

ASME B31.8-2018
(Revision of ASME B31.8-2016)

Gas Transmission and Distribution Piping Systems

ASME Code for Pressure Piping, B31

AN INTERNATIONAL PIPING CODE®



**The American Society of
Mechanical Engineers**

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**The American Society of
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CONTENTS

Foreword	vii
Committee Roster	x
Introduction	xv
Summary of Changes	xvi
	General Provisions and Definitions
	1
801	General
	1
802	Scope and Intent
	1
803	Piping Systems Definitions
	2
804	Piping Systems Component Definitions
	4
805	Design, Fabrication, Operation, and Testing Terms and Definitions
	7
806	Quality Assurance
	12
807	Training and Qualification of Personnel
	13
Chapter I	Materials and Equipment
	14
810	Materials and Equipment
	14
811	Qualification of Materials and Equipment
	14
812	Materials for Use in Low-Temperature Applications
	15
813	Marking
	15
814	Material Specifications
	15
815	Equipment Specifications
	16
816	Transportation of Line Pipe
	16
817	Conditions for the Reuse of Pipe
	16
Chapter II	Welding
	19
820	Welding
	19
821	General
	19
822	Preparation for welding
	19
823	Qualification of Procedures and Welders
	20
824	Preheating
	20
825	Stress Relieving
	20
826	Field Inspection Requirements
	21
827	Repair or Removal of Defective Welds in Piping Intended to Operate at Hoop Stress Levels of 20% or More of the Specified Minimum Yield Strength
	22
Chapter III	Piping System Components and Fabrication Details
	23
830	General
	23
831	Piping System Components
	23
832	Expansion and Flexibility
	30
833	Design for Longitudinal Stress
	31
834	Supports and Anchorage for Exposed Piping
	34
835	Anchorage for Buried Piping
	34

836	Liquid Removal Equipment	35
Chapter IV	Design, Installation, and Testing	36
840	Design, Installation, and Testing	36
841	Steel Pipe	38
842	Other Materials	51
843	Compressor Stations	59
844	Pipe-Type and Bottle-Type Holders	62
845	Control and Limiting of Gas Pressure	63
846	Valves	68
847	Vaults	69
848	Customers' Meters and Regulators	70
849	Gas Service Lines	71
Chapter V	Operating and Maintenance Procedures	76
850	Operating and Maintenance Procedures Affecting the Safety of Gas Transmission and Distribution Facilities	76
851	Pipeline Maintenance	79
852	Distribution Piping Maintenance	85
853	Miscellaneous Facilities Maintenance	88
854	Location Class and Changes in Number of Buildings Intended for Human Occupancy	91
855	Pipeline Service Conversions	93
856	Odorization	93
857	Upgrading	94
Chapter VI	Corrosion Control	97
860	Corrosion Control — General	97
861	External Corrosion Control for Steel Pipelines	98
862	Cathodic Protection Criteria	100
863	Operation and Maintenance of Cathodic Protection Systems	100
864	Internal Corrosion Control	100
865	Steel Pipelines in Arctic Environments	102
866	Steel Pipelines in High Temperature Service	102
867	Stress Corrosion and Other Phenomena	103
868	Cast Iron, Wrought Iron, Ductile Iron, and Other Metallic Pipelines	103
Chapter VIII	Offshore Gas Transmission	105
A800	Offshore Gas Transmission	105
A801	General	105
A802	Scope and Intent	105
A803	Offshore Gas Transmission Terms and Definitions	105
A811	Qualification of Materials and Equipment	107
A814	Material Specifications	107
A817	Conditions for the Reuse and Requalification of Pipe	107
A820	Welding Offshore Pipelines	107
A821	General	107
A823	Qualification of Procedures and Welders	108
A825	Stress Relieving	108
A826	Inspection of Welds	108

