wld. pipe	SA-814	TP348H	S34809	...
32	18Cr-10Ni-Cb	Smls. tube	SA-213	TP347HFG	S34710	...
33	18Cr-10Ni-Cb	Bolting	SA-320	B8C	S34700	2
34	18Cr-10Ni-Cb	Bolting	SA-320	B8C	S34700	2
35	18Cr-10Ni-Cb	Bolting	SA-320	B8C	S34700	2
36	18Cr-10Ni-Cb	Bolting	SA-320	B8C	S34700	2
37	18Cr-10Ni-Ti	Smls. & wld. pipe	SA-312	TP321	S32100	...
38	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321	S32100	...
39	18Cr-10Ni-Ti	Smls. & wld. pipe	SA-312	TP321H	S32109	...
40	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321H	S32109	...
41	18Cr-10Ni-Ti	Forgings	SA-182	F321	S32100	...
42	18Cr-10Ni-Ti	Forgings	SA-965	F321	S32100	...
43	18Cr-10Ni-Ti	Forgings	SA-182	F321H	S32109	...
44	18Cr-10Ni-Ti	Forgings	SA-965	F321H	S32109	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	75	30	...
2	...	75	30	...
3	...	75	30	...
4	...	75	30	...
5	...	75	30	...
6	...	75	30	... (a)
7	...	75	30	... (a)
8	≤ 5	75	30	...
9	...	75	30	...
10	...	75	30	...
11	...	75	30	...
12	...	75	30	...
13	...	75	30	...
14	...	75	30	...
15	...	75	30	...
16	...	75	30	...
17	...	75	30	...
18	...	75	30	...
19	...	75	30	...
20	...	75	30	...
21	...	75	30	...
22	...	75	30	...
23	≤ 5	75	30	...
24	...	75	30	...
25	...	75	30	...
26	...	75	30	...
27	...	75	30	...
28	...	75	30	...
29	...	75	30	...
30	...	75	30	...
31	...	75	30	...
32	...	80	30	...
33	$1\frac{1}{4} < t \leq 1\frac{1}{2}$	100	50	(6)
34	$1 < t \leq 1\frac{1}{4}$	105	65	(6)
35	$\frac{3}{4} < t \leq 1$	115	80	(6)
36	$\leq \frac{3}{4}$	125	100	(6)
37	$> \frac{3}{8}$	70	25	...
38	$> \frac{3}{8}$	70	25	...
39	$> \frac{3}{16}$	70	25	...
40	$> \frac{3}{8}$	70	25	...
41	> 5	70	30	...
42	...	70	30	...
43	> 5	70	30	...
44	...	70	30	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
2	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
3	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
4	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
5	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
(a) 6	30.0	...	26.5	...	24.0	...	21.9	...	20.4
(a) 7	30.0	...	26.5	...	24.0	...	21.9	...	20.4
8	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
9	30.0	...	27.6	...	25.7	...	24.0	...	22.5
10	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
11	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
12	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
13	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
14	30.0	...	27.6	...	25.7	...	24.0	...	22.5
15	30.0	...	27.6	...	25.7	...	24.0	...	22.5
16	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
17	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
18	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
19	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
20	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
21	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
22	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
23	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
24	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
25	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
26	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
27	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
28	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
29	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
30	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
31	30.0	28.6	27.6	26.6	25.7	...	24.0	...	22.6
32	30.0	...	27.1	...	25.3	...	23.9	...	22.8
33	50.0	...	...	...	...	...	...	...	...
34	65.0	...	...	...	...	...	...	...	...
35	80.0	...	...	...	...	...	...	...	...
36	100.0	...	...	...	...	...	...	...	...
37	25.0	23.4	22.5	21.5	20.7	...	19.2	...	17.9
38	25.0	23.4	22.5	21.5	20.7	...	19.2	...	17.9
39	25.0	23.4	22.5	21.5	20.7	...	19.2	...	17.9
40	25.0	23.4	22.5	21.5	20.7	...	19.2	...	17.9
41	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
42	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
43	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
44	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
2	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
3	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
4	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
5	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
6	...	19.4	19.1	18.9	18.7	18.7	18.6	18.6	18.6	18.6 (a)
7	...	19.4	19.1	18.9	18.7	18.7	18.6	18.6	18.6	18.6 (a)
8	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
9	...	21.5	21.1	20.7	20.5	20.4	20.3	20.2	20.1	20.1
10	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
11	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
12	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
13	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
14	...	21.5	21.1	20.7	20.5	20.4	20.3	20.2	20.1	20.1
15	...	21.5	21.1	20.7	20.5	20.4	20.3	20.2	20.1	20.1
16	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
17	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
18	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
19	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
20	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
21	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
22	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
23	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
24	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
25	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
26	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
27	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
28	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
29	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
30	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
31	...	21.5	21.1	20.7	20.5	20.3	20.2	20.2	20.1	20.1
32	...	21.9	21.5	21.2	20.9	20.6	20.4	20.2	19.9	19.7
33
34
35
36
37	...	16.9	16.5	16.2	15.9	15.7	15.5	15.3	15.2	15.0
38	...	16.9	16.5	16.2	15.9	15.7	15.5	15.3	15.2	15.0
39	...	16.9	16.5	16.2	15.9	15.7	15.5	15.3	15.2	15.0
40	...	16.9	16.5	16.2	15.9	15.7	15.5	15.3	15.2	15.0
41	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
42	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
43	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
44	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	18Cr-10Ni-Ti	Forgings	SA-182	F321	S32100	...
2	18Cr-10Ni-Ti	Bolting	SA-193	B8T	S32100	1
3	18Cr-10Ni-Ti	Smls. tube	SA-213	TP321	S32100	...
4	18Cr-10Ni-Ti	Plate	SA-240	321	S32100	...
5	18Cr-10Ni-Ti	Wld. tube	SA-249	TP321	S32100	...
6	18Cr-10Ni-Ti	Smls. & wld. pipe	SA-312	TP321	S32100	...
7	18Cr-10Ni-Ti	Bolting	SA-320	B8T	S32100	1
8	18Cr-10Ni-Ti	Bolting	SA-320	B8TA	S32100	1A
9	18Cr-10Ni-Ti	Wld. pipe	SA-358	321	S32100	1
10	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321	S32100	...
11	18Cr-10Ni-Ti	Smls. & wld. fittings	SA-403	321	S32100	...
12	18Cr-10Ni-Ti	Wld. pipe	SA-409	TP321	S32100	...
13	18Cr-10Ni-Ti	Bar	SA-479	321	S32100	...
14	18Cr-10Ni-Ti	Wld. pipe	SA-813	TP321	S32100	...
15	18Cr-10Ni-Ti	Wld. pipe	SA-814	TP321	S32100	...
16	18Cr-10Ni-Ti	Bar	SA/JIS G4303	SUS321	...	...
17	18Cr-10Ni-Ti	Forgings	SA-182	F321H	S32109	...
18	18Cr-10Ni-Ti	Smls. tube	SA-213	TP321H	S32109	...
19	18Cr-10Ni-Ti	Plate	SA-240	321H	S32109	...
20	18Cr-10Ni-Ti	Wld. tube	SA-249	TP321H	S32109	...
21	18Cr-10Ni-Ti	Smls. & wld. pipe	SA-312	TP321H	S32109	...
22	18Cr-10Ni-Ti	Smls. pipe	SA-376	TP321H	S32109	...
23	18Cr-10Ni-Ti	Smls. & wld. fittings	SA-403	321H	S32109	...
24	18Cr-10Ni-Ti	Bar	SA-479	321H	S32109	...
25	18Cr-10Ni-Ti	Wld. pipe	SA-813	TP321H	S32109	...
26	18Cr-10Ni-Ti	Wld. pipe	SA-814	TP321H	S32109	...
27	18Cr-10Ni-Ti	Bolting	SA-320	B8T	S32100	2
28	18Cr-10Ni-Ti	Bolting	SA-320	B8T	S32100	2
29	18Cr-10Ni-Ti	Bolting	SA-320	B8T	S32100	2
30	18Cr-10Ni-Ti	Bolting	SA-320	B8T	S32100	2
31	18Cr-11Ni	Plate	SA-240	305	S30500	...
32	18Cr-13Ni-3Mo	Forgings	SA-182	F317L	S31703	...
33	18Cr-13Ni-3Mo	Forgings	SA-182	F317L	S31703	...
34	18Cr-13Ni-3Mo	Forgings	SA-182	F317	S31700	...
35	18Cr-13Ni-3Mo	Plate	SA-240	317	S31700	...
36	18Cr-13Ni-3Mo	Plate	SA-240	317L	S31703	...
37	18Cr-13Ni-3Mo	Wld. tube	SA-249	TP317	S31700	...
38	18Cr-13Ni-3Mo	Wld. tube	SA-249	TP317L	S31703	...
39	18Cr-13Ni-3Mo	Smls. & wld. pipe	SA-312	TP317	S31700	...
40	18Cr-13Ni-3Mo	Smls. & wld. pipe	SA-312	TP317L	S31703	...
41	18Cr-13Ni-3Mo	Smls. & wld. fittings	SA-403	317	S31700	...
42	18Cr-13Ni-3Mo	Fittings	SA-403	317L	S31703	...
43	18Cr-15Ni-4Si	Forgings	SA-182	...	S30600	Solution ann.
44	18Cr-15Ni-4Si	Plate	SA-240	...	S30600	Solution ann.
45	18Cr-15Ni-4Si	Smls. & wld. pipe	SA-312	...	S30600	Solution ann.
46	18Cr-15Ni-4Si	Bar	SA-479	...	S30600	Solution ann.

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	≤ 5	75	30	...
2	...	75	30	...
3	...	75	30	...
4	...	75	30	...
5	...	75	30	...
6	$\leq \frac{3}{8}$	75	30	...
7	...	75	30	...
8	...	75	30	...
9	...	75	30	...
10	$\leq \frac{3}{8}$	75	30	...
11	...	75	30	...
12	...	75	30	...
13	...	75	30	...
14	...	75	30	...
15	...	75	30	...
16	...	75	30	...
17	≤ 5	75	30	...
18	...	75	30	...
19	...	75	30	...
20	...	75	30	...
21	$\leq \frac{3}{16}$	75	30	...
22	$\leq \frac{3}{8}$	75	30	...
23	...	75	30	...
24	...	75	30	...
25	...	75	30	...
26	...	75	30	...
27	$1\frac{1}{4} < t \leq 1\frac{1}{2}$	100	50	(6)
28	$1 < t \leq 1\frac{1}{4}$	105	65	(6)
29	$\frac{3}{4} < t \leq 1$	115	80	(6)
30	$\leq \frac{3}{4}$	125	100	(6)
31	...	75	30	...
32	> 5	65	25	...
33	≤ 5	70	25	...
34	≤ 5	75	30	...
35	...	75	30	...
36	...	75	30	...
37	...	75	30	...
38	...	75	30	...
39	...	75	30	...
40	...	75	30	...
41	...	75	30	...
42	...	75	30	...
43	...	78	35	...
44	≤ 2	78	35	...
45	...	78	35	...
46	≤ 4	78	35	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
2	30.0	...	27.0	...	24.8	...	23.0	...	21.5
3	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
4	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
5	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
6	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
7	30.0	...	27.0	...	24.8	...	23.0	...	21.5
8	30.0	...	27.0	...	24.8	...	23.0	...	21.5
9	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
10	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
11	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
12	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
13	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
14	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
15	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
16	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
17	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
18	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
19	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
20	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
21	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
22	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
23	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
24	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
25	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
26	30.0	28.1	27.0	25.8	24.8	...	23.0	...	21.5
27	50.0	...	...	...	...	...	...	...	...
28	65.0	...	...	...	...	...	...	...	...
29	80.0	...	...	...	...	...	...	...	...
30	100.0	...	...	...	...	...	...	...	...
31	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
32	25.0	22.7	21.3	20.1	19.0	...	17.5	...	16.4
33	25.0	22.7	21.3	20.1	19.0	...	17.5	...	16.4
34	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
35	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
36	30.0	27.3	25.5	24.1	22.8	...	21.0	...	19.7
37	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
38	30.0	27.3	25.5	24.1	22.8	...	21.0	...	19.7
39	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
40	30.0	27.3	25.5	24.1	22.8	...	21.0	...	19.7
41	30.0	27.4	25.9	24.6	23.4	...	21.4	...	20.0
42	30.0	27.3	25.5	24.1	22.8	...	21.0	...	19.7
43	35.0	...	26.9	...	24.2	...	...	...	...
44	35.0	...	26.9	...	24.2	...	...	...	...
45	35.0	...	26.9	...	24.2	...	...	...	...
46	35.0	...	26.9	...	24.2	...	...	...	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
2	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
3	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
4	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
5	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
6	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
7	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
8	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
9	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
10	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
11	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
12	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
13	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
14	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
15	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
16	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
17	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
18	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
19	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
20	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
21	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
22	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
23	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
24	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
25	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
26	...	20.3	19.8	19.4	19.1	18.8	18.6	18.4	18.2	18.0
27
28
29
30
31	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
32	...	15.6	15.3	15.0	14.7	14.4	14.1	13.8	13.5	13.2
33	...	15.6	15.3	15.0	14.7	14.4	14.1	13.8	13.5	13.2
34	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
35	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
36	...	18.7	18.3	18.0	17.6	17.2	16.9	16.5	16.1	15.8
37	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
38	...	18.7	18.3	18.0	17.6	17.2	16.9	16.5	16.1	15.8
39	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
40	...	18.7	18.3	18.0	17.6	17.2	16.9	16.5	16.1	15.8
41	...	18.9	18.5	18.2	17.9	17.7	17.5	17.3	17.1	17.0
42	...	18.7	18.3	18.0	17.6	17.2	16.9	16.5	16.1	15.8
43
44
45
46

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	18Cr-18Ni-2Si	Smls. tube	SA-213	XM-15	S38100	...
2	18Cr-18Ni-2Si	Plate	SA-240	XM-15	S38100	...
3	18Cr-18Ni-2Si	Wld. tube	SA-249	TPXM-15	S38100	...
4	18Cr-18Ni-2Si	Wld. pipe	SA-312	TPXM-15	S38100	...
5	18Cr-20Ni-5.5Si	Smls. tube	SA-213	...	S32615	Solution ann.
6	18Cr-20Ni-5.5Si	Plate	SA-240	...	S32615	Solution ann.
7	18Cr-20Ni-5.5Si	Smls. & wld. pipe	SA-312	...	S32615	Solution ann.
8	18Cr-20Ni-5.5Si	Bar	SA-479	...	S32615	Solution ann.
9	19Cr-9Ni- $\frac{1}{2}$ Mo	Castings	SA-351	CF10	J92590	...
10	19Cr-9Ni-Mo-W	Bolting	SA-453	651	S63198	B
11	19Cr-9Ni-Mo-W	Bolting	SA-453	651	S63198	B
12	19Cr-9Ni-Mo-W	Bolting	SA-453	651	S63198	A
13	19Cr-9Ni-Mo-W	Bolting	SA-453	651	S63198	A
14	19Cr-9Ni-2Mo	Castings	SA-351	CF10M	...	...
15	19Cr-10Ni-3Mo	Castings	SA-351	CG8M	J93000	...
16	19Cr-15Ni-4Mo	Smls. tube	SA-213	...	S31725	...
17	19Cr-15Ni-4Mo	Plate	SA-240	...	S31725	...
18	19Cr-15Ni-4Mo	Wld. tube	SA-249	...	S31725	...
19	19Cr-15Ni-4Mo	Smls. & wld. pipe	SA-312	...	S31725	...
20	19Cr-15Ni-4Mo	Wld. pipe	SA-358	...	S31725	...
21	19Cr-15Ni-4Mo	Smls. pipe	SA-376	...	S31725	...
22	19Cr-15Ni-4Mo	Wld. pipe	SA-409	...	S31725	...
23	19Cr-15Ni-4Mo	Bar	SA-479	...	S31725	...
24	20Cr-10Ni	Bar	SA-479	ER308	S30880	...
25	20Cr-18Ni-6Mo	Castings	SA-351	CK3MCuN	J93254	...
26	20Cr-18Ni-6Mo	Forgings	SA-182	F44	S31254	...
27	20Cr-18Ni-6Mo	Wld. tube	SA-249	...	S31254	...
28	20Cr-18Ni-6Mo	Smls. & wld. pipe	SA-312	...	S31254	...
29	20Cr-18Ni-6Mo	Wld. pipe	SA-358	...	S31254	...
30	20Cr-18Ni-6Mo	Plate	SA-240	...	S31254	...
31	21Cr-6Ni-9Mn	Forgings	SA-182	FXM-11	S21904	...
32	21Cr-6Ni-9Mn	Smls. & wld. pipe	SA-312	TPXM-11	S21904	...
33	21Cr-6Ni-9Mn	Plate	SA-666	XM-11	S21904	...
34	21Cr-6Ni-9Mn	Forgings	SA-965	FXM-11	S21904	...
35	21Cr-11Ni-N	Forgings	SA-182	F45	S30815	...
36	21Cr-11Ni-N	Smls. tube	SA-213	...	S30815	...
37	21Cr-11Ni-N	Plate	SA-240	...	S30815	...
38	21Cr-11Ni-N	Wld. tube	SA-249	...	S30815	...
39	21Cr-11Ni-N	Smls. & wld. pipe	SA-312	...	S30815	...
40	21Cr-11Ni-N	Bar	SA-479	...	S30815	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	75	30	...
2	...	75	30	...
3	...	75	30	...
4	...	75	30	...
5	...	80	32	...
6	...	80	32	...
7	...	80	32	...
8	...	80	32	...
9	...	70	30	...
10	> 3	95	50	...
11	≤ 3	95	60	...
12	> 3	100	60	...
13	≤ 3	100	70	...
14	...	70	30	...
15	...	75	35	...
16	...	75	30	...
17	...	75	30	...
18	...	75	30	...
19	...	75	30	...
20	...	75	30	...
21	...	75	30	...
22	...	75	30	...
23	...	75	30	...
24	...	75	30	...
25	...	80	38	...
26	...	94	44	...
27	...	94	44	...
28	...	94	44	...
29	...	94	44	...
30	...	100	45	...
31	...	90	50	...
32	...	90	50	...
33	...	90	50	...
34	...	90	50	...
35	...	87	45	...
36	...	87	45	...
37	...	87	45	...
38	...	87	45	...
39	...	87	45	...
40	...	87	45	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
2	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
3	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
4	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
5	32.0	...	26.4	...	24.8	...	23.1	...	...
6	32.0	...	26.4	...	24.8	...	23.1	...	...
7	32.0	...	26.4	...	24.8	...	23.1	...	...
8	32.0	...	26.4	...	24.8	...	23.1	...	...
9	30.0	26.7	25.0	23.6	22.4	...	20.6	...	19.3
10	50.0	...	46.4	...	44.3	...	42.5	...	41.1
11	60.0	...	55.7	...	53.1	...	51.1	...	49.4
12	60.0	...	55.7	...	53.1	...	51.1	...	49.4
13	70.0	...	65.0	...	62.0	...	59.6	...	57.6
14	30.0	27.7	26.2	24.8	23.5	...	21.4	...	19.9
15	35.0	30.5	28.1	26.2	24.5	...	22.1	...	20.5
16	30.0	27.0	25.3	24.0	22.8	...	21.0	...	19.7
17	30.0	27.0	25.3	24.0	22.8	...	21.0	...	19.7
18	30.0	27.0	25.3	24.0	22.8	...	21.0	...	19.7
19	30.0	27.0	25.3	24.0	22.8	...	21.0	...	19.7
20	30.0	27.0	25.3	24.0	22.8	...	21.0	...	19.7
21	30.0	27.0	25.3	24.0	22.8	...	21.0	...	19.7
22	30.0	27.0	25.3	24.0	22.8	...	21.0	...	19.7
23	30.0	27.0	25.3	24.0	22.8	...	21.0	...	19.7
24	30.0	26.7	25.0	23.6	22.4	...	20.7	...	19.4
25	38.0	33.3	31.0	29.2	27.8	...	25.6	...	24.2
26	44.0	38.5	35.9	33.8	32.1	...	29.7	...	28.0
27	44.0	38.5	35.9	33.8	32.1	...	29.7	...	28.0
28	44.0	38.5	35.9	33.8	32.1	...	29.7	...	28.0
29	44.0	38.5	35.9	33.8	32.1	...	29.7	...	28.0
30	45.0	39.4	36.7	34.6	32.9	...	30.4	...	28.6
31	50.0	42.5	38.6	35.5	33.0	...	29.4	...	27.1
32	50.0	42.5	38.6	35.5	33.0	...	29.4	...	27.1
33	50.0	42.5	38.6	35.5	33.0	...	29.4	...	27.1
34	50.0	42.5	38.6	35.5	33.0	...	29.4	...	27.1
35	45.0	40.2	37.5	35.1	33.0	...	29.9	...	27.8
36	45.0	40.2	37.5	35.1	33.0	...	29.9	...	27.8
37	45.0	40.2	37.5	35.1	33.0	...	29.9	...	27.8
38	45.0	40.2	37.5	35.1	33.0	...	29.9	...	27.8
39	45.0	40.2	37.5	35.1	33.0	...	29.9	...	27.8
40	45.0	40.2	37.5	35.1	33.0	...	29.9	...	27.8

2011a SECTION II, PART D (CUSTOMARY)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
2	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
3	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
4	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
5
6
7
8
9	...	18.4	17.9	17.6	17.2	16.9	16.6	16.3	15.9	15.6
10	...	39.9	39.4	38.9	38.3	37.8	37.3	36.7	36.0	35.4
11	...	47.9	47.3	46.6	46.0	45.4	44.7	44.0	43.3	42.4
12	...	47.9	47.3	46.6	46.0	45.4	44.7	44.0	43.3	42.4
13	...	55.9	55.1	54.4	53.7	52.9	52.2	51.3	50.5	49.5
14	...	18.8	18.5	18.1	17.9	17.6	17.4	17.2	17.0	16.9
15	...	19.4	19.0	18.7	18.4	18.2	18.0	17.7	17.4	17.0
16	...	18.7	18.3	18.0	17.6	17.3	16.9	16.6	16.2	15.9
17	...	18.7	18.3	18.0	17.6	17.3	16.9	16.6	16.2	15.9
18	...	18.7	18.3	18.0	17.6	17.3	16.9	16.6	16.2	15.9
19	...	18.7	18.3	18.0	17.6	17.3	16.9	16.6	16.2	15.9
20	...	18.7	18.3	18.0	17.6	17.3	16.9	16.6	16.2	15.9
21	...	18.7	18.3	18.0	17.6	17.3	16.9	16.6	16.2	15.9
22	...	18.7	18.3	18.0	17.6	17.3	16.9	16.6	16.2	15.9
23	...	18.7	18.3	18.0	17.6	17.3	16.9	16.6	16.2	15.9
24	...	18.4	18.0	17.6	17.2	16.9	16.5	16.2	15.9	15.5
25	...	23.2	22.8	22.6	22.4	22.3	22.1	...	...	...
26	...	26.8	26.4	26.2	26.0	25.8	25.6	...	...	...
27	...	26.8	26.4	26.2	26.0	25.8	25.6	...	...	...
28	...	26.8	26.4	26.2	26.0	25.8	25.6	...	...	...
29	...	26.8	26.4	26.2	26.0	25.8	25.6	...	...	...
30	...	27.4	27.0	26.8	26.6	26.4	26.2	...	...	...
31	...	25.7	25.3	25.0	24.8	24.6	24.4	24.1	23.5	22.6
32	...	25.7	25.3	25.0	24.8	24.6	24.4	24.1	23.5	22.6
33	...	25.7	25.3	25.0	24.8	24.6	24.4	24.1	23.5	22.6
34	...	25.7	25.3	25.0	24.8	24.6	24.4	24.1	23.5	22.6
35	...	26.5	26.1	25.8	25.5	25.2	25.0	24.7	24.3	23.9
36	...	26.5	26.1	25.8	25.5	25.2	25.0	24.7	24.3	23.9
37	...	26.5	26.1	25.8	25.5	25.2	25.0	24.7	24.3	23.9
38	...	26.5	26.1	25.8	25.5	25.2	25.0	24.7	24.3	23.9
39	...	26.5	26.1	25.8	25.5	25.2	25.0	24.7	24.3	23.9
40	...	26.5	26.1	25.8	25.5	25.2	25.0	24.7	24.3	23.9

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	22Cr-5Ni-3Mo-N	Forgings	SA-182	F51	S31803	...
2	22Cr-5Ni-3Mo-N	Plate	SA-240	...	S31803	...
3	22Cr-5Ni-3Mo-N	Bar	SA-479	...	S31803	...
4	22Cr-5Ni-3Mo-N	Smls. & wld. tube	SA-789	...	S31803	...
5	22Cr-5Ni-3Mo-N	Smls. & wld. pipe	SA-790	...	S31803	...
6	22Cr-5Ni-3Mo-N	Smls. & wld. fittings	SA-815	...	S31803	...
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	Smls. & wld. fittings	SA-403	XM-19	S20910	...
17	22Cr-13Ni-5Mn	Bar	SA-479	XM-19	S20910	Annealed
18	22Cr-13Ni-5Mn	Wld. pipe	SA-813	TPXM-19	S20910	...
19	22Cr-13Ni-5Mn	Wld. pipe	SA-814	TPXM-19	S20910	...
20	22Cr-13Ni-5Mn	Forgings	SA-965	FXM-19	S20910	...
21	22Cr-13Ni-5Mn	Bar	SA-479	XM-19	S20910	Hot rolled
22	22Cr-13Ni-5Mn	Bar	SA-479	XM-19	S20910	Hot rolled
23	22Cr-13Ni-5Mn	Bar	SA-479	XM-19	S20910	Hot rolled
(10) 24	23Cr-4Ni-Mo-Cu-N	Plate	SA-240	...	S32304	...
25	23Cr-4Ni-Mo-Cu-N	Smls. & wld. tube	SA-789	...	S32304	...
26	23Cr-4Ni-Mo-Cu-N	Smls. & wld. pipe	SA-790	...	S32304	...
27	23Cr-4Ni-Mo-Cu-N	Smls. & wld. tube	SA-789	...	S32304	...
28	23Cr-12Ni	Smls. & wld. fittings	SA-403	309	S30900	...
29	23Cr-12Ni	Smls. tube	SA-213	TP309S	S30908	...
30	23Cr-12Ni	Plate	SA-240	309S	S30908	...
31	23Cr-12Ni	Wld. tube	SA-249	TP309S	S30908	...
32	23Cr-12Ni	Smls. & wld. pipe	SA-312	TP309S	S30908	...
33	23Cr-12Ni	Wld. pipe	SA-358	309S	S30908	1
34	23Cr-12Ni	Bar	SA-479	309S	S30908	...
35	23Cr-12Ni	Wld. pipe	SA-813	TP309S	S30908	...
36	23Cr-12Ni	Wld. pipe	SA-814	TP309S	S30908	...
37	23Cr-12Ni	Bar	SA/JIS G4303	SUS309S	...	...
38	23Cr-12Ni	Smls. tube	SA-213	TP309H	S30909	...
39	23Cr-12Ni	Plate	SA-240	309H	S30909	...
40	23Cr-12Ni	Wld. tube	SA-249	TP309H	S30909	...
41	23Cr-12Ni	Smls. & wld. pipe	SA-312	TP309H	S30909	...
42	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, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	90	65	...
2	...	90	65	...
3	...	90	65	...
4	...	90	65	...
5	...	90	65	...
6	...	90	65	...
7	...	85	42.5	...
8	...	100	55	...
9	...	100	55	...
10	...	100	55	...
11	...	100	55	...
12	...	100	55	...
13	...	100	55	...
14	...	100	55	...
15	...	100	55	...
16	...	100	55	...
17	...	100	55	...
18	...	100	55	...
19	...	100	55	...
20	...	100	55	...
21	$3 < t \leq 8$	100	60	...
22	$2 < t \leq 3$	115	75	...
23	≤ 2	135	105	...
24	...	87	58	...
25	> 1	87	58	...
26	...	87	58	...
27	≤ 1	100	65	...
28	...	75	30	...
29	...	75	30	...
30	...	75	30	...
31	...	75	30	...
32	...	75	30	...
33	...	75	30	...
34	...	75	30	...
35	...	75	30	...
36	...	75	30	...
37	...	75	30	...
38	...	75	30	...
39	...	75	30	...
40	...	75	30	...
41	...	75	30	...
42	...	75	30	...

(10)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	65.0	60.5	57.8	55.5	53.7	...	51.2	...	49.6
2	65.0	60.5	57.8	55.5	53.7	...	51.2	...	49.6
3	65.0	60.5	57.8	55.5	53.7	...	51.2	...	49.6
4	65.0	60.5	57.8	55.5	53.7	...	51.2	...	49.6
5	65.0	60.5	57.8	55.5	53.7	...	51.2	...	49.6
6	65.0	60.5	57.8	55.5	53.7	...	51.2	...	49.6
7	42.5	38.4	36.4	34.8	33.4	...	31.5	...	30.0
8	55.0	49.8	47.1	45.0	43.3	...	40.7	...	38.8
9	55.0	49.8	47.1	45.0	43.3	...	40.7	...	38.8
10	55.0	49.8	47.1	45.0	43.3	...	40.7	...	38.8
11	55.0	49.8	47.1	45.0	43.3	...	40.7	...	38.8
12	55.0	49.8	47.1	45.0	43.3	...	40.7	...	38.8
13	55.0	49.8	47.1	45.0	43.3	...	40.7	...	38.8
14	55.0	49.8	47.1	45.0	43.3	...	40.7	...	38.8
15	55.0	49.8	47.1	45.0	43.3	...	40.7	...	38.8
16	55.0	49.8	47.1	45.0	43.3	...	40.7	...	38.8
17	55.0	49.8	47.1	45.0	43.3	...	40.7	...	38.8
18	55.0	49.8	47.1	45.0	43.3	...	40.7	...	38.8
19	55.0	49.8	47.1	45.0	43.3	...	40.7	...	38.8
20	55.0	49.8	47.1	45.0	43.3	...	40.7	...	38.8
21	60.0	...	51.4	...	47.2	...	44.4	...	42.4
22	75.0	...	64.2	...	59.0	...	55.5	...	53.0
23	105.0	...	89.9	...	82.6	...	77.8	...	74.2
(10) 24	58.0	52.6	49.8	47.8	46.3	...	44.5	...	43.4
25	58.0	52.6	49.8	47.8	46.3	...	44.5	...	43.4
26	58.0	52.6	49.8	47.8	46.3	...	44.5	...	43.4
27	65.0	58.9	55.9	53.6	51.9	...	49.6	...	48.6
28	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
29	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
30	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
31	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
32	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
33	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
34	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
35	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
36	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
37	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
38	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
39	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
40	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
41	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
42	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	47.9	46.9	...	...	...	...	...	...	...
2	...	47.9	46.9	...	...	...	...	...	...	...
3	...	47.9	46.9	...	...	...	...	...	...	...
4	...	47.9	46.9	...	...	...	...	...	...	...
5	...	47.9	46.9	...	...	...	...	...	...	...
6	...	47.9	46.9	...	...	...	...	...	...	...
7	...	28.9	28.4	28.0	27.6	27.3	27.0	26.7	26.4	26.0
8	...	37.4	36.8	36.3	35.8	35.3	34.9	34.5	34.1	33.7
9	...	37.4	36.8	36.3	35.8	35.3	34.9	34.5	34.1	33.7
10	...	37.4	36.8	36.3	35.8	35.3	34.9	34.5	34.1	33.7
11	...	37.4	36.8	36.3	35.8	35.3	34.9	34.5	34.1	33.7
12	...	37.4	36.8	36.3	35.8	35.3	34.9	34.5	34.1	33.7
13	...	37.4	36.8	36.3	35.8	35.3	34.9	34.5	34.1	33.7
14	...	37.4	36.8	36.3	35.8	35.3	34.9	34.5	34.1	33.7
15	...	37.4	36.8	36.3	35.8	35.3	34.9	34.5	34.1	33.7
16	...	37.4	36.8	36.3	35.8	35.3	34.9	34.5	34.1	33.7
17	...	37.4	36.8	36.3	35.8	35.3	34.9	34.5	34.1	33.7
18	...	37.4	36.8	36.3	35.8	35.3	34.9	34.5	34.1	33.7
19	...	37.4	36.8	36.3	35.8	35.3	34.9	34.5	34.1	33.7
20	...	37.4	36.8	36.3	35.8	35.3	34.9	34.5	34.1	33.7
21	...	40.8	40.1	39.5	39.0	38.5	38.1	37.7	37.2	36.7
22	...	51.0	50.2	49.4	48.8	48.2	47.6	47.1	46.6	45.9
23	...	71.4	70.3	69.2	68.3	67.5	66.7	66.0	65.2	64.2
24	...	42.1	41.3	40.4	39.4	38.6	...	...	...	...
25	...	42.1	41.3	40.4	39.4	38.6	...	...	...	...
26	...	42.1	41.3	40.4	39.4	38.6	...	...	...	...
27	...	47.2	46.3	45.3	...	...	...	...	...	...
28	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
29	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
30	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
31	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
32	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
33	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
34	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
35	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
36	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
37	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
38	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
39	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
40	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
41	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
42	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4

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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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	23Cr-12Ni-Cb	Smls. tube	SA-213	TP309Cb	S30940	...
2	23Cr-12Ni-Cb	Plate	SA-240	309Cb	S30940	...
3	23Cr-12Ni-Cb	Wld. tube	SA-249	TP309Cb	S30940	...
4	23Cr-12Ni-Cb	Smls. & wld. pipe	SA-312	TP309Cb	S30940	...
5	23Cr-12Ni-Cb	Bar	SA-479	309Cb	S30940	...
6	23Cr-12Ni-Cb	Wld. pipe	SA-813	TP309Cb	S30940	...
7	23Cr-12Ni-Cb	Wld. pipe	SA-814	TP309Cb	S30940	...
8	24Cr-10Ni-4Mo-N	Castings	SA-995	2A	J93345	...
9	25Cr-4Ni-4Mo-Ti	Plate	SA-240	...	S44635	...
10	25Cr-4Ni-4Mo-Ti	Wld. tube	SA-268	...	S44635	...
11	25Cr-5Ni-3Mo-2Cu	Castings	SA-995	1B	J93372	...
12	25Cr-5Ni-3Mo-2Cu	Plate	SA-240	...	S32550	...
13	25Cr-5Ni-3Mo-2Cu	Bar	SA-479	...	S32550	...
14	25Cr-5Ni-3Mo-2Cu	Smls. & wld. tube	SA-789	...	S32550	...
15	25Cr-5Ni-3Mo-2Cu	Smls. & wld. pipe	SA-790	...	S32550	...
16	25Cr-6Ni-Mo-N	Plate	SA-240	...	S31200	...
17	25Cr-6.5Ni-3Mo-N	Smls. & wld. tube	SA-789	...	S31260	...
18	25Cr-6.5Ni-3Mo-N	Smls. & wld. pipe	SA-790	...	S31260	...
19	25Cr-6.5Ni-3Mo-N	Plate	SA-240	...	S31260	...
20	25Cr-7Ni-3Mo-W-Cu-N	Forgings	SA-182	F54	S39274	...
21	25Cr-7Ni-3Mo-W-Cu-N	Smls. & wld. tube	SA-789	...	S39274	...
22	25Cr-7Ni-3Mo-W-Cu-N	Smls. & wld. pipe	SA-790	...	S39274	...
23	25Cr-7Ni-4Mo-N	Forgings	SA-182	F53	S32750	...
24	25Cr-7Ni-4Mo-N	Plate	SA-240	...	S32750	...
25	25Cr-7Ni-4Mo-N	Smls. & wld. tube	SA-789	...	S32750	...
26	25Cr-7Ni-4Mo-N	Smls. & wld. pipe	SA-790	...	S32750	...
27	25Cr-12Ni	Castings	SA-351	CH8	J93400	...
28	25Cr-12Ni	Cast pipe	SA-451	CPH8	J93400	...
29	25Cr-12Ni	Castings	SA-351	CH20	J93402	...
30	25Cr-12Ni	Cast pipe	SA-451	CPH20	J93402	...
31	25Cr-20Ni	Castings	SA-351	CK20	J94202	...
32	25Cr-20Ni	Cast pipe	SA-451	CPK20	J94202	...
33	25Cr-20Ni	Forgings	SA-182	F310	S31000	...
34	25Cr-20Ni	Forgings	SA-965	F310	S31000	...
35	25Cr-20Ni	Smls. tube	SA-213	TP310S	S31008	...
36	25Cr-20Ni	Plate	SA-240	310S	S31008	...
37	25Cr-20Ni	Wld. tube	SA-249	TP310S	S31008	...
38	25Cr-20Ni	Smls. & wld. pipe	SA-312	TP310S	S31008	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	75	30	...
2	...	75	30	...
3	...	75	30	...
4	...	75	30	...
5	...	75	30	...
6	...	75	30	...
7	...	75	30	...
8	...	95	65	...
9	...	90	75	...
10	...	90	75	...
11	...	100	70	...
12	...	110	80	...
13	...	110	80	...
14	...	110	80	...
15	...	110	80	...
16	...	100	65	...
17	...	100	65	...
18	...	100	65	...
19	...	100	70	...
20	...	116	80	...
21	...	116	80	...
22	...	116	80	...
23	...	116	80	...
24	...	116	80	...
25	≤ 1	116	80	...
26	≤ 1	116	80	...
27	...	65	28	...
28	...	65	28	...
29	...	70	30	...
30	...	70	30	...
31	...	65	28	...
32	...	65	28	...
33	≤ 5	75	30	...
34	...	75	30	...
35	...	75	30	...
36	...	75	30	...
37	...	75	30	...
38	...	75	30	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
2	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
3	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
4	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
5	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
6	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
7	30.0	27.6	26.3	25.1	24.2	...	22.7	...	21.6
8	65.0	56.6	52.4	49.2	46.8	...	43.9	...	42.5
9	75.0	66.1	62.0	58.7	55.8	...	51.0	...	47.5
10	75.0	66.1	62.0	58.7	55.8	...	51.0	...	47.5
11	70.0	...	...	...	...	...	...	...	...
12	80.0	73.8	70.2	67.0	64.3	...	60.5	...	58.7
13	80.0	73.8	70.2	67.0	64.3	...	60.5	...	58.7
14	80.0	73.8	70.2	67.0	64.3	...	60.5	...	58.7
15	80.0	73.8	70.2	67.0	64.3	...	60.5	...	58.7
16	65.0	58.6	55.3	52.6	50.4	...	47.5	...	45.5
17	65.0	59.5	56.6	54.2	52.3	...	49.5	...	47.9
18	65.0	59.5	56.6	54.2	52.3	...	49.5	...	47.9
19	70.0	64.1	61.0	58.4	56.3	...	53.3	...	51.5
20	80.0	70.6	66.9	64.2	62.1	...	59.3	...	58.2
21	80.0	70.6	66.9	64.2	62.1	...	59.3	...	58.2
22	80.0	70.6	66.9	64.2	62.1	...	59.3	...	58.2
23	80.0	74.0	70.5	67.4	64.7	...	60.7	...	58.3
24	80.0	74.0	70.5	67.4	64.7	...	60.7	...	58.3
25	80.0	74.0	70.5	67.4	64.7	...	60.7	...	58.3
26	80.0	74.0	70.5	67.4	64.7	...	60.7	...	58.3
27	28.0	24.4	22.9	21.8	21.1	...	20.2	...	19.6
28	28.0	24.4	22.9	21.8	21.1	...	20.2	...	19.6
29	30.0	26.1	24.5	23.4	22.6	...	21.7	...	21.0
30	30.0	26.1	24.5	23.4	22.6	...	21.7	...	21.0
31	28.0	24.4	22.9	21.8	21.1	...	20.2	...	19.6
32	28.0	24.4	22.9	21.8	21.1	...	20.2	...	19.6
33	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
34	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
35	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
36	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
37	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
38	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
2	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
3	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
4	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
5	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
6	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
7	...	20.8	20.5	20.2	20.0	19.7	19.4	19.1	18.8	18.4
8	...	41.4	40.6	39.3	...	...	...	...	...	...
9	...	45.0	43.5	...	...	...	...	...	...	...
10	...	45.0	43.5	...	...	...	...	...	...	...
11
12	...	58.4	58.2	57.4	55.4	51.5	...	...	...	...
13	...	58.4	58.2	57.4	55.4	51.5	...	...	...	...
14	...	58.4	58.2	57.4	55.4	51.5	...	...	...	...
15	...	58.4	58.2	57.4	55.4	51.5	...	...	...	...
16	...	43.6	42.2	...	...	...	...	...	...	...
17	...	46.8	46.3	45.8	45.2	...	...	...	...	...
18	...	46.8	46.3	45.8	45.2	...	...	...	...	...
19	...	50.4	49.9	49.4	48.7	...	...	...	...	...
20	...	58.2	58.2	58.2	58.2	...	...	...	...	...
21	...	58.2	58.2	58.2	58.2	...	...	...	...	...
22	...	58.2	58.2	58.2	58.2	...	...	...	...	...
23	...	57.2	57.0	57.0	57.0	...	...	...	...	...
24	...	57.2	57.0	57.0	57.0	...	...	...	...	...
25	...	57.2	57.0	57.0	57.0	...	...	...	...	...
26	...	57.2	57.0	57.0	57.0	...	...	...	...	...
27	...	19.0	18.6	18.1	17.6	17.1	16.6	16.0	15.4	14.8
28	...	19.0	18.6	18.1	17.6	17.1	16.6	16.0	15.4	14.8
29	...	20.3	19.9	19.4	18.9	18.3	17.7	17.1	16.5	15.9
30	...	20.3	19.9	19.4	18.9	18.3	17.7	17.1	16.5	15.9
31	...	19.0	18.6	18.1	17.6	17.1	16.6	16.0	15.4	14.8
32	...	19.0	18.6	18.1	17.6	17.1	16.6	16.0	15.4	14.8
33	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
34	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
35	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
36	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
37	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
38	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2

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 Designation/ UNS No.	Class/Condition/ Temper
Ferrous Materials (Cont'd)						
1	25Cr–20Ni	Wld. pipe	SA-358	310S	S31008	1
2	25Cr–20Ni	Smls. & wld. fittings	SA-403	310S	S31008	...
3	25Cr–20Ni	Bar	SA-479	310S	S31008	...
4	25Cr–20Ni	Wld. pipe	SA-813	TP310S	S31008	...
5	25Cr–20Ni	Wld. pipe	SA-814	TP310S	S31008	...
6	25Cr–20Ni	Bar	SA/JIS G4303	SUS310S	...	...
7	25Cr–20Ni	Smls. tube	SA-213	TP310H	S31009	...
8	25Cr–20Ni	Plate	SA-240	310H	S31009	...
9	25Cr–20Ni	Wld. tube	SA-249	TP310H	S31009	...
10	25Cr–20Ni	Smls. & wld. pipe	SA-312	TP310H	S31009	...
11	25Cr–20Ni	Bar	SA-479	310H	S31009	...
12	25Cr–20Ni–Cb	Smls. tube	SA-213	TP310Cb	S31040	...
13	25Cr–20Ni–Cb	Plate	SA-240	310Cb	S31040	...
14	25Cr–20Ni–Cb	Wld. tube	SA-249	TP310Cb	S31040	...
15	25Cr–20Ni–Cb	Smls. & wld. pipe	SA-312	TP310Cb	S31040	...
16	25Cr–20Ni–Cb	Bar	SA-479	310Cb	S31040	...
17	25Cr–20Ni–Cb	Wld. pipe	SA-813	TP310Cb	S31040	...
18	25Cr–20Ni–Cb	Wld. pipe	SA-814	TP310Cb	S31040	...
(10) 19	25Cr–20Ni–Cb–N	Smls. tube	SA-213	TP310HCbN	S31042	...
20	25Cr–22Ni–2Mo–N	Forgings	SA-182	F310MoLN	S31050	...
21	25Cr–22Ni–2Mo–N	Smls. tube	SA-213	TP310MoLN	S31050	...
22	25Cr–22Ni–2Mo–N	Wld. tube	SA-249	TP310MoLN	S31050	...
23	25Cr–22Ni–2Mo–N	Wld. pipe	SA-312	TP310MoLN	S31050	...
24	25Cr–22Ni–2Mo–N	Plate	SA-240	310MoLN	S31050	...
25	25Cr–22Ni–2Mo–N	Smls. tube	SA-213	TP310MoLN	S31050	...
26	25Cr–22Ni–2Mo–N	Wld. tube	SA-249	TP310MoLN	S31050	...
27	25Cr–22Ni–2Mo–N	Wld. pipe	SA-312	TP310MoLN	S31050	...
(10) 28	26Cr–4Ni–Mo	Plate	SA-240	329	S32900	...
(10) 29	26Cr–4Ni–Mo	Smls. & wld. tube	SA-789	...	S32900	...
(10) 30	26Cr–4Ni–Mo	Smls. & wld. pipe	SA-790	...	S32900	...
(10) 31	26Cr–4Ni–Mo–N	Plate	SA-240	...	S32950	...
(10) 32	26Cr–4Ni–Mo–N	Smls. & wld. tube	SA-789	...	S32950	...
(10) 33	26Cr–4Ni–Mo–N	Smls. & wld. pipe	SA-790	...	S32950	...
34	29Cr–6.5Ni–2Mo–N	Plate, sheet, strip	SA-240	...	S32906	...
35	29Cr–6.5Ni–2Mo–N	Bar	SA-479	...	S32906	...
36	29Cr–6.5Ni–2Mo–N	Smls. tube	SA-789	...	S32906	...
37	29Cr–6.5Ni–2Mo–N	Smls. pipe	SA-790	...	S32906	...
38	29Cr–6.5Ni–2Mo–N	Plate, sheet, strip	SA-240	...	S32906	...
39	29Cr–6.5Ni–2Mo–N	Smls. tube	SA-789	...	S32906	...
40	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, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Ferrous Materials (Cont'd)				
1	...	75	30	...
2	...	75	30	...
3	...	75	30	...
4	...	75	30	...
5	...	75	30	...
6	...	75	30	...
7	...	75	30	...
8	...	75	30	...
9	...	75	30	...
10	...	75	30	...
11	...	75	30	...
12	...	75	30	...
13	...	75	30	...
14	...	75	30	...
15	...	75	30	...
16	...	75	30	...
17	...	75	30	...
18	...	75	30	...
19	...	95	43	... (10)
20	...	78	37	...
21	$0.250 < t \leq 1.250$	78	37	...
22	$0.250 < t \leq 1.250$	78	37	...
23	$0.250 < t \leq 1.250$	78	37	...
24	...	80	35	...
25	≤ 0.250 , wall	84	39	...
26	≤ 0.250 , wall	84	39	...
27	≤ 0.250 , wall	84	39	...
28	...	90	70	... (10)
29	...	90	70	... (10)
30	...	90	70	... (10)
31	...	100	70	... (10)
32	...	100	70	... (10)
33	...	100	70	... (10)
34	≥ 0.40	109	80	...
35	...	109	80	...
36	≥ 0.40	109	80	...
37	≥ 0.40	109	80	...
38	< 0.40	116	94	...
39	< 0.40	116	94	...
40	< 0.40	116	94	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Ferrous Materials (Cont'd)								
1	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
2	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
3	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
4	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
5	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
6	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
7	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
8	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
9	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
10	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
11	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
12	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
13	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
14	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
15	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
16	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
17	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
18	30.0	27.9	26.5	25.3	24.2	...	22.6	...	21.4
(10) 19	43.0	...	36.0	...	32.5	...	30.2	...	28.8
20	37.0	33.4	31.5	29.9	28.6	...	26.7	...	25.2
21	37.0	33.4	31.5	29.9	28.6	...	26.7	...	25.2
22	37.0	33.4	31.5	29.9	28.6	...	26.7	...	25.2
23	37.0	33.4	31.5	29.9	28.6	...	26.7	...	25.2
24	35.0	31.6	29.8	28.3	27.1	...	25.2	...	23.8
25	39.0	35.2	33.2	31.5	30.2	...	28.1	...	26.5
26	39.0	35.2	33.2	31.5	30.2	...	28.1	...	26.5
27	39.0	35.2	33.2	31.5	30.2	...	28.1	...	26.5
(10) 28	70.0	65.3	62.4	59.8	57.6	...	53.9	...	51.3
(10) 29	70.0	65.3	62.4	59.8	57.6	...	53.9	...	51.3
(10) 30	70.0	65.3	62.4	59.8	57.6	...	53.9	...	51.3
(10) 31	70.0	64.9	62.0	59.5	57.3	...	53.8	...	51.3
(10) 32	70.0	64.9	62.0	59.5	57.3	...	53.8	...	51.3
(10) 33	70.0	64.9	62.0	59.5	57.3	...	53.8	...	51.3
34	80.0	...	68.9	...	63.2	...	59.4	...	57.1
35	80.0	...	68.9	...	63.2	...	59.4	...	57.1
36	80.0	...	68.9	...	63.2	...	59.4	...	57.1
37	80.0	...	68.9	...	63.2	...	59.4	...	57.1
38	94.0	...	81.0	...	74.3	...	69.8	...	67.1
39	94.0	...	81.0	...	74.3	...	69.8	...	67.1
40	94.0	...	81.0	...	74.3	...	69.8	...	67.1

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Ferrous Materials (Cont'd)									
1	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
2	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
3	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
4	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
5	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
6	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
7	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
8	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
9	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
10	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
11	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
12	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
13	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
14	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
15	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
16	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
17	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
18	...	20.6	20.2	19.9	19.6	19.4	19.1	18.8	18.5	18.2
19	...	27.8	27.4	27.1	26.8	26.4	26.1	25.7	25.3	24.9 (10)
20	...	23.9	23.3	22.7	22.1	21.6	21.0	20.6	20.2	19.9
21	...	23.9	23.3	22.7	22.1	21.6	21.0	20.6	20.2	19.9
22	...	23.9	23.3	22.7	22.1	21.6	21.0	20.6	20.2	19.9
23	...	23.9	23.3	22.7	22.1	21.6	21.0	20.6	20.2	19.9
24	...	22.6	22.0	21.5	20.9	20.4	19.9	19.5	19.1	18.8
25	...	25.2	24.6	23.9	23.3	22.7	22.2	21.7	21.3	21.0
26	...	25.2	24.6	23.9	23.3	22.7	22.2	21.7	21.3	21.0
27	...	25.2	24.6	23.9	23.3	22.7	22.2	21.7	21.3	21.0
28	...	49.6	49.1	48.8	...	...	...	...	...	... (10)
29	...	49.6	49.1	48.8	...	...	...	...	...	... (10)
30	...	49.6	49.1	48.8	...	...	...	...	...	... (10)
31	...	49.6	49.1	48.6	...	...	...	...	...	... (10)
32	...	49.6	49.1	48.6	...	...	...	...	...	... (10)
33	...	49.6	49.1	48.6	...	...	...	...	...	... (10)
34	...	55.9	...	...	...	...	...	...	...	...
35	...	55.9	...	...	...	...	...	...	...	...
36	...	55.9	...	...	...	...	...	...	...	...
37	...	55.9	...	...	...	...	...	...	...	...
38	...	65.7	...	...	...	...	...	...	...	...
39	...	65.7	...	...	...	...	...	...	...	...
40	...	65.7	...	...	...	...	...	...	...	...

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 Designation/ UNS No.	Class/Condition/ Temper
Nonferrous Materials						
1	...	Drawn smls. tube	SB-210	...	Alclad 3003	0
2	...	Smls. extr. tube	SB-241	...	Alclad 3003	0
3	...	Plate, sheet	SB-209	...	A93003	0
4	...	Plate, sheet	SB-209	...	A93003	H112
5	...	Plate, sheet	SB-209	...	A93003	H112
6	...	Drawn smls. tube	SB-210	...	A93003	0
7	...	Drawn smls. tube	SB-210	...	A93003	H113
8	...	Bar, rod, shapes	SB-221	...	A93003	0
9	...	Bar, rod, shapes	SB-221	...	A93003	H112
10	...	Smls. extr. tube	SB-241	...	A93003	0
11	...	Smls. extr. tube	SB-241	...	A93003	H112
12	...	Smls. extr. tube	SB-241	...	A93003	H112
13	...	Smls. pipe	SB-241	...	A93003	H112
14	...	Plate, sheet	SB-209	...	A93004	0
15	...	Plate, sheet	SB-209	...	A93004	H112
16	...	Plate, sheet	SB-209	...	A95052	0
17	...	Plate, sheet	SB-209	...	A95052	H112
18	...	Plate, sheet	SB-209	...	A95052	H112
19	...	Plate, sheet	SB-209	...	A95083	0
20	...	Plate, sheet	SB-209	...	A95083	0
21	...	Plate, sheet	SB-209	...	A95083	0
22	...	Plate, sheet	SB-209	...	A95083	0
23	...	Plate, sheet	SB-209	...	A95083	0
24	...	Plate, sheet	SB-209	...	A95083	H112
25	...	Plate, sheet	SB-209	...	A95083	H112
26	...	Bar, rod, shapes	SB-221	...	A95083	H111
27	...	Smls. extr. tube	SB-241	...	A95083	H111
28	...	Plate, sheet	SB-209	...	A95086	0
29	...	Plate, sheet	SB-209	...	A95086	H112
30	...	Plate, sheet	SB-209	...	A95086	H112
31	...	Plate, sheet	SB-209	...	A95086	H112
32	...	Plate, sheet	SB-209	...	A95454	0
33	...	Plate, sheet	SB-209	...	A95454	H112
34	...	Plate, sheet	SB-209	...	A95454	H112
35	...	Bar, rod, shapes	SB-221	...	A95454	0
36	...	Bar, rod, shapes	SB-221	...	A95454	H112
37	...	Smls. extr. tube	SB-241	...	A95454	0
38	...	Smls. extr. tube	SB-241	...	A95454	H112
39	...	Plate, sheet	SB-209	...	A96061	T4
40	...	Plate, sheet	SB-209	...	A96061	T451
41	...	Plate, sheet	SB-209	...	A96061	T6
42	...	Plate, sheet	SB-209	...	A96061	T651

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Nonferrous Materials				
1	0.010–0.500	...	4.5	...
2	...	13	4.5	...
3	0.051–3.000	...	5	...
4	0.250–0.499	...	10	...
5	0.500–3.000	...	6	...
6	0.010–0.500	...	5	...
7	0.050–0.500	14	4.5	...
8	...	...	5	...
9	...	...	5	...
10	...	14	5	...
11	...	14	5	...
12	...	14	5	...
13	...	14	5	...
14	0.051–3.000	...	8.5	...
15	0.250–3.000	...	9	...
16	0.051–3.000	...	9.5	...
17	0.250–0.499	...	16	...
18	0.500–3.000	...	9.5	...
19	0.051–1.500	40	18	...
20	1.501–3.000	39	17	...
21	3.001–5.000	38	16	...
22	5.001–7.000	37	15	...
23	7.001–8.000	36	14	...
24	0.250–1.500	...	18	...
25	1.501–3.000	39	17	...
26	≤ 5.000	...	24	...
27	≤ 5.000	40	24	...
28	0.051–2.000	...	14	...
29	0.250–0.499	...	18	...
30	0.500–1.000	...	16	...
31	1.001–3.000	...	14	...
32	0.051–3.000	30	12	...
33	0.250–0.499	...	18	...
34	0.500–3.000	31	12	...
35	≤ 5.000	31	12	...
36	≤ 5.000	31	12	...
37	≤ 5.000	31	12	...
38	≤ 5.000	31	12	...
39	0.051–0.249	...	16	...
40	0.250–3.000	...	16	...
41	0.051–0.249	...	35	...
42	0.250–6.000	...	35	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
Nonferrous Materials									
1	4.5	4.5	4.5	4.4	4.1	3.9	3.3	...	...
2	4.5	4.5	4.5	4.4	4.1	3.9	3.3	...	...
3	5.0	5.0	5.0	4.9	4.6	4.3	3.7	...	...
4	10.0	9.9	9.5	8.8	7.9	6.9	5.8	...	...
5	6.0	6.0	5.9	5.7	5.3	4.8	4.1	...	...
6	5.0	5.0	5.0	4.9	4.6	4.3	3.7	...	...
7	4.5	4.5	4.5	4.4	4.1	3.9	3.3	...	...
8	5.0	5.0	5.0	4.9	4.6	4.3	3.7	...	...
9	5.0	5.0	5.0	4.9	4.6	4.3	3.7	...	...
10	5.0	5.0	5.0	4.9	4.6	4.3	3.7	...	...
11	4.5	4.5	4.5	4.4	4.1	3.9	3.3	...	...
12	5.0	5.0	5.0	4.9	4.6	4.3	3.7	...	...
13	6.0	6.0	5.9	5.7	5.3	4.8	4.1	...	...
14	8.5	8.5	8.5	8.5	8.5	8.0	7.4	...	...
15	9.0	9.0	9.0	9.0	9.0	8.4	7.7	...	...
16	9.5	9.5	9.5	9.5	9.5	9.5	8.4	...	...
17	16.0	16.0	16.0	15.2	14.1	12.5	10.7	...	...
18	9.5	9.5	9.5	9.5	9.5	9.5	9.2	...	...
19	18.0	18.0	...	...	...	...	...	...	...
20	17.0	17.0	...	...	...	...	...	...	...
21	16.0	16.0	...	...	...	...	...	...	...
22	15.0	15.0	...	...	...	...	...	...	...
23	14.0	14.0	...	...	...	...	...	...	...
24	18.0	18.0	...	...	...	...	...	...	...
25	17.0	17.0	...	...	...	...	...	...	...
26	24.0	24.0	...	...	...	...	...	...	...
27	24.0	24.0	...	...	...	...	...	...	...
28	14.0	13.7	...	...	...	...	...	...	...
29	18.0	17.8	...	...	...	...	...	...	...
30	16.0	15.7	...	...	...	...	...	...	...
31	14.0	13.7	...	...	...	...	...	...	...
32	12.0	12.0	12.0	12.0	11.9	11.6	11.1	...	...
33	18.0	18.0	18.0	17.9	17.5	16.6	14.8	...	...
34	12.0	12.0	12.0	12.0	11.9	11.6	11.1	...	...
35	12.0	12.0	12.0	12.0	11.9	11.6	11.1	...	...
36	12.0	12.0	12.0	12.0	11.9	11.6	11.1	...	...
37	12.0	12.0	12.0	12.0	11.9	11.6	11.1	...	...
38	12.0	12.0	12.0	12.0	11.9	11.6	11.1	...	...
39	16.0	15.7	15.5	15.3	15.3	15.3	11.6	...	...
40	16.0	15.7	15.5	15.3	15.3	15.3	11.6	...	...
41	35.0	34.6	33.7	32.4	27.4	20.0	13.3	...	...
42	35.0	34.6	33.7	32.4	27.4	20.0	13.3	...	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials									
1
2
3
4
5
6
7
8
9
10
11
12
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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 Designation/ UNS No.	Class/Condition/ Temper
Nonferrous Materials (Cont'd)						
1	...	Drawn smls. tube	SB-210	...	A96061	T4
2	...	Drawn smls. tube	SB-210	...	A96061	T6
3	...	Bar, rod, shapes	SB-221	...	A96061	T4
4	...	Bar, rod, shapes	SB-221	...	A96061	T6
5	...	Smls. extr. tube	SB-241	...	A96061	T4
6	...	Smls. pipe & extr. tube	SB-241	...	A96061	T6
7	...	Bar, rod, shapes	SB-308	...	A96061	T6
8	...	Drawn smls. tube	SB-210	...	A96063	T6
9	...	Bar, rod, shapes	SB-221	...	A96063	T5
10	...	Bar, rod, shapes	SB-221	...	A96063	T5
11	...	Bar, rod, shapes	SB-221	...	A96063	T6
12	...	Smls. extr. tube	SB-241	...	A96063	T5
13	...	Smls. extr. tube	SB-241	...	A96063	T5
14	...	Smls. extr. tube	SB-241	...	A96063	T6
15	...	Rod	SB-187	...	C10200	060
16	...	Smls. pipe	SB-42	...	C10200	061
17	...	Smls. tube	SB-75	...	C10200	060
18	...	Plate, sheet, strip	SB-152	...	C10200	H00
19	...	Plate, sheet, strip	SB-152	...	C10200	H01
20	...	Plate, sheet, strip	SB-152	...	C10200	H02
21	...	Plate, sheet, strip	SB-152	...	C10200	H03
22	...	Plate, sheet, strip	SB-152	...	C10200	H04
23	...	Plate, sheet, strip	SB-152	...	C10200	025
24	...	Smls. pipe	SB-42	...	C10200	H55
25	...	Smls. tube	SB-75	...	C10200	H55
26	...	Smls. cond. tube	SB-111	...	C10200	H55
27	...	Smls. U-bend tube	SB-395	...	C10200	H55
28	...	Smls. pipe	SB-42	...	C10200	H80
29	...	Smls. tube	SB-75	...	C10200	H80
30	...	Smls. cond. tube	SB-111	...	C10200	H80
31	...	Plate, sheet, strip	SB-152	...	C10400	H00
32	...	Plate, sheet, strip	SB-152	...	C10400	H01
33	...	Plate, sheet, strip	SB-152	...	C10400	H02
34	...	Plate, sheet, strip	SB-152	...	C10400	H03
35	...	Plate, sheet, strip	SB-152	...	C10400	H04
36	...	Plate, sheet, strip	SB-152	...	C10400	025
37	...	Plate, sheet, strip	SB-152	...	C10500	H00
38	...	Plate, sheet, strip	SB-152	...	C10500	H01
39	...	Plate, sheet, strip	SB-152	...	C10500	H02
40	...	Plate, sheet, strip	SB-152	...	C10500	H03
41	...	Plate, sheet, strip	SB-152	...	C10500	H04
42	...	Plate, sheet, strip	SB-152	...	C10500	025

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Nonferrous Materials (Cont'd)				
1	0.025–0.500	...	16	...
2	0.025–0.500	...	35	...
3	...	...	16	...
4	...	...	35	...
5	...	26	16	...
6	...	38	35	...
7	...	...	35	...
8	0.025–0.500	...	28	...
9	≤ 0.500	...	16	...
10	0.501–1.000	...	15	...
11	≤ 1.000	...	25	...
12	≤ 0.500	22	16	...
13	0.501–1.000	21	15	...
14	≤ 1.000	30	25	...
15	...	28	8	...
16	$\frac{1}{8} < \text{NPS} \leq 2$	30	9	...
17	...	30	9	...
18	...	30	10	...
19	...	30	10	...
20	...	30	10	...
21	...	30	10	...
22	...	30	10	...
23	...	30	10	...
24	$2 < \text{NPS} \leq 12$	36	30	...
25	...	36	30	...
26	< 3	36	30	...
27	...	36	30	...
28	$\frac{1}{8} < \text{NPS} \leq 2$	45	40	...
29	< 4	45	40	...
30	< 3	45	40	...
31	...	30	10	...
32	...	30	10	...
33	...	30	10	...
34	...	30	10	...
35	...	30	10	...
36	...	30	10	...
37	...	30	10	...
38	...	30	10	...
39	...	30	10	...
40	...	30	10	...
41	...	30	10	...
42	...	30	10	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
Nonferrous Materials (Cont'd)									
1	16.0	15.7	15.5	15.3	15.3	15.3	11.6	...	...
2	35.0	34.6	33.7	32.4	27.4	20.0	13.3	...	...
3	16.0	15.7	15.5	15.3	15.3	15.3	11.6	...	...
4	35.0	34.6	33.7	32.4	27.4	20.0	13.3	...	...
5	16.0	15.7	15.5	15.3	15.3	15.3	11.6	...	...
6	35.0	34.6	33.7	32.4	27.4	20.0	13.3	...	...
7	35.0	34.6	33.7	32.4	27.4	20.0	13.3	...	...
8	28.0	26.8	25.9	24.8	17.9	10.0	5.7	...	...
9	16.0	15.4	15.0	14.6	13.3	8.9	5.1	...	...
10	15.0	14.4	14.0	13.7	12.5	8.9	5.1	...	...
11	25.0	24.0	23.2	22.1	16.0	8.9	5.1	...	...
12	16.0	15.4	15.0	14.6	13.3	8.9	5.1	...	...
13	15.0	14.4	14.0	13.7	12.5	8.9	5.1	...	...
14	25.0	24.0	23.2	22.1	16.0	8.9	5.1	...	...
15	8.0	6.8	6.5	6.4	6.3	6.1	5.8	5.6	...
16	9.0	7.6	7.3	7.2	7.0	6.8	6.6	6.3	...
17	9.0	7.6	7.3	7.2	7.0	6.8	6.6	6.3	...
18	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
19	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
20	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
21	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
22	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
23	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
24	30.0	29.7	29.0	28.1	27.0	25.7	24.4	23.0	...
25	30.0	29.7	29.0	28.1	27.0	25.7	24.4	23.0	...
26	30.0	29.7	29.0	28.1	27.0	25.7	24.4	23.0	...
27	30.0	29.7	29.0	28.1	27.0	25.7	24.4	23.0	...
28	40.0	38.3	37.6	36.9	35.7	33.7	30.5	25.5	...
29	40.0	38.3	37.6	36.9	35.7	33.7	30.5	25.5	...
30	40.0	38.3	37.6	36.9	35.7	33.7	30.5	25.5	...
31	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
32	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
33	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
34	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
35	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
36	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
37	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
38	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
39	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
40	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
41	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
42	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)									
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2
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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 Designation/ UNS No.	Class/Condition/ Temper
Nonferrous Materials (Cont'd)						
1	...	Plate, sheet, strip	SB-152	...	C10700	H00
2	...	Plate, sheet, strip	SB-152	...	C10700	H01
3	...	Plate, sheet, strip	SB-152	...	C10700	H02
4	...	Plate, sheet, strip	SB-152	...	C10700	H03
5	...	Plate, sheet, strip	SB-152	...	C10700	H04
6	...	Plate, sheet, strip	SB-152	...	C10700	025
7	...	Bar, rod	SB-187	...	C11000	060
8	...	Plate, sheet, strip, bar	SB-152	...	C11000	025
9	...	Smls. tube	SB-75	...	C12000	050
10	...	Smls. tube	SB-75	...	C12000	060
11	...	Smls. pipe	SB-42	...	C12000	061
12	...	Smls. pipe	SB-42	...	C12000	H55
13	...	Smls. tube	SB-75	...	C12000	H55
14	...	Smls. cond. tube	SB-111	...	C12000	H55
15	...	Smls. U-bend tube	SB-395	...	C12000	H55
16	...	Smls. pipe	SB-42	...	C12000	H80
17	...	Smls. tube	SB-75	...	C12000	H80
18	...	Smls. cond. tube	SB-111	...	C12000	H80
19	...	Smls. tube	SB-75	...	C12200	050
20	...	Smls. tube	SB-75	...	C12200	060
21	...	Smls. pipe	SB-42	...	C12200	061
22	...	Finned tube	SB-359	...	C12200	061
23	...	Plate, sheet, strip	SB-152	...	C12200	H00
24	...	Plate, sheet, strip	SB-152	...	C12200	H01
25	...	Plate, sheet, strip	SB-152	...	C12200	H02
26	...	Plate, sheet, strip	SB-152	...	C12200	H03
27	...	Plate, sheet, strip	SB-152	...	C12200	H04
28	...	Plate, sheet, strip	SB-152	...	C12200	025
29	...	Wld. cond. tube	SB-543	...	C12200	Light cold worked
30	...	Smls. pipe	SB-42	...	C12200	H55
31	...	Smls. tube	SB-75	...	C12200	H55
32	...	Smls. cond. tube	SB-111	...	C12200	H55
(a) 33	...	Finned tube	SB-359	...	C12200	H55
34	...	Smls. U-bend tube	SB-395	...	C12200	H55
35	...	Smls. pipe	SB-42	...	C12200	H80
36	...	Smls. cond. tube	SB-75	...	C12200	H80
37	...	Smls. tube	SB-111	...	C12200	H80
38	...	Plate, sheet, strip, bar	SB-152	...	C12300	H00
39	...	Plate, sheet, strip, bar	SB-152	...	C12300	H01
40	...	Plate, sheet, strip, bar	SB-152	...	C12300	H02
41	...	Plate, sheet, strip, bar	SB-152	...	C12300	H03
42	...	Plate, sheet, strip, bar	SB-152	...	C12300	H04
43	...	Plate, sheet, strip, bar	SB-152	...	C12300	025

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Nonferrous Materials (Cont'd)				
1	...	30	10	...
2	...	30	10	...
3	...	30	10	...
4	...	30	10	...
5	...	30	10	...
6	...	30	10	...
7	...	28	8	...
8	≤ 2	30	10	...
9	...	30	9	...
10	...	30	9	...
11	$\frac{1}{8} < \text{NPS} \leq 2$	30	9	...
12	$2 < \text{NPS} \leq 12$	36	30	...
13	...	36	30	...
14	< 3	36	30	...
15	< 2	36	30	...
16	$\frac{1}{8} < \text{NPS} \leq 2$	45	40	...
17	...	45	40	...
18	< 3	45	40	...
19	...	30	9	...
20	...	30	9	...
21	$\frac{1}{8} < t \leq 2$	30	9	...
22	...	30	9	...
23	...	30	10	...
24	...	30	10	...
25	...	30	10	...
26	...	30	10	...
27	...	30	10	...
28	...	30	10	...
29	...	32	15	...
30	$2 < t \leq 12$	36	30	...
31	...	36	30	...
32	< 3	36	30	...
33	...	36	30	...
34	< 2	36	30	...
35	$\frac{1}{8} < t \leq 3$	45	40	...
36	< 4	45	40	...
37	< 3	45	40	...
38	...	30	10	...
39	...	30	10	...
40	...	30	10	...
41	...	30	10	...
42	...	30	10	...
43	...	30	10	...

(a)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Nonferrous Materials (Cont'd)								
1	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
2	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
3	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
4	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
5	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
6	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
7	8.0	6.8	6.5	6.4	6.3	6.1	5.8	5.6	...
8	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
9	9.0	7.6	7.3	7.2	7.0	6.8	6.6	6.3	...
10	9.0	7.6	7.3	7.2	7.0	6.8	6.6	6.3	...
11	9.0	7.6	7.3	7.2	7.0	6.8	6.6	6.3	...
12	30.0	29.7	29.0	28.1	27.0	25.7	24.4	23.0	...
13	30.0	29.7	29.0	28.1	27.0	25.7	24.4	23.0	...
14	30.0	29.7	29.0	28.1	27.0	25.7	24.4	23.0	...
15	30.0	29.7	29.0	28.1	27.0	25.7	24.4	23.0	...
16	40.0	38.3	37.6	36.9	35.7	33.7	30.5	25.5	...
17	40.0	38.3	37.6	36.9	35.7	33.7	30.5	25.5	...
18	40.0	38.3	37.6	36.9	35.7	33.7	30.5	25.5	...
19	9.0	7.6	7.3	7.2	7.0	6.8	6.6	6.3	...
20	9.0	7.6	7.3	7.2	7.0	6.8	6.6	6.3	...
21	9.0	7.6	7.3	7.2	7.0	6.8	6.6	6.3	...
22	9.0	7.6	7.3	7.2	7.0	6.8	6.6	6.3	...
23	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
24	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
25	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
26	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
27	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
28	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
29	15.0	14.8	14.5	14.1	13.5	12.9	12.2	11.5	...
30	30.0	29.7	29.0	28.1	27.0	25.7	24.4	23.0	...
31	30.0	29.7	29.0	28.1	27.0	25.7	24.4	23.0	...
32	30.0	29.7	29.0	28.1	27.0	25.7	24.4	23.0	...
(a) 33	30.0	29.7	29.0	28.1	27.0	25.7	24.4	23.0	...
34	30.0	29.7	29.0	28.1	27.0	25.7	24.4	23.0	...
35	40.0	38.3	37.6	36.9	35.7	33.7	30.5	25.5	...
36	40.0	38.3	37.6	36.9	35.7	33.7	30.5	25.5	...
37	40.0	38.3	37.6	36.9	35.7	33.7	30.5	25.5	...
38	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
39	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
40	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
41	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
42	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
43	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)									
1
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3
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(a)

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 Designation/ UNS No.	Class/Condition/ Temper
Nonferrous Materials (Cont'd)						
1	...	Plate, sheet, strip	SB-152	...	C14200	O25
2	...	Smls. cond. tube	SB-111	...	C14200	H55
3	...	Smls. U-bend tube	SB-395	...	C14200	H55
4	...	Smls. cond. tube	SB-111	...	C14200	H80
5	...	Smls. cond. tube	SB-111	...	C19200	O61
6	...	Smls. U-bend tube	SB-395	...	C19200	O61
7	...	Wld. cond. tube	SB-543	...	C19400	Annealed
8	...	Wld. cond. tube	SB-543	...	C19400	Light cold worked
9	...	Smls. cond. tube	SB-111	...	C60800	O61
10	...	Smls. U-bend tube	SB-395	...	C60800	O61
11	...	Plate, sheet	SB-169	...	C61400	O25 or O60
12	...	Plate	SB-171	...	C61400	O25
13	...	Plate, sheet	SB-169	...	C61400	O25 or O60
14	...	Plate	SB-171	...	C61400	O25
15	...	Plate, sheet	SB-169	...	C61400	O25 or O60
16	...	Plate	SB-171	...	C63000	O25
17	...	Plate	SB-171	...	C63000	O25
18	...	Plate	SB-171	...	C63000	O25
19	...	Forgings	SB-283	...	C64200	M10
20	...	Forgings	SB-283	...	C64200	M10
21	...	Plate, sheet	SB-96	...	C65500	O61
22	...	Smls. pipe & tube	SB-466	...	C70600	O60
23	...	Wld. pipe	SB-467	...	C70600	W061
24	...	Bar, rod	SB-151	...	C70600	O60
25	...	Plate	SB-171	...	C70600	M20
26	...	Plate, sheet	SB-171	...	C70600	M20
27	...	Plate	SB-171	...	C70600	O25
28	...	Plate, sheet	SB-171	...	C70600	O25
29	...	Smls. cond. tube	SB-111	...	C70600	O61
30	...	Finned tube	SB-359	...	C70600	O61
31	...	Smls. U-bend tube	SB-395	...	C70600	O61
32	...	Wld. pipe	SB-467	...	C70600	W061
33	...	Wld. tube	SB-543	...	C70600	W061
34	...	Finned wld. tube	SB-956	...	C70600	W061
35	...	Wld. pipe	SB-467	...	C70600	W061
36	...	Smls. tube	SB-111	...	C70600	H55
37	...	Wld. tube	SB-543	...	C70600	WC55
38	...	Finned wld. tube	SB-956	...	C70600	WC55
39	...	Wld. pipe	SB-467	...	C70600	Wld. fr. cold rld. strip
40	...	Plate, sheet	SB-171	...	C71500	O25
41	...	Plate, sheet	SB-171	...	C71500	O25
42	...	Smls. cond. tube	SB-111	...	C71500	O61
43	...	Wld. tube	SB-543	...	C71500	W061
44	...	Finned wld. tube	SB-956	...	C71500	W061

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Nonferrous Materials (Cont'd)				
1	...	30	10	...
2	< 3	36	30	...
3	...	36	30	...
4	< 3	45	40	...
5	< 3	38	12	...
6	...	38	12	...
7	...	45	15	...
8	...	45	22	...
9	...	50	19	...
10	...	50	19	...
11	$2 < t \leq 5$	65	28	...
12	$2 < t \leq 5$	65	28	...
13	$\frac{1}{2} < t \leq 2$	70	30	...
14	≤ 2	70	30	...
15	$\leq \frac{1}{2}$	72	32	...
16	$3.5 < t \leq 5$	80	30	...
17	$2 < t \leq 3.5$	85	33	...
18	≤ 2	90	36	...
19	$> 1\frac{1}{2}$	68	23	...
20	$\leq 1\frac{1}{2}$	70	25	...
21	≤ 2	50	18	...
22	...	38	13	...
23	$> 4\frac{1}{2}$	38	13	...
24	...	38	15	...
25	...	40	15	...
26	≤ 2.5	40	15	...
27	...	40	15	...
28	≤ 2.5	40	15	...
29	...	40	15	...
30	...	40	15	...
31	...	40	15	...
32	$\leq 4\frac{1}{2}$	40	15	...
33	...	40	15	...
34	...	40	15	...
35	$\leq 4\frac{1}{2}$	45	30	...
36	...	45	35	...
37	...	45	35	...
38	...	45	35	...
39	$\leq 4\frac{1}{2}$	54	45	...
40	$2.5 < t \leq 5$	45	18	...
41	≤ 2.5	50	20	...
42	...	52	18	...
43	...	52	18	...
44	...	52	18	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
Nonferrous Materials (Cont'd)									
1	10.0	8.5	8.1	8.0	7.8	7.6	7.3	7.0	...
2	30.0	29.7	29.0	28.1	27.0	25.7	24.4	23.0	...
3	30.0	29.7	29.0	28.1	27.0	25.7	24.4	23.0	...
4	40.0	38.3	37.6	36.9	35.7	33.7	30.5	25.5	...
5	12.0	10.7	10.1	9.6	9.3	9.0	8.8	8.5	...
6	12.0	10.7	10.1	9.6	9.3	9.0	8.8	8.5	...
7	15.0	14.8	14.6	14.3	13.8	13.4	12.8	12.3	...
8	22.0	21.8	21.4	20.9	20.3	19.6	18.8	18.0	...
9	19.0	18.3	18.3	18.3	18.0	17.5	17.0	16.5	16.0
10	19.0	18.3	18.3	18.3	18.0	17.5	17.0	16.5	16.0
11	28.0	27.9	27.7	27.5	27.4	27.2	26.9	26.6	26.3
12	28.0	27.9	27.7	27.5	27.4	27.2	26.9	26.6	26.3
13	30.0	29.9	29.7	29.5	29.3	29.1	28.8	28.5	28.2
14	30.0	29.9	29.7	29.5	29.3	29.1	28.8	28.5	28.2
15	32.0	31.9	31.7	31.4	31.3	31.1	30.8	30.4	30.1
16	30.0	29.8	29.3	29.0	28.7	28.5	28.2	27.6	26.4
17	33.0	32.7	32.3	31.9	31.6	31.3	31.0	30.3	29.0
18	36.0	35.7	35.2	34.7	34.4	34.2	33.8	33.1	31.7
19	23.0	...	...	...	...	...	...	...	...
20	25.0	...	...	...	...	...	...	...	...
21	18.0	17.9	17.8	17.6	17.4	17.2	16.9	16.6	16.3
22	13.0	12.6	12.3	12.0	11.7	11.5	11.3	11.1	10.9
23	13.0	12.6	12.3	12.0	11.7	11.5	11.3	11.1	10.9
24	15.0	14.6	14.2	13.9	13.6	13.3	13.0	12.8	12.6
25	15.0	14.6	14.2	13.9	13.6	13.3	13.0	12.8	12.6
26	15.0	14.6	14.2	13.9	13.6	13.3	13.0	12.8	12.6
27	15.0	14.6	14.2	13.9	13.6	13.3	13.0	12.8	12.6
28	15.0	14.6	14.2	13.9	13.6	13.3	13.0	12.8	12.6
29	15.0	14.6	14.2	13.9	13.6	13.3	13.0	12.8	12.6
30	15.0	14.6	14.2	13.9	13.6	13.3	13.0	12.8	12.6
31	15.0	14.6	14.2	13.9	13.6	13.3	13.0	12.8	12.6
32	15.0	14.6	14.2	13.9	13.6	13.3	13.0	12.8	12.6
33	15.0	14.6	14.2	13.9	13.6	13.3	13.0	12.8	12.6
34	15.0	14.6	14.2	13.9	13.6	13.3	13.0	12.8	12.6
35	30.0	29.1	28.5	27.8	27.1	26.5	26.0	25.6	25.3
36	35.0	34.0	33.2	32.4	31.6	30.9	30.3	29.8	29.5
37	35.0	34.0	33.2	32.4	31.6	30.9	30.3	29.8	29.5
38	35.0	34.0	33.2	32.4	31.6	30.9	30.3	29.8	29.5
39	45.0	43.7	42.7	41.6	40.7	39.8	39.0	38.4	37.9
40	18.0	17.4	17.0	16.6	16.2	15.8	15.5	15.2	14.9
41	20.0	19.3	18.8	18.4	18.0	17.6	17.2	16.9	16.5
42	18.0	17.4	17.0	16.6	16.2	15.8	15.5	15.2	14.9
43	18.0	17.4	17.0	16.6	16.2	15.8	15.5	15.2	14.9
44	18.0	17.4	17.0	16.6	16.2	15.8	15.5	15.2	14.9

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)									
1	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...
16	24.3	21.0	16.1	9.2	...	...	...	...	...	...
17	26.7	23.1	17.7	10.2	...	...	...	...	...	...
18	29.2	25.2	19.3	11.1	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...
22	10.8	10.8	...	...	...	...	...	...	...	...
23	10.8	10.8	...	...	...	...	...	...	...	...
24	12.5	12.4	...	...	...	...	...	...	...	...
25	12.5	12.4	...	...	...	...	...	...	...	...
26	12.5	12.4	...	...	...	...	...	...	...	...
27	12.5	12.4	...	...	...	...	...	...	...	...
28	12.5	12.4	...	...	...	...	...	...	...	...
29	12.5	12.4	...	...	...	...	...	...	...	...
30	12.5	12.4	...	...	...	...	...	...	...	...
31	12.5	12.4	...	...	...	...	...	...	...	...
32	12.5	12.4	...	...	...	...	...	...	...	...
33	12.5	12.4	...	...	...	...	...	...	...	...
34	12.5	12.4	...	...	...	...	...	...	...	...
35	25.0	24.9	...	...	...	...	...	...	...	...
36	29.2	29.0	...	...	...	...	...	...	...	...
37	29.2	29.0	...	...	...	...	...	...	...	...
38	29.2	29.0	...	...	...	...	...	...	...	...
39	37.5	37.3	...	...	...	...	...	...	...	...
40	14.6	14.4	14.2	14.1	...	...	...	...	...	...
41	16.3	16.0	15.8	15.7	...	...	...	...	...	...
42	14.6	14.4	14.2	14.1	...	...	...	...	...	...
43	14.6	14.4	14.2	14.1	...	...	...	...	...	...
44	14.6	14.4	14.2	14.1	...	...	...	...	...	...

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 Designation/ UNS No.	Class/Condition/ Temper
Nonferrous Materials (Cont'd)						
1	...	Castings	SB-148	...	C95200	M01
2	...	Castings	SB-271	...	C95200	M02
3	...	Castings	SB-505	...	C95200	M07
4	...	Castings	SB-148	...	C95400	M01
5	...	Castings	SB-271	...	C95400	M02
6	99Ni	Plate, sheet, strip	SB-162	...	N02200	As rolled
7	99Ni	Smls. pipe & tube	SB-161	...	N02200	Stress rel.
8	99Ni	Smls. tube	SB-163	...	N02200	Stress rel.
9	99Ni–Low C	Smls. pipe & tube	SB-161	...	N02201	Annealed
10	99Ni–Low C	Smls. & wld. fittings	SB-366	...	N02201	Annealed
11	99Ni–Low C	Bar, rod	SB-160	...	N02201	Hot rolled/ann.
12	99Ni–Low C	Smls. pipe & tube	SB-161	...	N02201	Annealed
13	99Ni–Low C	Smls. tube	SB-163	...	N02201	Annealed
14	99Ni–Low C	Plate, sheet, strip	SB-162	...	N02201	Hot rolled/ann.
15	67Ni–30Cu	Bar	SB-164	...	N04400	Annealed
16	67Ni–30Cu	Smls. pipe & tube	SB-165	...	N04400	Annealed
17	67Ni–30Cu	Forgings	SB-564	...	N04400	Annealed
18	67Ni–30Cu	Plate	SB-127	...	N04400	Annealed
19	67Ni–30Cu	Smls. tube	SB-163	...	N04400	Annealed
20	67Ni–30Cu	Smls. pipe & tube	SB-165	...	N04400	Annealed
21	67Ni–30Cu	Smls. & wld. fittings	SB-366	...	N04400	Annealed
22	67Ni–30Cu	Bar	SB-164	...	N04400	Hot worked
23	67Ni–30Cu	Plate	SB-127	...	N04400	As rolled
24	67Ni–30Cu	Bar, rod	SB-164	...	N04400	Hot worked
25	67Ni–30Cu	Rounds	SB-164	...	N04400	Hot worked
26	67Ni–30Cu	Rounds	SB-164	...	N04400	Hot worked
27	67Ni–30Cu	Rounds	SB-164	...	N04400	CW & SR
28	67Ni–30Cu	Rounds	SB-164	...	N04400	CW & SR
29	67Ni–30Cu	Smls. tube	SB-163	...	N04400	Stress rel.
30	67Ni–30Cu	Smls. pipe & tube	SB-165	...	N04400	Stress rel.
31	67Ni–30Cu	Rounds	SB-164	...	N04400	CW & SR
32	67Ni–30Cu	Rounds	SB-164	...	N04400	Cold worked
33	67Ni–30Cu–S	Bar	SB-164	...	N04405	Annealed
34	67Ni–30Cu–S	Bar	SB-164	...	N04405	Hot worked
35	67Ni–28Cu–3Al	Bolting	SF-468	...	N05500	Ann./aged
36	67Ni–28Cu–3Al	Bolting	SF-468	...	N05500	Ann./aged
37	47Ni–22Cr–9Mo–18Fe	Plate	SB-435	...	N06002	Annealed
38	47Ni–22Cr–9Mo–18Fe	Sheet	SB-435	...	N06002	Solution ann.
39	47Ni–22Cr–9Mo–18Fe	Rod	SB-572	...	N06002	Annealed
40	47Ni–22Cr–9Mo–18Fe	Smls. & wld. fittings	SB-366	...	N06002	Annealed
41	47Ni–22Cr–9Mo–18Fe	Sheet	SB-435	...	N06002	Annealed
42	47Ni–22Cr–9Mo–18Fe	Wld. pipe	SB-619	...	N06002	Solution ann.
43	47Ni–22Cr–9Mo–18Fe	Smls. pipe & tube	SB-622	...	N06002	Solution ann.
44	47Ni–22Cr–9Mo–18Fe	Wld. tube	SB-626	...	N06002	Solution ann.

