ASME B31.5-2019
(Revision of ASME B31.5-2016)

Refrigeration Piping and Heat Transfer Components

ASME Code for Pressure Piping, B31

AN INTERNATIONAL PIPING CODE®

The American Society of Mechanical Engineers

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Two Park Avenue • New York, NY • 10016 USA

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The next edition of this Code is scheduled for publication in 2022. This Code will become effective 6 months after the Date of Issuance.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this Code. Interpretations are published on the Committee web page and under http://go.asme.org/Interpretations. Periodically certain actions of the ASME B31 Committee may be published as Cases. Cases are published on the ASME website under the B31 Committee Page at http://go.asme.org/B31committee as they are issued.

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The American Society of Mechanical Engineers
Two Park Avenue, New York, NY 10016-5990

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FOREWORD

The need for a national code for pressure piping became increasingly evident from 1915 to 1925. To meet this need, the American Engineering Standards Committee [later changed to American Standards Association (ASA), then changed to United States of America Standards Institute (USASI), and now known as the American National Standards Institute (ANSI)] initiated project B31 in March 1926, at the request of The American Society of Mechanical Engineers (ASME) and with that Society the sole administrative sponsor. Because of the wide field involved, Sectional Committee B31, later changed to Standards Committee, was composed of representatives of some 40 different engineering societies, industries, government bureaus, institutes, and trade associations. After several years' work, the first edition was published in 1935 as an American Tentative Standard Code for Pressure Piping.

In order to keep the Code abreast of current developments in piping design, welding, stress computations, new dimensional and material standards and specifications, and increases in the severity of service conditions, revisions, supplements, and new editions of the Code were published as follows:

Designator	Title
B31.1-1942	American Standard Code for Pressure Piping
B31.1a-1944	Supplement 1
B31.1b-1947	Supplement 2
B31.1-1951	American Standard Code for Pressure Piping
B31.1a-1953	Supplement 1 to B31.1-1951
B31.1-1955	American Standard Code for Pressure Piping

In 1952, a new section of the Code was published to cover Gas Transmission and Distribution Piping Systems. In 1955, after a review by B31 Executive and Sectional Committees, a decision was made to develop and publish other industry sections as separate code documents of the American Standard Code for Pressure Piping.

The first edition of Refrigeration Piping was published as ASA B31.5-1962, superseding Section 5 of B31.1-1955. This Section was revised in 1966. Following approval by the Sectional Committee and the sponsor, this revision was approved by USASI on September 8, 1966, and designated USAS B31.5-1966. Revision of this Section was approved on April 18, 1974, by ANSI and designated ANSI B31.5-1974.

In December 1978, the American National Standards Committee B31 was reorganized as the ASME Code for Pressure Piping, B31 Committee under procedures developed by ASME and accredited by ANSI. The Code designation was also changed to ANSI/ASME B31.

Previous editions of this Code include those of 1983, 1987, 1989, 1992, 2001, 2006, 2010, 2013, and 2016. In this, the 2019 edition, additions and revisions have been made to the text, shown in the Summary of Changes page.

This Code was approved as an American National Standard on June 21, 2019.

ASME B31 COMMITTEE
Code for Pressure Piping

(The following is the roster of the Committee at the time of approval of this Code.)

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General. ASME Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Code may interact with the Committee by requesting interpretations, proposing revisions or a case, and attending Committee meetings. Correspondence should be addressed to:

Secretary, B31 Standards Committee
The American Society of Mechanical Engineers
Two Park Avenue
New York, NY 10016-5990
http://go.asme.org/Inquiry

Proposing Revisions. Revisions are made periodically to the Code to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Code. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Code. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Proposing a Case. Cases may be issued to provide alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee web page.

Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the Code and the paragraph, figure, or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the Code to which the proposed Case applies.

Interpretations. Upon request, the B31 Standards Committee will render an interpretation of any requirement of the Code. Interpretations can only be rendered in response to a written request sent to the Secretary of the B31 Standards Committee.

Requests for interpretation should preferably be submitted through the online Interpretation Submittal Form. The form is accessible at http://go.asme.org/InterpretationRequest. Upon submittal of the form, the Inquirer will receive an automatic e-mail confirming receipt.

If the Inquirer is unable to use the online form, he/she may mail the request to the Secretary of the B31 Standards Committee at the above address. The request for an interpretation should be clear and unambiguous. It is further recommended that the Inquirer submit his/her request in the following format:

Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry in one or two words.
Edition:	Cite the applicable edition of the Code for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. Please provide a condensed and precise question, composed in such a way that a "yes" or "no" reply is acceptable.
Proposed Reply(ies):	Provide a proposed reply(ies) in the form of "Yes" or "No," with explanation as needed. If entering replies to more than one question, please number the questions and replies.
Background Information:	Provide the Committee with any background information that will assist the Committee in understanding the inquiry. The Inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in the format described above may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

Moreover, ASME does not act as a consultant for specific engineering problems or for the general application or understanding of the Code requirements. If, based on the inquiry information submitted, it is the opinion of the Committee that the Inquirer should seek assistance, the inquiry will be returned with the recommendation that such assistance be obtained.