A830	Piping System Components and Fabrication Details	108
A831	Piping System Components	108
A832	Expansion and Flexibility	109
A834	Supports and Anchorage for Exposed Piping	109
A835	Anchorage for Buried Piping	109
A840	Design, Installation, and Testing	109
A841	Design Considerations	109
A842	Strength Considerations	110
A843	Compressor Stations	111
A844	On-Bottom Stability	115
A846	Valves	116
A847	Testing	116
A850	Operating and Maintenance Procedures Affecting the Safety of Gas Transmission Facilities	117
A851	Pipeline Maintenance	117
A854	Location Class	118
A860	Corrosion Control of Offshore Pipelines	118
A861	External Corrosion Control	118
A862	Cathodic Protection Criteria	120
A864	Internal Corrosion Control	120
Chapter IX	Sour Gas Service	121
B800	Sour Gas Service	121
B801	General	121
B802	Scope and Intent	121
B803	Sour Gas Terms and Definitions	121
B813	Marking	122
B814	Material Specifications	122
B820	Welding Sour Gas Pipelines	122
B821	General	122
B822	Preparation for Welding	122
B823	Qualification of Procedures and Welders	122
B824	Preheating	123
B825	Stress Relieving	123
B826	Welding and Inspection Tests	123
B830	Piping System Components and Fabrication Details	123
B831	Piping System Components	123
B840	Design, Installation, and Testing	123
B841	Steel Pipe	123
B842	Other Materials	124
B843	Compressor Stations	124
B844	Pipe-Type and Bottle-Type Holders	124
B850	Additional Operating and Maintenance Considerations Affecting the Safety of Sour Gas Pipelines	125
B851	Pipeline Maintenance	125
B854	Location Class and Changes in Number of Buildings Intended for Human Occupancy	126
B860	Corrosion Control of Sour Gas Pipelines	127
B861	External Corrosion Control for Steel Pipelines	127

B864	Internal Corrosion Control	127
B867	Stress Corrosion and Other Phenomena	127

Mandatory Appendices

A	References	128
B	Numbers and Subjects of Standards and Specifications That Appear in Mandatory Appendix A	133
D	Specified Minimum Yield Strength for Steel Pipe Commonly Used in Piping Systems	137
E	Flexibility and Stress Intensification Factors	140
F	Extruded Headers and Welded Branch Connections	146
G	Testing of Welders Limited to Work on Lines Operating at Hoop Stresses of Less Than 20% of the Specified Minimum Yield Strength	153
H	Flattening Test for Pipe	154
I	End Preparations for Buttwelding	155
K	Criteria for Cathodic Protection	169
Q	Scope Diagrams	181

Nonmandatory Appendices

C	Publications That Do Not Appear in the Code or Mandatory Appendix	134
J	Commonly Used Conversion Factors	164
L	Determination of Remaining Strength of Corroded Pipe	170
M	Gas Leakage Control Criteria	171
N	Recommended Practice for Hydrostatic Testing of Pipelines in Place	177
O	Preparation of Technical Inquiries	179
P	Nomenclature for Figures	180
R	Estimating Strain in Dents	185

Figures

851.4.1-1	Allowable Ripple Heights	82
F-1	. . . . .	146
F-2	. . . . .	147
F-3	. . . . .	148
F-4	. . . . .	148
F-5	Rules for Reinforcement of Welded Branch Connections	149
F-6	. . . . .	150
F-7	. . . . .	151
I-1	Welding Details for Openings Without Reinforcement Other Than That in Header and Branch Walls	156
I-2	Welding Details for Openings With Localized-Type Reinforcement	156
I-3	Welding Details for Openings With Complete Encirclement Types of Reinforcement	157
I-3.1	Pressurized Hot Tap Tee Reinforcing Sleeve End Fillet Weld Design	158
I-4	Acceptable Combinations of Pipe End Preparations	159
I-5	Acceptable Design for Unequal Wall Thickness	160
I-6	Recommended Attachment Details of Flanges	161
Q-1	Scope of ASME B31.8 Transmission Piping Offshore	182
Q-2	Scope of ASME B31.8 Transmission Piping Onshore	183
Q-3	Scope of ASME B31.8 Distribution Piping	184