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Nonferrous Materials (Cont'd)				
1	...	65	25	...
2	...	65	25	...
3	...	68	26	...
4	...	75	30	...
5	...	75	30	...
6	...	55	20	...
7	...	65	40	...
8	...	65	40	...
9	> 5 O.D.	50	10	...
10	...	50	10	...
11	...	50	10	...
12	≤ 5 O.D.	50	12	...
13	...	50	12	...
14	...	50	12	...
15	...	70	25	...
16	> 5 O.D.	70	25	...
17	...	70	25	...
18	...	70	28	...
19	≤ 3	70	28	...
20	≤ 5 O.D.	70	28	...
21	...	70	28	...
22	...	75	30	...
23	...	75	40	...
24	...	75	40	...
25	12 < t ≤ 14	75	40	...
26	≤ 12	80	40	...
27	< 1/2	84	50	...
28	3 1/2 < t ≤ 4	84	55	...
29	...	85	55	...
30	...	85	55	...
31	1/2 ≤ t ≤ 3 1/2	87	60	...
32	< 1/2	110	85	...
33	...	70	25	...
34	...	75	35	...
35	1.000–1.500	130	85	...
36	0.250–0.875	130	90	...
37	> 3/16	95	35	...
38	≤ 3/16	95	35	...
39	...	95	35	...
40	...	100	40	...
41	1/16 < t ≤ 3/16	100	40	...
42	...	100	40	...
43	...	100	40	...
44	...	100	40	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
Nonferrous Materials (Cont'd)									
1	25.0	23.5	22.8	22.2	21.7	21.4	21.3	21.2	21.2
2	25.0	23.5	22.8	22.2	21.7	21.4	21.3	21.2	21.2
3	26.0	24.5	23.7	23.0	22.6	22.3	22.1	22.1	22.1
4	30.0	28.5	28.0	27.8	27.8	27.8	27.8	27.8	27.8
5	30.0	28.5	28.0	27.8	27.8	27.8	27.8	27.8	27.8
6	20.0	20.0	20.0	20.0	20.0	20.0	20.0	19.6	18.9
7	40.0	38.7	38.4	38.3	38.3	38.3	38.2	37.9	37.5
8	40.0	38.7	38.4	38.3	38.3	38.3	38.2	37.9	37.5
9	10.0	9.7	9.6	9.5	9.4	9.4	9.4	9.4	9.4
10	10.0	9.7	9.6	9.5	9.4	9.4	9.4	9.4	9.4
11	10.0	9.7	9.6	9.5	9.4	9.4	9.4	9.4	9.4
12	12.0	11.7	11.5	11.4	11.3	11.2	11.2	11.2	11.2
13	12.0	11.7	11.5	11.4	11.3	11.2	11.2	11.2	11.2
14	12.0	11.7	11.5	11.4	11.3	11.2	11.2	11.2	11.2
15	25.0	23.0	21.9	21.0	20.4	20.0	19.7	19.7	19.7
16	25.0	23.0	21.9	21.0	20.4	20.0	19.7	19.7	19.7
17	25.0	23.0	21.9	21.0	20.4	20.0	19.7	19.7	19.7
18	28.0	25.8	24.5	23.6	22.8	22.4	22.1	22.0	22.0
19	28.0	25.8	24.5	23.6	22.8	22.4	22.1	22.0	22.0
20	28.0	25.8	24.5	23.6	22.8	22.4	22.1	22.0	22.0
21	28.0	25.8	24.5	23.6	22.8	22.4	22.1	22.0	22.0
22	30.0	29.6	29.1	28.5	27.9	27.3	26.9	26.6	26.4
23	40.0	39.5	38.8	37.9	37.1	36.4	35.9	35.5	35.2
24	40.0	39.5	38.8	37.9	37.1	36.4	35.9	35.5	35.2
25	40.0	...	38.8	...	37.1	...	35.9	...	35.2
26	40.0	...	38.8	...	37.1	...	35.9	...	35.2
27	50.0	...	47.2	...	45.8	...	45.0	...	45.0
28	55.0	...	51.8	...	50.4	...	49.7	...	49.2
29	55.0	52.9	51.8	51.0	50.4	50.0	49.7	49.5	49.2
30	55.0	52.9	51.8	51.0	50.4	50.0	49.7	49.5	49.2
31	60.0	...	56.6	...	54.9	...	54.0	...	54.0
32	85.0	...	80.2	...	77.8	...	76.5	...	76.5
33	25.0	23.0	21.9	21.0	20.4	20.0	19.7	19.7	19.7
34	35.0	34.6	33.9	33.2	32.5	31.9	31.4	31.0	30.8
35	85.0	...	81.2	...	79.4	...	78.2	...	77.5
36	90.0	...	86.0	...	84.0	...	82.8	...	82.1
37	35.0	32.9	31.5	30.1	28.8	27.7	26.6	25.7	24.8
38	35.0	32.9	31.5	30.1	28.8	27.7	26.6	25.7	24.8
39	35.0	32.9	31.5	30.1	28.8	27.7	26.6	25.7	24.8
40	40.0	37.5	35.9	34.4	33.0	31.6	30.4	29.3	28.4
41	40.0	37.5	35.9	34.4	33.0	31.6	30.4	29.3	28.4
42	40.0	37.5	35.9	34.4	33.0	31.6	30.4	29.3	28.4
43	40.0	37.5	35.9	34.4	33.0	31.6	30.4	29.3	28.4
44	40.0	37.5	35.9	34.4	33.0	31.6	30.4	29.3	28.4

2011a SECTION II, PART D (CUSTOMARY)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)									
1	21.2	21.2	...	...	...	...	...	...	...	...
2	21.2	21.2	...	...	...	...	...	...	...	...
3	22.1	22.1	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...
6	18.1	17.2	...	...	...	...	...	...	...	...
7	37.0	36.4	35.7	...	...	...	...	...	...	...
8	37.0	36.4	35.7	...	...	...	...	...	...	...
9	9.4	9.4	9.3	9.3	9.2	9.0	8.8	8.6	8.2	7.9
10	9.4	9.4	9.3	9.3	9.2	9.0	8.8	8.6	8.2	7.9
11	9.4	9.4	9.3	9.3	9.2	9.0	8.8	8.6	8.2	7.9
12	11.2	11.2	11.2	11.1	11.0	10.8	10.6	10.3	9.9	9.4
13	11.2	11.2	11.2	11.1	11.0	10.8	10.6	10.3	9.9	9.4
14	11.2	11.2	11.2	11.1	11.0	10.8	10.6	10.3	9.9	9.4
15	19.7	19.7	19.7	19.6	19.4	19.1	18.9	18.8	...	...
16	19.7	19.7	19.7	19.6	19.4	19.1	18.9	18.8	...	...
17	19.7	19.7	19.7	19.6	19.4	19.1	18.9	18.8	...	...
18	22.0	22.0	22.0	21.9	21.7	21.4	21.2	21.1	...	...
19	22.0	22.0	22.0	21.9	21.7	21.4	21.2	21.1	...	...
20	22.0	22.0	22.0	21.9	21.7	21.4	21.2	21.1	...	...
21	22.0	22.0	22.0	21.9	21.7	21.4	21.2	21.1	...	...
22	26.2	26.0	25.8	25.5	25.2	24.7	24.2	23.7	...	...
23	34.9	34.7	34.4	34.0	33.5	32.9	32.3	31.6	...	...
24	34.9	34.7	34.4	34.0	33.5	32.9	32.3	31.6	...	...
25	...	34.7	34.4	34.0	33.5	32.9	...	...	...	...
26	...	34.7	34.4	34.0	33.5	32.9	...	...	...	...
27	...	44.2	42.1	42.1	41.8	40.4	...	...	...	...
28	...	48.1	47.3	46.3	45.3	44.4	...	...	...	...
29	48.7	48.1	47.3	46.3	45.3	44.4	...	...	...	...
30	48.7	48.1	47.3	46.3	45.3	44.4	...	...	...	...
31	...	53.0	50.5	50.5	50.1	48.5	...	...	...	...
32	...	75.1	71.6	71.6	71.0	68.7	...	...	...	...
33	19.7	19.7	19.7	19.6	19.4	19.1	18.9	18.8	...	...
34	30.6	30.3	30.1	29.8	29.3	28.8	28.2	27.7	...	...
35	...	77.1	76.9	76.7	...	...	...	...	...	...
36	...	81.6	81.4	81.2	...	...	...	...	...	...
37	24.1	23.5	23.0	22.6	22.3	22.1	21.9	21.7	21.6	21.5
38	24.1	23.5	23.0	22.6	22.3	22.1	21.9	21.7	21.6	21.5
39	24.1	23.5	23.0	22.6	22.3	22.1	21.9	21.7	21.6	21.5
40	27.5	26.9	26.3	25.8	25.5	25.2	25.0	24.9	24.7	24.6
41	27.5	26.9	26.3	25.8	25.5	25.2	25.0	24.9	24.7	24.6
42	27.5	26.9	26.3	25.8	25.5	25.2	25.0	24.9	24.7	24.6
43	27.5	26.9	26.3	25.8	25.5	25.2	25.0	24.9	24.7	24.6
44	27.5	26.9	26.3	25.8	25.5	25.2	25.0	24.9	24.7	24.6

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 Designation/ UNS No.	Class/Condition/ Temper
Nonferrous Materials (Cont'd)						
1	47Ni-22Cr-19Fe-6Mo	Rod	SB-581	...	N06007	Solution ann.
2	47Ni-22Cr-19Fe-6Mo	Plate, sheet, strip	SB-582	...	N06007	Solution ann.
3	47Ni-22Cr-19Fe-6Mo	Smls. & wld. fittings	SB-366	...	N06007	Annealed
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	Wld. pipe	SB-619	...	N06007	Solution ann.
7	47Ni-22Cr-19Fe-6Mo	Smls. pipe & tube	SB-622	...	N06007	Solution ann.
8	47Ni-22Cr-19Fe-6Mo	Wld. tube	SB-626	...	N06007	Solution ann.
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-564	...	N06022	Solution ann.
12	55Ni-21Cr-13.5Mo	Rod	SB-574	...	N06022	Solution ann.
13	55Ni-21Cr-13.5Mo	Plate, sheet, strip	SB-575	...	N06022	Solution ann.
14	55Ni-21Cr-13.5Mo	Wld. pipe	SB-619	...	N06022	Solution ann.
15	55Ni-21Cr-13.5Mo	Smls. pipe & tube	SB-622	...	N06022	Solution ann.
16	55Ni-21Cr-13.5Mo	Wld. tube	SB-626	...	N06022	Solution ann.
17	40Ni-29Cr-15Fe-5Mo	Smls. & wld. fittings	SB-366	...	N06030	Solution ann.
18	40Ni-29Cr-15Fe-5Mo	Forgings	SB-462	...	N06030	Solution ann.
19	40Ni-29Cr-15Fe-5Mo	Rod	SB-581	...	N06030	Solution ann.
20	40Ni-29Cr-15Fe-5Mo	Plate, sheet, strip	SB-582	...	N06030	Solution ann.
21	40Ni-29Cr-15Fe-5Mo	Wld. pipe	SB-619	...	N06030	Solution ann.
22	40Ni-29Cr-15Fe-5Mo	Smls. pipe & tube	SB-622	...	N06030	Solution ann.
23	40Ni-29Cr-15Fe-5Mo	Wld. tube	SB-626	...	N06030	Solution ann.
24	58Ni-33Cr-8Mo	Smls. & wld. fittings	SB-366	...	N06035	Solution ann.
25	58Ni-33Cr-8Mo	Forgings	SB-462	...	N06035	Solution ann.
26	58Ni-33Cr-8Mo	Forgings	SB-564	...	N06035	Solution ann.
27	58Ni-33Cr-8Mo	Rod	SB-574	...	N06035	Solution ann.
28	58Ni-33Cr-8Mo	Plate, sheet, strip	SB-575	...	N06035	Solution ann.
29	58Ni-33Cr-8Mo	Wld. pipe	SB-619	...	N06035	Solution ann.
30	58Ni-33Cr-8Mo	Smls. pipe & tube	SB-622	...	N06035	Solution ann.
31	58Ni-33Cr-8Mo	Wld. tube	SB-626	...	N06035	Solution ann.
32	46Ni-27Cr-23Fe-2.75Si	Rod	SB-166	...	N06045	Solution ann.
33	46Ni-27Cr-23Fe-2.75Si	Smls. pipe & tube	SB-167	...	N06045	Solution ann.
34	46Ni-27Cr-23Fe-2.75Si	Plate, sheet, strip	SB-168	...	N06045	Solution ann.
35	46Ni-27Cr-23Fe-2.75Si	Smls. & wld. fittings	SB-366	...	N06045	Solution ann.
36	46Ni-27Cr-23Fe-2.75Si	Wld. tube	SB-516	...	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	59Ni-23Cr-16Mo	Fittings	SB-366	CR5923	N06059	Annealed
40	59Ni-23Cr-16Mo	Fittings	SB-366	WP5923	N06059	Annealed
41	59Ni-23Cr-16Mo	Wld. fittings	SB-366	WP5923W	N06059	Annealed
42	59Ni-23Cr-16Mo	Fittings	SB-366	WP5923WX	N06059	Annealed

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Nonferrous Materials (Cont'd)				
1	$> \frac{3}{4}$	85	30	...
2	$> \frac{3}{4}$	85	30	...
3	...	90	35	...
4	$\leq \frac{3}{4}$	90	35	...
5	$\leq \frac{3}{4}$	90	35	...
6	...	90	35	...
7	...	90	35	...
8	...	90	35	...
9	...	100	45	...
10	...	100	45	...
11	...	100	45	...
12	...	100	45	...
13	...	100	45	...
14	...	100	45	...
15	...	100	45	...
16	...	100	45	...
17	...	85	35	...
18	...	85	35	...
19	...	85	35	...
20	...	85	35	...
21	...	85	35	...
22	...	85	35	...
23	...	85	35	...
24	...	85	35	...
25	...	85	35	...
26	...	85	35	...
27	...	85	35	...
28	...	85	35	...
29	...	85	35	...
30	...	85	35	...
31	...	85	35	...
32	...	90	35	...
33	...	90	35	...
34	...	90	35	...
35	...	90	35	...
36	...	90	35	...
37	...	90	35	...
38	...	90	35	...
39	...	100	45	...
40	...	100	45	...
41	...	100	45	...
42	...	100	45	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Nonferrous Materials (Cont'd)								
1	30.0	28.1	27.0	25.9	25.0	24.2	23.5	22.9	22.4
2	30.0	28.1	27.0	25.9	25.0	24.2	23.5	22.9	22.4
3	35.0	32.8	31.4	30.2	29.2	28.2	27.4	26.7	26.1
4	35.0	32.8	31.4	30.2	29.2	28.2	27.4	26.7	26.1
5	35.0	32.8	31.4	30.2	29.2	28.2	27.4	26.7	26.1
6	35.0	32.8	31.4	30.2	29.2	28.2	27.4	26.7	26.1
7	35.0	32.8	31.4	30.2	29.2	28.2	27.4	26.7	26.1
8	35.0	32.8	31.4	30.2	29.2	28.2	27.4	26.7	26.1
9	45.0	42.0	40.1	38.4	36.9	35.5	34.3	33.2	32.2
10	45.0	42.0	40.1	38.4	36.9	35.5	34.3	33.2	32.2
11	45.0	42.0	40.1	38.4	36.9	35.5	34.3	33.2	32.2
12	45.0	42.0	40.1	38.4	36.9	35.5	34.3	33.2	32.2
13	45.0	42.0	40.1	38.4	36.9	35.5	34.3	33.2	32.2
14	45.0	42.0	40.1	38.4	36.9	35.5	34.3	33.2	32.2
15	45.0	42.0	40.1	38.4	36.9	35.5	34.3	33.2	32.2
16	45.0	42.0	40.1	38.4	36.9	35.5	34.3	33.2	32.2
17	35.0	31.7	30.0	28.6	27.5	26.6	25.8	25.1	24.6
18	35.0	31.7	30.0	28.6	27.5	26.6	25.8	25.1	24.6
19	35.0	31.7	30.0	28.6	27.5	26.6	25.8	25.1	24.6
20	35.0	31.7	30.0	28.6	27.5	26.6	25.8	25.1	24.6
21	35.0	31.7	30.0	28.6	27.5	26.6	25.8	25.1	24.6
22	35.0	31.7	30.0	28.6	27.5	26.6	25.8	25.1	24.6
23	35.0	31.7	30.0	28.6	27.5	26.6	25.8	25.1	24.6
24	35.0	...	30.6	...	27.3	...	24.7	...	22.9
25	35.0	...	30.6	...	27.3	...	24.7	...	22.9
26	35.0	...	30.6	...	27.3	...	24.7	...	22.9
27	35.0	...	30.6	...	27.3	...	24.7	...	22.9
28	35.0	...	30.6	...	27.3	...	24.7	...	22.9
29	35.0	...	30.6	...	27.3	...	24.7	...	22.9
30	35.0	...	30.6	...	27.3	...	24.7	...	22.9
31	35.0	...	30.6	...	27.3	...	24.7	...	22.9
32	35.0	...	31.4	...	28.9	...	27.1	...	26.0
33	35.0	...	31.4	...	28.9	...	27.1	...	26.0
34	35.0	...	31.4	...	28.9	...	27.1	...	26.0
35	35.0	...	31.4	...	28.9	...	27.1	...	26.0
36	35.0	...	31.4	...	28.9	...	27.1	...	26.0
37	35.0	...	31.4	...	28.9	...	27.1	...	26.0
38	35.0	...	31.4	...	28.9	...	27.1	...	26.0
39	45.0	42.8	40.4	39.1	37.8	36.9	35.8	34.8	33.9
40	45.0	42.8	40.4	39.1	37.8	36.9	35.8	34.8	33.9
41	45.0	42.8	40.4	39.1	37.8	36.9	35.8	34.8	33.9
42	45.0	42.8	40.4	39.1	37.8	36.9	35.8	34.8	33.9

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)									
1	22.0	21.6	21.3	21.1	20.9	20.8	20.7	20.6	20.5	20.4
2	22.0	21.6	21.3	21.1	20.9	20.8	20.7	20.6	20.5	20.4
3	25.6	25.2	24.9	24.6	24.4	24.2	24.1	24.0	23.9	23.8
4	25.6	25.2	24.9	24.6	24.4	24.2	24.1	24.0	23.9	23.8
5	25.6	25.2	24.9	24.6	24.4	24.2	24.1	24.0	23.9	23.8
6	25.6	25.2	24.9	24.6	24.4	24.2	24.1	24.0	23.9	23.8
7	25.6	25.2	24.9	24.6	24.4	24.2	24.1	24.0	23.9	23.8
8	25.6	25.2	24.9	24.6	24.4	24.2	24.1	24.0	23.9	23.8
9	31.4	30.6	30.0	29.4	29.0	28.6	28.2	27.9	27.7	27.5
10	31.4	30.6	30.0	29.4	29.0	28.6	28.2	27.9	27.7	27.5
11	31.4	30.6	30.0	29.4	29.0	28.6	28.2	27.9	27.7	27.5
12	31.4	30.6	30.0	29.4	29.0	28.6	28.2	27.9	27.7	27.5
13	31.4	30.6	30.0	29.4	29.0	28.6	28.2	27.9	27.7	27.5
14	31.4	30.6	30.0	29.4	29.0	28.6	28.2	27.9	27.7	27.5
15	31.4	30.6	30.0	29.4	29.0	28.6	28.2	27.9	27.7	27.5
16	31.4	30.6	30.0	29.4	29.0	28.6	28.2	27.9	27.7	27.5
17	24.1	23.6	23.2	22.8	22.3	21.9	21.5	21.1	20.9	20.7
18	24.1	23.6	23.2	22.8	22.3	21.9	21.5	21.1	20.9	20.7
19	24.1	23.6	23.2	22.8	22.3	21.9	21.5	21.1	20.9	20.7
20	24.1	23.6	23.2	22.8	22.3	21.9	21.5	21.1	20.9	20.7
21	24.1	23.6	23.2	22.8	22.3	21.9	21.5	21.1	20.9	20.7
22	24.1	23.6	23.2	22.8	22.3	21.9	21.5	21.1	20.9	20.7
23	24.1	23.6	23.2	22.8	22.3	21.9	21.5	21.1	20.9	20.7
24	...	21.9	21.6	21.3	21.1	20.8	20.6	20.2	19.8	19.3
25	...	21.9	21.6	21.3	21.1	20.8	20.6	20.2	19.8	19.3
26	...	21.9	21.6	21.3	21.1	20.8	20.6	20.2	19.8	19.3
27	...	21.9	21.6	21.3	21.1	20.8	20.6	20.2	19.8	19.3
28	...	21.9	21.6	21.3	21.1	20.8	20.6	20.2	19.8	19.3
29	...	21.9	21.6	21.3	21.1	20.8	20.6	20.2	19.8	19.3
30	...	21.9	21.6	21.3	21.1	20.8	20.6	20.2	19.8	19.3
31	...	21.9	21.6	21.3	21.1	20.8	20.6	20.2	19.8	19.3
32	...	25.4	25.3	25.1	25.0	24.9	24.7	24.5	24.3	23.9
33	...	25.4	25.3	25.1	25.0	24.9	24.7	24.5	24.3	23.9
34	...	25.4	25.3	25.1	25.0	24.9	24.7	24.5	24.3	23.9
35	...	25.4	25.3	25.1	25.0	24.9	24.7	24.5	24.3	23.9
36	...	25.4	25.3	25.1	25.0	24.9	24.7	24.5	24.3	23.9
37	...	25.4	25.3	25.1	25.0	24.9	24.7	24.5	24.3	23.9
38	...	25.4	25.3	25.1	25.0	24.9	24.7	24.5	24.3	23.9
39	33.0	32.1	31.2	30.3	29.4	28.6	27.8	27.0	26.3	25.7
40	33.0	32.1	31.2	30.3	29.4	28.6	27.8	27.0	26.3	25.7
41	33.0	32.1	31.2	30.3	29.4	28.6	27.8	27.0	26.3	25.7
42	33.0	32.1	31.2	30.3	29.4	28.6	27.8	27.0	26.3	25.7

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 Designation/ UNS No.	Class/Condition/ Temper
Nonferrous Materials (Cont'd)						
1	59Ni-23Cr-16Mo	Forgings	SB-564	...	N06059	Solution ann.
2	59Ni-23Cr-16Mo	Rod	SB-574	...	N06059	Solution ann.
3	59Ni-23Cr-16Mo	Plate, sheet, strip	SB-575	...	N06059	Solution ann.
4	59Ni-23Cr-16Mo	Wld. pipe	SB-619	...	N06059	Solution ann.
5	59Ni-23Cr-16Mo	Smls. pipe & tube	SB-622	...	N06059	Solution ann.
6	59Ni-23Cr-16Mo	Wld. tube	SB-626	...	N06059	Solution ann.
7	59Ni-23Cr-16Mo-1.6Cu	Fittings	SB-366	...	N06200	Solution ann.
8	59Ni-23Cr-16Mo-1.6Cu	Forgings	SB-462	...	N06200	Solution ann.
9	59Ni-23Cr-16Mo-1.6Cu	Forgings	SB-564	...	N06200	Solution ann.
10	59Ni-23Cr-16Mo-1.6Cu	Rod	SB-574	...	N06200	Solution ann.
11	59Ni-23Cr-16Mo-1.6Cu	Plate, sheet, strip	SB-575	...	N06200	Solution ann.
12	59Ni-23Cr-16Mo-1.6Cu	Wld. pipe	SB-619	...	N06200	Solution ann.
13	59Ni-23Cr-16Mo-1.6Cu	Smls. pipe & tube	SB-622	...	N06200	Solution ann.
14	59Ni-23Cr-16Mo-1.6Cu	Wld. tube	SB-626	...	N06200	Solution ann.
15	60Ni-19Cr-19Mo-1.8Ta	Smls. & wld. fittings	SB-366	...	N06210	Solution ann.
16	60Ni-19Cr-19Mo-1.8Ta	Forgings	SB-564	...	N06210	Solution ann.
17	60Ni-19Cr-19Mo-1.8Ta	Rod	SB-574	...	N06210	Solution ann.
18	60Ni-19Cr-19Mo-1.8Ta	Plate, sheet, strip	SB-575	...	N06210	Solution ann.
19	60Ni-19Cr-19Mo-1.8Ta	Wld. pipe	SB-619	...	N06210	Solution ann.
20	60Ni-19Cr-19Mo-1.8Ta	Smls. pipe & tube	SB-622	...	N06210	Solution ann.
21	60Ni-19Cr-19Mo-1.8Ta	Wld. tube	SB-626	...	N06210	Solution ann.
22	57Ni-22Cr-14W-2Mo-La	Plate, sheet, strip	SB-435	...	N06230	Solution ann.
23	57Ni-22Cr-14W-2Mo-La	Forgings	SB-564	...	N06230	Solution ann.
24	57Ni-22Cr-14W-2Mo-La	Bar	SB-572	...	N06230	Solution ann.
25	57Ni-22Cr-14W-2Mo-La	Wld. pipe	SB-619	...	N06230	Solution ann.
26	57Ni-22Cr-14W-2Mo-La	Smls. pipe & tube	SB-622	...	N06230	Solution ann.
27	57Ni-22Cr-14W-2Mo-La	Wld. tube	SB-626	...	N06230	Solution ann.
28	61Ni-16Mo-16Cr	Smls. & wld. fittings	SB-366	...	N06455	Annealed
29	61Ni-16Mo-16Cr	Rod	SB-574	...	N06455	Solution ann.
30	61Ni-16Mo-16Cr	Plate, sheet, strip	SB-575	...	N06455	Solution ann.
31	61Ni-16Mo-16Cr	Wld. pipe	SB-619	...	N06455	Solution ann.
32	61Ni-16Mo-16Cr	Smls. pipe & tube	SB-622	...	N06455	Solution ann.
33	61Ni-16Mo-16Cr	Wld. tube	SB-626	...	N06455	Solution ann.
34	72Ni-15Cr-8Fe	Smls. pipe & tube	SB-167	...	N06600	Hot fin./ann.
35	72Ni-15Cr-8Fe	Smls. pipe & tube	SB-167	...	N06600	Hot fin./ann.
36	72Ni-15Cr-8Fe	Smls. & wld. fittings	SB-366	...	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	Hot fin./ann.
39	72Ni-15Cr-8Fe	Smls. tube	SB-163	...	N06600	Annealed
40	72Ni-15Cr-8Fe	Bar	SB-166	...	N06600	Annealed
41	72Ni-15Cr-8Fe	Plate	SB-168	...	N06600	Annealed
42	72Ni-15Cr-8Fe	Wld. tube	SB-516	...	N06600	Annealed
43	72Ni-15Cr-8Fe	Forgings	SB-564	...	N06600	...
44	72Ni-15Cr-8Fe	Pipe, tube	SB-167	...	N06600	Cold drawn/ann.
45	72Ni-15Cr-8Fe	Wld. pipe	SB-517	...	N06600	Cold drawn/ann.
46	72Ni-15Cr-8Fe	Smls. tube	SB-163	...	N06600	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Nonferrous Materials (Cont'd)				
1	...	100	45	...
2	...	100	45	...
3	...	100	45	...
4	...	100	45	...
5	...	100	45	...
6	...	100	45	...
7	...	100	45	...
8	...	100	45	...
9	...	100	45	...
10	...	100	45	...
11	...	100	45	...
12	...	100	45	...
13	...	100	45	...
14	...	100	45	...
15	...	100	45	...
16	...	100	45	...
17	...	100	45	...
18	...	100	45	...
19	...	100	45	...
20	...	100	45	...
21	...	100	45	...
22	...	110	45	...
23	...	110	45	...
24	...	110	45	...
25	...	110	45	...
26	...	110	45	...
27	...	110	45	...
28	...	100	40	...
29	...	100	40	...
30	...	100	40	...
31	...	100	40	...
32	...	100	40	...
33	...	100	40	...
34	> 5	75	25	...
35	> 5	80	30	...
36	...	80	30	...
37	> 5	80	30	...
38	≤ 5	80	30	...
39	≤ 3	80	35	...
40	...	80	35	...
41	...	80	35	...
42	...	80	35	...
43	...	80	35	...
44	≤ 5	80	35	...
45	...	80	35	...
46	...	80	40	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
Nonferrous Materials (Cont'd)									
1	45.0	42.8	40.4	39.1	37.8	36.9	35.8	34.8	33.9
2	45.0	42.8	40.4	39.1	37.8	36.9	35.8	34.8	33.9
3	45.0	42.8	40.4	39.1	37.8	36.9	35.8	34.8	33.9
4	45.0	42.8	40.4	39.1	37.8	36.9	35.8	34.8	33.9
5	45.0	42.8	40.4	39.1	37.8	36.9	35.8	34.8	33.9
6	45.0	42.8	40.4	39.1	37.8	36.9	35.8	34.8	33.9
7	45.0	...	40.4	...	37.2	...	34.3	...	31.8
8	45.0	...	40.4	...	37.2	...	34.3	...	31.8
9	45.0	...	40.4	...	37.2	...	34.3	...	31.8
10	45.0	...	40.4	...	37.2	...	34.3	...	31.8
11	45.0	...	40.4	...	37.2	...	34.3	...	31.8
12	45.0	...	40.4	...	37.2	...	34.3	...	31.8
13	45.0	...	40.4	...	37.2	...	34.3	...	31.8
14	45.0	...	40.4	...	37.2	...	34.3	...	31.8
15	45.0	...	40.0	...	36.8	...	33.9	...	31.4
16	45.0	...	40.0	...	36.8	...	33.9	...	31.4
17	45.0	...	40.0	...	36.8	...	33.9	...	31.4
18	45.0	...	40.0	...	36.8	...	33.9	...	31.4
19	45.0	...	40.0	...	36.8	...	33.9	...	31.4
20	45.0	...	40.0	...	36.8	...	33.9	...	31.4
21	45.0	...	40.0	...	36.8	...	33.9	...	31.4
22	45.0	...	42.3	...	39.6	...	37.0	...	34.7
23	45.0	...	42.3	...	39.6	...	37.0	...	34.7
24	45.0	...	42.3	...	39.6	...	37.0	...	34.7
25	45.0	...	42.3	...	39.6	...	37.0	...	34.7
26	45.0	...	42.3	...	39.6	...	37.0	...	34.7
27	45.0	...	42.3	...	39.6	...	37.0	...	34.7
28	40.0	38.2	36.9	35.6	34.5	33.5	32.6	31.8	31.2
29	40.0	38.2	36.9	35.6	34.5	33.5	32.6	31.8	31.2
30	40.0	38.2	36.9	35.6	34.5	33.5	32.6	31.8	31.2
31	40.0	38.2	36.9	35.6	34.5	33.5	32.6	31.8	31.2
32	40.0	38.2	36.9	35.6	34.5	33.5	32.6	31.8	31.2
33	40.0	38.2	36.9	35.6	34.5	33.5	32.6	31.8	31.2
34	25.0	24.3	23.8	23.3	22.8	22.3	21.9	21.4	21.0
35	30.0	29.2	28.6	28.0	27.4	26.8	26.2	25.7	25.2
36	30.0	29.2	28.6	28.0	27.4	26.8	26.2	25.7	25.2
37	30.0	29.2	28.6	28.0	27.4	26.8	26.2	25.7	25.2
38	30.0	29.2	28.6	28.0	27.4	26.8	26.2	25.7	25.2
39	35.0	32.8	32.0	31.5	31.2	30.9	30.7	30.5	30.3
40	35.0	32.8	32.0	31.5	31.2	30.9	30.7	30.5	30.3
41	35.0	32.8	32.0	31.5	31.2	30.9	30.7	30.5	30.3
42	35.0	32.8	32.0	31.5	31.2	30.9	30.7	30.5	30.3
43	35.0	32.8	32.0	31.5	31.2	30.9	30.7	30.5	30.3
44	35.0	32.8	32.0	31.5	31.2	30.9	30.7	30.5	30.3
45	35.0	32.8	32.0	31.5	31.2	30.9	30.7	30.5	30.3
46	40.0	...	36.6	...	35.6	...	35.1	...	34.7

2011a SECTION II, PART D (CUSTOMARY)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)									
1	33.0	32.1	31.2	30.3	29.4	28.6	27.8	27.0	26.3	25.7
2	33.0	32.1	31.2	30.3	29.4	28.6	27.8	27.0	26.3	25.7
3	33.0	32.1	31.2	30.3	29.4	28.6	27.8	27.0	26.3	25.7
4	33.0	32.1	31.2	30.3	29.4	28.6	27.8	27.0	26.3	25.7
5	33.0	32.1	31.2	30.3	29.4	28.6	27.8	27.0	26.3	25.7
6	33.0	32.1	31.2	30.3	29.4	28.6	27.8	27.0	26.3	25.7
7	...	29.8	29.1	28.6	28.2	28.0	27.8	27.6	27.2	26.4
8	...	29.8	29.1	28.6	28.2	28.0	27.8	27.6	27.2	26.4
9	...	29.8	29.1	28.6	28.2	28.0	27.8	27.6	27.2	26.4
10	...	29.8	29.1	28.6	28.2	28.0	27.8	27.6	27.2	26.4
11	...	29.8	29.1	28.6	28.2	28.0	27.8	27.6	27.2	26.4
12	...	29.8	29.1	28.6	28.2	28.0	27.8	27.6	27.2	26.4
13	...	29.8	29.1	28.6	28.2	28.0	27.8	27.6	27.2	26.4
14	...	29.8	29.1	28.6	28.2	28.0	27.8	27.6	27.2	26.4
15	...	29.3	28.4	27.5	26.8	26.2	25.7	25.2	24.9	24.7
16	...	29.3	28.4	27.5	26.8	26.2	25.7	25.2	24.9	24.7
17	...	29.3	28.4	27.5	26.8	26.2	25.7	25.2	24.9	24.7
18	...	29.3	28.4	27.5	26.8	26.2	25.7	25.2	24.9	24.7
19	...	29.3	28.4	27.5	26.8	26.2	25.7	25.2	24.9	24.7
20	...	29.3	28.4	27.5	26.8	26.2	25.7	25.2	24.9	24.7
21	...	29.3	28.4	27.5	26.8	26.2	25.7	25.2	24.9	24.7
22	...	32.9	32.3	31.9	31.6	31.4	31.3	31.3	31.3	31.3
23	...	32.9	32.3	31.9	31.6	31.4	31.3	31.3	31.3	31.3
24	...	32.9	32.3	31.9	31.6	31.4	31.3	31.3	31.3	31.3
25	...	32.9	32.3	31.9	31.6	31.4	31.3	31.3	31.3	31.3
26	...	32.9	32.3	31.9	31.6	31.4	31.3	31.3	31.3	31.3
27	...	32.9	32.3	31.9	31.6	31.4	31.3	31.3	31.3	31.3
28	30.6	30.2	29.8	29.4	29.0	28.7	28.3	27.9	27.6	27.3
29	30.6	30.2	29.8	29.4	29.0	28.7	28.3	27.9	27.6	27.3
30	30.6	30.2	29.8	29.4	29.0	28.7	28.3	27.9	27.6	27.3
31	30.6	30.2	29.8	29.4	29.0	28.7	28.3	27.9	27.6	27.3
32	30.6	30.2	29.8	29.4	29.0	28.7	28.3	27.9	27.6	27.3
33	30.6	30.2	29.8	29.4	29.0	28.7	28.3	27.9	27.6	27.3
34	20.6	20.3	19.9	19.6	19.3	19.1	18.8	18.6	...	...
35	24.7	24.3	23.9	23.5	23.2	22.9	22.6	22.3	...	...
36	24.7	24.3	23.9	23.5	23.2	22.9	22.6	22.3	...	...
37	24.7	24.3	23.9	23.5	23.2	22.9	22.6	22.3	...	...
38	24.7	24.3	23.9	23.5	23.2	22.9	22.6	22.3	...	...
39	30.1	29.9	29.7	29.4	29.1	28.7	28.1	27.3	...	...
40	30.1	29.9	29.7	29.4	29.1	28.7	28.1	27.3	...	...
41	30.1	29.9	29.7	29.4	29.1	28.7	28.1	27.3	...	...
42	30.1	29.9	29.7	29.4	29.1	28.7	28.1	27.3	...	...
43	30.1	29.9	29.7	29.4	29.1	28.7	28.1	27.3	...	...
44	30.1	29.9	29.7	29.4	29.1	28.7	28.1	27.3	...	...
45	30.1	29.9	29.7	29.4	29.1	28.7	28.1	27.3	...	...
46	...	34.2	33.9	33.6	33.2	32.8	...	...	...	...

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 Designation/ UNS No.	Class/Condition/ Temper
Nonferrous Materials (Cont'd)						
1	72Ni-15Cr-8Fe	Bar, rod	SB-166	...	N06600	Hot worked
2	72Ni-15Cr-8Fe	Plate, sheet, strip	SB-168	...	N06600	Hot rolled
3	72Ni-15Cr-8Fe	Rounds	SB-166	...	N06600	Hot worked
4	72Ni-15Cr-8Fe	Rounds	SB-166	...	N06600	Hot worked
5	60Ni-23Cr-Fe	Smls. tube	SB-163	...	N06601	Annealed
6	60Ni-23Cr-Fe	Bar	SB-166	...	N06601	Annealed
7	60Ni-23Cr-Fe	Smls. pipe & tube	SB-167	...	N06601	Annealed
8	60Ni-23Cr-Fe	Plate, sheet, strip	SB-168	...	N06601	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	Plate, sheet, strip	SB-168	...	N06617	Annealed
12	52Ni-22Cr-13Co-9Mo	Forgings	SB-564	...	N06617	Annealed
13	60Ni-22Cr-9Mo-3.5Cb	Plate, sheet, strip	SB-443	2	N06625	Solution ann.
14	60Ni-22Cr-9Mo-3.5Cb	Smls. pipe & tube	SB-444	2	N06625	Solution ann.
15	60Ni-22Cr-9Mo-3.5Cb	Bar	SB-446	2	N06625	Solution ann.
16	60Ni-22Cr-9Mo-3.5Cb	Smls. & wld. fittings	SB-366	...	N06625	Annealed
17	60Ni-22Cr-9Mo-3.5Cb	Bar	SB-446	1	N06625	Annealed
18	60Ni-22Cr-9Mo-3.5Cb	Forgings	SB-564	...	N06625	Annealed
19	60Ni-22Cr-9Mo-3.5Cb	Plate, sheet, strip	SB-443	1	N06625	Annealed
20	60Ni-22Cr-9Mo-3.5Cb	Plate, sheet, strip	SB-443	1	N06625	Annealed
21	60Ni-22Cr-9Mo-3.5Cb	Smls. pipe	SB-444	1	N06625	Annealed
22	60Ni-22Cr-9Mo-3.5Cb	Bar	SB-446	1	N06625	Annealed
23	60Ni-22Cr-9Mo-3.5Cb	Forgings	SB-564	...	N06625	Annealed
24	60Ni-22Cr-9Mo-3.5Cb	Wld. tube	SB-704	...	N06625	Annealed
25	60Ni-22Cr-9Mo-3.5Cb	Wld. pipe	SB-705	...	N06625	Annealed
26	Ni-Cr-Mo-W	Forgings	SB-564	...	N06686	Solution ann.
27	Ni-Cr-Mo-W	Rod	SB-574	...	N06686	Solution ann.
28	Ni-Cr-Mo-W	Plate, sheet, strip	SB-575	...	N06686	Solution ann.
29	Ni-Cr-Mo-W	Wld. pipe	SB-619	...	N06686	Solution ann.
30	Ni-Cr-Mo-W	Smls. pipe & tube	SB-622	...	N06686	Solution ann.
31	Ni-Cr-Mo-W	Wld. tube	SB-626	...	N06686	Solution ann.
32	58Ni-29Cr-9Fe	Smls. tube	SB-163	...	N06690	Annealed
33	58Ni-29Cr-9Fe	Bar, rod	SB-166	...	N06690	Annealed
34	58Ni-29Cr-9Fe	Smls. pipe & tube	SB-167	...	N06690	Annealed
35	58Ni-29Cr-9Fe	Plate, sheet, strip	SB-168	...	N06690	Annealed
36	58Ni-29Cr-9Fe	Forgings	SB-564	...	N06690	Annealed
37	58Ni-29Cr-9Fe	Smls. tube	SB-163	...	N06690	Annealed
38	49Ni-25Cr-18Fe-6Mo	Plate, sheet, strip	SB-582	...	N06975	Solution ann.
39	49Ni-25Cr-18Fe-6Mo	Wld. pipe	SB-619	...	N06975	Solution ann.
40	49Ni-25Cr-18Fe-6Mo	Smls. pipe & tube	SB-622	...	N06975	Solution ann.
41	49Ni-25Cr-18Fe-6Mo	Wld. tube	SB-626	...	N06975	Solution ann.

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Nonferrous Materials (Cont'd)				
1	> 3	85	35	...
2	...	85	35	...
3	$\frac{1}{2} < t \leq 3$	90	40	...
4	$\frac{1}{4} \leq t \leq \frac{1}{2}$	95	45	...
5	≤ 3 O.D.	80	30	...
6	...	80	30	...
7	...	80	30	...
8	...	80	30	...
9	...	95	35	...
10	...	95	35	...
11	...	95	35	...
12	...	95	35	...
13	...	100	40	...
14	...	100	40	...
15	...	100	40	...
16	...	110	50	...
17	$4 < t \leq 10$	110	50	...
18	$4 < t \leq 10$	110	50	...
19	...	110	55	...
20	...	120	60	...
21	...	120	60	...
22	≤ 4	120	60	...
23	≤ 4	120	60	...
24	...	120	60	...
25	...	120	60	...
26	...	100	45	...
27	...	100	45	...
28	...	100	45	...
29	≤ 8	100	45	...
30	...	100	45	...
31	$\leq 3\frac{1}{2}$	100	45	...
32	...	85	35	...
33	...	85	35	...
34	...	85	35	...
35	...	85	35	...
36	...	85	35	...
37	...	85	40	...
38	...	85	32	...
39	...	85	32	...
40	...	85	32	...
41	...	85	32	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
Nonferrous Materials (Cont'd)									
1	35.0	33.8	33.2	32.7	32.3	32.1	31.9	31.9	31.9
2	35.0	33.8	33.2	32.7	32.3	32.1	31.9	31.9	31.9
3	40.0	...	38.0	...	37.0	...	36.4	...	36.4
4	45.0	...	42.8	...	41.7	...	41.0	...	40.9
5	30.0	27.8	26.8	25.8	24.9	24.0	23.3	22.7	22.1
6	30.0	27.8	26.8	25.8	24.9	24.0	23.3	22.7	22.1
7	30.0	27.8	26.8	25.8	24.9	24.0	23.3	22.7	22.1
8	30.0	27.8	26.8	25.8	24.9	24.0	23.3	22.7	22.1
9	35.0	...	31.1	...	28.9	...	27.1	...	25.9
10	35.0	...	31.1	...	28.9	...	27.1	...	25.9
11	35.0	...	31.1	...	28.9	...	27.1	...	25.9
12	35.0	...	31.1	...	28.9	...	27.1	...	25.9
13	40.0	38.0	36.9	36.0	35.1	34.3	33.7	33.0	32.5
14	40.0	38.0	36.9	36.0	35.1	34.3	33.7	33.0	32.5
15	40.0	38.0	36.9	36.0	35.1	34.3	33.7	33.0	32.5
16	50.0	48.9	48.2	47.5	46.8	46.1	45.4	44.8	44.1
17	50.0	48.9	48.2	47.5	46.8	46.1	45.4	44.8	44.1
18	50.0	48.9	48.2	47.5	46.8	46.1	45.4	44.8	44.1
19	55.0	53.8	53.0	52.2	51.4	50.7	49.9	49.2	48.5
20	60.0	58.7	57.8	56.9	56.1	55.3	54.5	53.7	52.9
21	60.0	58.7	57.8	56.9	56.1	55.3	54.5	53.7	52.9
22	60.0	58.7	57.8	56.9	56.1	55.3	54.5	53.7	52.9
23	60.0	58.7	57.8	56.9	56.1	55.3	54.5	53.7	52.9
24	60.0	58.7	57.8	56.9	56.1	55.3	54.5	53.7	52.9
25	60.0	58.7	57.8	56.9	56.1	55.3	54.5	53.7	52.9
26	45.0	39.5	37.3	36.0	35.1	34.3	33.7	33.1	32.5
27	45.0	39.5	37.3	36.0	35.1	34.3	33.7	33.1	32.5
28	45.0	39.5	37.3	36.0	35.1	34.3	33.7	33.1	32.5
29	45.0	39.5	37.3	36.0	35.1	34.3	33.7	33.1	32.5
30	45.0	39.5	37.3	36.0	35.1	34.3	33.7	33.1	32.5
31	45.0	39.5	37.3	36.0	35.1	34.3	33.7	33.1	32.5
32	35.0	32.9	31.7	30.7	29.8	29.1	28.6	28.2	27.9
33	35.0	32.9	31.7	30.7	29.8	29.1	28.6	28.2	27.9
34	35.0	32.9	31.7	30.7	29.8	29.1	28.6	28.2	27.9
35	35.0	32.9	31.7	30.7	29.8	29.1	28.6	28.2	27.9
36	35.0	32.9	31.7	30.7	29.8	29.1	28.6	28.2	27.9
37	40.0	...	36.2	...	34.1	...	32.7	...	31.9
38	32.0	30.2	29.3	28.5	27.7	27.0	26.2	25.5	24.8
39	32.0	30.2	29.3	28.5	27.7	27.0	26.2	25.5	24.8
40	32.0	30.2	29.3	28.5	27.7	27.0	26.2	25.5	24.8
41	32.0	30.2	29.3	28.5	27.7	27.0	26.2	25.5	24.8

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)									
1	31.9	31.8	31.7	31.5	31.2	30.7	30.1	29.5	28.9	...
2	31.9	31.8	31.7	31.5	31.2	30.7	30.1	29.5	28.9	...
3	...	36.4	36.1	35.9	35.4	34.8	...	...	...	...
4	...	40.9	40.6	40.4	39.8	39.1	...	...	...	...
5	21.7	21.3	21.1	20.9	20.8	20.7	20.6	20.6	20.6	20.6
6	21.7	21.3	21.1	20.9	20.8	20.7	20.6	20.6	20.6	20.6
7	21.7	21.3	21.1	20.9	20.8	20.7	20.6	20.6	20.6	20.6
8	21.7	21.3	21.1	20.9	20.8	20.7	20.6	20.6	20.6	20.6
9	...	25.0	24.6	24.3	24.1	23.8	23.7	23.5	23.4	23.3
10	...	25.0	24.6	24.3	24.1	23.8	23.7	23.5	23.4	23.3
11	...	25.0	24.6	24.3	24.1	23.8	23.7	23.5	23.4	23.3
12	...	25.0	24.6	24.3	24.1	23.8	23.7	23.5	23.4	23.3
13	32.0	31.5	31.2	30.8	30.5	30.2	30.0	29.7	29.6	29.4
14	32.0	31.5	31.2	30.8	30.5	30.2	30.0	29.7	29.6	29.4
15	32.0	31.5	31.2	30.8	30.5	30.2	30.0	29.7	29.6	29.4
16	43.5	42.9	42.4	41.9	41.5	41.1	40.7	40.4	40.2	40.0
17	43.5	42.9	42.4	41.9	41.5	41.1	40.7	40.4	40.2	40.0
18	43.5	42.9	42.4	41.9	41.5	41.1	40.7	40.4	40.2	40.0
19	47.9	47.2	46.6	46.1	45.6	45.2	44.8	44.5	44.2	43.9
20	52.2	51.5	50.9	50.3	49.8	49.3	48.9	48.5	48.2	47.9
21	52.2	51.5	50.9	50.3	49.8	49.3	48.9	48.5	48.2	47.9
22	52.2	51.5	50.9	50.3	49.8	49.3	48.9	48.5	48.2	47.9
23	52.2	51.5	50.9	50.3	49.8	49.3	48.9	48.5	48.2	47.9
24	52.2	51.5	50.9	50.3	49.8	49.3	48.9	48.5	48.2	47.9
25	52.2	51.5	50.9	50.3	49.8	49.3	48.9	48.5	48.2	47.9
26	31.8	31.2	30.6	30.2	29.9	29.8	29.8	29.8	29.8	29.4
27	31.8	31.2	30.6	30.2	29.9	29.8	29.8	29.8	29.8	29.4
28	31.8	31.2	30.6	30.2	29.9	29.8	29.8	29.8	29.8	29.4
29	31.8	31.2	30.6	30.2	29.9	29.8	29.8	29.8	29.8	29.4
30	31.8	31.2	30.6	30.2	29.9	29.8	29.8	29.8	29.8	29.4
31	31.8	31.2	30.6	30.2	29.9	29.8	29.8	29.8	29.8	29.4
32	27.7	27.6	27.5	27.5	27.5	27.5	27.5	27.5	27.4	27.1
33	27.7	27.6	27.5	27.5	27.5	27.5	27.5	27.5	27.4	27.1
34	27.7	27.6	27.5	27.5	27.5	27.5	27.5	27.5	27.4	27.1
35	27.7	27.6	27.5	27.5	27.5	27.5	27.5	27.5	27.4	27.1
36	27.7	27.6	27.5	27.5	27.5	27.5	27.5	27.5	27.4	27.1
37	...	31.5	31.5	31.5	31.5	31.5	...	...	...	...
38	24.1	23.4	22.9	22.5	22.2	22.0	21.9	21.9	21.9	21.9
39	24.1	23.4	22.9	22.5	22.2	22.0	21.9	21.9	21.9	21.9
40	24.1	23.4	22.9	22.5	22.2	22.0	21.9	21.9	21.9	21.9
41	24.1	23.4	22.9	22.5	22.2	22.0	21.9	21.9	21.9	21.9

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 Designation/ UNS No.	Class/Condition/ Temper
Nonferrous Materials (Cont'd)						
1	47Ni-22Cr-20Fe-7Mo	Rod	SB-581	...	N06985	Annealed
2	47Ni-22Cr-20Fe-7Mo	Plate, sheet, strip	SB-582	...	N06985	Annealed
3	47Ni-22Cr-20Fe-7Mo	Smls. & wld. fittings	SB-366	...	N06985	Annealed
4	47Ni-22Cr-20Fe-7Mo	Rod	SB-581	...	N06985	Annealed
5	47Ni-22Cr-20Fe-7Mo	Plate, sheet, strip	SB-582	...	N06985	Annealed
6	47Ni-22Cr-20Fe-7Mo	Wld. pipe	SB-619	...	N06985	Annealed
7	47Ni-22Cr-20Fe-7Mo	Smls. pipe & tube	SB-622	...	N06985	Annealed
8	47Ni-22Cr-20Fe-7Mo	Wld. tube	SB-626	...	N06985	Annealed
9	35Ni-35Fe-20Cr-Cb	Forgings	SB-462	...	N08020	Annealed
10	35Ni-35Fe-20Cr-Cb	Plate	SB-463	...	N08020	Annealed
11	35Ni-35Fe-20Cr-Cb	Bar	SB-473	...	N08020	Annealed
12	35Ni-35Fe-20Cr-Cb	Smls. pipe & tube	SB-729	...	N08020	Annealed
13	35Ni-35Fe-20Cr-Cb	Wld. pipe	SB-464	...	N08020	Wld. ann.
14	35Ni-35Fe-20Cr-Cb	Wld. tube	SB-468	...	N08020	Wld. ann.
15	35Ni-35Fe-20Cr-Cb	Smls. & wld. fittings	SB-366	...	N08020	Annealed
16	37Ni-33Fe-23Cr-4Mo-Cu	Plate, sheet, strip	SB-463	...	N08024	Annealed
17	37Ni-33Fe-23Cr-4Mo-Cu	Wld. pipe	SB-464	...	N08024	Wld. ann.
18	37Ni-33Fe-23Cr-4Mo-Cu	Wld. tube	SB-468	...	N08024	Wld. ann.
19	35Ni-30Fe-24Cr-6Mo-Cu	Plate, sheet, strip	SB-463	...	N08026	Annealed
20	35Ni-30Fe-24Cr-6Mo-Cu	Wld. pipe	SB-464	...	N08026	Wld. ann.
21	35Ni-30Fe-24Cr-6Mo-Cu	Wld. tube	SB-468	...	N08026	Wld. ann.
22	31Ni-31Fe-29Cr-Mo	Smls. tube	SB-668	...	N08028	Annealed
23	31Ni-31Fe-29Cr-Mo	Plate, sheet, strip	SB-709	...	N08028	Annealed
24	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Smls. & wld. fittings	SB-366	...	N08031	Solution ann.
25	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Forgings	SB-564	...	N08031	Solution ann.
26	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Rod	SB-581	...	N08031	Solution ann.
27	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Wld. pipe	SB-619	...	N08031	Solution ann.
28	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Smls. pipe & tube	SB-622	...	N08031	Solution ann.
29	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Plate, sheet, strip	SB-625	...	N08031	Solution ann.
30	31Ni-33Fe-27Cr-6.5Mo-Cu-N	Wld. tube	SB-626	...	N08031	Solution ann.
31	37Ni-33Fe-25Cr	Condenser tube	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	Bar, rod	SB-408	...	N08120	Solution ann.
35	37Ni-33Fe-25Cr	Plate, sheet, strip	SB-409	...	N08120	Solution ann.
36	37Ni-33Fe-25Cr	Wld. pipe	SB-514	...	N08120	Solution ann.
37	37Ni-33Fe-25Cr	Wld. tube	SB-515	...	N08120	Solution ann.
38	37Ni-33Fe-25Cr	Forgings	SB-564	...	N08120	Solution ann.
39	26Ni-43Fe-22Cr-5Mo	Wld. pipe	SB-619	...	N08320	Solution ann.
40	26Ni-43Fe-22Cr-5Mo	Plate, sheet, strip	SB-620	...	N08320	Solution ann.
41	26Ni-43Fe-22Cr-5Mo	Rod	SB-621	...	N08320	Solution ann.
42	26Ni-43Fe-22Cr-5Mo	Smls. pipe & tube	SB-622	...	N08320	Solution ann.
43	26Ni-43Fe-22Cr-5Mo	Wld. tube	SB-626	...	N08320	Solution ann.

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Nonferrous Materials (Cont'd)				
1	$> \frac{3}{4}$	85	30	...
2	$> \frac{3}{4}$	85	30	...
3	...	90	35	...
4	$\leq \frac{3}{4}$	90	35	...
5	$\leq \frac{3}{4}$	90	35	...
6	...	90	35	...
7	...	90	35	...
8	...	90	35	...
9	...	80	35	...
10	...	80	35	...
11	...	80	35	...
12	...	80	35	...
13	...	80	35	...
14	...	80	35	...
15	...	85	40	...
16	...	80	35	...
17	...	80	35	...
18	...	80	35	...
19	...	80	35	...
20	...	80	35	...
21	...	80	35	...
22	...	73	31	...
23	...	73	31	...
24	...	94	40	...
25	...	94	40	...
26	...	94	40	...
27	...	94	40	...
28	...	94	40	...
29	...	94	40	...
30	...	94	40	...
31	...	90	40	...
32	...	90	40	...
33	...	90	40	...
34	...	90	40	...
35	...	90	40	...
36	...	90	40	...
37	...	90	40	...
38	...	90	40	...
39	...	75	28	...
40	...	75	28	...
41	...	75	28	...
42	...	75	28	...
43	...	75	28	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Nonferrous Materials (Cont'd)								
1	30.0	28.0	26.7	25.5	24.3	23.3	22.4	21.5	20.8
2	30.0	28.0	26.7	25.5	24.3	23.3	22.4	21.5	20.8
3	35.0	32.7	31.2	29.7	28.4	27.2	26.1	25.1	24.3
4	35.0	32.7	31.2	29.7	28.4	27.2	26.1	25.1	24.3
5	35.0	32.7	31.2	29.7	28.4	27.2	26.1	25.1	24.3
6	35.0	32.7	31.2	29.7	28.4	27.2	26.1	25.1	24.3
7	35.0	32.7	31.2	29.7	28.4	27.2	26.1	25.1	24.3
8	35.0	32.7	31.2	29.7	28.4	27.2	26.1	25.1	24.3
9	35.0	32.0	30.9	30.2	29.6	29.0	28.4	27.8	27.3
10	35.0	32.0	30.9	30.2	29.6	29.0	28.4	27.8	27.3
11	35.0	32.0	30.9	30.2	29.6	29.0	28.4	27.8	27.3
12	35.0	32.0	30.9	30.2	29.6	29.0	28.4	27.8	27.3
13	35.0	32.0	30.9	30.2	29.6	29.0	28.4	27.8	27.3
14	35.0	32.0	30.9	30.2	29.6	29.0	28.4	27.8	27.3
15	40.0	36.6	35.4	34.5	33.8	33.1	32.5	31.8	31.2
16	35.0	32.2	30.9	29.8	28.8	28.0	27.2	26.3	25.5
17	35.0	32.2	30.9	29.8	28.8	28.0	27.2	26.3	25.5
18	35.0	32.2	30.9	29.8	28.8	28.0	27.2	26.3	25.5
19	35.0	32.6	31.1	29.7	28.4	27.3	26.3	25.3	24.4
20	35.0	32.6	31.1	29.7	28.4	27.3	26.3	25.3	24.4
21	35.0	32.6	31.1	29.7	28.4	27.3	26.3	25.3	24.4
22	31.0	29.4	28.4	27.4	26.5	25.6	24.8	23.9	23.2
23	31.0	29.4	28.4	27.4	26.5	25.6	24.8	23.9	23.2
24	40.0	...	33.0	...	29.7	...	27.4	...	25.9
25	40.0	...	33.0	...	29.7	...	27.4	...	25.9
26	40.0	...	33.0	...	29.7	...	27.4	...	25.9
27	40.0	...	33.0	...	29.7	...	27.4	...	25.9
28	40.0	...	33.0	...	29.7	...	27.4	...	25.9
29	40.0	...	33.0	...	29.7	...	27.4	...	25.9
30	40.0	...	33.0	...	29.7	...	27.4	...	25.9
31	40.0	...	35.3	...	32.3	...	29.9	...	27.9
32	40.0	...	35.3	...	32.3	...	29.9	...	27.9
33	40.0	...	35.3	...	32.3	...	29.9	...	27.9
34	40.0	...	35.3	...	32.3	...	29.9	...	27.9
35	40.0	...	35.3	...	32.3	...	29.9	...	27.9
36	40.0	...	35.3	...	32.3	...	29.9	...	27.9
37	40.0	...	35.3	...	32.3	...	29.9	...	27.9
38	40.0	...	35.3	...	32.3	...	29.9	...	27.9
39	28.0	26.7	25.9	25.2	24.5	23.8	23.1	22.4	21.8
40	28.0	26.7	25.9	25.2	24.5	23.8	23.1	22.4	21.8
41	28.0	26.7	25.9	25.2	24.5	23.8	23.1	22.4	21.8
42	28.0	26.7	25.9	25.2	24.5	23.8	23.1	22.4	21.8
43	28.0	26.7	25.9	25.2	24.5	23.8	23.1	22.4	21.8

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)									
1	20.2	19.7	19.2	18.8	18.4	18.0	17.6	17.3	17.0	16.7
2	20.2	19.7	19.2	18.8	18.4	18.0	17.6	17.3	17.0	16.7
3	23.6	23.0	22.4	21.9	21.4	21.0	20.6	20.2	19.8	19.5
4	23.6	23.0	22.4	21.9	21.4	21.0	20.6	20.2	19.8	19.5
5	23.6	23.0	22.4	21.9	21.4	21.0	20.6	20.2	19.8	19.5
6	23.6	23.0	22.4	21.9	21.4	21.0	20.6	20.2	19.8	19.5
7	23.6	23.0	22.4	21.9	21.4	21.0	20.6	20.2	19.8	19.5
8	23.6	23.0	22.4	21.9	21.4	21.0	20.6	20.2	19.8	19.5
9	26.8	26.5	26.2	26.0	25.8	25.2	...	...	...	...
10	26.8	26.5	26.2	26.0	25.8	25.2	...	...	...	...
11	26.8	26.5	26.2	26.0	25.8	25.2	...	...	...	...
12	26.8	26.5	26.2	26.0	25.8	25.2	...	...	...	...
13	26.8	26.5	26.2	26.0	25.8	25.2	...	...	...	...
14	26.8	26.5	26.2	26.0	25.8	25.2	...	...	...	...
15	30.7	30.3	30.0	29.8	29.4	28.8	...	...	...	...
16	24.8	24.0	23.3	22.7	22.2	21.8	21.5	21.3	21.0	20.7
17	24.8	24.0	23.3	22.7	22.2	21.8	21.5	21.3	21.0	20.7
18	24.8	24.0	23.3	22.7	22.2	21.8	21.5	21.3	21.0	20.7
19	23.7	23.0	22.3	21.8	21.3	20.9	20.6	20.3	20.1	19.9
20	23.7	23.0	22.3	21.8	21.3	20.9	20.6	20.3	20.1	19.9
21	23.7	23.0	22.3	21.8	21.3	20.9	20.6	20.3	20.1	19.9
22	22.4	21.7	21.0	20.3	19.7	19.1	18.6	18.1	17.6	17.2
23	22.4	21.7	21.0	20.3	19.7	19.1	18.6	18.1	17.6	17.2
24	...	24.7	24.1	23.6	23.2	22.8	22.4	22.2	...	...
25	...	24.7	24.1	23.6	23.2	22.8	22.4	22.2	...	...
26	...	24.7	24.1	23.6	23.2	22.8	22.4	22.2	...	...
27	...	24.7	24.1	23.6	23.2	22.8	22.4	22.2	...	...
28	...	24.7	24.1	23.6	23.2	22.8	22.4	22.2	...	...
29	...	24.7	24.1	23.6	23.2	22.8	22.4	22.2	...	...
30	...	24.7	24.1	23.6	23.2	22.8	22.4	22.2	...	...
31	...	26.5	26.0	25.5	25.2	24.9	24.7	24.6	24.5	24.4
32	...	26.5	26.0	25.5	25.2	24.9	24.7	24.6	24.5	24.4
33	...	26.5	26.0	25.5	25.2	24.9	24.7	24.6	24.5	24.4
34	...	26.5	26.0	25.5	25.2	24.9	24.7	24.6	24.5	24.4
35	...	26.5	26.0	25.5	25.2	24.9	24.7	24.6	24.5	24.4
36	...	26.5	26.0	25.5	25.2	24.9	24.7	24.6	24.5	24.4
37	...	26.5	26.0	25.5	25.2	24.9	24.7	24.6	24.5	24.4
38	...	26.5	26.0	25.5	25.2	24.9	24.7	24.6	24.5	24.4
39	21.2	20.7	20.2	19.8	19.4	19.1	...	...	...	...
40	21.2	20.7	20.2	19.8	19.4	19.1	...	...	...	...
41	21.2	20.7	20.2	19.8	19.4	19.1	...	...	...	...
42	21.2	20.7	20.2	19.8	19.4	19.1	...	...	...	...
43	21.2	20.7	20.2	19.8	19.4	19.1	...	...	...	...

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 Designation/ UNS No.	Class/Condition/ Temper
Nonferrous Materials (Cont'd)						
1	35Ni-19Cr-1 $\frac{1}{4}$ Si	Bar	SB-511	...	N08330	...
2	35Ni-19Cr-1 $\frac{1}{4}$ Si	Pipe	SB-535	...	N08330	...
3	35Ni-19Cr-1 $\frac{1}{4}$ Si	Plate	SB-536	...	N08330	...
4	35Ni-19Cr-1 $\frac{1}{4}$ Si	Smls. & wld. fittings	SB-366	...	N08330	Annealed
5	35Ni-19Cr-1 $\frac{1}{4}$ Si	Smls. & wld. pipe	SB-535	...	N08330	Annealed
6	35Ni-19Cr-1 $\frac{1}{4}$ Si	Plate, sheet, strip	SB-536	...	N08330	Annealed
7	35Ni-19Cr-1 $\frac{1}{4}$ Si	Wld. pipe	SB-710	...	N08330	Annealed
8	46Fe-24Ni-21Cr-6Mo-Cu-N	Forgings	SB-462	...	N08367	Solution ann.
9	46Fe-24Ni-21Cr-6Mo-Cu-N	Forgings	SB-564	...	N08367	Solution ann.
10	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. pipe	SB-675	...	N08367	Solution ann.
11	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. tube	SB-676	...	N08367	Solution ann.
12	46Fe-24Ni-21Cr-6Mo-Cu-N	Plate, sheet, strip	SB-688	...	N08367	Solution ann.
13	46Fe-24Ni-21Cr-6Mo-Cu-N	Smls. pipe & tube	SB-690	...	N08367	Solution ann.
14	46Fe-24Ni-21Cr-6Mo-Cu-N	Bar, rod, wire	SB-691	...	N08367	Solution ann.
15	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. pipe	SB-804	...	N08367	Solution ann.
16	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. pipe	SB-675	...	N08367	Solution ann.
17	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. tube	SB-676	...	N08367	Solution ann.
18	46Fe-24Ni-21Cr-6Mo-Cu-N	Plate, sheet, strip	SB-688	...	N08367	Solution ann.
19	46Fe-24Ni-21Cr-6Mo-Cu-N	Smls. pipe & tube	SB-690	...	N08367	Solution ann.
20	46Fe-24Ni-21Cr-6Mo-Cu-N	Wld. pipe	SB-804	...	N08367	Solution ann.
21	46Fe-24Ni-21Cr-6Mo-Cu-N	Castings	SA-351	CN3MN	J94651	Solution ann.
22	25Ni-47Fe-21Cr-5Mo	Plate, sheet, strip	SB-599	...	N08700	Solution ann.
23	25Ni-47Fe-21Cr-5Mo	Bar, wire	SB-672	...	N08700	Solution ann.
24	32Ni-45Fe-20Cr-Cb	Castings	SA-351	CT15C	...	As cast
25	33Ni-42Fe-21Cr	Smls. tube	SB-163	...	N08800	Annealed
26	33Ni-42Fe-21Cr	Smls. & wld. fittings	SB-366	...	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	Plate	SB-409	...	N08800	Annealed
30	33Ni-42Fe-21Cr	Wld. pipe	SB-514	...	N08800	Annealed
31	33Ni-42Fe-21Cr	Wld. tube	SB-515	...	N08800	Annealed
32	33Ni-42Fe-21Cr	Forgings	SB-564	...	N08800	Annealed
33	33Ni-42Fe-21Cr	Smls. tube	SB-163	...	N08800	Annealed
34	33Ni-42Fe-21Cr	Smls. tube	SB-163	...	N08800	Cold worked
35	32Ni-44Fe-21Cr	Smls. tube	SB-163	...	N08801	Ann./stabilized
36	32Ni-44Fe-21Cr	Smls. pipe & tube	SB-407	...	N08801	Ann./stabilized
37	33Ni-42Fe-21Cr	Smls. tube	SB-163	...	N08810	Annealed
38	33Ni-42Fe-21Cr	Smls. pipe & tube	SB-407	...	N08810	Annealed
39	33Ni-42Fe-21Cr	Bar	SB-408	...	N08810	Annealed
40	33Ni-42Fe-21Cr	Plate	SB-409	...	N08810	Annealed
41	33Ni-42Fe-21Cr	Wld. pipe	SB-514	...	N08810	Annealed
42	33Ni-42Fe-21Cr	Wld. tube	SB-515	...	N08810	Annealed
43	33Ni-42Fe-21Cr	Forgings	SB-564	...	N08810	Annealed

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Nonferrous Materials (Cont'd)				
1	...	70	30	...
2	...	70	30	...
3	...	70	30	...
4	...	70	30	...
5	...	70	30	...
6	...	70	30	...
7	...	70	30	...
8	...	95	45	...
9	...	95	45	...
10	$> \frac{3}{16}$	95	45	...
11	$> \frac{3}{16}$	95	45	...
12	$> \frac{3}{16}$	95	45	...
13	$> \frac{3}{16}$	95	45	...
14	...	95	45	...
15	$> \frac{3}{16}$	95	45	...
16	$\leq \frac{3}{16}$	100	45	...
17	$\leq \frac{3}{16}$	100	45	...
18	$\leq \frac{3}{16}$	100	45	...
19	$\leq \frac{3}{16}$	100	45	...
20	$\leq \frac{3}{16}$	100	45	...
21	...	80	38	...
22	...	80	35	...
23	...	80	35	...
24	...	63	25	...
25	...	75	30	...
26	...	75	30	...
27	...	75	30	...
28	...	75	30	...
29	...	75	30	...
30	...	75	30	...
31	...	75	30	...
32	...	75	30	...
33	...	75	40	...
34	...	83	47	...
35	...	65	25	...
36	...	65	25	...
37	...	65	25	...
38	...	65	25	...
39	...	65	25	...
40	...	65	25	...
41	...	65	25	...
42	...	65	25	...
43	...	65	25	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Nonferrous Materials (Cont'd)								
1	30.0	27.7	26.5	25.5	24.7	23.9	23.2	22.6	22.0
2	30.0	27.7	26.5	25.5	24.7	23.9	23.2	22.6	22.0
3	30.0	27.7	26.5	25.5	24.7	23.9	23.2	22.6	22.0
4	30.0	27.7	26.5	25.5	24.7	23.9	23.2	22.6	22.0
5	30.0	27.7	26.5	25.5	24.7	23.9	23.2	22.6	22.0
6	30.0	27.7	26.5	25.5	24.7	23.9	23.2	22.6	22.0
7	30.0	27.7	26.5	25.5	24.7	23.9	23.2	22.6	22.0
8	45.0	41.3	39.3	37.4	35.7	34.2	32.9	31.8	30.8
9	45.0	41.3	39.3	37.4	35.7	34.2	32.9	31.8	30.8
10	45.0	41.3	39.3	37.4	35.7	34.2	32.9	31.8	30.8
11	45.0	41.3	39.3	37.4	35.7	34.2	32.9	31.8	30.8
12	45.0	41.3	39.3	37.4	35.7	34.2	32.9	31.8	30.8
13	45.0	41.3	39.3	37.4	35.7	34.2	32.9	31.8	30.8
14	45.0	41.3	39.3	37.4	35.7	34.2	32.9	31.8	30.8
15	45.0	41.3	39.3	37.4	35.7	34.2	32.9	31.8	30.8
16	45.0	41.3	39.3	37.4	35.7	34.2	32.9	31.8	30.8
17	45.0	41.3	39.3	37.4	35.7	34.2	32.9	31.8	30.8
18	45.0	41.3	39.3	37.4	35.7	34.2	32.9	31.8	30.8
19	45.0	41.3	39.3	37.4	35.7	34.2	32.9	31.8	30.8
20	45.0	41.3	39.3	37.4	35.7	34.2	32.9	31.8	30.8
21	38.0	34.3	32.0	30.0	28.2	26.6	25.4	24.3	23.5
22	35.0	33.1	31.5	29.9	28.5	27.4	26.6	26.1	25.7
23	35.0	33.1	31.5	29.9	28.5	27.4	26.6	26.1	25.7
24	25.0	24.1	23.6	23.2	22.9	22.7	22.4	22.1	21.8
25	30.0	28.5	27.7	27.1	26.6	26.2	25.8	25.5	25.1
26	30.0	28.5	27.7	27.1	26.6	26.2	25.8	25.5	25.1
27	30.0	28.5	27.7	27.1	26.6	26.2	25.8	25.5	25.1
28	30.0	28.5	27.7	27.1	26.6	26.2	25.8	25.5	25.1
29	30.0	28.5	27.7	27.1	26.6	26.2	25.8	25.5	25.1
30	30.0	28.5	27.7	27.1	26.6	26.2	25.8	25.5	25.1
31	30.0	28.5	27.7	27.1	26.6	26.2	25.8	25.5	25.1
32	30.0	28.5	27.7	27.1	26.6	26.2	25.8	25.5	25.1
33	40.0	...	37.0	...	35.5	...	34.4	...	33.5
34	47.0	...	43.4	...	41.7	...	40.4	...	39.5
35	25.0	23.8	23.0	22.3	21.7	21.0	20.4	19.8	19.3
36	25.0	23.8	23.0	22.3	21.7	21.0	20.4	19.8	19.3
37	25.0	23.8	23.0	22.3	21.7	21.0	20.4	19.8	19.3
38	25.0	23.8	23.0	22.3	21.7	21.0	20.4	19.8	19.3
39	25.0	23.8	23.0	22.3	21.7	21.0	20.4	19.8	19.3
40	25.0	23.8	23.0	22.3	21.7	21.0	20.4	19.8	19.3
41	25.0	23.8	23.0	22.3	21.7	21.0	20.4	19.8	19.3
42	25.0	23.8	23.0	22.3	21.7	21.0	20.4	19.8	19.3
43	25.0	23.8	23.0	22.3	21.7	21.0	20.4	19.8	19.3

2011a SECTION II, PART D (CUSTOMARY)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)									
1	21.5	21.0	20.6	20.1	19.7	19.3	18.9	18.5	18.2	17.9
2	21.5	21.0	20.6	20.1	19.7	19.3	18.9	18.5	18.2	17.9
3	21.5	21.0	20.6	20.1	19.7	19.3	18.9	18.5	18.2	17.9
4	21.5	21.0	20.6	20.1	19.7	19.3	18.9	18.5	18.2	17.9
5	21.5	21.0	20.6	20.1	19.7	19.3	18.9	18.5	18.2	17.9
6	21.5	21.0	20.6	20.1	19.7	19.3	18.9	18.5	18.2	17.9
7	21.5	21.0	20.6	20.1	19.7	19.3	18.9	18.5	18.2	17.9
8	29.9	29.1	28.5	27.9	27.4	27.0	26.6	26.2	...	...
9	29.9	29.1	28.5	27.9	27.4	27.0	26.6	26.2	...	...
10	29.9	29.1	28.5	27.9	27.4	27.0	26.6	26.2	...	...
11	29.9	29.1	28.5	27.9	27.4	27.0	26.6	26.2	...	...
12	29.9	29.1	28.5	27.9	27.4	27.0	26.6	26.2	...	...
13	29.9	29.1	28.5	27.9	27.4	27.0	26.6	26.2	...	...
14	29.9	29.1	28.5	27.9	27.4	27.0	26.6	26.2	...	...
15	29.9	29.1	28.5	27.9	27.4	27.0	26.6	26.2	...	...
16	29.9	29.1	28.5	27.9	27.4	27.0	26.6	26.2	...	...
17	29.9	29.1	28.5	27.9	27.4	27.0	26.6	26.2	...	...
18	29.9	29.1	28.5	27.9	27.4	27.0	26.6	26.2	...	...
19	29.9	29.1	28.5	27.9	27.4	27.0	26.6	26.2	...	...
20	29.9	29.1	28.5	27.9	27.4	27.0	26.6	26.2	...	...
21	22.9	22.4	22.0	21.8	21.5	21.4	21.2	21.1	21.1	21.1
22	25.3	24.7	23.8	...	...	...	...	...	...	...
23	25.3	24.7	23.8	...	...	...	...	...	...	...
24	21.5	21.2	20.9	20.6	20.3	19.9	19.6	19.3	19.0	18.8
25	24.8	24.5	24.1	23.8	23.5	23.2	22.9	22.7	22.4	22.1
26	24.8	24.5	24.1	23.8	23.5	23.2	22.9	22.7	22.4	22.1
27	24.8	24.5	24.1	23.8	23.5	23.2	22.9	22.7	22.4	22.1
28	24.8	24.5	24.1	23.8	23.5	23.2	22.9	22.7	22.4	22.1
29	24.8	24.5	24.1	23.8	23.5	23.2	22.9	22.7	22.4	22.1
30	24.8	24.5	24.1	23.8	23.5	23.2	22.9	22.7	22.4	22.1
31	24.8	24.5	24.1	23.8	23.5	23.2	22.9	22.7	22.4	22.1
32	24.8	24.5	24.1	23.8	23.5	23.2	22.9	22.7	22.4	22.1
33	...	32.6	32.2	31.8	31.4	31.0	...	...	...	...
34	...	38.7	38.7	...	...	...	...	...	...	...
35	18.8	18.3	17.9	17.4	17.1	16.7	16.4	16.1	15.8	15.5
36	18.8	18.3	17.9	17.4	17.1	16.7	16.4	16.1	15.8	15.5
37	18.8	18.3	17.9	17.4	17.1	16.7	16.4	16.1	15.8	15.5
38	18.8	18.3	17.9	17.4	17.1	16.7	16.4	16.1	15.8	15.5
39	18.8	18.3	17.9	17.4	17.1	16.7	16.4	16.1	15.8	15.5
40	18.8	18.3	17.9	17.4	17.1	16.7	16.4	16.1	15.8	15.5
41	18.8	18.3	17.9	17.4	17.1	16.7	16.4	16.1	15.8	15.5
42	18.8	18.3	17.9	17.4	17.1	16.7	16.4	16.1	15.8	15.5
43	18.8	18.3	17.9	17.4	17.1	16.7	16.4	16.1	15.8	15.5

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 Designation/ UNS No.	Class/Condition/ Temper
Nonferrous Materials (Cont'd)						
1	42Ni-21.5Cr-3Mo-2.3Cu	Smls. tube	SB-163	...	N08825	Annealed
2	42Ni-21.5Cr-3Mo-2.3Cu	Smls. & wld. fittings	SB-366	...	N08825	Annealed
3	42Ni-21.5Cr-3Mo-2.3Cu	Smls. pipe & tube	SB-423	...	N08825	Cold worked/ann.
4	42Ni-21.5Cr-3Mo-2.3Cu	Plate	SB-424	...	N08825	Annealed
5	42Ni-21.5Cr-3Mo-2.3Cu	Bar, rod	SB-425	...	N08825	Annealed
6	42Ni-21.5Cr-3Mo-2.3Cu	Forgings	SB-564	...	N08825	Annealed
7	42Ni-21.5Cr-3Mo-2.3Cu	Wld. tube	SB-704	...	N08825	Annealed
8	42Ni-21.5Cr-3Mo-2.3Cu	Wld. pipe	SB-705	...	N08825	Annealed
9	44Fe-25Ni-21Cr-Mo	Fittings	SB-366	...	N08904	Annealed
10	44Fe-25Ni-21Cr-Mo	Plate, sheet, strip	SB-625	...	N08904	Annealed
11	44Fe-25Ni-21Cr-Mo	Bar, wire	SB-649	...	N08904	Annealed
12	44Fe-25Ni-21Cr-Mo	Wld. pipe	SB-673	...	N08904	Annealed
13	44Fe-25Ni-21Cr-Mo	Wld. tube	SB-674	...	N08904	Annealed
14	44Fe-25Ni-21Cr-Mo	Smls. pipe & tube	SB-677	...	N08904	Annealed
15	25Ni-20Cr-6Mo-Cu-N	Plate, sheet, strip	SB-625	...	N08925	Annealed
16	25Ni-20Cr-6Mo-Cu-N	Bar, wire	SB-649	...	N08925	Annealed
17	25Ni-20Cr-6Mo-Cu-N	Wld. pipe	SB-673	...	N08925	Annealed
18	25Ni-20Cr-6Mo-Cu-N	Wld. tube	SB-674	...	N08925	Annealed
19	25Ni-20Cr-6Mo-Cu-N	Smls. pipe & tube	SB-677	...	N08925	Annealed
20	62Ni-28Mo-5Fe	Plate	SB-333	...	N10001	Annealed
21	62Ni-28Mo-5Fe	Smls. & wld. fittings	SB-366	...	N10001	Annealed
22	62Ni-28Mo-5Fe	Wld. pipe	SB-619	...	N10001	Solution ann.
23	62Ni-28Mo-5Fe	Smls. pipe & tube	SB-622	...	N10001	Solution ann.
24	62Ni-28Mo-5Fe	Wld. tube	SB-626	...	N10001	Solution ann.
25	62Ni-28Mo-5Fe	Rod	SB-335	...	N10001	Annealed
26	62Ni-28Mo-5Fe	Sheet, strip	SB-333	...	N10001	Annealed
27	70Ni-16Mo-7Cr-5Fe	Smls. & wld. fittings	SB-366	...	N10003	Annealed
28	70Ni-16Mo-7Cr-5Fe	Plate, sheet, strip	SB-434	...	N10003	Annealed
29	70Ni-16Mo-7Cr-5Fe	Rod	SB-573	...	N10003	Annealed
30	62Ni-25Mo-8Cr-2Fe	Smls. & wld. fittings	SB-366	...	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	Rod	SB-573	...	N10242	Annealed
34	62Ni-25Mo-8Cr-2Fe	Wld. pipe	SB-619	...	N10242	Solution ann.
35	62Ni-25Mo-8Cr-2Fe	Smls. pipe & tube	SB-622	...	N10242	Solution ann.
36	62Ni-25Mo-8Cr-2Fe	Wld. tube	SB-626	...	N10242	Solution ann.
37	54Ni-16Mo-15Cr	Smls. & wld. fittings	SB-366	...	N10276	Solution ann.
38	54Ni-16Mo-15Cr	Forgings	SB-462	...	N10276	Solution ann.
39	54Ni-16Mo-15Cr	Forgings	SB-564	...	N10276	Solution ann.
40	54Ni-16Mo-15Cr	Rod	SB-574	...	N10276	Solution ann.
41	54Ni-16Mo-15Cr	Plate, sheet, strip	SB-575	...	N10276	Solution ann.
42	54Ni-16Mo-15Cr	Wld. pipe	SB-619	...	N10276	Solution ann.
43	54Ni-16Mo-15Cr	Smls. pipe & tube	SB-622	...	N10276	Solution ann.
44	54Ni-16Mo-15Cr	Wld. tube	SB-626	...	N10276	Solution ann.

