

ASME B31.8-2016
(Revision of ASME B31.8-2014)

Gas Transmission and Distribution Piping Systems

ASME Code for Pressure Piping, B31

AN INTERNATIONAL PIPING CODE®



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Mechanical Engineers**

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**The American Society of
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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 the American Standards Association, now the American National Standards Institute (ANSI)] initiated Project B31 in March 1926 at the request of the American Society of Mechanical Engineers and with that Society as sole sponsor. After several years of work by Sectional Committee B31 and its subcommittees, a first Edition was published in 1935 as an American Tentative Standard Code for Pressure Piping.

A revision of the original tentative standard began in 1937. Several more years of effort were given to securing uniformity among sections, eliminating divergent requirements and discrepancies, keeping the Code abreast of current developments in welding technique, calculating stress computations, and including reference to new dimensional and material standards. During this period, a new section on refrigeration piping was prepared in cooperation with the American Society of Refrigeration Engineers and complemented the American Standard Code for Mechanical Refrigeration. This work culminated in the 1942 American Standard Code for Pressure Piping.

Supplements 1 and 2 of the 1942 Code, which appeared in 1944 and 1947, respectively, introduced new dimensional and material standards, a new formula for pipe wall thickness, and more comprehensive requirements for instrument and control piping. Shortly after the 1942 Code was issued, procedures were established for handling inquiries requiring explanation or interpretation of Code requirements and for publishing such inquiries and answers in *Mechanical Engineering* for the information of all concerned.

By 1948, continuing increases in the severity of service conditions combined with the development of new materials and designs to meet these higher requirements warranted more extensive changes in the Code than could be provided from supplements alone. The decision was reached by the American Standards Association and the sponsor to reorganize the sectional committee and its several subcommittees and to invite the various interested bodies to reaffirm their representatives or to designate new ones.

Because of the wide field involved, between 30 and 40 different engineering societies, government bureaus, trade associations, institutes, and similar organizations had one or more representatives on the sectional committee, plus a few "members-at-large" to represent general interests. Code activities were subdivided according to the scope of the several sections. General direction of Code activities rested with the Standards Committee officers and an executive committee, membership of which consisted principally of Standards Committee officers and section chairmen.

Following its reorganization in 1948, Standards Committee B31 made an intensive review of the 1942 Code that resulted in

- (a) a general revision and extension of requirements to agree with present-day practice
- (b) the revision of references to existing dimensional standards and material specifications and the addition of references to the new ones
- (c) the clarification of ambiguous or conflicting requirements

A revision was presented for letter ballot vote of Standards Committee B31. Following approval by this body, the project was approved by the sponsor organization and by the American Standards Association. It was finally designated as an American Standard in February 1951, with the designation B31.1-1951.

Standards Committee B31 at its annual meeting of November 29, 1951, authorized the separate publication of a section of the Code for Pressure Piping addressing gas transmission and distribution piping systems, to be complete with the applicable parts of Section 2, Gas and Air Piping Systems; Section 6, Fabrication Details; and Section 7, Materials — Their Specifications and Identification. The purpose was to provide an integrated document for gas transmission and distribution piping that would not require cross-referencing to other sections of the Code.

The first Edition of this integrated document, known as American Standard Code for Pressure Piping, Section 8, Gas Transmission and Distribution Piping Systems, was published in 1952 and

consisted almost entirely of material taken from Sections 2, 6, and 7 of the 1951 Edition of the Pressure Piping Code.

A new section committee was organized in 1952 to update Section 8 as necessary to address modern materials and methods of construction and operation.

After a review by B31 Executive and Standards Committees in 1955, a decision was made to develop and publish industry sections as separate Code documents of the American Standard B31 Code for Pressure Piping. The 1955 Edition constituted a general revision of the 1952 Edition with a considerably expanded scope. Further experience in the application of the Code resulted in revisions in 1958, 1963, 1966, 1967, 1968, 1969, 1975, and 1982.

In December 1978, the American National Standards Committee B31 was reorganized as the ASME Code for Pressure Piping, B31 Committee. The code designation was also changed to ANSI/ASME B31.

