ASME B31.3-2024
(Revision of ASME B31.3-2022)

Process Piping

ASME Code for Pressure Piping, B31

AN INTERNATIONAL PIPING CODE®

The American Society of
Mechanical Engineers

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The American Society of Mechanical Engineers

Two Park Avenue • New York, NY • 10016 USA

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CONTENTS

Figures

Tables

FOREWORD

Responding to evident need and at the request of The American Society of Mechanical Engineers (ASME), the American Standards Association initiated Project B31 in March 1926, with ASME as sole administrative sponsor. The breadth of the field involved required that membership of the Sectional Committee be drawn from some 40 engineering societies, industries, government bureaus, institutes, and trade associations.

Initial publication in 1935 was as the American Tentative Standard Code for Pressure Piping. Revisions from 1942 through 1955 were published as American Standard Code for Pressure Piping, ASA B31.1. It was then decided to publish as separate documents the various industry Sections, beginning with ASA B31.8-1955, Gas Transmission and Distribution Piping Systems. The first Petroleum Refinery Piping Code Section was designated ASA B31.3-1959. ASA B31.3 revisions were published in 1962 and 1966.

From 1967 to 1969, the American Standards Association became first the United States of America Standards Institute, then the American National Standards Institute (ANSI). The Sectional Committee became American National Standards Committee B31 and the Code was renamed the American National Standard Code for Pressure Piping. The next B31.3 revision was designated ANSI B31.3-1973. Revisions included changing the basis for allowable stresses from a factor of 4 on tensile strength to a factor of 3. Addenda to the 1973 Edition were published through 1975.

A draft Code Section for Chemical Plant Piping, prepared by Section Committee B31.6, was ready for approval in 1974. It was decided, rather than have two closely related Code Sections, to merge the Section Committees and develop a joint Code Section, titled Chemical Plant and Petroleum Refinery Piping. The first edition was published as ANSI B31.3-1976.

In this Code, responsibility for piping design was conceptually integrated with that for the overall processing facility, with safeguarding recognized as an effective safety measure. Three categories of Fluid Service were identified, with a separate Chapter for Category M Fluid Service. Coverage for nonmetallic piping was introduced. New concepts were better defined in five Addenda, the fourth of which added Appendix M, a graphic aid to selection of the proper Fluid Service category.

The Standards Committee was reorganized in 1978 as a Committee operating under ASME procedures with ANSI accreditation. It is now the ASME Code for Pressure Piping, B31 Committee. Section committee structure remains essentially unchanged.

The second edition of Chemical Plant and Petroleum Refinery Piping was compiled from the 1976 Edition and its five Addenda, with nonmetal requirements editorially relocated to a separate Chapter. Its new designation was ANSI/ASME B31.3-1980.

Section Committee B31.10 had a draft Code for Cryogenic Piping ready for approval in 1981. Again, it was decided to merge the two Section Committees and develop a more inclusive Code with the same title. The work of consolidation was partially completed in the ANSI/ASME B31.3-1984 Edition.

Significant changes were made in Addenda to the 1984 Edition: integration of cryogenic requirements was completed; a new stand-alone Chapter on high-pressure piping was added; and coverage of fabrication, inspection, testing, and allowable stresses was reorganized. The new Edition was designated as ASME/ANSI B31.3-1987 Edition.

Addenda to the subsequent five Editions, published at 3-year intervals, were primarily used to keep the Code up to date. New Appendices were added, however, on requirements for bellows expansion joints, estimating service life, submittal of Inquiries, aluminum flanges, and quality control in the 1990, 1993, 1999, and 2002 Editions, all designated as ASME B31.3.

In a program to clarify the application of all Sections of the Code for Pressure Piping, changes were made in the Introduction and Scope statements of the 1996 Edition, and its title was changed to Process Piping.

Under direction of ASME Codes and Standards management, SI (metric) units of measurement were emphasized. With certain exceptions, SI units were listed first in the 1996 Edition and were designated as the standard. Instructions for conversion were given where SI units data were not available. U.S. Customary units also were given. By agreement, either system may have been used.