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Nonferrous Materials (Cont'd)				
1	...	85	35	...
2	...	85	35	...
3	...	85	35	...
4	...	85	35	...
5	...	85	35	...
6	...	85	35	...
7	...	85	35	...
8	...	85	35	...
9	...	71	31	...
10	...	71	31	...
11	...	71	31	...
12	...	71	31	...
13	...	71	31	...
14	...	71	31	...
15	...	87	43	...
16	...	87	43	...
17	...	87	43	...
18	...	87	43	...
19	...	87	43	...
20	...	100	45	...
21	...	100	45	...
22	...	100	45	...
23	...	100	45	...
24	...	100	45	...
25	...	100	46	...
26	...	115	50	...
27	...	100	40	...
28	...	100	40	...
29	...	100	40	...
30	...	105	45	...
31	...	105	45	...
32	...	105	45	...
33	...	105	45	...
34	...	105	45	...
35	...	105	45	...
36	...	105	45	...
37	...	100	41	...
38	...	100	41	...
39	...	100	41	...
40	...	100	41	...
41	...	100	41	...
42	...	100	41	...
43	...	100	41	...
44	...	100	41	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Nonferrous Materials (Cont'd)								
1	35.0	33.0	32.1	31.2	30.5	29.7	29.1	28.4	27.8
2	35.0	33.0	32.1	31.2	30.5	29.7	29.1	28.4	27.8
3	35.0	33.0	32.1	31.2	30.5	29.7	29.1	28.4	27.8
4	35.0	33.0	32.1	31.2	30.5	29.7	29.1	28.4	27.8
5	35.0	33.0	32.1	31.2	30.5	29.7	29.1	28.4	27.8
6	35.0	33.0	32.1	31.2	30.5	29.7	29.1	28.4	27.8
7	35.0	33.0	32.1	31.2	30.5	29.7	29.1	28.4	27.8
8	35.0	33.0	32.1	31.2	30.5	29.7	29.1	28.4	27.8
9	31.0	26.8	25.1	23.8	22.7	21.7	20.8	19.9	19.0
10	31.0	26.8	25.1	23.8	22.7	21.7	20.8	19.9	19.0
11	31.0	26.8	25.1	23.8	22.7	21.7	20.8	19.9	19.0
12	31.0	26.8	25.1	23.8	22.7	21.7	20.8	19.9	19.0
13	31.0	26.8	25.1	23.8	22.7	21.7	20.8	19.9	19.0
14	31.0	26.8	25.1	23.8	22.7	21.7	20.8	19.9	19.0
15	43.0	37.0	34.8	33.2	31.9	30.8	29.6	28.5	27.5
16	43.0	37.0	34.8	33.2	31.9	30.8	29.6	28.5	27.5
17	43.0	37.0	34.8	33.2	31.9	30.8	29.6	28.5	27.5
18	43.0	37.0	34.8	33.2	31.9	30.8	29.6	28.5	27.5
19	43.0	37.0	34.8	33.2	31.9	30.8	29.6	28.5	27.5
20	45.0	42.2	40.8	39.6	38.6	37.7	36.9	36.2	35.6
21	45.0	42.2	40.8	39.6	38.6	37.7	36.9	36.2	35.6
22	45.0	42.2	40.8	39.6	38.6	37.7	36.9	36.2	35.6
23	45.0	42.2	40.8	39.6	38.6	37.7	36.9	36.2	35.6
24	45.0	42.2	40.8	39.6	38.6	37.7	36.9	36.2	35.6
25	46.0	43.1	41.7	40.5	39.4	38.5	37.7	37.0	36.4
26	50.0	46.9	45.3	44.0	42.8	41.9	41.0	40.2	39.6
27	40.0	38.2	36.8	35.4	34.0	32.7	31.6	30.7	30.0
28	40.0	38.2	36.8	35.4	34.0	32.7	31.6	30.7	30.0
29	40.0	38.2	36.8	35.4	34.0	32.7	31.6	30.7	30.0
30	45.0	...	42.3	...	39.2	...	37.0	...	35.9
31	45.0	...	42.3	...	39.2	...	37.0	...	35.9
32	45.0	...	42.3	...	39.2	...	37.0	...	35.9
33	45.0	...	42.3	...	39.2	...	37.0	...	35.9
34	45.0	...	42.3	...	39.2	...	37.0	...	35.9
35	45.0	...	42.3	...	39.2	...	37.0	...	35.9
36	45.0	...	42.3	...	39.2	...	37.0	...	35.9
37	41.0	38.8	37.3	35.9	34.5	33.2	32.0	30.9	29.8
38	41.0	38.8	37.3	35.9	34.5	33.2	32.0	30.9	29.8
39	41.0	38.8	37.3	35.9	34.5	33.2	32.0	30.9	29.8
40	41.0	38.8	37.3	35.9	34.5	33.2	32.0	30.9	29.8
41	41.0	38.8	37.3	35.9	34.5	33.2	32.0	30.9	29.8
42	41.0	38.8	37.3	35.9	34.5	33.2	32.0	30.9	29.8
43	41.0	38.8	37.3	35.9	34.5	33.2	32.0	30.9	29.8
44	41.0	38.8	37.3	35.9	34.5	33.2	32.0	30.9	29.8

2011a SECTION II, PART D (CUSTOMARY)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)									
1	27.2	26.7	26.3	26.0	25.7	25.6	25.4	25.3	25.1	24.8
2	27.2	26.7	26.3	26.0	25.7	25.6	25.4	25.3	25.1	24.8
3	27.2	26.7	26.3	26.0	25.7	25.6	25.4	25.3	25.1	24.8
4	27.2	26.7	26.3	26.0	25.7	25.6	25.4	25.3	25.1	24.8
5	27.2	26.7	26.3	26.0	25.7	25.6	25.4	25.3	25.1	24.8
6	27.2	26.7	26.3	26.0	25.7	25.6	25.4	25.3	25.1	24.8
7	27.2	26.7	26.3	26.0	25.7	25.6	25.4	25.3	25.1	24.8
8	27.2	26.7	26.3	26.0	25.7	25.6	25.4	25.3	25.1	24.8
9	18.4	17.8	17.4	17.1	...	...	...	...	...	...
10	18.4	17.8	17.4	17.1	...	...	...	...	...	...
11	18.4	17.8	17.4	17.1	...	...	...	...	...	...
12	18.4	17.8	17.4	17.1	...	...	...	...	...	...
13	18.4	17.8	17.4	17.1	...	...	...	...	...	...
14	18.4	17.8	17.4	17.1	...	...	...	...	...	...
15	26.6	25.9	25.5	25.3	25.3	25.3	...	...	...	...
16	26.6	25.9	25.5	25.3	25.3	25.3	...	...	...	...
17	26.6	25.9	25.5	25.3	25.3	25.3	...	...	...	...
18	26.6	25.9	25.5	25.3	25.3	25.3	...	...	...	...
19	26.6	25.9	25.5	25.3	25.3	25.3	...	...	...	...
20	35.0	34.6	34.1	33.8	33.4	33.2	...	...	...	...
21	35.0	34.6	34.1	33.8	33.4	33.2	...	...	...	...
22	35.0	34.6	34.1	33.8	33.4	33.2	...	...	...	...
23	35.0	34.6	34.1	33.8	33.4	33.2	...	...	...	...
24	35.0	34.6	34.1	33.8	33.4	33.2	...	...	...	...
25	35.8	35.3	34.9	34.5	34.2	33.9	...	...	...	...
26	38.9	38.4	37.9	37.5	37.2	36.9	...	...	...	...
27	29.4	29.0	28.7	28.4	28.1	27.7	27.1	26.3	25.3	23.9
28	29.4	29.0	28.7	28.4	28.1	27.7	27.1	26.3	25.3	23.9
29	29.4	29.0	28.7	28.4	28.1	27.7	27.1	26.3	25.3	23.9
30	...	35.5	35.4	35.2	34.8	34.3	33.6	33.0	32.5	32.4
31	...	35.5	35.4	35.2	34.8	34.3	33.6	33.0	32.5	32.4
32	...	35.5	35.4	35.2	34.8	34.3	33.6	33.0	32.5	32.4
33	...	35.5	35.4	35.2	34.8	34.3	33.6	33.0	32.5	32.4
34	...	35.5	35.4	35.2	34.8	34.3	33.6	33.0	32.5	32.4
35	...	35.5	35.4	35.2	34.8	34.3	33.6	33.0	32.5	32.4
36	...	35.5	35.4	35.2	34.8	34.3	33.6	33.0	32.5	32.4
37	28.9	28.0	27.3	26.7	26.1	25.7	25.3	25.1	24.9	24.8
38	28.9	28.0	27.3	26.7	26.1	25.7	25.3	25.1	24.9	24.8
39	28.9	28.0	27.3	26.7	26.1	25.7	25.3	25.1	24.9	24.8
40	28.9	28.0	27.3	26.7	26.1	25.7	25.3	25.1	24.9	24.8
41	28.9	28.0	27.3	26.7	26.1	25.7	25.3	25.1	24.9	24.8
42	28.9	28.0	27.3	26.7	26.1	25.7	25.3	25.1	24.9	24.8
43	28.9	28.0	27.3	26.7	26.1	25.7	25.3	25.1	24.9	24.8
44	28.9	28.0	27.3	26.7	26.1	25.7	25.3	25.1	24.9	24.8

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 Designation/ UNS No.	Class/Condition/ Temper
Nonferrous Materials (Cont'd)						
1	Ni-28Mo-3Fe-1.3Cr-0.25Al	Plate, sheet, strip	SB-333	...	N10629	Solution ann.
2	Ni-28Mo-3Fe-1.3Cr-0.25Al	Rod	SB-335	...	N10629	Solution ann.
3	Ni-28Mo-3Fe-1.3Cr-0.25Al	Smls. & wld. fittings	SB-366	...	N10629	Solution ann.
4	Ni-28Mo-3Fe-1.3Cr-0.25Al	Forgings	SB-564	...	N10629	Solution ann.
5	Ni-28Mo-3Fe-1.3Cr-0.25Al	Wld. pipe	SB-619	...	N10629	Solution ann.
6	Ni-28Mo-3Fe-1.3Cr-0.25Al	Smls. pipe & tube	SB-622	...	N10629	Solution ann.
7	Ni-28Mo-3Fe-1.3Cr-0.25Al	Wld. tube	SB-626	...	N10629	Solution ann.
8	65Ni-28Mo-2Fe	Smls. & wld. fittings	SB-366	...	N10665	Annealed
9	65Ni-28Mo-2Fe	Wld. pipe	SB-619	...	N10665	Annealed
10	65Ni-28Mo-2Fe	Wld. tube	SB-626	...	N10665	Annealed
11	65Ni-28Mo-2Fe	Plate, sheet, strip	SB-333	...	N10665	Solution ann.
12	65Ni-28Mo-2Fe	Rod	SB-335	...	N10665	Solution ann.
13	65Ni-28Mo-2Fe	Forgings	SB-462	...	N10665	Solution ann.
14	65Ni-28Mo-2Fe	Forgings	SB-564	...	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	Wld. tube	SB-626	...	N10665	Solution ann.
18	65Ni-29.5Mo-2Fe-2Cr	Plate, sheet, strip	SB-333	...	N10675	Solution ann.
19	65Ni-29.5Mo-2Fe-2Cr	Rod	SB-335	...	N10675	Solution ann.
20	65Ni-29.5Mo-2Fe-2Cr	Smls. & wld. fittings	SB-366	...	N10675	Solution ann.
21	65Ni-29.5Mo-2Fe-2Cr	Forgings	SB-462	...	N10675	Solution ann.
22	65Ni-29.5Mo-2Fe-2Cr	Forgings	SB-564	...	N10675	Solution ann.
23	65Ni-29.5Mo-2Fe-2Cr	Wld. pipe	SB-619	...	N10675	Solution ann.
24	65Ni-29.5Mo-2Fe-2Cr	Smls. pipe & tube	SB-622	...	N10675	Solution ann.
25	65Ni-29.5Mo-2Fe-2Cr	Wld. tube	SB-626	...	N10675	Solution ann.
26	37Ni-30Co-28Cr-2.7Si	Plate, sheet, strip	SB-435	...	N12160	Solution ann.
27	37Ni-30Co-28Cr-2.7Si	Forgings	SB-564	...	N12160	Solution ann.
28	37Ni-30Co-28Cr-2.7Si	Bar	SB-572	...	N12160	Solution ann.
29	37Ni-30Co-28Cr-2.7Si	Wld. pipe	SB-619	...	N12160	Solution ann.
30	37Ni-30Co-28Cr-2.7Si	Smls. pipe & tube	SB-622	...	N12160	Solution ann.
31	37Ni-30Co-28Cr-2.7Si	Wld. tube	SB-626	...	N12160	Solution ann.
32	33Cr-31Ni-32Fe-1.5Mo-0.6Cu-N	Smls. & wld. fittings	SB-366	...	R20033	Solution ann.
33	33Cr-31Ni-32Fe-1.5Mo-0.6Cu-N	Forgings	SB-564	...	R20033	Solution ann.
34	33Cr-31Ni-32Fe-1.5Mo-0.6Cu-N	Wld. pipe	SB-619	...	R20033	Solution ann.
35	33Cr-31Ni-32Fe-1.5Mo-0.6Cu-N	Smls. pipe & tube	SB-622	...	R20033	Solution ann.
36	33Cr-31Ni-32Fe-1.5Mo-0.6Cu-N	Plate, sheet, strip	SB-625	...	R20033	Solution ann.
37	33Cr-31Ni-32Fe-1.5Mo-0.6Cu-N	Wld. tube	SB-626	...	R20033	Solution ann.
38	33Cr-31Ni-32Fe-1.5Mo-0.6Cu-N	Rod	SB-649	...	R20033	Solution ann.
39	21Ni-30Fe-22Cr-18Co-3Mo-3W	Plate, sheet, strip	SB-435	...	R30556	Annealed
40	21Ni-30Fe-22Cr-18Co-3Mo-3W	Rod	SB-572	...	R30556	Annealed
41	21Ni-30Fe-22Cr-18Co-3Mo-3W	Wld. pipe	SB-619	...	R30556	Annealed
42	21Ni-30Fe-22Cr-18Co-3Mo-3W	Smls. pipe & tube	SB-622	...	R30556	Annealed
43	21Ni-30Fe-22Cr-18Co-3Mo-3W	Wld. tube	SB-626	...	R30556	Annealed

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Nonferrous Materials (Cont'd)				
1	...	110	51	...
2	...	110	51	...
3	...	110	51	...
4	...	110	51	...
5	...	110	51	...
6	...	110	51	...
7	...	110	51	...
8	...	110	51	...
9	...	110	51	...
10	...	110	51	...
11	...	110	51	...
12	...	110	51	...
13	...	110	51	...
14	...	110	51	...
15	...	110	51	...
16	...	110	51	...
17	...	110	51	...
18	...	110	51	...
19	...	110	51	...
20	...	110	51	...
21	...	110	51	...
22	...	110	51	...
23	...	110	51	...
24	...	110	51	...
25	...	110	51	...
26	...	90	35	...
27	...	90	35	...
28	...	90	35	...
29	...	90	35	...
30	...	90	35	...
31	...	90	35	...
32	...	109	55	...
33	...	109	55	...
34	...	109	55	...
35	...	109	55	...
36	...	109	55	...
37	...	109	55	...
38	...	109	55	...
39	...	100	45	...
40	...	100	45	...
41	...	100	45	...
42	...	100	45	...
43	...	100	45	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
Nonferrous Materials (Cont'd)									
1	51.0	...	47.1	...	44.4	...	42.2	...	40.5
2	51.0	...	47.1	...	44.4	...	42.2	...	40.5
3	51.0	...	47.1	...	44.4	...	42.2	...	40.5
4	51.0	...	47.1	...	44.4	...	42.2	...	40.5
5	51.0	...	47.1	...	44.4	...	42.2	...	40.5
6	51.0	...	47.1	...	44.4	...	42.2	...	40.5
7	51.0	...	47.1	...	44.4	...	42.2	...	40.5
8	51.0	49.2	47.9	46.6	45.4	44.3	43.4	42.6	41.9
9	51.0	49.2	47.9	46.6	45.4	44.3	43.4	42.6	41.9
10	51.0	49.2	47.9	46.6	45.4	44.3	43.4	42.6	41.9
11	51.0	49.2	47.9	46.6	45.4	44.3	43.4	42.6	41.9
12	51.0	49.2	47.9	46.6	45.4	44.3	43.4	42.6	41.9
13	51.0	49.2	47.9	46.6	45.4	44.3	43.4	42.6	41.9
14	51.0	49.2	47.9	46.6	45.4	44.3	43.4	42.6	41.9
15	51.0	49.2	47.9	46.6	45.4	44.3	43.4	42.6	41.9
16	51.0	49.2	47.9	46.6	45.4	44.3	43.4	42.6	41.9
17	51.0	49.2	47.9	46.6	45.4	44.3	43.4	42.6	41.9
18	51.0	...	47.8	...	45.4	...	43.2	...	41.1
19	51.0	...	47.8	...	45.4	...	43.2	...	41.1
20	51.0	...	47.8	...	45.4	...	43.2	...	41.1
21	51.0	...	47.8	...	45.4	...	43.2	...	41.1
22	51.0	...	47.8	...	45.4	...	43.2	...	41.1
23	51.0	...	47.8	...	45.4	...	43.2	...	41.1
24	51.0	...	47.8	...	45.4	...	43.2	...	41.1
25	51.0	...	47.8	...	45.4	...	43.2	...	41.1
26	35.0	...	30.8	...	27.5	...	24.7	...	22.5
27	35.0	...	30.8	...	27.5	...	24.7	...	22.5
28	35.0	...	30.8	...	27.5	...	24.7	...	22.5
29	35.0	...	30.8	...	27.5	...	24.7	...	22.5
30	35.0	...	30.8	...	27.5	...	24.7	...	22.5
31	35.0	...	30.8	...	27.5	...	24.7	...	22.5
32	55.0	...	46.3	...	42.1	...	39.2	...	37.1
33	55.0	...	46.3	...	42.1	...	39.2	...	37.1
34	55.0	...	46.3	...	42.1	...	39.2	...	37.1
35	55.0	...	46.3	...	42.1	...	39.2	...	37.1
36	55.0	...	46.3	...	42.1	...	39.2	...	37.1
37	55.0	...	46.3	...	42.1	...	39.2	...	37.1
38	55.0	...	46.3	...	42.1	...	39.2	...	37.1
39	45.0	40.8	38.4	36.4	34.7	33.2	32.0	31.0	30.2
40	45.0	40.8	38.4	36.4	34.7	33.2	32.0	31.0	30.2
41	45.0	40.8	38.4	36.4	34.7	33.2	32.0	31.0	30.2
42	45.0	40.8	38.4	36.4	34.7	33.2	32.0	31.0	30.2
43	45.0	40.8	38.4	36.4	34.7	33.2	32.0	31.0	30.2

2011a SECTION II, PART D (CUSTOMARY)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
Nonferrous Materials (Cont'd)										
1	...	39.2	38.7	38.3	37.9	37.7	37.4	37.3	37.1	...
2	...	39.2	38.7	38.3	37.9	37.7	37.4	37.3	37.1	...
3	...	39.2	38.7	38.3	37.9	37.7	37.4	37.3	37.1	...
4	...	39.2	38.7	38.3	37.9	37.7	37.4	37.3	37.1	...
5	...	39.2	38.7	38.3	37.9	37.7	37.4	37.3	37.1	...
6	...	39.2	38.7	38.3	37.9	37.7	37.4	37.3	37.1	...
7	...	39.2	38.7	38.3	37.9	37.7	37.4	37.3	37.1	...
8	41.3	40.8	40.3	39.8	39.3	38.7	38.0	37.3	36.5	35.8
9	41.3	40.8	40.3	39.8	39.3	38.7	38.0	37.3	36.5	35.8
10	41.3	40.8	40.3	39.8	39.3	38.7	38.0	37.3	36.5	35.8
11	41.3	40.8	40.3	39.8	39.3	38.7	38.0	37.3	36.5	35.8
12	41.3	40.8	40.3	39.8	39.3	38.7	38.0	37.3	36.5	35.8
13	41.3	40.8	40.3	39.8	39.3	38.7	38.0	37.3	36.5	35.8
14	41.3	40.8	40.3	39.8	39.3	38.7	38.0	37.3	36.5	35.8
15	41.3	40.8	40.3	39.8	39.3	38.7	38.0	37.3	36.5	35.8
16	41.3	40.8	40.3	39.8	39.3	38.7	38.0	37.3	36.5	35.8
17	41.3	40.8	40.3	39.8	39.3	38.7	38.0	37.3	36.5	35.8
18	...	39.4	38.7	38.1	37.6	37.3	37.0	36.8	36.6	36.3
19	...	39.4	38.7	38.1	37.6	37.3	37.0	36.8	36.6	36.3
20	...	39.4	38.7	38.1	37.6	37.3	37.0	36.8	36.6	36.3
21	...	39.4	38.7	38.1	37.6	37.3	37.0	36.8	36.6	36.3
22	...	39.4	38.7	38.1	37.6	37.3	37.0	36.8	36.6	36.3
23	...	39.4	38.7	38.1	37.6	37.3	37.0	36.8	36.6	36.3
24	...	39.4	38.7	38.1	37.6	37.3	37.0	36.8	36.6	36.3
25	...	39.4	38.7	38.1	37.6	37.3	37.0	36.8	36.6	36.3
26	...	21.1	20.7	20.4	20.3	20.3	20.3	20.3	20.3	20.3
27	...	21.1	20.7	20.4	20.3	20.3	20.3	20.3	20.3	20.3
28	...	21.1	20.7	20.4	20.3	20.3	20.3	20.3	20.3	20.3
29	...	21.1	20.7	20.4	20.3	20.3	20.3	20.3	20.3	20.3
30	...	21.1	20.7	20.4	20.3	20.3	20.3	20.3	20.3	20.3
31	...	21.1	20.7	20.4	20.3	20.3	20.3	20.3	20.3	20.3
32	...	35.7	35.2	34.7	34.3	33.9	33.6	33.2	...	...
33	...	35.7	35.2	34.7	34.3	33.9	33.6	33.2	...	...
34	...	35.7	35.2	34.7	34.3	33.9	33.6	33.2	...	...
35	...	35.7	35.2	34.7	34.3	33.9	33.6	33.2	...	...
36	...	35.7	35.2	34.7	34.3	33.9	33.6	33.2	...	...
37	...	35.7	35.2	34.7	34.3	33.9	33.6	33.2	...	...
38	...	35.7	35.2	34.7	34.3	33.9	33.6	33.2	...	...
39	29.5	28.9	28.4	28.0	27.6	27.3	27.0	26.7	26.5	26.2
40	29.5	28.9	28.4	28.0	27.6	27.3	27.0	26.7	26.5	26.2
41	29.5	28.9	28.4	28.0	27.6	27.3	27.0	26.7	26.5	26.2
42	29.5	28.9	28.4	28.0	27.6	27.3	27.0	26.7	26.5	26.2
43	29.5	28.9	28.4	28.0	27.6	27.3	27.0	26.7	26.5	26.2

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 Designation/ UNS No.	Class/Condition/ Temper
Nonferrous Materials (Cont'd)						
1	Co-26Cr-9Ni-5Mo-3Fe-2W	Rod	SB-815	...	R31233	Solution ann.
2	Co-26Cr-9Ni-5Mo-3Fe-2W	Plate, sheet, strip	SB-818	...	R31233	Solution ann.
3	Ti	Plate, sheet, strip	SB-265	1	R50250	Annealed
4	Ti	Smls. & wld. tube	SB-338	1	R50250	Annealed
5	Ti	Bar, billet	SB-348	1	R50250	Annealed
6	Ti	Forgings	SB-381	F-1	R50250	Annealed
7	Ti	Smls. pipe	SB-861	1	R50250	Annealed
8	Ti	Wld. pipe	SB-862	1	R50250	Annealed
9	Ti	Castings	SB-367	C-2	R50400	...
10	Ti	Plate, sheet, strip	SB-265	2	R50400	Annealed
11	Ti	Smls. & wld. tube	SB-338	2	R50400	Annealed
12	Ti	Bar, billet	SB-348	2	R50400	Annealed
13	Ti	Forgings	SB-381	F-2	R50400	Annealed
14	Ti	Smls. pipe	SB-861	2	R50400	Annealed
15	Ti	Wld. pipe	SB-862	2	R50400	Annealed
16	Ti	Plate, sheet, strip	SB-265	2H	R50400	Annealed
17	Ti	Smls. & wld. tube	SB-338	2H	R50400	Annealed
18	Ti	Bar, billet	SB-348	2H	R50400	Annealed
19	Ti	Smls. fittings	SB-363	WPT2H	R50400	Annealed
20	Ti	Wld. fittings	SB-363	WPT2HW	R50400	Annealed
21	Ti	Forgings	SB-381	F-2H	R50400	Annealed
22	Ti	Smls. pipe	SB-861	2H	R50400	Annealed
23	Ti	Wld. pipe	SB-862	2H	R50400	Annealed
24	Ti	Plate, sheet, strip	SB-265	3	R50550	Annealed
25	Ti	Smls. & wld. tube	SB-338	3	R50550	Annealed
26	Ti	Bar, billet	SB-348	3	R50550	Annealed
27	Ti	Castings	SB-367	C-3	R50550	Annealed
28	Ti	Forgings	SB-381	F-3	R50550	Annealed
29	Ti	Smls. pipe	SB-861	3	R50550	Annealed
30	Ti	Wld. pipe	SB-862	3	R50550	Annealed
31	Ti-Pd	Plate, sheet, strip	SB-265	11	R52250	Annealed
32	Ti-Pd	Plate, sheet, strip	SB-265	17	R52252	Annealed
33	Ti-Ru	Plate, sheet, strip	SB-265	27	R52254	Annealed
34	Ti-Pd	Plate, sheet, strip	SB-265	7	R52400	Annealed
35	Ti-Pd	Smls. & wld. tube	SB-338	7	R52400	Annealed
36	Ti-Pd	Bar, billet	SB-348	7	R52400	Annealed
37	Ti-Pd	Forgings	SB-381	F-7	R52400	Annealed
38	Ti-Pd	Smls. pipe	SB-861	7	R52400	Annealed
39	Ti-Pd	Wld. pipe	SB-862	7	R52400	Annealed
40	Ti-0.15Pd	Plate, sheet, strip	SB-265	7H	R52400	Annealed
41	Ti-0.15Pd	Smls. & wld. tube	SB-338	7H	R52400	Annealed
42	Ti-0.15Pd	Bar, billet	SB-348	7H	R52400	Annealed
43	Ti-0.15Pd	Smls. fittings	SB-363	WPT7H	R52400	Annealed
44	Ti-0.15Pd	Wld. fittings	SB-363	WPT7HW	R52400	Annealed

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Nonferrous Materials (Cont'd)				
1	...	130	55	...
2	...	130	55	...
3	...	35	20	...
4	...	35	20	...
5	...	35	20	...
6	...	35	20	...
7	...	35	20	...
8	...	35	20	...
9	...	50	40	...
10	...	50	40	...
11	...	50	40	...
12	...	50	40	...
13	...	50	40	...
14	...	50	40	...
15	...	50	40	...
16	...	58	40	...
17	...	58	40	...
18	...	58	40	...
19	...	58	40	...
20	...	58	40	...
21	...	58	40	...
22	...	58	40	...
23	...	58	40	...
24	...	65	55	...
25	...	65	55	...
26	...	65	55	...
27	...	65	55	...
28	...	65	55	...
29	...	65	55	...
30	...	65	55	...
31	...	35	20	...
32	...	35	20	...
33	...	35	20	...
34	...	50	40	...
35	...	50	40	...
36	...	50	40	...
37	...	50	40	...
38	...	50	40	...
39	...	50	40	...
40	...	58	40	...
41	...	58	40	...
42	...	58	40	...
43	...	58	40	...
44	...	58	40	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Nonferrous Materials (Cont'd)								
1	55.0	...	48.2	...	42.8	...	38.3	...	35.1
2	55.0	...	48.2	...	42.8	...	38.3	...	35.1
3	20.0	16.1	14.0	12.3	10.8	9.4	8.2	7.1	6.3
4	20.0	16.1	14.0	12.3	10.8	9.4	8.2	7.1	6.3
5	20.0	16.1	14.0	12.3	10.8	9.4	8.2	7.1	6.3
6	20.0	16.1	14.0	12.3	10.8	9.4	8.2	7.1	6.3
7	20.0	16.1	14.0	12.3	10.8	9.4	8.2	7.1	6.3
8	20.0	16.1	14.0	12.3	10.8	9.4	8.2	7.1	6.3
9	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
10	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
11	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
12	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
13	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
14	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
15	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
16	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
17	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
18	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
19	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
20	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
21	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
22	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
23	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
24	55.0	48.4	44.0	39.8	35.7	32.0	28.6	25.5	22.5
25	55.0	48.4	44.0	39.8	35.7	32.0	28.6	25.5	22.5
26	55.0	48.4	44.0	39.8	35.7	32.0	28.6	25.5	22.5
27	55.0	48.4	44.0	39.8	35.7	32.0	28.6	25.5	22.5
28	55.0	48.4	44.0	39.8	35.7	32.0	28.6	25.5	22.5
29	55.0	48.4	44.0	39.8	35.7	32.0	28.6	25.5	22.5
30	55.0	48.4	44.0	39.8	35.7	32.0	28.6	25.5	22.5
31	20.0	16.1	14.0	12.3	10.8	9.4	8.2	7.1	6.3
32	20.0	16.1	14.0	12.3	10.8	9.4	8.2	7.1	6.3
33	20.0	16.1	14.0	12.3	10.8	9.4	8.2	7.1	6.3
34	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
35	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
36	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
37	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
38	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
39	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
40	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
41	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
42	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
43	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
44	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)									
1	...	33.0	32.3	31.8	31.3	30.8	30.2	29.4	28.3	26.8
2	...	33.0	32.3	31.8	31.3	30.8	30.2	29.4	28.3	26.8
3	5.7	5.3	...	...	...	...	...	...	...	...
4	5.7	5.3	...	...	...	...	...	...	...	...
5	5.7	5.3	...	...	...	...	...	...	...	...
6	5.7	5.3	...	...	...	...	...	...	...	...
7	5.7	5.3	...	...	...	...	...	...	...	...
8	5.7	5.3	...	...	...	...	...	...	...	...
9	12.6	11.4	...	...	...	...	...	...	...	...
10	12.6	11.4	...	...	...	...	...	...	...	...
11	12.6	11.4	...	...	...	...	...	...	...	...
12	12.6	11.4	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...
14	12.6	11.4	...	...	...	...	...	...	...	...
15	12.6	11.4	...	...	...	...	...	...	...	...
16	12.6	11.4	...	...	...	...	...	...	...	...
17	12.6	11.4	...	...	...	...	...	...	...	...
18	12.6	11.4	...	...	...	...	...	...	...	...
19	12.6	11.4	...	...	...	...	...	...	...	...
20	12.6	11.4	...	...	...	...	...	...	...	...
21	12.6	11.4	...	...	...	...	...	...	...	...
22	12.6	11.4	...	...	...	...	...	...	...	...
23	12.6	11.4	...	...	...	...	...	...	...	...
24	19.8	17.1	...	...	...	...	...	...	...	...
25	19.8	17.1	...	...	...	...	...	...	...	...
26	19.8	17.1	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...
28	19.8	17.1	...	...	...	...	...	...	...	...
29	19.8	17.1	...	...	...	...	...	...	...	...
30	19.8	17.1	...	...	...	...	...	...	...	...
31	5.7	5.3	...	...	...	...	...	...	...	...
32	5.7	5.3	...	...	...	...	...	...	...	...
33	5.7	5.3	...	...	...	...	...	...	...	...
34	12.6	11.4	...	...	...	...	...	...	...	...
35	12.6	11.4	...	...	...	...	...	...	...	...
36	12.6	11.4	...	...	...	...	...	...	...	...
37	12.6	11.4	...	...	...	...	...	...	...	...
38	12.6	11.4	...	...	...	...	...	...	...	...
39	12.6	11.4	...	...	...	...	...	...	...	...
40	12.6	11.4	...	...	...	...	...	...	...	...
41	12.6	11.4	...	...	...	...	...	...	...	...
42	12.6	11.4	...	...	...	...	...	...	...	...
43	12.6	11.4	...	...	...	...	...	...	...	...
44	12.6	11.4	...	...	...	...	...	...	...	...

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 Designation/ UNS No.	Class/Condition/ Temper
Nonferrous Materials (Cont'd)						
1	Ti-0.15Pd	Forgings	SB-381	F-7H	R52400	Annealed
2	Ti-0.15Pd	Smls. pipe	SB-861	7H	R52400	Annealed
3	Ti-0.15Pd	Wld. pipe	SB-862	7H	R52400	Annealed
4	Ti-0.05Pd	Plate, sheet, strip	SB-265	16H	R52402	Annealed
5	Ti-0.05Pd	Smls. & wld. tube	SB-338	16H	R52402	Annealed
6	Ti-0.05Pd	Bar, billet	SB-348	16H	R52402	Annealed
7	Ti-0.05Pd	Smls. fittings	SB-363	WPT16H	R52402	Annealed
8	Ti-0.05Pd	Wld. fittings	SB-363	WPT16HW	R52402	Annealed
9	Ti-0.05Pd	Forgings	SB-381	F-16H	R52402	Annealed
10	Ti-0.05Pd	Smls. pipe	SB-861	16H	R52402	Annealed
11	Ti-0.05Pd	Wld. pipe	SB-862	16H	R52402	Annealed
12	Ti-Ru	Plate, sheet, strip	SB-265	26	R52404	Annealed
13	Ti-Ru	Smls. & wld. tube	SB-338	26	R52404	Annealed
14	Ti-Ru	Bar, billet	SB-348	26	R52404	Annealed
15	Ti-Ru	Smls. fittings	SB-363	WPT26	R52404	Annealed
16	Ti-Ru	Wld. fittings	SB-363	WPT26W	R52404	Annealed
17	Ti-Ru	Forgings	SB-381	F-26	R52404	Annealed
18	Ti-Ru	Smls. pipe	SB-861	26	R52404	Annealed
19	Ti-Ru	Wld. pipe	SB-862	26	R52404	Annealed
20	Ti-0.10Ru	Plate, sheet, strip	SB-265	26H	R52404	Annealed
21	Ti-0.10Ru	Smls. & wld. tube	SB-338	26H	R52404	Annealed
22	Ti-0.10Ru	Bar, billet	SB-348	26H	R52404	Annealed
23	Ti-0.10Ru	Smls. fittings	SB-363	WPT26H	R52404	Annealed
24	Ti-0.10Ru	Wld. fittings	SB-363	WPT26HW	R52404	Annealed
25	Ti-0.10Ru	Forgings	SB-381	F-26H	R52404	Annealed
26	Ti-0.10Ru	Smls. pipe	SB-861	26H	R52404	Annealed
27	Ti-0.10Ru	Wld. pipe	SB-862	26H	R52404	Annealed
28	Ti-0.3Mo-0.8Ni	Plate, sheet, strip	SB-265	12	R53400	Annealed
29	Ti-0.3Mo-0.8Ni	Smls. & wld. tube	SB-338	12	R53400	Annealed
30	Ti-0.3Mo-0.8Ni	Bar, billet	SB-348	12	R53400	Annealed
31	Ti-0.3Mo-0.8Ni	Forgings	SB-381	F-12	R53400	Annealed
32	Ti-0.3Mo-0.8Ni	Smls. pipe	SB-861	12	R53400	Annealed
33	Ti-0.3Mo-0.8Ni	Wld. pipe	SB-862	12	R53400	Annealed
34	Ti-3Al-2.5V	Plate, sheet, strip	SB-265	9	R56320	Annealed
35	Ti-3Al-2.5V	Smls. & wld. tube	SB-338	9	R56320	Annealed
36	Ti-3Al-2.5V	Bar, billet	SB-348	9	R56320	Annealed
37	Ti-3Al-2.5V	Smls. fittings	SB-363	WPT9	R56320	Annealed
38	Ti-3Al-2.5V	Wld. fittings	SB-363	WPT9W	R56320	Annealed
39	Ti-3Al-2.5V	Forgings	SB-381	F-9	R56320	Annealed
40	Ti-3Al-2.5V	Smls. pipe	SB-861	9	R56320	Annealed
41	Ti-3Al-2.5V	Wld. pipe	SB-862	9	R56320	Annealed
(10) 42	Ti-3Al-2.5V-0.1Ru	Plate, sheet, strip	SB-265	28	R56323	Annealed
(10) 43	Ti-3Al-2.5V-0.1Ru	Smls. & wld. tube	SB-338	28	R56323	Annealed
(10) 44	Ti-3Al-2.5V-0.1Ru	Bar, billet	SB-348	28	R56323	Annealed

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Nonferrous Materials (Cont'd)				
1	...	58	40	...
2	...	58	40	...
3	...	58	40	...
4	...	58	40	...
5	...	58	40	...
6	...	58	40	...
7	...	58	40	...
8	...	58	40	...
9	...	58	40	...
10	...	58	40	...
11	...	58	40	...
12	...	50	40	...
13	...	50	40	...
14	...	50	40	...
15	...	50	40	...
16	...	50	40	...
17	...	50	40	...
18	...	50	40	...
19	...	50	40	...
20	...	58	40	...
21	...	58	40	...
22	...	58	40	...
23	...	58	40	...
24	...	58	40	...
25	...	58	40	...
26	...	58	40	...
27	...	58	40	...
28	...	70	50	...
29	...	70	50	...
30	...	70	50	...
31	...	70	50	...
32	...	70	50	...
33	...	70	50	...
34	...	90	70	...
35	...	90	70	...
36	...	90	70	...
37	...	90	70	...
38	...	90	70	...
39	...	90	70	...
40	...	90	70	...
41	...	90	70	...
42	...	90	70	... (')
43	...	90	70	... (10)
44	...	90	70	... (10)

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
	-20 to 100	150	200	250	300	350	400	450	500
	Nonferrous Materials (Cont'd)								
1	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
2	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
3	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
4	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
5	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
6	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
7	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
8	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
9	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
10	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
11	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
12	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
13	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
14	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
15	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
16	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
17	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
18	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
19	40.0	34.5	31.5	28.6	25.6	22.6	19.6	17.0	14.8
20	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
21	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
22	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
23	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
24	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
25	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
26	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
27	40.0	34.9	32.2	28.4	25.2	22.0	18.6	16.3	14.1
28	50.0	45.0	41.5	38.1	35.0	32.2	29.4	27.7	26.0
29	50.0	45.0	41.5	38.1	35.0	32.2	29.4	27.7	26.0
30	50.0	45.0	41.5	38.1	35.0	32.2	29.4	27.7	26.0
31	50.0	45.0	41.5	38.1	35.0	32.2	29.4	27.7	26.0
32	50.0	45.0	41.5	38.1	35.0	32.2	29.4	27.7	26.0
33	50.0	45.0	41.5	38.1	35.0	32.2	29.4	27.7	26.0
34	70.0	65.1	61.1	58.1	55.3	52.5	49.7	46.9	44.8
35	70.0	65.1	61.1	58.1	55.3	52.5	49.7	46.9	44.8
36	70.0	65.1	61.1	58.1	55.3	52.5	49.7	46.9	44.8
37	70.0	65.1	61.1	58.1	55.3	52.5	49.7	46.9	44.8
38	70.0	65.1	61.1	58.1	55.3	52.5	49.7	46.9	44.8
39	70.0	65.1	61.1	58.1	55.3	52.5	49.7	46.9	44.8
40	70.0	65.1	61.1	58.1	55.3	52.5	49.7	46.9	44.8
41	70.0	65.1	61.1	58.1	55.3	52.5	49.7	46.9	44.8
(10) 42	70.0	65.1	61.1	58.1	55.3	52.5	49.7	46.9	44.8
(10) 43	70.0	65.1	61.1	58.1	55.3	52.5	49.7	46.9	44.8
(10) 44	70.0	65.1	61.1	58.1	55.3	52.5	49.7	46.9	44.8

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding									
	550	600	650	700	750	800	850	900	950	1000
	Nonferrous Materials (Cont'd)									
1	12.6	11.4	...	...	...	...	...	...	...	...
2	12.6	11.4	...	...	...	...	...	...	...	...
3	12.6	11.4	...	...	...	...	...	...	...	...
4	12.6	11.4	...	...	...	...	...	...	...	...
5	12.6	11.4	...	...	...	...	...	...	...	...
6	12.6	11.4	...	...	...	...	...	...	...	...
7	12.6	11.4	...	...	...	...	...	...	...	...
8	12.6	11.4	...	...	...	...	...	...	...	...
9	12.6	11.4	...	...	...	...	...	...	...	...
10	12.6	11.4	...	...	...	...	...	...	...	...
11	12.6	11.4	...	...	...	...	...	...	...	...
12	12.6	11.4	...	...	...	...	...	...	...	...
13	12.6	11.4	...	...	...	...	...	...	...	...
14	12.6	11.4	...	...	...	...	...	...	...	...
15	12.6	11.4	...	...	...	...	...	...	...	...
16	12.6	11.4	...	...	...	...	...	...	...	...
17	12.6	11.4	...	...	...	...	...	...	...	...
18	12.6	11.4	...	...	...	...	...	...	...	...
19	12.6	11.4	...	...	...	...	...	...	...	...
20	12.6	11.4	...	...	...	...	...	...	...	...
21	12.6	11.4	...	...	...	...	...	...	...	...
22	12.6	11.4	...	...	...	...	...	...	...	...
23	12.6	11.4	...	...	...	...	...	...	...	...
24	12.6	11.4	...	...	...	...	...	...	...	...
25	12.6	11.4	...	...	...	...	...	...	...	...
26	12.6	11.4	...	...	...	...	...	...	...	...
27	12.6	11.4	...	...	...	...	...	...	...	...
28	24.8	24.0	...	...	...	...	...	...	...	...
29	24.8	24.0	...	...	...	...	...	...	...	...
30	24.8	24.0	...	...	...	...	...	...	...	...
31	24.8	24.0	...	...	...	...	...	...	...	...
32	24.8	24.0	...	...	...	...	...	...	...	...
33	24.8	24.0	...	...	...	...	...	...	...	...
34	43.4	41.3	...	...	...	...	...	...	...	...
35	43.4	41.3	...	...	...	...	...	...	...	...
36	43.4	41.3	...	...	...	...	...	...	...	...
37	43.4	41.3	...	...	...	...	...	...	...	...
38	43.4	41.3	...	...	...	...	...	...	...	...
39	43.4	41.3	...	...	...	...	...	...	...	...
40	43.4	41.3	...	...	...	...	...	...	...	...
41	43.4	41.3	...	...	...	...	...	...	...	...
42	43.4	41.3	...	...	...	...	...	...	...	...
43	43.4	41.3	...	...	...	...	...	...	...	...
44	43.4	41.3	...	...	...	...	...	...	...	...

(10)
(10)
(10)

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 Designation/ UNS No.	Class/Condition/ Temper
Nonferrous Materials (Cont'd)						
(10) 1	Ti-3Al-2.5V-0.1Ru	Smls. fittings	SB-363	WPT28	R56323	Annealed
(10) 2	Ti-3Al-2.5V-0.1Ru	Wld. fittings	SB-363	WPT28W	R56323	Annealed
(10) 3	Ti-3Al-2.5V-0.1Ru	Forgings	SB-381	F-28	R56323	Annealed
(10) 4	Ti-3Al-2.5V-0.1Ru	Smls. pipe	SB-861	28	R56323	Annealed
(10) 5	Ti-3Al-2.5V-0.1Ru	Wld. pipe	SB-862	28	R56323	Annealed
6	99.2Zr	Forgings	SB-493	...	R60702	Annealed
7	99.2Zr	Smls. tube	SB-523	...	R60702	Annealed
8	99.2Zr	Wld. tube	SB-523	...	R60702	Annealed
9	99.2Zr	Bar, wire	SB-550	...	R60702	Annealed
10	99.2Zr	Plate, sheet, strip	SB-551	...	R60702	Annealed
11	99.2Zr	Smls. fittings	SB-653	PZ-2	R60702	Annealed
12	99.2Zr	Wld. fittings	SB-653	PZ-2W	R60702	Annealed
13	99.2Zr	Smls. & wld. pipe	SB-658	...	R60702	Annealed

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Size/Thickness, in.	Min. Tensile Strength, ksi	Min. Yield Strength, ksi	Notes
Nonferrous Materials (Cont'd)				
1	...	90	70	... (10)
2	...	90	70	... (10)
3	...	90	70	... (10)
4	...	90	70	... (10)
5	...	90	70	... (10)
6	...	55	30	...
7	...	55	30	...
8	...	55	30	...
9	...	55	30	...
10	...	55	30	...
11	...	55	30	...
12	...	55	30	...
13	...	55	30	...

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

		Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding								
Line No.		-20 to 100	150	200	250	300	350	400	450	500
		Nonferrous Materials (Cont'd)								
(10)	1	70.0	65.1	61.1	58.1	55.3	52.5	49.7	46.9	44.8
(10)	2	70.0	65.1	61.1	58.1	55.3	52.5	49.7	46.9	44.8
(10)	3	70.0	65.1	61.1	58.1	55.3	52.5	49.7	46.9	44.8
(10)	4	70.0	65.1	61.1	58.1	55.3	52.5	49.7	46.9	44.8
(10)	5	70.0	65.1	61.1	58.1	55.3	52.5	49.7	46.9	44.8
	6	30.0	25.8	23.1	20.4	18.0	15.9	14.0	12.4	11.0
	7	30.0	25.8	23.1	20.4	18.0	15.9	14.0	12.4	11.0
	8	30.0	25.8	23.1	20.4	18.0	15.9	14.0	12.4	11.0
	9	30.0	25.8	23.1	20.4	18.0	15.9	14.0	12.4	11.0
	10	30.0	25.8	23.1	20.4	18.0	15.9	14.0	12.4	11.0
	11	30.0	25.8	23.1	20.4	18.0	15.9	14.0	12.4	11.0
	12	30.0	25.8	23.1	20.4	18.0	15.9	14.0	12.4	11.0
	13	30.0	25.8	23.1	20.4	18.0	15.9	14.0	12.4	11.0

TABLE Y-1 (CONT'D)
YIELD STRENGTH VALUES S_y FOR FERROUS AND NONFERROUS MATERIALS

Line No.	Yield Strength, ksi (Multiply by 1000 to Obtain psi), for Metal Temperature, °F, Not Exceeding										
	550	600	650	700	750	800	850	900	950	1000	
	Nonferrous Materials (Cont'd)										
1	43.4	41.3	...	...	...	...	...	...	...	...	(10)
2	43.4	41.3	...	...	...	...	...	...	...	...	(10)
3	43.4	41.3	...	...	...	...	...	...	...	...	(10)
4	43.4	41.3	...	...	...	...	...	...	...	...	(10)
5	43.4	41.3	...	...	...	...	...	...	...	...	(10)
6	9.9	9.0	8.4	7.9	7.6	7.5	...	...	...	...
7	9.9	9.0	8.4	7.9	7.6	7.5	...	...	...	...
8	9.9	9.0	8.4	7.9	7.6	7.5	...	...	...	...
9	9.9	9.0	8.4	7.9	7.6	7.5	...	...	...	...
10	9.9	9.0	8.4	7.9	7.6	7.5	...	...	...	...
11	9.9	9.0	8.4	7.9	7.6	7.5	...	...	...	...
12	9.9	9.0	8.4	7.9	7.6	7.5	...	...	...	...
13	9.9	9.0	8.4	7.9	7.6	7.5	...	...	...	...

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; 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 Section I, Section III, or Section VIII 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 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.
- (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.

NOTES FOR SECTION VIII, DIVISION 3 APPLICATIONS

- (1) This material is permitted only in wire form when used for wire-wound vessels and wire-wound frames as described in Article KD-9 of Section VIII, Division 3.
- (2) Strength values for intermediate thickness may be interpolated.
- (3) This material is permitted only when used as an inner layer in a vessel whose design meets the leak-before-burst criteria of KD-141 of Section VIII, Division 3.
- (4) No welding is permitted on this material.
- (5) 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 550°F. See Appendix A, A-360.
- (6) 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 $\frac{1}{8}$ in. 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 tensile tests.

TABLE Y-2
FACTORS FOR LIMITING PERMANENT
STRAIN IN NICKEL, HIGH NICKEL ALLOYS,
AND HIGH ALLOY STEELS

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 or Table 1B, or the design stress intensity value listed in Table 2A or Table 2B, the lower value shall be used.

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SUBPART 2

PHYSICAL PROPERTIES TABLES

INTRODUCTION

Subpart 2 of Section II, Part D 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 70°F to as high as 1650°F. 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 $\pm 10\%$.

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.

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, the user is encouraged to bring the information to the attention of the ASME Boiler and Pressure Vessel Committee so it might be added to Subpart 2. Information should be directed to:

Secretary
ASME Boiler and Pressure Vessel Committee
Three Park Avenue
New York, NY 10016-5990
Telephone: (212) 591-8533
Fax: (212) 591-8501

TABLE TE-1
THERMAL EXPANSION FOR FERROUS MATERIALS

Temperature, °F	Coefficients for Carbon and Low Alloy Steels (Group 1) [Note (1)]			Coefficients for Other Low Alloy Steels (Group 2) [Note (2)]			Coefficients for 5Cr-1Mo and 29Cr-7Ni-2Mo-N Steels		
	A	B	C	A	B	C	A	B	C
70	6.4	6.4	0	7.0	7.0	0	6.4	6.4	0
100	6.6	6.5	0.2	7.1	7.1	0.3	6.6	6.5	0.2
150	6.8	6.6	0.6	7.3	7.2	0.7	6.8	6.6	0.6
200	7.0	6.7	1.0	7.5	7.3	1.1	7.0	6.7	1.0
250	7.2	6.8	1.5	7.6	7.3	1.6	7.1	6.8	1.5
300	7.3	6.9	1.9	7.8	7.4	2.0	7.2	6.9	1.9
350	7.5	7.0	2.4	7.9	7.5	2.5	7.3	6.9	2.3
400	7.7	7.1	2.8	8.0	7.6	3.0	7.3	7.0	2.8
450	7.8	7.2	3.3	8.1	7.6	3.5	7.4	7.0	3.2
500	8.0	7.3	3.7	8.3	7.7	4.0	7.4	7.1	3.7
550	8.2	7.3	4.2	8.4	7.8	4.5	7.5	7.1	4.1
600	8.3	7.4	4.7	8.4	7.8	5.0	7.6	7.2	4.6
650	8.5	7.5	5.2	8.5	7.9	5.5	7.7	7.2	5.0
700	8.7	7.6	5.7	8.6	7.9	6.0	7.7	7.2	5.5
750	8.8	7.7	6.3	8.7	8.0	6.5	7.8	7.3	5.9
800	9.0	7.8	6.8	8.8	8.0	7.0	7.9	7.3	6.4
850	9.1	7.9	7.4	8.8	8.1	7.6	8.0	7.4	6.9
900	9.2	7.9	7.9	8.9	8.1	8.1	8.1	7.4	7.4
950	9.3	8.0	8.5	9.0	8.2	8.6	8.1	7.4	7.9
1000	9.4	8.1	9.0	9.0	8.2	9.2	8.2	7.5	8.4
1050	9.4	8.1	9.6	9.0	8.3	9.7	8.3	7.5	8.8
1100	9.5	8.2	10.1	9.1	8.3	10.3	8.3	7.6	9.3
1150	9.5	8.3	10.7	9.1	8.3	10.8	8.4	7.6	9.8
1200	9.5	8.3	11.3	9.1	8.4	11.4	8.4	7.6	10.3
1250	9.5	8.4	11.9	9.1	8.4	11.9	8.5	7.7	10.9
1300	9.5	8.4	12.4	9.1	8.4	12.5	8.6	7.7	11.4
1350	...	...	...	9.1	8.5	13.0	8.7	7.7	11.9
1400	...	...	...	9.0	8.5	13.5	8.9	7.8	12.4
1450	...	...	...	8.9	8.5	14.1	...	...	...
1500	...	...	...	8.8	8.5	14.6	...	...	...

TABLE TE-1 (CONT'D)
THERMAL EXPANSION FOR FERROUS MATERIALS

Temperature, °F	Coefficients for 9Cr-1Mo Steels (Including Grades 9, 91, 911, and 92)			Coefficients for 5Ni- $\frac{1}{4}$ Mo Steels			Coefficients for 8Ni and 9Ni Steels		
	A	B	C	A	B	C	A	B	C
70	5.8	5.8	0	6.2	6.2	0	5.5	5.5	0
100	5.9	5.9	0.2	6.4	6.3	0.2	5.7	5.6	0.2
150	6.1	5.9	0.6	6.6	6.4	0.6	6.0	5.8	0.6
200	6.2	6.0	0.9	6.8	6.5	1.0	6.3	5.9	0.9
250	6.3	6.1	1.3	6.9	6.6	1.4	6.6	6.1	1.3
300	6.5	6.2	1.7	7.1	6.7	1.8	6.8	6.2	1.7
350	6.6	6.2	2.1	7.2	6.8	2.3	6.9	6.3	2.1
400	6.7	6.3	2.5	7.3	6.8	2.7	7.0	6.4	2.5
450	6.8	6.3	2.9	7.5	6.9	3.2	7.1	6.5	3.0
500	6.9	6.4	3.3	7.6	7.0	3.6	7.1	6.6	3.4
550	7.0	6.5	3.7	7.7	7.1	4.1	7.2	6.6	3.8
600	7.1	6.5	4.1	7.9	7.1	4.5	7.2	6.7	4.2
650	7.2	6.6	4.6	8.0	7.2	5.0	7.3	6.7	4.7
700	7.3	6.6	5.0	8.1	7.3	5.5	7.4	6.8	5.1
750	7.4	6.7	5.4	8.2	7.3	6.0	7.5	6.8	5.6
800	7.5	6.7	5.9	8.3	7.4	6.5	7.6	6.9	6.0
850	7.5	6.8	6.3	8.4	7.5	7.0	7.7	6.9	6.5
900	7.6	6.8	6.8	8.5	7.5	7.5	7.6	7.0	6.9
950	7.7	6.9	7.3	8.6	7.6	8.0	7.3	7.0	7.4
1000	7.8	6.9	7.7	8.7	7.6	8.5	6.8	7.0	7.8
1050	7.9	7.0	8.2	8.8	7.7	9.1	...	...	...
1100	8.1	7.0	8.7	9.0	7.8	9.6	...	...	...
1150	8.2	7.1	9.2	9.3	7.8	10.1	...	...	...
1200	8.4	7.1	9.7	9.7	7.9	10.7	...	...	...
1250	8.6	7.2	10.2	...	...	...	...	...	...
1300	...	...	...	...	...	...	...	...	...
1350	...	...	...	...	...	...	...	...	...
1400	...	...	...	...	...	...	...	...	...
1450	...	...	...	...	...	...	...	...	...
1500	...	...	...	...	...	...	...	...	...

TABLE TE-1 (CONT'D)
THERMAL EXPANSION FOR FERROUS MATERIALS

Temperature, °F	Coefficients for 12Cr, 12Cr-1Al, 13Cr, and 13Cr-4Ni Steels			Coefficients for 15Cr and 17Cr Steels			Coefficients for 27Cr Steels		
	A	B	C	A	B	C	A	B	C
70	5.9	5.9	0	5.3	5.3	0	5.0	5.0	0
100	6.1	6.0	0.2	5.4	5.4	0.2	5.1	5.1	0.2
150	6.2	6.1	0.6	5.6	5.5	0.5	5.2	5.1	0.5
200	6.4	6.2	1.0	5.7	5.5	0.9	5.3	5.2	0.8
250	6.5	6.2	1.3	5.8	5.6	1.2	5.3	5.2	1.1
300	6.6	6.3	1.7	6.0	5.7	1.6	5.4	5.2	1.4
350	6.6	6.4	2.1	6.1	5.7	1.9	5.4	5.3	1.8
400	6.7	6.4	2.5	6.2	5.8	2.3	5.5	5.3	2.1
450	6.7	6.4	2.9	6.3	5.8	2.7	5.6	5.3	2.4
500	6.8	6.5	3.3	6.4	5.9	3.0	5.6	5.4	2.8
550	6.8	6.5	3.7	6.4	6.0	3.4	5.7	5.4	3.1
600	6.9	6.5	4.2	6.5	6.0	3.8	5.8	5.4	3.5
650	6.9	6.6	4.6	6.6	6.0	4.2	5.9	5.5	3.8
700	7.0	6.6	5.0	6.6	6.1	4.6	6.0	5.5	4.2
750	7.1	6.6	5.4	6.7	6.1	5.0	6.1	5.5	4.5
800	7.1	6.7	5.8	6.7	6.2	5.4	6.2	5.6	4.9
850	7.2	6.7	6.3	6.8	6.2	5.8	6.2	5.6	5.3
900	7.2	6.7	6.7	6.8	6.2	6.2	6.3	5.7	5.6
950	7.3	6.8	7.1	6.8	6.3	6.6	6.4	5.7	6.0
1000	7.3	6.8	7.6	6.8	6.3	7.0	6.4	5.7	6.4
1050	7.4	6.8	8.0	6.9	6.3	7.4	6.5	5.8	6.8
1100	7.4	6.8	8.5	6.9	6.4	7.9	6.5	5.8	7.2
1150	7.4	6.9	8.9	7.0	6.4	8.3	6.5	5.8	7.6
1200	7.4	6.9	9.4	7.0	6.4	8.7	6.5	5.9	8.0
1250	7.4	6.9	9.8	7.1	6.4	9.1	6.6	5.9	8.4
1300	7.4	6.9	10.2	7.2	6.5	9.5	6.7	5.9	8.7
1350	7.4	7.0	10.7	7.4	6.5	10.0	6.8	6.0	9.2
1400	7.5	7.0	11.1	7.6	6.5	10.4	7.0	6.0	9.6
1450	7.5	7.0	11.6	7.9	6.6	10.9	7.3	6.0	10.0
1500	7.6	7.0	12.0	8.3	6.6	11.4	7.7	6.1	10.4

TABLE TE-1 (CONT'D)
THERMAL EXPANSION FOR FERROUS MATERIALS

(10)

Temperature, °F	Coefficients for Austenitic Stainless Steels (Group 3) [Note (3)]			Coefficients for Other Austenitic Stainless Steels (Group 4) [Note (4)]			Coefficients for Ductile Cast Iron		
	A	B	C	A	B	C	A	B	C
70	8.5	8.5	0	8.2	8.2	0	5.7	5.7	0
100	8.7	8.6	0.3	8.3	8.2	0.3	5.8	5.8	0.2
150	9.0	8.8	0.8	8.6	8.4	0.8	6.1	5.9	0.6
200	9.4	8.9	1.4	8.8	8.5	1.3	6.3	6.0	0.9
250	9.6	9.1	2.0	9.0	8.6	1.9	6.6	6.1	1.3
300	9.9	9.2	2.5	9.2	8.7	2.4	6.9	6.3	1.7
350	10.1	9.4	3.1	9.3	8.8	3.0	7.2	6.4	2.2
400	10.2	9.5	3.8	9.4	8.9	3.5	7.4	6.6	2.6
450	10.4	9.6	4.4	9.5	9.0	4.1	7.6	6.7	3.1
500	10.5	9.7	5.0	9.6	9.1	4.7	7.7	6.8	3.5
550	10.6	9.8	5.6	9.7	9.1	5.3	7.8	6.9	4.0
600	10.6	9.9	6.3	9.8	9.2	5.8	7.9	7.0	4.5
650	10.7	9.9	6.9	9.9	9.2	6.4	7.9	7.1	4.9
700	10.8	10.0	7.5	10.0	9.3	7.0	8.0	7.1	5.4
750	10.8	10.0	8.2	10.1	9.3	7.6	8.0	7.2	5.9
800	10.9	10.1	8.8	10.2	9.4	8.2	8.1	7.3	6.4
850	11.0	10.2	9.5	10.3	9.4	8.8	8.1	7.3	6.8
900	11.1	10.2	10.2	10.4	9.5	9.5	8.3	7.4	7.3
950	11.2	10.3	10.8	10.5	9.6	10.1	8.5	7.4	7.8
1000	11.4	10.3	11.5	10.6	9.6	10.7	8.7	7.5	8.4
1050	11.5	10.4	12.2	10.7	9.7	11.4	...	...	...
1100	11.7	10.4	12.9	10.9	9.7	12.0	...	...	...
1150	11.8	10.5	13.6	11.0	9.8	12.7	...	...	...
1200	12.0	10.6	14.3	11.1	9.8	13.3	...	...	...
1250	12.0	10.6	15.0	11.3	9.9	14.0	...	...	...
1300	12.0	10.7	15.8	11.4	9.9	14.7	...	...	...
1350	11.9	10.7	16.5	11.5	10.0	15.4	...	...	...
1400	11.7	10.8	17.2	11.7	10.1	16.1	...	...	...
1450	11.2	10.8	17.9	11.8	10.1	16.8	...	...	...
1500	10.5	10.8	18.5	12.0	10.2	17.5	...	...	...

(10)

TABLE TE-1 (CONT'D)
THERMAL EXPANSION FOR FERROUS MATERIALS

Temperature, °F	Coefficients for Precipitation Hardened 17Cr-4Ni-4Cu Stainless Steels, Condition 1075			Coefficients for Precipitation Hardened 17Cr-4Ni-4Cu Stainless Steels, Condition 1150		
	A	B	C	A	B	C
70	6.2	6.2	0	6.4	6.4	0
100	6.2	6.2	0.2	6.5	6.4	0.2
150	6.3	6.3	0.6	6.6	6.5	0.6
200	6.3	6.3	1.0	6.8	6.6	1.0
250	6.3	6.3	1.4	6.9	6.7	1.4
300	6.4	6.4	1.8	7.1	6.7	1.9
350	6.4	6.4	2.2	7.2	6.8	2.3
400	6.5	6.5	2.6	7.3	6.9	2.7
450	6.5	6.5	3.0	7.4	6.9	3.2
500	6.5	6.5	3.4	7.5	7.0	3.6
550	6.6	6.6	3.8	7.5	7.0	4.1
600	6.6	6.6	4.2	7.5	7.1	4.5
650	6.7	6.7	4.6	7.6	7.1	5.0
700	6.7	6.7	5.1	7.6	7.2	5.4
750	6.7	6.7	5.5	7.6	7.2	5.9
800	6.8	6.8	5.9	7.6	7.2	6.3
850	...	...	...	7.7	7.2	6.8
900	...	...	...	7.8	7.3	7.2
950	...	...	...	8.0	7.3	7.7
1000	...	...	...	8.4	7.4	8.2

Notes appear on following page.

TABLE TE-1 (CONT'D)

GENERAL NOTE: Coefficient A is the instantaneous coefficient of thermal expansion $\times 10^{-6}$ (in./in./°F). Coefficient B is the mean coefficient of thermal expansion $\times 10^{-6}$ (in./in./°F) in going from 70°F to indicated temperature. Coefficient C is the linear thermal expansion (in./100 ft) in going from 70°F 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- $\frac{1}{4}$ Mo
C- $\frac{1}{2}$ Mo
 $\frac{1}{2}$ Cr- $\frac{1}{5}$ Mo
 $\frac{1}{2}$ Cr- $\frac{1}{5}$ Mo-V
 $\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-Si
 $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo
 $\frac{3}{4}$ Cr- $\frac{1}{2}$ Ni-Cu
 $\frac{3}{4}$ Cr- $\frac{3}{4}$ Ni-Cu-Al
1Cr- $\frac{1}{5}$ Mo
1Cr- $\frac{1}{5}$ Mo-Si

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-Cu
 $1\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo-Ti
2Cr- $\frac{1}{2}$ Mo
2 $\frac{1}{4}$ Cr-1Mo
3Cr-1Mo
3Cr-1Mo- $\frac{1}{4}$ V-Cb-Ca
3Cr-1Mo- $\frac{1}{4}$ V-Ti-B
 $\frac{1}{2}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo
 $\frac{1}{2}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-V
 $\frac{1}{2}$ Ni- $\frac{1}{2}$ Mo-V
 $\frac{3}{4}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V
 $\frac{3}{4}$ Ni- $\frac{1}{2}$ Cu-Mo

$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo- $\frac{1}{3}$ Cr-V
 $\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo-Cr-V
 $\frac{3}{4}$ Ni-1Mo- $\frac{3}{4}$ Cr
1Ni- $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo
 $1\frac{1}{4}$ Ni-1Cr- $\frac{1}{2}$ Mo
 $1\frac{3}{4}$ Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo
2Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo
2Ni- $\frac{3}{4}$ Cr- $\frac{1}{3}$ Mo
2Ni-1 $\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-V
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

(2) Group 2 alloys (by nominal composition):

Mn- $\frac{1}{4}$ Mo
Mn- $\frac{1}{2}$ Mo
Mn- $\frac{1}{2}$ Mo- $\frac{1}{4}$ Ni
Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni

Mn- $\frac{1}{2}$ Mo- $\frac{3}{4}$ Ni
Mn-V
18Cr-5Ni-3Mo-N

22Cr-5Ni-3Mo-N
23Cr-4Ni-Mo-Cu
25Cr-7Ni-4Mo-N

(3) Group 3 alloys (by nominal composition):

16Cr-12Ni-2Mo
16Cr-12Ni-2Mo-N
16Cr-12Ni-2Mo-Ti
18Cr-8Ni

18Cr-8Ni-N
18Cr-10Ni-Cb
18Cr-10Ni-Ti
18Cr-11Ni

18Cr-13Ni-3Mo
18Cr-18Ni-2Si
19Cr-9Ni-Mo-W
21Cr-11Ni-N

(4) Group 4 alloys (by nominal composition):

25Ni-15Cr-2Ti
29Ni-20Cr-3Cu-2Mo
20Cr-18Ni-6Mo
22Cr-13Ni-5Mn

23Cr-12Ni
25Cr-12Ni
25Cr-20Ni

25Cr-20Ni-2Mo
31Ni-31Fe-29Cr-Mo
44Fe-25Ni-21Cr-Mo

(10) (5) DELETED.

TABLE TE-2
THERMAL EXPANSION FOR ALUMINUM ALLOYS

Temperature, °F	Coefficients for Aluminum Alloys		
	A	B	C
70	12.1	12.1	0
100	12.6	12.4	0.4
150	13.2	12.7	1.2
200	13.5	13.0	2.0
250	13.7	13.1	2.8
300	14.0	13.3	3.7
350	14.3	13.4	4.5
400	14.7	13.6	5.4
450	15.1	13.8	6.3
500	15.3	13.9	7.2
550	15.4	14.1	8.1
600	15.2	14.2	9.0

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 $\times 10^{-6}$ (in./in./°F). Coefficient B is the mean coefficient of thermal expansion $\times 10^{-6}$ (in./in./°F) in going from 70°F to indicated temperature. Coefficient C is the linear thermal expansion (in./100 ft) in going from 70°F to indicated temperature.

TABLE TE-3
THERMAL EXPANSION FOR COPPER ALLOYS

Temperature, °F	Coefficients for Copper Alloys, C1XXXX Series			Coefficients for Bronze Alloys			Coefficients for Brass Alloys			Coefficients for Copper-Nickel (70Cu-30Ni)			Coefficients for Copper-Nickel (90Cu-10Ni)		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
70	9.3	9.3	0	9.6	9.6	0	9.3	9.3	0	8.1	8.1	0	...	...	...
100	9.5	9.4	0.3	9.8	9.7	0.4	9.6	9.4	0.3	8.3	8.2	0.3	...	...	...
150	9.6	9.5	0.9	10.1	9.9	0.9	9.9	9.6	0.9	8.6	8.4	0.8	...	...	...
200	9.7	9.6	1.5	10.2	10.0	1.6	10.1	9.8	1.5	8.8	8.5	1.3	...	...	...
250	9.9	9.6	2.1	10.3	10.1	2.2	10.3	9.9	2.1	9.0	8.6	1.9	...	...	...
300	10.0	9.7	2.7	10.4	10.1	2.8	10.5	10.0	2.8	9.2	8.7	2.4	...	...	...
350	10.1	9.8	3.3	10.4	10.2	3.4	10.8	10.1	3.4	9.4	8.8	3.0	...	...	...
400	10.2	9.8	3.9	10.5	10.2	4.0	11.1	10.2	4.1	9.5	8.9	3.5	...	...	...
450	10.3	9.9	4.5	10.6	10.3	4.7	11.3	10.4	4.7	9.7	9.0	4.1	...	...	...
500	10.3	9.9	5.1	10.8	10.3	5.3	11.5	10.5	5.4	9.7	9.1	4.7	...	...	...
550	10.3	10.0	5.7	10.9	10.4	6.0	11.6	10.6	6.1	9.6	9.1	5.3	9.5	9.5	5.5
600	10.4	10.0	6.4	11.0	10.4	6.6	11.7	10.7	6.8	9.5	9.2	5.8	...	...	...
650	...	...	...	11.1	10.5	7.3	11.9	10.8	7.5	9.3	9.2	6.4	...	...	...
700	...	...	...	11.1	10.5	8.0	12.2	10.9	8.2	9.2	9.2	7.0	...	...	...
750	...	...	...	11.1	10.6	8.6	13.0	11.0	9.0	...	...	...	...	...	...
800	...	...	...	11.0	10.6	9.3	14.5	11.2	9.8	...	...	...	...	...	...

GENERAL NOTE: Coefficient A is the instantaneous coefficient of thermal expansion $\times 10^{-6}$ (in./in./°F). Coefficient B is the mean coefficient of thermal expansion $\times 10^{-6}$ (in./in./°F) in going from 70°F to indicated temperature. Coefficient C is the linear thermal expansion (in./100 ft) in going from 70°F to indicated temperature.

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TABLE TE-4
THERMAL EXPANSION FOR NICKEL ALLOYS

Temperature, °F	Coefficients for N02200 and N02201			Coefficients for N04400 and N04405			Coefficients for N06002		
	A	B	C	A	B	C	A	B	C
70	6.6	6.6	0	7.7	7.7	0	7.3	7.3	0
100	6.9	6.8	0.2	7.9	7.8	0.3	7.4	7.4	0.3
150	7.3	7.0	0.7	8.2	7.9	0.8	7.6	7.4	0.7
200	7.7	7.2	1.1	8.4	8.1	1.3	7.7	7.5	1.2
250	7.9	7.4	1.6	8.6	8.2	1.8	7.8	7.6	1.6
300	8.1	7.5	2.1	8.8	8.3	2.3	7.9	7.6	2.1
350	8.2	7.6	2.6	8.9	8.4	2.8	7.9	7.7	2.6
400	8.3	7.7	3.1	9.1	8.5	3.4	8.0	7.7	3.1
450	8.4	7.8	3.6	9.1	8.6	3.9	8.2	7.8	3.5
500	8.5	7.9	4.1	9.2	8.7	4.5	8.3	7.8	4.0
550	8.7	8.0	4.6	9.3	8.7	5.0	8.4	7.9	4.5
600	8.8	8.0	5.1	9.3	8.8	5.6	8.6	7.9	5.0
650	8.9	8.1	5.6	9.3	8.8	6.1	8.7	8.0	5.6
700	9.0	8.2	6.2	9.4	8.9	6.7	8.9	8.1	6.1
750	9.1	8.2	6.7	9.4	8.9	7.3	9.1	8.1	6.6
800	9.2	8.3	7.3	9.4	8.9	7.8	9.2	8.2	7.2
850	9.3	8.4	7.8	9.5	9.0	8.4	9.4	8.3	7.7
900	9.4	8.4	8.4	9.5	9.0	9.0	9.6	8.3	8.3
950	9.5	8.5	9.0	9.5	9.0	9.5	9.7	8.4	8.9
1000	9.5	8.5	9.5	9.6	9.1	10.1	9.8	8.5	9.5
1050	9.6	8.6	10.1	9.6	9.1	10.7	10.0	8.6	10.1
1100	9.6	8.6	10.7	9.7	9.1	11.3	10.1	8.6	10.7
1150	9.7	8.7	11.3	9.7	9.1	11.8	10.2	8.7	11.3
1200	9.7	8.7	11.8	9.8	9.2	12.4	10.3	8.8	11.9
1250	9.8	8.8	12.4	9.9	9.2	13.0	10.4	8.8	12.5
1300	10.0	8.8	13.0	9.9	9.2	13.6	10.5	8.9	13.1
1350	10.2	8.9	13.6	10.0	9.2	14.2	10.7	9.0	13.8
1400	10.6	8.9	14.2	10.0	9.3	14.8	10.9	9.0	14.4
1450	...	...	...	10.0	9.3	15.4	11.2	9.1	15.1
1500	...	...	...	10.1	9.3	16.0	11.7	9.2	15.8
1550	...	...	...	...	...	...	...	...	...
1600	...	...	...	...	...	...	...	...	...
1650	...	...	...	...	...	...	...	...	...

TABLE TE-4 (CONT'D)
THERMAL EXPANSION FOR NICKEL ALLOYS

(10)

Temperature, °F	Coefficients for N06007			Coefficients for N06022			Coefficients for N06030		
	A	B	C	A	B	C	A	B	C
70	7.4	7.4	0	6.9	6.9	0	6.7	6.7	0
100	7.5	7.4	0.3	6.9	6.9	0.2	6.9	6.8	0.2
150	7.5	7.5	0.7	6.9	6.9	0.7	7.3	7.0	0.7
200	7.6	7.5	1.2	6.9	6.9	1.1	7.6	7.1	1.1
250	7.7	7.5	1.6	6.9	6.9	1.5	7.8	7.3	1.6
300	7.7	7.6	2.1	6.9	6.9	1.9	8.0	7.4	2.1
350	7.8	7.6	2.6	6.9	6.9	2.3	8.2	7.6	2.5
400	8.0	7.7	3.0	7.0	6.9	2.7	8.4	7.7	3.0
450	8.1	7.7	3.5	7.1	6.9	3.2	8.5	7.8	3.5
500	8.3	7.8	4.0	7.3	7.0	3.6	8.6	7.9	4.1
550	8.6	7.8	4.5	7.4	7.0	4.0	8.7	8.0	4.6
600	8.8	7.9	5.0	7.6	7.0	4.5	8.8	8.0	5.1
650	9.0	8.0	5.6	7.8	7.1	4.9	8.9	8.1	5.6
700	9.3	8.1	6.1	8.1	7.2	5.4	9.0	8.2	6.2
750	9.5	8.2	6.7	8.3	7.2	5.9	9.1	8.2	6.7
800	9.8	8.3	7.3	8.6	7.3	6.4	9.3	8.3	7.3
850	10.0	8.4	7.9	8.8	7.4	6.9	9.4	8.4	7.8
900	10.1	8.5	8.5	9.1	7.5	7.5	9.6	8.4	8.4
950	10.2	8.6	9.1	9.3	7.6	8.0	9.8	8.5	9.0
1000	10.3	8.7	9.7	9.6	7.7	8.6	10.0	8.6	9.6
1050	10.4	8.8	10.3	9.8	7.8	9.2	10.1	8.7	10.2
1100	10.4	8.8	10.9	10.0	7.9	9.8	10.2	8.7	10.8
1150	10.4	8.9	11.6	10.2	8.0	10.4	10.2	8.8	11.4
1200	10.3	9.0	12.2	10.4	8.1	11.0	10.1	8.9	12.0
1250	10.4	9.0	12.8	10.5	8.2	11.6	9.7	8.9	12.6
1300	10.5	9.1	13.4	10.7	8.3	12.2	9.2	8.9	13.2
1350	10.7	9.2	14.1	10.9	8.4	12.9	8.3	8.9	13.7
1400	11.1	9.2	14.7	11.2	8.5	13.6	7.0	8.9	14.2
1450	11.8	9.3	15.4	11.5	8.6	14.2
1500	12.9	9.4	16.1	11.9	8.7	14.9
1550
1600
1650

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TABLE TE-4 (CONT'D)
THERMAL EXPANSION FOR NICKEL ALLOYS

Temperature, °F	Coefficients for N06045			Coefficients for N06059 and N06686			Coefficients for N06230		
	A	B	C	A	B	C	A	B	C
70	6.1	6.1	0	6.5	6.5	0	6.9	6.9	0
100	6.6	6.4	0.2	6.5	6.5	0.2	6.9	6.9	0.2
150	7.4	6.8	0.7	6.6	6.5	0.6	7.0	6.9	0.7
200	8.0	7.1	1.1	6.7	6.6	1.0	7.1	7.0	1.1
250	8.3	7.4	1.6	6.8	6.6	1.4	7.2	7.0	1.5
300	8.6	7.7	2.1	6.9	6.7	1.8	7.3	7.1	2.0
350	8.8	7.8	2.6	7.0	6.7	2.3	7.4	7.1	2.4
400	8.8	8.0	3.2	7.1	6.8	2.7	7.5	7.2	2.8
450	8.9	8.1	3.7	7.2	6.8	3.1	7.6	7.2	3.3
500	8.9	8.2	4.2	7.2	6.9	3.6	7.7	7.3	3.7
550	8.9	8.3	4.8	7.3	6.9	4.0	7.9	7.3	4.2
600	8.9	8.3	5.3	7.3	7.0	4.4	8.0	7.4	4.7
650	9.0	8.4	5.8	7.3	7.0	4.9	8.1	7.4	5.2
700	9.1	8.4	6.4	7.4	7.0	5.3	8.3	7.5	5.7
750	9.2	8.5	6.9	7.4	7.0	5.7	8.4	7.6	6.2
800	9.3	8.5	7.5	7.5	7.1	6.2	8.5	7.6	6.7
850	9.5	8.6	8.0	7.6	7.1	6.6	8.7	7.7	7.2
900	9.7	8.7	8.6	7.7	7.1	7.1	8.8	7.7	7.7
950	9.9	8.7	9.2	7.7	7.2	7.6	8.9	7.8	8.2
1000	10.1	8.8	9.8	7.6	7.2	8.0	8.9	7.9	8.8
1050	10.3	8.9	10.4	7.3	7.2	8.5	9.0	7.9	9.3
1100	10.5	8.9	11.0	...	7.2	8.9	9.1	8.0	9.9
1150	10.7	9.0	11.7	...	...	...	9.1	8.0	10.4
1200	10.8	9.1	12.3	...	...	...	9.2	8.1	11.0
1250	10.9	9.2	13.0	...	...	...	9.3	8.1	11.5
1300	11.0	9.2	13.6	...	...	...	9.3	8.2	12.1
1350	11.0	9.3	14.3	...	...	...	9.5	8.2	12.6
1400	11.0	9.4	15.0	...	...	...	9.6	8.3	13.2
1450	11.0	9.4	15.6	...	...	...	9.9	8.3	13.8
1500	11.1	9.5	16.3	...	...	...	10.2	8.4	14.4
1550	...	...	...	...	...	...	...	...	...
1600	...	...	...	...	...	...	...	...	...
1650	...	...	...	...	...	...	...	...	...

TABLE TE-4 (CONT'D)
THERMAL EXPANSION FOR NICKEL ALLOYS

(10)

Temperature, °F	Coefficients for N06455			Coefficients for N06600			Coefficients for N06625		
	A	B	C	A	B	C	A	B	C
70	5.8	5.8	0	6.8	6.8	0	6.7	6.7	0
100	6.0	5.9	0.2	7.0	6.9	0.2	6.9	6.8	0.2
150	6.2	6.0	0.6	7.2	7.0	0.7	7.2	7.0	0.7
200	6.5	6.2	1.0	7.4	7.1	1.1	7.4	7.1	1.1
250	6.8	6.3	1.4	7.6	7.2	1.6	7.4	7.2	1.6
300	7.0	6.4	1.8	7.7	7.3	2.0	7.5	7.2	2.0
350	7.2	6.5	2.2	7.9	7.4	2.5	7.5	7.3	2.4
400	7.4	6.7	2.6	8.0	7.5	3.0	7.5	7.3	2.9
450	7.5	6.8	3.1	8.2	7.6	3.5	7.5	7.3	3.3
500	7.7	6.9	3.5	8.3	7.6	3.9	7.5	7.4	3.8
550	7.7	7.0	4.0	8.4	7.7	4.4	7.6	7.4	4.2
600	7.8	7.0	4.5	8.5	7.8	5.0	7.7	7.4	4.7
650	7.9	7.1	4.9	8.6	7.9	5.5	7.8	7.4	5.2
700	7.9	7.2	5.4	8.7	7.9	6.0	8.0	7.5	5.6
750	7.9	7.2	5.9	8.8	8.0	6.5	8.2	7.5	6.1
800	7.9	7.3	6.4	8.9	8.0	7.0	8.4	7.6	6.6
850	7.9	7.3	6.8	9.1	8.1	7.6	8.7	7.6	7.1
900	7.9	7.3	7.3	9.2	8.2	8.1	8.9	7.7	7.7
950	7.9	7.4	7.8	9.3	8.2	8.7	9.1	7.8	8.2
1000	8.0	7.4	8.3	9.5	8.3	9.3	9.4	7.9	8.8
1050	8.0	7.4	8.7	9.7	8.4	9.8	9.6	7.9	9.3
1100	8.0	7.5	9.2	9.9	8.4	10.4	9.8	8.0	9.9
1150	8.1	7.5	9.7	10.1	8.5	11.0	9.9	8.1	10.5
1200	8.1	7.5	10.2	10.3	8.6	11.6	10.1	8.2	11.1
1250	8.1	7.5	10.7	10.5	8.6	12.2	10.2	8.3	11.7
1300	8.1	7.6	11.2	10.6	8.7	12.9	10.4	8.4	12.3
1350	8.0	7.6	11.7	10.8	8.8	13.5	10.5	8.4	13.0
1400	7.9	7.6	12.1	11.0	8.9	14.2	10.7	8.5	13.6
1450	7.6	7.6	12.6	11.1	9.0	14.8	10.9	8.6	14.2
1500	7.2	7.6	13.0	11.1	9.0	15.5	11.3	8.7	14.9
1550
1600
1650

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TABLE TE-4 (CONT'D)
THERMAL EXPANSION FOR NICKEL ALLOYS

Temperature, °F	Coefficients for N06690			Coefficients for N07718			Coefficients for N07750		
	A	B	C	A	B	C	A	B	C
70	7.7	7.7	0	7.1	7.1	0	6.7	6.7	0
100	7.8	7.8	0.3	7.1	7.1	0.3	6.8	6.8	0.2
150	7.9	7.8	0.8	7.2	7.2	0.7	7.1	6.9	0.7
200	8.0	7.9	1.2	7.4	7.2	1.1	7.3	7.0	1.1
250	8.0	7.9	1.7	7.5	7.3	1.6	7.5	7.1	1.5
300	8.1	7.9	2.2	7.6	7.3	2.0	7.7	7.2	2.0
350	8.2	8.0	2.7	7.7	7.4	2.5	7.8	7.3	2.5
400	8.3	8.0	3.2	7.9	7.5	3.0	7.8	7.4	2.9
450	8.5	8.1	3.7	8.0	7.5	3.4	7.8	7.4	3.4
500	8.6	8.1	4.2	8.0	7.6	3.9	7.7	7.5	3.9
550	8.7	8.2	4.7	8.1	7.6	4.4	7.7	7.5	4.3
600	8.7	8.2	5.2	8.2	7.7	4.9	7.7	7.5	4.8
650	8.7	8.3	5.8	8.3	7.7	5.4	7.8	7.6	5.3
700	8.5	8.3	6.3	8.4	7.8	5.9	8.1	7.6	5.7
750	8.3	8.3	6.8	8.5	7.8	6.4	8.6	7.6	6.2
800	8.1	8.3	7.3	8.6	7.9	6.9	9.4	7.7	6.8
850	...	...	...	8.7	7.9	7.4	...	...	...
900	...	...	...	8.8	8.0	7.9	...	...	...
950	...	...	...	8.9	8.0	8.5	...	...	...
1000	...	...	...	9.1	8.1	9.0	...	...	...
1050	...	...	...	9.2	8.1	9.6	...	...	...
1100	...	...	...	9.4	8.2	10.1	...	...	...
1150	...	...	...	...	...	...	...	...	...
1200	...	...	...	...	...	...	...	...	...
1250	...	...	...	...	...	...	...	...	...
1300	...	...	...	...	...	...	...	...	...
1350	...	...	...	...	...	...	...	...	...
1400	...	...	...	...	...	...	...	...	...
1450	...	...	...	...	...	...	...	...	...
1500	...	...	...	...	...	...	...	...	...
1550	...	...	...	...	...	...	...	...	...
1600	...	...	...	...	...	...	...	...	...
1650	...	...	...	...	...	...	...	...	...

TABLE TE-4 (CONT'D)
THERMAL EXPANSION FOR NICKEL ALLOYS

(10)

Temperature, °F	Coefficients for N08031			Coefficients for N08330			Coefficients for N08800, N08801, N08810, and N08811		
	A	B	C	A	B	C	A	B	C
70	7.7	7.7	0	8.1	8.1	0	7.9	7.9	0
100	7.8	7.7	0.3	8.2	8.1	0.3	8.1	8.0	0.3
150	7.9	7.8	0.7	8.3	8.2	0.8	8.5	8.2	0.8
200	8.1	7.9	1.2	8.5	8.3	1.3	8.7	8.4	1.3
250	8.3	8.0	1.7	8.7	8.4	1.8	8.9	8.5	1.8
300	8.4	8.0	2.2	8.8	8.5	2.3	9.1	8.6	2.4
350	8.5	8.1	2.7	8.9	8.5	2.9	9.2	8.7	2.9
400	8.7	8.2	3.2	9.0	8.6	3.4	9.3	8.8	3.5
450	8.7	8.3	3.8	9.1	8.7	4.0	9.4	8.9	4.0
500	8.8	8.3	4.3	9.2	8.7	4.5	9.5	8.9	4.6
550	8.9	8.4	4.8	9.3	8.8	5.1	9.5	9.0	5.2
600	9.0	8.4	5.4	9.5	8.8	5.6	9.6	9.0	5.7
650	9.0	8.5	5.9	9.7	8.9	6.2	9.7	9.1	6.3
700	9.1	8.5	6.4	9.9	9.0	6.8	9.7	9.1	6.9
750	9.2	8.6	7.0	9.9	9.0	7.4	9.8	9.2	7.5
800	9.3	8.6	7.6	9.6	9.1	8.0	9.9	9.2	8.1
850	9.3	8.7	8.1	...	...	...	10.0	9.3	8.7
900	9.4	8.7	8.7	...	...	...	10.1	9.3	9.3
950	9.4	8.7	9.2	...	...	...	10.2	9.4	9.9
1000	9.3	8.8	9.8	...	...	...	10.3	9.4	10.5
1050	9.1	8.8	10.3	...	...	...	10.4	9.5	11.1
1100	8.8	8.8	10.9	...	...	...	10.5	9.5	11.8
1150	...	...	...	...	...	...	10.6	9.6	12.4
1200	...	...	...	...	...	...	10.8	9.6	13.0
1250	...	...	...	...	...	...	10.9	9.7	13.7
1300	...	...	...	...	...	...	11.1	9.7	14.4
1350	...	...	...	...	...	...	11.3	9.8	15.0
1400	...	...	...	...	...	...	11.6	9.8	15.7
1450	11.9	9.9	16.4
1500	12.4	10.0	17.1
1550	13.0	10.1	17.9
1600	13.7	10.2	18.7
1650	14.7	10.3	19.6

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TABLE TE-4 (CONT'D)
THERMAL EXPANSION FOR NICKEL ALLOYS

Temperature, °F	Coefficients for N08825			Coefficients for N10001			Coefficients for N10003		
	A	B	C	A	B	C	A	B	C
70	7.5	7.5	0	6.0	6.0	0	6.2	6.2	0
100	7.6	7.5	0.3	6.2	6.1	0.2	6.3	6.2	0.2
150	7.8	7.6	0.7	6.3	6.2	0.6	6.5	6.3	0.6
200	8.0	7.7	1.2	6.4	6.3	1.0	6.6	6.4	1.0
250	8.1	7.8	1.7	6.5	6.3	1.4	6.8	6.5	1.4
300	8.2	7.9	2.2	6.5	6.3	1.8	6.9	6.6	1.8
350	8.2	7.9	2.7	6.5	6.4	2.1	7.0	6.6	2.2
400	8.3	8.0	3.2	6.5	6.4	2.5	7.0	6.7	2.6
450	8.3	8.0	3.7	6.6	6.4	2.9	7.1	6.7	3.1
500	8.5	8.1	4.2	6.6	6.4	3.3	7.1	6.8	3.5
550	8.7	8.1	4.7	6.7	6.5	3.7	7.2	6.8	3.9
600	8.9	8.2	5.2	6.9	6.5	4.1	7.4	6.9	4.4
650	9.2	8.3	5.8	7.0	6.5	4.5	7.6	6.9	4.8
700	9.2	8.3	6.3	7.2	6.6	5.0	7.7	7.0	5.3
750	8.9	8.4	6.9	7.4	6.6	5.4	7.8	7.0	5.7
800	7.8	8.4	7.4	7.6	6.7	5.9	7.7	7.1	6.2
850	...	...	...	7.7	6.7	6.3	...	...	...
900	...	...	...	7.9	6.8	6.8	...	...	...
950	...	...	...	8.1	6.9	7.3	...	...	...
1000	...	...	...	8.2	6.9	7.7	...	...	...
1050	...	...	...	8.4	7.0	8.2	...	...	...
1100	...	...	...	8.5	7.1	8.8	...	...	...
1150	...	...	...	8.6	7.1	9.3	...	...	...
1200	...	...	...	8.7	7.2	9.8	...	...	...
1250	...	...	...	8.8	7.3	10.3	...	...	...
1300	...	...	...	9.0	7.3	10.8	...	...	...
1350	...	...	...	9.3	7.4	11.4	...	...	...
1400	...	...	...	9.8	7.5	12.0	...	...	...
1450	...	...	...	10.4	7.6	12.6	...	...	...
1500	...	...	...	11.3	7.7	13.2	...	...	...
1550	...	...	...	...	...	...	...	...	...
1600	...	...	...	...	...	...	...	...	...
1650	...	...	...	...	...	...	...	...	...

TABLE TE-4 (CONT'D)
THERMAL EXPANSION FOR NICKEL ALLOYS

(10)

Temperature, °F	Coefficients for N10242			Coefficients for N10276			Coefficients for N10629		
	A	B	C	A	B	C	A	B	C
70	5.8	5.8	0	6.0	6.0	0	5.5	5.5	0
100	5.9	5.8	0.2	6.1	6.1	0.2	5.6	5.5	0.2
150	6.0	5.9	0.6	6.4	6.2	0.6	5.8	5.6	0.5
200	6.2	6.0	0.9	6.6	6.3	1.0	5.9	5.7	0.9
250	6.4	6.1	1.3	6.8	6.4	1.4	6.0	5.8	1.2
300	6.5	6.1	1.7	7.0	6.5	1.8	6.2	5.9	1.6
350	6.7	6.2	2.1	7.2	6.6	2.2	6.3	5.9	2.0
400	6.8	6.3	2.5	7.3	6.7	2.7	6.3	6.0	2.4
450	6.9	6.4	2.9	7.5	6.8	3.1	6.4	6.0	2.7
500	7.0	6.5	3.3	7.7	6.9	3.6	6.5	6.1	3.1
550	7.0	6.5	3.8	7.8	7.0	4.0	6.6	6.1	3.5
600	7.0	6.6	4.2	7.9	7.1	4.5	6.7	6.2	3.9
650	7.0	6.6	4.6	8.0	7.1	5.0	6.8	6.2	4.3
700	7.0	6.6	5.0	8.1	7.2	5.5	6.8	6.3	4.7
750	7.0	6.7	5.4	8.2	7.3	5.9	6.9	6.3	5.2
800	7.0	6.7	5.8	8.3	7.4	6.4	6.9	6.4	5.6
850	7.0	6.7	6.3	8.4	7.4	6.9	6.9	6.4	6.0
900	7.0	6.7	6.7	8.5	7.5	7.5	7.0	6.4	6.4
950	7.2	6.7	7.1	8.6	7.5	8.0	7.0	6.5	6.8
1000	7.3	6.8	7.5	8.7	7.6	8.5	7.0	6.5	7.2
1050	7.6	6.8	8.0	8.8	7.7	9.0	7.0	6.5	7.7
1100	8.0	6.8	8.5	8.9	7.7	9.5	7.1	6.5	8.1
1150	8.4	6.9	9.0	8.9	7.8	10.1	7.2	6.6	8.5
1200	9.0	7.0	9.5	9.0	7.8	10.6	...	...	...
1250	9.8	7.1	10.0	9.1	7.9	11.2	...	...	...
1300	10.6	7.2	10.6	9.2	7.9	11.7	...	...	...
1350	11.7	7.4	11.3	9.2	8.0	12.3	...	...	...
1400	12.9	7.6	12.1	9.3	8.0	12.8
1450	14.2	7.8	12.9	9.2	8.1	13.4
1500	15.8	8.0	13.8	9.2	8.1	13.9
1550
1600
1650

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(10)

TABLE TE-4 (CONT'D)
THERMAL EXPANSION FOR NICKEL ALLOYS

Temperature, °F	Coefficients for N10665			Coefficients for N10675			Coefficients for N12160		
	A	B	C	A	B	C	A	B	C
70	5.3	5.3	0	...	5.7	0	6.9	6.9	0
100	5.5	5.4	0.2	...	5.7	0.2	7.0	7.0	0.3
150	5.8	5.6	0.5	...	5.8	0.6	7.3	7.1	0.7
200	6.0	5.7	0.9	...	5.8	0.9	7.5	7.2	1.1
250	6.1	5.8	1.3	...	5.9	1.3	7.7	7.3	1.6
300	6.2	5.9	1.6	...	5.9	1.6	7.9	7.4	2.0
350	6.3	6.0	2.0	...	6.0	2.0	8.1	7.5	2.5
400	6.4	6.0	2.4	...	6.1	2.4	8.2	7.6	3.0
450	6.5	6.1	2.8	...	6.1	2.8	8.3	7.7	3.5
500	6.5	6.1	3.2	...	6.2	3.2	8.4	7.8	4.0
550	6.6	6.2	3.6	...	6.3	3.6	8.5	7.9	4.5
600	6.7	6.2	4.0	...	6.3	4.0	8.6	7.9	5.0
650	6.9	6.3	4.4	...	6.4	4.4	8.6	8.0	5.6
700	7.0	6.3	4.8	...	6.4	4.9	8.7	8.0	6.1
750	7.1	6.4	5.2	...	6.5	5.3	8.7	8.1	6.6
800	7.2	6.4	5.6	...	6.5	5.7	8.8	8.1	7.1
850	7.3	6.5	6.1	...	6.5	6.1	8.9	8.2	7.7
900	7.3	6.5	6.5	...	6.5	6.5	9.0	8.2	8.2
950	7.3	6.6	6.9	...	6.5	6.9	9.2	8.3	8.7
1000	7.3	6.6	7.4	...	6.5	7.3	9.3	8.3	9.3
1050	7.2	6.6	7.8	...	6.6	7.7	9.5	8.4	9.9
1100	7.1	6.7	8.2	...	6.6	8.1	9.8	8.4	10.4
1150	7.0	6.7	8.7	...	6.6	8.5	10.1	8.5	11.0
1200	6.9	6.7	9.1	...	6.6	9.0	10.4	8.6	11.6
1250	6.8	6.7	9.5	...	6.7	9.4	10.6	8.7	12.3
1300	6.8	6.7	9.9	...	6.7	9.9	10.9	8.8	12.9
1350	7.0	6.7	10.3	...	6.8	10.5	11.1	8.8	13.6
1400	7.3	6.7	10.7	...	7.0	11.1	11.2	8.9	14.2
1450	7.9	6.8	11.2	...	7.2	11.9	11.2	9.0	14.9
1500	8.8	6.8	11.7	...	7.4	12.7	10.9	9.1	15.6
1550	...	...	...	...	...	...	...	...	...
1600	...	...	...	...	...	...	...	...	...
1650	...	...	...	...	...	...	...	...	...

TABLE TE-4 (CONT'D)
THERMAL EXPANSION FOR NICKEL ALLOYS

Temperature, °F	Coefficients for R20033		
	A	B	C
70	7.8	7.8	0
100	7.9	7.9	0.3
150	8.2	8.0	0.8
200	8.4	8.1	1.3
250	8.6	8.2	1.8
300	8.7	8.3	2.3
350	8.8	8.4	2.8
400	8.7	8.5	3.3
450	8.7	8.5	3.9
500	8.6	8.5	4.4
550	8.7	8.5	4.9
600	8.8	8.5	5.4
650	9.0	8.6	6.0
700	9.4	8.6	6.5
750	9.7	8.7	7.1
800	9.9	8.8	7.7
850	9.9	8.8	8.3
900	9.3	8.9	8.9
950	...	...	...
1000	...	...	...
1050	...	...	...
1100	...	...	...
1150	...	...	...
1200	...	...	...
1250	...	...	...
1300	...	...	...
1350	...	...	...
1400	...	...	...
1450	...	...	...
1500	...	...	...
1550	...	...	...
1600	...	...	...
1650	...	...	...

GENERAL NOTE: Coefficient A is the instantaneous coefficient of thermal expansion $\times 10^{-6}$ (in./in./°F). Coefficient B is the mean coefficient of thermal expansion $\times 10^{-6}$ (in./in./°F) in going from 70°F to indicated temperature. Coefficient C is the linear thermal expansion (in./100 ft) in going from 70°F to indicated temperature.

TABLE TE-5
THERMAL EXPANSION FOR TITANIUM ALLOYS

(10)

Temperature, °F	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		
	A	B	C	A	B	C
70	4.6	4.6	0	4.7	4.7	0
100	4.7	4.7	0.2	4.8	4.7	0.2
150	4.8	4.7	0.5	4.8	4.8	0.5
200	4.8	4.7	0.7	4.9	4.8	0.8
250	4.8	4.8	1.0	5.1	4.9	1.1
300	4.9	4.8	1.3	5.2	4.9	1.4
350	4.9	4.8	1.6	5.3	5.0	1.7
400	5.0	4.8	1.9	5.3	5.0	2.0
450	5.0	4.8	2.2	5.3	5.1	2.3
500	5.1	4.9	2.5	5.3	5.1	2.6
550	5.1	4.9	2.8	5.5	5.1	2.9
600	5.2	4.9	3.1	6.4	5.2	3.3
650	5.3	4.9	3.4	...	...	...
700	5.5	5.0	3.8	...	...	...
750	5.9	5.0	4.1	...	...	...
800	6.6	5.1	4.5	...	...	...