The 1989 Edition of the Code was a compilation of the 1986 Edition and the subsequent addenda issued to the 1986 Edition.

The 1992 Edition of the Code was a compilation of the 1989 Edition, the subsequent three addenda, and the two special Errata issued to the 1989 Edition.

The 1995 Edition of the Code was a compilation of the 1992 Edition and the subsequent three addenda issued to the 1992 Edition.

The 1999 Edition of the Code was a compilation of the 1995 Edition and the revisions that occurred following the issuance of the 1995 Edition.

The 2003 Edition of the Code was a compilation of the 1999 Edition and revisions that occurred following the issuance of the 1999 Edition.

The 2007 Edition of the Code was a compilation of the 2003 Edition and revisions that occurred following the issuance of the 2003 Edition.

The 2010 Edition of the Code was a compilation of the 2007 Edition and revisions that occurred following the issuance of the 2007 Edition.

The 2012 Edition of the Code was a compilation of the 2010 Edition and revisions that occurred following the issuance of the 2010 Edition.

The 2014 Edition of the Code was a compilation of the 2012 Edition and revisions that occurred following the issuance of the 2012 Edition.

The 2016 Edition of the Code is a compilation of the 2014 Edition and revisions that have occurred since the issuance of the 2014 Edition. This Edition was approved by ANSI on August 26, 2016.

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INTRODUCTION

The ASME Code for Pressure Piping consists of many individually published sections, each an American National Standard. Hereafter, in this Introduction and in the text of this Code Section, B31.8, when the word “Code” is used without specific identification, it means this Code Section.

The Code specifies engineering requirements deemed necessary for the safe design and construction of pressure piping. While safety is the primary consideration, this factor alone will not necessarily govern the final specifications of any piping installation or operation. The Code is not a design handbook. Many decisions that must be made to produce a sound piping installation and maintain system integrity during operation are not specified in detail within this Code. The Code does not serve as a substitute for sound engineering judgment by the operating company and designer.

To the greatest possible extent, Code requirements for design are stated in terms of basic design principles and formulas. These are supplemented as necessary with specific requirements to ensure uniform application of principles and to guide selection and application of piping elements. The Code prohibits designs and practices known to be unsafe and contains warnings where caution, but not prohibition, is warranted.

This Code Section includes

- (a) references to acceptable material specifications and component standards, including dimensional and mechanical property requirements
- (b) requirements for designing components and assemblies
- (c) requirements and data for evaluating and limiting stresses, reactions, and movements associated with pressure, temperature changes, and other forces
- (d) guidance and limitations on selecting and applying materials, components, and joining methods
- (e) requirements for fabricating, assembling, and installing piping
- (f) requirements for examining, inspecting, and testing piping
- (g) procedures for operation and maintenance that are essential to public safety
- (h) provisions for protecting pipelines from external and internal corrosion

It is intended that this Edition of Code Section B31.8 not be retroactive. The latest edition issued at least 6 months before the original contract date for the first phase of activity covering a piping system or systems shall be the governing document, unless agreement is specifically made between contracting parties to use

another issue, or unless the regulatory body having jurisdiction imposes the use of another issue or different requirements.

Users of this Code are cautioned against making use of revisions without assurance that they are acceptable to any authorities of jurisdiction where the piping is to be installed.

The Code is under the direction of ASME Committee B31, Code for Pressure Piping, which is organized and operates under procedures of The American Society of Mechanical Engineers that have been accredited by the American National Standards Institute. The Committee is a continuing one and keeps all Code Sections current with new developments in materials, construction, and industrial practice.

When no Section of the ASME Code for Pressure Piping specifically covers a piping system, the user has discretion to select any Section determined to be generally applicable; however, it is cautioned that supplementary requirements to the Section chosen may be necessary to provide for a safe piping system for the intended application. Technical limitations of the various Sections, legal requirements, and possible applicability of other Codes or Standards are some of the factors to be considered by the user in determining the applicability of any Section of this Code.

Appendices

This Code contains two kinds of appendices: mandatory and nonmandatory. Mandatory appendices contain materials the user needs to carry out a requirement or recommendation in the main text of the Code. Nonmandatory appendices, which are written in mandatory language, are offered for application at the user’s discretion.