R-1	Method for Estimating Strain in Dents	185
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Tables

817.1.3-1	Tensile Testing	18
831.4.2-1	Reinforcement of Welded Branch Connections, Special Requirements	29
832.2-1	Thermal Expansion or Contraction of Piping Materials — Carbon and Low Alloy High Tensile Steel and Wrought Iron	30
832.5-1	Modulus of Elasticity for Carbon and Low Alloy Steel	31
841.1.6-1	Basic Design Factor, F	40
841.1.6-2	Design Factors for Steel Pipe Construction	41
841.1.7-1	Longitudinal Joint Factor, E	42
841.1.8-1	Temperature Derating Factor, T , for Steel Pipe	42
841.1.11-1	Pipeline Cover Requirements	44
841.2.3-1	Pipeline Field Cold Bend Requirements	46
841.3.2-1	Test Requirements for Steel Pipelines and Mains to Operate at Hoop Stress of 30% or More of the Specified Minimum Yield Strength of the Pipe	50
841.3.3-1	Maximum Hoop Stress Permissible During an Air or Gas Test	51
842.1.1-1	Standard Thickness Selection Table for Ductile Iron Pipe	53
842.2.9-1	Nominal Values for Coefficients of Thermal Expansion of Thermoplastic Pipe Materials	57
844.3-1	Design Factors, F	63
844.3-2	Minimum Clearance Between Containers and Fenced Boundaries	63
845.2.2-1	Maximum Allowable Operating Pressure for Steel or Plastic Pipelines or Mains	64
845.2.3-1	Maximum Allowable Operating Pressure for Pipelines Operating at 100 psig (690 kPa) or More	65
845.2.3-2	Maximum Allowable Operating Pressure for Pipelines Operating at Less Than 100 psig (690 kPa)	65
851.4.4-1	Wall Thickness for Unlikely Occurrence of Burn-Through	83
854.1-1	Location Class	92
857.4-1	Wall Thickness Allowance for Upgrading a Ductile Iron High-Pressure Main or System	96
A842.2.2-1	Design Factors for Offshore Pipelines, Platform Piping, and Pipeline Risers	112
B850.1-1	100-ppm ROE	125
B850.1-2	500-ppm ROE	126
B850.1-3	Metric Example for 100-ppm ROE	126
B850.1-4	Metric Example for 500-ppm ROE	126
D-1	Specified Minimum Yield Strength for Steel Pipe Commonly Used in Piping Systems	138
D-2	HDB Values for Thermoplastic Materials	139
E-1	Flexibility Factor, k , and Stress Intensification Factor, i	141
I-1	Lightweight Flanges	162
I-1M	Lightweight Flanges (Metric Dimensions)	163
J-1	Commonly Used Conversion Factors	165
J-2	List of SI Units for Use With B31.8 Code	167
M-4-1	Leak Detection Instruments: Type and General Usage	173
M-5.3-1	Leak Classification and Action Criteria: Grade 1	175
M-5.3-2	Leak Classification and Action Criteria: Grade 2	176
M-5.3-3	Leak Classification and Action Criteria: Grade 3	176

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 a general 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 was a compilation of the 2014 Edition and revisions that occurred following the issuance of the 2014 Edition.

The 2018 Edition of the Code is a compilation of the 2016 Edition and revisions that have occurred since the issuance of the 2016 Edition. This Edition was approved by ANSI on August 1, 2018.

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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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INTRODUCTION

General. 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 judgement 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 2016 Edition and revisions to the 2016 Edition.

ASME B31.8-2018 SUMMARY OF CHANGES

Following approval by the ASME B31 Committee and ASME, and after public review, ASME B31.8-2018 was approved by the American National Standards Institute on August 3, 2018.