Beginning with the 2004 Edition, the publication cycle of ASME B31.3 was changed to biennial. Other changes made in the 2004 Edition included the introduction of the weld joint strength reduction factor, W, and the additions of Appendix P, Alternative Rules for Evaluating Stress Range, and Appendix S, Piping System Stress Analysis Examples.

Changes that were made to the 2006 and 2008 Editions of ASME B31.3 included the requirement that valves have blowout-proof stems and the addition of a definition for elevated temperature fluid service, respectively. The most significant change that was made to the 2010 Edition of ASME B31.3 was the addition of Chapter X, High Purity

Piping. In the 2012 Edition, Tables A-1M and A-2M were added to Appendix A to give allowable design values in SI units, and Appendix N, Application of ASME B31.3 Internationally, was also added.

The 2014 Edition significantly revised the heat treatment requirements, which along with significant revisions to ASME B31.1, made the heat treatment requirements in the two Codes very similar.

For the 2016 Edition, the allowable design values in SI units as shown in Tables A-1M and A-2M were changed from for information only to values that may be used to meet the requirements of the Code.

In the 2018 Edition, Appendix W, which describes an alternate method for evaluating high cycle fatigue, was added.

In the 2020 Edition, Appendix D, the appendix describing methods for calculating flexibility and stress intensification factors, was removed, referring to ASME B31J, Stress Intensification Factors (*i*-Factors), Flexibility Factors (*k*-Factors), and Their Determination for Metallic Piping Components, instead. Appendix P, Alternative Rules for Evaluating Stress Range, was also removed.

In the 2022 Edition, Table K-1M, which tabulates allowable stresses in SI units for piping in High Pressure Fluid Service, was added.

In the 2024 Edition, figures and tables have been redesignated according to their parent paragraph. Cross-references have been updated accordingly.

In the text, SI units are given first, with U.S. Customary units in parentheses. The values in Tables A-1, A-4, B-1, and K-1 are given in SI units, and the U.S. Customary values are given in Tables A-1C, A-4C, B-1C, and K-1C.

Code Cases and errata to the ASME B31.3 Code on Process Piping are published on the following ASME web page: http://go.asme.org/B31committee. Interpretations to the ASME B31.3 Code may be found at http://go.asme.org/Interpretations.

ASME B31.3-2024 was approved by ANSI on July 9, 2024.

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(24)

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General. ASME codes and standards are developed and maintained by committees with the intent to represent the consensus of concerned interests. Users of ASME codes and standards may correspond with the committees to propose revisions or cases, report errata, or request interpretations. Correspondence for this Code should be sent to the staff secretary noted on the committee's web page, accessible at https://go.asme.org/B31committee.

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

In addition, the committee may post errata on the committee web page. Errata become effective on the date posted. Users can register on the committee web page to receive email notifications of posted errata.

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

Cases

(a) The most common applications for cases are

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

(2) to provide alternative requirements

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

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

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

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

(1) a statement of need and background information

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

(3) the Code and the paragraph, figure, or table number

(4) the editions of the Code to which the proposed case applies

(d) A case is effective for use when the public review process has been completed and it is approved by the cognizant supervisory board. Approved cases are posted on the committee web page.

Interpretations. Upon request, the committee will issue an interpretation of any requirement of this Code. An interpretation can be issued only in response to a request submitted through the online Inquiry Submittal Form at https://go.asme.org/InterpretationRequest. Upon submitting the form, the inquirer will receive an automatic email confirming receipt.

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

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.

Interpretations are published in the ASME Interpretations Database at https://go.asme.org/Interpretations as they are issued.

Committee Meetings. The B31 Standards Committee regularly holds meetings that are open to the public. Persons wishing to attend any meeting should contact the secretary of the committee. Information on future committee meetings can be found on the committee web page at https://go.asme.org/B31committee.