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

Attending Committee Meetings. The B31 Standards Committee regularly holds meetings and/or telephone conferences that are open to the public. Persons wishing to attend any meeting and/or telephone conference should contact the Secretary of the B31 Standards Committee.

INTRODUCTION (19)

The ASME B31 Code for Pressure Piping consists of a number of individually published Sections, each an American National Standard, under the direction of ASME Committee B31, Code for Pressure Piping. Rules for each Section reflect the kinds of piping installations considered during its development. This is the B31.5 Refrigeration Piping and Heat Transfer Components Code Section. Hereafter, in this Introduction and in the text of this Code Section B31.5, when the word "Code" is used without specific identification, it means this Code Section. This Section also includes appendices containing referenced standards (Mandatory Appendix I), information instructing users on the selection of appropriate piping codes (Nonmandatory Appendix B), and nomenclature (Nonmandatory Appendix C).

It is the owner's responsibility to select the Code Section that most nearly applies to a proposed piping installation. Factors to be considered by the owner include limitations of the Code Section, jurisdictional requirements, and the applicability of other codes and standards. All applicable requirements of the selected Code Section shall be met. For some installations, more than one Code Section may apply to different parts of the installation. The owner is also responsible for imposing requirements supplementary to those of the Code if necessary to assure safe piping for the proposed installation. (See Nonmandatory Appendix B.)

The Code specifies engineering requirements deemed necessary for safe design and construction of refrigeration, heat transfer components, and secondary coolant piping systems. While safety is the primary consideration, this factor alone will not necessarily govern the final specifications for any pressure piping system.

The Code is not a design handbook. Many decisions that must be made to produce a sound piping installation are not specified in detail within this Code. The Code does not serve as a substitute for sound engineering judgments by the owner and the designer.

The Code contains basic reference data and formulas necessary for design. It is intended to state these requirements in terms of basic design principles to the fullest possible extent, supplemented with specific requirements, where necessary, to obtain uniform interpretation of principle. It contains prohibitions in areas where practices or designs are known to be unsafe. In other areas, the Code contains warnings or "flags" where caution is known to be necessary, but where it is considered that a direct prohibition would be unwarranted.

The Code includes the following:

(a) references to material specifications and component standards that are acceptable for Code usage

(b) references to acceptable dimensional standards for the elements comprising piping systems

(c) requirements for the pressure design of component parts and assembled units

(d) requirements for the evaluation and limitation of stresses, reactions, and movements associated with pressure, temperature, and external forces, and for the design of pipe supports

(e) requirements for the fabrication, assembly, and erection of piping systems

(f) requirements for examination, inspection, and testing of piping systems

Either U.S. Customary (USC) or International System (SI, also known as metric) units may be used with this edition. Local customary units may also be used to demonstrate compliance with this Code. One system of units should be used consistently for requirements applying to a specific installation. The equations in this Code may be used with any consistent system of units. It is the responsibility of the organization performing calculations to ensure that a consistent system of units is used.

It is the intent of the Code that this not be retroactive and that, unless agreement is specifically made between contracting parties to use other issues, or the regulatory body having jurisdiction imposes the use of other issues, the latest Code, issued 6 months prior to the original contract date for the first phase of activity covering a piping system(s), be the governing document for all design, materials, fabrication, erection, examination, and testing activities for the piping system(s) until the completion of the work and initial operation.

Manufacturers and users of piping are cautioned against making use of revisions less restrictive than former requirements without having assurance that they have been accepted by the proper authorities in the jurisdiction where the piping is to be installed.

Users of this Code are advised that in some locations legislation may establish jurisdiction over the subject matter of this Code.

Attention of Code users is directed to the fact that the numbering of the Divisions and the text therein may not be consecutive. This is not the result of editorial or printing errors. An attempt has been made to follow a uniform outline of the various Sections. Therefore, the same subject, in general, appears under the same number and subnumber in all Sections.

The Committee is a continuing one and is organized to keep the Code current with new developments in materials, construction, and usage. New editions are published at 3-yr to 5-yr intervals.

ASME B31.5-2019
SUMMARY OF CHANGES

Following approval by the ASME B31 Committee and ASME, and after public review, ASME B31.5-2019 was approved by the American National Standards Institute on June 21, 2019.

ASME B31.5-2019 includes the following changes identified by a margin note, **(19)**.

