AN AMERICAN NATIONAL STANDARD

ASME CODE FOR PRESSURE PIPING, B31

GAS TRANSMISSION AND DISTRIBUTION PIPING SYSTEMS

ASME B31.8-1992 EDITION

The American Society of
Mechanical Engineers

345 East 47th Street, New York, N.Y. 10017

Date of Issuance: January 31, 1993

The 1992 Edition of this Code is being issued with an automatic update service that includes Addenda, Interpretations, and Cases. The next Edition is scheduled for publication in 1995.

The use of Addenda allows revisions made in response to public review comments or committee actions to be published on a regular basis; revisions published in Addenda will become effective 6 months after the Date of Issuance of the Addenda.

ASME issues written replies to inquiries concerning interpretations of technical aspects of the Code. The Interpretations are not part of the Code or the Addenda and are published in a separate supplement.

Periodically certain actions of the ASME B31 Committee will be published as Cases. While these Cases do not constitute formal revisions of the Code, they may be used in specifications, or otherwise, as representing considered opinions of the Committee. The Cases are not part of the Code or the Addenda and are published in a separate supplement.

[ANSI/ASME B31.8a-1993

ASME CODE FOR PRESSURE PIPING, B31
AN AMERICAN NATIONAL STANDARD

ASME B31.8a-1993

ADDENDA

to

ASME B31.8-1992 EDITION
GAS TRANSMISSION
AND DISTRIBUTION PIPING SYSTEMS

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

United Engineering Center • 345 East 47th Street • New York, N.Y. 10017

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Page	*Location*	*Change*
21	831.31(d)	Revised
92	A803	*offshore platform* relocated by Errata
	A813.1(a)	Revised
93, 94	A823	Revised in its entirety
95	A841.24	Second paragraph revised
105	A862.2(b)	Revised
109	Appendix A	AGA A21.14-89 added
112	Appendix B	AGA A21.14 added
170	Index	Updated to reflect A93

NOTES:

(1) The interpretations to ASME B31.8 issued between September 1, 1991, and August 31, 1992, follow the last page of this Addenda as a separate supplement, Interpretations No. 9. The supplement is not part of ASME B31.8 or the Addenda.

(2) There is no cases supplement included after this Addenda. The cases are not part of ASME B31.8 or the Addenda.

ASME CODE FOR PRESSURE PIPING, B31
AN AMERICAN NATIONAL STANDARD

ASME B31.8b-1994

ADDENDA

to

ASME B31.8-1992 EDITION
GAS TRANSMISSION
AND DISTRIBUTION PIPING SYSTEMS

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

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Page	*Location*	*Change*
xii	Contents	Updated to reflect Addenda (b)
23	831.41(c)	Revised
30, 30.1	840.2(b)(1)(a)	Added
	840.2(b)(1)(b)	Added
46, 46.1	842.43(a)	Revised in its entirety
55	845.241(e)	Revised
57, 57.1	845.411	Revised in its entirety
65	849.3	Title revised
	849.31	Deleted; 849.321 redesignated as new 849.31
	849.32	(1) Old paragraph revised and made introductory paragraph to 849.3. (2) 849.322 redesignated as new 849.32.
67	850.3(b)	Corrected by Errata
92, 92.1	A803	*platform piping* added
98	Table A842.22	Revised
	A842.27	Second paragraph revised
99	A843.1	Revised
101	A844.6	Revised
109	Appendix A	RP 2A added
111	Appendix B	RP 2A added
114	Appendix C	RP 2A deleted
125	Fig. F-5	Nomenclature for *d* revised
126	Appendix F	In Examples 1 and 2, first line of each Example revised
169, 170, 173	Index	Revised

NOTES:

(1) The interpretations to ASME B31.8 issued between September 1, 1992, and August 31, 1993, follow the last page of this Addenda as a separate supplement, Interpretations No. 10. The supplement is not part of ASME B31.8 or the Addenda.

(2) There is no cases supplement included after this Addenda. The cases are not part of ASME B31.8 or the Addenda.

ASME CODE FOR PRESSURE PIPING, B31
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ASME B31.8c-1994

ADDENDA

to

ASME B31.8-1992 EDITION
GAS TRANSMISSION
AND DISTRIBUTION PIPING SYSTEMS

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

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This Addenda, ASME B31.8c-1994, is the third and last Addenda to be issued to ASME B31.8-1992 Edition. A margin designator, (c), is used to identify the affected material and corresponds to the items listed in the Summary of Changes page. Previous Addenda were published as ASME B31.8a-1993 and ASME B31.8b-1994. Either an (a) or a (b) is used to identify material affected by the first or second Addenda, respectively. The margin designators will remain on the pages until the 1995 Edition of B31.8 is published.