(24)

INTRODUCTION

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, as follows:

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

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

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

B31.5 Refrigeration Piping and Heat Transfer Components: piping for refrigerants and secondary coolants

B31.8 Gas Transmission and Distribution Piping Systems: piping transporting products that are predominately gas between sources and terminals, including compressor, regulating, and metering stations; gas gathering pipelines

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 B31.1

B31.12 Hydrogen Piping and Pipelines: piping in gaseous and liquid hydrogen service and pipelines in gaseous hydrogen service

This is the B31.3 Process Piping Code Section. Hereafter, in this Introduction and in the text of this Code Section B31.3, where the word *Code* is used without specific identification, it means this Code Section.

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.

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

— ANSI Z223.1 National Fuel Gas Code: piping for fuel gas from the point of delivery to the connection of each fuel utilization device

— NFPA Fire Protection Standards: fire protection systems using water, carbon dioxide, halon, foam, dry chemicals, and wet chemicals

— NFPA 99 Health Care Facilities: medical and laboratory gas systems

— building and plumbing codes, as applicable, for potable hot and cold water, and for sewer and drain systems

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 required 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.

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 the following:

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

(b) requirements for design of components and assemblies, including piping supports

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

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

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

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

Either International System (SI, also known as metric) or U.S. Customary 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.

ASME Committee B31 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. New editions are published at intervals of 2 years.

Code users will note that paragraphs in the Code are not necessarily numbered consecutively. Such discontinuities result from following a common outline, insofar as practical, 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.

This edition of Code Section B31.3 is not retroactive. Normally, agreement is made between contracting parties to use a specific edition, considering requirements of the authority having jurisdiction. When specified as the latest edition and when no edition is specified, the specific edition is the one issued at least 6 months prior to the original contract date for the first design activity.

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

The B31 Committee has established an orderly procedure to consider requests for interpretation and revision of Code requirements. To receive consideration, such request shall be in writing and shall give full particulars in accordance with Appendix Z.

The approved reply to an inquiry will be sent directly to the inquirer. In addition, the question and reply will be published in the ASME Interpretation Database at http://go.asme.org/InterpsDatabase.

A Case is the prescribed form of reply 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 B31.3 web page at http://go.asme.org/B31committee.

Code Cases remain available for use until annulled by the ASME B31 Standards Committee.

A request for revision of the Code will be placed on the Committee's agenda. Further information or active participation on the part of the proponent may be requested during consideration of a proposed revision.

Materials ordinarily are listed in the stress tables only when sufficient usage in piping within the scope of the Code has been shown. 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. 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. 323.1.2.)

ASME B31.3-2024
SUMMARY OF CHANGES

Following approval by the ASME B31.3 Committee and ASME, and after public review, ASME B31.3-2024 was approved by the American National Standards Institute on July 9, 2024.

ASME B31.3-2024 includes the following changes identified by a margin note, **(24)**. In addition, many of the figures and tables have been editorially redesignated. Cross-references have been updated accordingly. For the user's convenience, a table listing the former and current figure and table designations follows this Summary of Changes.

Page	*Location*	*Change*
xxiv	Introduction	Revised
xxii	Correspondence With the B31 Committee	Added
3	300.1.5	(1) Revised (2) Footnote 3 added and subsequent footnote redesignated
3	300.2	Definitions of *may*, *reinforcement*, *shall*, and *should* revised
12	301.5	Paragraphs 301.5.1 and 301.5.4 revised
15	302.3.2	Subparagraph (d)(3) revised
16	Table 302.3.3-1	General Note and Notes (2) and (3) revised
17	Table 302.3.3-2	First column and General Note revised
16	302.3.5	Subparagraph (f)(2) revised
25	304.3.1	Subparagraph (a)(3) revised
25	304.3.2	First sentence revised
25	304.3.3	Subparagraphs (a), (c)(2), and (f)(3) revised
26	Figure 304.3.3-1	Revised in its entirety
28	304.3.4	Subparagraphs (c) and (d) revised
35	306.2.1	Subparagraph (b) revised
36	306.7	Added
36	308.2.1	Subparagraph (c)(1) revised
39	314.2.2	First sentence revised
39	Table 314.2.1-1	Note (3) revised
40	319.2.2	Subparagraph (b)(3) revised
44	319.5.2	Revised
44	319.6	Revised
44	320.1	Revised
45	320.2	(1) Revised (2) Footnote 9 deleted and subsequent footnotes redesignated
50	323.2.2	(1) Subparagraph (b)(3) corrected by errata (2) Footnote 1 revised
51	Table 323.2.2-1	Editorially reformatted
55	Table 323.2.2-2	Nominal Thickness columns revised
59	Table 323.3.4-1	Revised

