ASME B31.9-2020
(Revision of ASME B31.9-2017)

Building Services Piping

ASME Code for Pressure Piping, B31

AN AMERICAN NATIONAL STANDARD

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 2023. 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/InterpsDatabase. Periodically certain actions of the ASME B31 Committees 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.

Errata to codes and standards may be posted on the ASME website under the Committee Pages of the associated codes and standards to provide corrections to incorrectly published items, or to correct typographical or grammatical errors in codes and standards. Such errata shall be used on the date posted.

The B31 Committee Page can be found at http://go.asme.org/B31committee. The associated B31 Committee Pages for each code and standard can be accessed from this main page. There is an option available to automatically receive an e-mail notification when errata are posted to a particular code or standard. This option can be found on the appropriate Committee Page after selecting “Errata” in the “Publication Information” section.

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. The American Standards Association (ASA) initiated the B31 Project in March 1926 to meet that need. The American Society of Mechanical Engineers (ASME) proposed the work and has served as sponsor since its inception.

The first edition was published in 1935 as the American Tentative Standard Code for Pressure Piping. To keep the Code abreast of developments in design, welding, and service conditions, and of new standards and specifications, new or supplementary editions were issued as follows:

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 1955, a decision was made to develop and publish separate Code Sections for various industries. The current Sections are as follows:

B31.1	Power Piping
B31.3	Process Piping
B31.4	Pipeline Transportation Systems for Liquids and Slurries
B31.5	Refrigeration Piping and Heat Transfer Components
B31.8	Gas Transmission and Distribution Piping Systems
B31.9	Building Services Piping
B31.12	Hydrogen Piping and Pipelines

In 1969, ASA, renamed the United States of America Standards Institute (USASI), became the American National Standards Institute (ANSI), and the B31 Sectional Committee became the B31 Standards Committee. In 1978, ASME was granted accreditation by ANSI to organize the B31 Committee as the ASME Code for Pressure Piping, with Code Sections designated as ANSI/ASME B31.

Need for a separate building services section of the Code for Pressure Piping had been recognized for several years. ASME B31.9, Building Services Piping, first issued in 1982, was developed to fill that need.

The Code has intentionally been written on a conservative basis in order to avoid the necessity for complex design, fabrication, and inspection criteria. For this reason, application of this Code is expected to be simple and straightforward.

Metric (SI) units were added in parentheses after U.S. Customary (USC) units. The 2008 edition was approved by ANSI on April 1, 2008, and designated as ASME B31.9-2008.

The 2011 edition of ASME B31.9 contained revisions to the definitions and materials section of the Code. Additionally, the allowable stress values were updated to the 3.5 design margin.

The 2014 edition of ASME B31.9 included revisions to materials and the standards for material specifications, and other errata found in the Code.

The 2017 edition of ASME B31.9 included the addition of allowable stresses for (austenitic) stainless steels to Table I-1 and revisions to references in Mandatory Appendix III. Following approval by the B31 Main Committee and the ASME Board on Pressure Technology Codes and Standards, and after public review, ASME B31.9-2017 was approved by ANSI on October 31, 2017.

ASME B31.9-2020 was approved by ANSI on September 16, 2020.

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Code for Pressure Piping

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

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CORRESPONDENCE WITH THE B31 COMMITTEE (20)

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 (20)

The ASME B31 Code for Pressure Piping consists of a number of individually published Sections, each an American National Standard. Hereafter, in this Introduction and in the text of this Code Section B31.9, where the word *Code* is used without specific identification, it means this Code Section.

The Code specifies engineering requirements deemed necessary for safe design and construction of pressure piping. While safety is the primary consideration, this factor alone will not necessarily govern the final specifications for any piping installation. 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 judgment by the owner 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.