GENERAL NOTE: Coefficient A is the instantaneous coefficient of thermal expansion $\times 10^{-6}$ (in./in./°F). Coefficient B is the mean coefficient of thermal expansion $\times 10^{-6}$ (in./in./°F) in going from 70°F to indicated temperature. Coefficient C is the linear thermal expansion (in./100 ft) in going from 70°F to indicated temperature.

TABLE TCD
NOMINAL COEFFICIENTS OF THERMAL CONDUCTIVITY (TC) AND THERMAL DIFFUSIVITY (TD)

Carbon and Low Alloy Steels										
Temp., °F	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)]	
	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
70	34.9	0.700	27.3	0.530	23.7	0.459	21.0	0.408	15.9	0.311
100	34.7	0.676	27.6	0.520	23.6	0.451	21.0	0.401	16.2	0.311
150	34.2	0.641	27.8	0.504	23.5	0.437	21.2	0.392	16.7	0.312
200	33.7	0.611	27.8	0.487	23.5	0.424	21.3	0.384	17.1	0.313
250	33.0	0.585	27.6	0.471	23.4	0.412	21.4	0.377	17.5	0.312
300	32.3	0.560	27.3	0.455	23.4	0.401	21.5	0.371	17.8	0.311
350	31.6	0.537	26.9	0.440	23.3	0.390	21.5	0.364	18.0	0.308
400	30.9	0.516	26.5	0.426	23.1	0.379	21.5	0.357	18.2	0.304
450	30.1	0.495	26.1	0.412	23.0	0.368	21.5	0.350	18.4	0.299
500	29.4	0.474	25.7	0.399	22.7	0.357	21.4	0.342	18.5	0.294
550	28.7	0.454	25.3	0.386	22.5	0.347	21.3	0.333	18.5	0.287
600	28.0	0.433	24.9	0.373	22.2	0.336	21.1	0.324	18.5	0.280
650	27.3	0.414	24.5	0.360	21.9	0.325	20.9	0.314	18.5	0.273
700	26.6	0.394	24.1	0.346	21.6	0.314	20.7	0.304	18.5	0.265
750	26.0	0.375	23.7	0.333	21.3	0.303	20.5	0.294	18.4	0.258
800	25.3	0.356	23.2	0.319	21.0	0.292	20.2	0.284	18.3	0.250
850	24.6	0.337	22.8	0.305	20.6	0.281	20.0	0.274	18.2	0.242
900	23.8	0.318	22.3	0.291	20.3	0.269	19.7	0.263	18.1	0.234
950	23.1	0.301	21.7	0.277	20.0	0.258	19.4	0.253	17.9	0.226
1000	22.4	0.283	21.1	0.263	19.7	0.247	19.1	0.242	17.8	0.217
1050	21.6	0.266	20.5	0.250	19.4	0.235	18.8	0.230	17.6	0.208
1100	20.9	0.249	19.8	0.234	19.1	0.223	18.5	0.218	17.4	0.199
1150	20.1	0.232	19.0	0.219	18.7	0.212	18.3	0.205	17.2	0.188
1200	19.4	0.215	18.3	0.204	18.3	0.200	18.0	0.192	17.0	0.177
1250	18.6	0.199	17.6	0.185	17.7	0.183	17.7	0.177	16.8	0.164
1300	17.9	0.179	16.9	0.157	16.6	0.164	17.3	0.160	16.5	0.150
1350	17.2	0.138	16.2	0.120	15.7	0.137	16.3	0.137	16.2	0.135
1400	16.6	0.083	15.7	0.078	15.3	0.077	15.6	0.073	15.8	0.117
1450	16.0	0.155	15.2	0.160	15.1	0.128	15.4	0.124	15.6	0.143
1500	15.5	0.166	14.9	0.172	15.1	0.200	15.3	0.197	15.7	0.161
1550	...	...	...	...	...	...	...	...	...	...

TABLE TCD (CONT'D)
NOMINAL COEFFICIENTS OF THERMAL CONDUCTIVITY (TC) AND THERMAL DIFFUSIVITY (TD)

Temp., °F	Carbon and Low Alloy Steels (Cont'd)		High Chrome 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)]	
	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
70	12.8	0.256	14.2	0.276	11.6	0.221	10.0	0.188	8.6	0.151
100	13.1	0.257	14.2	0.271	11.6	0.220	10.1	0.189	8.7	0.152
150	13.6	0.258	14.3	0.265	11.7	0.217	10.3	0.189	9.0	0.154
200	14.0	0.260	14.3	0.260	11.7	0.214	10.6	0.190	9.3	0.156
250	14.4	0.261	14.4	0.256	11.8	0.211	10.9	0.190	9.6	0.158
300	14.7	0.262	14.4	0.251	11.8	0.208	11.2	0.190	9.8	0.160
350	15.0	0.262	14.4	0.246	11.9	0.205	11.5	0.190	10.1	0.162
400	15.2	0.260	14.5	0.242	11.9	0.203	11.7	0.190	10.4	0.165
450	15.4	0.258	14.5	0.237	12.0	0.200	12.0	0.190	10.6	0.167
500	15.6	0.254	14.5	0.231	12.0	0.198	12.3	0.190	10.9	0.169
550	15.8	0.250	14.6	0.226	12.1	0.195	12.5	0.190	11.1	0.172
600	15.9	0.245	14.6	0.221	12.2	0.193	12.8	0.189	11.3	0.174
650	16.0	0.239	14.6	0.216	12.2	0.190	13.0	0.188	11.6	0.177
700	16.0	0.233	14.6	0.210	12.3	0.187	13.1	0.187	11.8	0.179
750	16.1	0.227	14.6	0.205	12.3	0.183	13.3	0.184	12.0	0.182
800	16.1	0.220	14.7	0.200	12.4	0.179	13.4	0.181	12.3	0.184
850	16.1	0.214	14.7	0.196	12.5	0.174	13.6	0.177	12.5	0.186
900	16.1	0.207	14.7	0.191	12.6	0.169	13.7	0.171	12.7	0.189
950	16.1	0.200	14.7	0.186	12.6	0.163	13.8	0.166	12.9	0.191
1000	16.1	0.193	14.7	0.180	12.7	0.158	13.9	0.159	13.1	0.194
1050	16.0	0.185	14.7	0.174	12.8	0.153	14.0	0.152	13.4	0.196
1100	16.0	0.176	14.7	0.167	12.9	0.148	14.0	0.144	13.6	0.198
1150	15.9	0.166	14.8	0.159	13.0	0.152	14.1	0.136	13.8	0.201
1200	15.8	0.155	14.8	0.149	13.1	0.159	14.3	0.130	14.0	0.203
1250	15.7	0.142	14.8	0.137	13.2	0.168	14.4	0.138	14.3	0.205
1300	15.6	0.127	14.8	0.123	13.4	0.176	14.5	0.153	14.5	0.208
1350	15.4	0.111	14.8	0.107	13.5	0.183	14.7	0.171	14.7	0.210
1400	15.3	0.147	14.8	0.158	13.7	0.189	14.9	0.185	14.9	0.212
1450	15.1	0.165	14.8	0.172	13.8	0.194	15.2	0.194	15.1	0.214
1500	14.9	0.177	14.9	0.173	14.0	0.199	15.5	0.200	15.3	0.216
1550	...	...	...	...	...	...	...	...	...	...

TABLE TCD (CONT'D)
 NOMINAL COEFFICIENTS OF THERMAL CONDUCTIVITY (TC) AND THERMAL DIFFUSIVITY (TD)

Temp., °F	High Alloy Steels (Cont'd)				High Nickel Alloys					
	Material Group K [Note (11)]		Material Group L [Note (12)]		Nickel N02200		Low C–Nickel N02201		Ni–Cu N04400	
	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
70	8.2	0.139	6.4	0.115	...	...	...	...	12.6	0.224
100	8.3	0.140	6.6	0.116	...	...	...	...	12.9	0.228
150	8.6	0.142	6.9	0.118	...	...	...	...	13.4	0.234
200	8.8	0.145	7.1	0.121	38.7	...	42.5	...	13.9	0.241
250	9.1	0.147	7.4	0.124	38.0	...	41.8	...	14.5	0.247
300	9.3	0.150	7.7	0.126	37.2	...	40.7	...	15.0	0.254
350	9.5	0.152	8.0	0.129	36.3	...	39.5	...	15.6	0.261
400	9.8	0.155	8.2	0.132	35.5	...	38.2	...	16.1	0.268
450	10.0	0.157	8.5	0.135	34.8	...	37.0	...	16.6	0.275
500	10.2	0.160	8.8	0.138	34.1	...	35.9	...	17.0	0.280
550	10.5	0.162	9.1	0.141	33.3	...	35.0	...	17.5	0.285
600	10.7	0.165	9.3	0.143	32.5	...	34.2	...	17.9	0.289
650	10.9	0.167	9.6	0.146	31.8	...	33.7	...	18.4	0.291
700	11.2	0.170	9.9	0.149	31.7	...	33.3	...	18.9	0.292
750	11.4	0.172	10.1	0.152	32.2	...	33.1	...	19.3	0.293
800	11.6	0.175	10.4	0.155	32.5	...	33.0	...	19.9	0.293
850	11.9	0.177	10.7	0.158	32.8	...	33.1	...	20.4	...
900	12.1	0.180	10.9	0.161	33.1	...	33.3	...	20.9	...
950	12.3	0.182	11.2	0.164	33.4	...	33.6	...	21.5	...
1000	12.5	0.184	11.4	0.167	33.8	...	34.0	...	22.0	...
1050	12.8	0.187	11.7	0.170	...	...	34.4	...	...	...
1100	13.0	0.189	11.9	0.173	...	...	34.9	...	...	...
1150	13.2	0.191	12.2	0.176	...	...	35.3	...	...	...
1200	13.4	0.194	12.5	0.178	...	...	35.7	...	...	...
1250	13.6	0.196	12.7	0.181	...	...	36.1	...	...	...
1300	13.8	0.198	13.0	0.184	...	...	36.4	...	...	...
1350	14.1	0.200	13.2	0.186	...	...	36.7	...	...	...
1400	14.3	0.203	13.5	0.188	...	...	37.0	...	...	...
1450	14.5	0.205	13.7	0.190	...	...	37.4	...	...	...
1500	14.7	0.207	14.0	0.191	...	...	37.8	...	...	...
1550	...	...	...	0.192	...	...	...	...	...	...

TABLE TCD (CONT'D)
 NOMINAL COEFFICIENTS OF THERMAL CONDUCTIVITY (TC) AND THERMAL DIFFUSIVITY (TD)

High Nickel Alloys (Cont'd)										
Temp., °F	Ni-Cu N04405		Ni-Cr-Mo-Fe N06002		Ni-Cr-Fe-Mo-Cu N06007		N06022		N06030	
	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
70	12.6	...	5.2	0.088	5.8	0.117	5.6	...	5.9	...
100	12.9	...	5.5	0.092	6.0	0.116	5.8	...	6.1	...
150	13.4	...	5.9	0.098	6.2	0.116	6.0	...	6.5	...
200	13.9	...	6.3	0.105	6.4	0.116	6.4	...	6.9	...
250	14.5	...	6.6	0.111	6.7	0.118	6.7	...	7.3	...
300	15.0	...	7.0	0.116	6.9	0.120	7.0	...	7.6	...
350	15.6	...	7.3	0.122	7.2	0.122	7.4	...	8.0	...
400	16.1	...	7.6	0.127	7.4	0.125	7.8	...	8.4	...
450	16.6	...	7.9	0.132	7.7	0.128	8.1	...	8.7	...
500	17.0	...	8.2	0.136	7.9	0.131	8.5	...	9.1	...
550	17.5	...	8.5	0.141	8.2	0.133	8.8	...	9.5	...
600	17.9	...	8.8	0.145	8.4	0.136	9.1	...	9.8	...
650	18.4	...	9.1	0.149	8.6	0.139	9.4	...	10.2	...
700	18.9	...	9.4	0.153	8.9	0.142	9.7	...	10.5	...
750	19.3	...	9.7	0.156	9.2	0.145	10.1	...	10.8	...
800	19.9	...	10.1	0.160	9.4	0.148	10.4	...	11.1	...
850	20.4	...	10.4	0.163	9.7	0.151	10.7	...	11.4	...
900	20.9	...	10.7	0.166	9.9	0.154	11.0	...	11.6	...
950	21.5	...	11.0	0.169	10.2	0.157	11.4	...	11.9	...
1000	22.0	...	11.4	0.172	10.5	0.160	11.7	...	12.1	...
1050	...	...	11.7	0.174	10.7	0.163	12.0	...	12.2	...
1100	...	...	12.0	0.176	10.9	0.166	12.3	...	12.4	...
1150	...	...	12.3	0.178	11.1	0.168	...	...	...	...
1200	...	...	12.6	0.180	11.2	0.171	...	...	...	...
1250	...	...	12.9	0.182	...	...	...	...	...	...
1300	13.2	0.183
1350	13.5	0.183
1400	13.8	0.184
1450	14.2	0.183
1500	14.6	0.182
1550	0.181

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TABLE TCD (CONT'D)
NOMINAL COEFFICIENTS OF THERMAL CONDUCTIVITY (TC) AND THERMAL DIFFUSIVITY (TD)

High Nickel Alloys (Cont'd)										
Temp., °F	N06045		N06059		N06230		Ni-Mo-Cr-Low C N06455 and N06686		Ni-Cr-Fe N06600	
	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
70	7.5	0.125	6.0	0.113	5.2	0.095	5.8	0.110	8.6	0.154
100	6.3	...	5.4	0.097	5.9	0.112	8.7	0.154
150	6.6	...	5.6	0.100	6.2	0.115	8.9	0.155
200	6.9	...	5.9	0.104	6.5	0.118	9.1	0.156
250	7.2	...	6.2	0.107	6.8	0.121	9.3	0.158
300	7.4	...	6.6	0.111	7.1	0.124	9.6	0.160
350	7.7	...	6.9	0.114	7.4	0.127	9.8	0.163
400	7.9	...	7.2	0.117	7.7	0.130	10.1	0.165
450	8.2	...	7.5	0.121	8.0	0.134	10.3	0.168
500	8.5	...	7.9	0.124	8.2	0.137	10.6	0.170
550	8.7	...	8.2	0.127	8.5	0.140	10.8	0.172
600	9.0	...	8.5	0.130	8.8	0.144	11.1	0.175
650	9.3	...	8.9	0.133	9.1	0.147	11.3	0.177
700	9.5	...	9.2	0.136	9.3	0.151	11.6	0.179
750	9.8	...	9.5	0.139	9.6	0.154	11.8	0.181
800	10.1	...	9.8	0.141	9.9	0.158	12.1	0.183
850	10.3	...	10.2	0.144	10.2	0.161	12.4	0.184
900	10.6	...	10.5	0.147	10.5	0.165	12.6	0.186
950	10.8	...	10.8	0.150	10.8	0.169	12.9	0.188
1000	11.1	...	11.1	0.152	11.1	0.173	13.2	0.189
1050	11.4	...	11.4	0.155	11.5	0.177	13.4	0.191
1100	11.7	...	11.7	0.158	11.8	0.181	13.7	0.192
1150	12.0	0.160	12.1	0.185	14.0	0.194
1200	12.3	0.163	12.5	0.189	14.3	0.196
1250	12.7	0.165	...	...	14.6	0.197
1300	13.0	0.166	...	...	14.9	0.199
1350	13.3	0.168	...	...	15.2	0.201
1400	13.6	0.168	...	...	15.5	0.204
1450	13.9	0.168	...	...	15.8	0.206
1500	14.2	0.167	...	...	16.0	0.208
1550	0.210

TABLE TCD (CONT'D)
 NOMINAL COEFFICIENTS OF THERMAL CONDUCTIVITY (TC) AND THERMAL DIFFUSIVITY (TD)

Temp., °F	High Nickel Alloys (Cont'd)									
	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	
	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
70	5.7	0.110	6.8	0.125	6.4	0.119	6.9	0.132	...	...
100	5.8	0.113	7.0	0.127	6.6	0.122	7.0	0.132	6.9	0.198
150	6.0	0.116	7.3	0.131	6.8	0.127	7.2	0.132	7.2	0.207
200	6.3	0.119	7.6	0.134	7.1	0.130	7.4	0.133	7.5	0.214
250	6.5	0.121	7.9	0.137	7.4	0.133	7.6	0.134	7.8	0.222
300	6.7	0.124	8.2	0.141	7.7	0.135	7.8	0.135	8.0	0.230
350	7.0	0.126	8.5	0.144	7.9	0.138	8.0	0.136	8.3	0.238
400	7.2	0.128	8.8	0.147	8.2	0.140	8.2	0.138	8.6	0.246
450	7.5	0.130	9.1	0.150	8.5	0.143	8.4	0.141	8.8	0.255
500	7.7	0.132	9.4	0.154	8.8	0.147	8.6	0.143	9.1	0.263
550	7.9	0.134	9.7	0.157	9.0	0.151	8.8	0.146	9.4	0.271
600	8.2	0.136	10.0	0.160	9.3	0.155	9.1	0.148	9.7	0.278
650	8.4	0.138	10.3	0.164	9.6	0.160	9.3	0.151	10.0	0.286
700	8.7	0.140	10.6	0.167	9.9	0.165	9.5	0.153	10.2	0.293
750	8.9	0.142	10.9	0.171	10.1	0.169	9.8	0.156	10.5	0.300
800	9.1	0.144	11.2	0.174	10.4	0.174	10.0	0.158	10.8	0.309
850	9.4	0.146	11.5	0.177	10.7	0.178	10.2	0.160	11.0	...
900	9.6	0.148	11.8	0.181	11.0	0.181	10.5	0.162	11.3	...
950	9.8	0.150	12.2	0.184	11.2	0.183	10.7	0.165	11.6	...
1000	10.1	0.152	12.5	0.187	11.5	0.184	10.9	0.169	11.9	...
1050	10.3	0.154	12.8	0.190	11.8	0.183	...	...	...	...
1100	10.5	0.156	13.1	0.192	12.0	0.182	...	...	...	...
1150	10.8	0.158	13.4	0.195	12.3	0.179	...	...	...	...
1200	11.0	0.159	13.7	0.197	12.6	0.175	...	...	...	...
1250	11.3	0.161	14.0	0.199	12.8	0.171	...	...	...	...
1300	11.5	0.163	14.3	0.201	13.1	0.167	...	...	...	...
1350	11.8	0.165	14.6	0.203	13.3	0.163	...	...	...	...
1400	12.0	0.167	14.9	0.204	13.6	0.160	...	...	...	...
1450	12.3	0.169	15.2	0.206	13.8	0.160	...	...	...	...
1500	12.6	0.172	15.5	0.208	14.1	0.162	...	...	...	...
1550	...	0.175	...	0.211	...	0.169	...	...	...	...

TABLE TCD (CONT'D)
 NOMINAL COEFFICIENTS OF THERMAL CONDUCTIVITY (TC) AND THERMAL DIFFUSIVITY (TD)

High Nickel Alloys (Cont'd)										
Temp., °F	N08031		Ni-Fe-Cr-Si N08330		Ni-Fe-Cr N08800, N08801, N08810, N08811		Ni-Fe-Cr-Mo-Cu N08825		Ni-Mo N10001	
	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
70	6.7	0.122	7.1	0.131	6.7	0.122	...	0.132	...	...
100	6.9	...	7.3	0.131	6.8	0.125	...	0.129	6.1	0.115
150	7.2	...	7.5	0.135	7.1	0.129	...	0.127	6.2	0.115
200	7.5	...	7.7	0.141	7.4	0.133	7.1	0.126	6.4	0.115
250	7.8	...	7.9	...	7.7	0.137	7.3	0.127	6.5	0.116
300	8.1	...	8.2	...	8.0	0.140	7.6	0.128	6.7	0.117
350	8.4	...	8.5	...	8.3	0.144	7.9	0.129	6.8	0.118
400	8.7	...	8.8	...	8.5	0.147	8.1	0.130	7.0	0.119
450	9.0	...	9.1	...	8.8	0.150	8.4	0.131	7.2	0.120
500	9.3	...	9.4	...	9.1	0.153	8.6	0.132	7.4	0.121
550	9.6	...	9.7	...	9.3	0.156	8.9	0.133	7.5	0.122
600	9.8	...	10.0	...	9.6	0.159	9.1	0.133	7.7	0.124
650	10.1	...	10.3	...	9.8	0.161	9.3	0.133	8.0	0.125
700	10.4	...	10.6	...	10.1	0.164	9.6	0.133	8.2	0.127
750	10.6	...	10.9	...	10.3	0.167	9.8	0.133	8.4	0.129
800	10.9	...	11.2	...	10.6	0.169	10.0	0.133	8.7	0.132
850	11.2	...	11.5	...	10.8	0.171	10.2	0.133	9.0	0.135
900	11.5	...	11.8	...	11.1	0.174	10.4	0.132	9.3	0.138
950	11.8	...	12.1	...	11.3	0.176	10.7	0.131	9.7	0.142
1000	12.0	...	12.4	...	11.6	0.178	10.9	0.128	10.0	0.146
1050	12.3	...	12.7	...	11.8	0.181	11.1	...	10.4	0.149
1100	12.6	...	13.0	...	12.1	0.183	11.4	...	10.7	0.153
1150	...	...	13.3	...	12.4	0.185	11.6	...	11.1	0.156
1200	...	...	13.5	...	12.7	0.187	11.8	...	...	...
1250	...	...	13.8	...	13.0	0.189	12.1	...	...	...
1300	...	...	...	...	13.3	0.191	12.4	...	...	...
1350	...	...	...	...	13.6	0.193	12.7	...	...	...
1400	...	...	...	...	13.9	0.194	13.0	...	...	...
1450	...	...	...	...	14.2	0.196	13.3	...	...	...
1500	...	...	...	...	14.5	0.198	13.6	...	...	...
1550	...	...	...	...	...	0.200	...	...	...	...

TABLE TCD (CONT'D)
 NOMINAL COEFFICIENTS OF THERMAL CONDUCTIVITY (TC) AND THERMAL DIFFUSIVITY (TD)

Temp., °F	High Nickel Alloys (Cont'd)									
	Ni-Mo-Cr-Fe N10003		65Ni-25Mo- 8Cr-2Fe N10242		Ni-Mo-Cr N10276		N10629		Ni-Mo N10665	
	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
70	...	...	6.3	0.117	...	...	6.4	0.124	...	...
100	...	...	6.4	0.120	5.9	...	6.5	...	6.8	0.128
150	6.2	0.114	6.7	0.124	6.2	...	6.8	...	6.9	0.129
200	6.5	0.120	7.0	0.128	6.4	...	7.0	...	7.0	0.130
250	6.8	0.124	7.2	0.131	6.7	...	7.2	...	7.2	0.132
300	7.0	0.126	7.5	0.134	7.0	...	7.4	...	7.3	0.133
350	7.2	0.128	7.7	0.137	7.2	...	7.6	...	7.5	0.135
400	7.4	0.129	8.0	0.140	7.5	...	7.8	...	7.6	0.137
450	7.6	0.130	8.2	0.142	7.8	...	8.0	...	7.8	0.139
500	7.9	0.133	8.5	0.145	8.1	...	8.2	...	8.0	0.141
550	8.1	0.135	8.8	0.148	8.4	...	8.4	...	8.2	0.144
600	8.3	0.139	9.0	0.152	8.7	...	8.7	...	8.4	0.146
650	8.5	0.143	9.3	0.155	8.9	...	8.9	...	8.6	0.149
700	8.7	0.147	9.5	0.159	9.2	...	9.1	...	8.9	0.151
750	9.0	0.151	9.8	0.163	9.5	...	9.3	...	9.1	0.154
800	9.2	0.155	10.1	0.167	9.8	...	9.5	...	9.4	0.157
850	9.5	0.158	10.3	0.171	10.1	...	9.7	...	9.7	0.160
900	9.8	0.160	10.6	0.175	10.4	...	9.9	...	10.0	0.164
950	10.1	0.161	10.8	0.179	10.7	...	10.1	...	10.3	0.167
1000	10.4	0.160	11.1	0.182	11.0	...	10.3	...	10.7	0.171
1050	10.7	0.159	11.3	0.185	11.3	...	10.5	...	11.0	0.175
1100	11.1	0.158	11.6	0.188	11.5	...	10.8	...	11.4	0.179
1150	11.4	0.157	11.9	0.190	11.8	...	11.3	...	11.8	0.184
1200	11.7	0.157	12.1	0.191	12.1	...	12.0	...	12.2	0.188
1250	12.1	0.161	12.4	0.191	...	...	...	...	...	...
1300	12.5	0.171	12.7	0.189	...	...	...	...	...	...
1350	12.9	...	12.9	0.187
1400	13.3	...	13.2	0.183
1450	13.7	...	13.4	0.178
1500	14.2	...	13.7	0.172
1550

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TABLE TCD (CONT'D)
NOMINAL COEFFICIENTS OF THERMAL CONDUCTIVITY (TC) AND THERMAL DIFFUSIVITY (TD)

Temp., °F	High Nickel Alloys (Cont'd)						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	
	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
70	6.5	0.115	6.3	0.115	7.7	0.130	12.7	0.359	5.1	0.145
100	6.6	0.117	6.4	0.116	7.9	...	12.5	0.352	5.2	0.147
150	6.8	0.120	6.6	0.117	8.1	...	12.2	0.341	5.5	0.150
200	6.9	0.123	6.8	0.119	8.4	...	12.0	0.330	5.7	0.152
250	7.1	0.126	7.1	0.122	8.6	...	11.9	0.321	5.9	0.155
300	7.3	0.129	7.3	0.124	8.8	...	11.7	0.313	6.1	0.158
350	7.5	0.132	7.6	0.127	9.1	...	11.6	0.306	6.2	0.160
400	7.7	0.135	7.9	0.130	9.3	...	11.5	0.300	6.4	0.163
450	8.0	0.137	8.2	0.134	9.5	...	11.4	0.294	6.6	0.166
500	8.2	0.140	8.5	0.138	9.8	...	11.3	0.290	6.7	0.168
550	8.4	0.143	8.8	0.142	10.0	...	11.2	0.286	6.8	0.170
600	8.7	0.146	9.1	0.146	10.3	...	11.2	0.283	6.9	0.172
650	8.9	0.149	9.4	0.150	10.5	...	11.2	0.280	...	...
700	9.2	0.151	9.8	0.154	10.7	...	11.2	0.278	...	...
750	9.4	0.154	10.1	0.158	11.0	...	11.2	0.276	...	...
800	9.7	0.157	10.5	0.162	11.2	...	11.2	0.275	...	...
850	9.9	0.161	10.9	0.165	11.4	...	11.2	0.274	...	...
900	10.2	0.164	11.2	0.169	11.6	...	11.3	0.273	...	...
950	10.5	0.167	11.6	0.171	...	...	11.4	0.272	...	...
1000	10.7	0.170	12.0	0.174	...	...	11.4	0.271	...	...
1050	11.0	0.174	12.4	0.176	...	...	11.5	0.270	...	...
1100	11.3	0.177	12.8	0.178	...	...	11.6	0.270	...	...
1150	11.6	0.180	13.1	0.180	...	...	...	...	...	...
1200	11.8	0.183	13.5	0.181	...	...	...	...	...	...
1250	12.1	0.185	13.9	0.182	...	...	...	...	...	...
1300	12.4	0.187	14.2	0.183	...	...	...	...	...	...
1350	12.7	0.188	14.5	0.183	...	...	...	...	...	...
1400	13.0	0.188	14.8	0.185	...	...	...	...	...	...
1450	13.3	0.186	15.0	0.186	...	...	...	...	...	...
1500	13.7	0.183	15.1	0.188	...	...	...	...	...	...
1550	...	...	...	...	...	...	...	...	...	...

TABLE TCD (CONT'D)
NOMINAL COEFFICIENTS OF THERMAL CONDUCTIVITY (TC) AND THERMAL DIFFUSIVITY (TD)

Temp., °F	Aluminum Alloys											
	A24430		A03560		A91060		A91100		A92014		A92024	
	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
70	94.0	2.641	92.0	2.611	135.2	3.721	133.1	3.671	89.9	2.470	85.8	2.360
100	94.5	2.638	92.9	2.608	133.7	3.647	131.8	3.606	90.9	2.480	86.9	2.370
150	96.0	2.632	94.2	2.603	131.7	3.544	130.0	3.505	92.3	2.480	88.5	2.381
200	97.3	2.629	95.4	2.597	130.1	3.457	128.5	3.418	93.6	2.480	90.0	2.388
250	98.2	2.628	96.4	2.592	128.7	3.380	127.3	3.347	94.7	2.481	91.3	2.393
300	98.9	2.622	97.4	2.590	127.5	3.311	126.2	3.285	95.7	2.479	92.4	2.398
350	99.8	2.609	98.2	2.590	126.5	3.249	125.3	3.227	96.6	2.470	93.4	2.401
400	100.4	2.600	98.9	2.580	125.6	3.190	124.5	3.170	97.4	2.470	94.4	2.390

Temp., °F	Aluminum Alloys (Cont'd)									
	A93003		A93004		A95052 and A95652		A95083		A95086	
	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
70	102.3	2.810	94.0	2.601	79.6	2.220	67.2	1.880	73.4	2.05
100	102.8	2.800	94.9	2.598	80.8	2.229	68.7	1.909	74.8	2.08
150	103.5	2.779	96.1	2.592	82.7	2.251	70.8	1.942	76.8	2.10
200	104.2	2.762	97.2	2.589	84.4	2.269	72.8	1.968	78.7	2.12
250	104.7	2.748	98.1	2.588	85.9	2.280	74.6	1.990	80.3	2.14
300	105.2	2.731	99.0	2.582	87.2	2.290	76.2	2.011	81.9	2.16
350	105.7	2.709	99.7	2.569	88.4	2.300	77.8	2.029	83.2	2.17
400	106.1	2.690	100.4	2.560	89.6	2.300	79.2	2.050	84.5	2.18

Temp., °F	Aluminum Alloys (Cont'd)									
	A95154 and A95254		A95454		A95456		A96061		A96063	
	TC	TD	TC	TD	TC	TD	TC	TD	TC	TD
70	73.4	2.050	77.5	2.150	67.2	1.890	96.1	2.661	120.8	3.340
100	74.8	2.079	78.6	2.169	68.7	1.909	96.9	2.660	120.3	3.299
150	76.8	2.101	80.7	2.191	70.8	1.940	98.0	2.650	119.7	3.232
200	78.7	2.119	82.6	2.210	72.8	1.971	99.0	2.649	119.0	3.177
250	80.3	2.141	84.1	2.228	74.6	1.998	99.8	2.641	118.5	3.133
300	81.9	2.160	85.4	2.242	76.3	2.022	100.6	2.629	118.1	3.088
350	83.2	2.170	86.7	2.249	77.8	2.039	101.3	2.620	118.0	3.040
400	84.5	2.180	87.9	2.250	79.2	2.050	101.9	2.620	117.6	3.000

TABLE TCD (CONT'D)

GENERAL NOTES:

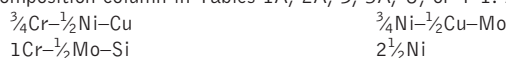
(a) TC is the thermal conductivity, Btu/hr-ft-°F, and TD is the thermal diffusivity, ft²/hr:

$$TD = \frac{TC \text{ (Btu/hr-ft-°F)}}{\text{density (lb/ft}^3\text{)} \times \text{specific heat (Btu/lb-°F)}}$$

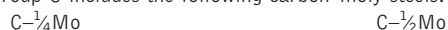
(b) Values of thermal expansion and thermal diffusivity should be used with the understanding that there is an associated $\pm 10\%$ uncertainty. This uncertainty results from compositional variations and variables associated with original data acquisition and analysis.

NOTES:

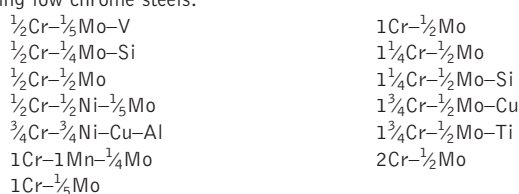
- (1) Material Group A includes those materials listed as "Carbon steel" in the Nominal Composition column in Tables 1A, 2A, 3, 5A, U, or Y-1.
- (2) Material Group B includes those materials listed as "C-Mn-Si-Cb," "C-Mn-Si-V," "C-Mn-Si-V-Cb," "C-Mn-Ti," or "C-Si-Ti" in the Nominal Composition column in Tables 1A, 2A, 3, 5A, U, or Y-1. Also includes:



- (3) Material Group C includes the following carbon-moly steels:



The following low chrome steels:



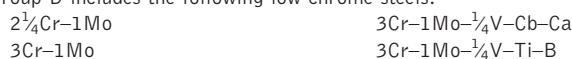
The following manganese steels:



The following nickel steels:



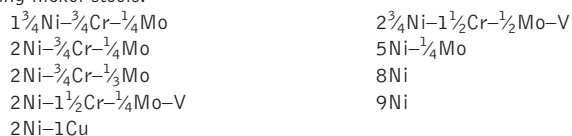
- (4) Material Group D includes the following low chrome steels:



The following manganese steel:



The following nickel steels:



- (10) (5) Material Group E includes:



- (10) (6) Material Group F includes:



- (7) Material Group G includes:



- (8) Material Group H includes:



- (9) Material Group I includes:



TABLE TCD (CONT'D)

NOTES (CONT'D):

(10) Material Group J includes:

15Cr-6Ni-Cu-Mo (only to 800°F)	18Cr-8Ni-S (or Se)
17Cr-7Ni-1Al (only to 800°F)	18Cr-11Ni
18Cr-8Ni	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 800°F)	19Cr-9Ni-Mo-W
29Cr-7Ni-2Mo-N	21Cr-11Ni-N
25Ni-15Cr-2Ti	22Cr-5Ni-3Mo-N
29Ni-20Cr-3Cu-2Mo	23Cr-12Ni
16Cr-12Ni-2Mo	25Cr-7Ni-4Mo-N
18Cr-5Ni-3Mo	25Cr-20Ni
18Cr-10Ni-Cb	25Cr-20Ni-2Mo
18Cr-10Ni-Ti	44Fe-25Ni-21Cr-Mo
18Cr-13Ni-3Mo	

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:

18Cr-18Ni-2Si	25Cr-12Ni
22Cr-13Ni-5Mn	25Cr-35Ni-N-Ce
24Cr-22Ni-7.5Mo	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 $\times 10^6$ psi, for Temperature, $^{\circ}\text{F}$, of																	
	-325	-200	-100	70	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500
Carbon steels with $C \leq 0.30\%$	31.4	30.8	30.3	29.4	28.8	28.3	27.9	27.3	26.5	25.5	24.2	22.5	20.4	18.0	...	...	...	...
Carbon steels with $C > 0.30\%$	31.2	30.6	30.1	29.2	28.6	28.1	27.7	27.1	26.4	25.3	24.0	22.3	20.2	17.9	15.4	...	...	...
Material Group A [Note (1)]	31.1	30.5	30.0	29.0	28.5	28.0	27.6	27.0	26.3	25.3	23.9	22.2	20.1	17.8	15.3	...	...	...
Material Group B [Note (2)]	29.6	29.0	28.6	27.8	27.1	26.7	26.2	25.7	25.1	24.6	23.9	23.2	22.4	21.5	20.4	19.2	17.7	...
Material Group C [Note (3)]	31.6	30.9	30.5	29.6	29.0	28.5	28.0	27.4	26.9	26.2	25.6	24.8	23.9	23.0	21.8	20.5	18.9	...
Material Group D [Note (4)]	32.6	31.9	31.4	30.6	29.9	29.4	28.8	28.3	27.7	27.0	26.3	25.6	24.7	23.7	22.5	21.1	19.4	...
Material Group E [Note (5)]	33.0	32.4	31.9	31.0	30.3	29.7	29.2	28.6	28.1	27.5	26.9	26.2	25.4	24.4	23.3	22.0	20.5	...
Material Group F [Note (6)]	31.2	30.7	30.2	29.2	28.4	27.9	27.3	26.8	26.2	25.5	24.5	23.2	21.5	19.2	16.5	...	...	...
Material Group G [Note (7)]	30.3	29.7	29.2	28.3	27.5	27.0	26.4	25.9	25.3	24.8	24.1	23.5	22.8	22.0	21.2	20.3	19.2	18.1
Material Group H [Note (14)]	...	...	30.2	29.0	28.2	27.5	27.0	26.4	26.0	25.5	25.1	...	...	...	...	...	...	...
Material Group I [Note (15)]	27.8	27.1	26.6	25.8	25.1	24.6	24.1	23.6	23.1	22.6	22.1	21.6	21.1	20.6	20.1	19.6	19.1	18.6
Material Group J [Note (16)]	31.1	30.3	29.7	28.6	27.8	27.2	26.6	26.0	25.4	24.7	24.1	23.5	22.9	...	...	...	...	...
S13800 [Note (8)]	31.5	30.9	30.3	29.4	28.7	28.1	27.5	26.9	26.3	25.7	25.0	24.4	...	...	...	...	...	...
S15500 [Note (9)]	30.5	29.9	29.4	28.5	27.8	27.2	26.7	26.1	25.5	24.9	24.3	23.7	...	...	...	...	...	...
S45000 [Note (10)]	31.6	31.0	30.4	29.5	28.8	28.2	27.6	27.0	26.4	25.8	25.1	24.5	...	...	...	...	...	...
S17400 [Note (11)]	30.5	29.9	29.4	28.5	27.8	27.2	26.7	26.1	25.5	24.9	24.3	23.7	...	...	...	...	...	...
S17700 [Note (12)]	31.6	31.0	30.4	29.5	28.8	28.2	27.6	27.0	26.4	25.8	25.1	24.5	...	...	...	...	...	...
S66286 [Note (13)]	31.0	30.6	30.2	29.2	28.5	27.9	27.3	26.7	26.1	25.5	24.9	24.2	...	...	...	...	...	...

Notes appear on following page.

TABLE TM-1 (CONT'D)

NOTES:

- (1) Material Group A consists of the following carbon-molybdenum and manganese steels:

C- $\frac{1}{4}$ Mo	Mn- $\frac{1}{2}$ Mo- $\frac{1}{4}$ Ni
C- $\frac{1}{2}$ Mo	Mn- $\frac{1}{2}$ Mo- $\frac{1}{2}$ Ni
Mn- $\frac{1}{4}$ Mo	Mn- $\frac{1}{2}$ Ni-V
Mn- $\frac{1}{2}$ Mo	Mn-V

- (2) Material Group B consists of the following Ni steels:

$\frac{3}{4}$ Cr- $\frac{1}{2}$ Ni-Cu	$1\frac{1}{4}$ Ni-1Cr- $\frac{1}{2}$ Mo
$\frac{3}{4}$ Cr- $\frac{3}{4}$ Ni-Cu-Al	$1\frac{3}{4}$ Ni- $\frac{3}{4}$ Cr- $\frac{1}{4}$ Mo
$\frac{1}{2}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-V	2Ni- $1\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-V
$\frac{1}{2}$ Ni- $\frac{1}{2}$ Mo-V	2Ni-1Cu
$\frac{3}{4}$ Ni- $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V	2 $\frac{1}{2}$ Ni
$\frac{3}{4}$ Ni- $\frac{1}{2}$ Cu-Mo	2 $\frac{3}{4}$ Ni- $1\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V
$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo- $\frac{1}{3}$ Cr-V	3 $\frac{1}{2}$ Ni
$\frac{3}{4}$ Ni- $\frac{1}{2}$ Mo-Cr-V	3 $\frac{1}{2}$ Ni- $1\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo-V
$\frac{3}{4}$ Ni-1Mo- $\frac{3}{4}$ Cr	4Ni- $1\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo-V
1Ni- $\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	

- (3) Material Group C consists of the following
- $\frac{1}{2}$
- 2Cr steels:

$\frac{1}{2}$ Cr- $\frac{1}{5}$ Mo-V	1Cr- $\frac{1}{2}$ Mo-V
$\frac{1}{2}$ Cr- $\frac{1}{4}$ Mo-Si	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo
$\frac{1}{2}$ Cr- $\frac{1}{2}$ Mo	$1\frac{1}{4}$ Cr- $\frac{1}{2}$ Mo-Si
1Cr- $\frac{1}{5}$ Mo	$1\frac{3}{4}$ Cr- $\frac{1}{2}$ Mo-Ti
1Cr- $\frac{1}{2}$ Mo	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- $\frac{1}{4}$ V-Cb-Ca
3Cr-1Mo	3Cr-1Mo- $\frac{1}{4}$ V-Ti-B

- (5) Material Group E consists of the following 5-9Cr steels:

5Cr- $\frac{1}{2}$ Mo	7Cr- $\frac{1}{2}$ Mo
5Cr- $\frac{1}{2}$ Mo-Si	9Cr-Mo, including variations thereof
5Cr- $\frac{1}{2}$ Mo-Ti	

- (6) Material Group F consists of the following chromium steels:

12Cr-Al	15Cr
13Cr	17Cr

- (7) Material Group G consists of the following austenitic steels:

16Cr-12Ni-2Mo	18Cr-10Ni-Ti
16Cr-12Ni-2Mo-N	18Cr-13Ni-3Mo
18Cr-3Ni-13Mn	18Cr-18Ni-2Si
18Cr-8Ni	21Cr-6Ni-9Mn
18Cr-8Ni-N	22Cr-13Ni-5Mn
18Cr-8Ni-S	23Cr-12Ni
18Cr-8Ni-Se	25Cr-20Ni
18Cr-10Ni-Cb	

- (8) Also known as 13Cr-8Ni-2Mo, XM-13, or PH13-8Mo.

- (9) Also known as 15Cr-5Ni-3Mo, XM-12, or 15-5PH.

- (10) Also known as 15Cr-6Ni-Cu-Mo, Custom 450, or XM-25. Modulus values are for material aged at 900°F.

- (11) Also known as 17Cr-4Ni-4Cu, Grade 630, or 17-4PH.

- (12) Also known as 17Cr-7Ni-1Al, Grade 631, or 17-7PH.

- (13) Also known as 25Ni-15Cr-2Ti, Grade 660, or A-286 stainless steel.

- (10) (14) Material Group H consists of the following duplex (austenitic-ferritic) stainless steels:

18Cr-5Ni-3Mo	25Cr-6.5Ni-3Mo-N
22Cr-5Ni-3Mo-N	25Cr-7Ni-3Mo-W-Cu-N
23Cr-4Ni-Mo-Cu-N	25Cr-7Ni-4Mo-N
24Cr-10Ni-4Mo-N	25Cr-7.5Ni-3.5Mo-N-Cu-W
25Cr-5Ni-3Mo-2Cu	29Cr-6.5Ni-2Mo-N
25Cr-6Ni-Mo-N	

- (10) (15) Material Group I consists of the following high-silicon austenitic steels:

17.5Cr-17.5Ni-5.3Si	18Cr-20Ni-5.5Si
18Cr-8Ni-4Si-N	UNS S38815

- (10) (16) Material Group J consists of the following high-molybdenum austenitic stainless steels:

20Cr-18Ni-6Mo	25Ni-47Fe-21Cr-5Mo
44Fe-25Ni-21Cr-Mo	27Ni-22Cr-7Mo-Cu-N
46Fe-24Ni-21Cr-6Mo-Cu-N	31Ni-31Fe-29Cr-Mo
25Ni-20Cr-6Mo-Cu-N	

TABLE TM-2
MODULI OF ELASTICITY E OF ALUMINUM AND ALUMINUM ALLOYS
FOR GIVEN TEMPERATURES

Material	Modulus of Elasticity E = Value Given $\times 10^6$ psi, for Temperature, °F, of							
	-325	-200	-100	70	200	300	400	500
A03560	11.4	11.1	10.8	10.3	9.8	9.5	9.0	8.1
A95083	11.4	11.1	10.8	10.3	9.8	9.5	9.0	8.1
A95086	11.4	11.1	10.8	10.3	9.8	9.5	9.0	8.1
A95456	11.4	11.1	10.8	10.3	9.8	9.5	9.0	8.1
A24430	11.1	10.8	10.5	10.0	9.6	9.2	8.7	8.1
A91060	11.1	10.8	10.5	10.0	9.6	9.2	8.7	8.1
A91100	11.1	10.8	10.5	10.0	9.6	9.2	8.7	8.1
A93003	11.1	10.8	10.5	10.0	9.6	9.2	8.7	8.1
A93004	11.1	10.8	10.5	10.0	9.6	9.2	8.7	8.1
A96061	11.1	10.8	10.5	10.0	9.6	9.2	8.7	8.1
A96063	11.1	10.8	10.5	10.0	9.6	9.2	8.7	8.1
A92014	11.7	11.4	11.1	10.6	10.2	9.7	9.2	8.6
A92024	11.7	11.4	11.1	10.6	10.2	9.7	9.2	8.6
A95052	11.3	11.0	10.7	10.2	9.7	9.4	8.9	8.3
A95154	11.3	11.0	10.7	10.2	9.7	9.4	8.9	8.3
A95254	11.3	11.0	10.7	10.2	9.7	9.4	8.9	8.3
A95454	11.3	11.0	10.7	10.2	9.7	9.4	8.9	8.3
A95652	11.3	11.0	10.7	10.2	9.7	9.4	8.9	8.3

TABLE TM-3
MODULI OF ELASTICITY E OF COPPER AND COPPER ALLOYS FOR GIVEN
TEMPERATURES

Material	Modulus of Elasticity E = Value Given $\times 10^6$ psi, for Temperature, °F, of									
	-325	-200	-100	70	200	300	400	500	600	700
C93700	11.6	11.4	11.3	11.0	10.7	10.5	10.3	10.1	9.8	9.4
C83600	14.8	14.6	14.4	14.0	13.7	13.4	13.2	12.9	12.5	12.0
C92200	14.8	14.6	14.4	14.0	13.7	13.4	13.2	12.9	12.5	12.0
C28000	15.9	15.6	15.4	15.0	14.6	14.4	14.1	13.8	13.4	12.8
C36500	15.9	15.6	15.4	15.0	14.6	14.4	14.1	13.8	13.4	12.8
C46400	15.9	15.6	15.4	15.0	14.6	14.4	14.1	13.8	13.4	12.8
C65500	15.9	15.6	15.4	15.0	14.6	14.4	14.1	13.8	13.4	12.8
C66100	15.9	15.6	15.4	15.0	14.6	14.4	14.1	13.8	13.4	12.8
C95200	15.9	15.6	15.4	15.0	14.6	14.4	14.1	13.8	13.4	12.8
C95400	15.9	15.6	15.4	15.0	14.6	14.4	14.1	13.8	13.4	12.8
C44300	16.9	16.7	16.4	16.0	15.6	15.3	15.0	14.7	14.2	13.7
C44400	16.9	16.7	16.4	16.0	15.6	15.3	15.0	14.7	14.2	13.7
C44500	16.9	16.7	16.4	16.0	15.6	15.3	15.0	14.7	14.2	13.7
C64200	16.9	16.7	16.4	16.0	15.6	15.3	15.0	14.7	14.2	13.7
C68700	16.9	16.7	16.4	16.0	15.6	15.3	15.0	14.7	14.2	13.7
C10200	18.0	17.7	17.5	17.0	16.6	16.3	16.0	15.6	15.1	14.5
C10400	18.0	17.7	17.5	17.0	16.6	16.3	16.0	15.6	15.1	14.5
C10500	18.0	17.7	17.5	17.0	16.6	16.3	16.0	15.6	15.1	14.5
C10700	18.0	17.7	17.5	17.0	16.6	16.3	16.0	15.6	15.1	14.5
C11000	18.0	17.7	17.5	17.0	16.6	16.3	16.0	15.6	15.1	14.5
C12000	18.0	17.7	17.5	17.0	16.6	16.3	16.0	15.6	15.1	14.5
C12200	18.0	17.7	17.5	17.0	16.6	16.3	16.0	15.6	15.1	14.5
C12300	18.0	17.7	17.5	17.0	16.6	16.3	16.0	15.6	15.1	14.5
C12500	18.0	17.7	17.5	17.0	16.6	16.3	16.0	15.6	15.1	14.5
C14200	18.0	17.7	17.5	17.0	16.6	16.3	16.0	15.6	15.1	14.5
C23000	18.0	17.7	17.5	17.0	16.6	16.3	16.0	15.6	15.1	14.5
C61000	18.0	17.7	17.5	17.0	16.6	16.3	16.0	15.6	15.1	14.5
C61400	18.0	17.7	17.5	17.0	16.6	16.3	16.0	15.6	15.1	14.5
C65100	18.0	17.7	17.5	17.0	16.6	16.3	16.0	15.6	15.1	14.5
C70400	18.0	17.7	17.5	17.0	16.6	16.3	16.0	15.6	15.1	14.5
C19400	18.5	18.2	18.0	17.5	17.1	16.8	16.5	16.1	15.6	15.0
C60800	18.5	18.2	18.0	17.5	17.1	16.8	16.5	16.1	15.6	15.0
C63000	18.5	18.2	18.0	17.5	17.1	16.8	16.5	16.1	15.6	15.0
C70600	19.0	18.7	18.5	18.0	17.6	17.3	16.9	16.5	16.0	15.4
C97600	20.1	19.8	19.6	19.0	18.5	18.2	17.9	17.5	16.9	16.2
C71000	21.2	20.8	20.6	20.0	19.5	19.2	18.8	18.4	17.8	17.1
C71500	23.3	22.9	22.6	22.0	21.5	21.1	20.7	20.2	19.6	18.8

TABLE TM-4
MODULI OF ELASTICITY E OF HIGH NICKEL ALLOYS FOR GIVEN TEMPERATURES

Material	Modulus of Elasticity E = Value Given $\times 10^6$ psi, for Temperature, $^{\circ}$ F, of														
	-325	-200	-100	70	200	300	400	500	600	700	800	900	1000	1100	1200
N02200	32.2	31.4	30.9	30.0	29.4	28.9	28.5	28.1	27.6	27.2	26.7	26.2	25.7	25.1	24.5
N02201	32.2	31.4	30.9	30.0	29.4	28.9	28.5	28.1	27.6	27.2	26.7	26.2	25.7	25.1	24.5
N04400	27.8	27.2	26.8	26.0	25.5	25.1	24.7	24.3	23.9	23.6	23.1	22.7	22.2	21.7	21.2
N04405	27.8	27.2	26.8	26.0	25.5	25.1	24.7	24.3	23.9	23.6	23.1	22.7	22.2	21.7	21.2
N06002	30.5	29.9	29.3	28.5	27.9	27.5	27.1	26.7	26.2	25.8	25.4	24.9	24.3	23.8	23.2
N06007	29.8	29.1	28.6	27.8	27.2	26.8	26.4	26.0	25.6	25.2	24.7	24.3	23.8	23.2	22.6
N06022	32.1	31.3	30.8	29.9	29.3	28.8	28.4	28.0	27.5	27.1	26.6	26.1	25.6	25.0	24.4
N06030	31.5	30.7	30.2	29.3	28.7	28.2	27.8	27.4	27.0	26.5	26.1	25.6	25.1	24.5	23.9
N06045	30.0	29.3	28.8	28.0	27.4	27.0	26.6	26.2	25.8	25.4	24.9	24.4	23.9	23.4	22.8
N06059	32.7	31.9	31.3	30.5	29.9	29.4	29.0	28.5	28.1	27.6	27.1	26.6	26.0	25.4	24.8
N06230	32.8	32.0	31.5	30.6	29.9	29.5	29.0	28.6	28.2	27.7	27.2	26.7	26.1	25.5	24.9
N06455	32.0	31.2	30.7	29.8	29.2	28.7	28.3	27.9	27.4	27.0	26.5	26.0	25.5	24.9	24.3
N06600	33.3	32.5	31.9	31.0	30.3	29.9	29.4	29.0	28.6	28.1	27.6	27.1	26.5	25.9	25.3
N06617	...	...	...	29.2	28.4	28.0	27.7	27.4	27.0	26.5	26.0	25.5	24.9	24.3	23.8
N06625	32.2	31.4	30.9	30.0	29.4	28.9	28.5	28.1	27.6	27.2	26.7	26.2	25.7	25.1	24.5
N06686	32.7	31.9	31.3	30.5	29.9	29.4	29.0	28.5	28.1	27.6	27.1	26.6	26.0	25.4	24.8
N06690	32.6	31.8	31.2	30.3	29.6	29.2	28.8	28.3	27.9	27.5	27.0	26.5	25.9	25.3	24.7
N07718	31.0	30.5	29.9	28.9	28.3	27.9	27.5	27.2	26.8	26.3	25.8	25.2	24.7	24.2	...
N07750	33.2	32.6	31.9	30.9	30.3	29.8	29.4	29.1	28.6	28.2	27.6	27.0	26.4	25.8	25.3
N08020	30.0	29.3	28.8	28.0	27.4	27.0	26.6	26.2	25.8	25.4	24.9	24.4	23.9	23.4	22.8
N08031	30.7	30.1	29.5	28.7	28.1	27.7	27.2	26.8	26.4	26.0	25.5	25.0	24.5	24.0	23.4
N08330	30.0	29.3	28.8	28.0	27.4	27.0	26.6	26.2	25.8	25.4	24.9	24.4	23.9	23.4	22.8
N08800	30.5	29.9	29.3	28.5	27.9	27.5	27.1	26.7	26.2	25.8	25.4	24.9	24.4	23.8	23.2
N08801	30.5	29.9	29.3	28.5	27.9	27.5	27.1	26.7	26.2	25.8	25.4	24.9	24.4	23.8	23.2
N08810	30.5	29.9	29.3	28.5	27.9	27.5	27.1	26.7	26.2	25.8	25.4	24.9	24.4	23.8	23.2
N08825	30.0	29.3	28.8	28.0	27.4	27.0	26.6	26.2	25.8	25.4	24.9	24.4	23.9	23.4	22.8
N10001	33.4	32.6	32.0	31.1	30.4	30.0	29.5	29.1	28.7	28.2	27.7	27.2	26.6	26.0	25.3
N10003	34.0	33.2	32.6	31.7	31.0	30.5	30.1	29.6	29.2	28.7	28.2	27.7	27.1	26.5	25.8
N10242	35.6	34.8	34.2	33.2	32.5	32.0	31.5	31.0	30.5	30.0	29.5	29.0	28.4	27.7	27.1
N10276	32.0	31.2	30.7	29.8	29.2	28.7	28.3	27.9	27.4	27.0	26.5	26.0	25.5	24.9	24.3
N10629	33.7	32.9	32.3	31.4	30.7	30.2	29.8	29.3	28.9	28.4	27.9	27.4	26.8	26.2	25.6
N10665	33.7	32.9	32.3	31.4	30.7	30.2	29.8	29.3	28.9	28.4	27.9	27.4	26.8	26.2	25.6
N10675	33.7	32.9	32.3	31.4	30.7	30.2	29.8	29.3	28.9	28.4	27.9	27.4	26.8	26.2	25.6
N12160	32.8	32.0	31.5	30.6	29.9	29.5	29.0	28.6	28.2	27.7	27.2	26.7	26.1	25.5	24.9
R20033	30.4	29.6	29.1	28.3	27.7	27.3	26.9	26.5	26.1	25.7	25.2	24.7	24.2	23.6	23.1

TABLE TM-5
MODULI OF ELASTICITY E OF TITANIUM AND ZIRCONIUM FOR GIVEN TEMPERATURES

(10)

Material Grade/UNS No.	Modulus of Elasticity E = Value Given $\times 10^6$ psi, for Temperature, °F, of							
	70	200	300	400	500	600	700	800
Titanium Alloys								
1 (R50250)	15.5	15.0	14.6	14.0	13.3	12.6	11.9	11.2
2, 2H (R50400)	15.5	15.0	14.6	14.0	13.3	12.6	11.9	11.2
3 (R50550)	15.5	15.0	14.6	14.0	13.3	12.6	11.9	11.2
7, 7H (R52400)	15.5	15.0	14.6	14.0	13.3	12.6	11.9	11.2
9 (R56320)	15.9	15.3	14.6	13.9	13.2	12.4	...	...
11 (R52250)	15.5	15.0	14.6	14.0	13.3	12.6	11.9	11.2
12 (R53400)	15.5	15.0	14.6	14.0	13.3	12.6	11.9	11.2
16, 16H (R52402)	15.5	15.0	14.6	14.0	13.3	12.6	11.9	11.2
17 (R52252)	15.5	15.0	14.6	14.0	13.3	12.6	11.9	11.2
26, 26H (R52404)	15.5	15.0	14.6	14.0	13.3	12.6	11.9	11.2
27 (R52254)	15.5	15.0	14.6	14.0	13.3	12.6	11.9	11.2
28 (R56323)	15.9	15.3	14.6	13.9	13.2	12.4	...	...
Zirconium Alloys								
702 (R60702)	14.4	13.5	12.6	11.7	10.9	10.1	9.3	8.2
705 (R60705)	13.7	13.1	12.7	12.2	11.7	11.3	10.8	10.4

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-454.

TABLE PRD
POISSON'S RATIO AND DENSITY OF MATERIALS

Material	Poisson's Ratio	Density, lb/in. ³	Material	Poisson's Ratio	Density, lb/in. ³
Ferrous Materials			Nonferrous Materials (Cont'd)		
Carbon steels	0.30	0.280	Cobalt Base		
Cast irons	0.29	0.260	R30556	0.31	0.297
Low alloy steels			R31233	0.31	0.306
C-Mn steels	0.30	0.280	Copper Base		
$\frac{1}{2}$ Cr to $1\frac{1}{4}$ Cr steels	0.30	0.280	C10200, C10400, C10500, and C10700	0.33	0.323
$1\frac{3}{4}$ Cr to 3Cr steels	0.30	0.280	C11000	0.33	0.321
5Cr to 9Cr steels	0.30	0.280	C12000, C12200, C12300, and C14200	0.33	0.323
Mn, Mn-Mo, and Si steels	0.30	0.280	C19200	0.33	0.320
Ni steels	0.30	0.280	C19400	0.33	0.322
PH stainless: S15500, S17400, S17700	0.31	0.280	C23000	0.33	0.316
High alloy steels (200 series)	0.31	0.282	C28000	0.33	0.303
High alloy steels (300 series)	0.31	0.290	C36500	0.33	0.304
High-Si stainless: S30600, S30601, S32615, and S38815	0.31	0.275	C37700	0.33	0.305
5-7% Mo stainless: S32050, S31254, S31266, S31277, and S32654	0.31	0.293	C44300, C44400, and C44500	0.33	0.308
High alloy steels (400 series)	0.31	0.280	C46400 and C46500	0.33	0.304
PH stainless: S66286	0.31	0.286	C60800	0.33	0.295
Cast high alloy steels	0.30	0.283	C61400	0.33	0.285
Nonferrous Materials			C63000	0.33	0.274
Aluminum Base			C64200	0.33	0.278
Alclad 3003	0.33	0.098	C65100	0.33	0.316
Alclad 3004	0.33	0.098	C65500 and C66100	0.33	0.308
Alclad 6061	0.33	0.098	C68700	0.33	0.301
A02040	0.33	0.101	C70400, C70600, C71000, C71500, and C72200	0.33	0.323
A03560	0.33	0.097	C83600	0.33	0.318
A24430	0.33	0.097	C99200	0.33	0.312
A91060	0.33	0.098	C93700	0.33	0.320
A91100	0.33	0.098	C95200	0.31	0.276
A92014	0.33	0.101	C95400	0.32	0.269
A92024	0.33	0.100	C97600	0.33	0.321
A93003	0.33	0.099	Nickel Base		
A93004	0.33	0.098	N02200 and N02201	0.31	0.321
A95052	0.33	0.097	N04400 and N04405	0.31	0.320
A95083	0.33	0.096	N05500	0.31	0.300
A95086	0.33	0.096	N06002	0.31	0.300
A95154	0.33	0.096	N06022	0.31	0.314
A95254	0.33	0.096	N06030	0.31	0.297
A95454	0.33	0.097	N06045	0.31	0.289
A95456	0.33	0.096	N06059	0.31	0.311
A95652	0.33	0.096	N06200	0.31	0.307
A96061	0.33	0.098	N06230	0.31	0.324
A96063	0.33	0.097	N06455	0.31	0.312
Chromium Base			N06600	0.31	0.300
R20033	0.31	0.285	N06601	0.31	0.291
			N06617	0.31	0.302

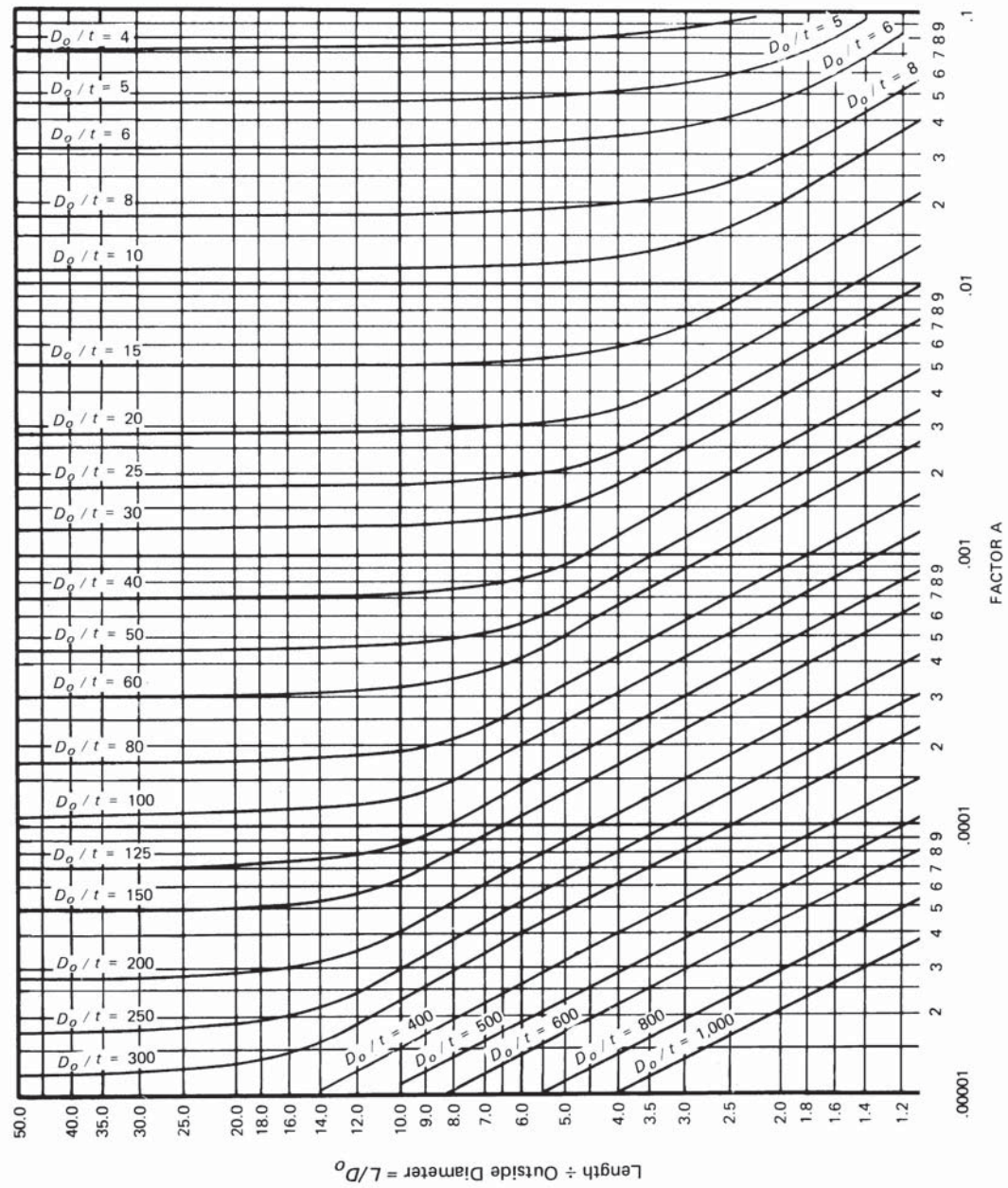
TABLE PRD (CONT'D)
POISSON'S RATIO AND DENSITY OF MATERIALS

Material	Poisson's Ratio	Density, lb/in. ³	Material	Poisson's Ratio	Density, lb/in. ³
Nonferrous Materials (Cont'd)			Nonferrous Materials (Cont'd)		
Nickel Base (Cont'd)			Nickel Base (Cont'd)		
N06625	0.31	0.305	N08926	0.31	0.291
N06686	0.31	0.315	N10001	0.31	0.331
N06690	0.31	0.293	N10003	0.31	0.320
N06975	0.31	0.295	N10242	0.31	0.327
N06985	0.31	0.300	N10276	0.31	0.320
N07718	0.31	0.297	N10629	0.31	0.332
N07750	0.31	0.298	N10665 and N10675	0.31	0.333
N08020	0.31	0.291	N12160	0.31	0.292
N08024	0.31	0.293	Titanium Base		
N08026	0.31	0.294	R50250, R50400, R50550,	0.32	0.163
N08028	0.31	0.289	R52250, R52252, R52254,		
N08031	0.31	0.293	R52400, R52402, R52404,		
N08330	0.31	0.290	and R53400		
N08367 and J94651	0.31	0.291	R56320 and R56323	0.32	0.162
N08800, N08810, and N08811	0.31	0.290	Zirconium Base		
N08825	0.31	0.294	R60702, R60704, and R60705	0.35	0.234
N08904	0.31	0.291			
N08925	0.31	0.294			

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SUBPART 3
CHARTS AND TABLES FOR
DETERMINING SHELL
THICKNESS OF COMPONENTS
UNDER EXTERNAL PRESSURE

FIG. G GEOMETRIC CHART FOR COMPONENTS UNDER EXTERNAL OR COMPRESSIVE LOADINGS (FOR ALL MATERIALS) [NOTE (1)]



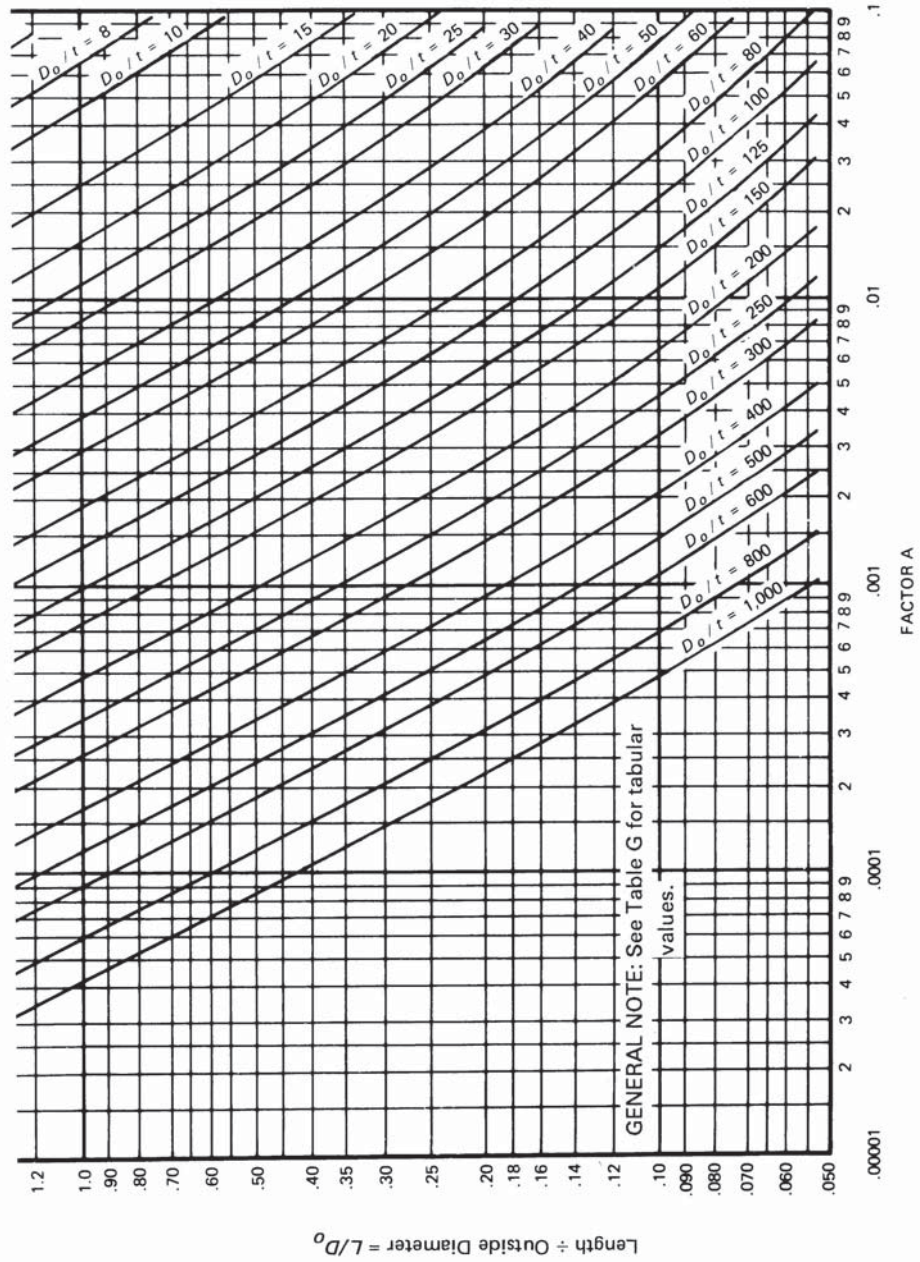


FIG. CS-1 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR CARBON OR LOW ALLOY STEELS WITH SPECIFIED MINIMUM YIELD STRENGTH LESS THAN 30,000 psi

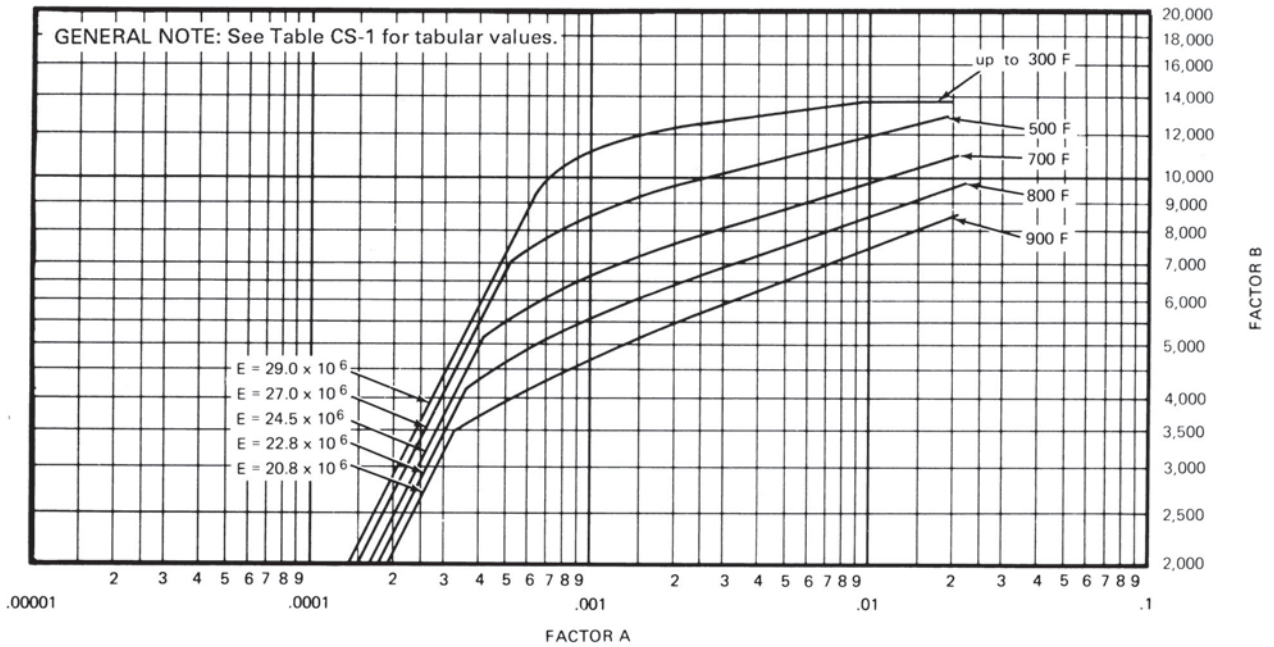


FIG. CS-2 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR CARBON OR LOW ALLOY STEELS WITH SPECIFIED MINIMUM YIELD STRENGTH 30,000 psi AND HIGHER

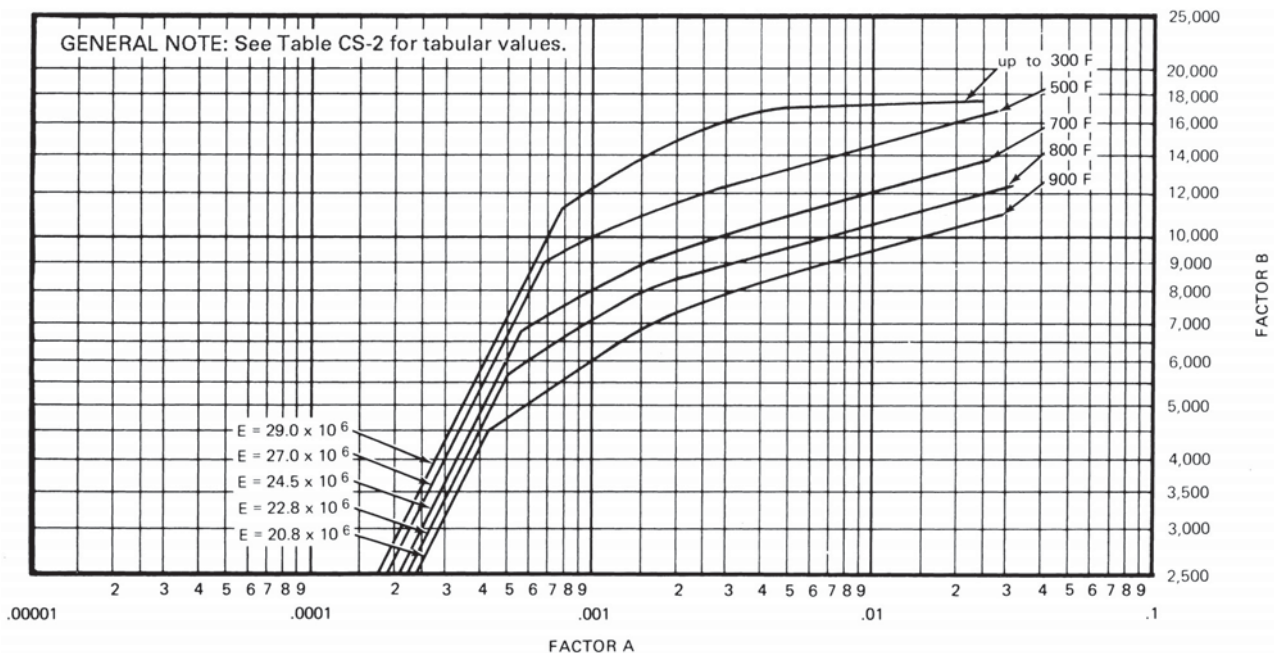


FIG. CS-3 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR CARBON STEEL AND LOW ALLOY STEELS WITH SPECIFIED MINIMUM YIELD STRENGTH 38,000 psi AND HIGHER FOR TEMPERATURES 300°F AND LESS [NOTES (2) and (3)]

(10)

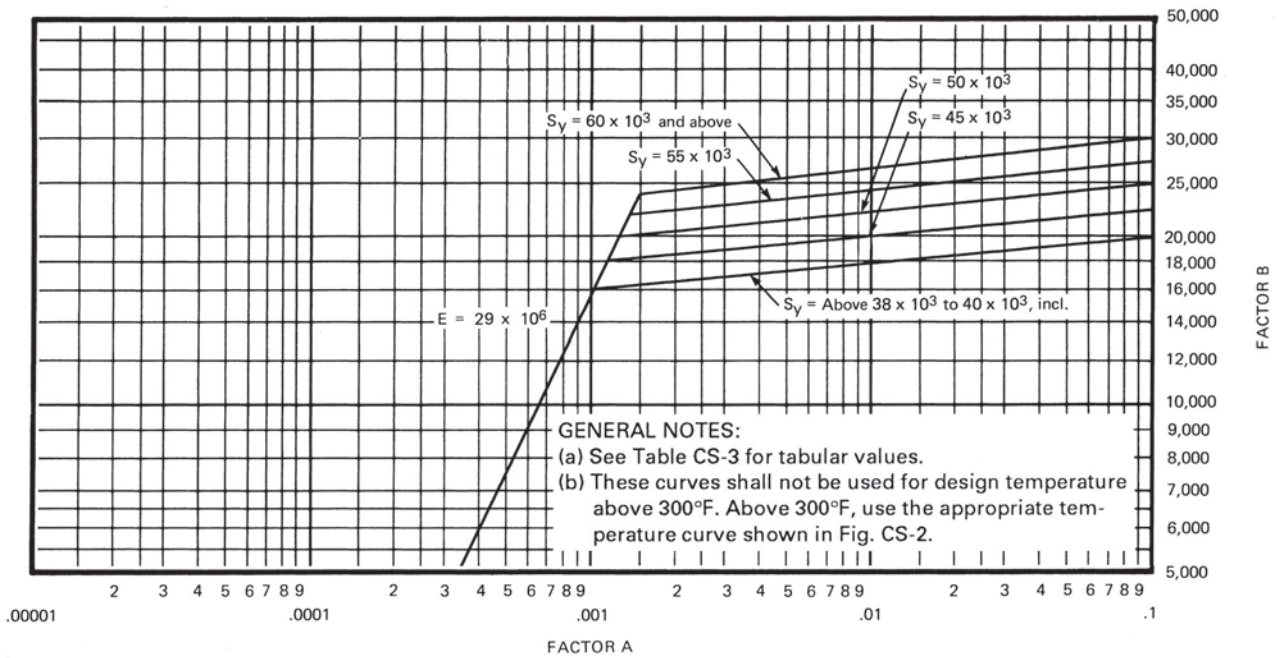


FIG. CS-4 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR SA-537 THICKNESS 2½ in. AND LESS

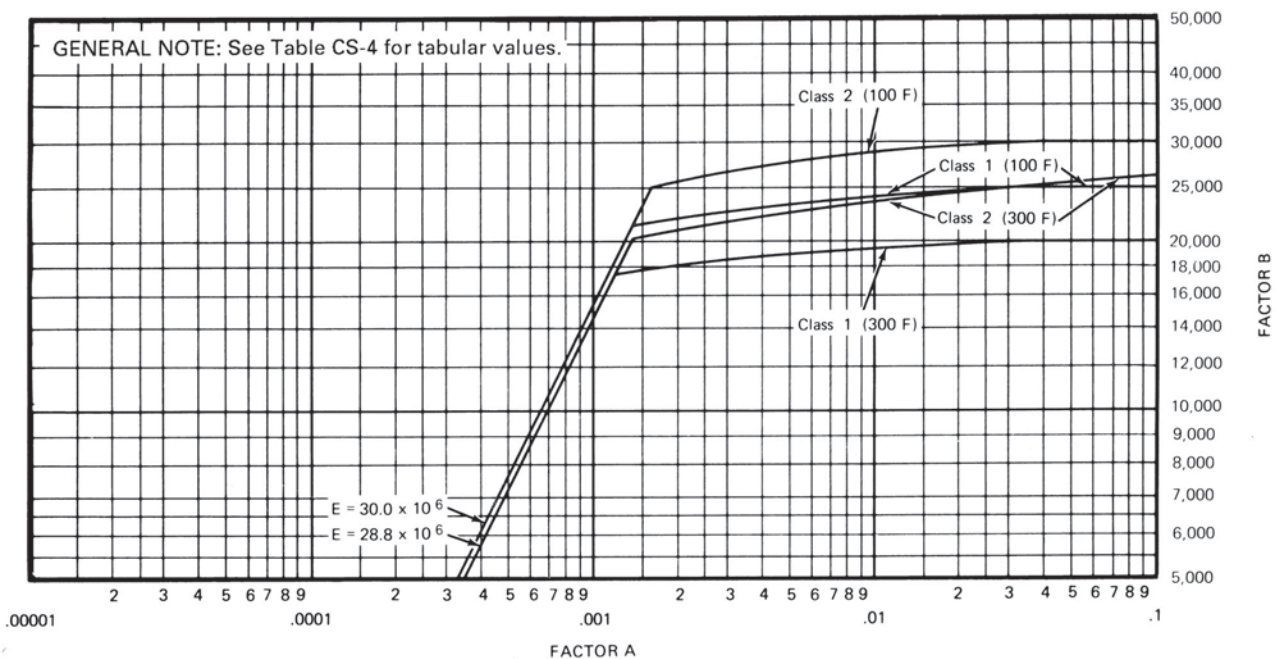


FIG. CS-5 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR SA-508 CLASS 1, GRADES 2 AND 3; SA-508 CLASS 2, GRADE 2; SA-533 CLASS 1, GRADES A, B, C, AND D; SA-533 CLASS 2, GRADES A, B, C, AND D; OR SA-541 GRADES 2 AND 3

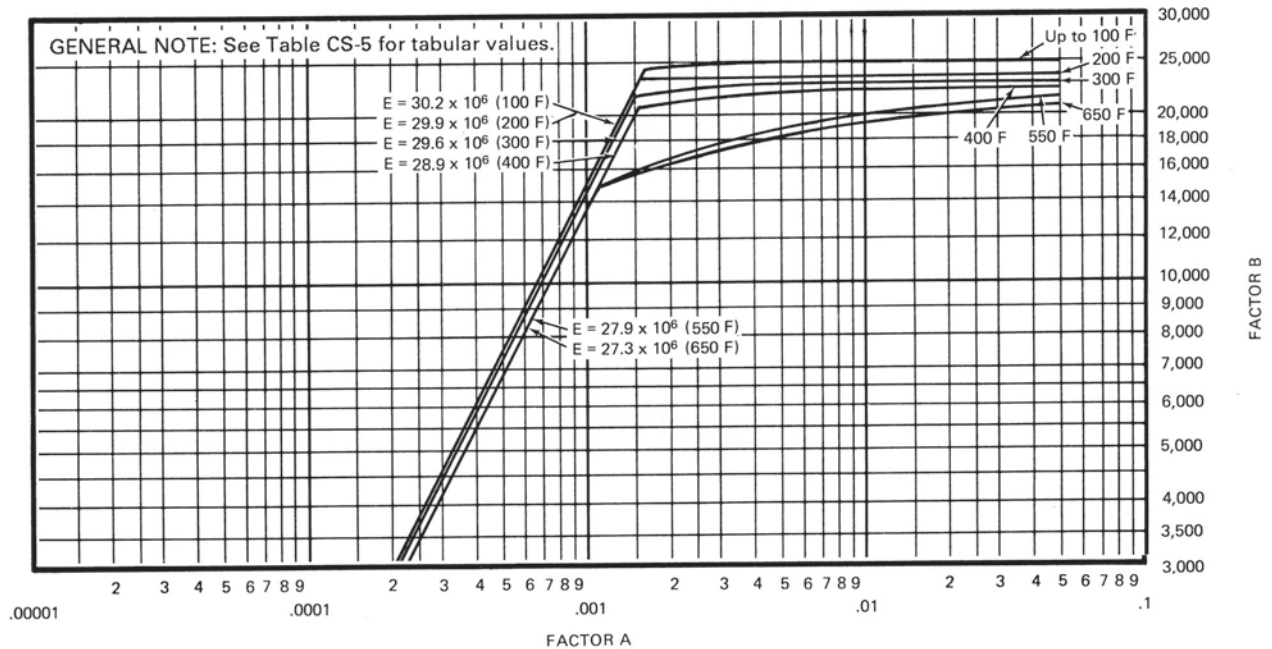


FIG. CS-6 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR CARBON STEEL WITH SPECIFIED MINIMUM YIELD STRENGTH OF 20,000 psi

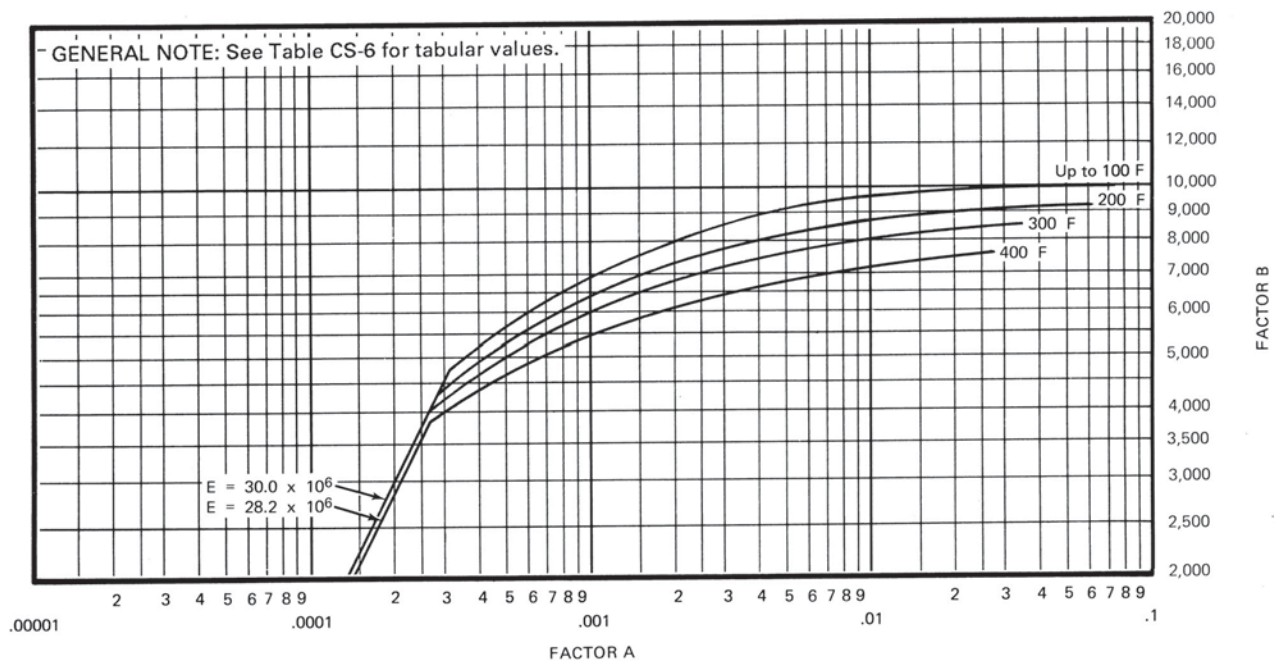


FIG. HT-1 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR QUENCHED AND TEMPERED LOW ALLOY STEEL WITH SPECIFIED MINIMUM YIELD STRENGTH OF 100,000 psi AND THICKNESS $2\frac{1}{2}$ in. AND LESS

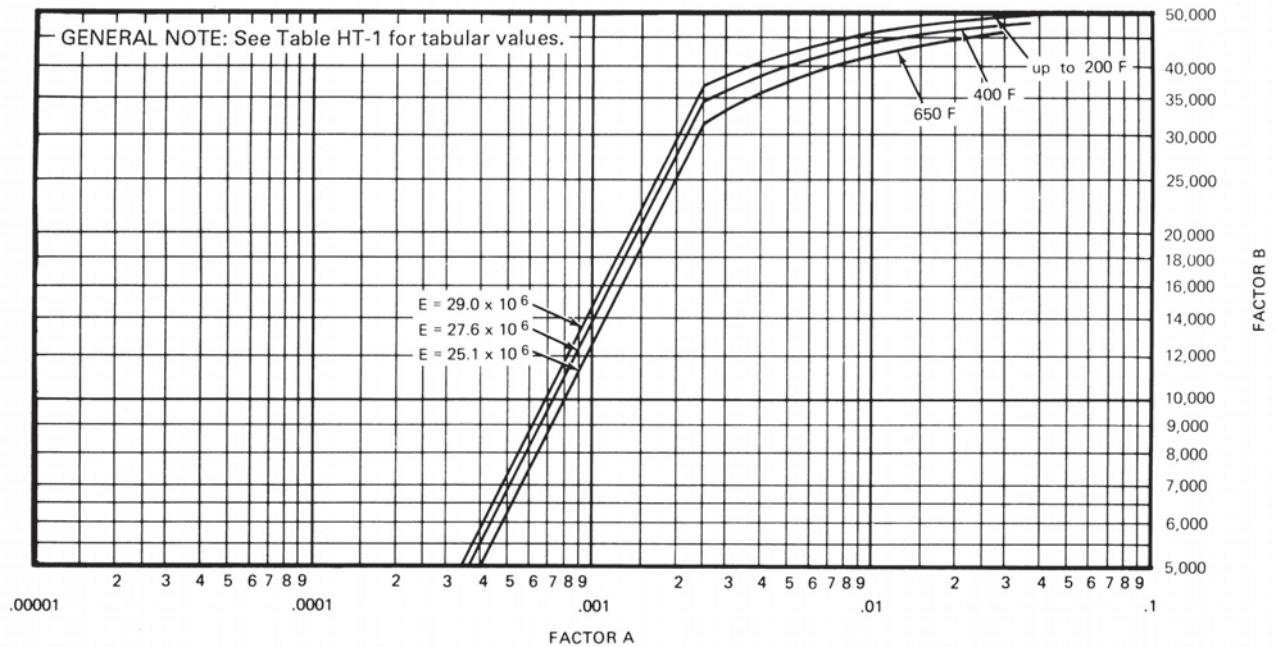


FIG. HT-2 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR SA-508 GRADE 4N, CLASS 2 OR SA-543 TYPES B AND C, CLASS 2 WITH SPECIFIED MINIMUM YIELD STRENGTH OF 100,000 psi