Page	*Location*	*Change*
58	323.3.5	Subparagraph (d)(2) revised
62	326.1.1	Footnote 1 revised
63	Table 326.1.1-1	(1) Updated (2) General Note (a) revised (3) Notes (9) and (10) deleted
69	328.5.1	(1) Subparagraph (g) added (2) Footnote 1 added and subsequent footnotes redesignated
70	328.5.2	Revised by errata
74	328.7	Revised
76	Table 330.1.1-1	Revised
75	330.1.4	Revised
75	330.2.2	Subparagraph (a) revised
77	Table 331.1.1-1	Minimum Holding Time columns and Notes (7) and (8) revised
78	Table 331.1.2-1	Note (1) revised
79	Table 331.1.3-1	Revised
78	331.2.2	Second paragraph revised
81	331.2.5	Revised
81	331.2.6	Revised
81	332.2.1	Title and first sentence revised
82	333.1.2	Footnote 3 added
82	333.2.1	(1) Revised (2) Footnotes 4 and 5 added
82	335.2.2	Title and subpara. (a) revised
85	340.3	Revised
86	341.3.2	Subparagraph (c) added
87	Figure 341.3.2-1	Illustrations (a) and (b) revised
88	Table 341.3.2-1	(1) Revised (2) Notes (5) and (6) added and former Note (5) redesignated as Note (7)
89	Criterion Value Notes for Table 341.3.2-1	(1) Revised (2) Note (3) added and subsequent Notes redesignated
86	341.4	Revised
86	341.4.1	Subparagraphs (a)(3) and (b)(1) revised
92	342.1	(1) First paragraph revised (2) Footnotes 1 and 2 added and subsequent footnote redesignated
94	344.5.2	Subparagraph (c)(2) and last sentence revised
94	344.6	Subparagraph (b) revised
95	345.1	First sentence revised
95	345.2.3	Revised in its entirety
96	345.2.5	Subparagraph (a) revised
97	345.5.1	Revised
98	346.2	Revised
102	A304.3.1	First sentence revised
108	A323.2.2	Subparagraph (a) revised
110	A328.1	Revised

Page	*Location*	*Change*
111	Table A326.1-1	General Note revised
110	A328.2.2	Revised
113	A328.2.4	Revised
114	A328.5.3	Subparagraphs (a) and (b) revised
114	A328.5.4	Subparagraph (b) revised
115	A328.5.5	(1) Subparagraph (b) revised (2) Last paragraph added
115	Figure A328.5.5-1	Revised
125	M341.4	Revised
129	K300	(1) Subparagraph (b)(2) revised (2) Subparagraphs (b)(2)(-a) through (b)(2)(-j) added
130	K301.3.2	Revised in its entirety
131	K302.3.2	In subparagraph (b), eq. (31a) and nomenclature revised
131	K302.3.3	Subparagraphs (b) and (c) revised
132	K302.3.5	Subparagraphs (a) and (c) revised
132	Table K302.3.3-1	First column revised
133	K304.1.1	In subpara. (b), second definition of c revised
134	K304.5.1	Subparagraph (b) revised
134	K304.5.2	Subparagraph (b) revised
136	Table K305.1.2-1	Revised
137	K309	Revised
138	K314.2	Subparagraph (b) revised
140	K323.2.1	Revised
141	K323.3.1	(1) Subparagraph (a) revised (2) Subparagraph (a)(4) added and subsequent subparagraph redesignated
142	Table K323.3.1-1	Note (2) deleted and subsequent Notes redesignated
144	Table K323.3.5-1	In second column, inch equivalencies revised
143	K323.4.3	Subparagraph (b) revised
145	Table K326.1.1-1	Revised in its entirety
143	K326.1.1	Revised
146	K328.3.1	Footnote 8 revised
147	K328.7	Added
147	K330.1.3	Title revised
148	K332.2.1	Revised in its entirety
149	K333.2.3	Subparagraph (d) revised
150	K335	(1) First paragraph revised (2) Former para. K335.4 redesignated as para. K335.6 (3) Paragraph K335.5 deleted
150	K341.3.2	Revised
151	Table K341.3.2-1	First row and General Note (a) revised
150	K341.4	(1) In para. K341.4.1, subpara. (a) revised in its entirety and subpara. (d) added (2) Paragraph K341.4.3 added and subsequent paragraph redesignated
153	K344.1	Corrected by errata