(a) This Code Section includes

(1) references to acceptable material specifications and component standards, including dimensional requirements and pressure–temperature ratings

(2) requirements for design of components and assemblies, including pipe supports

(3) requirements and data for evaluation and limitation of stresses, reactions, and movements associated with pressure, temperature changes, and other forces

(4) guidance and limitations on the selection and application of materials, components, and joining methods

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

(6) requirements for examination, inspection, and testing of piping

It is intended that this edition of Code Section B31.9 not be retroactive. Unless agreement is specifically made between contracting parties to use another issue, or the regulatory body having jurisdiction imposes the use of another issue, the latest edition issued at least 6 months prior to the original contract date for the first phase of activity covering a piping system or systems shall be the governing document for all design, materials, fabrication, erection, examination, and testing for the piping until the completion of the work and initial operation.

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

Code users will note that clauses in the Code are not necessarily numbered consecutively. Such discontinuities result from following a common outline, insofar as practicable, for all Code Sections. In this way, corresponding material is correspondingly numbered in most Code Sections, thus facilitating reference by those who have occasion to use more than one Section.

The Code is under the direction of ASME Committee B31, Code for Pressure Piping, which is organized and operates under ASME procedures 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. New editions are published at intervals of 3 to 5 years.

It is the owner's responsibility to select the Code Section that most nearly applies to a proposed piping installation. Different Code Sections may apply to different parts of an 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, and the owner should impose additional requirements supplementing those of the Code in order to ensure safe piping for the proposed installation.

(b) Rules for each Code Section have been developed considering the need for application-specific requirements for the pressure piping involved. Applications considered for each Code Section include

(1) B31.1, Power Piping — piping typically found in electric power generating stations, industrial and institutional plants, geothermal heating systems, and central and district heating and cooling systems

(2) B31.3, Process Piping — piping typically found in petroleum refineries; onshore and offshore petroleum and natural gas production facilities; chemical, pharmaceutical, textile, paper, ore-processing, semiconductor, and cryogenic plants; food- and beverage-processing facilities; and related processing plants and terminals

(3) B31.4, Pipeline Transportation Systems for Liquids and Slurries — piping transporting products that are predominately liquid between plants and terminals, and within terminals and pumping, regulating, and metering stations

(4) B31.5, Refrigeration Piping and Heat Transfer Components — piping for refrigerants and secondary coolants

(5) B31.8, Gas Transportation and Distribution Piping Systems — piping transporting products that are predominately gas between sources and terminals, including compressor, regulating, and metering stations; and gas gathering pipelines

(6) B31.9, Building Services Piping — piping typically found in industrial, institutional, commercial, and public buildings, and in multi-unit residences, which does not require the range of sizes, pressures, and temperatures covered in ASME B31.1

(7) B31.12, Hydrogen Piping and Pipelines — piping in gaseous and liquid hydrogen service, and pipelines in gaseous hydrogen service

(c) Certain piping within a facility may be subject to other codes and standards, including but not limited to

(1) ASME Boiler and Pressure Vessel Code, Section III — nuclear power piping

(2) ANSI Z223.1, National Fuel Gas Code — fuel gas piping from the point of delivery to the connections of each gas utilization device

(3) NFPA Fire Protection Standards — fire protection systems using water and other materials such as carbon dioxide, halon, foam, dry chemicals, and wet chemicals

(4) NFPA 85, Boiler and Combustion Systems Hazards Code

(5) NFPA 99, Health Care Facilities — medical and laboratory gas systems

(d) Either U.S. Customary (USC) units 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 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.

(e) See the Correspondence With the B31 Committee page for information on Code Cases. The ASME B31 Standards Committee took action to eliminate Code Case expiration dates effective September 21, 2007. This means that all Code Cases in effect as of that date will remain available for use until annulled by the ASME B31 Standards Committee.

(f) 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, maximum and minimum temperature limits, and other restrictions. (To develop usage and gain experience, unlisted materials may be used in accordance with para. 923.1.2.)

ASME B31.9-2020
SUMMARY OF CHANGES

Following approval by the ASME B31 Committee and ASME, and after public review, ASME B31.9-2020 was approved by the American National Standards Institute on September 16, 2020.

ASME B31.9-2020 includes the following changes identified by a margin note, **(20)**.