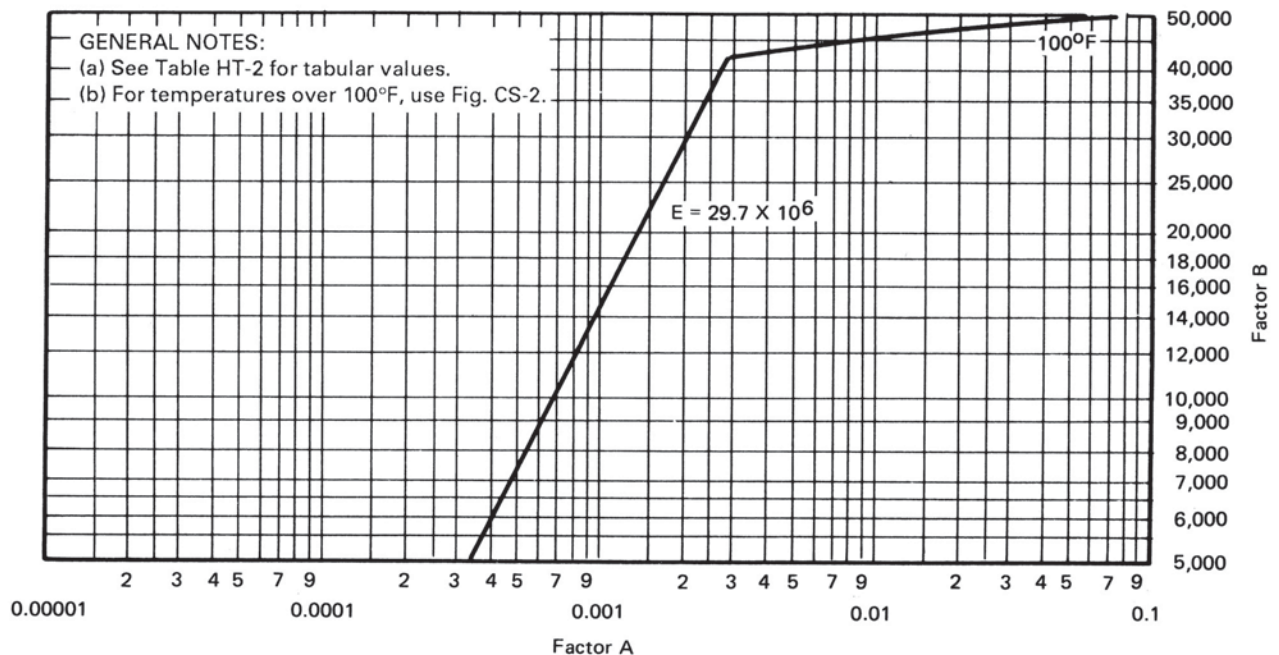


FIG. HA-1 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR AUSTENITIC STEEL 18Cr-8Ni, TYPE 304

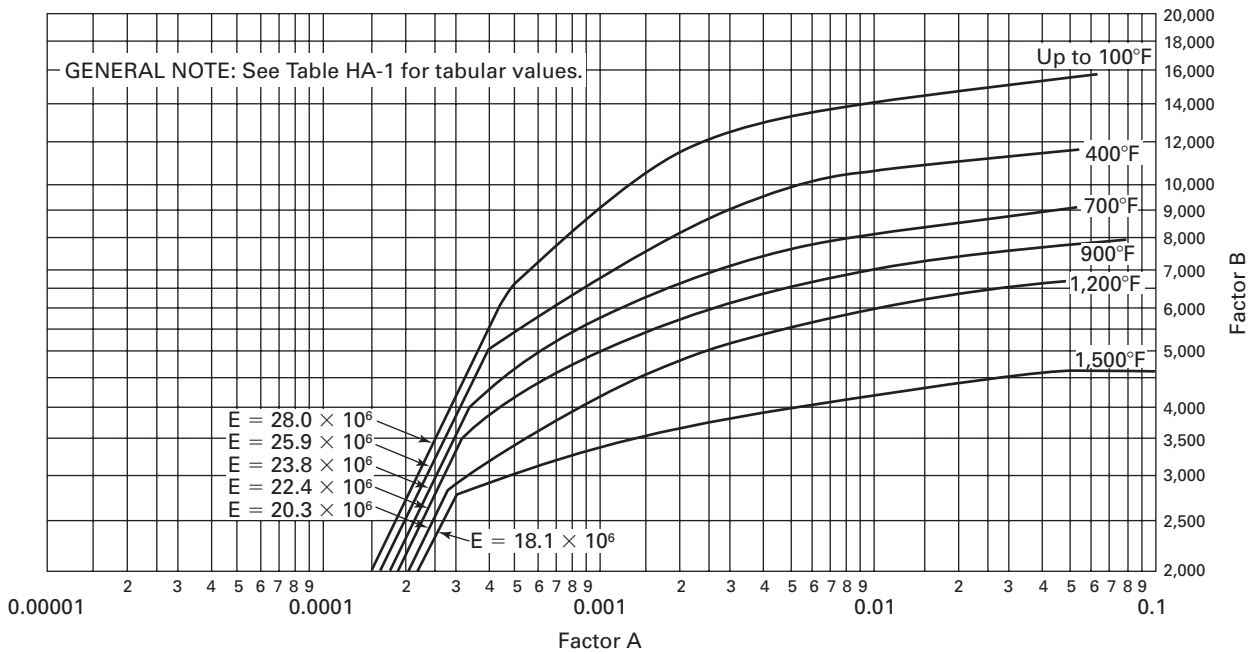


FIG. HA-2 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR AUSTENITIC STEEL 16Cr-12Ni-2Mo, TYPE 316

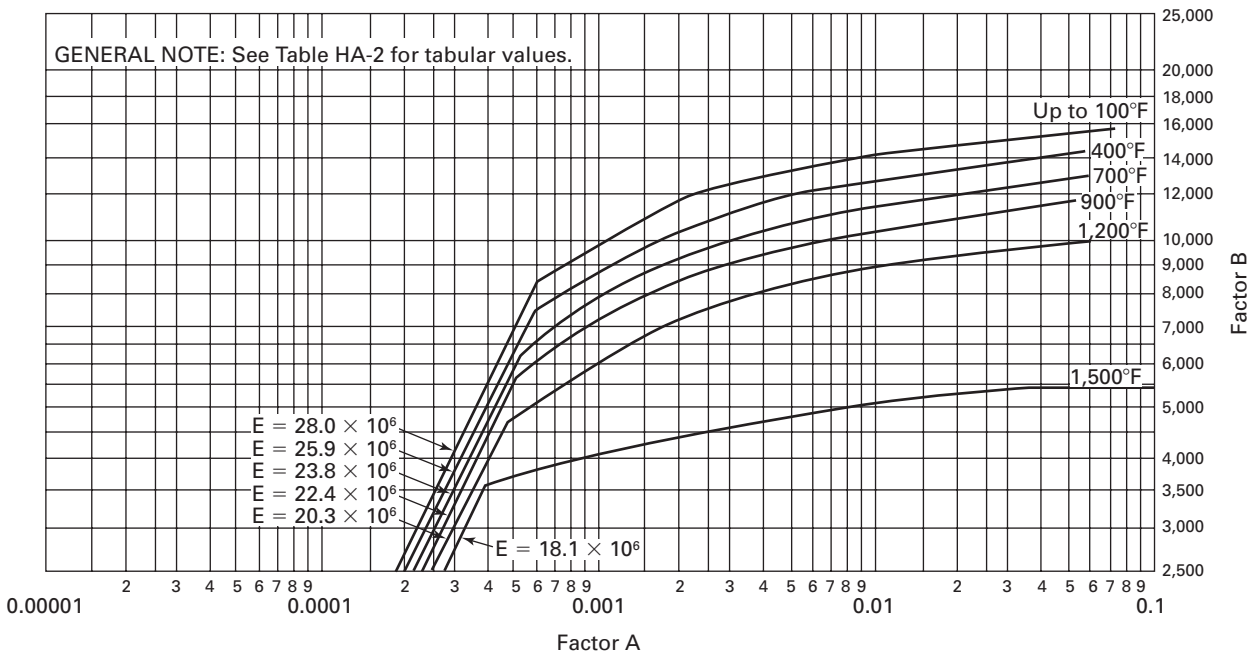


FIG. HA-3 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR AUSTENITIC STEEL 18Cr-8Ni-0.035 MAXIMUM CARBON, TYPE 304L

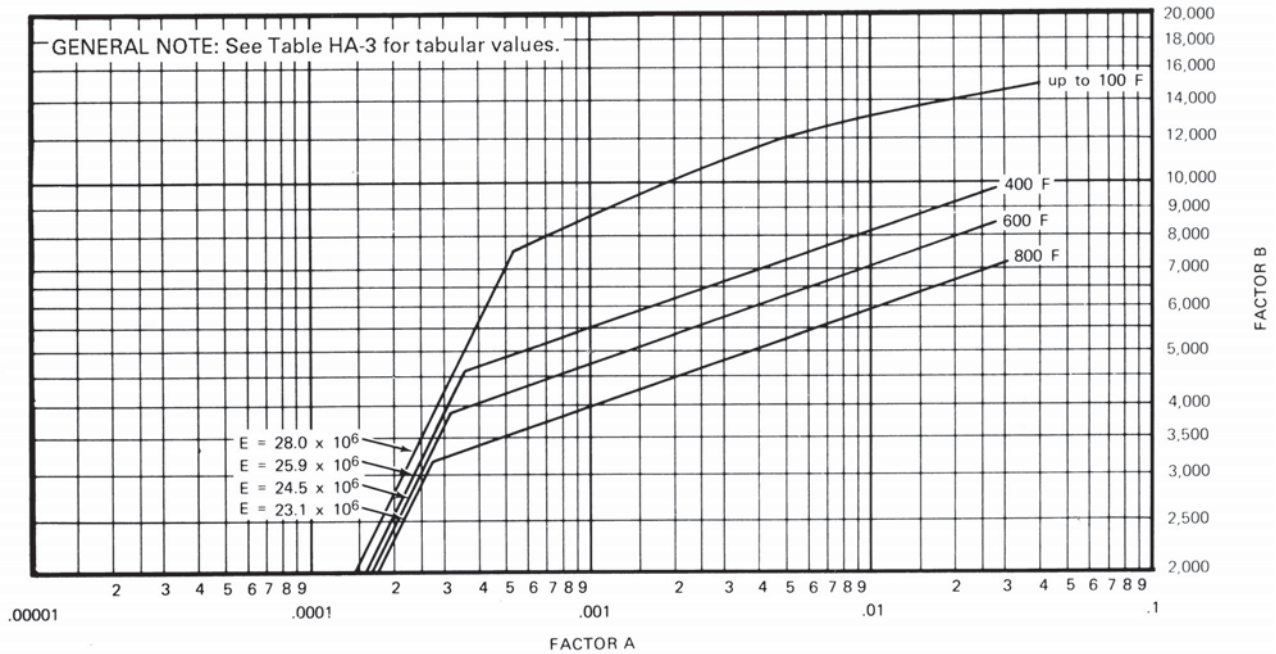


FIG. HA-4 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR AUSTENITIC STEEL 18Cr-8Ni-Mo-0.035 MAXIMUM CARBON, TYPE 316L

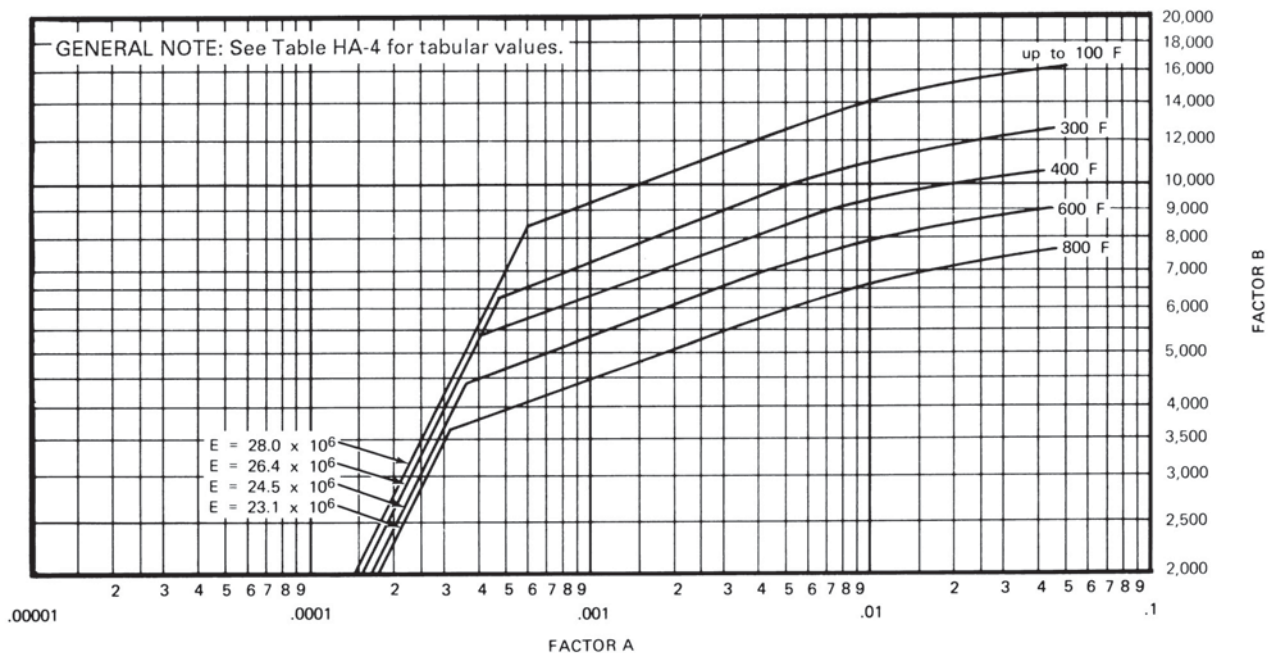


FIG. HA-5 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR AUSTENITIC-FERRITIC STEEL 18Cr-5Ni-3Mo S31500

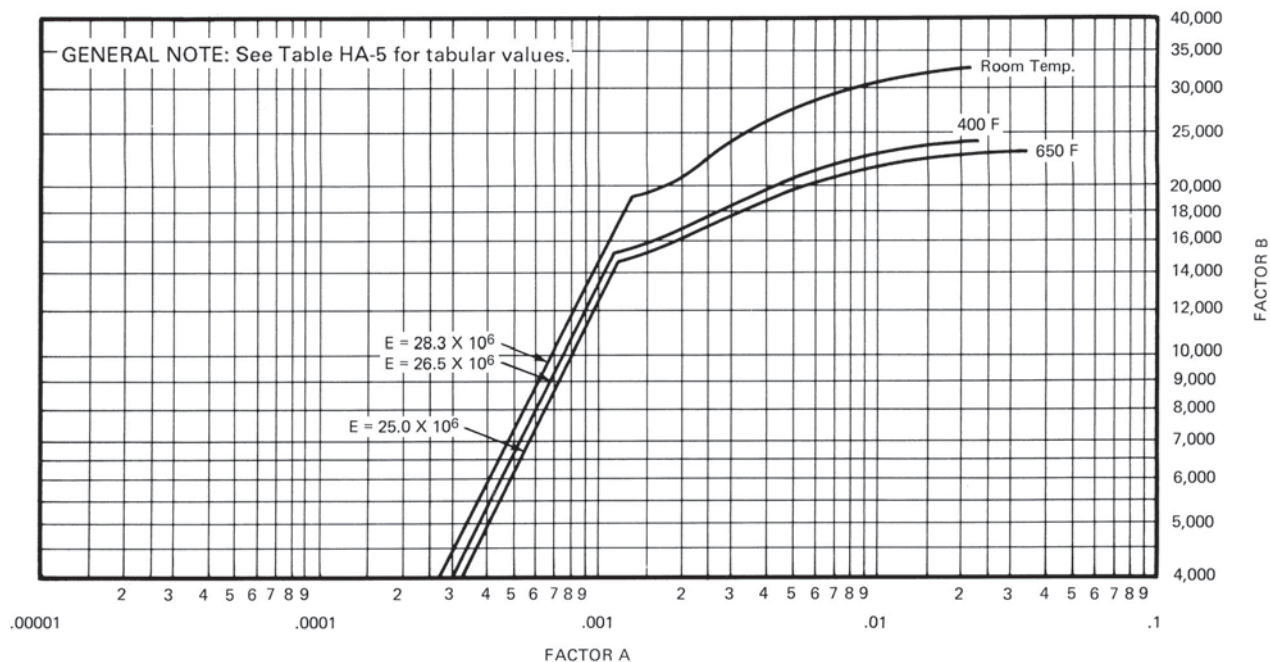


FIG. HA-6 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR AUSTENITIC STEEL 21Cr-11Ni-N S30815 [NOTE (4)]

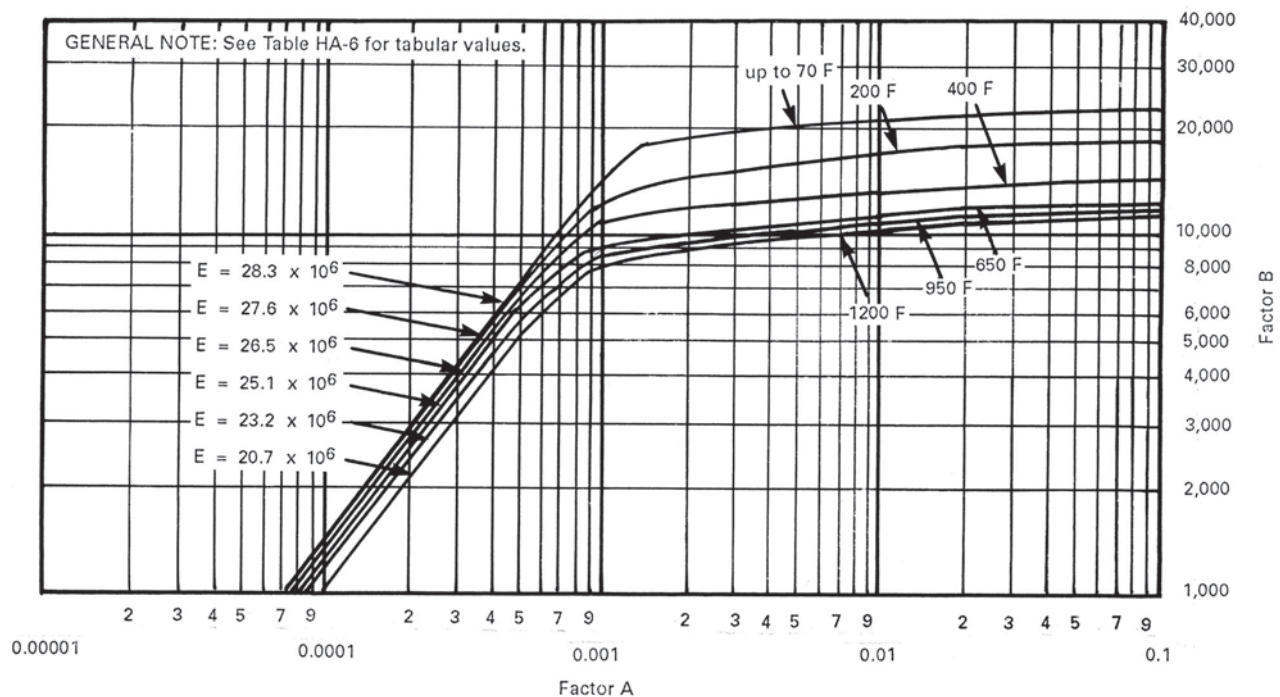


FIG. HA-7 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR SA-564 TYPE 630 H1150 (17Cr-4Ni-4Cu S17400)

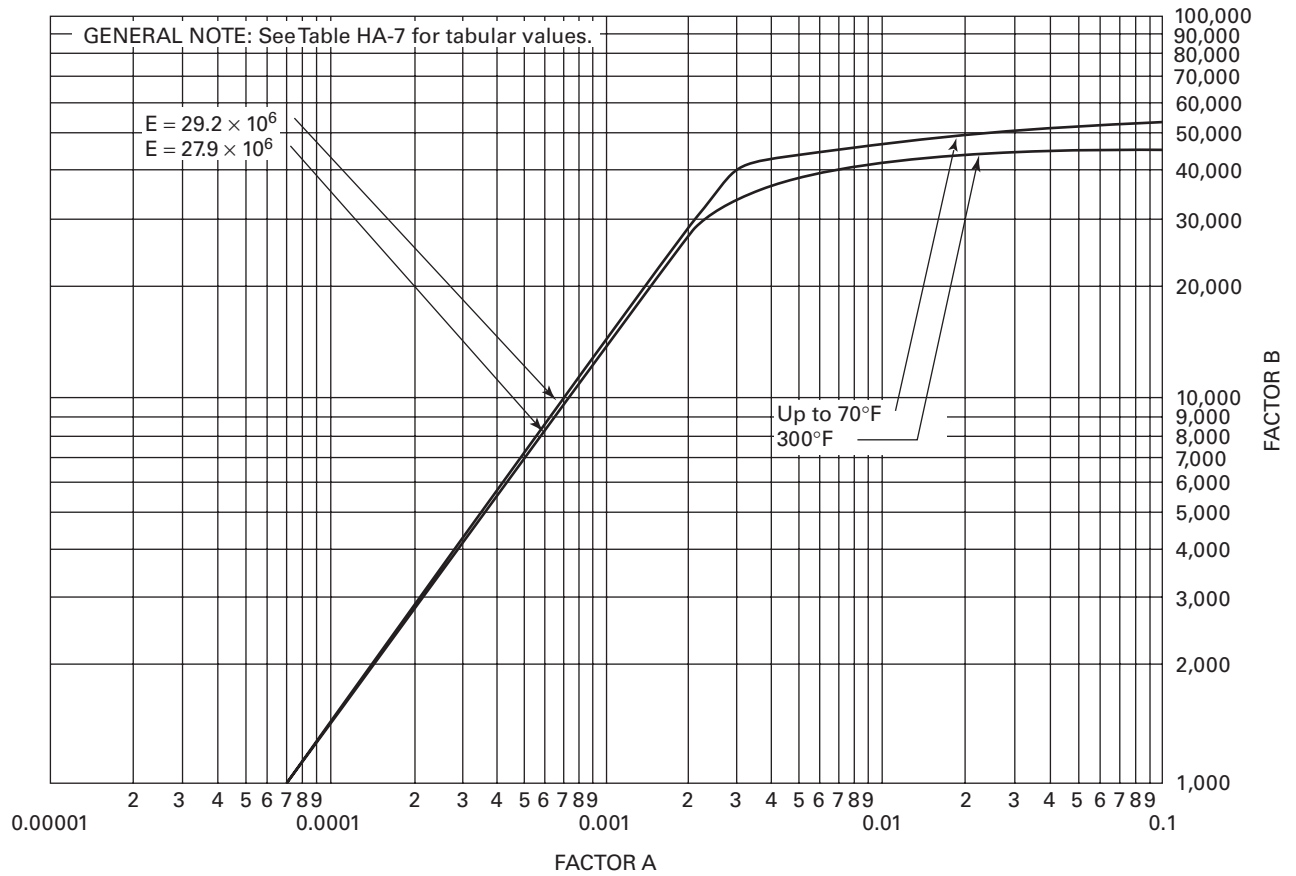


FIG. HA-8 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR AUSTENITIC-FERRITIC STEEL 25Cr-7Ni-3Mo-2W-0.28N S39274

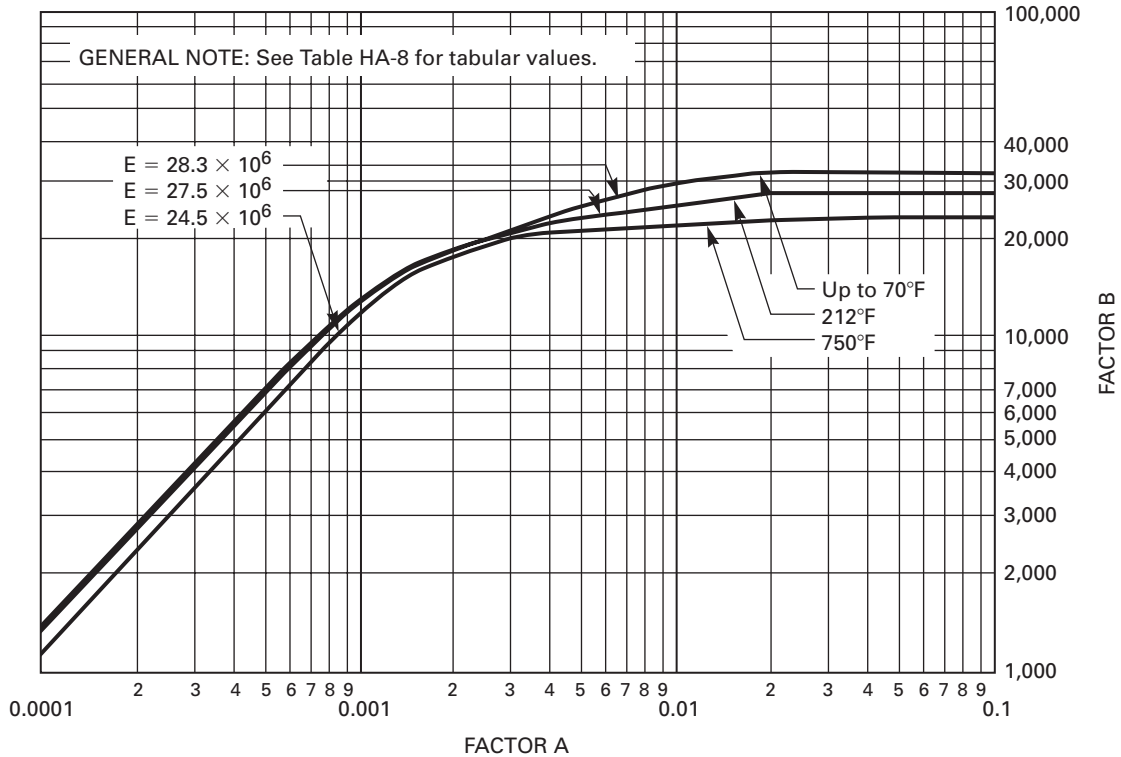


FIG. CI-1 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR CAST IRON

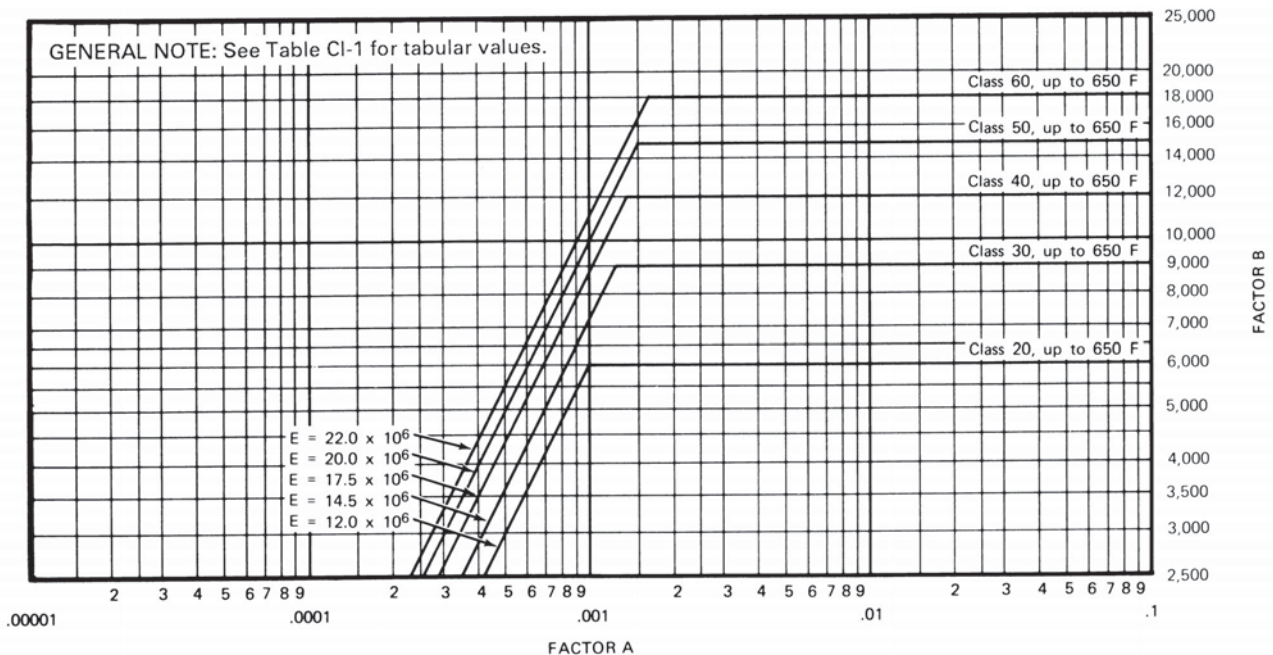


FIG. CD-1 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR CAST DUCTILE IRON WITH A SPECIFIED MINIMUM YIELD STRENGTH OF 40,000 psi

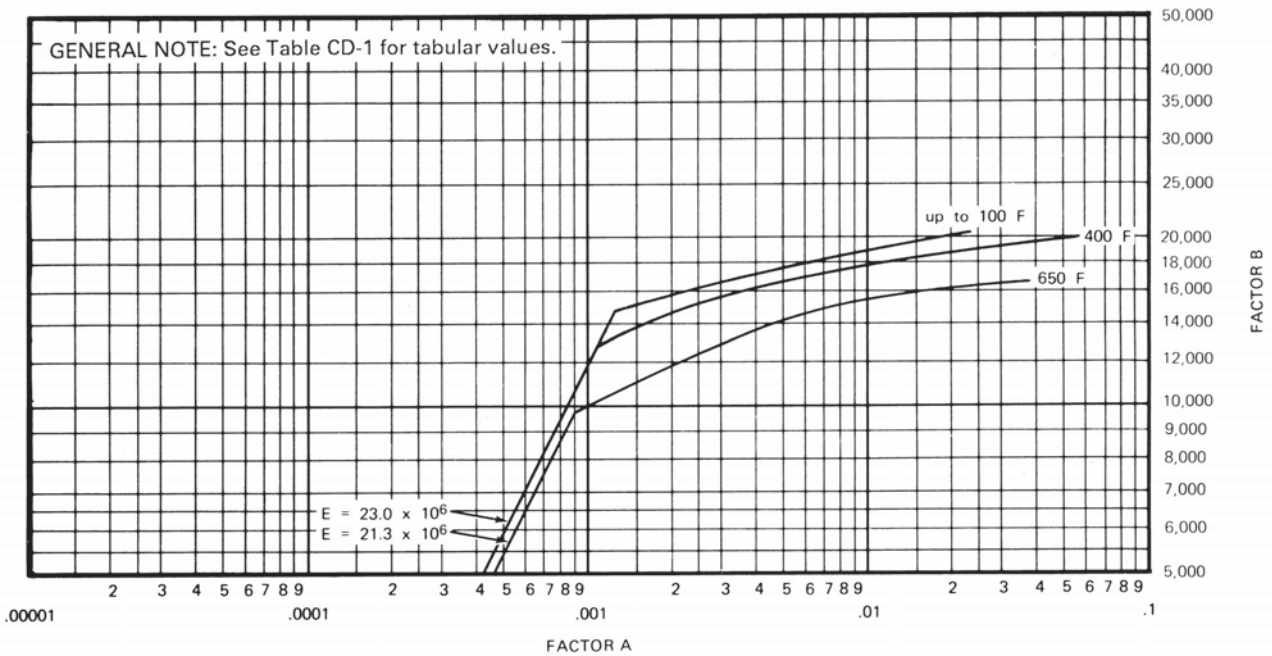


FIG. NFA-1 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ALUMINUM ALLOY 3003 IN O TEMPER [NOTE (5)]

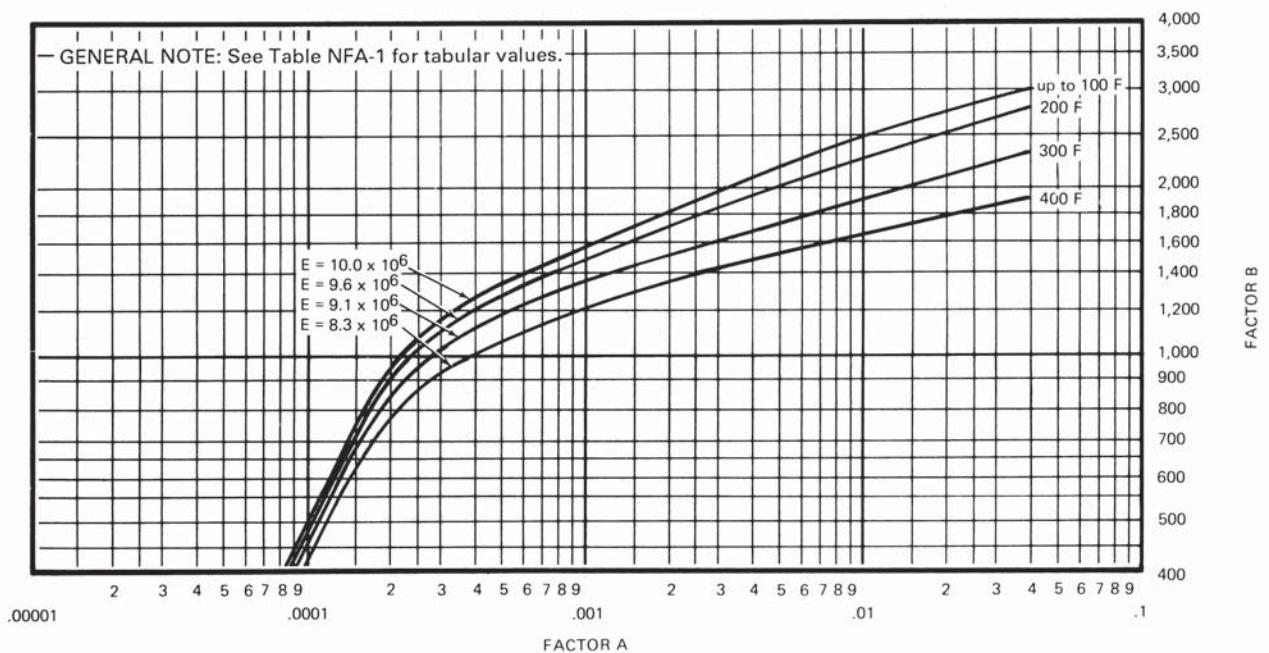


FIG. NFA-2 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ALUMINUM ALLOY 3003 IN H14 TEMPER [NOTE (5)]

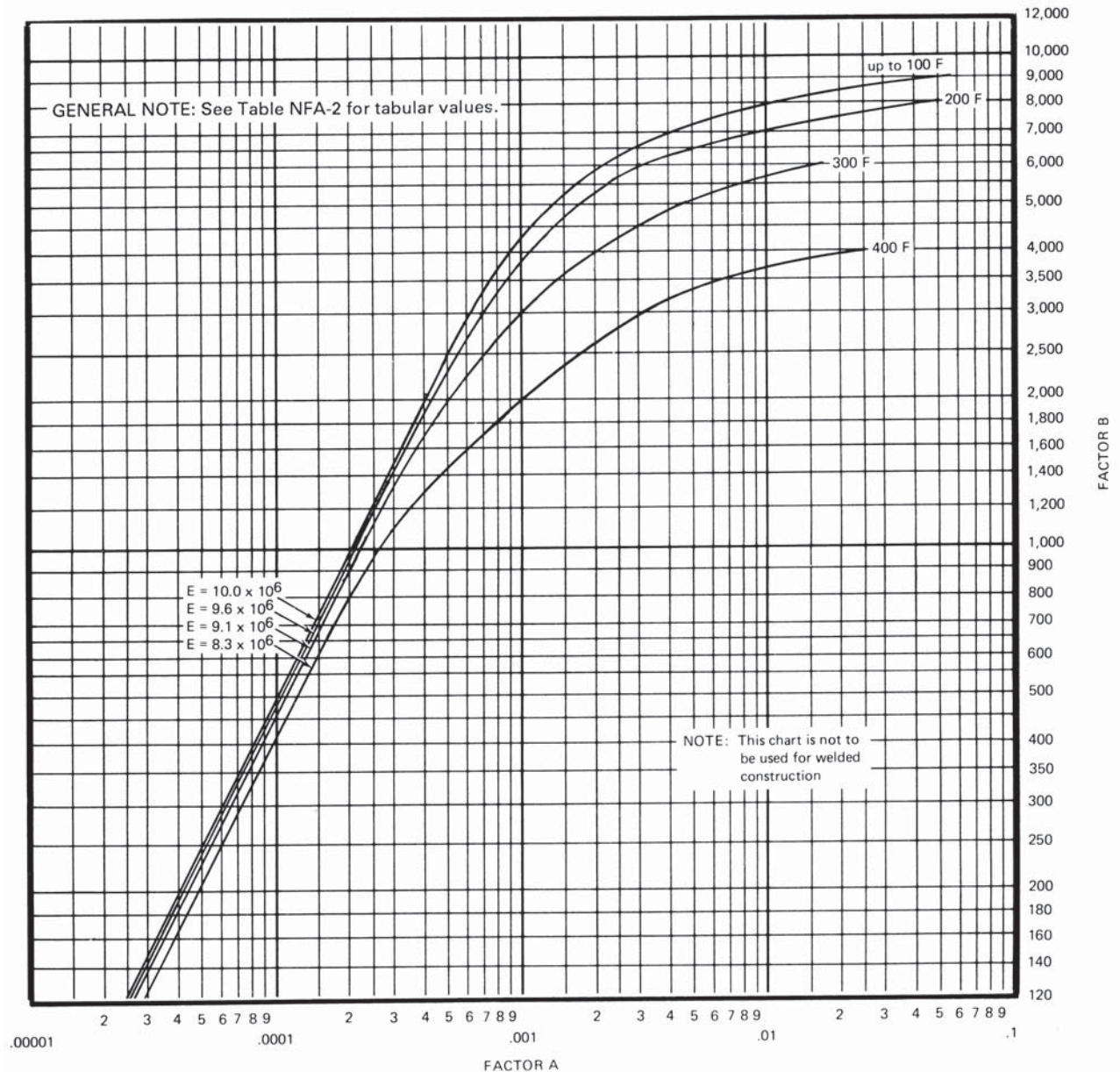


FIG. NFA-3 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ALUMINUM ALLOY 3004 IN O TEMPER

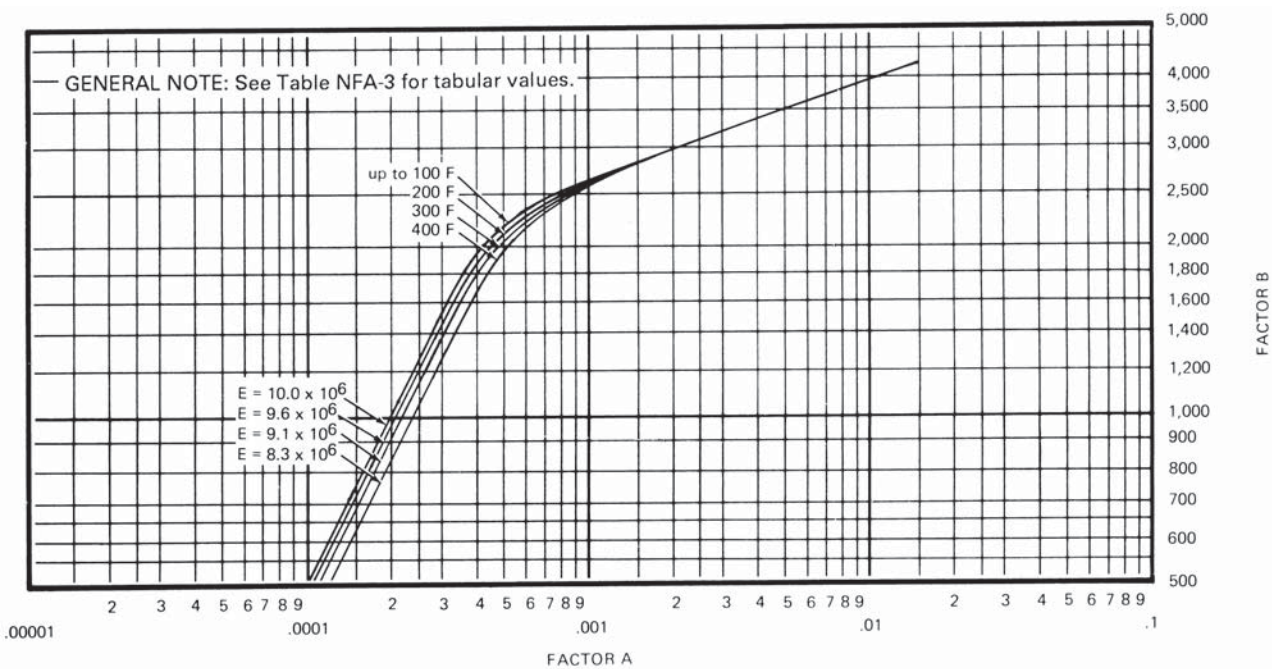


FIG. NFA-4 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ALUMINUM ALLOY 3004 IN H34 TEMPER [NOTE (5)]

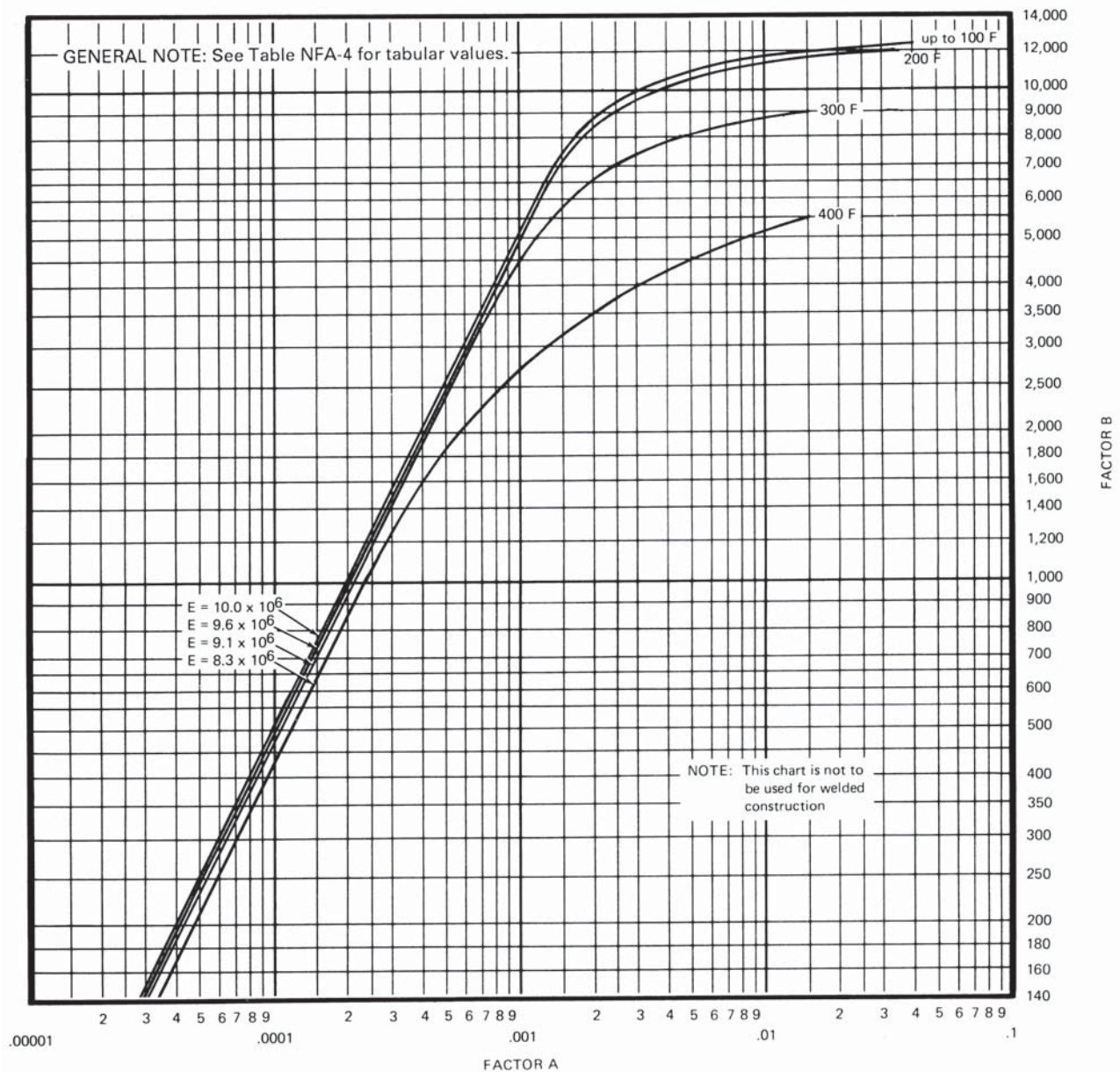


FIG. NFA-5 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ALUMINUM ALLOY 5154 IN 0 TEMPER

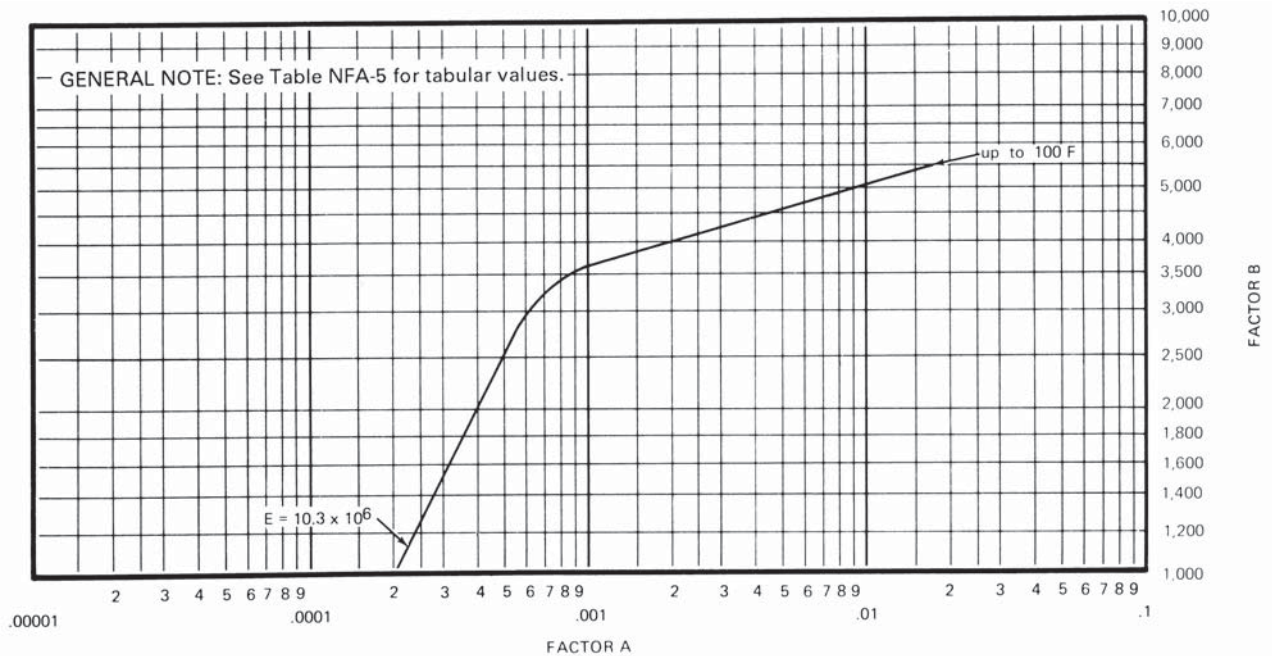


FIG. NFA-6 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ALUMINUM ALLOY 5454 IN 0 TEMPER

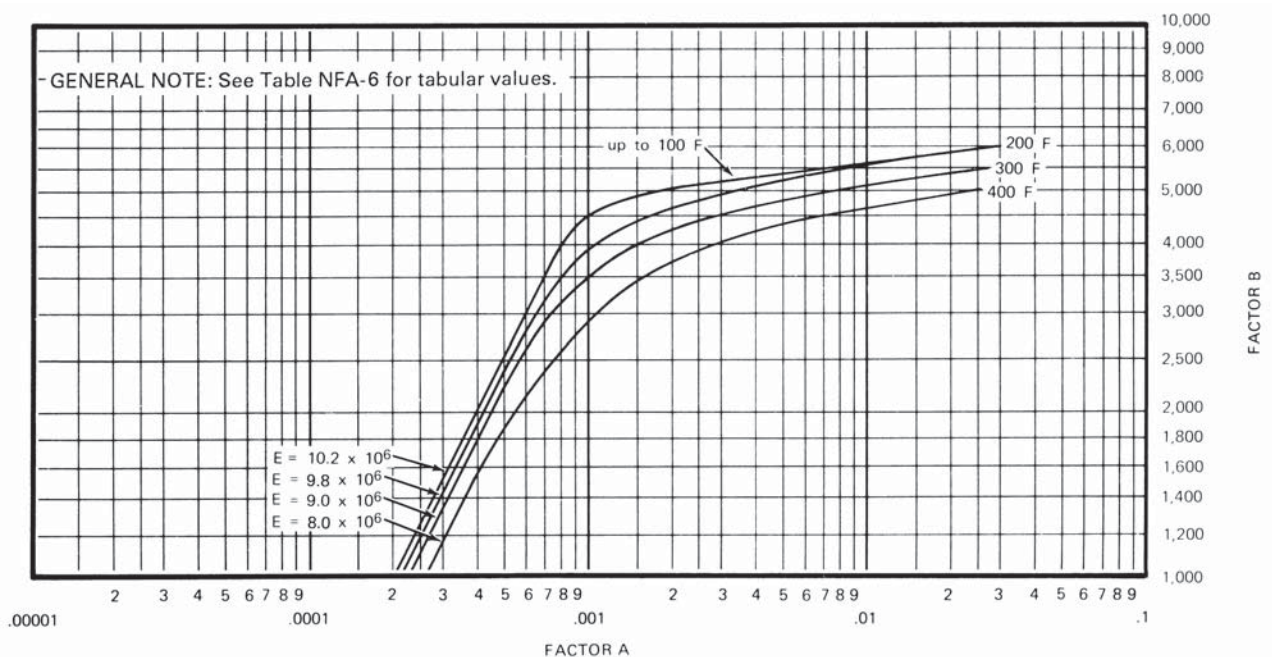


FIG. NFA-7 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ALUMINUM ALLOY 1060 IN O TEMPER

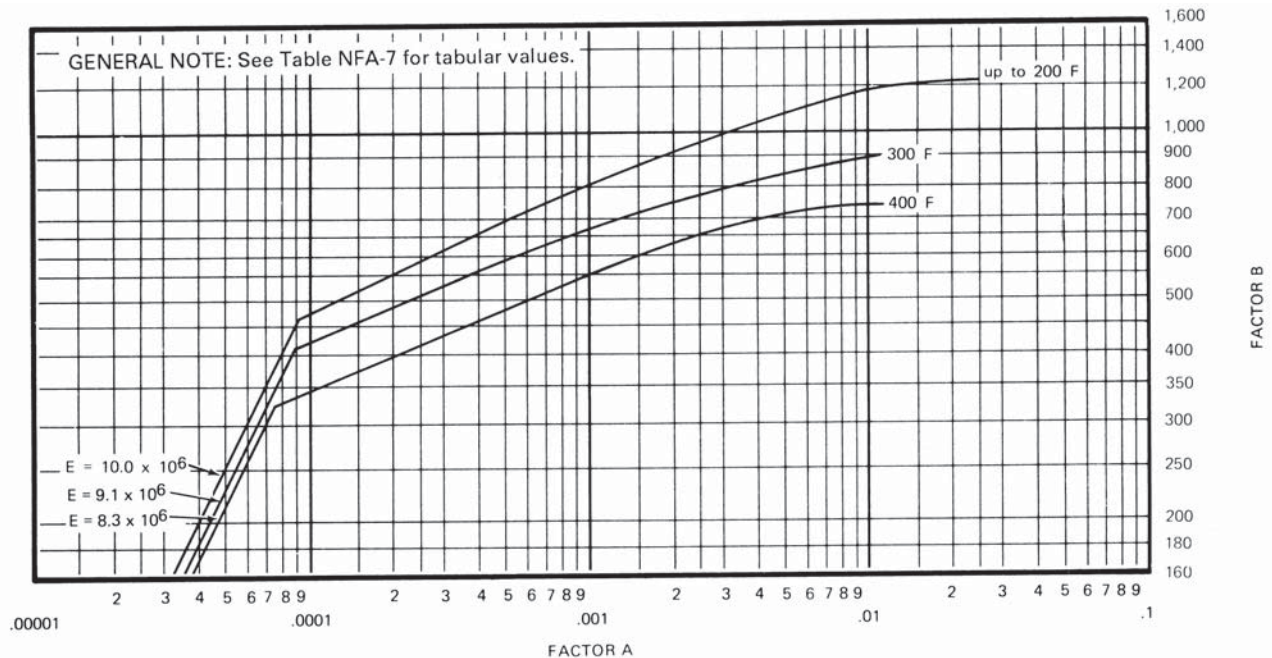


FIG. NFA-8 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ALUMINUM ALLOY 5052 IN O TEMPER [NOTE (6)]

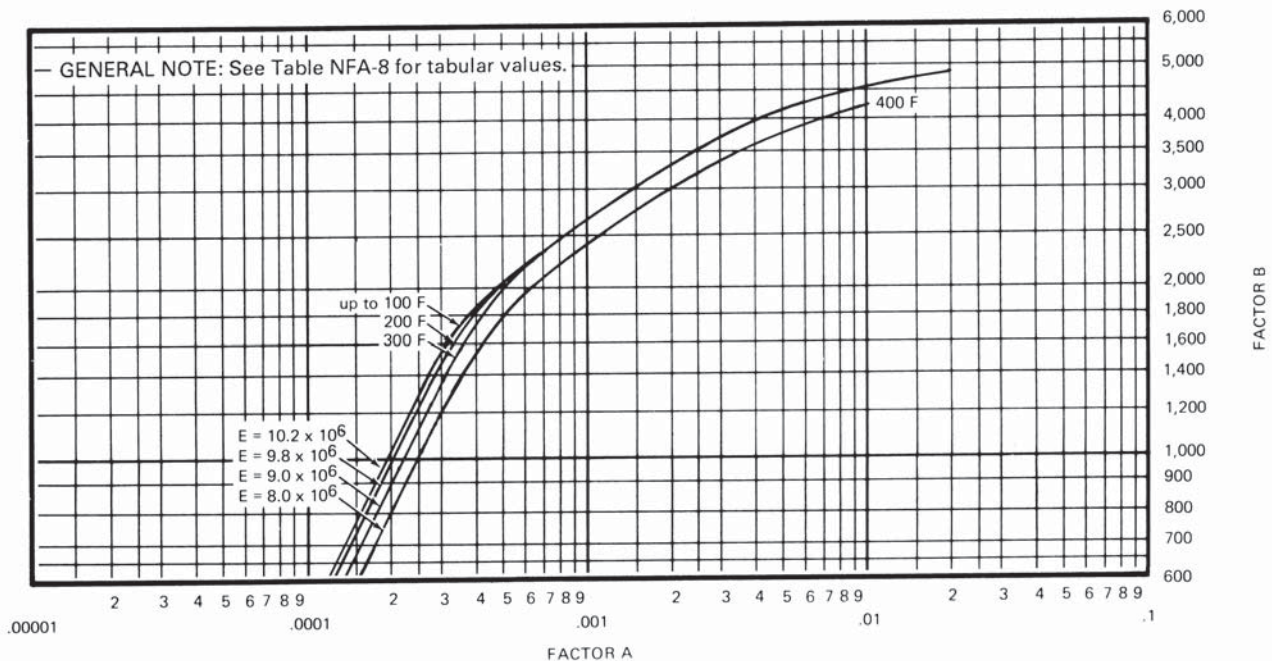


FIG. NFA-9 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ALUMINUM ALLOY 5086 IN O TEMPER

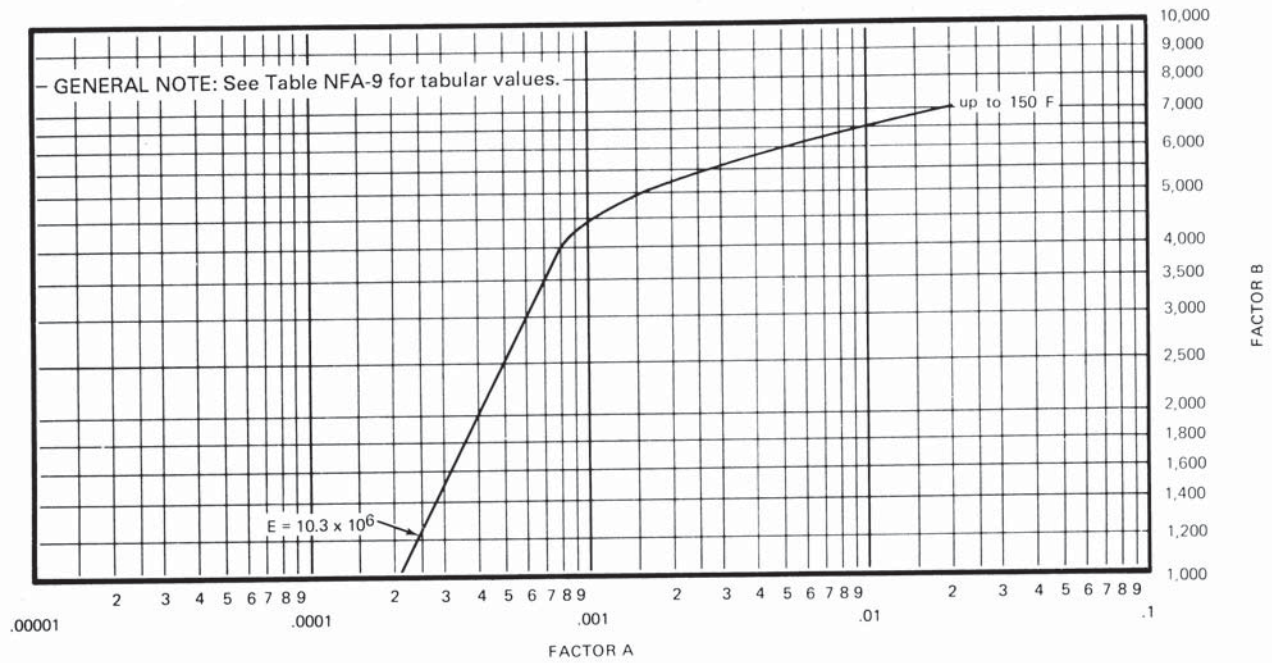


FIG. NFA-10 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ALUMINUM ALLOY 5456 IN O TEMPER

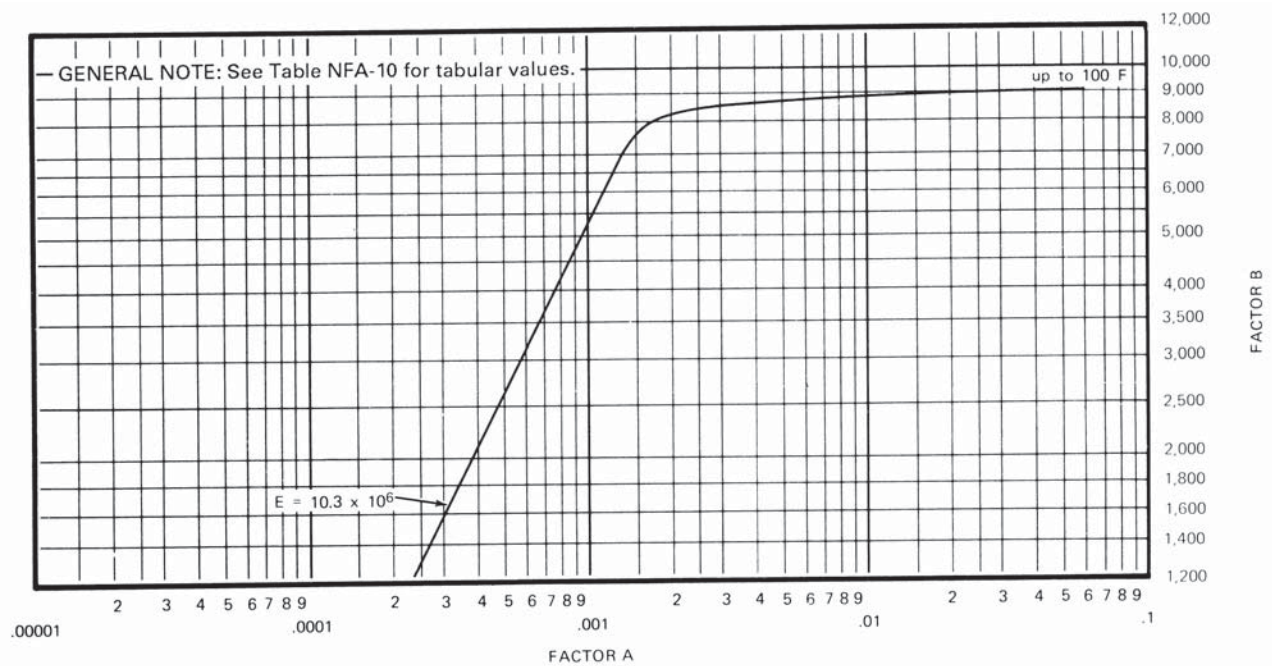


FIG. NFA-11 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ALUMINUM ALLOY 5083 IN O TEMPER

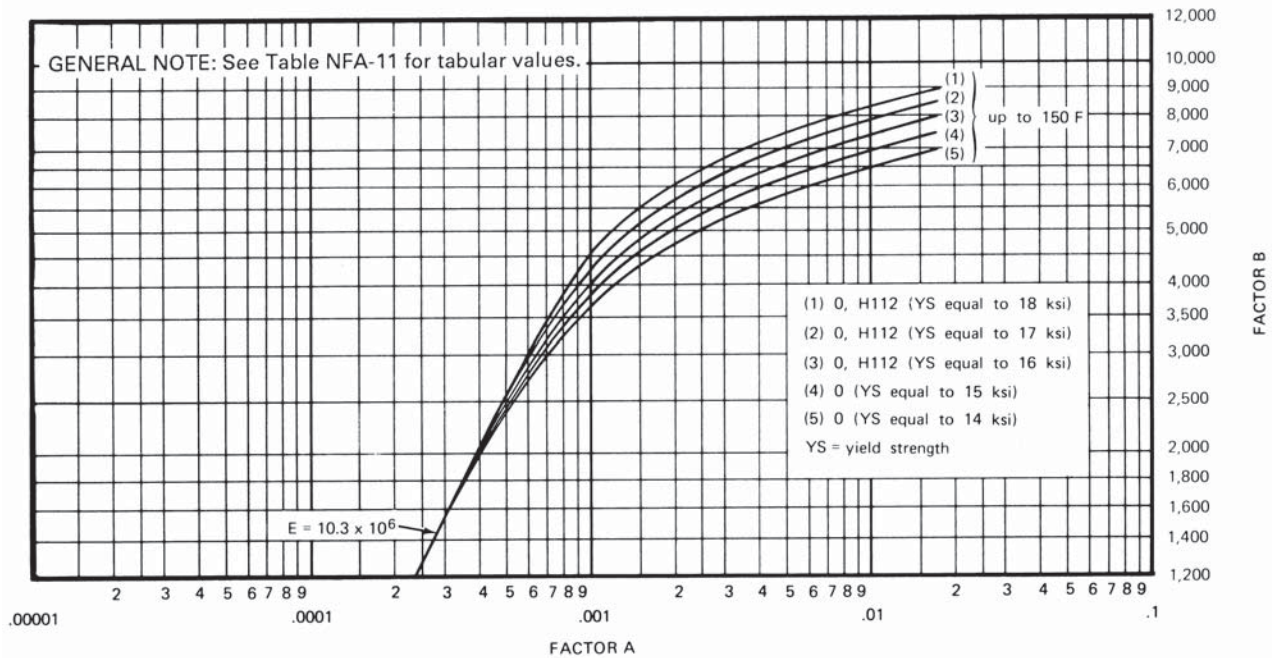


FIG. NFA-12 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR WELDED ALUMINUM ALLOY 6061-T6

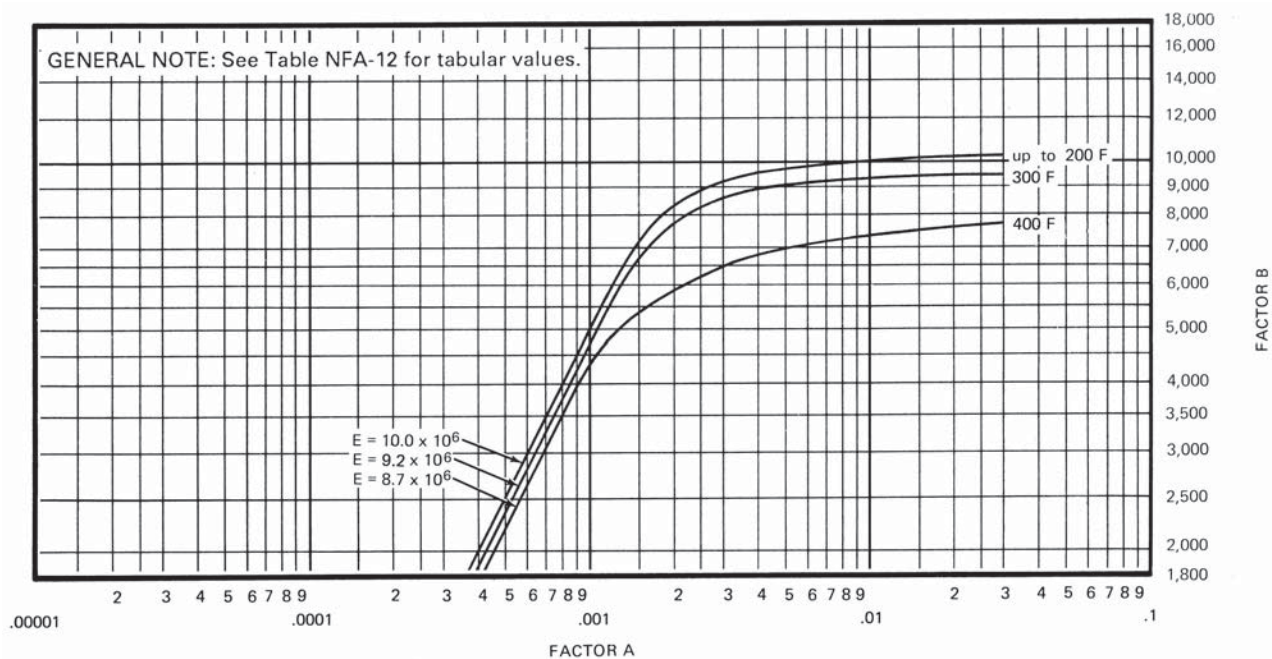


FIG. NFA-13 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR WELDED ALUMINUM ALLOY 6061-T4

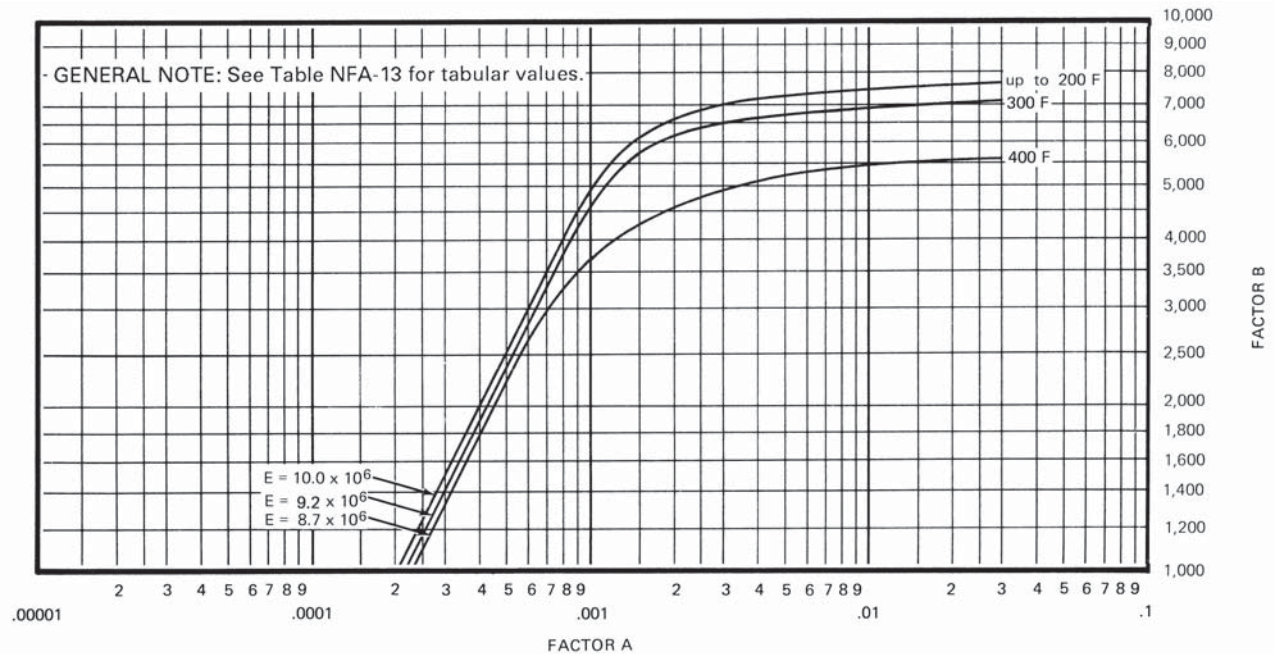


FIG. NFC-1 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ANNEALED COPPER, TYPE DHP

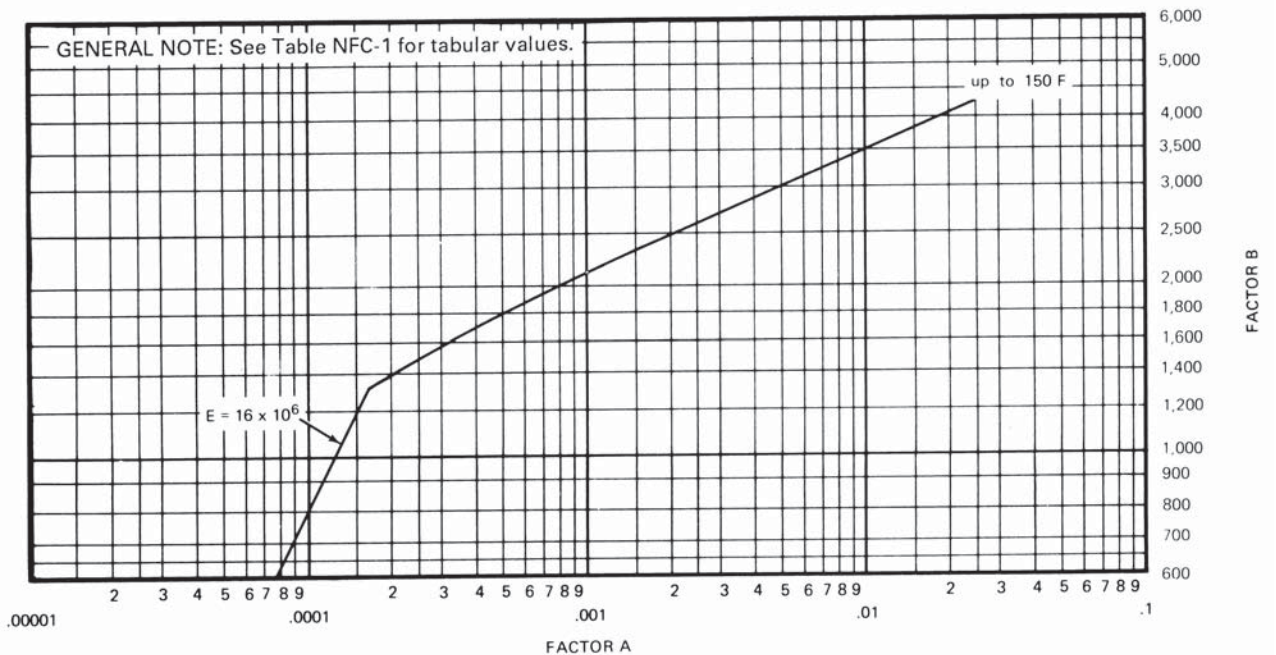


FIG. NFC-2 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR COPPER-SILICON ALLOYS A AND C

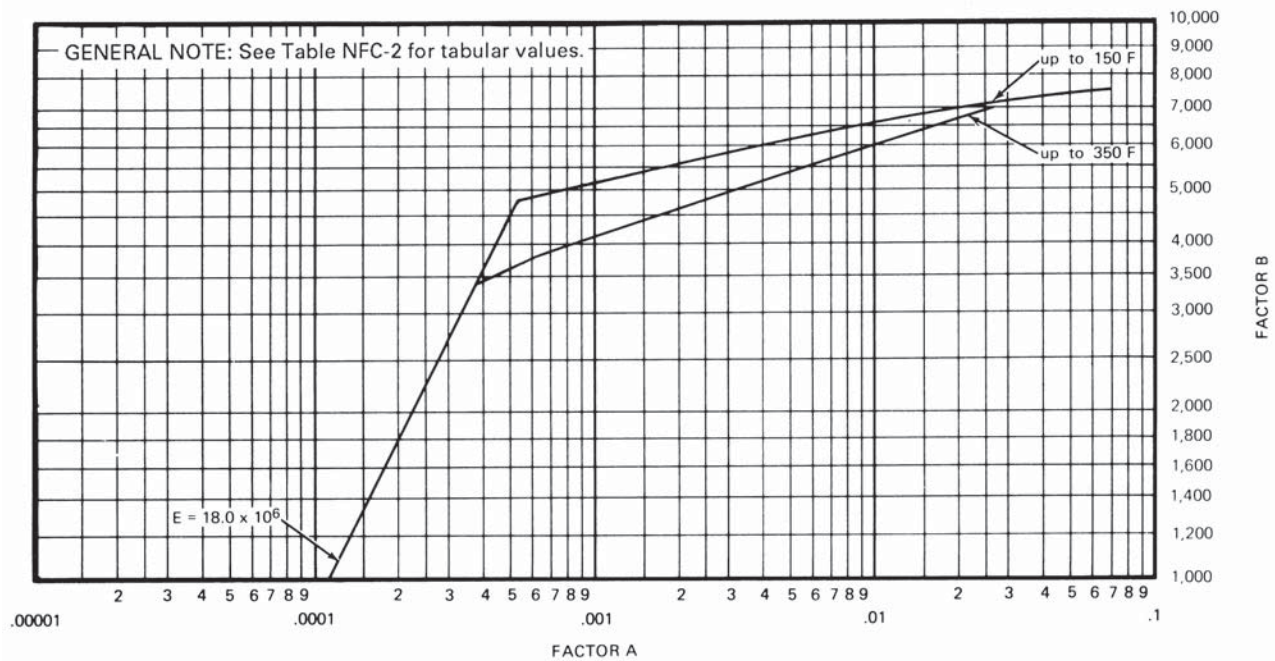


FIG. NFC-3 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ANNEALED 90-10 COPPER-NICKEL ALLOY

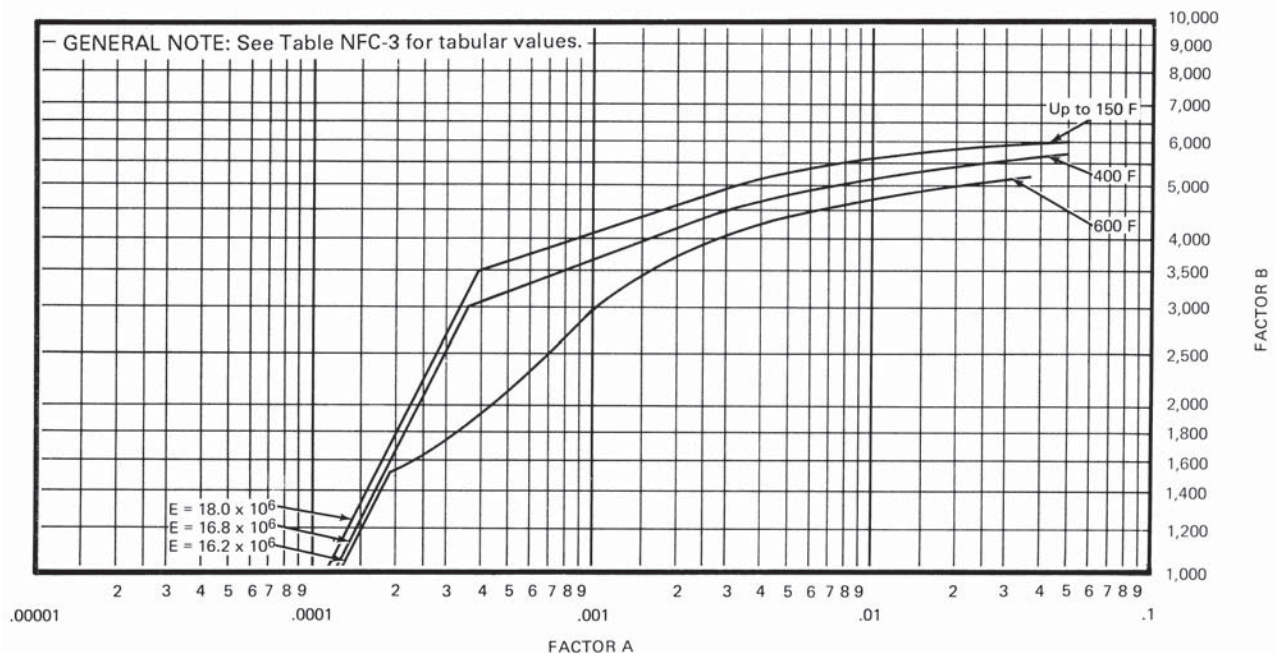


FIG. NFC-4 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ANNEALED 70-30 COPPER-NICKEL ALLOY

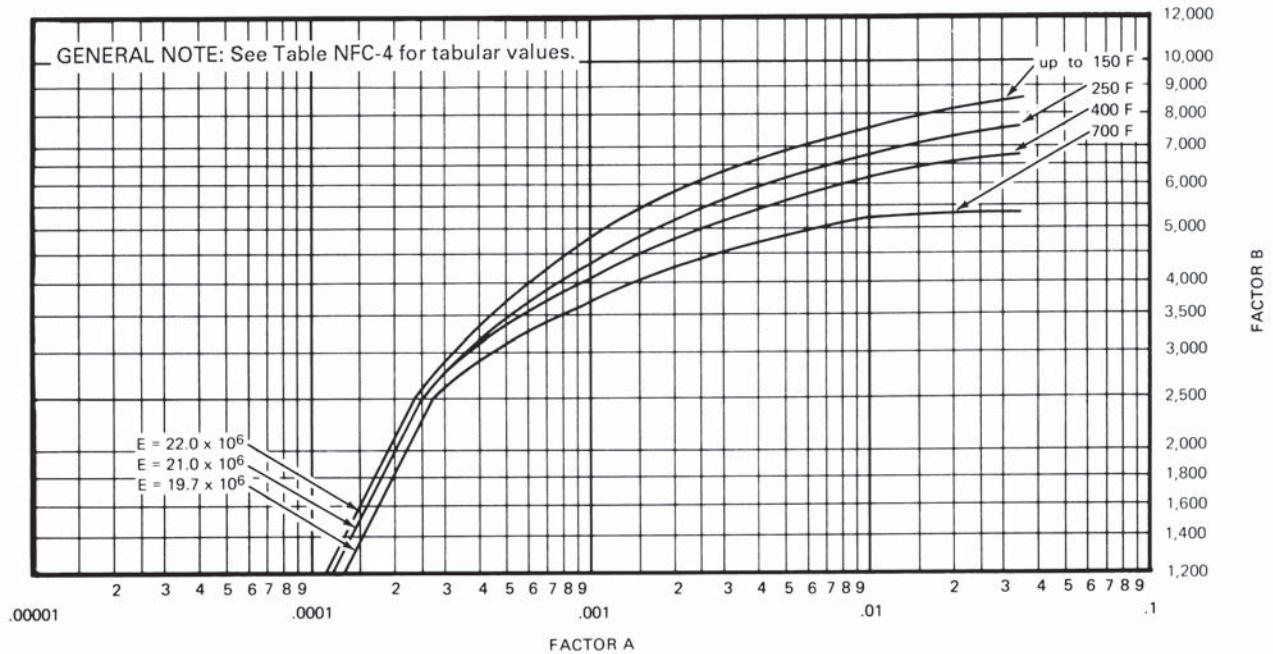


FIG. NFC-5 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR WELDED COPPER-IRON ALLOY TUBE C19400 (SB-543 WELDED)

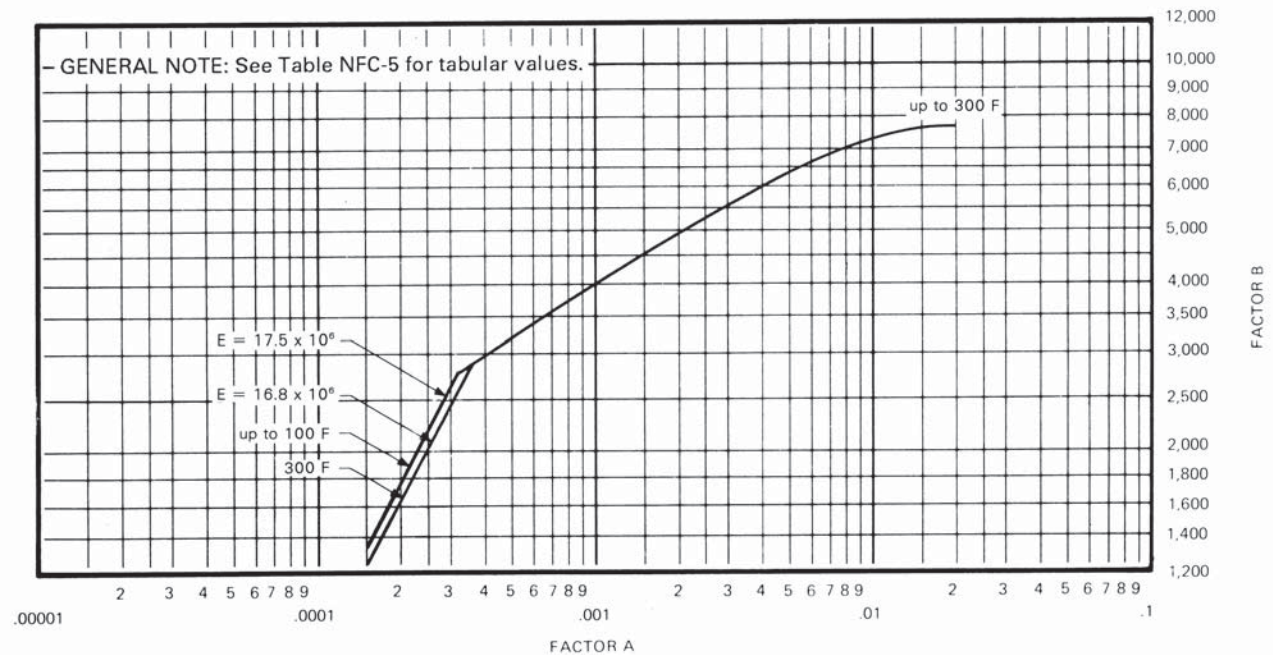
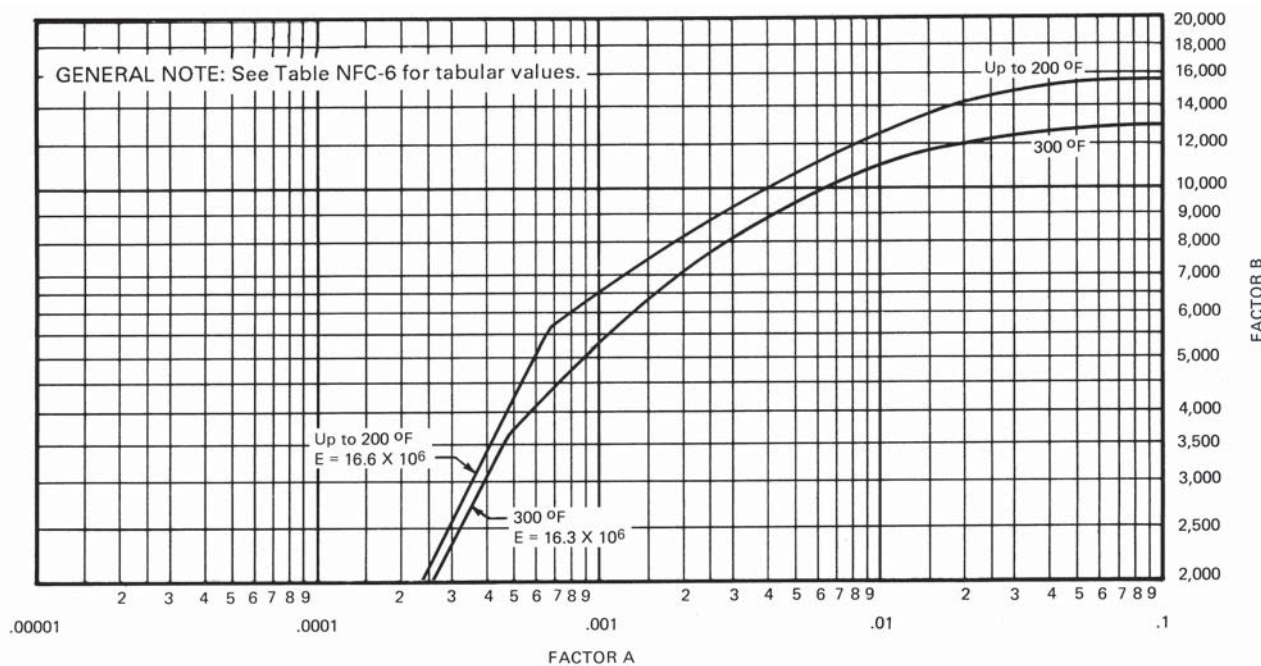


FIG. NFC-6 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR SB-75 AND SB-111 LIGHT DRAWN SEAMLESS COPPER TUBES, ALLOYS C10200, C12000, C12200, AND C14200



(a) FIG. NFC-7 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ANNEALED COPPER, SB-75, UNS C12200, TEMPER 050