Page	*Location*	*Change*
153	K344.6.2	(1) Subparagraphs (a) and (c) revised (2) Footnote 9 added
154	K344.6.3	Revised
154	K344.8	Subparagraph (b) revised
154	K345.1	First sentence revised
155	K345.2.2	Revised
155	K345.2.3	(1) Subparagraph (b) revised in its entirety (2) Subparagraph (d) added
157	Chapter X, Part 2	U304, U304.5, and U304.5.3 titles added
159	U328.4.2	Subparagraphs (b)(1) through (b)(3) revised
160	Figure U328.4.2-1	Revised
163	U346.2	Revised
165	Appendix A	Introductory text editorially revised
169	Specification Index for Appendix A	(1) Titles of ASTM A565, ASTM B423, and ASTM B725 revised (2) ASTM B637 added (3) General Note revised
170	Notes for Tables A-1 and A-1C	(1) Notes (7), (12), (21) through (23), and (46) revised (2) Note (65) added
174	Table A-1	Revised in its entirety
284	Table A-1C	(1) Revised in its entirety (2) For Low and Intermediate Alloy Steels, order of the following column headings corrected by errata: “Min. Tensile Strength” and “Min. Yield Strength”
370	Notes for Tables A-4 and A-4C	General Note (e) revised
372	Table A-4	Lines 81 and 133 added and subsequent lines redesignated
388	Table A-4C	(1) Revised (2) In line 26 under Alloy Steel, design stress values at 800°F to 1,000°F corrected by errata (3) For Copper and Copper Alloys, Nickel and Nickel Alloys, and Aluminum Alloys, Note reference in “Min. Temp.” column heading corrected by errata
398	Appendix B	Introductory text editorially revised
399	Specification Index for Appendix B	General Note revised
406	Appendix C	Introductory text editorially revised
408	Table C-1	Revised in its entirety
414	Table C-1C	Revised in its entirety
421	Table C-3	(1) N07718 added (2) A95652 deleted
424	Table C-3C	(1) N07718 added (2) A95652 deleted
430	Appendix E	Updated
436	F304.7.4	Subparagraph (f) revised
437	F306	Added
437	F312.1	First paragraph revised
438	F323.2.2	Revised
440	F335.9	Subparagraph (c) revised
441	F335.10	Revised

Page	*Location*	*Change*
443	G300	Subparagraph (b) revised
448	H304	Revised
453	Appendix J	Revised
470	Appendix K	Introductory text editorially revised
471	Specification Index for Appendix K	Revised
472	Notes for Tables K-1 and K-1C	General Note (d) and Notes (1), (16), and (17) revised
474	Table K-1	Revised in its entirety
486	Table K-1C	Revised in its entirety
500	L301.2	Revised
501	Table L301.1-1	Revised
501	Table L301.1-1C	Revised
502	L305	Subparagraph (a) revised
504	Figure M-1	(1) Revised (2) General Note (a) revised
505	Appendix N	Revised in its entirety
510	R304	Subparagraph (b) revised
511	R307	Subparagraphs (a), (a)(1), and (a)(2) revised
513	S301.1	First paragraph revised
513	S301.2	Revised
520	S303.1	Second paragraph revised
521	S303.2	Revised
531	W300	First paragraph revised
532	W302.1	Revised
536	X301	“Piping designer” revised to “designer” throughout
536	X301.1	Revised
538	X302.2.2	Subparagraph (a) revised
540	Appendix Z	Revised in its entirety
541	Index	Updated