Page	*Location*	*Change*
xi	Introduction	Revised
1	500.1	(1) Designation deleted from former para. 500.1.1 (2) Former para. 500.1.3 redesignated as 500.1.1, and title added (3) Paragraph 500.1.2 added
6	Table 500.2-1	General Note (a) revised
8	Table 500.2-2	General Note (a) revised
13	Table 502.3.1-1	Former Table 502.3.1 editorially redesignated and reformatted
22	Figure 502.3.2-1	Former Figure 502.3.2 editorially redesignated
32	504.7	Subparagraph (d) added
33	Figure 504.5.3-1	Former Figure 504.5.3 editorially redesignated
36	Table 514-1	Former Table 514 editorially redesignated
39	Table 519.3.1-1	(1) Former Table 519.3.1 editorially redesignated (2) In title and subheading, “IP” revised to “USC”
40	Table 519.3.2-1	(1) Former Table 519.3.2 editorially redesignated (2) In title and subheading, “IP” revised to “USC”
41	Table 519.3.6-1	Former Table 519.3.6 editorially redesignated
48	Table 521.3.1-1	Former Table 521.3.1 editorially redesignated
49	523.1.1	Subparagraph (b) revised
49	523.1.5	Added
50	Table 523.1-1	(1) Former Table 523.1 editorially redesignated (2) General Note (a) revised
54	Figure 523.2.2-1	Former Figure 523.2.2 editorially redesignated
55	Table 523.2.2-1	Former Table 523.2.2 editorially redesignated
57	Table 526.1-1	(1) Former Table 526.1 editorially redesignated (2) Entries for ASME B16.36 and MSS SP-105 added (3) General Note revised, and Note (1) added
60	Figure 527.1.2-1	Former Figure 527.1.2 editorially redesignated
69	529.3	Last sentence added
69	531.2.1	Last sentence added
69	531.3.1	Last sentence added
72	Table 531.2.1-1	(1) Former Table 531.2.1 editorially redesignated (2) In first column, P-No. 5 entries revised to “5A” and “5B” (3) General Note added, and General Note (9) revised

Page	*Location*	*Change*
79	Mandatory Appendix I	Former Nonmandatory Appendix A redesignated and updated, and remaining Nonmandatory Appendices redesignated
82	Nonmandatory Appendix A	Formerly Nonmandatory Appendix B; information relocated to the Correspondence With the B31 Committee page in the front matter
83	B-2	Paragraph B-2.7 (formerly para. C-2.7) deleted

Chapter I
Scope and Definitions

500 GENERAL STATEMENTS

This Refrigeration Piping and Heat Transfer Components Code is a Section of the American Society of Mechanical Engineers (ASME) Code for Pressure Piping, B31. This Section is published as a separate document for simplicity and for convenience of Code users. The users of this Code are advised that in some areas legislation may establish governmental jurisdiction over the subject matter covered by the Code. The owner of a piping installation shall choose which piping codes are applicable to the installation and shall have the overall responsibility for compliance with this Code. (See Nonmandatory Appendix B.) The owner of a complete piping installation shall have the overall responsibility for compliance with this Code.

It is required that the engineering design specify any special requirements pertinent to the particular service involved. For example, the engineering design shall not for any service specify a weld quality lower than that stipulated in para. 527.3.2(d) for the Code-required visual examination quality and for the types of welds involved; but where service requirements necessitate added quality and more extensive nondestructive examination, these are to be specified in the engineering design and any revision thereto, and when so specified, the Code requires that they be accomplished.

The Code generally employs a simplified approach for many of its requirements. A designer may choose to use a more complete and rigorous analysis to develop design and construction requirements. When the designer decides to take this approach, the designer shall provide details and calculations demonstrating that design, contruction, examination, and testing are consistent with the criteria of this Code. The details shall be documented in the engineering design.

(19) 500.1 Scope

Rules for this Code Section have been developed considering the needs for applications that include piping and heat transfer components for refrigerants and secondary coolants.

This Code prescribes requirements for the materials, design, fabrication, assembly, erection, test, and inspection of refrigerant, heat transfer components, and secondary coolant piping for temperatures as low as −320°F (−196°C), whether erected on the premises or factory assembled, except as specifically excluded in the following paragraphs.

500.1.1 Exclusions. This Code shall not apply to any of the following:

(a) any self-contained or unit systems subject to the requirements of Underwriters Laboratories or other nationally recognized testing laboratory

(b) water piping, other than where water is used as a secondary coolant or refrigerant

(c) piping designed for external or internal gage pressure not exceeding 15 psi (105 kPa) regardless of size

(d) pressure vessels, compressors, or pumps, but does include all connecting refrigerant and secondary coolant piping starting at the first joint adjacent to such apparatus

500.1.2 Units of Measure. This Code states values in both U.S. Customary (USC) and International System (SI) units. Within the text, the SI units are shown in parentheses or in separate tables. The values stated in each system are not exact equivalents; therefore, each system of units should be used independently of the other.

When separate equations are provided for USC and SI units, those equations shall be executed using variables in the units associated with the specific equation. The results obtained from execution of these equations may be converted to other units. When necessary to convert from one system of units to another, conversion should be made by rounding the values to the number of significant digits of implied precision in the starting value, but not less than four significant digits for use in calculations.

500.2 Definitions

For convenience in reference, some of the more common terms relating to piping are defined in this paragraph.

Most welding definitions were taken from the AWS Welding Handbook, Volume 1, 7th Edition. Heat treatment terms were taken from ASM Metals Handbook Properties and Selection of Materials, Volume 1, 8th Edition.

arc welding: a group of welding processes wherein coalescence is produced by heating with an electric arc(s), with or without the application of pressure and with or without the use of filler metal.