Interpretations and Revisions

The Committee has established an orderly procedure to consider requests for interpretation and revision of Code requirements. To receive consideration, inquiries must be in writing and must give full particulars. (See Nonmandatory Appendix O covering preparation of technical inquiries.)

The approved reply to an inquiry will be sent directly to the inquirer. In addition, the question and reply will be published as part of an Interpretation Supplement to the Code Section, issued with the revisions.

Requests for interpretation and suggestions for revision should be addressed to the Secretary, ASME B31 Committee, The American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016-5990.

Cases

A Case is the prescribed form of reply to an inquiry when study indicates that the Code wording needs clarification or when the reply modifies existing requirements of the Code or grants permission to use new materials or alternative constructions. The Case will be published on the B31.8 Committee Page at <http://cstools.asme.org/>.

A Case is normally issued for a limited period, after which it may be renewed, incorporated in the Code, or allowed to expire if there is no indication of further need for the requirements covered by the Case. The provisions of a Case, however, may be used after its expiration

or withdrawal, provided the Case was effective on the original contract date or was adopted before completion of the work, and the contracting parties agree to its use.

Materials are listed in the Stress Tables only when sufficient usage in piping within the scope of the Code has been shown. Materials may be covered by a Case. Requests for listing shall include evidence of satisfactory usage and specific data to permit establishment of allowable stresses or pressure rating, maximum and minimum temperature limits, and other restrictions. Additional criteria can be found in the guidelines for addition of new materials in the ASME Boiler and Pressure Vessel Code, Section II. (To develop usage and gain experience, unlisted materials may be used in accordance with para. 811.2.2.)

Effective Date

This Edition, when issued, contains new Code provisions. It is a compilation of the 2014 Edition and revisions to the 2014 Edition.

ASME B31.8-2016 SUMMARY OF CHANGES

Following approval by the B31 Committee and ASME, and after public review, ASME B31.8-2016 was approved by the American National Standards Institute on August 26, 2016.

ASME B31.8-2016 consists of editorial changes, revisions, and corrections identified by a margin note, (16), placed next to the affected area.

<i>Page</i>	<i>Location</i>	<i>Change</i>
xiv, xv	Introduction	Updated
1	802.1	Subparagraph (b)(2) revised
2	802.2	New para. 802.2.2 added, and remaining paragraphs redesignated
3	803.4	Definition of <i>gathering system</i> revised in its entirety
8	805.2.3	Definition of <i>hoop stress, S_H [psi (MPa)]</i> revised
15	813.3	Added
16	814.1.3	Subparagraph (a)(2) revised
18	817.3	Subparagraph (a) revised
20	823.2.1	Revised
25, 26	831.3.1	Subparagraph (f) revised
27	831.4.1	Subparagraphs (b) and (e) revised
34	834.5	Subparagraph (b) revised
37, 38	841.1.2	Subparagraph (c) revised in its entirety
39	841.1.5	Subparagraph (a) revised
40	Table 841.1.6-2	“Pressure/flow control and metering facilities” row revised
49	Table 841.3.2-1	General Note (b) revised
52	Table 842.1.1-1	Last row revised
53	842.2.1	Definition for <i>S</i> revised
	842.2.2	(1) Subparagraph (c) revised (2) Table 842.2.2-1 deleted
54	842.2.3	(1) Subparagraph (c) revised (2) Table 842.2.3-1 deleted
	842.2.9	(1) Subparagraphs (b)(5) and (c)(3) revised (2) Subparagraph (b)(5)(-c) added
56, 57	Table 842.2.9-1	Second row added
	842.3.3	Former subpara. (d)(1) deleted, and remaining subparagraphs redesignated