Page	*Location*	*Change*
1, 2	802.11	Revised
	802.13(f)	Revised
	802.22(b)	Revised
16	823.23	Revised
18	827	Revised
32, 34	841.121	Revised
36	841.231	Revised in its entirety
63–66	849	(1) 849.223 through 849.64 reorganized, redesignated as 849.3 through 849.65, and revised (2) Topics revised under 849.3, 849.31, and 849.32 in ASME B31.8b-1994 now covered under 849.62 and 849.621
70	851.4	Second paragraph revised in its entirety
78	Table 854.1(c)	Location Class 1 for 11–25 buildings revised
94	A825	Revised in its entirety
141–142.1	Fig. I-8	Replaced with revised Fig. I-8 and added Figs. I-9 and I-10
	Fig. I-9	Added
	Fig. I-10	Added
161, 162	N2.0(a)	Revised
	N2.0(b)	Revised
	N2.0(d)	Added
	N3.0	Second paragraph revised
	N5.0	Revised in its entirety
	N7.0(e)	Revised
	N7.0(i)	Revised
	N7.0(m)	Revised
	N7.0(n)	Sentence that follows added

NOTES:

(1) There is no Interpretations supplement following the last page of this Addenda. The supplements are not part of ASME B31.8 or the Addenda.

(2) There is no cases supplement included after this Addenda. The supplements are not part of ASME B31.8 or the Addenda.

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) 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' 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 was begun in 1937. Several more years' effort was given to securing uniformity between sections and to eliminating divergent requirements and discrepancies as well as to 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 was added on refrigeration piping, prepared in cooperation with the American Society of Refrigeration Engineers and complementing 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* magazine for the information of all concerned.

By 1948, continuing increases in the severity of service conditions, with concurrent developments of new materials and designs equal to meeting these higher requirements, had pointed to the need for 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, some 30 to 40 different engineering societies, government bureaus, trade associations, institutes, and similar organizations have had one or more representatives on the sectional committee, plus a few "members at large" to represent general interests. Code activities have been 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 which 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; and

(c) the clarification of ambiguous or conflicting requirements.

A revision was prepared which was presented for letter ballot vote of Standards Committee B31. Following approval by this body, the project was next 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 dealing with 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 amplify Section 8 as necessary in the light of 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.

This Edition of the code is a compilation of the 1989 Edition, the subsequent three addendas, and the two special Errata issued to the 1989 Edition.

ASME CODE FOR PRESSURE PIPING, B31

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Appendices

(b)

INTRODUCTION

The ASME 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 B31.8, when the word "Code" is used without specific identification, it means this Code Section.

The Code sets forth engineering requirements deemed necessary for safe design and construction of pressure piping. While safety is the basic consideration, this factor alone will not necessarily govern the final specifications of any piping system. The designer is cautioned that the Code is not a design handbook; it does not do away with the need for the designer or for competent engineering judgment.

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 assure 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 design of components and assemblies;

(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 installation of piping;

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

(g) procedures for operation and maintenance that are essential to public safety; and

(h) provisions for protecting pipelines from external and internal corrosion.

It is intended that this Edition of Code Section B31.8 and any subsequent addenda not be retroactive. The latest Edition and addenda 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, unless agreement is specifically made between contracting parties to use another issue, or 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 which 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. Addenda are issued periodically. New editions are published at intervals of 3 years to 5 years.

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.

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 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 together with Addenda.

Requests for interpretation and suggestions for revision should be addressed to the Secretary, ASME B31 Committee, care of The American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, New York 10017.

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. Proposed Cases are published in *Mechanical Engineering* for public review. In addition, the Case will be published as part of an Interpretation Supplement issued together with Addenda to the applicable Code Section.

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. However, the provisions of a Case 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 and Section VIII, Division 1, Appendix B. (To develop usage and gain experience, unlisted materials may be used in accordance with para. 811.22.)

Effective Date

This Edition when issued, contains no new Code provisions. It is a compilation of the Addendas to the previous Edition. The effective dates of Addenda to this Edition can be found on the copyright page for each addenda.

GENERAL PROVISIONS AND DEFINITIONS

801 GENERAL

801.1 Standards and Specifications

801.11 Standards and specifications approved for use under the Code and the names and addresses of the sponsoring organizations are shown in Appendices A and B. It is not considered practicable to refer to a specific edition of each of the standards and specifications in the individual Code paragraphs. Instead, the specific edition references are included in Appendices A and B, which will be revised at intervals as needed.

801.12 Use of Standards and Specifications Incorporated by Reference. Some standards and specifications cited in Appendices A and B 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.

801.2 Standard Dimensions

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

801.3 SI (Metric) Conversion

For factors used in converting English units to SI units, see Appendix J.

