

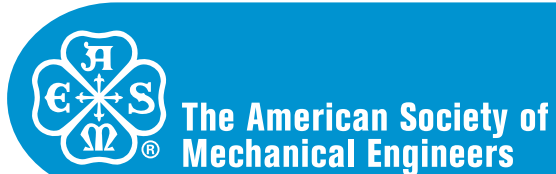
**ASME B31.9-2017**  
(Revision of ASME B31.9-2014)

# Building Services Piping

---

**ASME Code for Pressure Piping, B31**

**AN AMERICAN NATIONAL STANDARD**



**ASME B31.9-2017**  
(Revision of ASME B31.9-2014)

# **Building Services Piping**

---

**ASME Code for Pressure Piping, B31**

**AN AMERICAN NATIONAL STANDARD**



**The American Society of  
Mechanical Engineers**

Two Park Avenue • New York, NY • 10016 USA

Date of Issuance: December 29, 2017

The next edition of this Code is scheduled for publication in 2020. This Code will become effective 6 months after the Date of Issuance.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this Code. Interpretations are published under <http://go.asme.org/Interpretations>. Periodically certain actions of the ASME B31 Committees may be published as Cases. Cases are published on the ASME Web site under the Committee Pages at <http://go.asme.org/B31committee> as they are issued.

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.

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

ASME is the registered trademark of The American Society of Mechanical Engineers.

This code or standard was developed under procedures accredited as meeting the criteria for American National Standards. The Standards Committee that approved the code or standard was balanced to assure that individuals from competent and concerned interests have had an opportunity to participate. The proposed code or standard was made available for public review and comment that provides an opportunity for additional public input from industry, academia, regulatory agencies, and the public-at-large.

ASME does not "approve," "rate," or "endorse" any item, construction, proprietary device, or activity.

ASME does not take any position with respect to the validity of any patent rights asserted in connection with any items mentioned in this document, and does not undertake to insure anyone utilizing a standard against liability for infringement of any applicable letters patent, nor assume any such liability. Users of a code or standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, is entirely their own responsibility.

Participation by federal agency representative(s) or person(s) affiliated with industry is not to be interpreted as government or industry endorsement of this code or standard.

ASME accepts responsibility for only those interpretations of this document issued in accordance with the established ASME procedures and policies, which precludes the issuance of interpretations by individuals.

No part of this document may be reproduced in any form,  
in an electronic retrieval system or otherwise,  
without the prior written permission of the publisher.

The American Society of Mechanical Engineers  
Two Park Avenue, New York, NY 10016-5990

Copyright © 2017 by  
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS  
All rights reserved  
Printed in U.S.A.

# CONTENTS

Foreword .....	vi
Committee Roster .....	vii
Introduction .....	ix
Summary of Changes .....	xi
<b>Chapter I</b>	
<b>Scope and Definitions</b> .....	1
900 General .....	1
<b>Chapter II</b>	
<b>Design</b> .....	9
<b>PART 1</b>	
<b>Conditions and Criteria</b> .....	9
901 Design Conditions .....	9
902 Design Criteria .....	9
<b>PART 2</b>	
<b>Pressure Design of Piping Components</b> .....	11
903 Criteria for Pressure Design of Piping Components .....	11
904 Pressure Design of Components .....	12
<b>PART 3</b>	
<b>Selection and Limitation of Components</b> .....	14
905 Pipe .....	14
906 Fittings, Bends, and Intersections .....	15
907 Valves .....	15
908 Flanges, Blanks, Gaskets, and Bolting .....	15
<b>PART 4</b>	
<b>Selection and Limitation of Joints</b> .....	15
910 Piping Joints .....	15
911 Welded Joints .....	15
912 Flanged Joints .....	16
913 Mechanical and Proprietary Joints .....	16
914 Threaded Joints .....	16
915 Flared, Flareless, and Compression Joints .....	16
916 Bell and Spigot Joints .....	16
917 Brazed and Soldered Joints .....	17
<b>PART 5</b>	
<b>Expansion, Flexibility, and Support</b> .....	17
919 Expansion and Flexibility .....	17
920 Loads on Pipe-Supporting Elements .....	20
921 Design of Pipe-Supporting Elements .....	21
<b>PART 6</b>	
<b>Systems</b> .....	25
922 Design Requirements Pertaining to Specific Piping Systems .....	25
<b>Chapter III</b>	
<b>Materials</b> .....	27
923 Materials — General Requirements .....	27
<b>Chapter IV</b>	
<b>Component Requirements and Standard Practices</b> .....	29
926 Dimensions and Ratings of Components .....	29
<b>Chapter V</b>	
<b>Fabrication, Assembly, and Erection</b> .....	36

