ASME B31.12-2014
(Revision of ASME B31.12-2011)

Hydrogen Piping and Pipelines

ASME Code for Pressure Piping, B31

AN AMERICAN NATIONAL STANDARD

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The American Society of Mechanical Engineers
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The next edition of this Code is scheduled for publication in 2017. This Code will become effective 6 months after the Date of Issuance.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this Code. Interpretations, Code Cases, and errata are published on the ASME Web site under the Committee Pages at http://cstools.asme.org/ as they are issued. Interpretations and Code Cases are also included with each edition.

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

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The American Society of Mechanical Engineers
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FOREWORD

Responding to an evident need and at the request of The American Society of Mechanical Engineers, 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.

The initial publication in 1935 was the American Tentative Standard Code for Pressure Piping. Revisions from 1942 through 1955 were published as the American Standard Code for Pressure Piping, ASA B31.1. Then it was decided that the various industry sections, beginning with ASA B31.8-1955, Gas Transmission and Distribution Piping Systems, be published as separate documents. The first Petroleum Refinery Piping Code Section was designated ASA B31.3-1959. ASA B31.3 revisions were published in 1962 and 1966. In 1967–1969, the American Standards Association became first the United States of America Standards Institute, then the American National Standards Institute. 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. Addenda were published through 1975. 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. The Section committee structure remains essentially unchanged.

As a result of preliminary studies, it was concluded that gaps exist between existing piping and pipeline codes and standards, and hydrogen infrastructure applications. A Project Team was formed under the B31 Standards Committee to develop a new B31.12 Code for hydrogen piping and pipelines. The Project Team was subsequently restructured under the B31 Standards Committee as a Section Committee.

The first edition of the B31.12 Code applies to design, construction, operation, and maintenance requirements for piping, pipelines, and distribution systems in hydrogen service. Typical applications are power generation, process plants, refining, transportation, distribution, and automotive filling stations. This Code is composed of Part GR, General Requirements, including common requirements referenced by all other parts; Part IP, Industrial Piping; and Part PL, Pipelines, including distribution systems. These Parts incorporate information specific to hydrogen service and either reference or incorporate applicable parts of ASME B31.3, Process Piping; ASME B31.1, Power Piping; ASME B31.8, Gas Transmission and Distribution Piping Systems; ASME B31.8S, Managing System Integrity of Gas Pipelines; and Section VIII, Division 3 of the ASME Boiler and Pressure Vessel Code, where appropriate.

Material performance factors have been included to account for the adverse effects of hydrogen gas on the mechanical properties of carbon and low alloy steels operating within the hydrogen embrittlement range. Many materials included in B31.3 have been omitted from B31.12's tables due to their unsuitability for hydrogen service. Rules have been added for conversion or retrofit of existing pipeline and distribution systems from natural gas or petroleum to hydrogen service. Parts covering commercial, residential, and nonmetallic systems will be added in future editions. Material performance factors will be reevaluated as materials research data is developed and understanding of hydrogen embrittlement of carbon and low alloy steels increases.

ASME B31.12-2008 was approved by the American National Standards Institute on December 3, 2008.

ASME B31.12-2011 was approved by the American National Standards Institute on June 7, 2011.

ASME B31.12-2014 was approved by the American National Standards Institute on October 24, 2014.

ASME B31 COMMITTEE
Code for Pressure Piping

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

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ASME B31.12-2014
SUMMARY OF CHANGES

Following approval by the B31 Committee and ASME, and after public review, ASME B31.12-2014 was approved by the American National Standards Institute on October 24, 2014.

Changes given below are identified on the pages by a margin note, **(14),** placed next to the affected area.

Page	*Location*	*Change*
2–11	GR-1.5	Definitions of *elevated temperature fluid service* and *ventilated location* revised
18, 24	GR-2.1.3	Subparagraph (d) revised
64	GR-5.17	Subparagraph (a) revised
81	IP-3.1	Revised
90	IP-3.8.2	Subparagraph (c) revised
106	IP-8.2.2	Second paragraph added
107	Table IP-8.1.1-1	MSS SP-134 added
108	IP-9.6.1	Subparagraphs (a) through (c) deleted
	IP-9.6.3.1	Revised
109	Table IP-9.6.3-1	Revised
115	Table IP-10.4.3-2	Revised
135, 136	PL-3.7.1	Subparagraphs (b)(1)(-a), (b)(1)(-b), (b)(2)(-c), (b)(2)(-d), and (b)(2)(-e) revised
153, 154	PL-3.21	Subparagraph (o) revised
159, 160	Mandatory Appendix II	(1) Under ASME Standards, API 579/ ASME FFS-1 replaced by API 579-1/ ASME FFS-1 (2) CSA HGV 4.10-2008 and MSS SP-134-2012 added
216	A-1	(1) Paragraph A-1.1 heading added (2) Paragraph A-1.2 added

NOTE: A separate supplement containing Case 186 follows this edition.

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PART GR
GENERAL REQUIREMENTS

Chapter GR-1
Scope and Definitions

GR-1.1 SCOPE

This Code is applicable to piping in gaseous and liquid hydrogen service and to pipelines in gaseous hydrogen service. This Code is applicable up to and including the joint connecting the piping to associated pressure vessels and equipment but not to the vessels and equipment themselves. It is applicable to the location and type of support elements but not to the structure to which the support elements are attached. The design for pressure and temperature shall be in accordance with the requirements of Part IP for industrial piping and Part PL for pipelines. This Code is presented in the following parts and appendices:

(a) Part GR — General Requirements. Part GR contains requirements applicable to and referenced by other parts. It contains definitions and requirements for materials, welding, brazing, heat treating, forming, testing, inspection, examination, operation, and maintenance. It also contains quality system topics common to the other parts.

(b) Part IP — Industrial Piping. Part IP includes requirements for components, design, fabrication, assembly, erection, inspection, examination, and testing of piping.

(c) Part PL — Pipelines. Part PL sets forth requirements for components, design, installation, and testing of hydrogen pipelines.

(d) Mandatory Appendices I through IX

(e) Nonmandatory Appendices A through F

Each part defines requirements for piping or pipelines, as applicable, within its scope. The requirements are different for different aspects of components, design, fabrication, installation, assembly, erection, inspection, examination, and testing. It is required that each part be used in conjunction with the General Requirements section but independent of the other parts. The joint connecting piping governed by two different parts shall be subject exclusively to the requirements of one of the two parts. It is not intended that this edition of this Code be applied retroactively to existing hydrogen systems.

GR-1.2 RESPONSIBILITIES

GR-1.2.1 Owner

The owner shall have overall responsibility for compliance with this Code and for establishing the requirements for design, construction, examination, inspection, testing, operation, and maintenance of the hydrogen piping or pipeline system.

GR-1.2.2 Designer

The designer is responsible to the owner for assurance that the engineering design of piping or the pipeline system complies with the requirements of this Code and with any additional requirements established by the owner.

GR-1.2.3 Construction Organization

The construction organization of piping and pipeline systems is responsible for providing materials, components, and workmanship in compliance with the requirements of this Code and the engineering design.

GR-1.2.4 Owner's Inspector

The owner's Inspector is responsible to the owner to verify that all required examinations, inspections, and testing are complete. The owner's Inspector verifies that all required certifications and records have been completed. Also, the owner's Inspector is responsible for verification of the construction organization's quality systems program implementation.