802 SCOPE AND INTENT

802.1 Scope

(c) **802.11** This Code covers the design, fabrication, installation, inspection, testing, and safety aspects of operation and maintenance of gas transmission and distribution systems, including gas pipelines, gas compressor stations, gas metering and regulation stations, gas mains, and service lines up to the outlet of the customer's meter set assembly. Included within the scope of this Code are gas transmission and gathering pipelines, including appurtenances, that are installed offshore for the purpose of transporting gas from production facilities to onshore locations; gas storage equipment of the closed pipe type, fabricated or forged from pipe or fabricated from pipe and fittings, and gas storage lines. (See Figs. I8, I9, and I10.)

802.12 The requirements of this Code also cover the conditions of use of the elements of the piping systems described in para. 802.11, including, but not limited to, pipe, valves, fittings, flanges, bolting, gaskets, regulators, pressure vessels, pulsation dampeners, and relief valves.

802.13 This Code does not apply to:

(a) design and manufacture of pressure vessels covered by the BPV Code[1];

(b) piping with metal temperatures above 450°F or below −20°F. (For low temperatures within the range covered by this Code, see para. 812.)

(c) piping beyond the outlet of the customer's meter set assembly (refer to ANSI Z223.1 and NFPA 54);

(d) 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.)

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

(f) wellhead assemblies, including control valves, flow lines between wellhead and trap or separator, off- (c)

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

shore platform production facility piping, or casing and tubing in gas or oil wells (for offshore platform production facility piping, see API RP 14E);

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

(h) the design and manufacture of heat exchangers (refer to appropriate TEMA[2] Standard);

(i) liquid petroleum transportation piping systems (refer to ANSI/ASME B31.4);

(j) liquid slurry transportation piping systems (refer to ASME B31.11);

(k) carbon dioxide transportation piping systems;

(l) liquefied natural gas piping systems (refer to NFPA 59A and ASME B31.3).

802.2 Intent

802.21 The requirements of this Code are adequate for safety under conditions usually encountered in the gas industry. Requirements for all unusual conditions cannot be specifically provided for, nor are all details of engineering and construction prescribed. Therefore, activities involving the design, construction, operation, or maintenance of gas transmission or distribution pipelines should be undertaken using supervisory personnel having the experience or knowledge to make adequate provision for such unusual conditions and specific engineering and construction details. All work performed within the scope of this Code shall meet or exceed the safety standards expressed or implied herein.

802.22 This Code is concerned with:

(a) safety of the general public;

(c) *(b)* employee safety to the extent that it is affected by basic design, quality of materials and workmanship, and requirements for testing, operations, and maintenance of gas transmission and distribution facilities. Existing industrial safety procedures pertaining to work areas, safety devices, and safe work practices are not intended to be supplanted by this Code.

802.23 It is not intended that this Code be applied retroactively to existing installations insofar as design, fabrication, installation, and testing at the time of construction are concerned. Further, it is not intended that this Code be applied retroactively to established operating pressures of existing installations, except as provided for in Chapter V.

802.24 Provisions of this Code shall be applicable to operating and maintenance procedures of existing installations, and when existing installations are uprated.

802.25 Qualification of Those Performing Inspections. Individuals who perform inspections shall be qualified by training or experience, or both, to implement the applicable requirements and recommendations of this Code.

803 PIPING SYSTEMS DEFINITIONS

803.1 General Terms

803.11 *Gas,* as used in this Code, is any gas or mixture of gases suitable for domestic or industrial fuel and transmitted or distributed to the user through a piping system. The common types are natural gas, manufactured gas, and liquefied petroleum gas distributed as a vapor, with or without the admixture of air.

803.12 *Operating company,* as used herein, is the individual, partnership, corporation, public agency, or other entity that operates the gas transmission or distribution facilities.

803.13 *Private rights-of-way,* as used in this Code, are rights-of-way not located on roads, streets, or highways used by the public, or on railroad rights-of-way.

803.14 *Parallel encroachment,* as used in this Code, pertains to that portion of the route of a pipeline or main which lies within, runs in a generally parallel direction, and does not necessarily cross, the rights-of-way of a road, street, highway, or railroad.

803.15 *Hot taps* are branch piping connections made to operating pipelines, mains, or other facilities while they are in operation. The connection of the branch piping to the operating line and the tapping of the operating line is done while it is under gas pressure.

803.16 *Vault* is an underground structure which may be entered, and which is designed to contain piping and piping components (such as valves or pressure regulators).

803.2 Piping Systems

803.21 *Pipeline or transmission line* is a pipe installed for the purpose of transmitting gas from a source or sources of supply to one or more distribution centers or to one or more large volume customers, or a pipe installed to interconnect sources of supply. In typical cases, pipelines differ from gas mains in that they operate at higher pressures, are longer, and have greater distances between connections.

[2]Tubular Exchanger Manufacturers Association, 25 N Broadway, Tarrytown, NY 10591