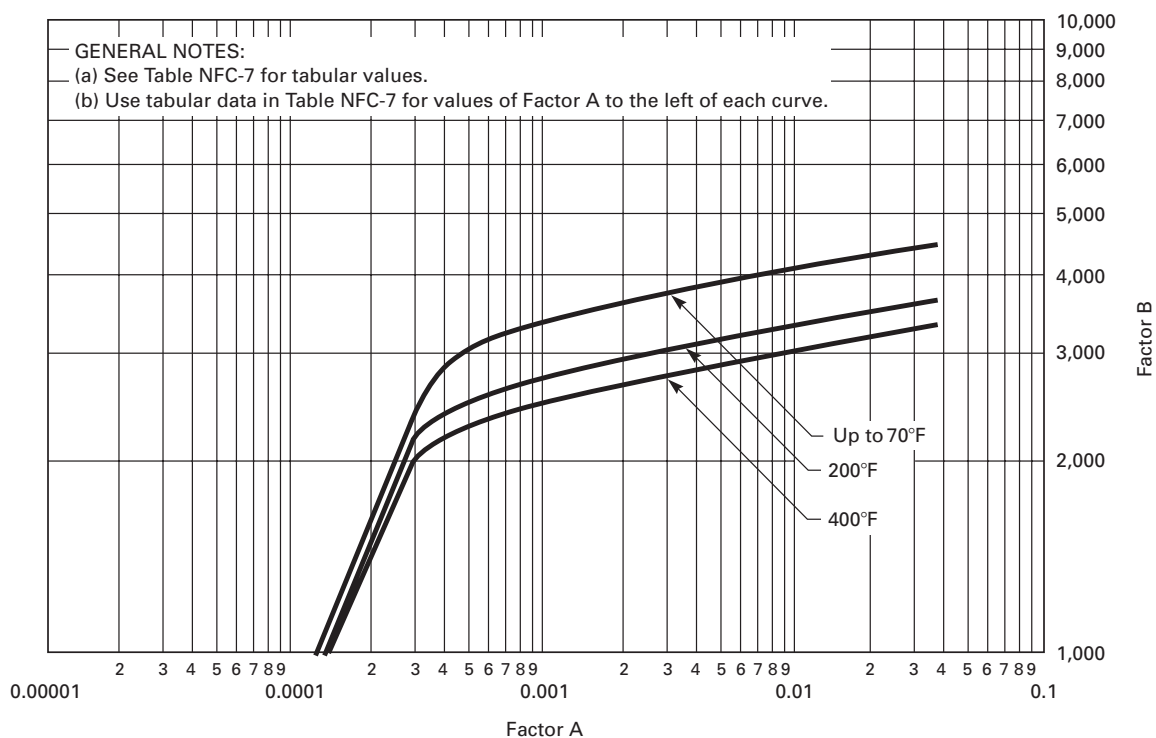


FIG. NFC-8 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ALUMINUM BRONZE ALLOY C61400

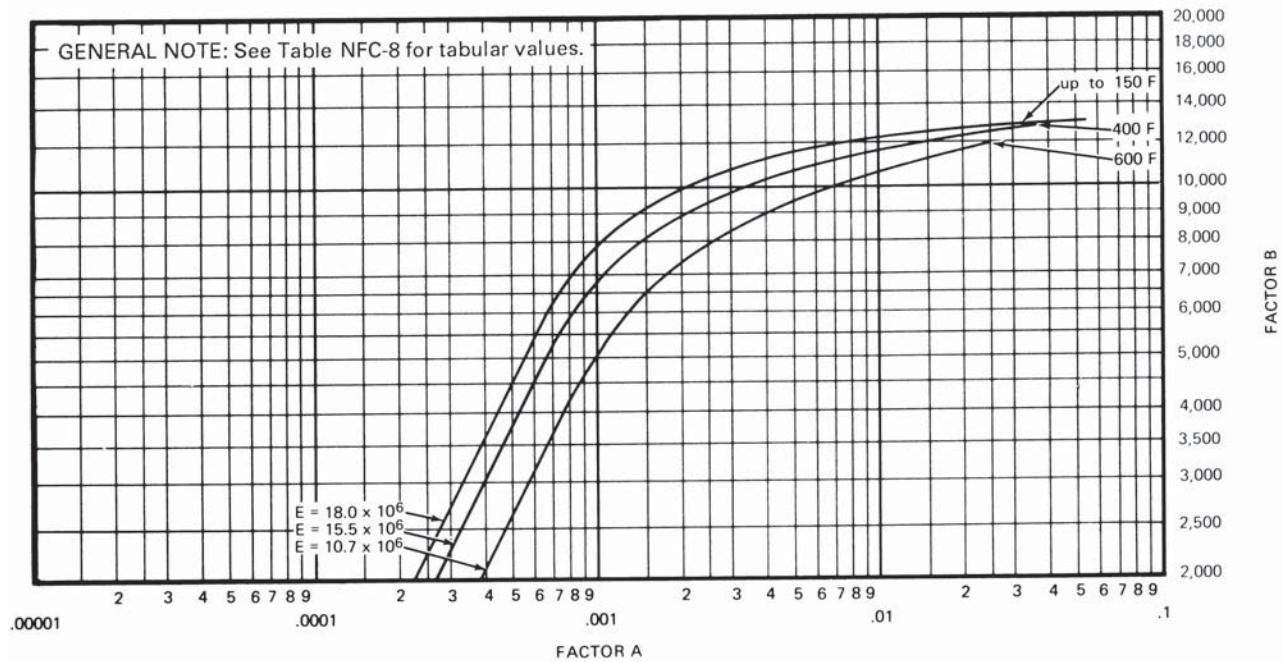


FIG. NFN-1 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ANNEALED LOW CARBON NICKEL N02201

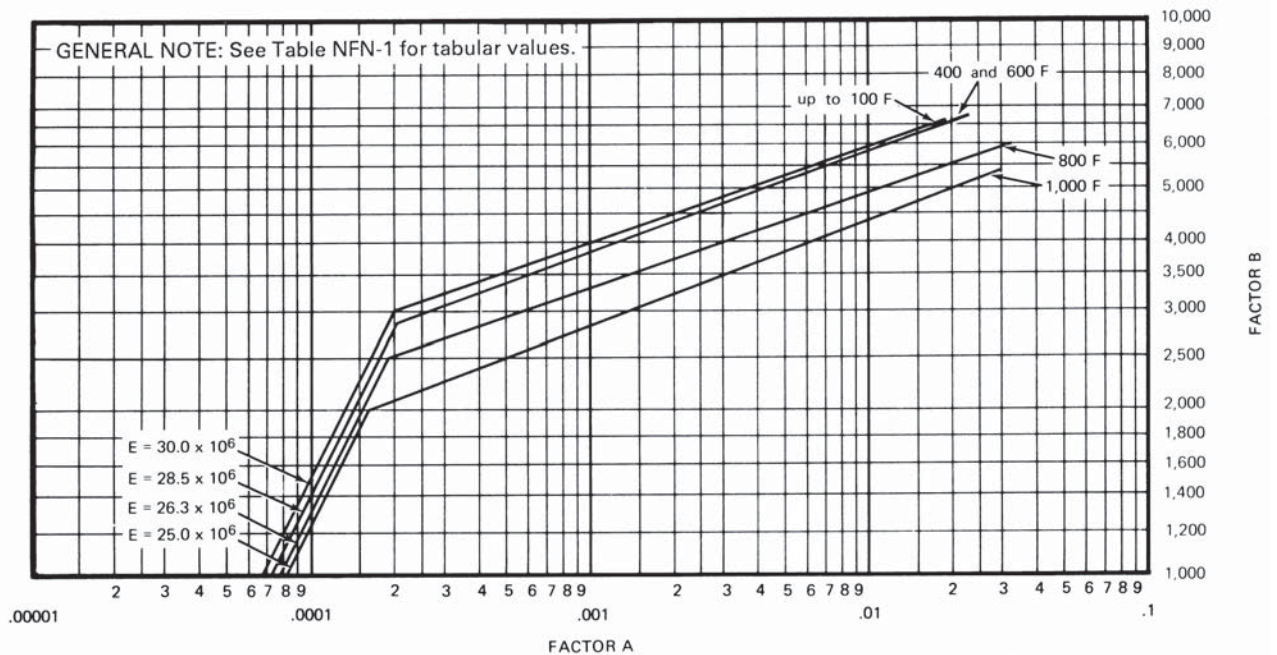


FIG. NFN-2 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ANNEALED NICKEL N02200

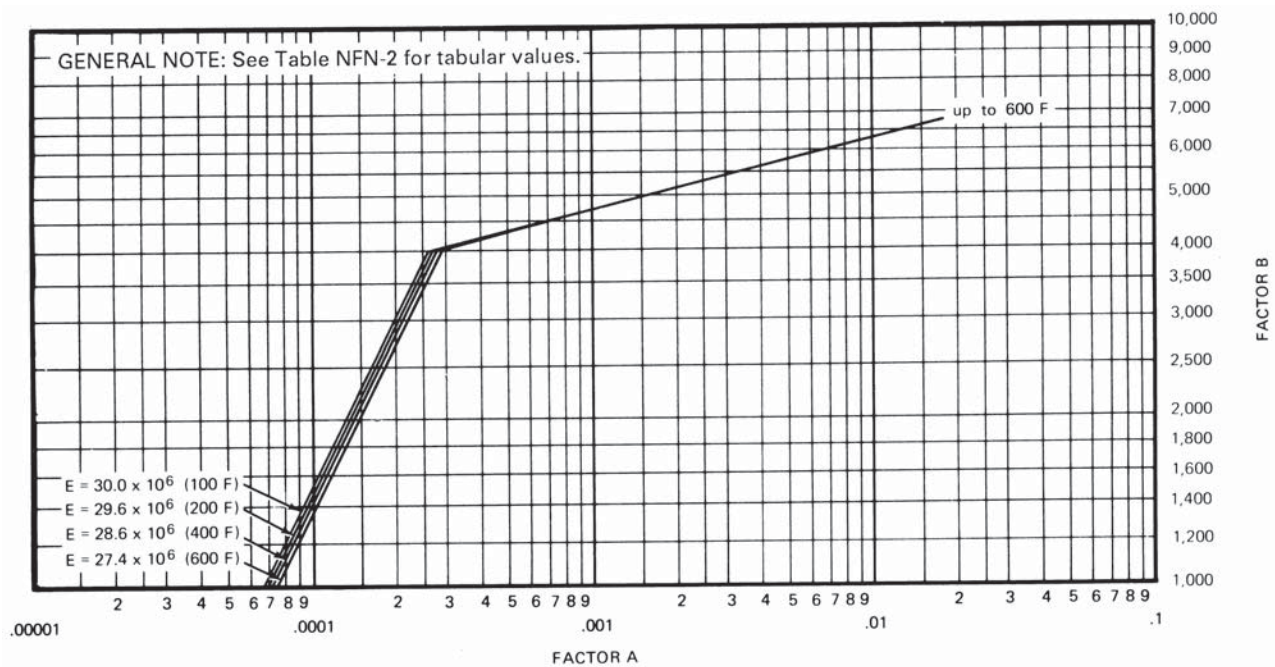


FIG. NFN-3 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ANNEALED NICKEL-COPPER ALLOY N04400

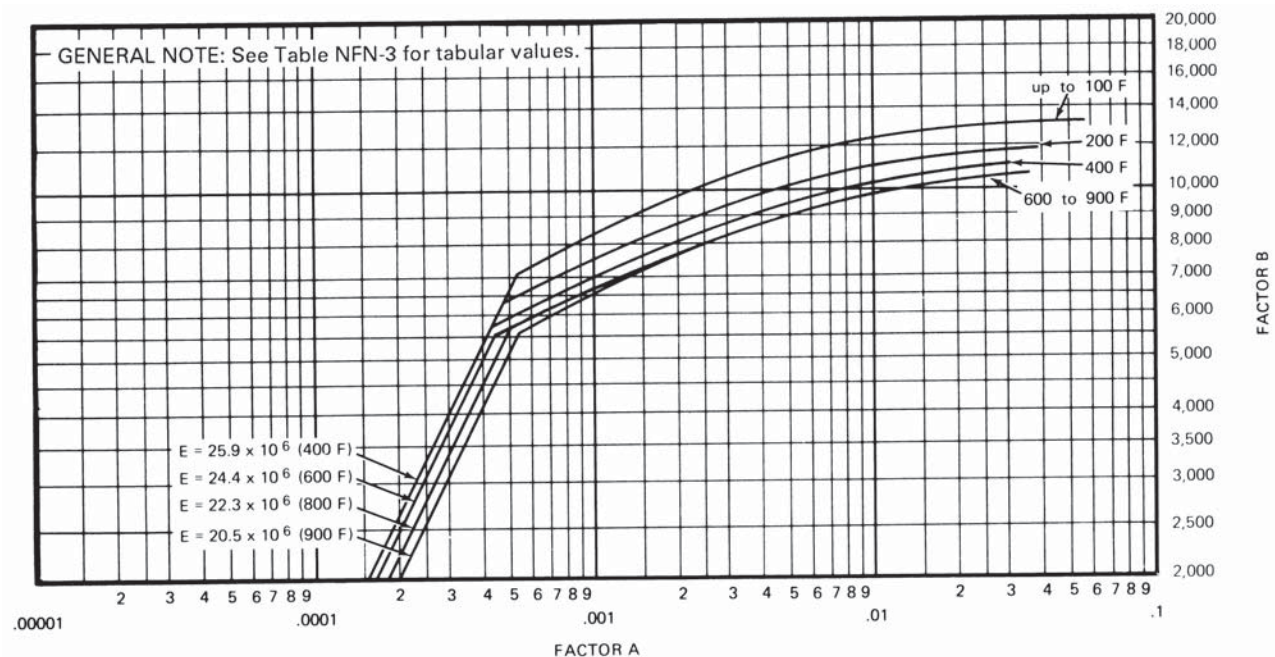


FIG. NFN-4 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ANNEALED NICKEL–CHROMIUM–IRON ALLOY N06600

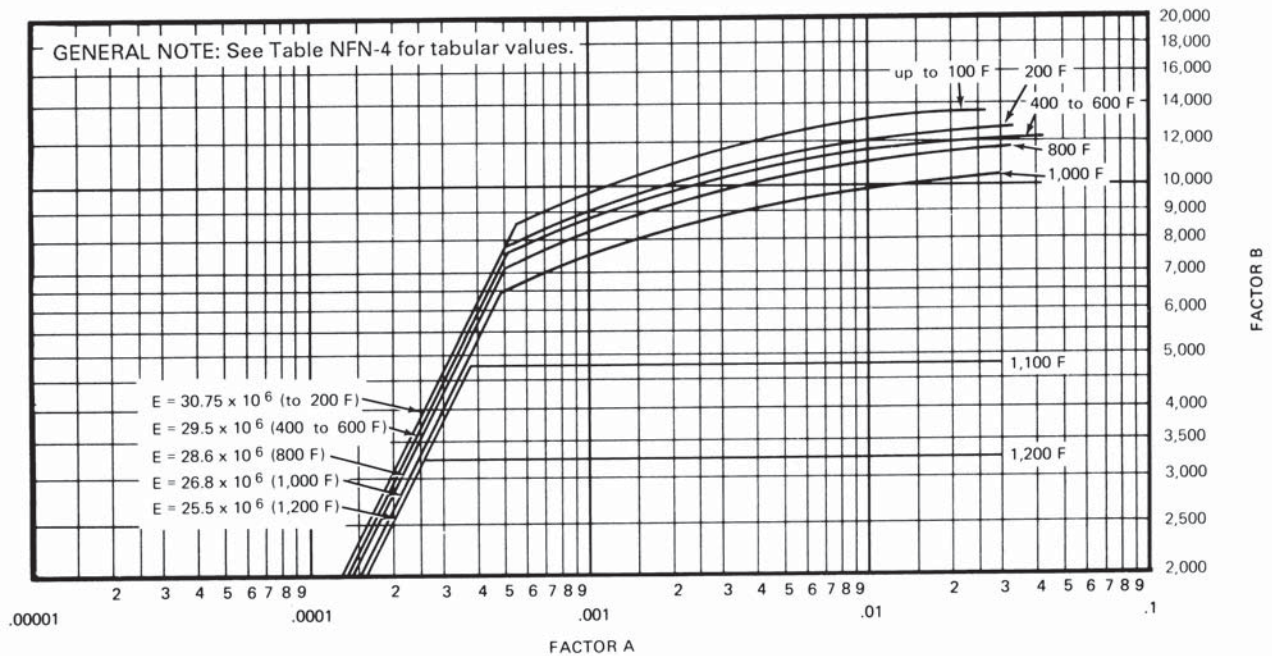


FIG. NFN-5 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR NICKEL–MOLYBDENUM ALLOY N10001

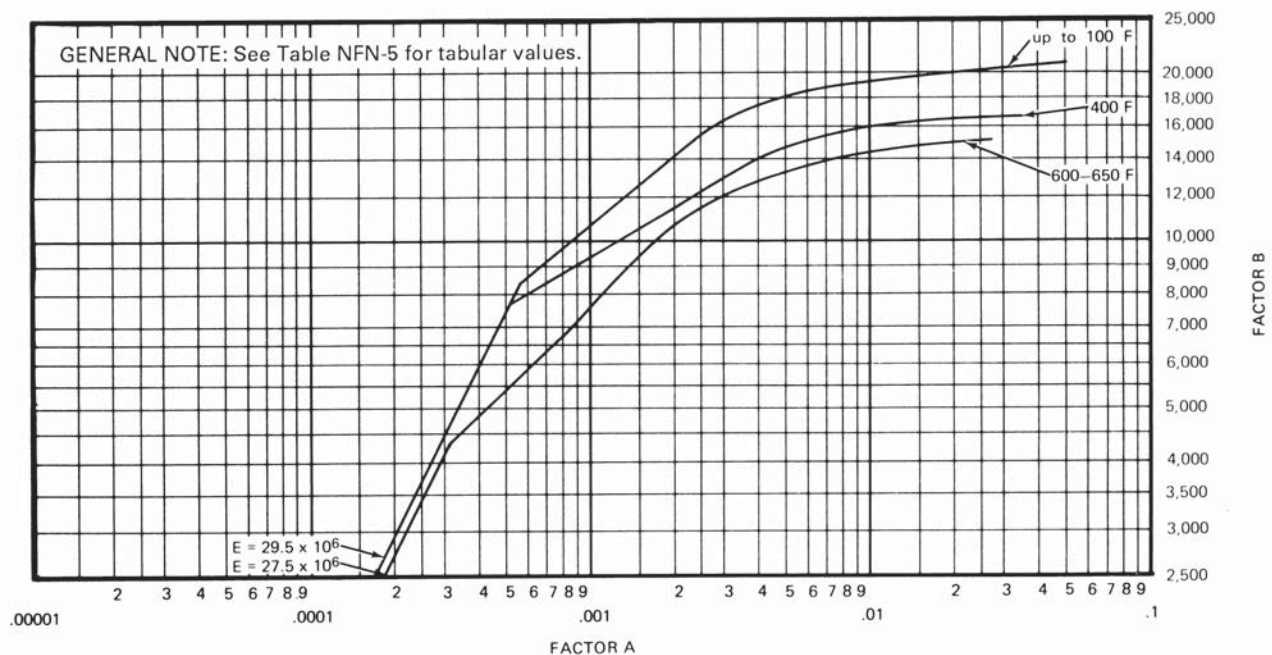


FIG. NFN-6 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR NICKEL-MOLYBDENUM-CHROMIUM-IRON ALLOY N10003

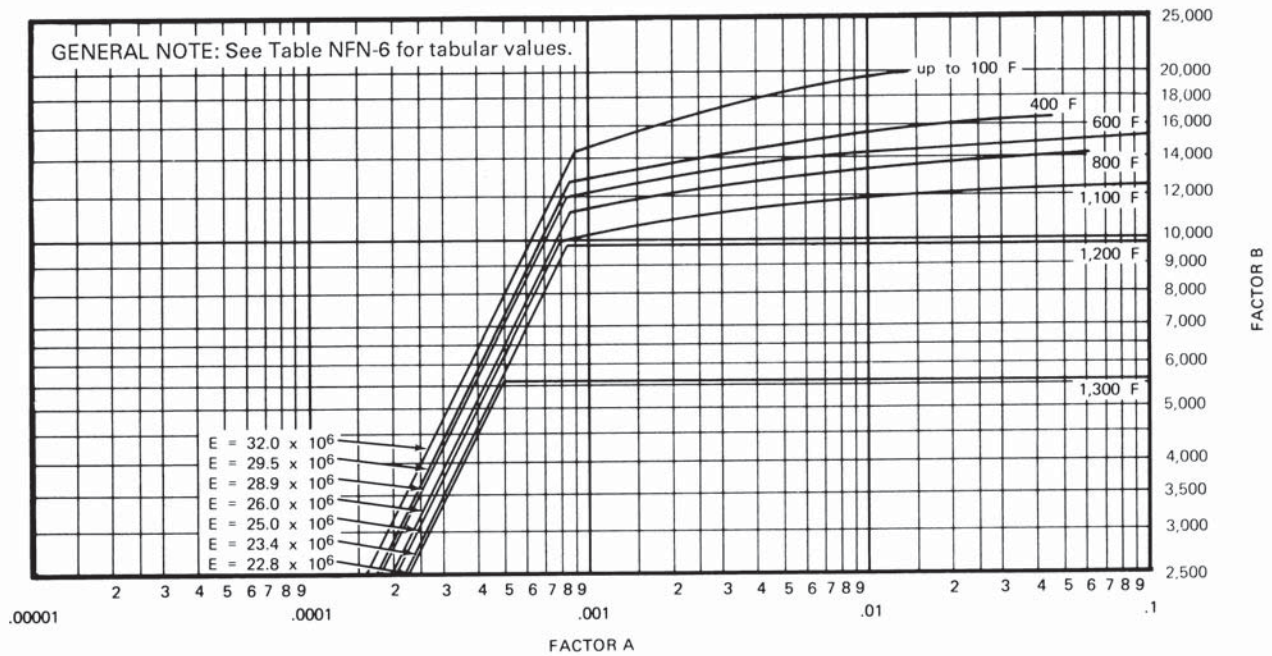


FIG. NFN-7 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR NICKEL-IRON-CHROMIUM-MOLYBDENUM-COPPER ALLOY N08825

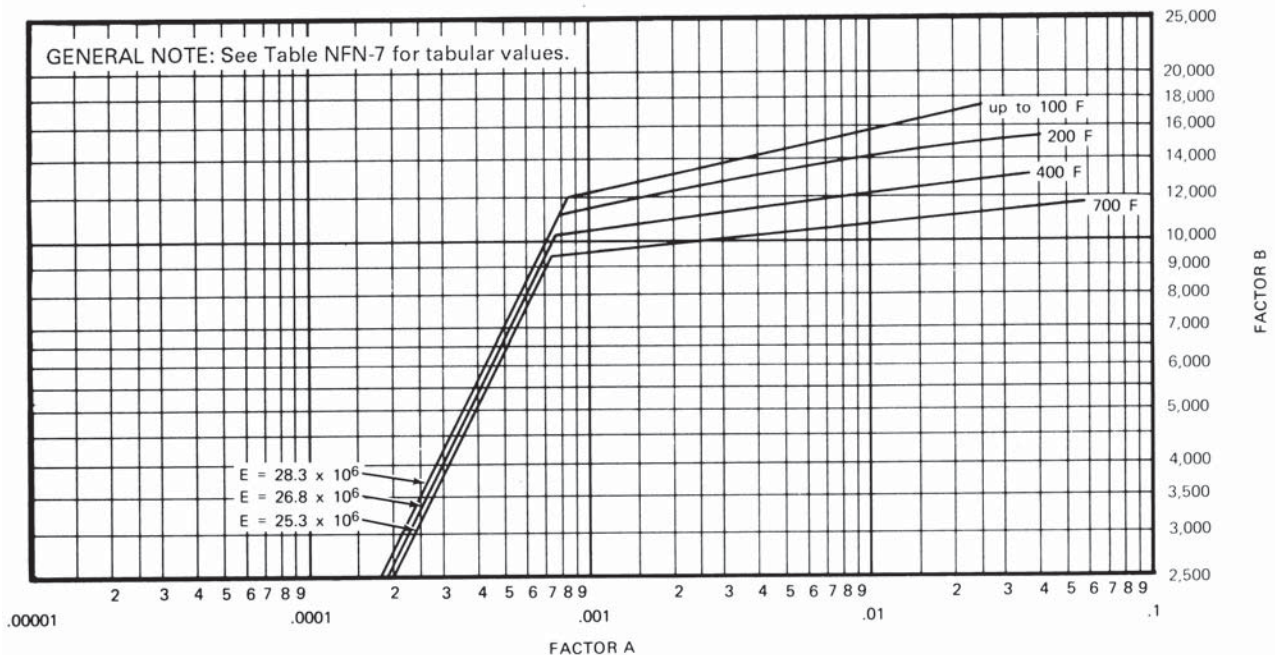


FIG. NFN-8 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ANNEALED NICKEL-IRON-CHROMIUM ALLOY N08800

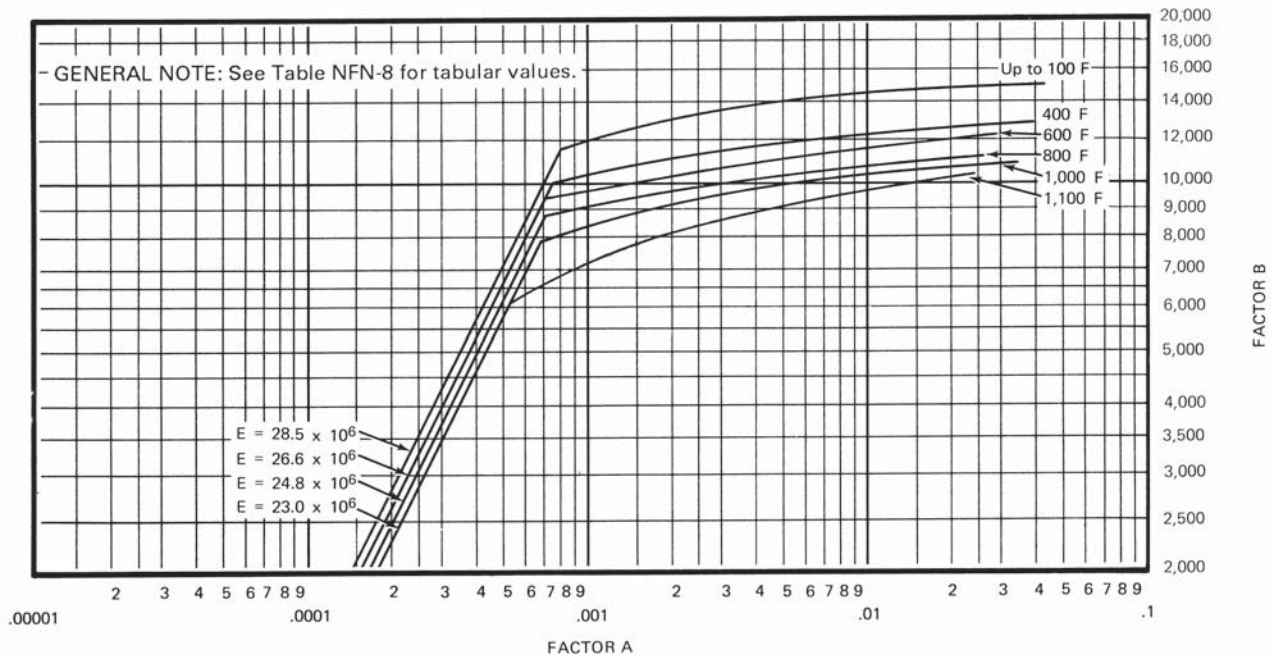


FIG. NFN-9 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ANNEALED NICKEL-IRON-CHROMIUM ALLOY N08810 (10)

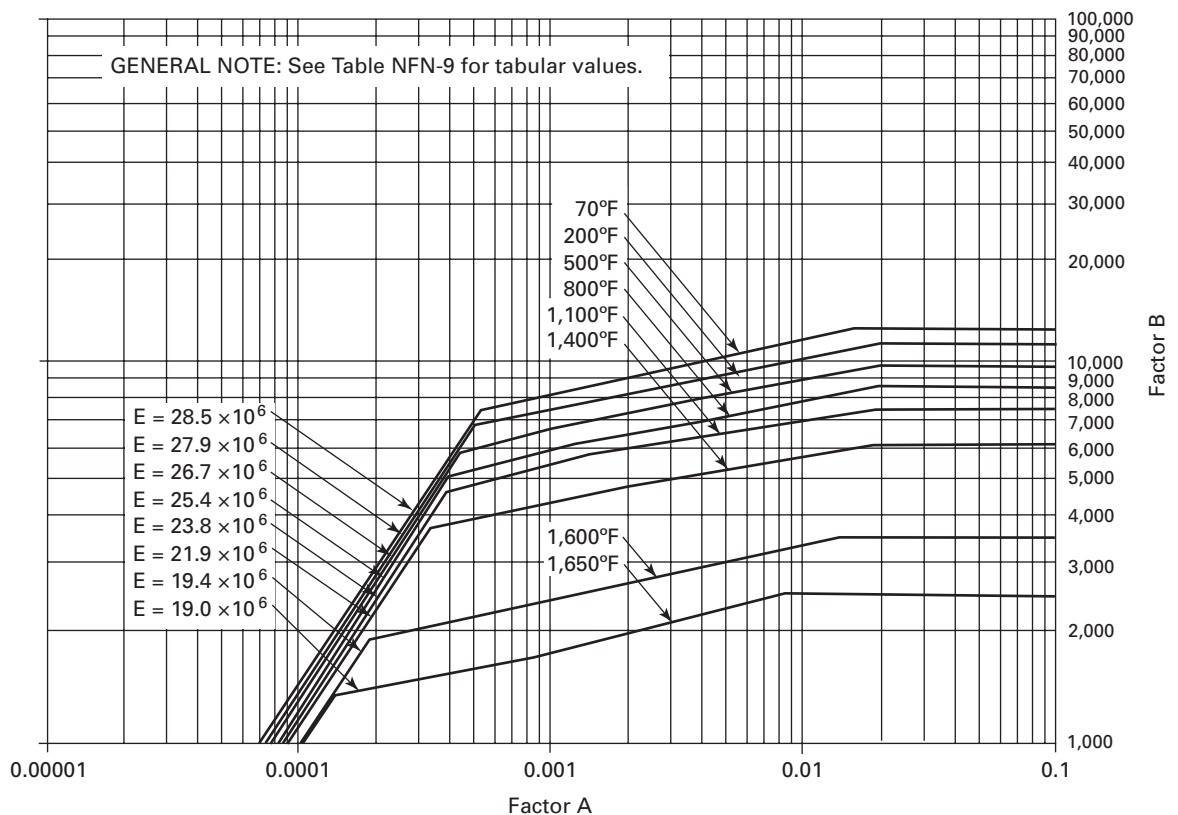


FIG. NFN-10 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR LOW CARBON NICKEL-MOLYBDENUM-CHROMIUM ALLOY N10276

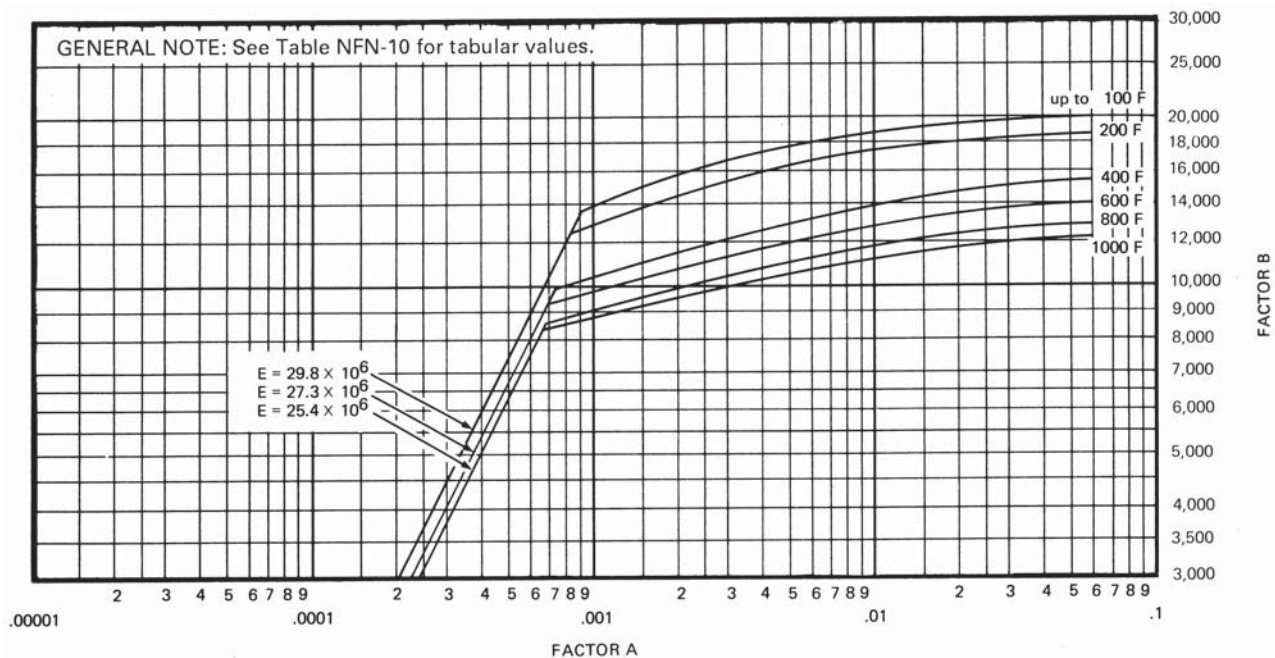


FIG. NFN-11 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR SOLUTION TREATED NICKEL-CHROMIUM-IRON-MOLYBDENUM-COPPER ALLOY N06007

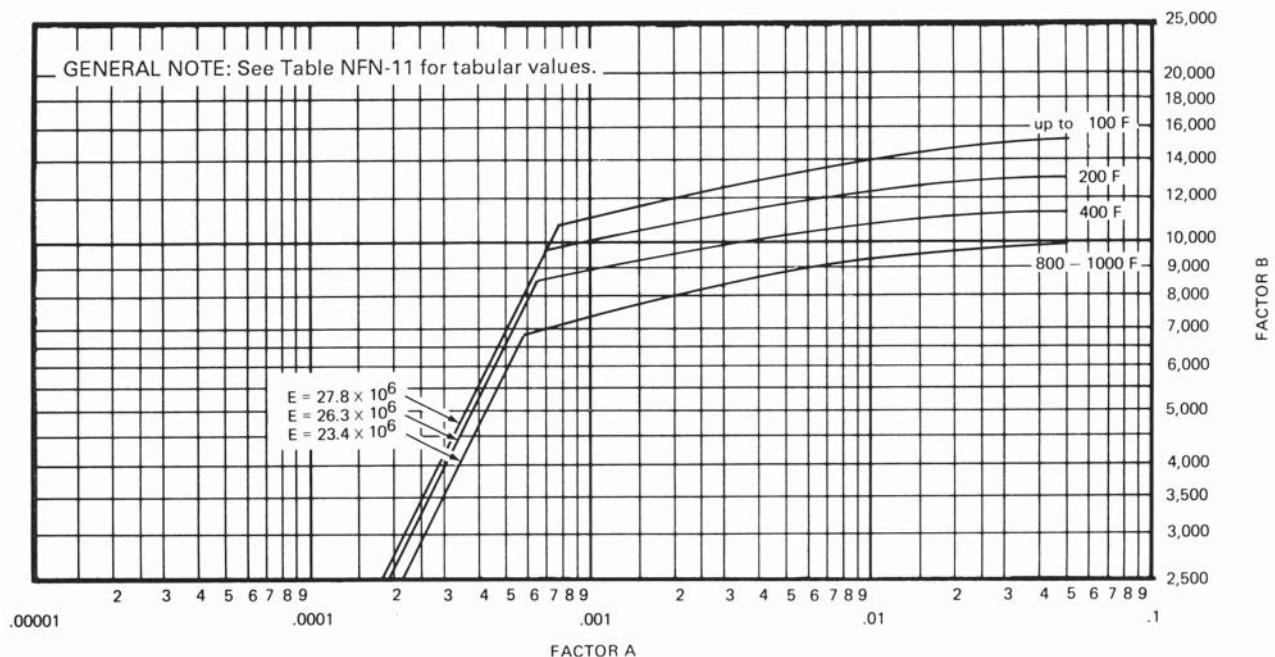


FIG. NFN-12 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR CHROMIUM-NICKEL-IRON-MOLYBDENUM-COPPER-COLUMBIUM ALLOY N08020

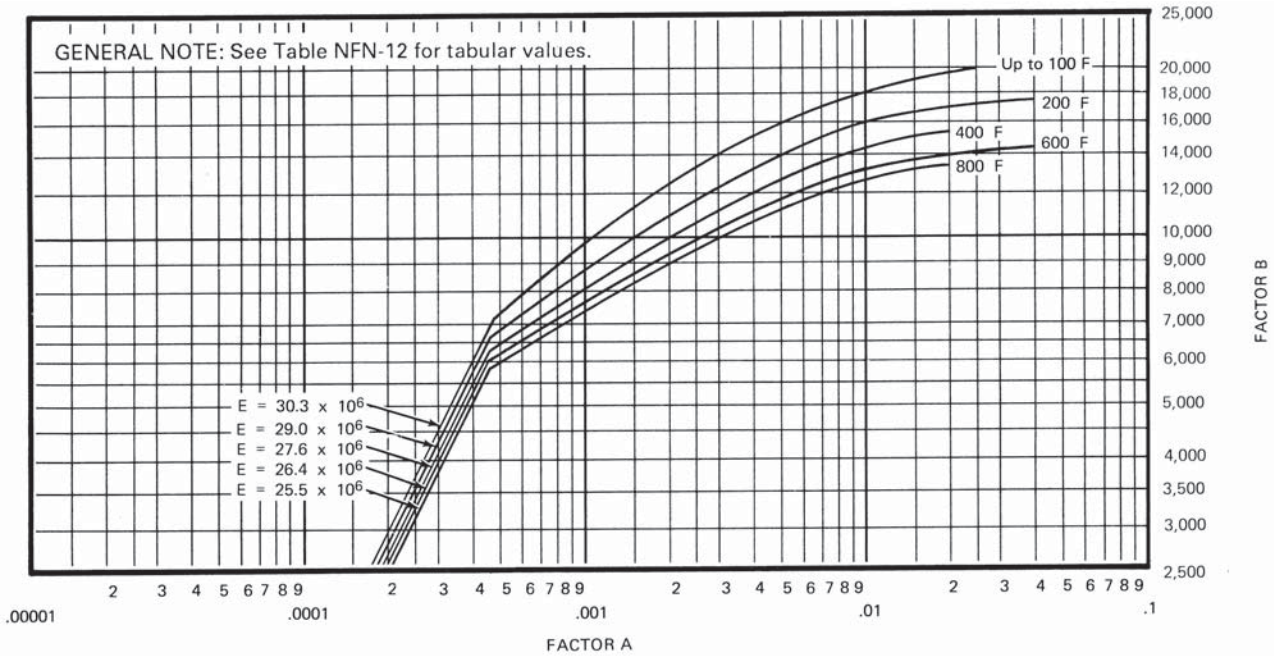


FIG. NFN-13 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR NICKEL-IRON-CHROMIUM-SILICON ALLOY N08330

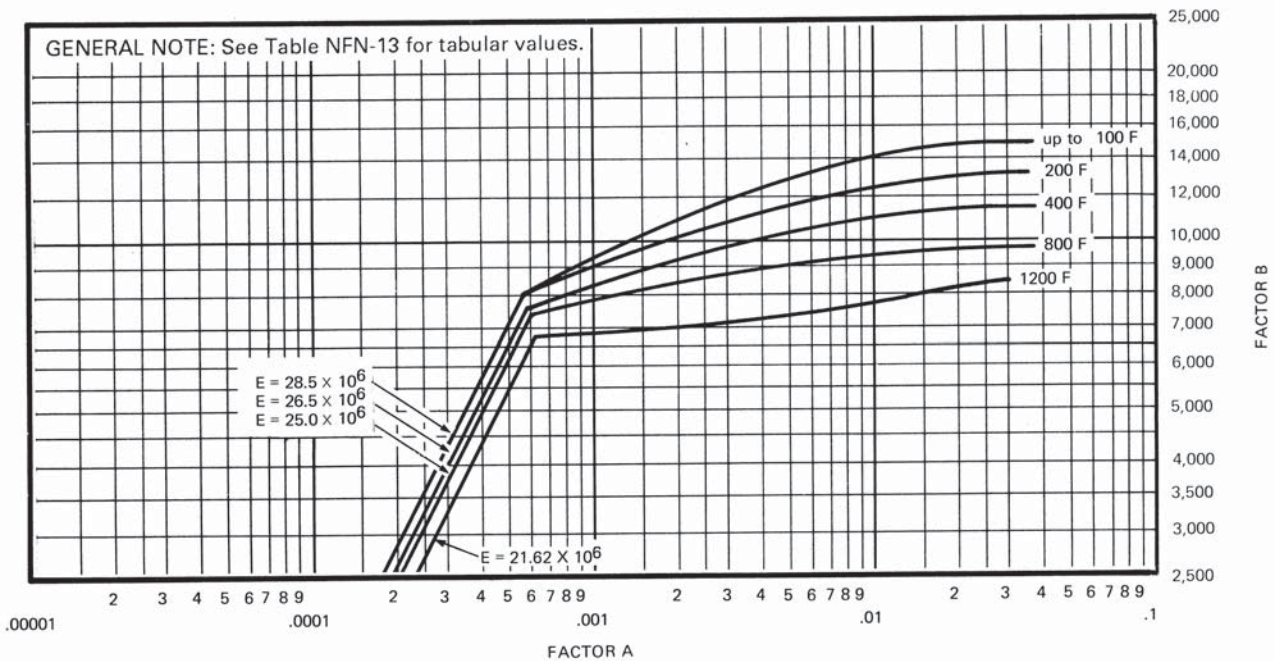


FIG. NFN-14 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR NICKEL–CHROMIUM–MOLYBDENUM ALLOY N06455

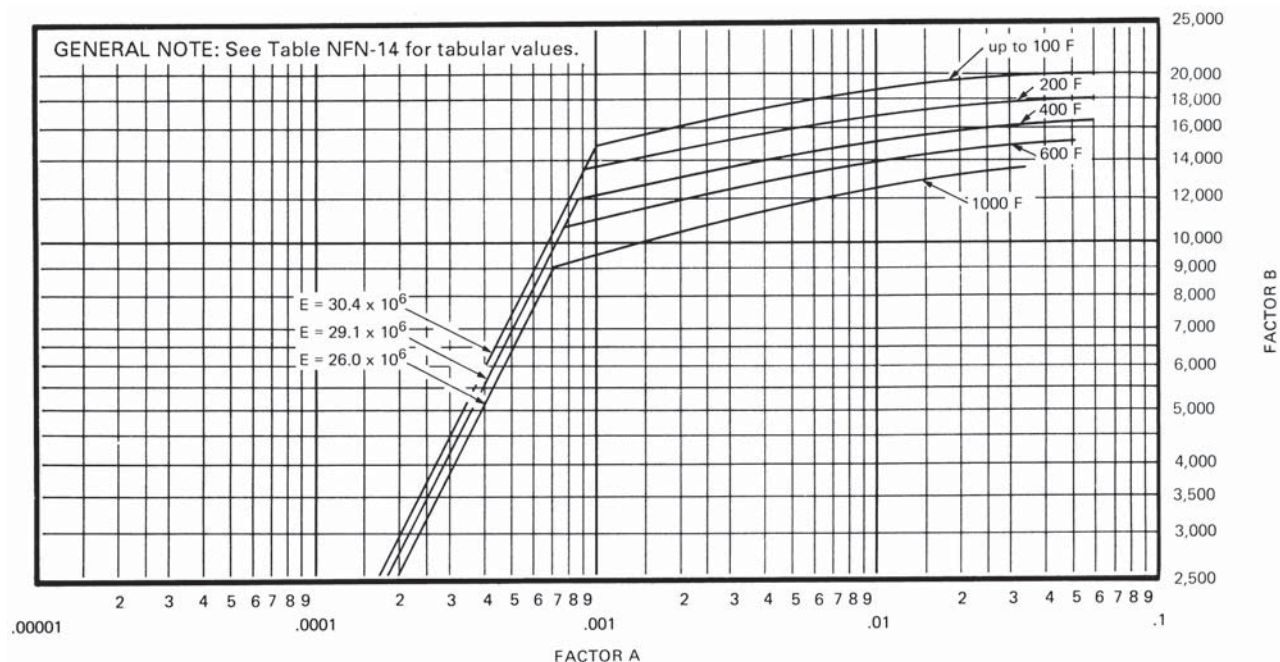


FIG. NFN-15 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR NICKEL–MOLYBDENUM ALLOY N06002

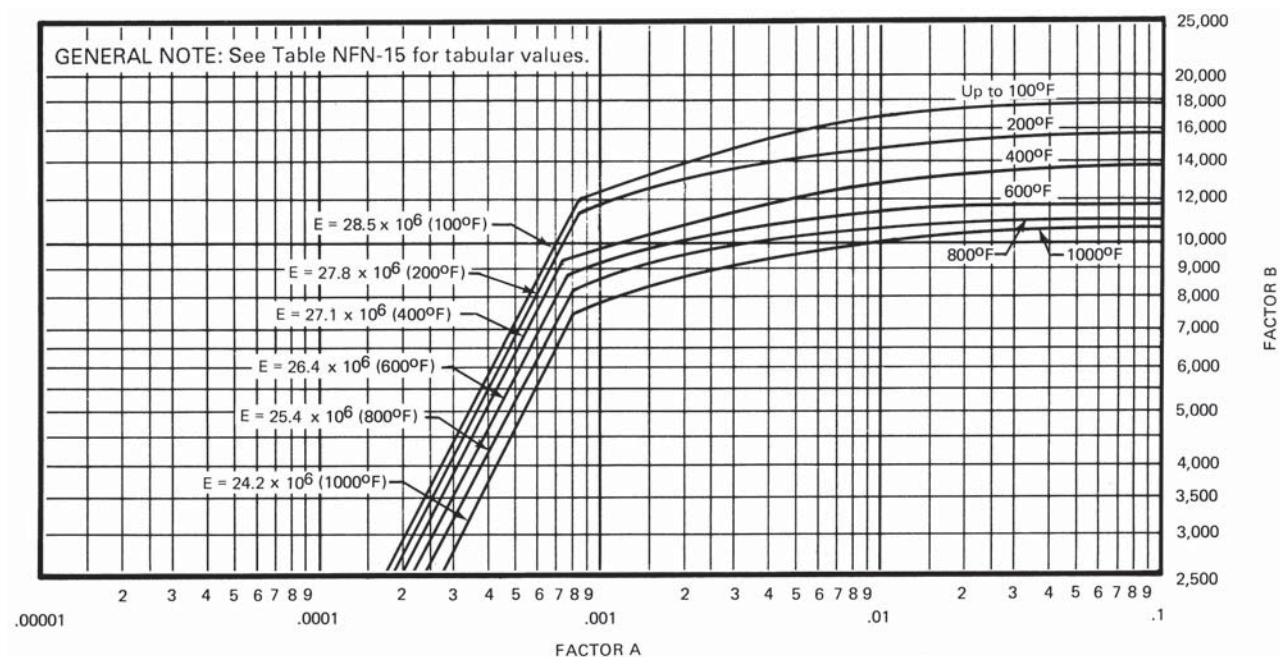


FIG. NFN-16 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR NICKEL-MOLYBDENUM ALLOY N10665

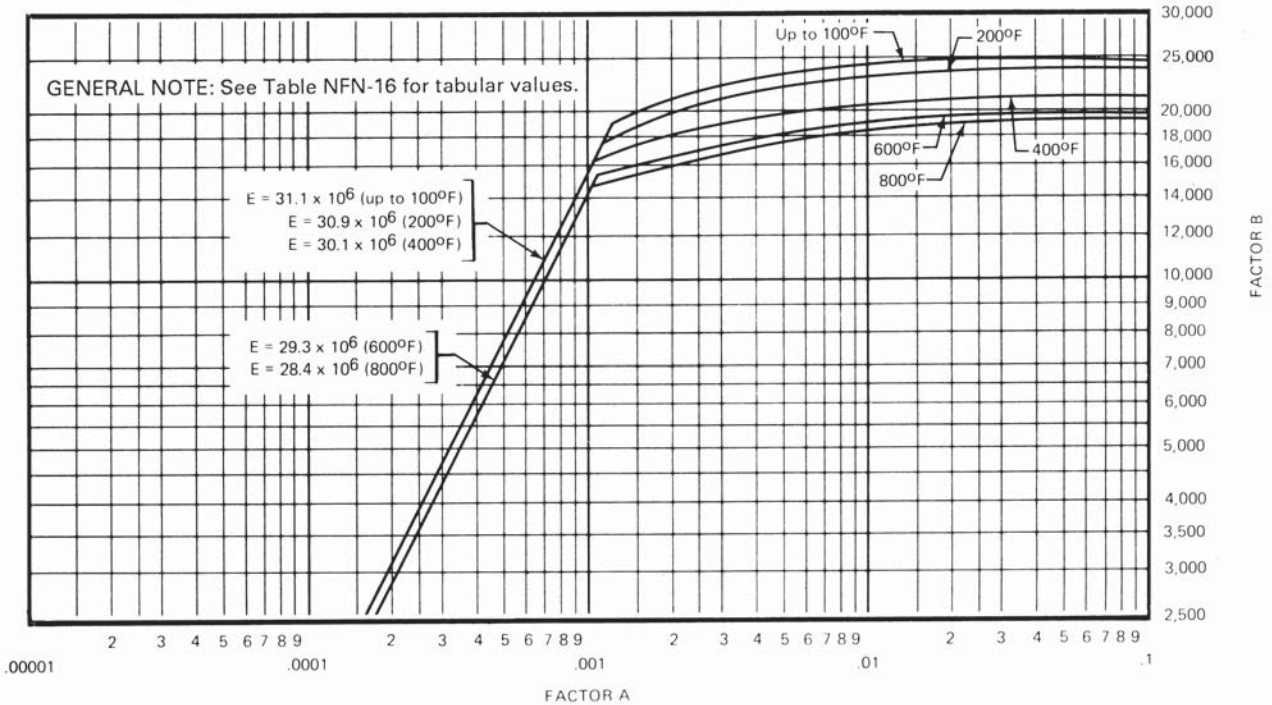


FIG. NFN-17 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ANNEALED NICKEL-CHROMIUM-MOLYBDENUM-COLUMBIUM ALLOY N06625 (SB-443, SB-444, AND SB-446)

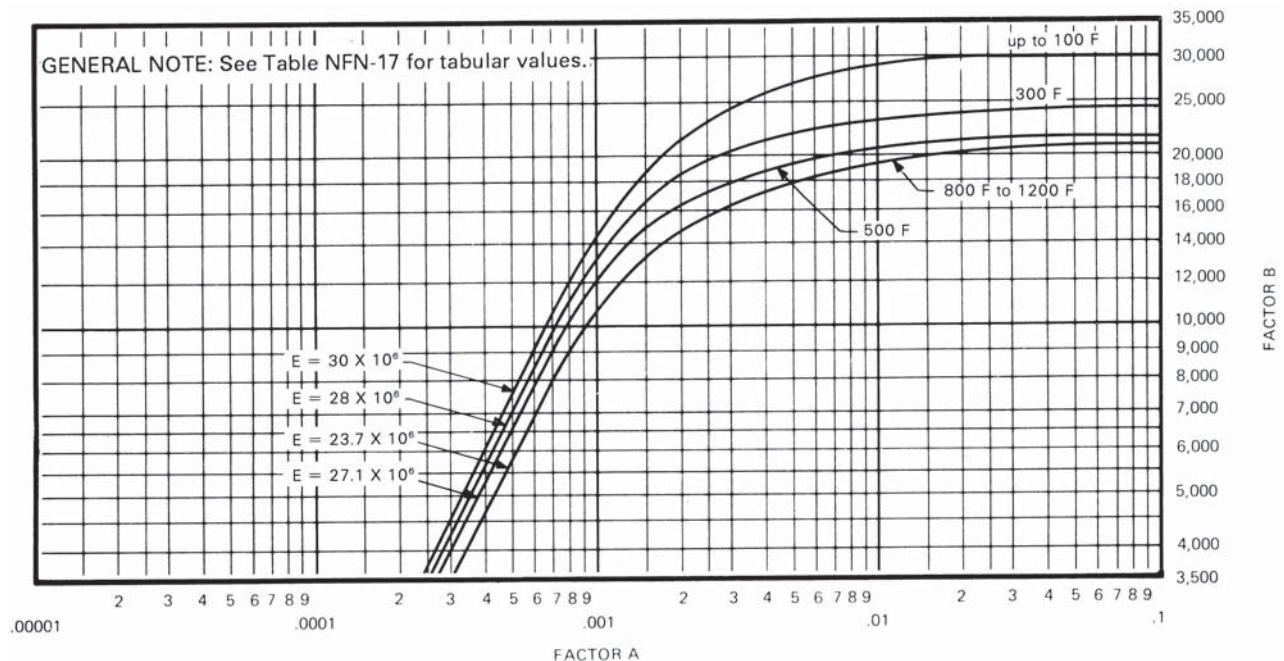


FIG. NFN-18 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR NICKEL-MOLYBDENUM-CHROMIUM-IRON-COPPER ALLOY N06985 HAVING A MINIMUM YIELD STRENGTH OF 35 ksi

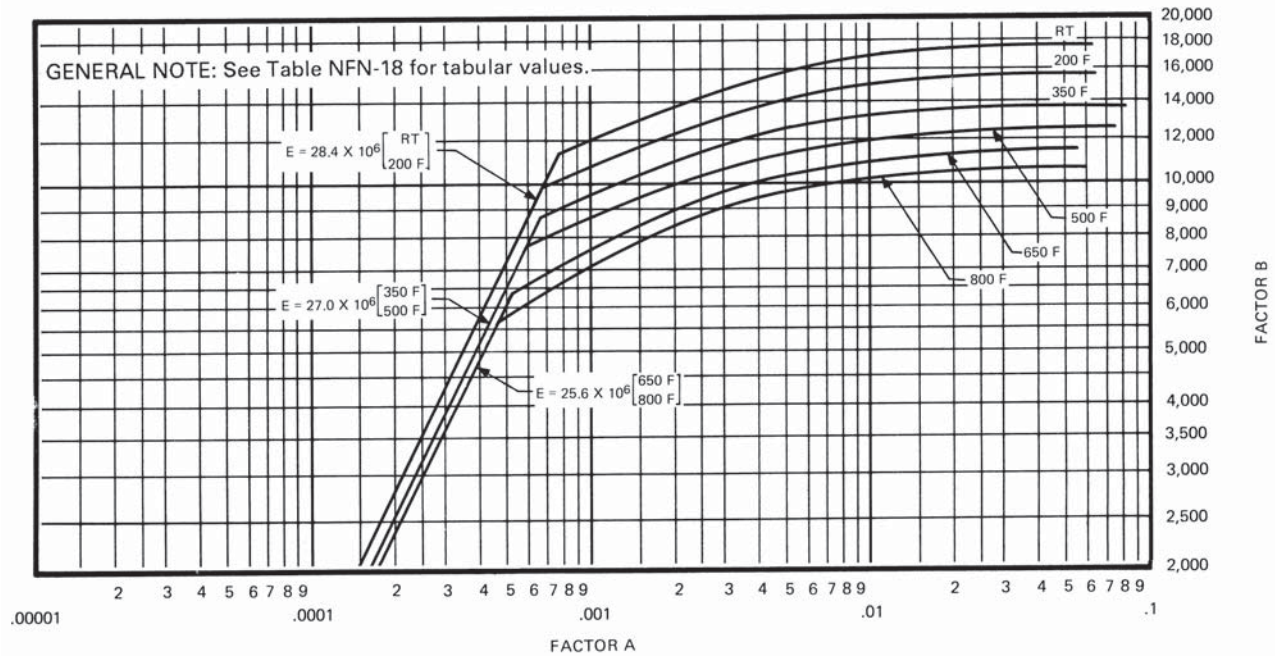


FIG. NFN-19 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR NICKEL-MOLYBDENUM-CHROMIUM-IRON-COPPER ALLOY N06985 HAVING A MINIMUM YIELD STRENGTH OF 30 ksi

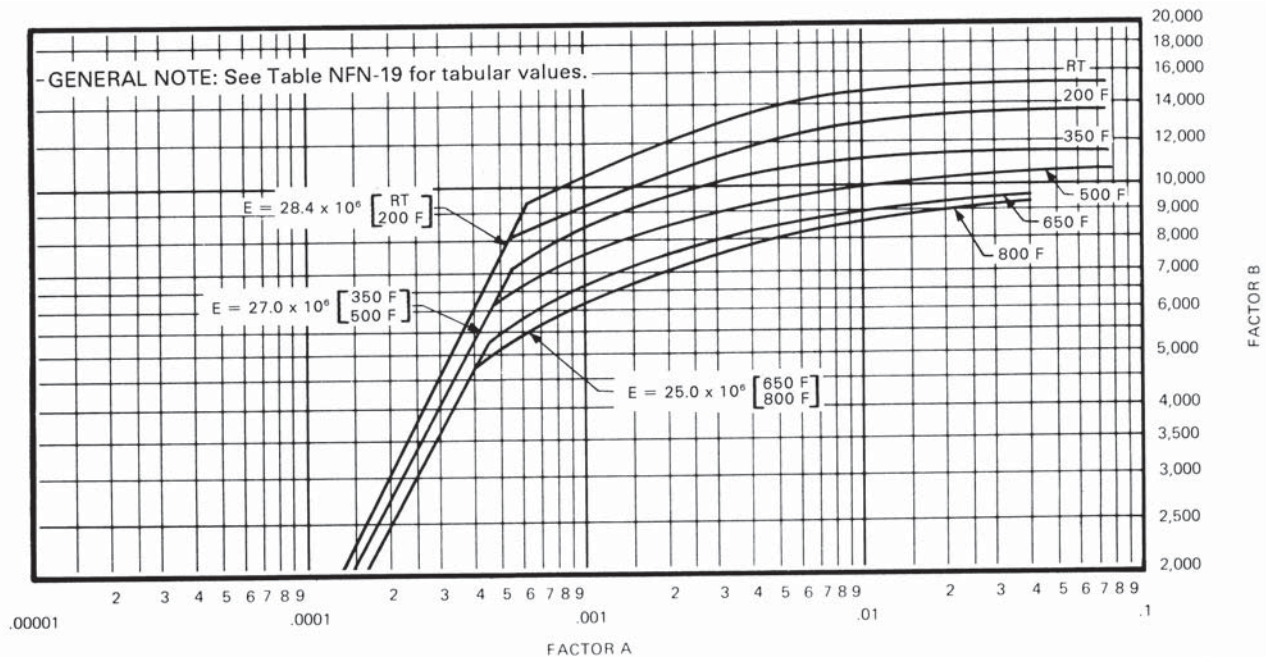


FIG. NFN-20 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR WORK-HARDENED NICKEL [NOTE (7)]

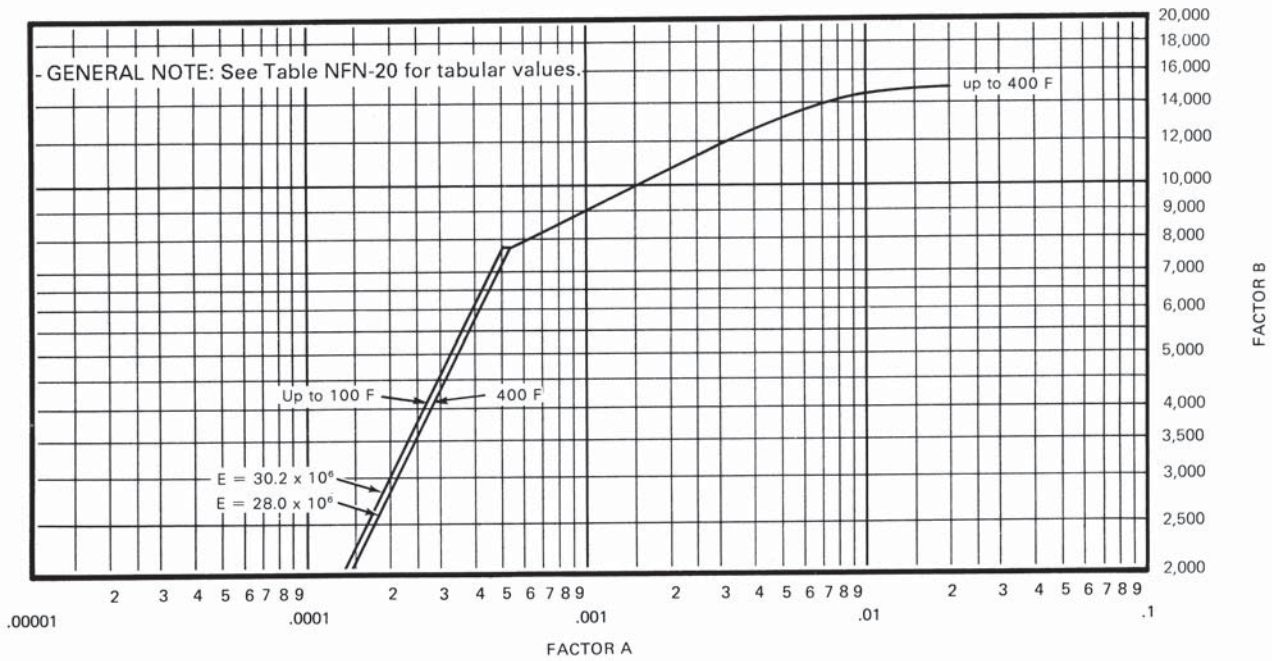


FIG. NFN-21 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR NICKEL-CHROMIUM-IRON ALLOY N06600 (SPECIFIED MINIMUM YIELD STRENGTH 40,000 psi)

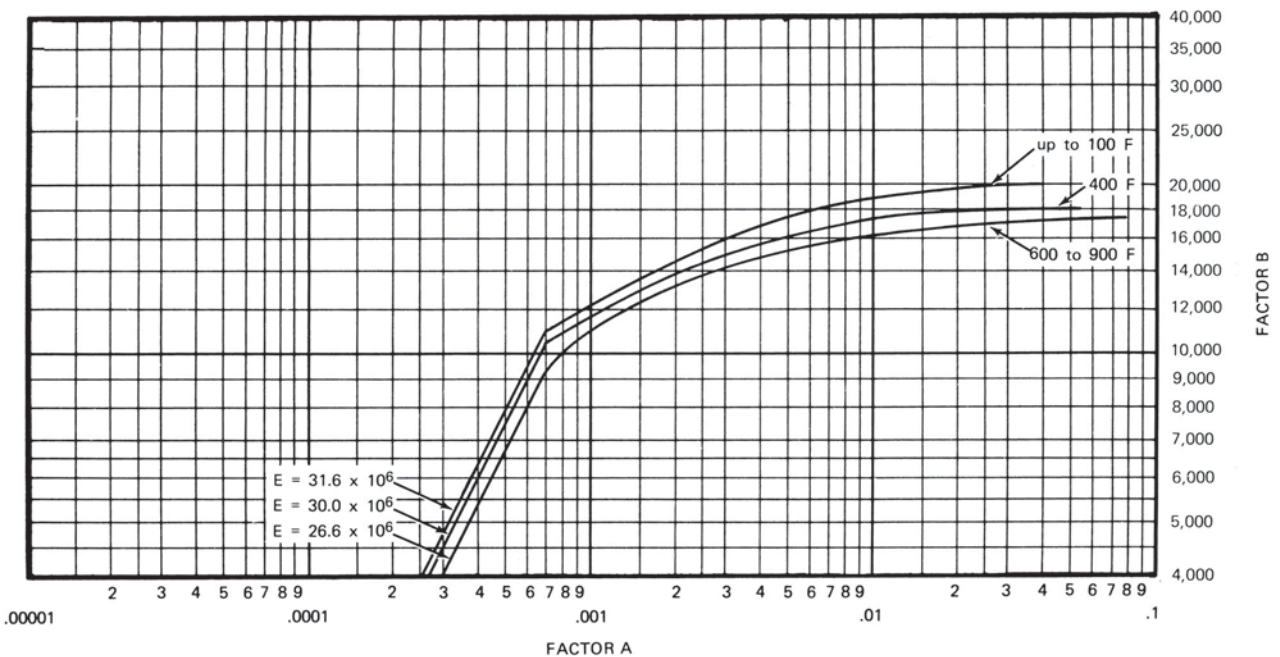
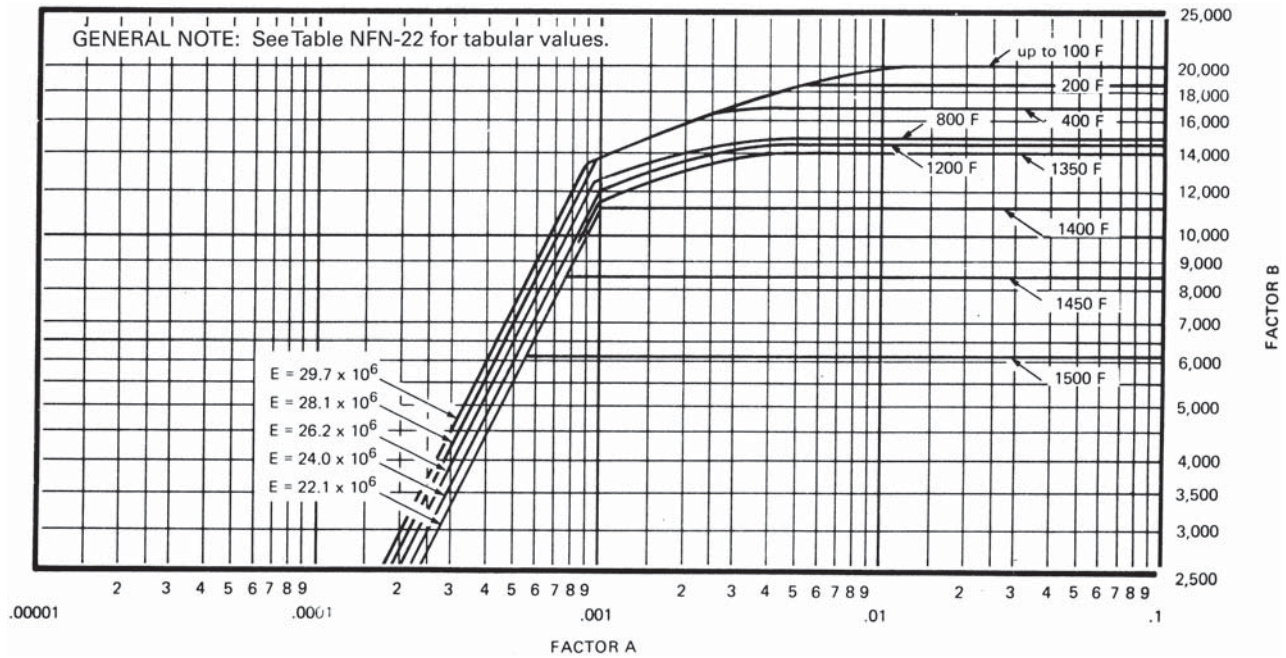


FIG. NFN-22 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR SOLUTION ANNEALED Ni-Cr-Mo-Cb ALLOY, GRADE 2 N06625 [NOTE (8)]



(10) FIG. NFN-23 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR COLD WORKED NICKEL-IRON-CHROMIUM ALLOY N08800

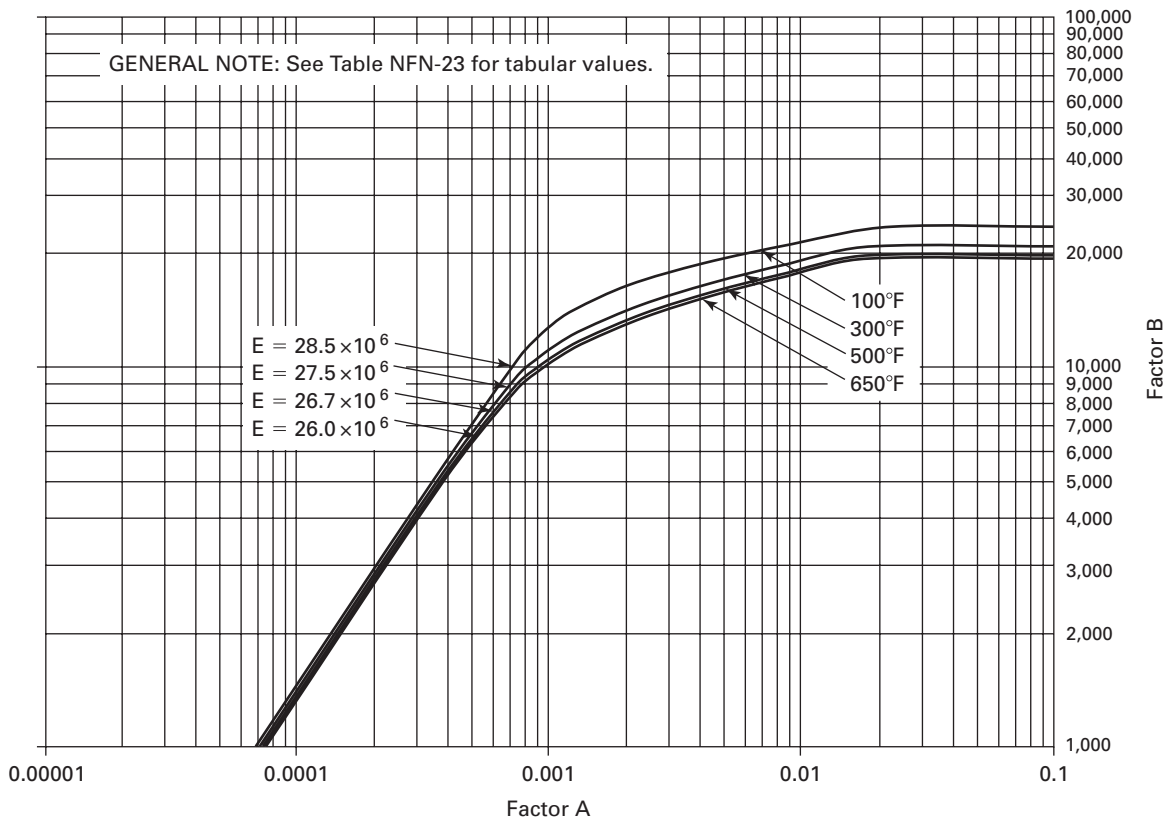


FIG. NFN-24 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR NICKEL ALLOY N06230

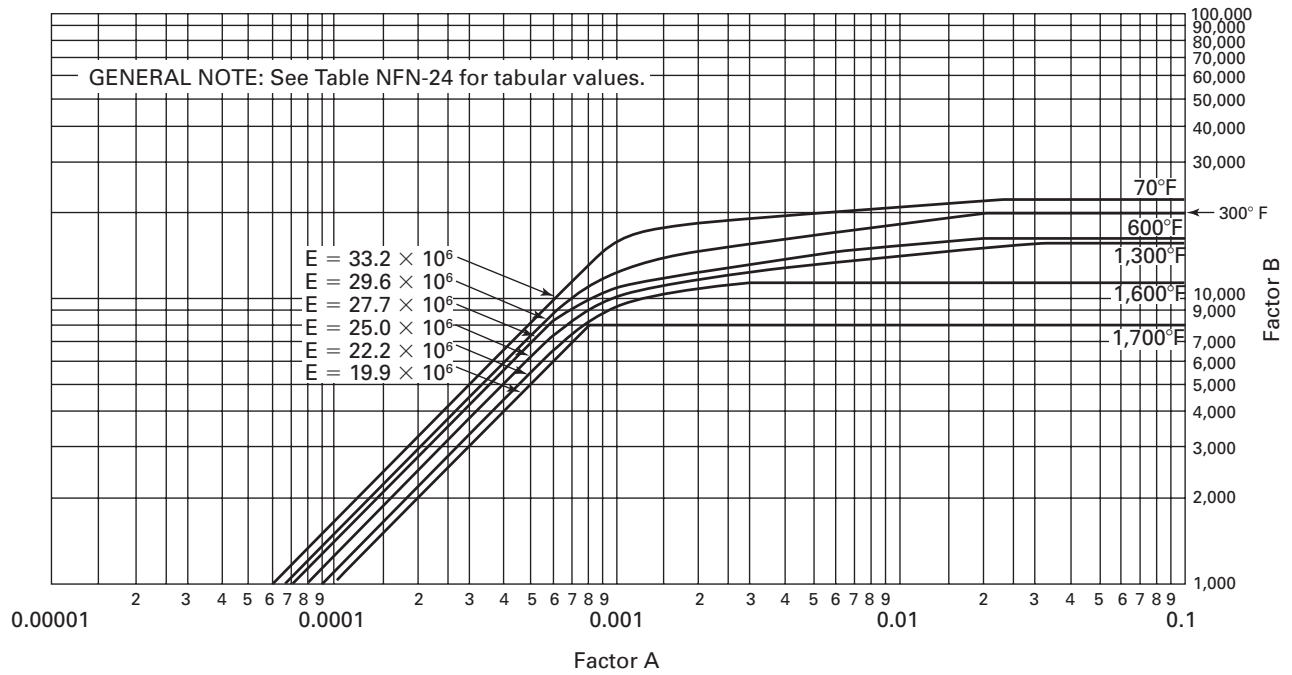


FIG. NFN-25 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR STRESS RELIEVED NICKEL ALLOY N02200

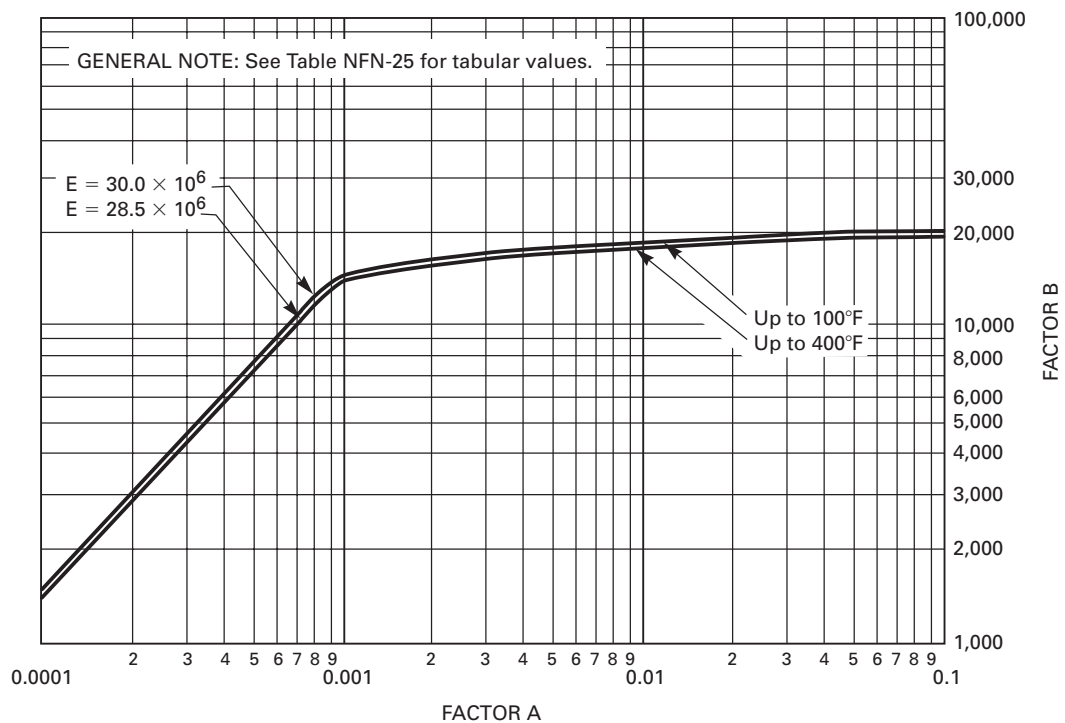


FIG. NFN-26 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ALLOY S31277

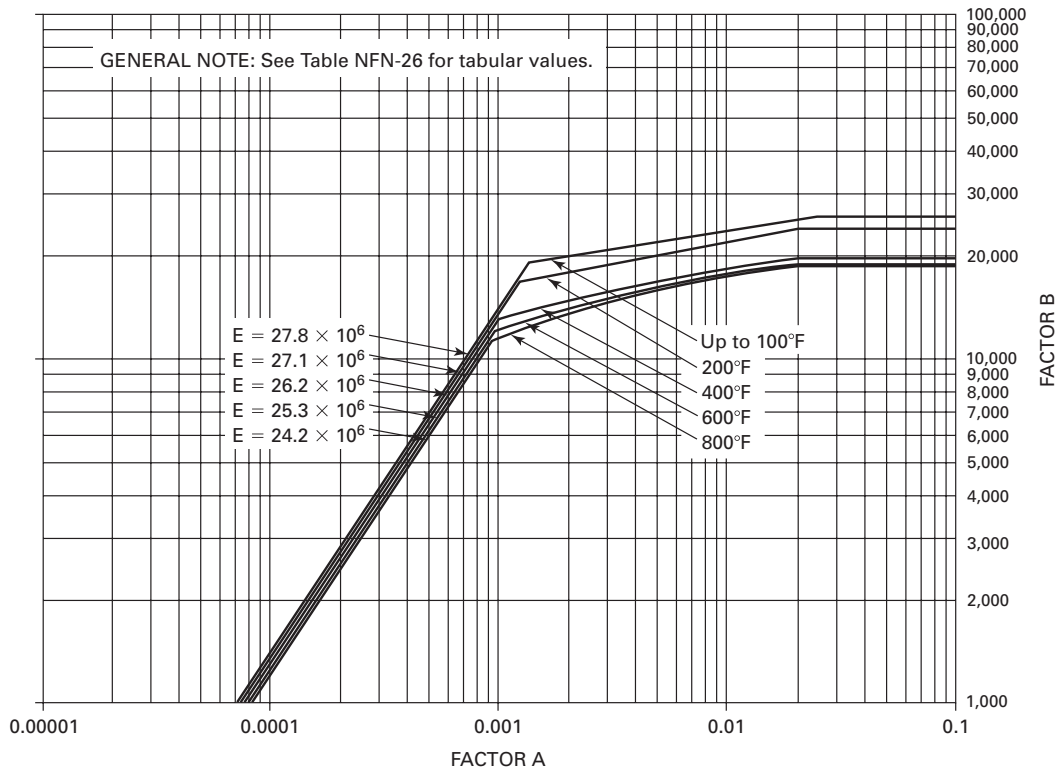


FIG. NFN-27 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ALLOY N06035

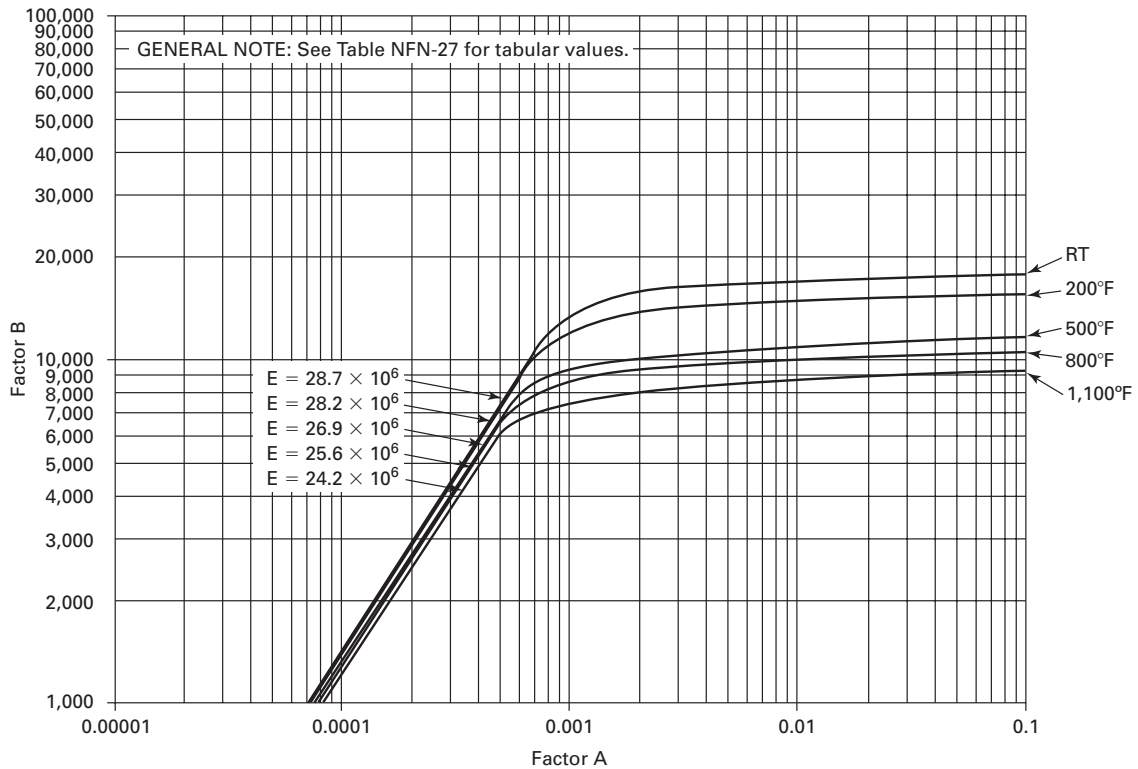


FIG. NFT-1 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR UNALLOYED TITANIUM GRADE 3 (UNS R50550) [NOTE (9)]

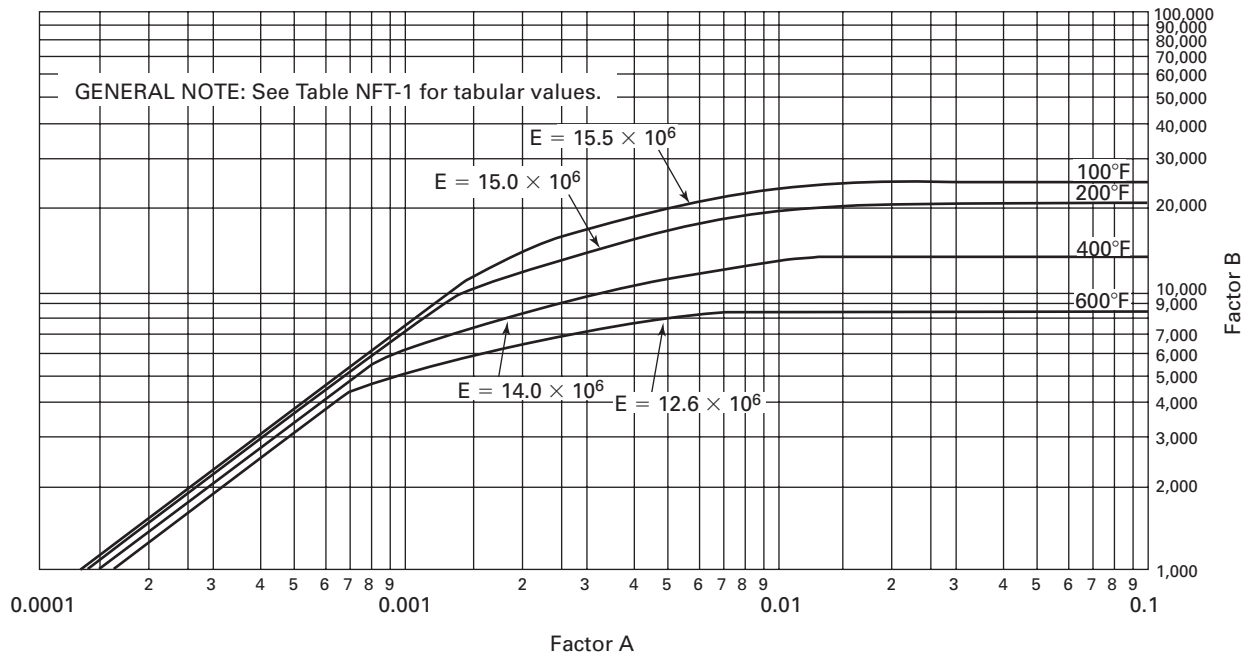


FIG. NFT-2 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR UNALLOYED TITANIUM GRADE 2 (UNS R50400) [NOTE (9)]

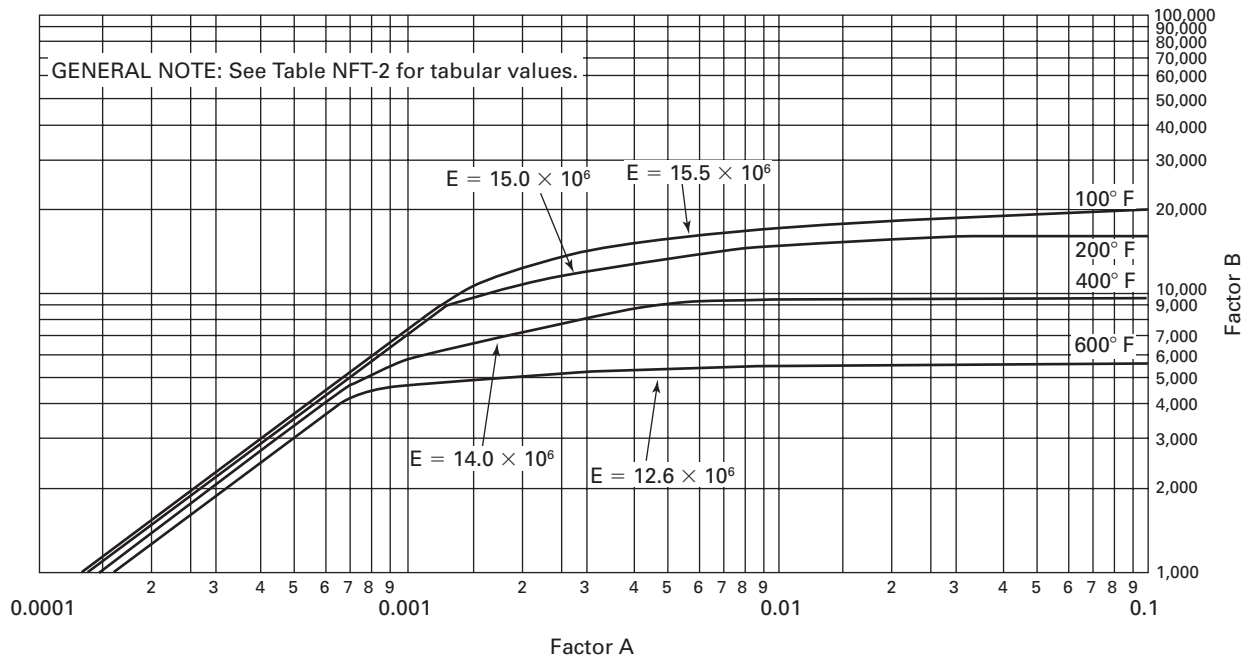


FIG. NFT-3 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR TITANIUM GRADE 1 (UNS R50250) [NOTE (9)]

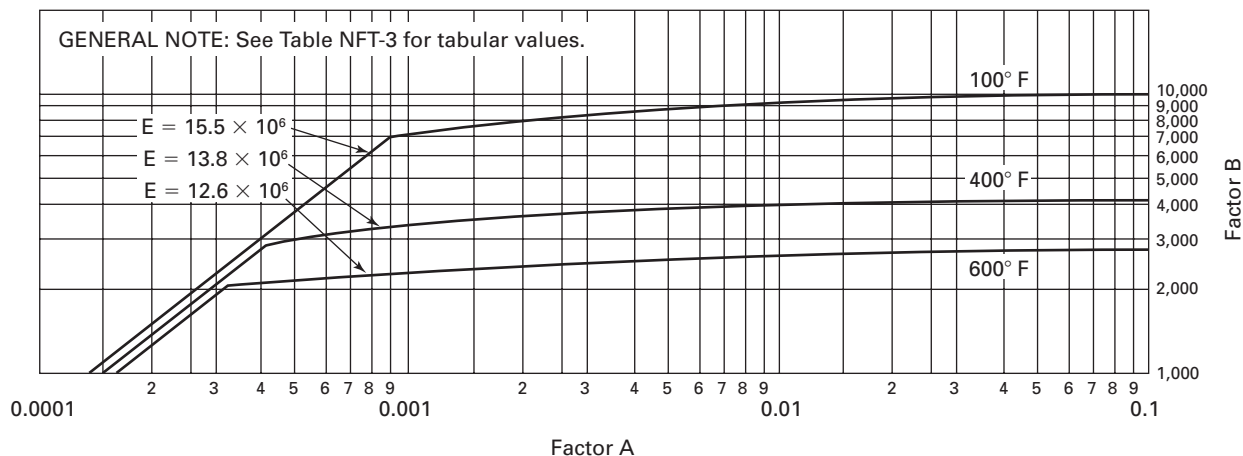


FIG. NFT-4 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR TITANIUM GRADE 9 ALLOY (UNS R56320) [NOTE (9)]

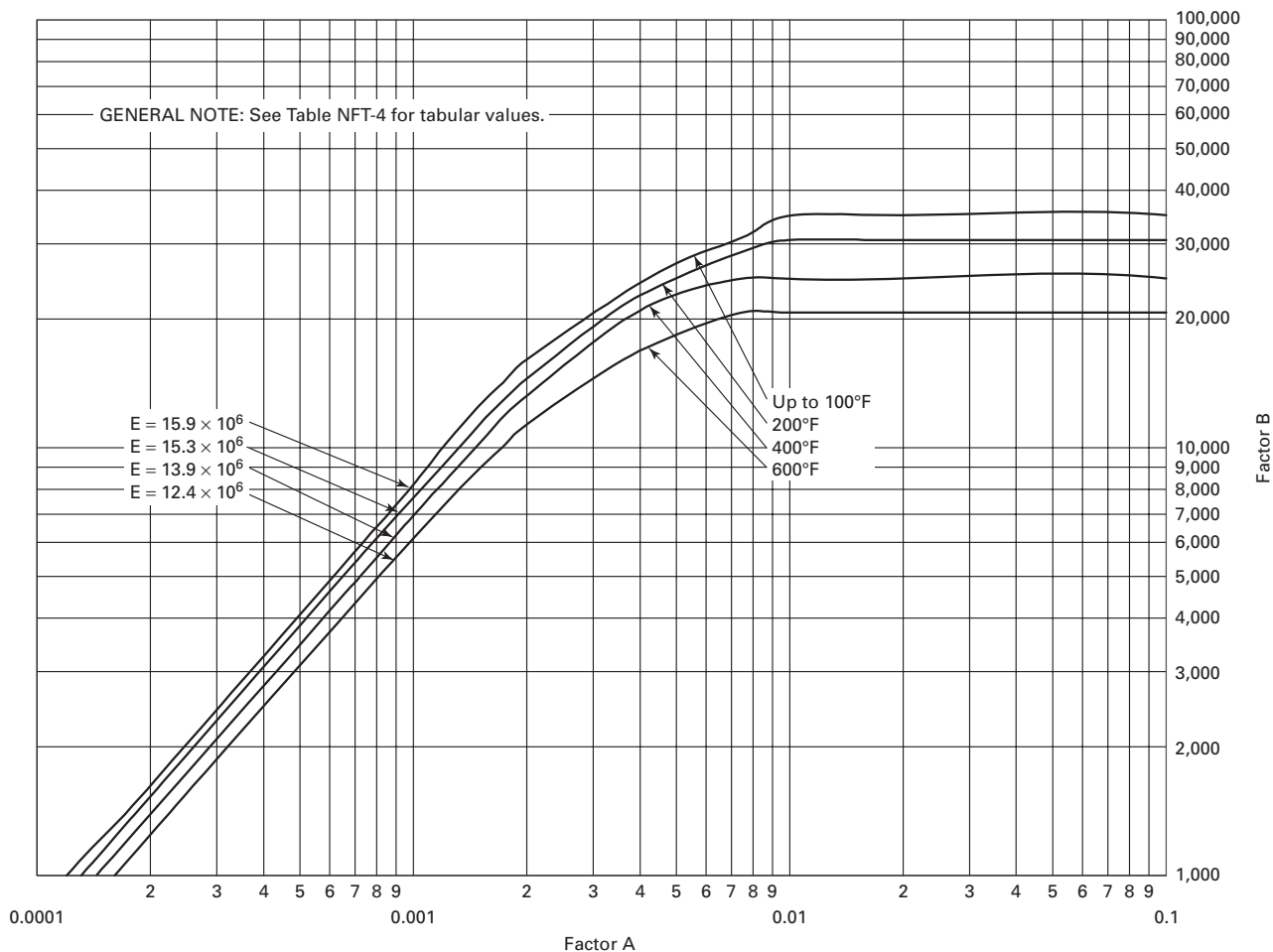


FIG. NFT-5 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR TITANIUM GRADE 12 ALLOY (UNS R53400) [NOTE (9)]

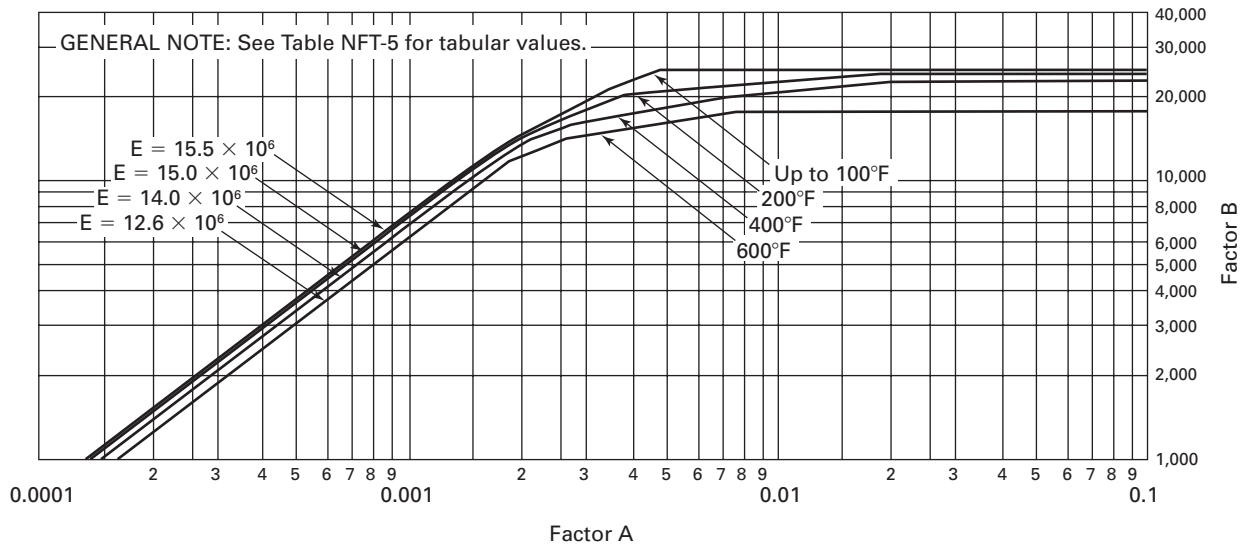


FIG. NFZ-1 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ZIRCONIUM ALLOY (UNS R60702) [NOTE (9)]

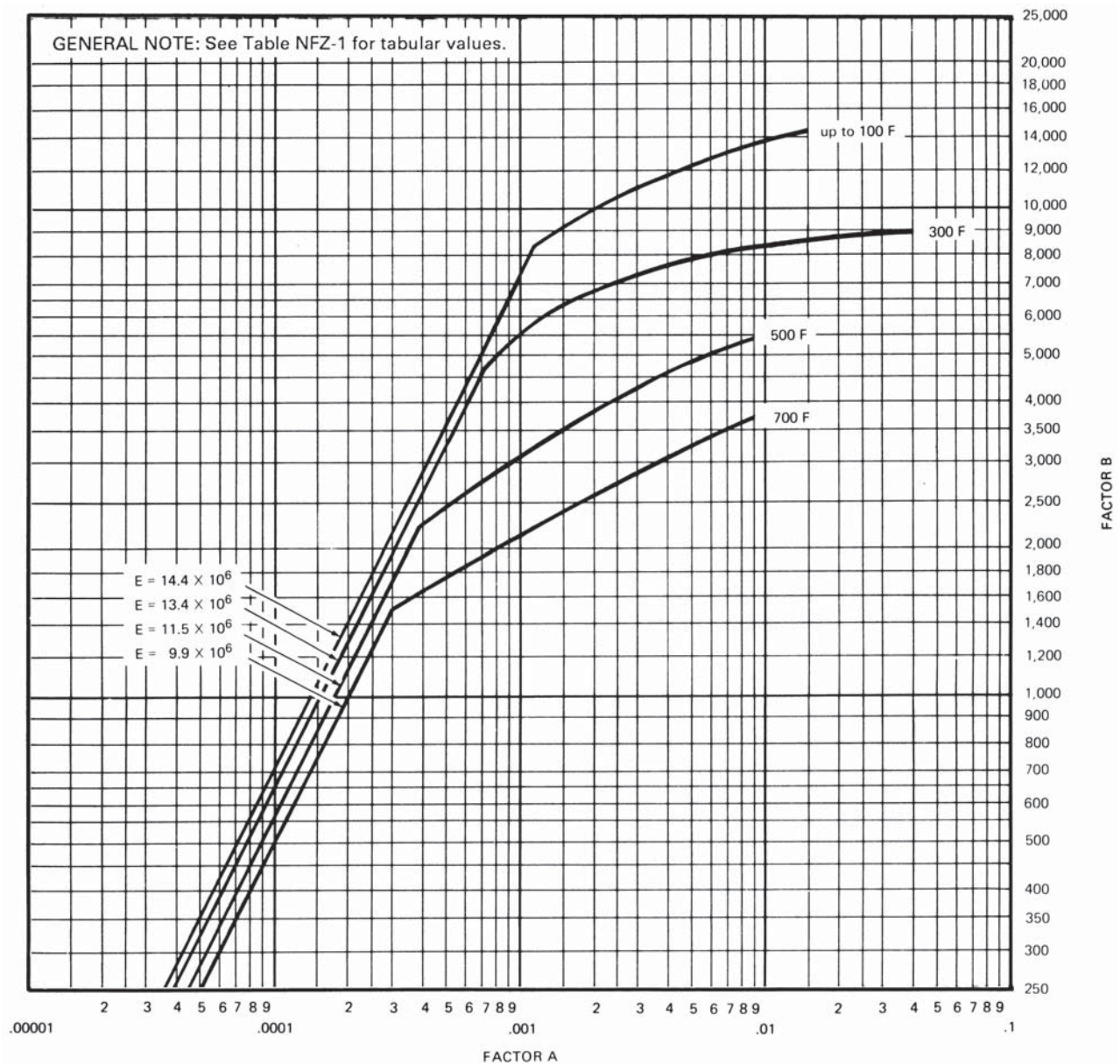
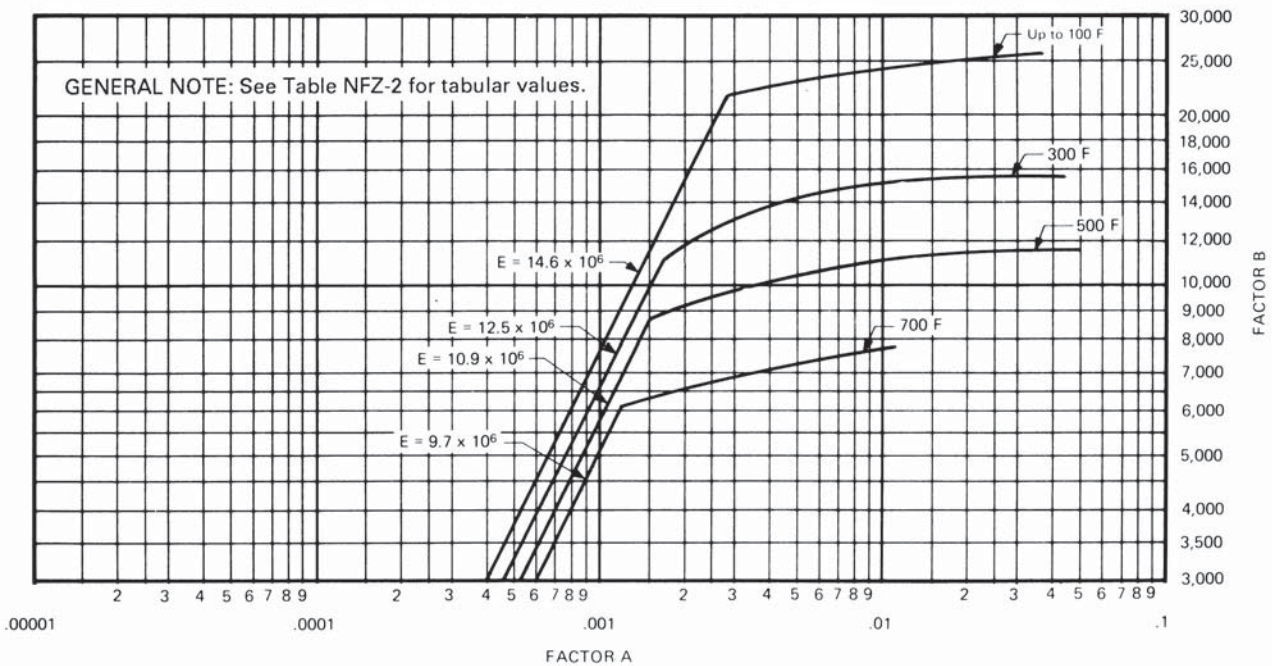


FIG. NFZ-2 CHART FOR DETERMINING SHELL THICKNESS OF COMPONENTS UNDER EXTERNAL PRESSURE DEVELOPED FOR ZIRCONIUM ALLOY (UNS R60705) [NOTE (9)]



(10) NOTES TO FIGURES OF SUBPART 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, 2A, 2B, 5A, and 5B.
- (b) The external pressure chart assigned for a particular material is obtained from stress 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.