<i>Page</i>	<i>Location</i>	<i>Change</i>
59	843.3.1	Subparagraph (b) revised
61	843.4.6	Revised
67	845.4.1	Subparagraphs (a)(1), (a)(2), and (a)(3) revised
103, 104	A801	Revised
	A803	Definitions for <i>minimum wall thickness</i> , <i>t_{min}</i> ; <i>prefabricated piping</i> ; and <i>special assembly</i> added
109–111	A842.1.6	Revised
	A842.2.2	Revised in its entirety
	Table A842.2.2-1	Note (1) revised
	A842.2.10	First sentence revised
121	B842.2.2	Subparagraph (g) revised
	B842.2.9	Subparagraph (b) revised
125–129	Mandatory Appendix A	Updated
131–133	Nonmandatory Appendix C	Updated
136	Table D-2	(1) Headers revised (2) Second row added
138–141	Table E-1	“Tapered transition per ASME B16.25” sketch and Note (1) revised
143, 145, 147	F-2.1	Last sentence revised
	F-2.1.5	Last sentence revised
	F-2.1M	Last sentence revised
	F-2.1.5M	Last sentence revised
175	N-1	Last sentence revised
183–191	Index	Updated

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GAS TRANSMISSION AND DISTRIBUTION PIPING SYSTEMS

General Provisions and Definitions

801 GENERAL

801.1 Approved Standards and Specifications

Standards and specifications approved for use under this Code and the names and addresses of the sponsoring organizations are shown in Mandatory Appendix A. It is not considered practicable to refer to a specific edition of each of the standards and specifications in the individual Code paragraphs.

801.2 Use of Standards and Specifications Incorporated by Reference

Some standards and specifications cited in Mandatory Appendix A are supplemented by specific requirements elsewhere in this Code. Users of this Code are advised against attempting direct application of any of these standards without carefully observing the Code's reference to that standard.

801.3 Standard Dimensions

Adherence to American National Standards Institute (ANSI) dimensions is strongly recommended wherever practicable. Paragraphs or notations specifying these and other dimensional standards in this Code, however, shall not be mandatory, provided that other designs of at least equal strength and tightness, capable of withstanding the same test requirements, are substituted.

801.4 SI (Metric) Conversion

For factors used in converting U.S. Customary units to SI units, see Nonmandatory Appendix J.

802 SCOPE AND INTENT

(16) 802.1 Scope

(a) This Code covers the design, fabrication, installation, inspection, and testing of pipeline facilities used for the transportation of gas. This Code also covers safety aspects of the operation and maintenance of those facilities. (See Mandatory Appendix Q for scope diagrams.)

This Code is concerned only with certain safety aspects of liquefied petroleum gases when they are

vaporized and used as gaseous fuels. All of the requirements of NFPA 58 and NFPA 59 and of this Code concerning design, construction, and operation and maintenance of piping facilities shall apply to piping systems handling butane, propane, or mixtures of these gases.

(b) This Code does not apply to

(1) design and manufacture of pressure vessels covered by the BPV Code¹

(2) piping with metal temperatures above 450°F (232°C) (For low-temperature considerations, see para. 812.)

(3) piping beyond the outlet of the customer's meter set assembly (Refer to ANSI Z223.1/NFPA 54.)

(4) piping in oil refineries or natural gasoline extraction plants, gas treating plant piping other than the main gas stream piping in dehydration, and all other processing plants installed as part of a gas transmission system, gas manufacturing plants, industrial plants, or mines (See other applicable sections of the ASME Code for Pressure Piping, B31.)

(5) vent piping to operate at substantially atmospheric pressures for waste gases of any kind

(6) wellhead assemblies, including control valves, flow lines between wellhead and trap or separator, offshore platform production facility piping, or casing and tubing in gas or oil wells (For offshore platform production facility piping, see API RP 14E.)

(7) the design and manufacture of proprietary items of equipment, apparatus, or instruments

(8) the design and manufacture of heat exchangers (Refer to appropriate TEMA² standard.)

(9) liquid petroleum transportation piping systems (Refer to ASME B31.4.)

(10) liquid slurry transportation piping systems (Refer to ASME B31.4.)

(11) carbon dioxide transportation piping systems

¹ BPV Code references here and elsewhere in this Code are to the ASME Boiler and Pressure Vessel Code.

² Tubular Exchanger Manufacturers Association, 25 North Broadway, Tarrytown, NY 10591.