Figures and Tables Redesignated in ASME B31.3-2024

Figure Designators	
ASME B31.3-2022	**ASME B31.3-2024**
300.1.1	300.1.1-1
302.3.5	302.3.5-1
304.2.1	304.2.1-1
304.2.3	304.2.3-1
304.3.3	304.3.3-1
304.3.4	304.3.4-1
304.5.3	304.5.3-1
319.4.4A	319.4.4-1
319.4.4B	319.4.4-2
323.2.2A	323.2.2-1
323.2.2B	323.2.2-2
328.3.2	328.3.2-1
328.4.2	328.4.2-1
328.4.3	328.4.2-2
328.4.4	328.4.3-1
328.5.2A	328.5.2-1
328.5.2B	328.5.2-2
328.5.2C	328.5.2-3
328.5.4A, B, C	328.5.4-1
328.5.4D	328.5.4-2
328.5.4E	328.5.4-3
328.5.4F	328.5.4-4
328.5.5	328.5.5-1

Figure Designators	
ASME B31.3-2022	**ASME B31.3-2024**
335.3.3	335.3.3-1
341.3.2	341.3.2-1
A328.5.3	A328.5.3-1
A328.5.4	A328.5.4-1
A328.5.5	A328.5.5-1
A328.5.6	A328.5.6-1
A328.5.7	A328.5.7-1
K323.3.3	K323.3.3-1
K328.4.3	K328.4.3-1
K328.5.4	K328.5.4-1
U304.5.3	U304.5.3-1
U328.4.2	U328.4.2-1
U335.7.1	U335.7.1-1
U335.8A	U335.8-1
U335.8B	U335.8-2
U335.8C	U335.8-3
H301	H301-1
H311	H311-1
M300	M-1
R307	R307-1
S301.1	S301.1-1
S302.1	S302.1-1
S303.1	S303.1-1

Table Designators	
ASME B31.3-2022	**ASME B31.3-2024**
300.4	300.4-1
302.3.3C	302.3.3-1
302.3.3D	302.3.3-2
302.3.4	302.3.4-1
302.3.5	302.3.5-1
304.1.1	304.1.1-1
304.4.1	304.4.1-1
308.2.1	308.2.1-1
314.2.1	314.2.1-1
323.2.2	323.2.2-1
323.2.2A	323.2.2-2
323.2.2B	323.2.2-3
323.3.1	323.3.1-1

Table Designators	
ASME B31.3-2022	**ASME B31.3-2024**
323.3.4	323.3.4-1
323.3.5	323.3.5-1
326.1	326.1.1-1
330.1.1	330.1.1-1
331.1.1	331.1.1-1
331.1.2	331.1.2-1
331.1.3	331.1.3-1
341.3.2	341.3.2-1
A323.2.2	A323.2.2-1
A323.4.2C	A323.4.2-1
A323.4.3	A323.4.3-1
A326.1	A326.1-1
A341.3.2	A341.3.2-1

Table Designators	
ASME B31.3-2022	**ASME B31.3-2024**
K302.3.3D	K302.3.3-1
K305.1.2	K305.1.2-1
K323.3.1	K323.3.1-1
K323.3.5	K323.3.5-1
K326.1	K326.1.1-1
K341.3.2	K341.3.2-1
A-1	A-1C
A-1M	A-1
A-1A	A-2
A-1B	A-3
A-2	A-4C
A-2M	A-4
B-1	B-1C
B-1M	B-1
B-2	No change
B-3	No change
B-4	No change
B-5	No change
B-6	No change
C-1	C-1C
C-1M	C-1
C-5	C-2
C-6	C-3C
C-6M	C-3
C-8	C-4
K-1	K-1C
K-1M	K-1