NOTES:

- (1) Extrapolation is not permitted except as explicitly allowed by the Construction Code.
- (2) See Table Y-1 for values of yield strength at design temperature.
- (3) When Table Y-1 yield strength values at design temperature are less than 38,000 psi for the material covered by this chart, Fig. CS-2 shall be used.
- (4) The external pressure chart does not account for reduction of buckling strength due to creep under long-term loads at temperatures above 1000°F.
- (5) For Section III application, maximum use limit is 250°F, except for SB-209/3003/H112/0.250–0.499 and 0.500–3.0 in. use limits are 300°F and 200°F, respectively. Use 300°F curve for interpolation only.
- (6) For Section III application, maximum use limit is 250°F, except for SB-210 use limit is 300°F. Use 300°F curve for interpolation only.
- (7) 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.
- (8) The external pressure chart does not account for reduction of buckling strength due to creep under long-term loads at temperatures above 1200°F.
- (9) 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 FIG. 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	
4	2.2	0.959 -01	8	3.0	0.212 -01	20	0.8	0.203 -01	30	3.0	0.246 -02	50	6.0	0.548 -03	
	2.6	0.884		4.0	0.192		1.0	0.156		4.0	0.177		7.0	0.502	
	3.0	0.839		5.0	0.184		1.2	0.127		4.4	0.161		8.0	0.478	
	4.0	0.783		7.0	0.179		2.0	0.713 -02		5.0	0.147		10.0	0.458	
	5.0	0.759		10.0	0.176		3.0	0.446		6.0	0.136		12.0	0.449	
	7.0	0.739		20.0	0.174		3.4	0.388		7.0	0.130		16.0	0.444	
	10.0	0.729		50.0	0.174		4.0	0.342		10.0	0.125		40.0	0.440	
	30.0	0.720					5.0	0.308		30.0	0.122		50.0	0.440	
	50.0	0.720	10	0.56	0.964 -01		7.0	0.287		50.0	0.122				
				0.7	0.720		10.0	0.280					60	0.074	
5	1.4	0.929 -01		1.0	0.463		40.0	0.275	40	0.12	0.864 -01		0.10	0.556	
	1.6	0.802		1.2	0.371		50.0	0.275		0.2	0.385		0.14	0.323	
	2.0	0.658		2.0	0.201					0.3	0.222		0.2	0.193	
	2.4	0.586		2.4	0.165	25	0.2	0.877 -01		0.4	0.155		0.4	0.812 -02	
	3.0	0.532		3.0	0.139		0.3	0.484		0.6	0.958 -02		0.6	0.510	
	4.0	0.494		4.0	0.124		0.5	0.250		0.8	0.691		0.8	0.371	
	5.0	0.478		5.0	0.118		0.8	0.143		1.0	0.539		1.0	0.291	
	7.0	0.465		7.0	0.114		1.0	0.111		1.2	0.441		2.0	0.138	
	10.0	0.459		10.0	0.112		1.2	0.902 -02		2.0	0.252		3.0	0.886 -03	
	30.0	0.454		16.0	0.111		2.0	0.508		4.0	0.117		4.0	0.645	
6	50.0	0.453		50.0	0.111		3.0	0.323		5.0	0.912 -03		6.0	0.409	
							3.4	0.278		6.0	0.804		7.0	0.364	
	1.2	0.837 -01	15	0.34	0.968 -01		4.0	0.235		7.0	0.756		8.0	0.341	
	1.6	0.584		0.4	0.770		4.4	0.219		8.0	0.731		10.0	0.322	
	2.0	0.469		0.6	0.453		5.0	0.204		10.0	0.708		14.0	0.310	
	2.4	0.411		1.0	0.244		6.0	0.191		16.0	0.692		40.0	0.306	
	3.0	0.369		1.2	0.197		7.0	0.186		40.0	0.688		50.0	0.306	
	4.0	0.341		2.0	0.109		10.0	0.180		50.0	0.688				
	5.0	0.329		2.4	0.890 -02		30.0	0.176							
	7.0	0.320		3.0	0.691		50.0	0.176	50	0.088	0.930 -01	80	0.054	0.990 -01	
8	10.0	0.316		4.0	0.573					0.1	0.782		0.07	0.608	
	30.0	0.312		5.0	0.534					0.2	0.263		0.09	0.391	
	50.0	0.312		6.0	0.516					0.3	0.154		0.14	0.196	
				10.0	0.497					0.4	0.108		0.20	0.120	
				40.0	0.490					0.6	0.677 -02		0.24	0.950 -02	
				50.0	0.490					0.8	0.490		0.4	0.516	
							0.8	0.108		1.0	0.384		0.6	0.328	
							0.6	0.150		2.0	0.181		0.8	0.239	
				20	0.24	0.982 -01		1.0	0.838 -02		4.0	0.842 -03		1.0	0.188
				0.4	0.477		1.2	0.683		5.0	0.652		2.0	0.895 -03	
	2.4	0.242		0.6	0.286		2.0	0.388					9.0	0.904 -04	

TABLE G (CONT'D)
TABULAR VALUES FOR FIG. 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
125	10.0	0.837 -04	200	0.08	0.909 -02	250	2.0	0.163 -03	300	40.0	0.123 -04	500	0.6	0.199 -03	800	0.10	0.682 -03
	12.0	0.770		0.10	0.659		4.0	0.789 -04		50.0	0.122		0.8	0.148		0.12	0.551
	14.0	0.740		0.14	0.421		6.0	0.513					1.0	0.118		0.16	0.398
	20.0	0.713		0.2	0.272		8.0	0.377	400	0.05	0.549 -02		2.0	0.579 -04		0.2	0.312
	40.0	0.704		0.3	0.171		10.0	0.293		0.06	0.417		4.0	0.282		0.4	0.149
	50.0	0.704		0.5	0.976 -03		12.0	0.238		0.08	0.278		6.0	0.185		0.6	0.980 -04
				0.8	0.592		14.0	0.210		0.10	0.208		8.0	0.137		0.8	0.728
150	0.05	0.338 -01		1.0	0.469		16.0	0.196		0.12	0.166		10.0	0.107		1.0	0.580
	0.06	0.244		2.0	0.227		20.0	0.184		0.16	0.118		12.0	0.880 -05		2.0	0.286
	0.08	0.151		4.0	0.110		40.0	0.176		0.2	0.914 -03					4.0	0.140
	0.10	0.108		6.0	0.711 -04		50.0	0.176		0.4	0.429	600	0.05	0.270 -02		5.0	0.112
	0.12	0.833 -02		8.0	0.520	300	0.05	0.923 -02		0.6	0.280		0.06	0.208		5.6	0.992 -05
	0.16	0.569		10.0	0.403		0.06	0.690		0.8	0.207		0.08	0.142			
	0.2	0.431		12.0	0.338		0.08	0.452		1.0	0.165		0.10	0.108			
	0.4	0.194		14.0	0.309		0.10	0.334		2.0	0.808 -04		0.12	0.868 -03			
	0.6	0.125		16.0	0.295		0.12	0.264		4.0	0.393		0.16	0.624			
	1.0	0.726 -03		20.0	0.283		0.2	0.143		6.0	0.257		0.2	0.486			
	2.0	0.349		40.0	0.275		0.4	0.666 -03		8.0	0.189		0.4	0.231	1000	0.05	0.113 -02
	4.0	0.168		50.0	0.275		0.6	0.433		10.0	0.148		0.6	0.151		0.06	0.891 -03
	6.0	0.108					0.8	0.321		14.0	0.102		0.8	0.112		0.07	0.733
	8.0	0.787 -04	250	0.05	0.129 -01		1.0	0.254		16.0	0.882 -05		1.0	0.894 -04		0.09	0.541
	10.0	0.619		0.06	0.955 -02		2.0	0.124	500	0.05	0.370 -02		2.0	0.439		0.12	0.388
	12.0	0.553		0.08	0.617		4.0	0.602 -04		0.06	0.284		4.0	0.216		0.16	0.282
	16.0	0.510		0.10	0.452		6.0	0.393		0.08	0.192		6.0	0.141		0.2	0.221
	20.0	0.498		0.14	0.293		8.0	0.287		0.10	0.145		8.0	0.104		0.4	0.106
	40.0	0.489		0.2	0.191		10.0	0.225		0.12	0.116		8.4	0.988 -05		0.7	0.596 -04
	50.0	0.489		0.4	0.881 -03		14.0	0.156		0.16	0.830 -03	800	0.05	0.165 -02		1.0	0.414
				0.6	0.572		16.0	0.142		0.2	0.645		0.06	0.129		2.0	0.204
200	0.05	0.196 -01		0.8	0.422		20.0	0.130		0.4	0.305		0.08	0.892 -03		4.0	0.101
	0.06	0.143		1.0	0.335											4.2	0.957 -05

GENERAL NOTE: Extrapolation is not permitted except as explicitly allowed by the Construction Code.

TABLE CS-1
TABULAR VALUES FOR FIG. CS-1

Temp., °F	A	B, psi	Temp., °F	A	B, psi
300	0.135 -04	0.200 +03	700	0.900	0.650
	0.645 -03	0.940 +04		0.100 -02	0.665
	0.700	0.990		0.150	0.725
	0.800	0.105 +05		0.200	0.760
	0.900	0.109		0.212 -01	0.110 +05
	0.100 -02	0.112		0.100 +00	0.110
	0.150	0.119	800	0.178 -04	0.200 +03
	0.200	0.123		0.367 -03	0.416 +04
	0.950	0.138		0.400	0.435
	0.200 -01	0.138		0.500	0.465
	0.100 +00	0.138		0.600	0.485
500	0.143 -04	0.200 +03		0.700	0.510
	0.513 -03	0.700 +04	900	0.100 -02	0.560
	0.600	0.747		0.150	0.605
	0.800	0.810		0.200	0.640
	0.100 -02	0.850		0.225 -01	0.975
	0.150	0.935		0.100 +00	0.975
	0.250	0.995		0.188 -04	0.200 +03
	0.195 -01	0.131 +05		0.331 -03	0.349 +04
	0.100 +00	0.131		0.500	0.395
700	0.157 -04	0.200 +03		0.700	0.430
	0.413 -03	0.513 +04		0.100 -02	0.471
	0.500	0.556		0.150	0.516
	0.600	0.580		0.250	0.575
	0.700	0.610		0.213 -01	0.850
	0.800	0.630		0.100 +00	0.850

2011a SECTION II, PART D (CUSTOMARY)

TABLE CS-2
TABULAR VALUES FOR FIG. CS-2

Temp., °F	A	B, psi	Temp., °F	A	B, psi
300	0.176 -04	0.250 +03	700	0.213 -04	0.250 +03
	0.783 -03	0.113 +05		0.564 -03	0.680 +04
	0.800	0.114		0.100 -02	0.800
	0.900	0.118		0.300	0.101 +05
	0.100 -02	0.123		0.100 -01	0.121
	0.200	0.150		0.264	0.138
	0.300	0.162		0.100 +00	0.138
	0.400	0.168	800	0.223 -04	0.250 +03
	0.500	0.172		0.505 -03	0.571 +04
	0.250 -01	0.176		0.100 -02	0.710
500	0.100 +00	0.176		0.150	0.795
				0.200	0.840
				0.300	0.890
	0.194 -04	0.250 +03		0.319 -01	0.124 +05
	0.675 -03	0.900 +04		0.100 +00	0.124
	0.900	0.965	900	0.237 -04	0.250 +03
	0.100 -02	0.100 +05		0.428 -03	0.449 +04
	0.250	0.120		0.100 -02	0.600
	0.300	0.124		0.150	0.680
	0.800	0.142		0.200	0.735
	0.100 -01	0.146		0.300	0.790
	0.150	0.155		0.800	0.920
	0.200	0.161		0.300 -01	0.111 +05
	0.280	0.169		0.100 +00	0.111
	0.100 +00	0.169			

TABLE CS-3
TABULAR VALUES FOR FIG. CS-3

Yield Strength, psi	A	B, psi
60,000	0.400 -04	0.580 +03
	0.100 -02	0.145 +05
	0.166 -02	0.240 +05
	0.100 +00	0.300 +05
55,000	0.400 -04	0.580 +03
	0.100 -02	0.145 +05
	0.152 -02	0.220 +05
	0.100 +00	0.270 +05
50,000	0.400 -04	0.580 +03
	0.100 -02	0.145 +05
	0.138 -02	0.200 +05
	0.100 +00	0.250 +05
45,000	0.400 -04	0.580 +03
	0.100 -02	0.145 +05
	0.124 -02	0.180 +05
	0.100 +00	0.225 +05
38,000 to 40,000	0.400 -04	0.580 +03
	0.100 -02	0.145 +05
	0.110 -02	0.160 +05
	0.100 +00	0.200 +05

TABLE CS-4
TABULAR VALUES FOR FIG. CS-4

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.150 +03	300	0.100 -04	0.142 +03
(Cl. 2)	0.156 -02	0.252 +05	(Cl. 2)	0.135 -02	0.204 +05
	0.300	0.269		0.600	0.230
	0.700	0.287		0.100 -01	0.239
	0.900	0.290		0.400	0.256
	0.300 -01	0.304		0.100 +00	0.267
	0.400	0.307			
	0.100 +00	0.307			
100	0.100 -04	0.150 +03	300	0.100 -04	0.142 +03
(Cl. 1)	0.136 -02	0.216 +05	(Cl. 1)	0.118 -02	0.177 +05
	0.400	0.233		0.300	0.187
	0.100 -01	0.244		0.400	0.190
	0.300	0.253		0.300 -01	0.202
	0.100 +00	0.253		0.700	0.204
				0.100 +00	0.204

TABLE CS-5
TABULAR VALUES FOR FIG. CS-5

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.199 -03	0.300 +04	400	0.210 -03	0.300 +04
	0.160 -02	0.245 +05		0.154 -02	0.207 +05
	0.200	0.246		0.300	0.212
	0.300	0.248		0.700	0.220
	0.500	0.249		0.900	0.221
	0.600	0.250		0.100 -01	0.223
	0.500 -01	0.250		0.500	0.223
			550	0.215 -03	0.300 +04
				0.108 -02	0.150 +05
200	0.200 -03	0.300 +04		0.200	0.164
	0.157 -02	0.235 +05		0.400	0.184
	0.500 -01	0.235		0.100 -01	0.200
				0.200	0.207
				0.500	0.213
			650	0.220 -03	0.300 +04
300	0.203 -03	0.300 +04		0.121 -02	0.150 +05
	0.150 -02	0.220 +05		0.200	0.164
	0.300	0.225		0.400	0.179
	0.600	0.225		0.100 -01	0.194
	0.500 -01	0.225		0.500	0.207

TABLE CS-6
TABULAR VALUES FOR FIG. CS-6

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.150 -03	0.220 +04	300	0.150 -03	0.220 +04
	0.200	0.300		0.200	0.300
	0.300	0.450		0.500	0.500
	0.600	0.600		0.100 -02	0.600
	0.800	0.650		0.250	0.700
	0.200 -02	0.800		0.900	0.800
	0.420	0.900		0.250 -01	0.830
	0.400 -01	0.100 +05	400	0.180 -03	0.250 +04
	0.700	0.100		0.300	0.400
200	0.150 -03	0.220 +04		0.100 -02	0.550
	0.200	0.300		0.700	0.700
	0.420	0.500		0.250 -01	0.750
	0.800	0.600			
	0.150 -02	0.700			
	0.400	0.800			
	0.200 -01	0.900			

TABLE HT-1
TABULAR VALUES FOR FIG. HT-1

Temp., °F	A	B, psi
Up to 200	0.100 -04	0.146 +03
	0.245 -02	0.368 +05
	0.400	0.406
	0.700	0.441
	0.100 -01	0.460
	0.200	0.482
	0.500	0.500
400	0.100 -04	0.137 +03
	0.245 -02	0.346 +05
	0.400	0.384
	0.700	0.420
	0.100 -01	0.441
	0.400	0.482
650	0.100 -04	0.124 +03
	0.243 -02	0.315 +05
	0.400	0.357
	0.700	0.399
	0.100 -01	0.417
	0.300	0.464

TABLE HT-2
TABULAR VALUES FOR FIG. HT-2

Temp., °F	A	B, psi
100	0.337 -03	0.500 +04
	0.283 -02	0.420 +05
	0.400	0.432
	0.600	0.440
	0.800	0.448
	0.100 -01	0.454
	0.150	0.468
	0.200	0.475
	0.250	0.482
	0.300	0.488
	0.400	0.494
	0.500	0.497
	0.600	0.498
	0.700	0.500
	0.100 +00	0.500

TABLE HA-1
TABULAR VALUES FOR FIG. HA-1

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.142 -04	0.200 +03	900	0.181 -04	0.200 +03
	0.463 -03	0.650 +04		0.315 -03	0.350 +04
	0.150 -02	0.106 +05		0.400	0.386
	0.200	0.115		0.500	0.416
	0.300	0.125		0.150 -02	0.548
	0.100 -01	0.140		0.300	0.612
	0.631	0.158		0.100 -01	0.707
	0.100 +00	0.158		0.200	0.742
400	0.159 -04	0.200 +03	1200	0.784	0.794
	0.391 -03	0.500 +04		0.100 +00	0.794
	0.200 -02	0.820		0.200 -04	0.200 +03
	0.300	0.910		0.283 -03	0.284 +04
	0.400	0.969		0.100 -02	0.416
	0.500	0.100 +05		0.200	0.483
	0.100 -01	0.106		0.500	0.554
	0.538	0.116		0.100 -01	0.595
700	0.100 +00	0.116		0.200	0.635
	0.170 -04	0.200 +03		0.488	0.670
	0.338 -03	0.400 +04		0.100 +00	0.670
	0.400	0.433	1500	1.00 -04	0.905 +03
	0.500	0.471		1.10	0.100 +04
	0.600	0.500		3.12	0.2825
	0.100 -02	0.576		4.00	0.300
	0.200	0.667		1.27 -03	0.350
	0.500	0.765		5.06	0.400
	0.600	0.780		4.00 -02	0.465
	0.100 -01	0.810		1.00 -01	0.465
	0.542	0.900			
	0.100 +00	0.900			

TABLE HA-2
TABULAR VALUES FOR FIG. HA-2

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.184 -04	0.250 +03	900	0.228 -04	0.250 +03
	0.605 -03	0.840 +04		0.510 -03	0.566 +04
	0.150 -02	0.111 +05		0.600	0.610
	0.200	0.117		0.100 -02	0.720
	0.250	0.122		0.300	0.905
	0.300	0.126		0.400	0.940
	0.400	0.130		0.100 -01	0.103 +05
	0.500	0.133		0.522	0.117
	0.700	0.136		0.100 +00	0.117
	0.100 -01	0.140	1200	0.247 -04	0.250 +03
	0.200	0.146		0.460 -03	0.466 +04
	0.726	0.156		0.100 -02	0.600
	0.100 +00	0.156		0.200	0.720
400	0.199 -04	0.250 +03		0.300	0.780
	0.585 -03	0.750 +04		0.400	0.820
	0.100 -02	0.870		0.500	0.840
	0.150	0.970		0.100 -01	0.895
	0.200	0.104 +05		0.700	0.100 +05
	0.300	0.112		0.100 +00	0.100
	0.400	0.117	1500	1.00 -04	0.905 +03
	0.500	0.120		1.10	0.100 +04
	0.600	0.122		3.95	0.3575
	0.100 -01	0.127		1.45 -03	0.425
	0.574	0.143		2.54	0.450
	0.100 +00	0.143		5.62	0.4819
				3.50 -02	0.545
				1.00 -01	0.545
700	0.218 -04	0.250 +03			
	0.533 -03	0.625 +04			
	0.700	0.700			
	0.100 -02	0.780			
	0.300	0.100 +05			
	0.400	0.105			
	0.100 -01	0.114			
	0.500	0.127			
	0.592	0.129			
	0.100 +00	0.129			

TABLE HA-3
TABULAR VALUES FOR FIG. HA-3

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.139 -04	0.200 +03	600	0.165 -04	0.200 +03
	0.535 -03	0.755 +04		0.319 -03	0.389 +04
	0.200 -02	0.101 +05		0.100 -02	0.475
	0.600	0.124		0.100 -01	0.710
	0.400 -01	0.150		0.281	0.845
	0.100 +00	0.150		0.100 +00	0.845
400	0.158 -04	0.200 +03	800	0.174 -04	0.200 +03
	0.361 -03	0.463 +04		0.275 -03	0.317 +04
	0.100 -02	0.550		0.150 -02	0.427
	0.100 -01	0.815		0.100 -01	0.590
	0.283	0.975		0.300	0.720
	0.100 +00	0.975		0.100 +00	0.720

TABLE HA-4
TABULAR VALUES FOR FIG. HA-4

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.143 -04	0.200 +03	400	0.154 -04	0.200 +03
	0.600 -03	0.840 +04		0.410 -03	0.538 +04
	0.700 -02	0.133 +05		0.700 -02	0.895
	0.100 -01	0.140		0.100 -01	0.940
	0.200	0.152		0.429	0.106 +05
	0.500	0.162		0.100 +00	0.106
	0.100 +00	0.162	600	0.169 -04	0.200 +03
300	0.153 -04	0.200 +03		0.363 -03	0.438 +04
	0.475 -03	0.625 +04		0.500 -02	0.720
	0.500 -02	0.995		0.100 -01	0.790
	0.600	0.102 +05		0.456	0.900
	0.100 -01	0.110		0.100 +00	0.900
	0.458	0.126	800	0.176 -04	0.200 +03
	0.100 +00	0.126		0.317 -03	0.363 +04
				0.500 -02	0.595
				0.100 -01	0.660
				0.468	0.770
				0.100 +00	0.770

TABLE HA-5
TABULAR VALUES FOR FIG. HA-5

Temp., °F	A	B, psi	Temp., °F	A	B, psi
Room Temp.	0.000141	2,000	650	0.000160	2,000
	0.001340	19,000 P.L.		0.00120	15,000 P.L.
	0.0015	19,250		0.0015	15,500
	0.0020	20,600		0.0020	16,200
	0.0025	22,500		0.0025	17,000
	0.0030	23,800		0.0030	17,800
	0.0040	26,000		0.0040	19,000
	0.0060	28,300		0.0060	20,300
	0.010	30,500		0.010	21,900
	0.015	31,500		0.015	22,500
	0.021	32,600		0.034	22,800
400	0.0001509	2,000			
	0.001166	15,450 P.L.			
	0.0015	15,750			
	0.0020	16,500			
	0.0025	17,500			
	0.0030	18,300			
	0.0040	19,500			
	0.0060	21,000			
	0.010	22,500			
	0.015	23,250			
	0.023	24,000			

TABLE HA-6
TABULAR VALUES FOR FIG. HA-6

Temp., °F	A	B, psi	Temp., °F	A	B, psi
70	7.07 -05	1.00 +03	650	7.98 -05	1.00 +03
	5.00 -04	7.08		4.99 -04	6.25
	1.00 -03	1.41 +04		8.85	8.92
	1.44	1.80		1.44 -03	9.65
	1.81	1.88		1.81	9.90
	4.48	2.02		4.66	1.07 +04
	9.42	2.09		9.80	1.12
	1.89 -02	2.16		2.00 -02	1.18
	5.00	2.25		5.00	1.20
	1.00 -01	2.25		1.00 -01	1.20
200	7.25 -05	1.00 +03	950	8.62 -05	1.00 +03
	5.00 -04	6.90		4.99 -04	5.79
	9.71	1.23 +04		9.64	8.84
	1.37 -03	1.37		1.09 -03	9.05
	1.95	1.45		1.27	9.25
	4.81	1.60		4.84	1.03 +04
	9.81	1.70		9.68	1.08
	1.96 -02	1.79		1.99 -02	1.12
	5.00	1.84		5.00	1.15
	1.00 -01	1.84		1.00 -01	1.15
400	7.55 -05	1.00 +03	1200	9.64 -05	1.00 +03
	5.00 -04	6.62		4.98 -04	5.17
	9.76	1.08 +04		9.32	8.05
	1.31 -03	1.14		1.38 -03	8.70
	1.97	1.19		1.90	9.06
	4.44	1.27		4.88	9.84
	9.57	1.33		9.94	1.04 +04
	1.99 -02	1.38		1.94 -02	1.08
	5.00	1.44		5.00	1.13
	1.00 -01	1.44		1.00 -01	1.13

TABLE HA-7
TABULAR VALUES FOR FIG. HA-7

Temp., °F	A	B, psi	Temp., °F	A	B, psi
70	0.700 -04	0.100 +04	300	0.700 -04	0.100 +04
	0.500 -03	0.730		0.500 -03	0.698
	0.750	0.110 +05		0.750	0.105 +05
	0.100 -02	0.146		0.100 -02	0.139
	0.125	0.183		0.125	0.174
	0.150	0.219		0.150	0.209
	0.174	0.254		0.174	0.242
	0.198	0.288		0.198	0.274
	0.289	0.393		0.271	0.337
	0.407	0.429		0.462	0.380
	0.641	0.454		0.619	0.394
	0.749	0.460		0.763	0.403
	0.157 -01	0.486		0.199 -01	0.436
	0.500	0.520		0.500	0.462
	0.100 +00	0.525		0.100 +00	0.465

TABLE HA-8
TABULAR VALUES FOR FIG. HA-8

Temp., °F	A	B, psi	Temp., °F	A	B, psi
70	0.707 -04	0.100 +04	212	0.337	0.220
	0.403 -03	0.568		0.476	0.233
	0.606	0.841		0.742	0.247
	0.836	0.111 +05		0.985	0.256
	0.113 -02	0.139		0.199 -01	0.278
	0.148	0.162		0.500	0.282
	0.164	0.170	750	0.100 +00	0.282
	0.182	0.179		0.878 -04	0.100 +04
	0.346	0.226		0.500 -03	0.611
	0.487	0.250		0.750	0.917
	0.730	0.278		0.100 -02	0.120 +05
	0.989	0.299		0.125	0.140
	0.200 -01	0.325		0.147	0.155
	0.500	0.325		0.170	0.167
	0.100 +00	0.325		0.192	0.175
212	0.727 -04	0.100 +04		0.329	0.207
	0.473 -03	0.651		0.499	0.213
	0.707	0.973		0.736	0.218
	0.950	0.125 +05		0.937	0.221
	0.125 -02	0.151		0.197 -01	0.230
	0.146	0.165		0.500	0.238
	0.174	0.178		0.100 +00	0.239
	0.195	0.185			

TABLE CI-1
TABULAR VALUES FOR FIG. CI-1

Class / Temp., °F	A	B, psi	Class / Temp., °F	A	B, psi
Class 60	0.100 -04	0.110 +03	Class 30	0.100 -04	0.716 +02
up to 650	0.160 -02	0.182 +05	up to 650	0.122 -02	0.908 +04
	0.100 +00	0.182		0.100 +00	0.908
Class 50	0.100 -04	0.997 +02	Class 20	0.100 -04	0.595 +02
up to 650	0.147 -02	0.150 +05	up to 650	0.991 -03	0.607 +04
	0.100 +00	0.150		0.100 +00	0.607
Class 40	0.100 -04	0.872 +02			
up to 650	0.135 -02	0.120 +05			
	0.100 +00	0.120			

TABLE CD-1
TABULAR VALUES FOR FIG. CD-1

Temp., °F	A	B, psi	Temp., °F	A	B, psi
Up to	0.100 -04	0.122 +03	650	0.100 -04	0.112 +03
100	0.124 -02	0.149 +05		0.892 -03	0.982 +04
	0.200	0.158		0.200 -02	0.119 +05
	0.400	0.173		0.400	0.138
	0.100 -01	0.191		0.600	0.147
	0.250	0.207		0.800	0.152
				0.100 -01	0.155
400	0.100 -04	0.122 +03		0.200	0.163
	0.107 -02	0.130 +05		0.400	0.169
	0.200	0.148			
	0.300	0.157			
	0.400	0.164			
	0.100 -01	0.180			
	0.300	0.195			
	0.600	0.203			

TABLE NFA-1
TABULAR VALUES FOR FIG. NFA-1

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.502 +02	300	0.110 -04	0.500 +02
	0.148 -03	0.742 +03		0.148 -03	0.680 +03
	0.200	0.951		0.200	0.841
	0.250	0.107 +04		0.250	0.949
	0.300	0.116		0.300	0.102 +04
	0.100 -02	0.156		0.400	0.112
	0.150	0.171		0.700	0.127
	0.400	0.208		0.250 -02	0.156
	0.100 -01	0.246		0.400 -01	0.230
	0.150	0.262		0.100 +00	0.230
	0.400	0.301	400	0.119 -04	0.500 +02
	0.100 +00	0.301		0.998	0.428 +03
200	0.103 -04	0.500 +02		0.150 -03	0.623
	0.148 -03	0.709 +03		0.200	0.763
	0.200	0.910		0.250	0.861
	0.250	0.102 +04		0.300	0.927
	0.300	0.110		0.400	0.100 +04
	0.400	0.121		0.500	0.105
	0.100 -02	0.148		0.100 -02	0.121
	0.300	0.183		0.300	0.143
	0.600	0.208		0.100 -01	0.164
	0.200 -01	0.250		0.400	0.191
	0.400	0.279		0.100 +00	0.191
	0.100 +00	0.279			

TABLE NFA-2
TABULAR VALUES FOR FIG. NFA-2

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.501 +02	300	0.110 -04	0.500 +02
	0.405 -03	0.200 +04		0.199 -03	0.901 +03
	0.500	0.248		0.250	0.111 +04
	0.600	0.291		0.300	0.134
	0.700	0.331		0.400	0.168
	0.800	0.365		0.500	0.197
	0.900	0.401		0.600	0.224
	0.100 -02	0.427		0.700	0.244
	0.150	0.520		0.100 -02	0.299
	0.200	0.584		0.150	0.359
	0.250	0.622		0.250	0.425
	0.300	0.653		0.300	0.450
	0.400	0.695		0.400	0.484
	0.500	0.726		0.500	0.507
	0.600	0.740		0.100 -01	0.563
	0.100 -01	0.793		0.150	0.592
	0.200	0.844		0.100 +00	0.592
	0.400	0.884	400	0.118 -04	0.500 +02
	0.500	0.898		0.147 -03	0.603 +03
	0.100 +00	0.898		0.200	0.795
200	0.102 -04	0.500 +02		0.250	0.953
	0.301 -03	0.143 +04		0.300	0.108 +04
	0.600	0.264		0.400	0.128
	0.700	0.299		0.500	0.145
	0.100 -02	0.381		0.100 -02	0.200
	0.150	0.468		0.150	0.233
	0.200	0.525		0.200	0.259
	0.250	0.566		0.250	0.278
	0.300	0.592		0.300	0.295
	0.400	0.623		0.500	0.333
	0.500	0.645		0.600	0.342
	0.600	0.659		0.700	0.350
	0.100 -01	0.695		0.100 -01	0.368
	0.500	0.800		0.150	0.384
	0.100 +00	0.800		0.200	0.392
				0.250	0.399
				0.100 +00	0.399

TABLE NFA-3
TABULAR VALUES FOR FIG. NFA-3

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.506 +02	300	0.107 -04	0.500 +02
	0.353 -03	0.179 +04		0.348 -03	0.159 +04
	0.400	0.195		0.400	0.180
	0.500	0.217		0.500	0.204
	0.600	0.232		0.600	0.221
	0.700	0.243		0.700	0.233
	0.800	0.251		0.800	0.244
	0.100 -02	0.264		0.100 -02	0.256
	0.150	0.282		0.150	0.282
	0.150 -01	0.423		0.150 -01	0.423
	0.100 +00	0.423		0.100 +00	0.423
200	0.104 -04	0.501 +02	400	0.116 -04	0.500 +02
	0.375 -03	0.179 +04		0.334 -03	0.141 +04
	0.400	0.187		0.400	0.168
	0.500	0.209		0.500	0.197
	0.600	0.225		0.600	0.216
	0.700	0.238		0.700	0.229
	0.800	0.247		0.800	0.239
	0.100 -02	0.261		0.900	0.248
	0.150	0.282		0.100 -02	0.255
	0.150 -01	0.423		0.150	0.282
	0.100 +00	0.423		0.150 -01	0.423
				0.100 +00	0.423

TABLE NFA-4
TABULAR VALUES FOR FIG. NFA-4

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.507 +02	300	0.107 -04	0.500 +02
	0.126 -02	0.652 +04		0.698 -03	0.331 +04
	0.150	0.745		0.100 -02	0.450
	0.200	0.874		0.150	0.578
	0.250	0.948		0.200	0.656
	0.300	0.998		0.250	0.710
	0.400	0.105 +05		0.300	0.742
	0.500	0.109		0.400	0.782
	0.600	0.112		0.500	0.812
	0.100 -01	0.117		0.600	0.831
	0.150	0.119		0.100 -01	0.872
	0.250	0.122		0.150	0.901
	0.400	0.124		0.100 +00	0.901
	0.100 +00	0.124			
200	0.101 -04	0.500 +02	400	0.117 -04	0.500 +02
	0.131 -02	0.652 +04		0.248 -03	0.106 +04
	0.150	0.720		0.300	0.126
	0.200	0.837		0.400	0.159
	0.250	0.907		0.500	0.185
	0.300	0.957		0.600	0.206
	0.400	0.101 +05		0.700	0.224
	0.500	0.105		0.900	0.254
	0.600	0.108		0.100 -02	0.268
	0.700	0.110		0.150	0.315
	0.100 -01	0.113		0.200	0.349
	0.250	0.118		0.250	0.377
	0.300	0.119		0.300	0.395
	0.400	0.120		0.400	0.426
	0.100 +00	0.120		0.100 -01	0.512
				0.150	0.549
				0.100 +00	0.549

TABLE NFA-5
TABULAR VALUES FOR FIG. NFA-5

Temp., °F	A	B, psi
100	0.100 -04	0.514 +02
	0.492 -03	0.255 +04
	0.600	0.300
	0.700	0.327
	0.800	0.347
	0.900	0.359
	0.100 -02	0.367
	0.171 -01	0.550
	0.100 +00	0.550

TABLE NFA-6
TABULAR VALUES FOR FIG. NFA-6

Temp., °F	A	B, psi	Temp., °F	A	B, psi
Up to	0.100 -04	0.523 +02	300	0.110 -04	0.500 +02
100	0.687 -03	0.356 +04		0.499 -03	0.227 +04
	0.800	0.406		0.600	0.264
	0.900	0.439		0.700	0.294
	0.100 -02	0.456		0.800	0.321
	0.150	0.498		0.100 -02	0.356
	0.200	0.512		0.150	0.407
	0.300	0.525		0.200	0.432
	0.100 -01	0.570		0.300	0.460
	0.300	0.611		0.100 -01	0.520
				0.300	0.562
200	0.101 -04	0.500 +02	400	0.126 -04	0.500 +02
	0.499 -03	0.243 +04		0.398 -03	0.159 +04
	0.700	0.322		0.500	0.189
	0.800	0.354		0.700	0.240
	0.900	0.382		0.100 -02	0.294
	0.100 -02	0.397		0.150	0.351
	0.150	0.447		0.200	0.380
	0.200	0.472		0.300	0.410
	0.300	0.500		0.500	0.443
	0.100 -01	0.566		0.100 -01	0.473
	0.300	0.611		0.250	0.511

TABLE NFA-7
TABULAR VALUES FOR FIG. NFA-7

Temp., °F	A	B, psi	Temp., °F	A	B, psi
200	0.101 -04	0.500 +02	300	0.700 -03	0.634 +03
	0.901	0.466 +03		0.150 -02	0.724
	0.500 -03	0.701		0.300	0.798
	0.700	0.751		0.600	0.861
	0.150 -02	0.880		0.100 -01	0.906
	0.400	0.105 +04		0.100 +00	0.906
	0.700	0.115	400	0.119 -04	0.500 +02
	0.100 -01	0.120		0.746	0.327 +03
	0.150	0.123		0.150 -02	0.604
	0.200	0.125		0.300	0.680
	0.100 +00	0.125		0.500	0.719
300	0.112 -04	0.500 +02		0.700	0.736
	0.885	0.415 +03		0.900	0.746
	0.500 -03	0.594		0.100 +00	0.746

TABLE NFA-8
TABULAR VALUES FOR FIG. NFA-8

Temp., °F	A	B, psi	Temp., °F	A	B, psi
200	0.104 -04	0.500 +02	300	0.800 -02	0.444 +04
	0.283 -03	0.141 +04		0.900	0.452
	0.300	0.148		0.100 -01	0.456
	0.400	0.182		0.150	0.476
	0.100 -02	0.265		0.200	0.486
	0.250	0.354		0.100 +00	0.486
	0.500	0.415	400	0.123 -04	0.500 +02
	0.600	0.428		0.288 -03	0.116 +04
	0.700	0.438		0.300	0.121
	0.800	0.444		0.400	0.153
	0.900	0.452		0.600	0.197
	0.100 -01	0.456		0.100 -02	0.240
	0.150	0.476		0.250	0.320
	0.200	0.486		0.300	0.336
	0.100 +00	0.486		0.400	0.360
300	0.110 -04	0.500 +02		0.500	0.378
	0.338 -03	0.153 +04		0.600	0.389
	0.400	0.175		0.700	0.401
	0.100 -02	0.265		0.800	0.410
	0.250	0.354		0.900	0.418
	0.500	0.415		0.100 -01	0.423
	0.600	0.428		0.100 +00	0.423
	0.700	0.438			

TABLE NFA-9
TABULAR VALUES FOR FIG. NFA-9

Temp., °F	A	B, psi
150	0.100 -04	0.500 +02
	0.792 -03	0.407 +04
	0.900	0.434
	0.100 -02	0.454
	0.150	0.505
	0.200	0.531
	0.400	0.589
	0.600	0.625
	0.200 -01	0.715
	0.100 +00	0.715

TABLE NFA-10
TABULAR VALUES FOR FIG. NFA-10

Temp., °F	A	B, psi
100	0.100 -04	0.518 +02
	0.134 -02	0.724 +04
	0.150	0.776
	0.200	0.840
	0.250	0.859
	0.300	0.871
	0.500	0.888
	0.100 -01	0.900
	0.150	0.911
	0.250	0.915
	0.300	0.919
	0.400	0.921
	0.500	0.925
	0.100 +00	0.925

TABLE NFA-11
TABULAR VALUES FOR FIG. NFA-11

Temp., °F				B, psi				Temp., °F				B, psi			
A				A				A				A			
150 (Curve 1)	0.100	−04	0.509	+02	150 (Curve 2)	0.500	−02	0.717	+04	150 (Curve 4)	0.100	−02	0.391	+04	
	0.301	−03	0.157	+04		0.900		0.790			0.150		0.466		
	0.500		0.258			0.100	−01	0.802			0.200		0.510		
	0.600		0.307			0.174		0.861			0.250		0.544		
	0.700		0.352			0.100	+00	0.861			0.300		0.568		
	0.100	−02	0.462						0.400			0.606			
	0.150		0.557						0.900			0.693			
	0.200		0.614	150 (Curve 3)	0.100	−04	0.509	+02	0.100		−01	0.706			
	0.250		0.652		0.301	−03	0.157	+04	0.150			0.748			
	0.300		0.686		0.500		0.251		0.174			0.753			
	0.400		0.729		0.600		0.290		0.100		+00	0.753			
	0.500		0.758		0.700		0.326								
	0.900		0.836		0.100	−02	0.406	150 (Curve 5)	0.100	−04	0.509	+02			
	0.150	−01	0.894		0.150		0.492		0.301	−03	0.157	+04			
	0.174		0.906		0.200		0.538		0.500		0.241				
	0.100	+00	0.906		0.250		0.573		0.600		0.275				
			0.300			0.603	0.700			0.304					
			0.900		0.739	0.100	−02		0.372						
			0.100	−01	0.753	0.150			0.440						
			0.174		0.811	0.200			0.480						
			0.100	+00	0.811	0.250			0.508						
						0.300			0.534						
						0.400		0.566							
150 (Curve 2)	0.100	−04	0.509	+02					0.900		0.646				
	0.301	−03	0.157	+04	150 (Curve 4)	0.100	−04	0.509	+02	0.100	−01	0.658			
	0.500		0.258	0.301		−03	0.157	+04	0.150		0.698				
	0.800		0.374	0.500			0.245	0.174		0.706					
	0.100	−02	0.430	0.600			0.283	0.100	+00	0.706					
	0.150		0.525	0.700			0.316								
	0.200		0.574												
	0.250		0.614												
	0.300		0.643												
	0.400		0.686												

TABLE NFA-12
TABULAR VALUES FOR FIG. NFA-12

Temp., °F	A	B, psi	Temp., °F	A	B, psi
Up to	0.100 -04	0.505 +02	400	0.114 -04	0.500 +02
200	0.119 -02	0.613 +04		0.891 -03	0.404 +04
	0.150	0.730		0.100 -02	0.442
	0.200	0.844		0.150	0.545
	0.250	0.899		0.200	0.595
	0.300	0.933		0.300	0.659
	0.400	0.968		0.500	0.710
	0.700	0.100 +05		0.100 -01	0.750
	0.100 -01	0.102		0.300	0.788
	0.200	0.104			
300	0.107 -04	0.500 +02			
	0.122 -02	0.587 +04			
	0.150	0.681			
	0.200	0.786			
	0.250	0.839			
	0.300	0.872			
	0.400	0.905			
	0.500	0.920			
	0.100 -01	0.946			
	0.250	0.964			

TABLE NFA-13
TABULAR VALUES FOR FIG. NFA-13

Temp., °F	A	B, psi	Temp., °F	A	B, psi
Up to	0.100 -04	0.500 +02	400	0.113 -04	0.500 +02
200	0.787 -03	0.407 +04		0.495 -03	0.225 +04
	0.900	0.455		0.600	0.268
	0.100 -02	0.500		0.700	0.303
	0.150	0.623		0.800	0.332
	0.200	0.671		0.100 -02	0.373
	0.250	0.696		0.150	0.431
	0.300	0.712		0.200	0.463
	0.400	0.731		0.250	0.483
	0.100 -01	0.759		0.300	0.497
	0.250	0.782		0.400	0.517
				0.500	0.529
300	0.107 -04	0.500 +02		0.100 -01	0.555
	0.787 -03	0.385 +04		0.250	0.570
	0.100 -02	0.465			
	0.150	0.585			
	0.200	0.629			
	0.250	0.649			
	0.300	0.657			
	0.500	0.683			
	0.100 -01	0.706			
	0.300	0.726			

TABLE NFC-1
TABULAR VALUES FOR FIG. NFC-1

Temp., °F	A	B, psi
150	0.100 -04	0.797 +02
	0.163 -03	0.134 +04
	0.250	0.151
	0.500	0.181
	0.100 -02	0.214
	0.400	0.291
	0.250 -01	0.435
	0.100 +00	0.435

TABLE NFC-2
TABULAR VALUES FOR FIG. NFC-2

Temp., °F	A	B, psi
150	0.100 -04	0.909 +02
	0.524 -03	0.484 +04
	0.400 -02	0.610
	0.100 -01	0.668
	0.200	0.711
	0.250	0.724
	0.300	0.733
	0.400	0.745
	0.500	0.755
	0.600	0.762
	0.700	0.768
	0.100 +00	0.768
350	0.100 -04	0.909 +02
	0.376 -03	0.346 +04
	0.500	0.367
	0.600	0.382
	0.700	0.393
	0.400 -02	0.524
	0.100 -01	0.609
	0.300	0.704
	0.100 +00	0.704

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TABLE NFC-3
TABULAR VALUES FOR FIG. NFC-3

Temp., °F	A	B, psi	Temp., °F	A	B, psi
150	0.100 -04	0.899 +02	600	0.100 -04	0.804 +02
	0.386 -03	0.353 +04		0.189 -03	0.154 +04
	0.300 -02	0.499		0.200	0.155
	0.400	0.521		0.250	0.165
	0.500	0.535		0.300	0.176
	0.100 -01	0.567		0.400	0.195
	0.200	0.592		0.500	0.214
	0.250	0.596		0.600	0.233
	0.500	0.612		0.100 -02	0.300
	0.100 +00	0.612		0.150	0.347
400	0.100 -04	0.837 +02		0.200	0.374
	0.358 -03	0.307 +04		0.250	0.392
	0.300 -02	0.453		0.300	0.408
	0.400	0.472		0.400	0.429
	0.100 -01	0.519		0.100 -01	0.476
	0.150	0.537		0.300	0.521
	0.200	0.550		0.400	0.530
	0.500	0.583		0.100 +00	0.530
	0.100 +00	0.583			

TABLE NFC-4
TABULAR VALUES FOR FIG. NFC-4

Temp., °F	A	B, psi	Temp., °F	A	B, psi
150	0.100 -04	0.115 +03	400	0.100 -04	0.108 +03
	0.230 -03	0.251 +04		0.248 -03	0.251 +04
	0.400	0.339		0.300	0.281
	0.500	0.375		0.400	0.316
	0.600	0.404		0.500	0.340
	0.100 -02	0.486		0.700	0.375
	0.150	0.551		0.100 -02	0.411
	0.300	0.639		0.150	0.454
	0.400	0.674		0.200	0.486
	0.700	0.731		0.250	0.503
	0.100 -01	0.764		0.300	0.521
	0.200	0.830		0.600	0.584
	0.400	0.874		0.100 -01	0.623
	0.100 +00	0.874		0.200	0.666
				0.400	0.683
				0.100 +00	0.688
250	0.100 -04	0.108 +03	700	0.100 -04	0.987 +02
	0.248 -03	0.251 +04		0.269 -03	0.251 +04
	0.300	0.280		0.300	0.263
	0.400	0.322		0.400	0.293
	0.500	0.351		0.500	0.316
	0.700	0.393		0.700	0.344
	0.100 -02	0.436		0.100 -02	0.374
	0.150	0.488		0.150	0.409
	0.200	0.523		0.200	0.432
	0.300	0.569		0.250	0.446
	0.400	0.601		0.300	0.460
	0.700	0.655		0.600	0.481
	0.100 -01	0.683		0.100 -01	0.526
	0.150	0.719		0.200	0.537
	0.300	0.767		0.100 +00	0.539
	0.400	0.775			
	0.100 +00	0.775			

TABLE NFC-5
TABULAR VALUES FOR FIG. NFC-5

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.150 -03	0.131 +04	100	0.800 -02	0.700 +04
	0.200	0.175		0.100 -01	0.725
	0.250	0.219		0.150	0.765
	0.300	0.263		0.190	0.770
	0.325	0.285	300	0.150 -03	0.126 +04
	0.400	0.300		0.200	0.168
	0.100 -02	0.395		0.250	0.210
	0.400	0.600		0.300	0.252
	0.500	0.640		0.345	0.290
	0.600	0.660			

TABLE NFC-6
TABULAR VALUES FOR FIG. NFC-6

Temp., °F	A	B, psi	Temp., °F	A	B, psi
200	0.301 -03	2,500	300	0.307 -03	2,500
	0.669	5,550		0.442	3,600
	0.10 -02	6,500		0.70	4,550
	0.20	8,200		0.10 -02	5,400
	0.40	10,000		0.20	7,200
	0.60	11,000		0.40	9,000
	0.80	11,850		0.60	10,000
	0.10 -01	12,400		0.80	10,600
	0.20	13,900		0.10 -01	11,100
	0.40	14,900		0.20	12,200
	0.60	15,000		0.40	12,800
				0.60	13,000

(a)

TABLE NFC-7
TABULAR VALUES FOR FIG. NFC-7

Temp., °F	A	B, psi	Temp., °F	A	B, psi
70	0.118 -04	0.100 +03	200	0.150	0.284
	0.100 -03	0.813		0.175	0.288
	0.123	0.100 +04		0.200	0.291
	0.200	0.162		0.350	0.305
	0.300	0.243		0.500	0.314
	0.400	0.288		0.750	0.324
	0.600	0.315		0.100 -01	0.331
	0.800	0.328		0.200	0.349
	0.100 -02	0.337		0.371	0.365
	0.125	0.345	400	0.123 -04	0.100 +03
	0.150	0.351		0.100 -03	0.753
	0.175	0.357		0.133	0.100 +04
	0.200	0.360		0.200	0.150
	0.350	0.378		0.300	0.204
	0.500	0.388		0.400	0.218
	0.750	0.400		0.600	0.233
	0.100 -01	0.409		0.800	0.241
	0.200	0.430		0.100 -02	0.247
	0.371	0.449		0.125	0.253
200	0.120 -04	0.100 +03		0.150	0.256
	0.100 -03	0.775		0.175	0.260
	0.129	0.100 +04		0.200	0.263
	0.200	0.154		0.350	0.276
	0.300	0.221		0.500	0.284
	0.400	0.240		0.750	0.293
	0.600	0.257		0.100 -01	0.299
	0.800	0.266		0.200	0.315
	0.100 -02	0.273		0.367	0.330
	0.125	0.280			

TABLE NFC-8
TABULAR VALUES FOR FIG. NFC-8

Temp., °F	A	B, psi	Temp., °F	A	B, psi
150	0.100 -04	0.915 +02	400	0.200 -02	0.906 +04
	0.585 -03	0.550 +04		0.300	0.992
	0.700	0.635		0.400	0.105 +05
	0.800	0.704		0.700	0.114
	0.100 -02	0.801		0.100 -01	0.118
	0.150	0.936		0.150	0.122
	0.200	0.101 +05		0.300	0.129
	0.300	0.109		0.400	0.131
	0.400	0.114		0.100 +00	0.131
	0.700	0.121	600	0.100 -04	0.530 +02
	0.100 -01	0.125		0.788 -03	0.422 +04
	0.150	0.128		0.900	0.475
	0.300	0.131		0.100 -02	0.513
	0.500	0.133		0.150	0.664
	0.100 +00	0.133		0.200	0.749
400	0.100 -04	0.767 +02		0.250	0.803
	0.585 -03	0.461 +04		0.400	0.913
	0.700	0.534		0.600	0.992
	0.800	0.598		0.100 -01	0.108 +05
	0.100 -02	0.691		0.250	0.121
	0.151	0.828		0.100 +00	0.121

TABLE NFN-1
TABULAR VALUES FOR FIG. NFN-1

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.153 +03	600	0.100 -01	0.592 +04
	0.197 -03	0.305 +04		0.184	0.655
	0.100 -02	0.404		0.100 +00	0.655
	0.100 -01	0.601	800	0.100 -04	0.132 +03
	0.165	0.655		0.187 -03	0.252 +04
	0.100 +00	0.655		0.100 -02	0.336
400	0.100 -04	0.142 +03		0.100 -01	0.498
	0.201 -03	0.291 +04		0.300	0.603
	0.100 -02	0.388		0.100 +00	0.603
	0.100 -01	0.592	1000	0.100 -04	0.125 +03
	0.184	0.655		0.162 -03	0.205 +04
	0.100 +00	0.655		0.100 -02	0.287
600	0.100 -04	0.142 +03		0.100 -01	0.444
	0.201 -03	0.291 +04		0.300	0.547
	0.100 -02	0.388		0.100 +00	0.547

TABLE NFN-2
TABULAR VALUES FOR FIG. NFN-2

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.153 +03	400	0.100 -04	0.143 +03
	0.257 -03	0.406 +04		0.276 -03	0.405 +04
	0.500	0.439		0.500	0.439
	0.178 -01	0.686		0.178 -01	0.686
	0.100 +00	0.686		0.100 +00	0.686
200	0.100 -04	0.148 +03	600	0.101 -04	0.138 +03
	0.265 -03	0.404 +04		0.291 -03	0.405 +04
	0.500	0.439		0.500	0.439
	0.178 -01	0.686		0.178 -01	0.686
	0.100 +00	0.686		0.100 +00	0.686

TABLE NFN-3
TABULAR VALUES FOR FIG. NFN-3

Temp., °F	A	B, psi	Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.132 +03	200	0.400 -01	0.120 +05	600	0.200 -01	0.105 +05
	0.523 -03	0.721 +04		0.100 +00	0.120		0.300	0.107
	0.700	0.771					0.100 +00	0.107
	0.100 -02	0.850	400	0.100 -04	0.132 +03	800	0.100 -04	0.110 +03
	0.200	0.988		0.423 -03	0.582 +04		0.500 -03	0.574 +04
	0.250	0.103 +05		0.700	0.652		0.100 -02	0.675
	0.300	0.107		0.100 -02	0.712		0.200	0.776
	0.500	0.116		0.150	0.776		0.300	0.842
	0.600	0.119		0.250	0.854		0.400	0.878
	0.700	0.121		0.300	0.882		0.600	0.937
	0.800	0.122		0.400	0.928		0.800	0.968
	0.100 -01	0.125		0.600	0.984		0.100 -01	0.993
	0.200	0.130		0.700	0.100 +05		0.150	0.103 +05
	0.250	0.132		0.900	0.103		0.200	0.105
	0.400	0.133		0.100 -01	0.104		0.300	0.107
	0.100 +00	0.133		0.150	0.107		0.100 +00	0.107
				0.200	0.110	900	0.100 -04	0.998 +02
				0.300	0.112		0.528 -03	0.565 +04
				0.100 +00	0.112		0.100 -02	0.661
200	0.100 -04	0.132 +03	600	0.100 -04	0.122 +03		0.200	0.773
	0.468 -03	0.643 +04		0.437 -03	0.562 +04		0.300	0.842
	0.600	0.677		0.500	0.574		0.400	0.878
	0.900	0.746		0.100 -02	0.675		0.600	0.937
	0.100 -02	0.767		0.200	0.776		0.800	0.963
	0.150	0.834		0.300	0.842		0.100 -01	0.993
	0.200	0.880		0.400	0.878		0.150	0.103 +05
	0.300	0.950		0.600	0.937		0.200	0.105
	0.400	0.995		0.800	0.968		0.300	0.107
	0.500	0.103 +05		0.100 -01	0.993		0.100 +00	0.107
	0.700	0.107		0.150	0.103 +05			
	0.100 -01	0.111						
	0.150	0.115						
	0.250	0.118						

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TABLE NFN-4
TABULAR VALUES FOR FIG. NFN-4

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.159 +03	600	0.400 -02	0.108 +05
	0.531 -03	0.865 +04		0.500	0.111
	0.100 -02	0.983		0.100 -01	0.117
	0.300	0.117 +05		0.300	0.123
	0.400	0.122		0.100 +00	0.123
	0.100 -01	0.133	800	0.100 -04	0.144 +03
	0.200	0.138		0.487 -03	0.722 +04
	0.100 +00	0.138		0.100 -02	0.834
200	0.100 -04	0.159 +03		0.400	0.102 +05
	0.494 -03	0.792 +04		0.150 -01	0.114
	0.100 -02	0.906		0.300	0.118
	0.200	0.102 +05		0.100 +00	0.118
	0.300	0.108	1000	0.100 -04	0.135 +03
	0.900	0.121		0.471 -03	0.652 +04
	0.200 -01	0.126		0.100 -02	0.760
	0.100 +00	0.128		0.200	0.845
400	0.100 -04	0.150 +03		0.500	0.941
	0.500 -03	0.769 +04	1100	0.100 -01	0.994
	0.100 -02	0.883		0.300	0.106 +05
	0.200	0.985		0.100 +00	0.106
	0.400	0.108 +05		0.100 -04	0.128 +03
	0.500	0.111		0.372 -03	0.486 +04
	0.100 -01	0.117		0.400	0.486
	0.300	0.123		0.100 +00	0.486
	0.100 +00	0.123	1200	0.100 -04	0.128 +03
600	0.100 -04	0.150 +03		0.250 -03	0.328 +04
	0.500 -03	0.769 +04		0.100 +00	0.328
	0.100 -02	0.883			
	0.200	0.985			

TABLE NFN-5
TABULAR VALUES FOR FIG. NFN-5

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.148 +03	400	0.250 -01	0.169 +05
	0.551 -03	0.850 +04		0.100 +00	0.169
	0.250 -02	0.157 +05	600-650	0.100 -04	0.137 +03
	0.300	0.167		0.312 -03	0.437 +04
	0.400	0.178		0.900	0.734
	0.500	0.185		0.150 -02	0.959
	0.700	0.191		0.200	0.108 +05
	0.100 -01	0.196		0.250	0.117
	0.500	0.213		0.300	0.122
	0.100 +00	0.213		0.400	0.130
400	0.100 -04	0.148 +03		0.500	0.135
	0.509 -03	0.783 +04		0.700	0.141
	0.400 -02	0.142 +05		0.100 -01	0.147
	0.500	0.149		0.150	0.151
	0.900	0.161		0.250	0.155
	0.150 -01	0.166		0.100 +00	0.155

TABLE NFN-6
TABULAR VALUES FOR FIG. NFN-6

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.161 +03	1100	0.100 -04	0.124 +03
	0.879 -03	0.146 +05		0.786 -03	0.101 +05
	0.100 -02	0.149		0.100 -02	0.104
	0.100 -01	0.199		0.200	0.110
	0.150	0.203		0.400	0.116
400	0.100 -04	0.146 +03	1200	0.100 -01	0.120
	0.847 -03	0.129 +05		0.200	0.123
	0.100 -02	0.131		0.600	0.126
	0.300	0.144		0.100 -04	0.116 +03
	0.100 -01	0.158		0.839 -03	0.994 +04
600	0.400	0.168		0.100 +00	0.994
	0.100 -04	0.142 +03	1300	0.100 -04	0.112 +03
	0.820 -03	0.121 +05		0.493 -03	0.567 +04
	0.100 -02	0.124		0.100 +00	0.567
	0.500	0.140			
	0.100 -01	0.145			
800	0.300	0.150			
	0.100 +00	0.155			
	0.100 -04	0.129 +03			
	0.851 -03	0.114 +05			
	0.100 -02	0.116			
	0.200	0.123			
	0.400	0.129			
	0.100 -01	0.135			
	0.500	0.144			

TABLE NFN-7
TABULAR VALUES FOR FIG. NFN-7

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.140 +03	400	0.100 -04	0.132 +03
	0.825 -03	0.121 +05		0.745 -03	0.104 +05
	0.100 -02	0.124		0.100 -02	0.106
	0.200	0.133		0.400	0.116
	0.600	0.151		0.100 -01	0.123
	0.100 -01	0.160		0.400	0.134
	0.200	0.173	700	0.100 -04	0.125 +03
	0.250	0.178		0.722 -03	0.953 +04
200	0.100 -04	0.143 +03		0.100 -02	0.967
	0.777 -03	0.113 +05		0.200	0.100 +05
	0.100 -02	0.116		0.800	0.108
	0.400	0.133		0.200 -01	0.113
	0.100 -01	0.144		0.600	0.120
	0.400	0.157			

TABLE NFN-8
TABULAR VALUES FOR FIG. NFN-8

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.143 +03	800	0.100 -04	0.122 +03
	0.779 -03	0.117 +05		0.687 -03	0.885 +04
	0.100 -02	0.121		0.100 -02	0.926
	0.200	0.133		0.200	0.980
	0.400	0.141		0.400	0.103 +05
	0.100 -01	0.148		0.100 -01	0.109
	0.400	0.154		0.250	0.114
	0.100 +00	0.154		0.100 +00	0.114
400	0.100 -04	0.132 +03	1000	0.100 -04	0.114 +03
	0.737 -03	0.102 +05		0.672 -03	0.801 +04
	0.100 -02	0.105		0.100 -02	0.852
	0.400	0.118		0.200	0.933
	0.100 -01	0.125		0.400	0.996
	0.300	0.131		0.100 -01	0.105 +05
	0.100 +00	0.131		0.300	0.111
				0.100 +00	0.111
600	0.100 -04	0.132 +03	1100	0.100 -04	0.114 +03
	0.697 -03	0.957 +04		0.526 -03	0.625 +04
	0.100 -02	0.986		0.100 -02	0.733
	0.300	0.109 +05		0.200	0.833
	0.100 -01	0.118		0.400	0.903
	0.300	0.125		0.100 -01	0.986
	0.100 +00	0.125		0.250	0.106 +05
				0.100 +00	0.106

TABLE NFN-9
TABULAR VALUES FOR FIG. NFN-9

Temp., °F	A	B, psi	Temp., °F	A	B, psi
70	1.00 -05	1.43 +02	1100	1.00 -05	1.19 +02
	7.02	1.00 +03		8.40	1.00 +03
	5.26 -04	7.50		3.78 -04	4.50
	8.80	8.10		7.84	5.05
	1.53 -03	8.85		1.64 -03	5.625
	3.54	1.00 +04		2.83	6.025
	6.96	1.10		5.02	6.50
	1.22 -02	1.20		9.91	7.075
	1.63	1.25		1.63 -02	7.50
	1.00 -01	1.25		1.00 -01	7.50
200	1.00 -05	1.40 +02	1400	1.00 -05	1.10 +02
	7.17	1.00 +03		9.13	1.00 +03
	4.95 -04	6.90		3.38 -04	3.70
	1.43 -03	7.97		5.63	4.00
	1.98	8.32		1.24 -03	4.475
	3.57	9.10		3.17	5.025
	5.28	9.575		6.99	5.50
	1.15 -02	1.06 +04		1.92 -02	6.15
	2.02	1.15		1.00 -01	6.15
	1.00 -01	1.15	1600	1.00 -05	9.7 +01
500	1.00 -05	1.34 +02		1.03 -04	1.00 +03
	7.49	1.00 +03		1.93	1.875
	4.34 -04	5.80		7.71	2.30
	7.30	6.35		1.28 -03	2.475
	1.18 -03	6.90		1.97	2.625
	3.46	8.00		4.52	2.975
	1.04 -02	9.025		8.12	3.25
	2.08	9.65		1.49 -02	3.55
	1.00 -01	9.65		1.00 -01	3.55
800	1.00 -05	1.27 +02	1650	1.00 -05	9.5 +01
	7.87	1.00 +03		1.05 -04	1.00 +03
	3.94 -04	5.00		1.39	1.325
	1.33 -03	6.15		6.00	1.60
	2.10	6.55		1.17 -03	1.775
	3.29	6.95		2.46	2.00
	6.43	7.50		6.62	2.40
	1.35 -02	8.05		8.33	2.50
	2.06	8.35		1.00 -01	2.50
	1.00 -01	8.35			

2011a SECTION II, PART D (CUSTOMARY)

TABLE NFN-10
TABULAR VALUES FOR FIG. NFN-10

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.150 +03	600	0.100 -04	0.134 +03
	0.897 -03	0.137 +05		0.692 -03	0.938 +04
	0.200 -02	0.159		0.100 -02	0.981
	0.400	0.175		0.200	0.108 +05
	0.600	0.181		0.400	0.117
	0.100 -01	0.189		0.600	0.122
	0.200	0.196		0.100 -01	0.128
	0.400	0.201		0.200	0.135
200			800	0.500	0.141
	0.100 -04	0.150 +03		0.100 -04	0.125 +03
	0.822 -03	0.125 +05		0.667 -03	0.863 +04
	0.200 -02	0.145		0.100 -02	0.908
	0.400	0.161		0.200	0.997
	0.600	0.168		0.400	0.108 +05
	0.100 -01	0.176		0.600	0.112
	0.200	0.182		0.100 -01	0.118
400	0.500	0.188		0.200	0.124
	0.100 -04	0.134 +03		0.600	0.130
	0.732 -03	0.100 +05	1000	0.100 -04	0.125 +03
	0.100 -02	0.104		0.655 -03	0.843 +04
	0.200	0.115		0.100 -02	0.883
	0.400	0.126		0.200	0.960
	0.600	0.132		0.400	0.103 +05
	0.100 -01	0.140		0.600	0.108
	0.200	0.148		0.100 -01	0.112
	0.600	0.156		0.200	0.117
				0.600	0.123

TABLE NFN-11
TABULAR VALUES FOR FIG. NFN-11

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.139 +03	400	0.100 -04	0.131 +03
	0.761 -03	0.108 +05		0.635 -03	0.846 +04
	0.200 -02	0.120		0.200 -02	0.948
	0.600	0.134		0.600	0.104 +05
	0.100 -01	0.140		0.100 -01	0.107
	0.200	0.148		0.200	0.111
	0.400	0.153	800 to 1000	0.300	0.113
200	0.100 -04	0.139 +03		0.100 -04	0.116 +03
	0.687 -03	0.970 +04		0.576 -03	0.680 +04
	0.200 -02	0.108 +05		0.200 -02	0.798
	0.600	0.119		0.600	0.896
	0.100 -01	0.123		0.100 -01	0.930
	0.200	0.129		0.200	0.961
	0.500	0.132		0.300	0.979
				0.500	0.993

TABLE NFN-12
TABULAR VALUES FOR FIG. NFN-12

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.200 -03	0.300 +04	600	0.300 -03	0.400 +04
	0.400	0.600		0.450	0.600
	0.800	0.900		0.600	0.650
	0.300 -02	0.140 +05		0.250 -02	0.990
	0.500	0.160		0.200 -01	0.140 +05
	0.100 -01	0.180	800	0.400 -03	0.500 +04
200	0.250 -03	0.360 +04		0.500	0.600
	0.800	0.800		0.200 -02	0.900
	0.100 -02	0.100 +05		0.300	0.100 +05
	0.500	0.140		0.700	0.120
	0.100 -01	0.160		0.150 -01	0.130
	0.250	0.170			
400	0.400 -03	0.550 +04			
	0.500	0.650			
	0.200 -02	0.100 +05			
	0.400	0.120			
	0.850	0.140			

TABLE NFN-13
TABULAR VALUES FOR FIG. NFN-13

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.200 -03	0.280 +04	800	0.250 -03	0.300 +04
	0.500	0.700		0.500	0.600
	0.100 -02	0.930		0.600	0.730
	0.300	0.120 +05		0.120 -02	0.800
	0.100 -01	0.140		0.500	0.900
	0.250	0.148		0.260 -01	0.960
200	0.200 -03	0.280 +04	1200	0.600 -03	0.650 +04
	0.500	0.700		0.200 -02	0.700
	0.100 -02	0.900		0.400	0.715
	0.180	0.100 +05		0.590	0.737
	0.700	0.120		0.850	0.755
	0.250 -01	0.130		0.115 -01	0.778
400	0.230 -03	0.300 +04		0.170	0.810
	0.500	0.650		0.300	0.835
	0.800	0.800			
	0.150 -02	0.900			
	0.400	0.100 +05			
	0.250 -01	0.113			

TABLE NFN-14
TABULAR VALUES FOR FIG. NFN-14

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.200 -03	0.280 +04	600	0.250 -03	0.343 +04
	0.800	0.118 +05		0.500	0.700
	0.100 -02	0.149		0.765	0.108 +05
	0.200	0.160		0.200 -02	0.120
	0.600	0.180		0.100 -01	0.140
	0.400 -01	0.200		0.500	0.150
200	0.200 -03	0.280 +04	1000	0.270 -03	0.350 +04
	0.800	0.118 +05		0.700	0.900
	0.920	0.137		0.150 -02	0.100 +05
	0.500 -02	0.160		0.650	0.120
	0.150 -01	0.170		0.300 -01	0.130
	0.400	0.180			
400	0.250 -03	0.343 +04			
	0.500	0.700			
	0.850	0.120 +05			
	0.400 -02	0.140			
	0.250 -01	0.160			

TABLE NFN-15
TABULAR VALUES FOR FIG. NFN-15

Temp. up to 100°F, E = 28.5 × 10 ⁶ psi		Temp. 200°F, E = 27.8 × 10 ⁶ psi		Temp. 400°F, E = 27.1 × 10 ⁶ psi		Temp. 600°F, E = 26.4 × 10 ⁶ psi		Temp. 800°F, E = 25.4 × 10 ⁶ psi		Temp. 1,000°F, E = 24.2 × 10 ⁶ psi	
A	B, psi	A	B, psi	A	B, psi	A	B, psi	A	B, psi	A	B, psi
0.00021	3,000	0.00022	3,000	0.00022	3,000	0.00023	3,000	0.00024	3,000	0.00025	3,000
0.00042	6,000	0.00043	6,000	0.00044	6,000	0.00045	6,000	0.00047	6,000	0.00050	6,000
0.00084	12,000 P.L.	0.00081	11,300 P.L.	0.00068	9,200 P.L.	0.00061	8,000 P.L.	0.00067	8,500 P.L.	0.00062	7,500 P.L.
0.001	12,200	0.001	11,600	0.0009	9,500	0.0008	8,900	0.0009	8,600	0.0009	7,700
0.0015	13,200	0.0015	12,300	0.0010	9,800	0.0010	9,200	0.001	8,800	0.001	7,800
0.002	13,990	0.002	12,800	0.0015	10,400	0.0015	9,400	0.0015	9,200	0.0015	8,300
0.003	14,700	0.003	13,400	0.002	10,800	0.002	10,000	0.002	9,500	0.002	8,600
0.004	15,300	0.004	14,000	0.003	11,500	0.003	10,400	0.0025	9,700	0.0025	8,900
0.006	16,000	0.006	14,200	0.004	11,990	0.004	10,600	0.003	9,900	0.003	9,100
0.008	16,300	0.008	14,500	0.006	12,200	0.006	10,900	0.004	10,100	0.004	9,400
0.010	16,700	0.010	14,700	0.008	12,500	0.008	11,300	0.006	10,300	0.006	9,700
0.020	17,500	0.015	15,000	0.010	12,800	0.010	11,400	0.008	10,600	0.008	9,900
0.030	17,700	0.020	15,100	0.015	13,100	0.015	11,600	0.010	10,700	0.010	10,100
0.040	17,800	0.040	15,500	0.020	13,300	0.020	11,700	0.015	10,800	0.015	10,300
0.060	17,800	0.060	15,600	0.030	13,500	0.030	11,700	0.020	10,900	0.020	10,600
0.080	17,800	0.080	15,600	0.040	13,700	0.040	11,700	0.030	11,000	0.040	10,800
0.100	17,800	0.100	15,600	0.060	13,700	0.060	11,700	0.040	11,000	0.060	10,800
...	...	...	...	0.080	13,700	0.080	11,700	0.060	11,000	0.080	10,800
...	...	...	...	0.100	13,700	0.080	11,700	0.060	11,000	0.100	10,800
...	...	...	...	...	...	...	...	0.080	11,000	...	...
...

TABLE NFN-16
TABULAR VALUES FOR FIG. NFN-16

Temp. up to 100°F, E = 31.1 × 10 ⁶ psi		Temp. 200°F, E = 30.9 × 10 ⁶ psi		Temp. 400°F, E = 30.1 × 10 ⁶ psi		Temp. 600°F, E = 29.3 × 10 ⁶ psi		Temp. 800°F, E = 28.4 × 10 ⁶ psi	
A	B, psi	A	B, psi	A	B, psi	A	B, psi	A	B, psi
0.00019	3,000	0.000195	3,000	0.0002	3,000	0.00020	3,000	0.00021	3,000
0.00038	6,000	0.00039	6,000	0.00040	6,000	0.00041	6,000	0.00042	6,000
0.00058	9,000	0.00058	9,000	0.00060	9,000	0.00061	9,000	0.00063	9,000
0.00077	12,000	0.00078	12,000	0.00080	12,000	0.00082	12,000	0.00085	12,000
0.00115	18,000	0.00114	17,600	0.00108	16,300	0.0010	15,100	0.0010	14,200
0.0012	19,000	0.0015	18,600	0.0015	16,800	0.0015	15,900	0.0015	15,600
0.0015	19,500	0.002	19,600	0.002	17,400	0.002	16,500	0.002	16,200
0.002	20,500	0.003	20,800	0.003	18,100	0.003	17,000	0.003	17,400
0.003	21,600	0.004	21,400	0.004	18,900	0.004	17,500	0.004	17,800
0.004	22,800	0.006	22,000	0.006	19,600	0.006	18,400	0.006	18,200
0.005	23,000	0.008	22,600	0.008	20,000	0.008	18,600	0.008	18,400
0.007	23,600	0.010	22,800	0.010	20,200	0.010	19,100	0.010	18,500
0.010	24,500	0.020	23,400	0.020	20,900	0.020	19,900	0.020	18,800
0.012	24,700	0.040	23,800	0.040	21,100	0.040	19,900	0.040	19,000
0.030	25,000	0.060	24,000	0.060	21,200	0.060	19,900	0.060	19,100
0.050	25,500	0.080	24,000	0.080	21,300	0.080	19,900	0.080	19,100
0.100	25,500	0.100	24,000	0.100	21,400	0.100	19,900	0.100	19,100

TABLE NFN-17
TABULAR VALUES FOR FIG. NFN-17

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.200 -03	0.300 +04	500	0.220 -03	0.300 +04
	0.930	0.140 +05		0.660	0.900
	0.108 -02	0.160		0.800	0.110 +05
	0.116	0.170		0.900	0.120
	0.125	0.180		0.950	0.125
	0.140	0.190		0.100 -02	0.130
	0.160	0.200		0.112	0.135
	0.182	0.210		0.125	0.140
	0.205	0.220		0.139	0.145
	0.240	0.230		0.155	0.150
	0.280	0.240		0.190	0.160
	0.350	0.250		0.250	0.170
	0.700	0.275		0.340	0.180
	0.200 -01	0.300		0.500	0.190
	0.100 +00	0.300		0.800	0.200
				0.150 -01	0.210
				0.100 +00	0.210
300	0.210 -03	0.300 +04	800 to 1200	0.250 -03	0.300 +04
	0.850	0.120 +05		0.800	0.900
	0.950	0.130		0.105 -02	0.110 +05
	0.105 -02	0.140		0.125	0.120
	0.125	0.150		0.135	0.125
	0.142	0.160		0.148	0.130
	0.165	0.170		0.163	0.135
	0.190	0.180		0.180	0.140
	0.230	0.190		0.200	0.145
	0.300	0.200		0.225	0.150
	0.400	0.210		0.280	0.160
	0.520	0.220		0.370	0.170
	0.100 -01	0.230		0.540	0.180
	0.400	0.240		0.830	0.190
	0.800	0.243		0.165 -01	0.200
	0.100 +00	0.243		0.300	0.205
				0.100 +00	0.205

TABLE NFN-18
TABULAR VALUES FOR FIG. NFN-18

Room Temp., E = 28.4 × 10 ⁶ psi		Temp. 200°F, E = 28.4 × 10 ⁶ psi		Temp. 350°F, E = 27.0 × 10 ⁶ psi		Temp. 500°F, E = 27.0 × 10 ⁶ psi		Temp. 650°F, E = 25.6 × 10 ⁶ psi		Temp. 800°F, E = 25.6 × 10 ⁶ psi	
A	B, psi	A	B, psi	A	B, psi	A	B, psi	A	B, psi	A	B, psi
0.0002	2,340	0.0002	2,840	0.0002	2,700	0.0002	2,700	0.0002	2,560	0.0002	2,560
0.00079	11,300	0.00068	9,700	0.00064	8,600	0.00057	7,700	0.00049	6,300	0.00045	5,800
0.0008	11,400	0.0007	9,800	0.0007	8,900	0.0006	7,800	0.0005	6,450	0.0005	6,000
0.0009	11,600	0.0008	10,200	0.0008	9,200	0.0007	8,100	0.0006	6,700	0.0006	6,400
0.001	12,000	0.0009	10,400	0.0009	9,400	0.0008	8,400	0.0007	7,000	0.0007	6,700
0.0015	12,800	0.001	10,600	0.001	9,700	0.0009	8,600	0.0008	7,300	0.0008	6,900
0.002	13,800	0.0015	11,600	0.0015	10,400	0.001	8,800	0.0009	7,500	0.0009	7,200
0.0025	14,100	0.002	12,300	0.002	11,000	0.0015	9,000	0.001	7,800	0.001	7,400
0.003	14,500	0.0025	12,900	0.0025	11,500	0.002	10,100	0.0015	8,500	0.0015	8,000
0.004	15,100	0.003	13,300	0.003	11,800	0.0025	10,300	0.002	9,000	0.002	8,400
0.005	15,600	0.004	13,900	0.004	12,300	0.003	10,600	0.0025	9,300	0.0025	8,800
0.006	16,000	0.005	14,300	0.005	12,600	0.004	11,000	0.003	9,500	0.003	9,000
0.007	16,400	0.006	14,600	0.006	12,800	0.005	11,300	0.004	10,000	0.004	9,200
0.008	16,500	0.007	14,900	0.007	13,000	0.006	11,400	0.005	10,300	0.005	9,500
0.009	16,600	0.008	15,000	0.008	13,100	0.007	11,500	0.006	10,400	0.006	9,600
0.01	16,800	0.009	15,100	0.009	13,200	0.008	11,600	0.007	10,500	0.007	9,700
0.015	17,100	0.01	15,200	0.01	13,300	0.009	11,700	0.008	10,600	0.008	9,800
0.02	17,400	0.015	15,400	0.015	13,500	0.01	11,800	0.009	10,700	0.009	9,900
0.025	17,500	0.02	15,500	0.02	13,700	0.015	12,000	0.01	10,700	0.01	10,000
0.03	17,500	0.025	15,600	0.025	13,700	0.02	12,100	0.015	11,000	0.015	10,100
0.04	17,500	0.03	15,600	0.03	13,700	0.025	12,200	0.02	11,000	0.02	10,200
0.05	17,500	0.04	15,600	0.04	13,800	0.03	12,300	0.025	11,200	0.025	10,300
0.06	17,500	0.05	15,600	0.05	13,800	0.04	12,500	0.03	11,200	0.03	10,400
0.07	17,500	0.06	15,600	0.06	13,800	0.05	12,600	0.04	11,400	0.04	10,500
...	...	0.07	15,600	0.07	13,800	0.06	12,600	0.05	11,400	0.05	10,500
...	...	...	...	0.08	13,800	0.07	12,600	0.06	11,400	0.06	10,500
...	...	...	...	0.09	13,800	0.08	12,600	...	...	...	...
...