Page	*Location*	*Change*
ix	Correspondence With the B31 Committee	Added
xi	Introduction	Revised
2	Figure 900.1.2	Revised
3	900.1.4	Added
3	900.2	Definition of *manufacturer's weld line* added
14	904.7.2	Introductory paragraph revised
30	Table 926.1	Updated
37	927.4.6	In subpara. (b), second paragraph added
41	Figure 927.4.6-3	Added
42	931	Second paragraph added
50	Table I-1	(1) Under Carbon Steel — Seamless Pipe and Tube, Electric Resistance Welded Pipe and Tube, and Spiral-Welded Pipe and Tube, last 3 rows added (2) Note (2) added and subsequent Notes redesignated
59	Mandatory Appendix III	(1) ASME B31P, ASTM F1476, ASTM F1548, ASTM F3226, MSS SP-127, and MSS SP-136 added (2) AWWA C606 updated
62	Mandatory Appendix IV	Information moved to Correspondence With the B31 Committee page
65	Table B-3.2.1	For $a > 0.3g$, under Noncritical Piping, NPS > 4 in., "NR" revised to "DR"
65	B-3.2	Paragraph after subpara. (c) added

Chapter I
Scope and Definitions

900 GENERAL

This Building Services Piping Code is a Section of The American Society of Mechanical Engineers (ASME) Code for Pressure Piping, B31. This Section, herein called the Code, is published as a separate document for convenience.

Standards and specifications incorporated by reference in this Code are shown in Table 926.1, Mandatory Appendix I, and elsewhere. It is not considered practical to refer to a dated edition of each standard or specification where referenced. Instead, the dated edition references are included in Mandatory Appendix III.

The user is cautioned that the local building code must be observed and adhered to when its requirements are more stringent than those of this Code.

Components of piping systems shall conform to the specifications and standards listed in this Code. Piping elements neither specifically approved nor specifically prohibited by this Code may be used, provided they are qualified for use as set forth in applicable chapters of this Code.

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

900.1 Scope

900.1.1 Coverage and Application. This Code Section has rules for the piping in industrial, institutional, commercial, and public buildings, and in multi-unit residences, which does not require the range of sizes, pressures, and temperatures covered in ASME B31.1. This Code prescribes requirements for the design, materials, fabrication, installation, inspection, examination, and testing of piping systems for building services. It includes piping systems in the building or within the property limits.

900.1.2 Services and Limits

(a) Services. This Code applies to the following building services, except as excluded in para. 900.1.3:

(1) water and antifreeze solutions for heating and cooling
(2) condensing water
(3) steam or other condensate
(4) other nontoxic liquids
(5) steam
(6) vacuum
(7) compressed air
(8) other nontoxic, nonflammable gases
(9) combustible liquids including fuel oil

(b) Boiler External Piping. The scope of this Code includes boiler external piping within the following limits:

(1) for steam boilers, 15 psig (103 kPa gage) max.
(2) for water heating units, 160 psig (1 103 kPa gage) max. and 250°F (121°C) max.

Boiler external piping above these pressure or temperature limits is within the scope of ASME B31.1. Boiler external piping is the piping connected to the boiler and extending to the points identified in Figure 900.1.2.

(c) Material and Size Limits. Piping systems of the following materials are within the scope of this Code, through the indicated maximum size (and wall thickness if noted):

(1) carbon steel: NPS 48 (DN 1200) and 0.50 in. (12.7 mm) wall
(2) stainless steel: NPS 24 (DN 600) and 0.50 in. (12.7 mm) wall
(3) aluminum: NPS 12 (DN 300)
(4) brass and copper: NPS 12 (DN 300) and 12.125 in. (308 mm) O.D. for copper tubing
(5) thermoplastics: NPS 24 (DN 600)
(6) ductile iron: NPS 48 (DN 1200)
(7) reinforced thermosetting resin (RTR): 24 in. (600 mm) nominal

Other materials may be used as noted in Chapter III.

(d) Pressure Limits. Piping systems with working pressures not in excess of the following limits are within the scope of this Code:

(1) steam and condensate: 150 psig (1 034 kPa gage)
(2) liquids: 350 psig (2 413 kPa gage)
(3) vacuum: 1 atm external pressure
(4) compressed air and gas: 150 psig (1 034 kPa gage)