Table Designators	
ASME B31.3-2022	**ASME B31.3-2024**
L301.2M	L301.1-1
L301.2U	L301.1-1C
L303.2	L303.2-1
R308.1	R308-1
R308.2	R308-2
S301.1	S301.1-1
S301.3.1	S301.3-1
S301.3.2	S301.3-2
S301.5.1	S301.5-1
S301.5.2	S301.5-2
S301.6	S301.6-1
S301.7	S301.7-1
S302.2	S302.2-1
S302.3	S302.3-1
S302.5	S302.5-1
S302.6.2	S302.6.2-1
S302.6.3	S302.6.3-1
S303.1	S303.1-1
S303.3	S303.3-1
S303.7.1	S303.7-1
S303.7.2	S303.7-2
S303.7.3	S303.7-3
W301-1	No change
W302.1-1	No change
W302.1-2	No change
W302.1-3	No change
W302.1-4	No change

Chapter I
Scope and Definitions

300 GENERAL STATEMENTS

(a) Identification This Process Piping Code is a Section of The American Society of Mechanical Engineers Code for Pressure Piping, ASME B31, an American National Standard. It is published as a separate document for convenience of Code users.

(b) Responsibilities

(1) Owner. The owner of a piping installation shall have overall responsibility for compliance with this Code, and for establishing the requirements for design and construction that will govern the entire fluid handling or process installation of which the piping is a part. The owner is also responsible for designating piping in Category D, Category M, High Pressure, and High Purity Fluid Services, and for determining if a specific Quality System is to be employed. [See (d)(4) through (d)(7) and Appendix Q.] Where applicable, the owner shall consider requirements imposed by the authority having jurisdiction regarding the piping installation. The owner may designate a representative to carry out selected responsibilities required by this Code, but the owner retains ultimate responsibility for the actions of the representative.

(2) Designer. The designer is responsible to the owner for assurance that the engineering design of piping complies with the requirements of this Code and with any additional requirements established by the owner.

(3) Manufacturer, Fabricator, and Erector. The manufacturer, fabricator, and erector of piping are responsible for providing materials, components, and workmanship in compliance with the requirements of this Code and of the engineering design.

(4) Owner's Inspector. The owner's Inspector (see para. 340) is responsible to the owner for ensuring that the requirements of this Code for inspection, examination, and testing are met. If a Quality System is specified by the owner to be employed, the owner's Inspector is responsible for verifying that it is implemented.

(c) Intent of the Code

(1) It is the intent of this Code to set forth engineering requirements deemed necessary for safe design and construction of piping installations.

(2) This Code is not intended to apply to the operation, examination, inspection, testing, maintenance, or repair of piping that has been placed in service. See para. F300.1 for examples of standards that may apply in these situations. The provisions of this Code may optionally be applied for those purposes, although other considerations may also be necessary.

(3) 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, materials, fabrication, assembly, erection, examination, and testing requirements. When the designer decides to take this approach, the designer shall provide to the owner details and calculations demonstrating that the proposed design, materials, fabrication, assembly, erection, examination, and testing requirements are consistent with the criteria of this Code, including the design criteria described in para. 302. These details shall be adequate for the owner to verify the validity of the approach. The approach may be implemented following approval by the owner. The details and calculations shall be documented in the engineering design.

(4) Piping elements shall conform to the specifications and standards listed in this Code or, if not prohibited by this Code, shall be qualified for use as set forth in applicable Chapters of this Code.

(5) The engineering design shall specify any unusual requirements for a particular service. Where service requirements necessitate measures beyond those required by this Code, such measures shall be specified by the engineering design. Where so specified, the Code requires that they be accomplished.

(6) Compatibility of materials with the service and hazards from instability of contained fluids are not within the scope of this Code. See para. F323.

(d) Determining Code Requirements

(1) Code requirements for design and construction include fluid service requirements, which affect selection and application of materials, components, and joints. Fluid service requirements include prohibitions, limitations, and conditions, such as temperature limits or a requirement for safeguarding (see Appendix G). Code requirements for a piping system are the most restrictive of those that apply to any of its elements.