TABLE NFN-19
TABULAR VALUES FOR FIG. NFN-19

Room Temp., E = 28.4 × 10 ⁶ psi		Temp. 200°F, E = 28.4 × 10 ⁶ psi		Temp. 350°F, E = 27.0 × 10 ⁶ psi		Temp. 500°F, E = 27.0 × 10 ⁶ psi		Temp. 650°F, E = 25.0 × 10 ⁶ psi		Temp. 800°F, E = 25.0 × 10 ⁶ psi	
A	B, psi	A	B, psi	A	B, psi	A	B, psi	A	B, psi	A	B, psi
0.0002	2,840	0.0002	2,840	0.0002	2,700	0.0002	2,700	0.0002	2,500	0.0002	2,500
0.00061	9,200	0.00056	8,000	0.00051	7,000	0.00045	6,100	0.0004	5,000	0.00037	4,650
0.0007	9,400	0.0006	8,100	0.0006	7,300	0.0005	6,200	0.0005	5,500	0.0004	4,750
0.0008	9,700	0.0007	8,500	0.0007	7,650	0.0006	6,600	0.0006	5,800	0.0005	5,100
0.0009	10,000	0.0008	8,750	0.0008	7,900	0.0007	6,900	0.0007	6,000	0.0006	5,150
0.0010	10,300	0.0009	9,000	0.0009	8,150	0.0008	7,200	0.0008	6,200	0.0007	5,600
0.0015	11,300	0.001	9,200	0.001	8,300	0.0009	7,400	0.0009	6,400	0.0008	5,850
0.002	12,000	0.0015	10,000	0.0015	9,000	0.001	7,500	0.001	6,500	0.0009	6,000
0.0025	12,500	0.002	10,500	0.002	9,300	0.0015	8,000	0.0015	7,100	0.001	6,150
0.003	12,900	0.0025	11,000	0.0025	9,700	0.002	8,400	0.002	7,600	0.0015	6,700
0.004	13,400	0.003	11,300	0.003	10,000	0.0025	8,600	0.0025	7,800	0.002	7,100
0.005	13,800	0.004	11,700	0.004	10,300	0.003	8,800	0.003	8,000	0.0025	7,300
0.006	13,950	0.005	12,000	0.005	10,500	0.004	9,100	0.004	8,300	0.003	7,500
0.007	14,050	0.006	12,300	0.006	10,700	0.005	9,400	0.005	8,500	0.004	7,800
0.008	14,300	0.007	12,400	0.007	10,800	0.006	9,500	0.006	8,650	0.005	8,000
0.009	14,400	0.008	12,500	0.008	10,850	0.007	9,600	0.007	8,800	0.006	8,150
0.010	14,500	0.009	12,600	0.009	10,900	0.008	9,700	0.008	8,900	0.007	8,300
0.015	14,900	0.010	12,700	0.01	10,950	0.009	9,800	0.009	9,000	0.008	8,400
0.020	15,000	0.015	12,900	0.015	11,200	0.01	9,900	0.01	9,050	0.009	8,500
0.025	15,000	0.020	13,200	0.02	11,400	0.015	10,000	0.015	9,200	0.010	8,600
0.03	15,025	0.025	13,300	0.025	11,400	0.02	10,100	0.02	9,500	0.015	8,700
0.04	15,075	0.03	13,300	0.03	11,400	0.025	10,100	0.025	9,500	0.02	8,800
0.05	15,100	0.04	13,300	0.04	11,400	0.03	10,200	0.03	9,500	0.025	9,000
0.06	15,125	0.05	13,300	0.05	11,400	0.04	10,300	0.04	9,500	0.03	9,300
0.07	15,175	0.06	13,300	0.06	11,400	0.05	10,300	0.04	9,500	0.04	9,300
0.08	15,200	0.07	13,300	0.07	11,400	0.06	10,300	0.05	9,500	0.04	9,300
...	...	0.08	13,300	0.08	11,400	0.07	10,400	0.06	9,500	...	...
...	...	0.09	13,300	0.08	11,400	0.07	10,400	0.06	9,500	...	...
...	...	0.09	13,300	...	...	0.08	10,400	0.07	9,500	...	...

TABLE NFN-20
TABULAR VALUES FOR FIG. NFN-20

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.132 -03	0.200 +04	400	0.143 -03	0.200 +04
	0.513	0.775		0.554	0.775
	0.600	0.790		0.600	0.790
	0.100 -02	0.900		0.100 -02	0.900
	0.300	0.119 +05		0.300	0.119 +05
	0.400	0.126		0.400	0.126
	0.500	0.132		0.500	0.132
	0.600	0.136		0.600	0.136
	0.700	0.140		0.700	0.140
	0.800	0.142		0.800	0.142
	0.900	0.144		0.900	0.144
	0.100 -01	0.145		0.100 -01	0.145
	0.150	0.149		0.150	0.149
	0.200	0.150		0.200	0.150

TABLE NFN-22
TABULAR VALUES FOR FIG. NFN-22

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.0002	3,000	800	0.004	14,800
	0.0009	13,400		0.005	14,900
	0.002	15,700		0.1	14,900
	0.003	17,000	1,200	0.00025	3,000
	0.004	17,700		0.001	12,000
	0.005	18,400		0.002	13,600
	0.007	19,200		0.003	14,300
	0.009	19,600		0.004	14,500
	0.012	20,000		0.005	14,600
	0.1	20,000		0.1	14,600
200	0.0002	3,000	1,350	0.00025	2,800
	0.0009	13,400		0.001	11,500
	0.002	15,700		0.002	13,000
	0.003	17,000		0.003	13,600
	0.004	17,700		0.004	14,000
	0.005	18,400		0.1	14,000
	0.1	18,400	1,400	0.00025	2,700
400	0.0002	2,750		0.001	11,300
	0.00095	13,600		0.1	11,300
	0.002	15,700	1,450	0.00025	2,700
	0.0025	16,300		0.001	8,500
	0.003	16,600		0.1	8,500
	0.004	16,900	1,500	0.00025	2,700
	0.1	16,900		0.001	6,100
800	0.0002	2,500		0.1	6,100
	0.00095	12,500			
	0.002	14,000			
	0.003	14,600			

TABLE NFN-23
TABULAR VALUES FOR FIG. NFN-23

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	1.006 -05	143	500	1.006 -05	134
	7.017	1,000		7.501	1,001
	3.509 -04	5,000		3.764 -04	5,000
	7.675	10,575		7.415	8,888
	8.842	11,750		8.892	9,875
	1.036 -03	12,925		1.091 -03	10,863
	1.251	14,100		1.375	11,850
	2.073	16,450		2.374	13,825
	4.108	18,800		4.470	15,800
	9.257	21,150		8.922	17,775
	6.037 -02	23,500		1.881 -02	19,750
	1.000 -01	23,500		1.000 -01	19,750
300	1.001 -05	138	650	1.005 -05	131
	7.279	1,001		7.695	1,000
	3.649 -04	5,004		3.870 -04	5,000
	7.470	9,383		7.502	8,708
	8.891	10,425		9.014	9,675
	1.082 -03	11,468		1.107 -03	10,643
	1.356	12,510		1.397	11,610
	2.332	14,595		2.407	13,545
	4.432	16,680		4.503	15,480
	9.009	19,360		8.906	17,415
	1.944 -02	20,850		1.860 -02	19,350
	1.000 -01	20,850		1.000 -01	19,350

TABLE NFN-24
TABULAR VALUES FOR FIG. NFN-24

Temp., °F	A	B, psi	Temp., °F	A	B, psi
70	1.00 -05	166	1,300	1.00 -05	125
	6.02	1,000		8.00	1,000
	7.48 -04	12,400		6.00 -04	7,500
	9.68	15,500		8.48	9,400
	1.20 -03	17,000		1.20 -03	10,600
	1.65	18,000		2.88	12,400
	5.00	20,000		1.00 -02	14,300
	2.30 -02	22,500		3.00	15,600
	1.00 -01	22,500		1.00 -01	15,600
300	1.00 -05	148	1,600	1.00 -05	111
	6.76	1,000		9.00	1,000
	6.00 -04	8,900		5.00 -04	5,600
	7.28	10,400		7.50	8,000
	9.24	12,000		1.20 -03	10,000
	1.28 -03	13,500		1.90	10,900
	3.22	15,800		3.00	11,500
	2.00 -02	19,800		1.00 -01	11,500
	1.00 -01	19,800			
600	1.00 -05	138	1,700	1.00 -05	100
	7.22	1,000		1.01 -04	1,000
	6.00 -04	8,300		5.00	5,000
	7.05	9,200		8.14	8,100
	9.50	10,600		1.00 -01	8,100
	1.30 -03	11,600			
	4.60	14,200			
	2.00 -02	16,400			
	1.00 -01	16,400			

TABLE NFN-25
TABULAR VALUES FOR FIG. NFN-25

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.150 +03	400	0.100 -04	0.143 +03
	0.100 -03	0.150 +04		0.100 -03	0.143 +04
	0.500	0.750		0.500	0.713
	0.750	0.112 +05		0.750	0.107 +05
	0.100 -02	0.143		0.990	0.135
	0.124	0.154		0.125 -02	0.146
	0.145	0.158		0.145	0.151
	0.174	0.163		0.173	0.155
	0.192	0.164		0.192	0.157
	0.295	0.170		0.288	0.163
	0.465	0.176		0.493	0.169
	0.677	0.180		0.663	0.172
	0.927	0.183		0.972	0.176
	0.188 -01	0.190		0.194 -01	0.183
	0.500	0.199		0.500	0.191
	0.100 +00	0.200		0.100 +00	0.191

TABLE NFN-26
TABULAR VALUES FOR FIG. NFN-26

Temp., °F	A	B, ksi	Temp., °F	A	B, ksi
Up to 100	1.00 -05	0.139	400	8.90 -03	18.0
	7.21	1.0		2.10 -02	19.8
	1.37 -03	19.0		1.00 -01	19.8
	2.00	20.0	600	1.00 -05	0.126
	5.00	22.0		7.92	1.0
	1.10 -02	24.0		9.50 -04	12.0
	2.40	26.0		2.00 -03	14.0
	1.00 -01	26.0		4.50	16.0
200	1.00 -05	0.136	800	1.20 -02	18.0
	7.38	1.0		2.10	19.0
	1.22 -03	16.6		1.00 -01	19.0
	2.10	18.0		1.00 -05	0.121
	4.70	20.0		8.27	1.0
	2.10 -02	24.1		9.27 -04	11.3
	1.00 -01	24.1		1.70 -03	13.0
400	1.00 -05	0.131		3.50	15.0
	7.63	1.0		8.50	17.0
	9.92 -04	13.0		2.00 -02	18.7
	2.20 -03	15.0		1.00 -01	18.7
	5.50	17.0			

TABLE NFN-27
TABULAR VALUES FOR FIG. NFN-27

Temp., °F	A	B, ksi	Temp., °F	A	B, ksi
Room temp.	1.00 -05	0.143	500	1.10 -03	9.5
	6.97	1.0		1.90	10.0
	8.01 -04	11.5		4.61	10.5
	1.00 -03	13.0		1.83 -02	11.0
	1.55	15.0		1.00 -01	11.5
	3.00	16.0	800	1.00 -05	0.128
	1.65 -02	17.0		7.81	1.0
	1.00 -01	17.5		5.47 -04	7.0
200	1.00 -05	0.141		7.60	8.0
	7.09	1.0		1.50 -03	9.0
	7.20 -04	10.0		3.11	9.5
	9.50	11.5		1.26 -02	10.0
	1.30 -03	12.5		1.00 -01	10.4
	2.20	13.5	1100	1.00 -05	0.121
	3.50	14.0		8.26	1.0
	7.60	14.5		4.96 -04	6.0
	2.68 -02	15.0		5.60	6.5
	1.00 -01	15.3		7.37	7.0
500	1.00 -05	0.114		2.20 -03	8.0
	7.43	1.0		2.57 -02	9.0
	6.15 -04	8.0		1.00 -01	9.2
	8.50	9.0			

TABLE NFT-1
TABULAR VALUES FOR FIG. NFT-1

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.775 +02	400	0.100 -04	0.700 +02
	0.116 -02	0.899 +04		0.788 -03	0.552 +04
	0.150	0.116 +05		0.900	0.590
	0.200	0.141		0.100 -02	0.622
	0.250	0.159		0.150	0.756
	0.300	0.171		0.200	0.845
	0.400	0.190		0.250	0.912
	0.500	0.203		0.300	0.971
	0.600	0.211		0.400	0.107 +05
	0.700	0.219		0.500	0.113
	0.800	0.225		0.600	0.119
	0.900	0.229		0.700	0.122
	0.100 -01	0.232		0.800	0.126
	0.150	0.245		0.900	0.130
	0.200	0.248		0.100 -01	0.132
	0.250	0.252		0.126	0.137
	0.100 +00	0.252		0.100 +00	0.137
200	0.100 -04	0.750 +02	600	0.100 -04	0.630 +02
	0.122 -02	0.915 +04		0.692 -03	0.436 +04
	0.150	0.106 +05		0.800	0.468
	0.200	0.120		0.100 -02	0.512
	0.250	0.132		0.150	0.587
	0.300	0.141		0.200	0.647
	0.400	0.158		0.250	0.692
	0.500	0.172		0.300	0.728
	0.600	0.181		0.400	0.774
	0.700	0.187		0.500	0.812
	0.800	0.192		0.700	0.855
	0.900	0.195		0.900	0.855
	0.100 -01	0.198		0.100 -01	0.855
	0.150	0.203		0.150	0.855
	0.200	0.206		0.100 +00	0.855
	0.250	0.208			
	0.300	0.209			
	0.100 +00	0.209			

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TABLE NFT-2
TABULAR VALUES FOR FIG. NFT-2

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.775 +02	400	0.100 -04	0.700 +02
	0.128 -02	0.992 +04		0.685 -03	0.480 +04
	0.150	0.110 +05		0.100 -02	0.595
	0.200	0.130		0.200	0.720
	0.300	0.149		0.400	0.866
	0.500	0.167		0.600	0.937
	0.800	0.178		0.900	0.963
	0.100 -01	0.181		0.100 -01	0.974
	0.200	0.188		0.130	0.980
	0.600	0.200		0.100 +00	0.980
	0.100 +00	0.200	600	0.100 -04	0.630 +02
200	0.100 -04	0.750 +02		0.641 -03	0.404 +04
	0.123 -02	0.923 +04		0.685	0.428
	0.150	0.102 +05		0.800	0.460
	0.200	0.113		0.100 -02	0.480
	0.400	0.134		0.200	0.499
	0.700	0.148		0.300	0.515
	0.100 -01	0.155		0.500	0.530
	0.200	0.163		0.800	0.540
	0.400	0.168		0.100 -01	0.550
	0.100 +00	0.168		0.150	0.560
				0.180	0.565
				0.100 +00	0.570

TABLE NFT-3
TABULAR VALUES FOR FIG. NFT-3

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.775 +02	400	0.100 -04	0.700 +02
	0.129 -03	0.100 +04		0.143 -03	0.100 +04
	0.187	0.145		0.207	0.145
	0.900	0.698		0.420	0.294
	0.250 -02	0.800		0.200 -02	0.360
	0.550	0.880		0.400	0.380
	0.110 -01	0.931		0.700	0.397
	0.200	0.974			
	0.300	0.998			
	0.400	0.100 +05			
200	0.100 -04	0.750 +02	600	0.100 -04	0.630 +02
	0.123 -02	0.923 +04		0.159 -03	0.100 +04
	0.150	0.102 +05		0.230	0.145
	0.200	0.113		0.330	0.208
	0.400	0.134		0.100 -02	0.230
	0.700	0.148		0.150	0.240
	0.100 -01	0.155		0.250	0.251
	0.200	0.163		0.400	0.260
	0.400	0.168		0.700	0.265
	0.100 +00	0.168		0.100 -01	0.265
400	0.100 -04	0.775 +02		0.200	0.265
	0.128 -02	0.992 +04		0.300	0.265
	0.150	0.110 +05		0.400	0.265
	0.200	0.130		0.100 +00	0.265
	0.300	0.149			
	0.500	0.167			
	0.800	0.178			
	0.100 -01	0.181			
	0.200	0.188			
	0.600	0.200			
	0.100 +00	0.200			

TABLE NFT-4
TABULAR VALUES FOR FIG. NFT-4

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.833 +02	400	0.100 -04	0.694 +02
	0.120 -03	0.100 +04		0.144 -03	0.100 +04
	0.179	0.145		0.209	0.145
	0.735	0.600		0.745	0.517
	0.977	0.800		0.994	0.689
	0.124 -02	0.104 +05		0.125 -02	0.861
	0.149	0.125		0.146	0.100 +05
	0.173	0.142		0.167	0.114
	0.198	0.160		0.189	0.127
	0.350	0.225		0.342	0.192
	0.499	0.270		0.497	0.228
	0.749	0.310		0.749	0.249
	0.100 -01	0.349		0.993	0.249
	0.200	0.350		0.200 -01	0.249
	0.100 +00	0.350		0.100 +00	0.249
200	0.100 -04	0.763 +02	600	0.100 -04	0.621 +02
	0.131 -03	0.100 +04		0.161 -03	0.100 +04
	0.190	0.145		0.233	0.145
	0.781	0.600		0.748	0.462
	0.100 -02	0.762		0.992	0.610
	0.125	0.945		0.122 -02	0.743
	0.149	0.113 +05		0.146	0.875
	0.173	0.129		0.172	0.100 +05
	0.198	0.144		0.199	0.113
	0.346	0.210		0.342	0.156
	0.494	0.248		0.500	0.184
	0.746	0.287		0.748	0.207
	0.991	0.306		0.997	0.207
	0.200 -01	0.306		0.200 -01	0.207
	0.100 +00	0.306		0.100 +00	0.207

TABLE NFT-5
TABULAR VALUES FOR FIG. NFT-5

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -03	0.774 +03	400	0.100 -03	0.700 +03
	0.129	0.100 +04		0.143	0.100 +04
	0.188	0.145		0.207	0.145
	0.998	0.769		0.244	0.171
	0.125 -02	0.955		0.295	0.207
	0.150	0.113 +05		0.347	0.243
	0.174	0.129		0.398	0.278
	0.200	0.145		0.449	0.314
	0.348	0.212		0.757	0.529
	0.470	0.245		0.213 -02	0.140 +05
	0.750	0.250		0.265	0.155
	0.100 -01	0.250		0.750	0.200
	0.200	0.250		0.200 -01	0.223
	0.500	0.250		0.500	0.223
	0.100 +00	0.250		0.100 +00	0.223
200	0.100 -03	0.749 +03	600	0.100 -03	0.629 +03
	0.133	0.100 +04		0.159	0.100 +04
	0.193	0.145		0.230	0.145
	0.298	0.224		0.549	0.346
	0.364	0.273		0.680	0.428
	0.430	0.323		0.810	0.511
	0.497	0.372		0.941	0.593
	0.563	0.422		0.107 -02	0.675
	0.961	0.719		0.186	0.117 +05
	0.136 -02	0.100 +05		0.265	0.140
	0.206	0.145		0.750	0.174
	0.380	0.201		0.100 -01	0.174
	0.200 -01	0.241		0.200	0.174
	0.500	0.241		0.500	0.174
	0.100 +00	0.241		0.100 +00	0.174

TABLE NFZ-1
TABULAR VALUES FOR FIG. NFZ-1

Temp., °F	A	B, psi	Temp., °F	A	B, psi
100	0.100 -04	0.711 +02	500	0.100 -04	0.575 +02
	0.108 -02	0.841 +04		0.383 -03	0.223 +04
	0.200	0.101 +05		0.100 -02	0.311
	0.400	0.118		0.300	0.431
	0.600	0.128		0.900	0.548
	0.100 -01	0.139	700	0.100 -04	0.505 +02
	0.150	0.145		0.293 -03	0.152 +04
300	0.100 -04	0.659 +02		0.100 -02	0.214
	0.672 -03	0.467 +04		0.300	0.289
	0.100 -02	0.559		0.900	0.375
	0.150	0.641			
	0.200	0.686			
	0.400	0.772			
	0.600	0.811			
	0.100 -01	0.845			
	0.200	0.886			
	0.400	0.911			

TABLE NFZ-2
TABULAR VALUES FOR FIG. NFZ-2

Temp. up to 100°F, E = 14.6×10^6 psi		Temp. 300°F, E = 12.5×10^6 psi		Temp. 500°F, E = 10.9×10^6 psi		Temp. 700°F, E = 9.7×10^6 psi	
A	B, psi	A	B, psi	A	B, psi	A	B, psi
0.00002	146	0.00002	125	0.00002	109	0.00002	97
0.00289	21,097	0.00196	12,250	0.00151	8,230	0.00126	6,111
0.003	21,500	0.0025	12,400	0.002	9,500	0.0015	6,300
0.004	22,200	0.003	13,000	0.0025	9,800	0.0020	6,600
0.005	22,800	0.004	13,600	0.003	10,100	0.0025	6,800
0.006	23,000	0.005	14,000	0.004	10,400	0.003	6,900
0.007	23,700	0.006	14,400	0.005	10,700	0.004	7,100
0.008	24,000	0.007	14,600	0.006	10,800	0.005	7,200
0.009	24,100	0.008	14,900	0.007	10,900	0.006	7,400
0.01	24,200	0.009	15,100	0.008	11,000	0.007	7,500
0.015	24,500	0.01	15,200	0.009	11,050	0.008	7,600
0.02	25,000	0.015	15,400	0.01	11,100	0.009	7,700
0.03	25,100	0.02	15,500	0.015	11,150	0.01	7,800
0.035	25,300	0.03	15,600	0.020	11,200	0.012	7,820
...	...	0.04	15,700	0.030	11,250
...	...	0.045	15,800	0.040	11,300
...	0.050	11,300

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MANDATORY APPENDICES

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 hr. At 1500°F and below, $F_{avg} = 0.67$. Above 1500°F, it is determined from the slope of the log time-to-rupture versus log stress plot at 100,000 hr 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 hr

S_{Ravg} = average stress to cause rupture at the end of 100,000 hr

S_{Rmin} = minimum stress to cause rupture at the end of 100,000 hr

S_T = specified minimum tensile strength at room temperature, ksi

S_Y = specified minimum yield strength at room temperature, ksi

n = a negative number equal to $\Delta \log$ time-to-rupture divided by $\Delta \log$ stress at 100,000 hr

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 materials and specific nonferrous alloys. 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 hr
- (2) $100F_{avg}\%$ of the average stress to cause rupture at the end of 100,000 hr
- (3) 80% of the minimum stress to cause rupture at the end of 100,000 hr

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					Creep Rate	
	Tensile Strength	Yield Strength	Tensile Strength		Yield Strength	Stress Rupture			
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)]	$F_{avg} S_{R\ avg}$	$0.8 S_{R\ min}$	$1.0 S_c$
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)]	$(F_{avg} \times 0.85) S_{R\ avg}$	$(0.8 \times 0.85) S_{R\ min}$	$0.85 S_c$

NOTE:

(1) Two sets of allowable stress values may be provided in Table 1A for austenitic materials and in Table 1B for specific nonferrous alloys. The lower values are not specifically identified by a footnote. These lower values do not exceed two-thirds of the minimum 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 minimum 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 design stress intensity values for nonnuclear 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 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 hr. At 1500°F and below, $F_{\text{avg}} = 0.67$. Above 1500°F, it is determined from the slope of the log time-to-rupture versus log stress plot at 100,000 hr such that $\log F_{\text{avg}} = 1/n$, 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, ksi

S_Y = specified minimum yield strength at room temperature, ksi

n = a negative number equal to Δ log time-to-rupture divided by Δ log stress at 100,000 hr

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 and specific nonferrous materials, 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).

(e) 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 $1.1 S_T R_T$.

(f) 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 hr;
- (2) $100 F_{avg} \%$ of the average stress to cause rupture at the end of 100,000 hr;
- (3) 80% of the minimum stress to cause rupture at the end of 100,000 hr.

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 FOR USE WITH PART 5
AND ANNEX 5.F OF SECTION VIII,
DIVISION 2 AND SECTION III,
SUBSECTIONS NB AND WB**

The design stress intensity value shown at any temperature in Table 4 is the least of the following, with credit being granted for enhancement of properties by heat treatment or by strain hardening:

- (a) one-third of the specified minimum yield strength at room temperature;
- (b) one-third of the yield strength at temperature.

TABLE 2-100(a)
CRITERIA FOR ESTABLISHING DESIGN STRESS INTENSITY VALUES FOR TABLES 2A AND 2B

Product/Material	Room Temperature and Below		Above Room Temperature			
	Tensile Strength	Yield Strength	Tensile Strength		Yield Strength	
Wrought or cast, ferrous and nonferrous	$\frac{S_T}{3}$	$\frac{2}{3} S_Y$	$\frac{S_T}{3}$	$\frac{1.1}{3} S_T R_T$	$\frac{2}{3} S_Y$	$\frac{2}{3} S_Y R_Y$ 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 materials in Table 2A and for specific nonferrous alloys in Table 2B, the design stress intensity values 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	$\frac{S_T}{4}$	$\frac{2}{3} S_Y$	$\frac{S_T}{4}$	$\frac{1.1}{4} S_{TRT}$	$\frac{2}{3} S_Y$	$\frac{2}{3} S_Y R_Y$	$F_{avg} S_{R\ avg}$	$0.8 S_{R\ min}$	$1.0 S_c$
Bolting, with strength enhanced by heat treatment or strain hardening, ferrous and nonferrous [Note (1)]	$\frac{S_T}{5}$	$\frac{S_Y}{4}$	$\frac{1}{5} S_T$	$\frac{1.1}{4} S_{TRT}$	$\frac{1}{4} S_Y$	$\frac{2}{3} S_Y R_Y$	$F_{avg} S_{R\ avg}$	$0.8 S_{R\ min}$	$1.0 S_c$

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 DESIGN STRESS INTENSITY VALUES FOR TABLE 4

Product/Material	Tensile Strength		Yield Strength	
	NA	NA	$\frac{1}{3} S_Y$	$\frac{1}{3} S_Y R_Y$
Bolting, with strength enhanced by heat treatment or strain hardening	NA	NA	$\frac{1}{3} S_Y$	$\frac{1}{3} S_Y R_Y$

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. These charts are pseudo stress-strain curves for the various materials in the Code and incorporate the moduli of elasticity and allowable stress limits at temperature of the materials. Entrance into the charts is via the Factor A , abscissa, which, in addition to being a strain term, is also 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, Fig. G, applies to all materials and is used in conjunction with the materials charts in Subpart 3.

3-300

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 formulas 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* [3-800(a)], *Theory of Plates and Shells* [3-800(b)], and *Theory of Elastic Stability* [3-800(c)]; a group of papers reprinted as Section 9 in ASME's publication *Pressure Vessel and Piping Design — Collected Papers 1927–1959* [3-800(d)]; and Sturm's 1941 University of Illinois Bulletin 329, *A Study of the Collapsing Pressure of Thin Walled Cylinders* [3-800(e)]. The format for the charts in Subpart 3 is detailed in Sturm's University of Illinois Bulletin 329 [3-800(e)], with additional comments in Bergman's 1952 paper, *The New Type Code Chart for the Design of Vessels Under External Pressure* [included in 3-800(d)]. 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* [3-800(f)]. The Michalopoulos paper [3-800(g)] contains a new mathematical approach to the development of external pressure charts, using stress-strain curve fitting techniques rather than the graphical approach used in the recent charts for the design of vessels under external pressure.

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, Fig. G,¹ for components is used in conjunction with the appropriate material chart and a formula for B to obtain

¹ This chart is used only for this condition and is only applicable to uniform external pressure.

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 3-800(e), 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 formulas 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 formula 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.*² A formula 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 formula 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 1 — Subsection NH, Appendix T, T-1500. 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 Fig. 3-500.1 for a cylinder under external pressure, Fig. 3-500.2 for a cylinder under axial compression, or Fig. 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 Figs. 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 3-800(h)]; the design limits of Subsection NH; and 100,000 hr 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

² This applies to unstiffened cylinders.

FIG. 3-500.1 TEMPERATURE LIMITS FOR APPLICATION OF SECTION II EXTERNAL PRESSURE CHARTS FOR CYLINDER UNDER EXTERNAL PRESSURE

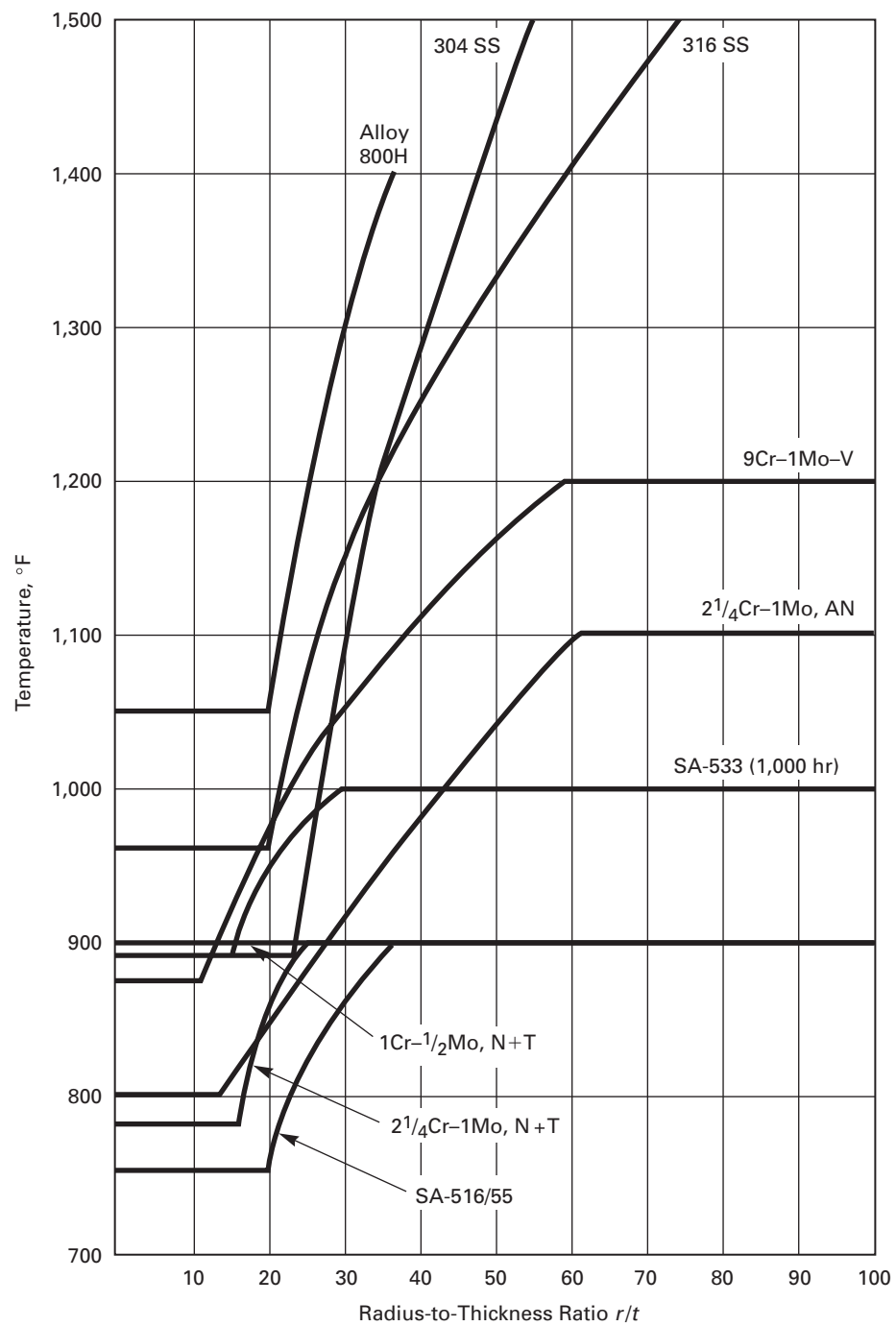
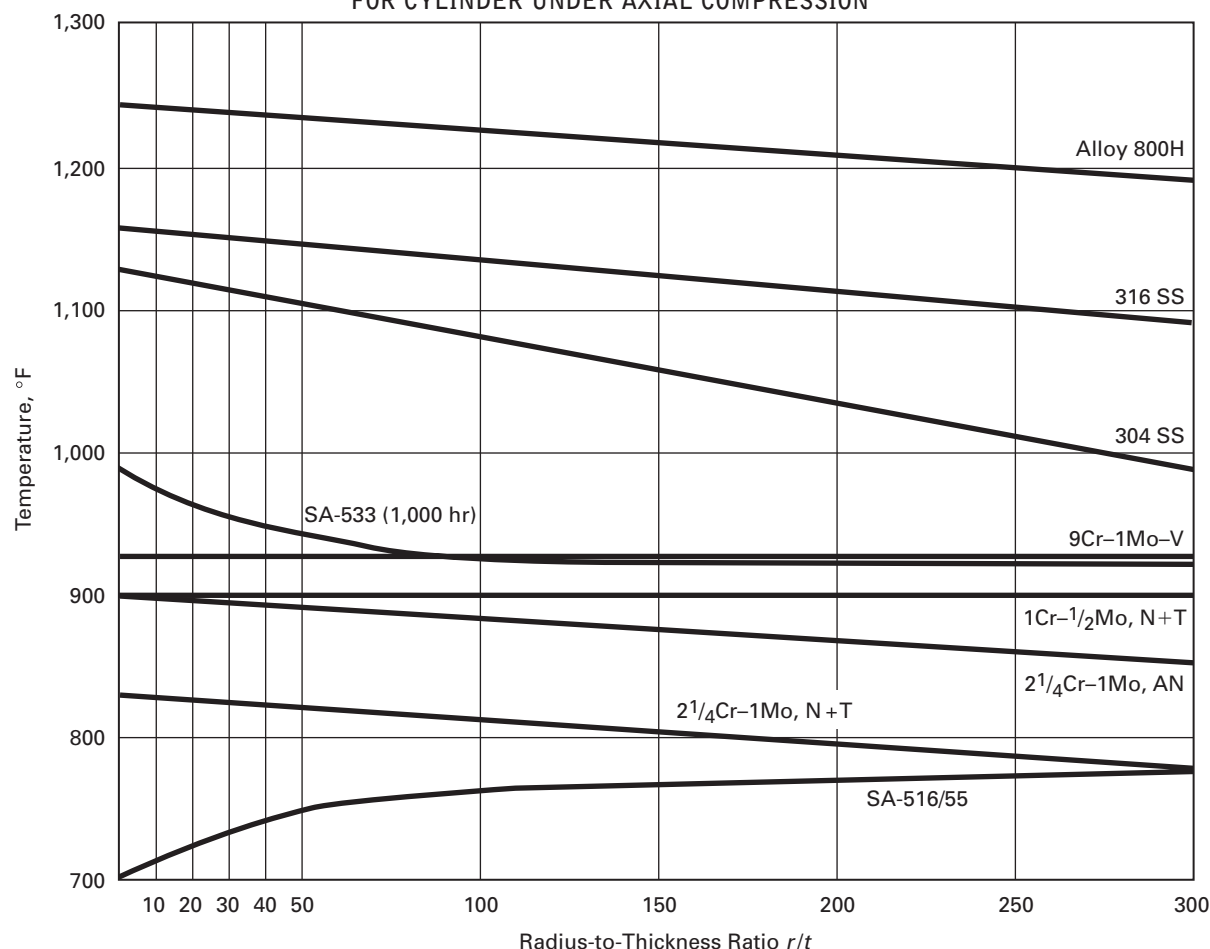


FIG. 3-500.2 TEMPERATURE LIMITS FOR APPLICATION OF SECTION II EXTERNAL PRESSURE CHARTS FOR CYLINDER UNDER AXIAL COMPRESSION



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 hr

(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 hr

(4) 100% of the allowable stress in tension

(c) For cylindrical shells under axial compression, the allowable stress is the least of

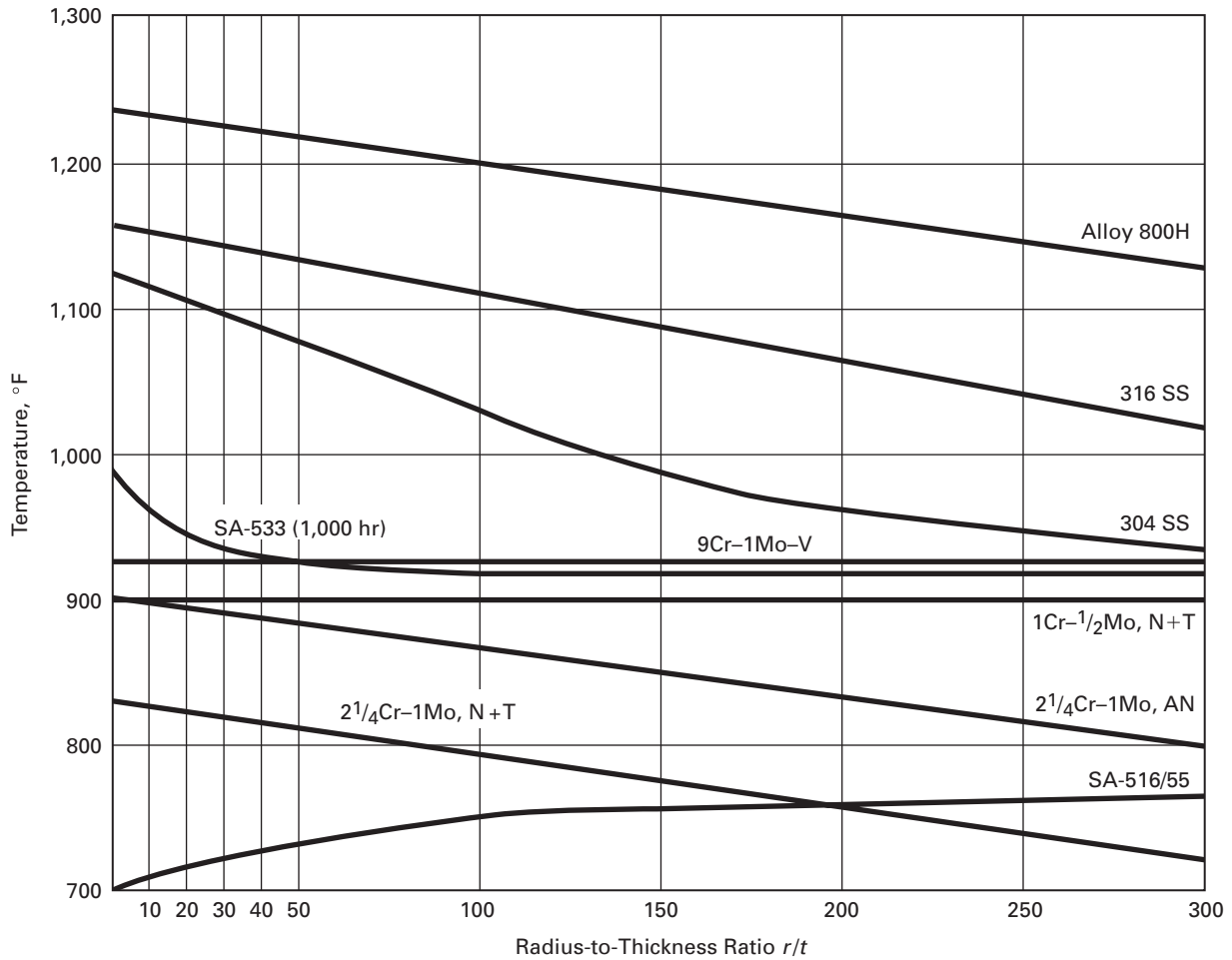
(1) 50% of the assumed critical buckling stress as defined in 3-500(c)(1) but limited by allowable tolerances defined in 3-500(c)(4)

(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 hr

(4) 100% of the allowable stress in tension

FIG. 3-500.3 TEMPERATURE LIMITS FOR APPLICATION OF SECTION II EXTERNAL PRESSURE CHARTS FOR SPHERE UNDER EXTERNAL PRESSURE



3-700 RESPONSIBLE COMMITTEE FOR CHART DEVELOPMENT

The external pressure charts and tabular values in Subpart 3 are developed by the Subgroup on External Pressure (Subcommittee on Design/Subcommittee on Materials). The charts and tabulated values are established by the Committee only.

3-800 REFERENCES

- (a) Timoshenko, S. and Goodier, J. N., *Theory of Elasticity*, McGraw-Hill Book Co., New York, 1951
- (b) Timoshenko, S. and Woinowsky-Krieger, S., *Theory of Plates and Shells*, McGraw-Hill Book Co., New York, 1959

(c) Timoshenko, S. and Gere, J. M., *Theory of Elastic Stability*, McGraw-Hill Book Co., New York, 1961

(d) *Pressure Vessel and Piping Design — Collected Papers 1927–1959*, ASME, New York, 1960

(e) Sturm, R. G., *A Study of the Collapsing Pressure of Thin Walled Cylinders*, University of Illinois Bulletin 329, 1941

(f) Sturm, R. G. and O'Brien, H. L., *Computing Strength of Vessels Subjected to External Pressure*, Transactions of the ASME, May 1947

(g) Michalopoulos, E., *A New Method for the Development of External Pressure Charts*, ASME PVP-Vol. 312-2, pp. 293–301, 1995

(h) Griffin, D. S., *External Pressure: Effect of Initial Imperfections and Temperature Limits*, WRC Bulletin 443

(a)

MANDATORY APPENDIX 4
SUBMITTAL OF TECHNICAL INQUIRIES TO THE
BOILER AND PRESSURE VESSEL COMMITTEE

This material has been moved to the front matter and shall be considered as mandatory.

MANDATORY APPENDIX 5

GUIDELINE ON THE APPROVAL OF NEW MATERIALS UNDER THE ASME BOILER AND PRESSURE VESSEL CODE

Code Policy. It is the policy of the ASME Boiler and Pressure Vessel Committee to adopt for inclusion in Section II only such specifications as have been adopted by the American Society for Testing and Materials (ASTM), by the American Welding Society (AWS), and by other recognized national or international organizations.

It is expected that requests for Code approval will normally be for materials for which there is a recognized national or international specification. For materials made to a recognized national or international specification other than those of ASTM or AWS, the inquirer shall give notice to the standards developing organization that a request has been made to ASME for adoption of their specification under the ASME Code and shall request that the organization grant ASME permission to reprint the specification. For other materials, a request shall be made to ASTM, AWS, or a recognized national or international organization to develop a specification that can be presented to the Code Committee.

It is the policy of the ASME Boiler and Pressure Vessel Committee to consider requests to adopt new materials only from boiler, pressure vessel, or nuclear power plant component Manufacturers or users. Further, such requests should be for materials for which there is a reasonable expectation of use in a boiler, pressure vessel, or nuclear power plant component constructed to the rules of one of the Sections of this Code. Requests for new materials shall be accompanied by a communication from an ASME Certificate Holder, an end user, or an organization that specifies materials and contracts with Certificate Holders for the construction of products to the rules of one of the Sections of this Code. The letter shall state the inquirer's name and status as one of these three types of organizations.

Application. The inquirer shall identify to the Committee the Section or Sections and Divisions of the Code in which the new material is to be incorporated, the temperature range of application, whether cyclic service is to be considered, and whether external pressure service is to be considered. The inquirer shall identify all product

forms, size ranges, and specifications for which incorporation is desired.

Mechanical Properties. Together with the specification for the material, the inquirer shall furnish the Committee with adequate data on which to base design values for inclusion in the applicable tables. The data shall include values of ultimate tensile strength, yield strength, reduction of area, and elongation, at 100°F intervals, from room temperature to 100°F above the maximum intended use temperature, unless the maximum intended use temperature does not exceed 100°F. Any heat treatment that is required to produce the mechanical properties should be fully described.

If adoption is desired at temperatures at which time-dependent behavior may be expected to control design values, stress-rupture and creep rate data for these time-dependent properties shall be provided, starting at temperatures about 50°F below the temperature where time-dependent properties may govern (see Appendix 1 of Section II, Part D) and extending to about 100°F above the maximum intended use temperature. The longest rupture time at each test temperature must be in excess of 6,000 hr and the shortest about 100 hr, with at least three additional tests at stresses selected to provide rupture times nominally equally spaced in log (time); i.e., times nominally of 100, 300, 800, 2,200, and 6,000 hr at each test temperature. Obviously, longer times and additional tests are beneficial. The interval between successive test temperatures shall be chosen such that rupture lives shall not differ by more than a factor of about 10 at any given stress for two adjacent temperatures. In general, test temperatures should be in about 50°F intervals if maximum test times are no longer than 6,000 hr. The goal of the testing is to facilitate data analysis to estimate the average and minimum stresses for rupture in 100,000 hr and an average creep rate of 10^{-5} %/hr for each temperature where design stresses are established. Alternative test plans that deviate from the prior description but achieve the overall objective may be considered.

Minimum creep rate data shall be provided over the same range of temperatures as above, with the lowest stress

at each temperature selected to achieve a minimum creep rate of 1.0 to 2.0×10^{-4} %/hr or less. Creep rate data may be obtained in the course of stress-rupture testing or may be obtained on additional specimens. 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 stress-rupture data. Submission of creep curves for evaluation of creep rate behavior is acceptable and encouraged.

For materials that will be used in welded applications, sufficient time-dependent data shall be provided for weldments and filler metals to allow ASME to assess the properties in comparison with the base material. In the time-dependent range, this includes providing stress-rupture data for specimen tests in excess of 6,000 hr at each temperature and for each welding process. In addition, minimum creep rate data on filler metals shall also be provided to rates below 1.0 to 2.0×10^{-4} %/hr.

If adoption at temperatures below room temperature is requested, and if it is desired to take design advantage of increased strength at lower temperatures, data on the time-independent properties shall be provided at 100°F intervals to and including the lowest intended use temperature.

Notch toughness data shall be provided for materials for which Code toughness rules would be expected to apply. The data shall include test results for the intended lowest service metal temperature and for the range of material thicknesses desired. For welded construction, the notch toughness data shall include the results of Code toughness tests for weld metal and heat-affected zone for weldments made by the intended welding processes.

If the material is to be used in components that operate under external pressure, stress-strain curves (tension or compression) shall be furnished, at 100°F intervals over the range of design temperatures desired. Stress-strain information in the form of diagrams and digitized data shall be provided up to at least 1% strain. Digitized stress-strain data shall be in intervals not greater than 0.1% strain, except a smaller interval may be necessary in the area above the proportional limit in the region where the slope of the curve changes most drastically. In addition, the yield strength, modulus of elasticity, and proportional limit shall be identified. The stress-strain curve (not load versus extension) shall be determined using a Class B-2 or better accuracy extensometer as defined in ASTM E 83. Numerical data, when available, should be submitted. The data should include the original cross-sectional area of the test specimen and stress-strain curves with units marked on them.

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 shall also be furnished over the range of design temperatures desired.

In general, for all mechanical properties, data shall be provided from at least three heats of material meeting all of the requirements of a specification for at least one product form for which adoption is desired, for each test at each test temperature. When adoption for both cast and wrought product forms is desired, data from at least three heats each of a wrought and of a cast product form shall be submitted. It is desired that the data represent all product forms for which adoption is desired. For product forms for which the properties may be size dependent, data from products of different sizes, including the largest size for which adoption is desired, shall be provided.

Test methods employed shall be those referenced in or by the material specifications, or shall be appropriate ASTM test methods or recommended practices for the properties tested.

Information describing service experience in the temperature range contemplated will be useful to the Committee.

Other Properties. The inquirer shall furnish to the Committee adequate data necessary to establish values for coefficient of thermal expansion, thermal conductivity and diffusivity, Young's modulus, shear modulus, and Poisson's ratio, when the Construction Code in which adoption is desired requires explicit consideration of these properties. Data shall be provided over the range of temperatures for which the material is to be used.

Weldability. The inquirer shall furnish complete data on the weldability of material intended for welding, including data on procedure qualification tests made in accordance with the requirements of Section IX. Welding tests shall be made over the full range of thickness in which the material is to be used. Pertinent information, such as postweld heat treatment required, susceptibility to air hardening, effect of welding procedure and heat-affected zone and weld metal notch toughness, and the amount of experience in welding the material shall be given.

Physical Changes. For new materials, it is important to know the structural stability characteristics and the degree of retention of properties with exposure at temperature. The influence of fabrication practices, such as forming, welding, and thermal treatment, on the mechanical properties, ductility, and microstructure of the material are important, particularly where degradation in properties may occur. Where particular temperature ranges of exposure or heat treatment, cooling rates, combinations of mechanical working and thermal treatments, fabrication practices, exposure to particular environments, etc., cause significant changes in the mechanical properties, microstructure, resistance to brittle fracture, etc., it is of prime importance to call attention to those conditions that should be avoided in service or in manufacture of parts or vessels from the material.

Requests for Additional Data. The Committee may request additional data, including data on properties or

material behavior not explicitly treated in the Construction Code in which adoption is desired.

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 by each inquiry. The Committee reserves the right to request additional data and application information when considering new materials.

- (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, and has a copy been submitted to the Committee? 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 Division coverage been identified?
- (e) Has the material been defined as ferrous or nonferrous and has the application (product forms, size range, and specification) been defined?
- (f) Has the range (maximum/minimum) of temperature application been defined?
- (g) Has mechanical property data been submitted (ultimate tensile strength, yield strength, reduction of area, and elongation at 100°F intervals, from room temperature to 100°F above the maximum intended use temperature for three heats of appropriate product forms and sizes)?
- (h) If requested temperatures of coverage are above those at which time-dependent properties begin to govern design values, has appropriate time-dependent property data for base metal, weld metal, and weldments been submitted?
- (i) If coverage below room temperature is requested, has appropriate mechanical property data below room temperature been submitted?
- (j) Have toughness considerations required by the construction Code been defined and has appropriate data been submitted?
- (k) Have external pressure considerations been defined and have stress-strain curves been submitted for the establishment of external pressure charts?
- (l) Have cyclic service considerations and service limits been defined and has appropriate fatigue data been submitted?
- (m) Has physical properties data (coefficient of thermal expansion, thermal conductivity and diffusivity, Young's modulus, shear modulus, Poisson's ratio) been submitted?
- (n) Have welding requirements been defined and has procedure qualification test data been submitted?
- (o) Has influence of fabrication practices on material properties been defined?

Requirements for Requests for ASME Acceptance of Material Specifications of Recognized National or International Organizations Other Than ASTM or AWS. The Committee will consider only requests for specifications in the English language and in U.S. or SI/metric units. The Committee will consider accepting specifications of recognized national or international organizations, such as, but not limited to, American Petroleum Institute (API), ASTM, AWS, Canadian Standards Association (CSA), European Committee for Standardization (CEN), and Japanese Standards Association (JIS). Material specifications of other than national or international organizations, such as those of material producers and suppliers, will not be considered for acceptance.

Requirements for Recognized National or International Specifications. Acceptable material specifications will be identified by date or edition. 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 must be contained in a material specification for which acceptance is being requested include such items as name of 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.

Publication of Recognized National or International Specifications. Specifications for which ASME has not been given permission to publish 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 documents will be maintained in Nonmandatory Appendix A of those Parts. Documents that are referenced in accepted national or international material specifications will not be published by ASME. However, information on obtaining a copy of those documents will be maintained in Nonmandatory Appendix A of Section II, Parts A and B. Additions and exceptions to the material specification will be noted in the subtitle of the specification.

CEN Specifications. European standards are adopted by CEN in three official versions (English, French, and German). After the CEN adoption, to become applicable in a member country of CEN, a European 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 United Kingdom, NF for France, and DIN for Germany) is added to the

designation of the EN standard (e.g., BS EN 10028-1 and 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 of EN standards can only be obtained from European national standardization bodies as XX EN (CEN does not sell EN standards). Consequently, in order to maintain coherence and homogeneity in the reference system, the mentions in the subtitle of the corresponding ASME specification will refer to the EN standard number without any prefix and to the year of approval by CEN. It shall also be mentioned in the cover sheet that the national parts do not apply for the ASME specification.

Code Case. The Code Committee will consider the issuance of an ASME Code Case, to be effective for a period of 3 years, permitting the use of a new material, provided that the following conditions are met:

(a) the inquirer provides evidence that a request for coverage of the material in a specification has been made to ASTM or a recognized national or international organization;

(b) the material is commercially available and can be purchased within the proposed specification requirements;

(c) the inquirer shows that there will be a reasonable demand for the material by industry and that there exists an urgency for approval by means of a Code Case;

(d) the requests for approval of the material shall clearly describe it in specification form, including such items as scope, process, manufacture, conditions for delivery, heat treatment, chemical and tensile requirements, forming properties, testing specifications and requirements, workmanship, finish, marking, inspection, and rejection;

(e) all other requirements identified previously under Code Policy and Application apply; and

(f) the inquirer shall furnish the Code Committee with all the data specified in this Appendix.

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: (1) the material contains an element (other than nitrogen) that is unspecified for one of the grades marked; and (2) 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 $5 \times (C + N)$ 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 (ksi√in.)	MPa square root meters (MPa√m)
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 hr. At 1500°F and below, $F_{avg} = 0.67$. Above 1500°F, it is determined from the slope of the log time-to-rupture versus log stress plot at 100,000 hr such that $\log [F_{avg}] = 1/n$, but F_{avg} may not exceed 0.67.

NA = not applicable

n = a negative number equal to $\Delta \log$ time-to-rupture divided by $\Delta \log$ stress at 100,000 hr

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 hr

S_{Ravg} = average stress to cause rupture at the end of 100,000 hr

S_{Rmin} = minimum stress to cause rupture at the end of 100,000 hr

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

In the application of these criteria, the Committee considers the yield strength at temperature to be $R_y S_y$.

Two sets of allowable stress values are provided in Tables 5A and 5B for austenitic materials and similar non-ferrous alloys. The higher alternative allowable stresses are identified by a footnote to the tables. These allowable stress values exceed two-thirds but do not exceed 90% of the minimum yield strength at temperature. The higher values should be used only where slightly higher deformation is not in itself objectionable. These higher values are not recommended for the design of flanges or other strain sensitive applications.

(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 hr

(2) $100F_{avg}\%$ of the average stress to cause rupture at the end of 100,000 hr

(3) 80% of the minimum stress to cause rupture at the end of 100,000 hr

Stress values for high temperature are based, whenever possible, on representative uniaxial properties of the materials obtained under standard testing conditions. The stress

TABLE 10-100
CRITERIA FOR ESTABLISHING ALLOWABLE STRESS VALUES FOR TABLES 5A AND 5B

Product/Material	Below Room Temperature		Room Temperature and Above			
	Tensile Strength	Yield Strength	Tensile Strength	Yield Strength	Stress Rupture	Creep Rate
All wrought or cast ferrous and nonferrous product forms except bolting	$\frac{S_T}{2.4}$	$\frac{S_Y}{1.5}$	$\frac{S_T}{2.4}$	$\frac{R_Y S_Y}{1.5}$	$\text{Min.} \left(F_{\text{avg}} S_{R \text{ avg}}, 0.8 S_{R \text{ min}} \right)$	$1.0 S_{C \text{ avg}}$
All wrought or cast austenitic and similar nonferrous product forms except bolting [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) Two sets of allowable stress values are provided in Table 5A for austenitic materials and in Table 5B for specific nonferrous alloys. The lower values are not specifically identified by a footnote. These lower values do not exceed two-thirds of the minimum 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 minimum yield strength at temperature. The higher values should be used only where slightly higher deformation is not in itself objectionable. These higher allowable stresses are not recommended for the design of flanges or other strain-sensitive applications.

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.

NONMANDATORY APPENDICES

NONMANDATORY APPENDIX A METALLURGICAL PHENOMENA

A-100 GENERAL

The properties of steels and nonferrous alloys are influenced by the processing history, heat treatment, melting practice, and level of residual elements.

(10) A-120 MAGNETIC BEHAVIOR AND PHYSICAL PROPERTIES

Ferritic steels transform from magnetic to nonmagnetic behavior at elevated temperatures. The temperature of this transition is called the *Curie temperature*. The Curie temperature for pure iron and plain carbon steels is approximately 1,420°F. Alloying elements reduce the Curie temperature. For low alloy steels, including 5% Cr grades, this reduction is minimal. For ferritic stainless steels, approximate Curie temperatures are 1,375°F for 9% Cr grades, 1,290°F for Type 409, and 1,200°F for Types 439 and 444.

The magnetic transition requires energy, which is reflected in a sharp peak in specific heat near the Curie temperature. Most other physical properties are relatively unaffected by this transition, but thermal diffusivity (TD), which is thermal conductivity (TC) divided by specific heat, shows a sharp minimum at the Curie temperature.

A-200 CARBON AND CARBON- MOLYBDENUM ALLOY STEELS

A-220 CREEP-RUPTURE PROPERTIES OF CARBON STEELS

Previous studies suggested that carbon steel produced to a coarse austenitic grain size melting practice exhibited

superior creep properties compared to those produced to a fine austenitic grain size melting practice (aluminum treated). However, studies by Glen¹ have shown that the 100,000 hr rupture strengths of steel made to either fine or coarse austenitic grain size melting practices are about the same at temperatures above 850°F. More recent studies have shown that the superiority of the “coarse grain” steels is associated with “free” nitrogen. Once the free nitrogen is removed from solid solution by precipitation, the differences in creep properties are negated. Precipitation of nitrogen may occur prior to service by heat treatment (tempering or postweld heat treatment) or by service at elevated temperatures. The amount of precipitation is dependent on both the temperature and the time at temperature.

In addition to deoxidation practice and heat treatment, the creep and creep-rupture properties of carbon steel are influenced by residual elements. For example, a small addition (0.10%) of molybdenum can markedly increase the strength of carbon steel.

Because of the superior notch toughness of normalized steel made to a fine austenitic grain size melting practice, it is often desirable to forego any possible creep strength advantage of the steels made to “coarse grain” practice. However, when considering fine austenitic grain size materials, it should be recognized that aluminum-treated steels have been shown to be more prone to graphitization than silicon-killed steels not treated with aluminum.

The existing data base for carbon steels does not permit a quantitative assessment of the various factors affecting the strength of these steels. To a large extent, the existing allowable stresses are based on service experiences rather than on individual test data.

¹ Glen, J., Factors Controlling the Rupture Strength of Carbon Steel, Metallurgical Developments — Carbon Steel, Iron and Steel Institute, Special Report No. 81, 1963.

A-240 GRAPHITIZATION AND SPHEROIDIZATION OF CARBON AND CARBON-MOLYBDENUM STEELS

In the boiler and pressure vessel industry, prolonged exposure of carbon and low alloy steel components to temperatures exceeding 800°F can result in several kinds of microstructural deterioration; for example, creep cavitation, carbide coarsening, spheroidization, and, less commonly, graphitization.

Graphitization is essentially confined to carbon steel (C–Mn, C–Si, and C–Mn–Si) and to carbon–molybdenum steel (C– $\frac{1}{2}$ Mo) exposed to service temperatures above about 800°F to 875°F. Graphitization occurs when iron carbide that is mainly in the pearlite phase decomposes into the true equilibrium structure of ferrite (nearly pure iron) and graphite. The formation of graphite particles or nodules, if dispersed throughout the metal, is not considered a problem, because there is no aligned plane of weakness. However, if they form in a continuous plane, the resulting embrittled material can fail catastrophically due to the unfavorable alignment of the graphite, even at ASME Code-acceptable stress levels after very long times. The two regions most prone to the unfavorable alignment are weld heat-affected zones (HAZ) and cold-worked areas. During welding, decomposition of the pearlite phase tends to become unstable in the portion of the HAZ heated above the lower transformation temperature of approximately 1340°F, setting the stage for subsequent graphitization in a narrow aligned band [1]. Cold work can occur in bends, in tubes straightened with a rotary straightener at the tube mill (spiral pattern of cold work), or from significant dings to the surface, again creating planes for formation of preferentially aligned graphite.

Carbide spheroidization is also a mechanism of pearlitic decomposition where the iron carbides coarsen from a lamellar shape to a dispersed spheroid shape. Spheroidization occurs more frequently than graphitization and is less deleterious to the material properties. In some cases, a 30% loss in strength can occur due to spheroidization, but failure is not likely to occur except under very high applied stresses [2]. Graphitization and spheroidization are competing processes, with graphitization being preferred at temperatures below about 1030°F and spheroidization favored at higher temperatures [1, 3, 4]. It is important to note that this generalization does not always apply, because of the complexities associated with steel composition, heat treatment, and melting practice, which change the temperature or even the tendency toward spheroidization and graphitization.

It was formerly believed that the deoxidation practice of either silicon or aluminum killing affected the propensity toward graphitization, with aluminum-killed steels being more vulnerable. The role of deoxidation practice is now thought to be of secondary importance.

Researchers have developed ranking methods to metallographically categorize the severity of graphitization [5, 6, 7].

Steels with chromium of 0.5% or higher have been shown to be immune to graphitization. Thus, there is no issue with graphitization of the chromium–molybdenum (Cr–Mo) alloy steels used in boilers and pressure vessels.

The following references, which were previously cited, provide additional information:

- [1] *Boiler Tube Failures: Theory and Practice, Volume 3: Steam Touched Tubes*, EPRI TR-105261-V3.
- [2] *Damage Mechanisms Affecting Fixed Equipment in the Fossil Electric Power Industry*, WRC Bulletin 490, April, 2004.
- [3] *Embrittlement of Components in Fossil Fueled Power Plants*, EPRI 1004515, 2003.
- [4] W. L. Hemingway, “The Study of Graphitization, Edwards Valve Co.,” 1952.
- [5] Thielsch, “Interpreting Graphitization for Power Engineer,” *Combustion*, October 1954.
- [6] “Defects and Failures in Pressure Vessels and Piping,” H. Thielsch, 1965.
- [7] J. R. Foulds and R. Viswanathan, “Graphitization of Steels in Elevated Temperature Service,” *Microstructures and Mechanical Properties of Aging Materials*, The Minerals, Metals, and Materials Society, 1993, pp. 61–69.

A-250 TEMPER EMBRITTLEMENT OF LOW ALLOY STEELS

Certain types of low alloy steels (Ni–Cr, Ni–Cr–Mo, and Cr–Mo) and welds are susceptible to temper embrittlement. Temper embrittlement occurs when the material is either cooled slowly through the temperature range of 1100°F to 600°F or is exposed for a prolonged time in that temperature range. The rate of temper embrittlement is a function of temperature, increasing as the temperature increases. Temper embrittlement may occur during fabrication of a pressure component or during prolonged service exposure in that temperature range. Studies indicate that P, As, Sb, Sn, Mn, and Si can produce some degree of temper embrittlement in Ni–Cr, Ni–Cr–Mo, and Cr–Mo steels. Of these, the trace elements P, As, Sb, and Sn appear to be the most damaging. The embrittling mechanism involves segregation of the elements within the grain boundaries. Temper embrittlement is manifested by a large increase of the ductile-to-brittle transition temperature and fracture along prior austenite grain boundaries. The upper shelf energy value generally is not affected.

Temper embrittlement is reversible. Severely embrittled material may be de-embrittled by heating for a short time above the embrittling temperature range, followed by

quenching. This is not a permanent solution and re-embrittlement with additional time in the temper embrittling range will occur.

The usual method of reducing or avoiding temper embrittlement is to restrict the amounts of trace elements that may be present in the steel and to reduce the Mn and Si contents. Commonly used parameters for limiting these elements in 2¼Cr–1Mo steels are as follows:

(a) for wrought material product forms

$$J = (\text{Si} + \text{Mn})(\text{P} + \text{Sn})(10^4) \leq 150$$

where Si, Mn, P, and Sn are in wt %;

(b) for weld metal

$$X = (10\text{P} + 5\text{Sb} + 4\text{Sn} + \text{As})/100 \leq 15$$

where P, Sb, Sn, and As are in ppm.

In addition, some users find it beneficial to impose limitations on Cu and Ni for base metals and for welds, e.g., Cu 0.20% maximum and Ni 0.30% maximum.

A-300 HIGH ALLOY AND STAINLESS STEELS

A-310 STRUCTURE

The composition, mechanical working, heat treatment cycle, and the solidification rate in castings and weld metal largely determine the degree to which ferrite, carbide, and sigma phases are formed in austenitic stainless steels. The type of structure and the thermal and mechanical treatment it receives are determining factors in its resistance to intergranular corrosion, stress corrosion cracking, and crack susceptibility, and in its ductility and toughness.

A-320 INTERGRANULAR CORROSION

When austenitic steels are held for a sufficient time between 800°F and 1600°F, chromium carbide tends to precipitate preferentially at austenite grain boundaries. This type of precipitation is referred to as sensitization. Intergranular corrosion takes place when a sensitized material is exposed to a sufficiently strong corrosive medium for a long enough time.

Methods for combating intergranular corrosion include the following:

(a) An anneal at 1850°F to 2050°F followed by rapid cooling through the sensitization range. Subsequent operation of a vessel in the sensitization range may resensitize the material.

(b) Stabilizing with columbium, titanium, or tantalum. These elements have a strong affinity for carbon and, in sufficient quantities, prevent the precipitation of chromium carbides.

(c) Use of types of steel having a low enough carbon content that the chromium depletion at the grain boundaries is kept within safe limits.

A-330 STRESS CORROSION CRACKING

Stress corrosion cracking is a mechanical–environmental failure process in which sustained tensile stress and chemical attack, primarily in aqueous environments, combine to initiate and propagate cracks in susceptible materials. Following an appropriate exposure time, stress corrosion cracking can proceed along the grain boundaries of the material and that is known as *intergranular stress corrosion cracking*. Stress corrosion cracking can also occur through the grains and that is referred to as *transgranular stress corrosion cracking* (TGSCC).

The sustained tensile stress may originate during the manufacturing process or during operation. During manufacturing, residual tensile stresses may result from welding, heat treating (including the quenching process), surface finishing, and cold forming. During plant start-up, steady-state operation, and shutdown, there will be additional stresses introduced. These collective tensile stresses contribute to the stress corrosion cracking mode of failure.

Most ferrous and nonferrous materials are susceptible to some form of stress corrosion cracking. For ferrous materials, susceptibility includes carbon and low alloy steels, austenitic stainless steels, ferritic stainless steels (to a lesser extent), and the higher-strength martensitic and precipitation-hardened stainless steels. Stress corrosion cracking has also been experienced in aluminum alloys, copper alloys, nickel-base alloys, and titanium alloys. The chemical species leading to stress corrosion cracking in these various alloy systems are delineated in various authoritative sources, such as *ASM Metals Handbook, Failure Analysis and Prevention, Volume 10, 8th Edition* (pages 205–227) and the publications listed in A-440. The source of the offending chemical species can be internal or external from the bulk fluid, or from condensate, insulation, atmosphere, and elsewhere, and may be concentrated by crevices or other concentrating mechanisms, such as alternate wetting and drying cycles, etc.

Methods of reducing susceptibility to stress corrosion cracking include the selection of an alloy that is more resistant to cracking. For some materials, the susceptibility is reduced by controlling welding heat input and the heat treating processes; minimizing cold working during forming and component assembly; minimizing surface grinding; using shot-peening, coating, or other surface-conditioning treatments to negate surface residual tensile stresses; and ensuring that harmful chemical species are held to acceptable levels.

A-340 SIGMA PHASE EMBRITTLEMENT

The existence of sigma phase in stainless steels (austenitic, ferritic, martensitic, and austenitic–ferritic) may significantly reduce their ductility and toughness. The sigma phase is formed in the temperature range between 1050°F and 1700°F. Factors contributing to the rate of formation of sigma phase include the amount of ferrite, time in the sigma phase transformation range, prior cold working, variation in composition due to progressive solidification, high chromium content, and the presence of ferrite stabilizing elements, particularly molybdenum, columbium, and titanium. Formation of sigma phase may be minimized or prevented by a proper selection of composition, or the sigma may be transformed into austenite and ferrite by suitable heating, followed by water quenching or rapidly cooling by other means.

A-350 HEAT TREATMENT OF AUSTENITIC CHROMIUM–NICKEL STEELS

In recognition of controversial opinion relative to the effects of postweld heat treatment of austenitic stainless steels, mandatory requirements for such have been omitted. Service experience is too limited to permit comparison between the relative safety of as-welded and postweld heat treated austenitic steel weldments, particularly in thick sections. It is recognized that the stability of austenitic steels and their optimum behavior in service are influenced by the mechanical and thermal treatment they have received; however, it is a basic principle that the Code rules are intended to provide minimum safety requirements for new construction, not to cover deterioration which may occur in service as a result of corrosion, instability of the material, or unusual operating conditions such as fatigue or shock loading.

Where maximum corrosion resistance is required, it is advisable to heat treat in such a fashion as to place all chromium carbides in solution. For such service it is recommended that the following procedure be followed: hold the vessel within the solution temperature range prescribed by the governing material specifications for not less than 1 hr/in. of thickness. Quench all parts of the vessel uniformly and as rapidly as possible. Material not stabilized with columbium or titanium should be cooled through the range from 1700°F to 1000°F in not more than 3 min. The rapid cooling should be continued to below 800°F. Slower cooling rates may be just as satisfactory for some compositions of the material and conditions of service.

A-360 885°F EMBRITTLEMENT

Upon exposure to elevated temperatures, high-chromium steels and the ferrite phase of austenitic and

**TABLE A-360
CAUTIONARY FERRITE GUIDELINES**

% Ferrite	Temperature, °F						1100 and higher
	500	600	700	800	900	1000	
0	...	...	...	...	...	...	C
5	...	...	...	...	...	...	C
10	...	...	...	...	C	C	C
15	...	...	...	C	C	C	C
20	...	...	C	C	C	C	C
25	...	C	C	C	C	C	C
30	...	C	C	C	C	C	C
35	C	C	C	C	C	C	C
40	C	C	C	C	C	C	C

GENERAL NOTES:

- (a) C stands for caution.
 (b) At the ferrite levels and temperatures identified with the letter C, the subject alloy will have significant reductions in Charpy V-notch toughness values at room temperature and below following service exposure. This reduction indicates the potential for brittle fracture with high rate loading in the presence of sharp notches or cracks.

austenitic–ferritic stainless steels are subject to embrittlement characterized by an increase in hardness and a loss in tensile ductility and toughness at and below the service temperature. The phenomenon is observed at chromium levels in excess of about 12%. The severity of embrittlement increases with increasing chromium content, the effect of which is enhanced by some alloying elements, notably aluminum, molybdenum, and tungsten, and with increasing ferrite content. While the maximum rate of embrittlement occurs at 885°F, 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 a few thousand hours exposure at temperatures as low as 500°F. Table A-360 provides precautionary guidelines with respect to ferrite content and temperature of exposure.

A-370 COLD FORMING OF AUSTENITIC MATERIALS

Cold forming operations performed during the manufacture of austenitic stainless steel pressure parts may cause impaired service performance when the component operates in the creep range (above 1000°F). This impairment may entail either:

- (a) recrystallization to a finer grain size, leading to an increase in creep rate and a decrease in rupture strength; or
 (b) a decrease in ductility which renders the component vulnerable to premature failure from the formation of cracks, particularly at attachments and stress concentrations.

With regard to the first impairment mechanism, the major variables governing recrystallization kinetics are extent of cold work, temperature, time, and alloy composition. For a given amount of cold work, the recrystallization kinetics are broadly described by an Arrhenius type of relationship in which recrystallization occurs in a short time (minutes to hours) at a high temperature or in a long time (hundreds to thousands of hours) at a lower temperature. At forming strains below about 20%, recrystallization is not likely to occur during the service life of an austenitic steel component if the temperature is sufficiently low (about 1050°F or lower for simple alloys like TP304H or TP316H, or about 1150°F or lower for a more complex material like Alloy 800H). At a sufficiently high level of cold forming strain and service temperature, recrystallization during operation becomes a threat to the long-term serviceability of an alloy. Because of the relationship between grain size and creep-rupture strength, the finer-grained recrystallized material has lower stress-rupture strength, higher creep rate, and higher rupture ductility. The consequence is premature failure relative to an equivalent unstrained material which does not recrystallize during service. Heat treatment after cold forming at temperatures given in the material specification will restore the intended properties of the material and will minimize the threat of premature failure due to recrystallization during the time of operation.

With regard to the second impairment mechanism, as austenitic alloys are cold worked, the hardness and strength are enhanced, but the ductility is reduced. At temperatures below the creep range, this tradeoff between strength and ductility can be exploited without significant risk of service problems related to low ductility. However, as operation intrudes into the creep range, another problem besides recrystallization emerges, which involves failure due to impaired stress-rupture ductility. This phenomenon is operative below the recrystallization threshold. It is characterized by premature creep crack growth in the cold worked material and is exacerbated by the presence of stress concentrators (e.g., notches, welded attachments, etc.).

The alloys that are most susceptible to premature failure from ductility impairment are those which have been strengthened by the addition of a potent carbide former such as columbium (TP347H) or by the addition of gamma prime formers such as titanium and aluminum (Alloy 800H). Titanium is a carbide former in TP321H, but it has less effect on the ductility impairment mechanism than does columbium in TP347H. Even when solution treated, these particle-strengthened alloys are typically stronger but have less stress-rupture ductility than the simpler substitutionally strengthened alloys such as TP304H and TP316H. Failures by ductility impairment are always intergranular

and occur with little or no macrodistortion of the component; i.e., there is no obvious necking down or swelling of the failed component.

The ductility impairment damage mechanism is not fully understood, but it is generally thought to involve deformation of the grains by cold work, followed by precipitation at intragranular dislocation sites created by the cold work during service exposure. This produces a matrix with a very high creep strength, so that most creep deformation must be accommodated at the “weaker” grain boundaries. Such strain concentration at the grain boundaries greatly increases the risk of low ductility creep-crack growth type fractures. In the most extreme cases, the rupture ductility cannot accommodate the inelastic strains associated with redistribution of the cold-forming residual stresses; fracture initiates soon after service begins and failure occurs within months or even weeks. This same phenomena has been observed in heavily constrained thick section weldments in materials such as TP347H and Alloy 800H, and has been referred to as *relaxation cracking* or *strain-induced precipitation hardening* (SIPH). As was the case with recrystallization, heat treatment after cold forming at the temperatures indicated in the material specification restores the intended properties of the material and minimizes the threat of premature failure by ductility impairment.

In adopting rules restricting cold forming, the Code recognizes that a simplified treatment has been given to a complex subject, and that application of these rules is not an absolute 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 and heat treatment practices of the material producer, initial grain size, and the presence of certain deleterious residual elements are believed to play an important role in explaining both good and bad service experiences with cold formed material. However, the rules represent a consensus achieved by parties representing disparate interests and are viewed as a step in the right direction. As with all Code rules, the limits are subject to modification and revision as new laboratory data and field experience are gathered.

A-380 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 -200°F to 200°F. 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-400 NONFERROUS ALLOYS

A-410 MAGNETIC PROPERTIES

Both aluminum and copper are practically nonmagnetic, but nickel, like steel, is strongly magnetic at room temperature. The Curie temperature (the temperature at which a metal loses its magnetic properties) of nickel is 680°F. Nickel-copper alloy is slightly magnetic at room temperature and has a Curie temperature of 110–140°F, depending on slight variations in copper content and other alloy elements. Nickel-chromium-iron alloy is nonmagnetic at room temperature and has a Curie temperature of –40°F. These statements suggest a simple magnetic test for differentiating the nickel alloys.

A-420 ELEVATED TEMPERATURE EFFECTS

The nonferrous alloys, in general, do not harden when quenched from an elevated temperature. The cooling rate from an elevated temperature does not usually affect mechanical properties. Heating for forming should be within temperature ranges recommended by the material producers. If the material is reannealed following hot or cold working, annealing per the material specification is recommended. Other heat treatments should be agreed upon by the user and Manufacturer.

A-430 LOW TEMPERATURE BEHAVIOR

The nonferrous alloys listed in Tables 1B and 2B do not exhibit a transition range at low temperatures as do some ferrous materials and hence do not suffer a loss of impact resistance at low temperatures. The static tensile strength increases as the temperature decreases, and the ductility as measured by percent elongation is not adversely affected to any significant degree. For these reasons low temperature impact tests of nonferrous materials are not required.

A-440 CORROSION

(a) *General.* The nonferrous materials listed in Tables 1B and 2B offer resistance to corrosion for many engineering applications. For specific information concerning the corrosion resistance, reference may be made to nonferrous materials producing companies and/or trade associations, as well as the following sources:

(1) National Association of Corrosion Engineers (NACE), Houston, Texas

(2) *Corrosion Data Survey-Metals*, National Association of Corrosion Engineers, Texas, 1974

(3) *Process Industries Corrosion*, National Association of Corrosion Engineers, Texas, 1975

(4) *Corrosion, Vols. 1 and 2*, 2nd Ed., edited by L. L. Shreir, Newnes-Butterworth, London, 1976

(5) *Metals Handbook*, Ninth Edition, American Society for Metals, Ohio, 1977-79

(6) *Corrosion and Oxidation of Metals*, V. R. Evans, Crane-Russak Company, London, 1971

(7) *Corrosion Engineering*, M. G. Fontana and N. D. Greene, McGraw-Hill, New York, 1967

(8) *The Corrosion Handbook*, edited by H. H. Uhlig, John Wiley & Sons, New York, 1948

(b) *Stress Corrosion.* Because of the occasionally contingent danger from the failure of pressure vessels by stress corrosion cracking, the following seems pertinent. The materials listed in Tables 1B and 2B are suitable for engineering use under a wide variety of ordinary corrosive conditions, with no particular hazard in respect to stress corrosion. However, 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.

(c) *Galvanic Corrosion.* By virtue of their relative solution potentials, some materials are anodic to others in the presence of an electrolyte. The extent of galvanic attack will vary with the nature, concentration, and temperature of the environment, and with the inherent characteristics of the dissimilar metals and their relative areas. Where practicable avoid dissimilar metals or select special precautions, such as insulation between dissimilar-metal parts. The use of protective coatings should be considered.

A-450 SPECIAL COMMENTS

A-451 Aluminum

Threaded Connections. Under some conditions of loading, aluminum and aluminum-alloy threaded connections seize so that repeated tightening and loosening are impossible. All threaded connections should be treated with a suitable antiseize compound.²

² Army-Navy Aeronautical Specification AN-C-53 Amend. It may be obtained from Supt. of Documents, U.S. Printing Office.

TABLE A-452
LIMITING SERVICE TEMPERATURE, °F

Material	Spec No.	Sulfur-Free Atmospheres			Sulfurous Atmospheres		
		Oxidizing	Reducing H ₂	Reducing CO	Steam	Oxidizing	Reducing
Nickel	SB-160, SB-161, SB-162, SB-163	1900	2300	2300	800	600	500
Low-Carbon Nickel	SB-160, SB-161, SB-162, SB-163	1900	2300	2300	800	600	500
Nickel-Copper	SB-127, SB-161, SB-163, SB-164, SB-165	1000	2000	1500	700	600	500
Ni-Cr-Fe	SB-163, SB-167, SB-168	2000	2100	2100	1500	1500	1000
Ni-Fe-Cr	SB-163, SB-407, SB-408, SB-409	2000	2300	2100	1800	1500	1000

Dissimilar Metals. If dissimilar metals must be used in combination with aluminum alloys, the best choices would ordinarily be galvanized steel and stainless steel, austenitic types preferred.

A-452 Nickel

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 which 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. Table A-452 lists the normal limiting service temperatures. The more sulfur present or the higher the temperature, the more rapid and deep will be the attack.

Material which has been sulfur embrittled cannot be salvaged. It must be scrapped.

Prior to any operation which 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 100 cu ft or a fuel oil containing less than 0.5% sulfur will be satisfactory for heating. Coal and coke are not satisfactory.

Lead Embrittlement. Lead causes embrittlement in all nickel-base alloys in much the same manner as sulfur. Lead-containing drawing or threading lubricants must be removed prior to a heating operation. Welding must not be done adjacent to or over soft solder. "Buttering" of threads with a lead-containing antigalling compound is to be avoided if the temperature of operation will exceed 400°F or if seal welding is done.

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-453 Titanium and Zirconium

(a) Heat treatment of zirconium Grade R60705 after welding is mandatory for Section VIII, Division 1 fabrication. Heat treatment of all other titanium or zirconium alloys after welding is not mandatory, but is recommended after forming operations.

For titanium, it is recommended that heat treatment be performed in a furnace and at a metal temperature of not less than 900°F or more than 1200°F, with time at temperature of 1 hr. The stress-relieving heat treatment usually recommended is 900°F to 1100°F for ½ hr for Grades 1, 2, 3, and 7, and 1 hr for Grade 12.

For zirconium, postweld heat treatment is mandatory for Grade R60705 (see Section VIII, Division 1, UNF-56). Heat treatment is generally recommended after forming operations for all grades of zirconium (R60702 and R60705). It is recommended that the heat treatment be performed in a furnace and at a temperature of not less than 950°F or more than 1150°F, for not less than ½ hr/in. of thickness.

For reactive metals such as titanium and zirconium, prolonged exposure at temperatures above 1100°F will result in heavier surface oxide films that are not satisfactorily removed by acid pickling. It is required that a descaling treatment be employed for removal of the thicker oxide film.

(b) In certain environments associated with pickling and annealing, as well as under actual operating conditions, absorption of hydrogen may cause embrittlement of titanium or zirconium.

In addition, oxide thickening will result from excessive annealing time and temperatures in oxidizing environments. In any heat treatment operation, reducing furnace atmospheres shall not be used. Suitable procedures are available from the manufacturers and other sources to minimize scaling and/or hydrogen pickup during the various steps associated with fabrication and heat treatment.

(c) Titanium or zirconium weld metal in its molten state or at elevated temperature will react readily with air. Contamination during welding by oxygen, hydrogen, and nitrogen increases the weld metal hardness and decreases the ductility and notch toughness.

(d) When zirconium is placed in rotating or sliding contact with itself or other materials, it may suffer surface damage. Galling or seizing of zirconium threaded or rotating parts can be prevented by an oxidation treatment of the finished part by heating in air at 950°F to 1150°F for 2–4 hr at temperature. If the part is required to be welded following the oxidation treatment, the oxide layer must be removed or contamination of the weld will occur.

(10) A-454 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.

A-500 SPECIAL TOPICS

A-510 MICROBIOLOGICALLY INFLUENCED CORROSION AND FOULING

Acceleration of corrosion of ferrous and nonferrous metals and alloys can occur as a result of the influence of microbial activity. Sulfate-reducing bacteria, sulfur-oxidizing bacteria, and iron-oxidizing bacteria are most commonly associated with corrosion effects. Microbiologically influenced corrosion (MIC) most often results in pitting, accompanied by excessive deposition of corrosion products. Heat tint next to stainless steel welds in stagnant or untreated water also increases susceptibility to MIC.

MIC has long been recognized as a primary component of the corrosion that occurs on the outside of carbon steel, cast iron, and ductile iron piping buried in soils, and on the inside of piping made of these and other materials carrying water. In addition to steel and cast iron, copper alloys, welded Types 304/304L and 316/316L stainless steels, and the nickel-base alloys without chromium are susceptible to MIC. Titanium, 6% (minimum) molybdenum stainless steels, and the nickel–chromium–molybdenum alloys are quite resistant.

The environment is also a major factor, with temperatures from about 50–120°F being most conducive to MIC. Unless certain precautions are taken, it is important to minimize the total time that hydrotest water is allowed to be present and puddles should be eliminated after draining. These precautions include testing to ensure that the MIC-causing bacteria are not present, coating the surface (especially in the lower areas, since the settling out of the water by gravity causes the concentration of bacteria necessary to get the high corrosion rates), treating the water, or maintaining sufficient flow to keep the bacteria suspended. In addition to the hydrotest environment, materials may be vulnerable in the entire construction phase and in all lay-up periods. Some systems, such as service water systems, and tanks and piping for standby systems such as fire protection, are susceptible throughout plant life.

After startup, water treatment is probably the most common mitigating step for prevention and treatment of MIC. Biocides (chlorine, hypochlorite, ozone, and hydrogen peroxide), agents to increase the pH of the system to 10 or 10.5, and dispersants to break up deposits on metals are all used, often in combination. Note that such treatments, notably chlorine additions, can themselves result in metal corrosion and should be used in low, intermittent dosages depending on the alloy. Mechanical cleaning is also used and is generally necessary to remove deposits so that the water treatment agent can get to the metal surface. Hydrolazing and flushing can be used to reduce blockage.

Additional information on MIC may be found in references (a) through (f):

(a) *Biologically Influenced Corrosion: Proceedings of the International Conference on Biologically Induced Corrosion*, Gaithersburg, MD, June 1985. NACE Reference Book #8.

(b) Stocker, J. G. "Guide for the Investigation of Microbiologically Induced Corrosion," *Materials Performance*, 23 (8), 1984, 48–55.

(c) Tatnall, R. E. "Fundamentals of Bacteria Induced Corrosion," *Materials Performance*, 20 (9), 1981, 32–38.

(d) Kobrin, G. "Corrosion by Microbiological Organisms in Natural Waters," *Materials Performance*, 16 (7), 1976, 38–42.

(e) Lucina, G. J. *Sourcebook for Microbiologically Influenced Corrosion in Nuclear Power Plants*, EPRI NP-5580s, Electric Power Research Institute, 1988.

(f) Kobrin, G., Ed. *A Practical Manual on Microbiologically Influenced Corrosion*, NACE International, Houston, TX, 1993.

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 Nonmandatory Appendix 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 nomenclature associated with that equation. 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.

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:

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

Fraction, in.	Proposed SI Conversion, mm	Difference, %
$\frac{1}{32}$	0.8	-0.8
$\frac{3}{64}$	1.2	-0.8
$\frac{1}{16}$	1.5	5.5
$\frac{3}{32}$	2.5	-5.0
$\frac{1}{8}$	3	5.5
$\frac{5}{32}$	4	-0.8
$\frac{3}{16}$	5	-5.0
$\frac{7}{32}$	5.5	1.0
$\frac{1}{4}$	6	5.5
$\frac{5}{16}$	8	-0.8
$\frac{3}{8}$	10	-5.0
$\frac{7}{16}$	11	1.0
$\frac{1}{2}$	13	-2.4
$\frac{9}{16}$	14	2.0
$\frac{5}{8}$	16	-0.8
$\frac{11}{16}$	17	2.6
$\frac{3}{4}$	19	0.3
$\frac{7}{8}$	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 $\frac{1}{8}$	29
1 $\frac{1}{4}$	32
1 $\frac{1}{2}$	38
2	50
2 $\frac{1}{4}$	57
2 $\frac{1}{2}$	64
3	75
3 $\frac{1}{2}$	89
4	100
4 $\frac{1}{2}$	114
5	125
6	150
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 $\frac{1}{8}$	DN 6	NPS 20	DN 500
NPS $\frac{1}{4}$	DN 8	NPS 22	DN 550
NPS $\frac{3}{8}$	DN 10	NPS 24	DN 600
NPS $\frac{1}{2}$	DN 15	NPS 26	DN 650
NPS $\frac{3}{4}$	DN 20	NPS 28	DN 700
NPS 1	DN 25	NPS 30	DN 750
NPS 1 $\frac{1}{4}$	DN 32	NPS 32	DN 800
NPS 1 $\frac{1}{2}$	DN 40	NPS 34	DN 850
NPS 2	DN 50	NPS 36	DN 900
NPS 2 $\frac{1}{2}$	DN 65	NPS 38	DN 950
NPS 3	DN 80	NPS 40	DN 1000
NPS 3 $\frac{1}{2}$	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 mm (mm²) and areas in square feet (ft²) were converted to square meters (m²). 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 mm (mm³) and volumes in cubic feet (ft³) were converted to cubic meters (m³). 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	200 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

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	Used exclusively in equations
psi	kPa	6.894757	Used 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 $\sqrt{\text{in.}}$	MPa $\sqrt{\text{m}}$	1.0988434	...
Btu/hr	W	0.2930711	Use for boiler rating and heat transfer
lb/ft ³	kg/m ³	16.018463	...

C-300 SOFT CONVERSION FACTORS

The following table of “soft” conversion factors is provided for convenience. Multiply the U.S. Customary value

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