927	Welded Fabrication of Metals . . . . .	36
928	Brazing and Soldering of Metals . . . . .	41
929	Bending . . . . .	41
930	Forming . . . . .	41
931	Heat Treatment . . . . .	41
934	Fabrication of Nonmetals . . . . .	42
935	Assembly . . . . .	43
<b>Chapter VI</b>	<b>Inspection, Examination, and Testing . . . . .</b>	<b>45</b>
936	Inspection and Examination . . . . .	45
937	Leak Testing . . . . .	46
 <b>Mandatory Appendices</b>		
I	Stress Tables . . . . .	48
II	Allowable Pressures for Nonmetallic, Nonplastic Pressure Piping . . . . .	56
III	Reference Standards . . . . .	57
IV	Preparation of Technical Inquiries . . . . .	61
 <b>Nonmandatory Appendices</b>		
A	Nonmandatory Quality System Program . . . . .	62
B	Seismic Design and Retrofit of Piping Systems . . . . .	63
 <b>Figures</b>		
900.1.2	Code Jurisdictional Limits for Piping — Drum-Type Boilers . . . . .	3
904.2.2	Nomenclature for Miter Joints . . . . .	13
921.1.3-1	Support Spans for Standard Wall Steel Pipe . . . . .	22
921.1.3-2	Support Spans for Copper and Thermoplastic Pipe . . . . .	23
927.4.3-1	Fillet Weld Size . . . . .	37
927.4.3-2	Minimum Weld Size, Setback, and Depth of Insertion for Slip-On and Socket Weld Flanges . . . . .	38
927.4.3-3	Minimum Welding Dimensions for Socket-Welding Components Other Than Flanges . . . . .	38
927.4.5-1	Acceptable Welds for Flat Heads . . . . .	39
927.4.5-2	Unacceptable Welds for Flat Heads . . . . .	39
927.4.6-1	Typical Weld Branch Connections . . . . .	40
927.4.6-2	Typical Weld Details . . . . .	40
 <b>Tables</b>		
902.4.3	Joint Factors, <i>e</i> . . . . .	11
904.2.1	Pipe Thickness for Bends . . . . .	12
917.3	Rated Internal Working Pressures of Joints Made With Copper Water Tube and Solder Joint Fittings, psig . . . . .	17
919.3.1	Moduli of Elasticity and Thermal Expansion Coefficients . . . . .	18
921.2.2	Capacities of Threaded ASTM A36 Steel Rods . . . . .	24
926.1	Component Standards and Specifications . . . . .	30
926.2	Standard Practices . . . . .	35
I-1	Allowable Stresses . . . . .	49
I-2	Hydrostatic Design Stresses (HDS) and Recommended Temperature Limits for Thermoplastic Pipe . . . . .	53

I-3	Design Stress Values for Contact Molded (Hand-Lay-Up) Pipe Made From Reinforced Thermosetting Resins . . . . .	54
I-4	Hydrostatic Design Basis Stress for Machine-Made Thermosetting Resin Pipe . . . . .	55
II-1	Allowable Pressures for Nonmetallic, Nonplastic Pressure Piping . . . . .	56
B-3.2.1	Seismic Design Requirements, Applicable Sections . . . . .	64
B-3.3.1	Maximum Span (ft) Between Lateral Seismic Restraints for Steel Pipe With a Yield Stress of 35 ksi, in Water Service at 70°F . . . . .	66