ASME B31.8-2018 includes the following changes identified by a margin note, **(18)**.

<i>Page</i>	<i>Location</i>	<i>Change</i>
xiv	Introduction	Last paragraph updated
4	803.7	Definition of <i>excess flow valve</i> added
6	804.7.3	(1) Subparagraphs (a) and (d) revised (2) Subparagraph (f) deleted (3) Former subpara. (g) redesignated as (f)
7	805.1.4	Definition of <i>wrinkle bend</i> revised
12	805.2.6	Definition of <i>vortex-induced vibration (vortex shedding)</i> added
14	811.2.2	Revised
15	814.1.1	In subpara. (a), ASTM A984, ASTM A1005, and ASTM A1006 deleted
19	820	Paragraph added
19	821	Revised in its entirety
24	831.1.4	Added
33	833.10	Revised in its entirety
35	836	Added
38	841.1.1	(1) Subparagraph (b) added (2) Former subpara. (b) redesignated as (c)
38	841.1.2	Subparagraph (c) revised
40	841.1.4	Subparagraph (a)(1) revised
41	Table 841.1.6-2	Penultimate row revised
42	Table 841.1.7-1	Last three ASTM rows deleted
43	841.1.10	(1) Subparagraph (c) revised (2) Subparagraph (e) added
45	841.2.3	Subparagraph (a)(7) revised
50	Table 841.3.2-1	Note (2) revised
59	843.3.1	Revised in its entirety
72	849.1.6	Added
77	850.4.3	Subparagraph (a) revised
77	850.4.4	Last sentence added
78	850.8	Revised in its entirety
78	850.9	Added
79	851.4	Revised
80	851.4.1	Subparagraph (d) revised

81	851.4.2	Subparagraph (c)(3) revised in its entirety
82	851.4.3	(1) Subparagraph (e) deleted (2) Former subpara. (f) redesignated as (e) (3) Subparagraph (f) added
83	851.4.4	Revised in its entirety
83	851.4.5	Subparagraph (a) revised
83	851.5.1	Revised
83	851.5.3	Added
98	861.1.2	Second paragraph revised
100	862.1	Revised
105	A800	Paragraph added
105	A802.1	Revised
105	A803	(1) Definition of <i>offshore platform</i> revised (2) Definition of <i>vortex shedding</i> deleted
107	A820	Paragraph added
107	A821.1	Revised
110	A842.1.1	Second paragraph revised
111	A842.1.2	Second paragraph revised
111	A842.1.3	Second paragraph revised
111	A842.2.1	Subparagraph (a) revised
111	A842.2.2	(1) First paragraph revised (2) In subpara. (b), last paragraph revised
113	A842.2.4	Last paragraph revised
115	A844	Second paragraph revised
115	A844.5	Second paragraph revised
119	A861.1.2	Subparagraph (a) revised
120	A862	Revised in its entirety
121	B800	Paragraph added
121	B801	First paragraph revised
122	B820	Paragraph added
122	B821.1	Revised
123	B840	Paragraph added
127	B861.1.2	Penultimate paragraph revised
128	Mandatory Appendix A	Updated
134	Nonmandatory Appendix C	Updated
139	Table D-1	(1) ASTM A984, ASTM A1005, and ASTM A1006 deleted (2) Note (1) revised
139	Table D-2	Metric values added to second column
146	F-2.1	First paragraph revised
147	F-2.1M	First paragraph revised
150	F-2.2	First paragraph revised
151	F-2.2M	First paragraph revised
151	F-2.2.5M	Second and penultimate equations revised
169	Mandatory Appendix K	Deleted
185	Nonmandatory Appendix R	Revised in its entirety

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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

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 [section 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

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

(13) cryogenic piping systems

802.2 Intent

802.2.1 Adequacy for Normal Conditions. 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, gathering, or distribution pipelines should be undertaken using supervisory personnel having the experience or knowledge to make adequate provision for such unusual conditions and specific

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.