(2) For metallic piping not designated by the owner as Category M, High Pressure, or High Purity Fluid Service (see para. 300.2 and Appendix M), Code requirements are found in Chapters I through VI (the base Code) and fluid service requirements are found in

(-a) Chapter III for materials
(-b) Chapter II, Part 3, for components
(-c) Chapter II, Part 4, for joints

(3) For nonmetallic piping and piping lined with nonmetals, all requirements are found in Chapter VII. Paragraph designations begin with "A."

(4) For piping in a fluid service designated as Category M, all requirements are found in Chapter VIII. Paragraph designations begin with "M."

(5) For piping in a fluid service designated as Category D, piping elements restricted to Category D Fluid Service in Chapters I through VII, as well as elements suitable for other fluid services, may be used.

(6) For piping designated as High Pressure Fluid Service, all requirements are found in Chapter IX. These rules apply only when specified by the owner. Paragraph designations begin with "K."

(7) For piping designated as High Purity Fluid Service, all requirements are found in Chapter X. Paragraph designations begin with "U."

(8) Requirements for Normal Fluid Service in Chapters I through VI are applicable under severe cyclic conditions unless alternative requirements for severe cyclic conditions are stated.

(9) Requirements for Normal Fluid Service in Chapters I through VI are applicable for Elevated Temperature Fluid Service unless alternative requirements for Elevated Temperature Fluid Service are invoked.

(e) Appendices. Appendices of this Code contain Code requirements, supplementary guidance, or other information. See para. 300.4 for a description of the status of each Appendix.

(f) Code Cases. ASME issues Code Cases that are applicable to this Code. The Code Cases

(1) modify the requirements of this Code

(2) are applicable from the issue date until the Cases are annulled

(3) may be used only when approved by the owner. When so approved, the Code Cases shall be specified in the engineering design and become requirements of this Code.

300.1 Scope

Rules for the Process Piping Code Section B31.3[1] have been developed considering 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.

[1] B31 references here and elsewhere in this Code are to the ASME B31 Code for Pressure Piping and its various Sections, which are identified and briefly described in the Introduction.

300.1.1 Content and Coverage

(a) This Code prescribes requirements for materials and components, design, fabrication, assembly, erection, examination, inspection, and testing of piping.

(b) This Code applies to piping for all fluids, including

(1) raw, intermediate, and finished chemicals
(2) petroleum products
(3) gas, steam, air, and water
(4) fluidized solids
(5) refrigerants
(6) cryogenic fluids

(c) See Figure 300.1.1-1 for a diagram illustrating the application of B31.3 piping at equipment. The joint connecting piping to equipment is within the scope of B31.3.

300.1.2 Packaged Equipment Piping. Also included within the scope of this Code is piping that interconnects pieces or stages within a packaged equipment assembly.

300.1.3 Exclusions. This Code excludes the following:

(a) piping systems designed for internal gage pressures at or above zero but less than 105 kPa (15 psi), provided the fluid handled is nonflammable, nontoxic, and not damaging to human tissues as defined in 300.2, and its design temperature is from −29°C (−20°F) through 186°C (366°F)

(b) power boilers in accordance with ASME BPVC,[2] Section I and boiler external piping that is required to conform to ASME B31.1

(c) tubes, tube headers, crossovers, and manifolds of fired heaters that are internal to the heater enclosure

(d) pressure vessels, heat exchangers, pumps, compressors, and other fluid handling or processing equipment, including internal piping and connections for external piping

300.1.4 Units of Measure. This Code states values in both SI and U.S. Customary units. Within the text, the U.S. Customary 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 SI and U.S. Customary units, those equations shall be executed using variables in the units associated with the specific equation.

[2] ASME BPVC references here and elsewhere in this Code are to the ASME Boiler and Pressure Vessel Code and its various Sections as follows:

Section I, Rules for Construction of Power Boilers
Section II, Materials, Parts C and D
Section III, Rules for Construction of Nuclear Facility Components, Division 1, Subsection NH
Section V, Nondestructive Examination
Section VIII, Rules for Construction of Pressure Vessels, Divisions 1, 2, and 3
Section IX, Welding, Brazing, and Fusing Qualifications