

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**

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**

Two Park Avenue • New York, NY • 10016 USA

Date of Issuance: December 27, 2024

The next edition of this Code is scheduled for publication in 2026. This Code will become effective 6 months after the Date of Issuance.

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 ensure that individuals from competent and concerned interests had an opportunity to participate. The proposed code or standard was made available for public review and comment, which provided an opportunity for additional public input from industry, academia, regulatory agencies, and the public-at-large.

ASME does not “approve,” “certify,” “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 does ASME 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 representatives or persons 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.

The endnotes and preamble in this document (if any) are part of this American National Standard.



ASME Collective Membership Mark

All rights reserved. “ASME” and the above ASME symbol are registered trademarks of The American Society of Mechanical Engineers. No part of this document may be copied, modified, distributed, published, displayed, or otherwise reproduced in any form or by any means, electronic, digital, or mechanical, now known or hereafter invented, without the express written permission of ASME. No works derived from this document or any content therein may be created without the express written permission of ASME. Using this document or any content therein to train, create, or improve any artificial intelligence and/or machine learning platform, system, application, model, or algorithm is strictly prohibited.

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

Copyright © 2024 by
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
Printed in U.S.A.

CONTENTS

Foreword		xiv
Committee Roster		xvi
Correspondence With the B31 Committee		xxii
Introduction		xxiv
Summary of Changes		xxvi
Figures and Tables Redesignated in ASME B31.3-2024		xxxi
Chapter I	Scope and Definitions	1
300	General Statements	1
Chapter II	Design	11
Part 1	Conditions and Criteria	11
301	Design Conditions	11
302	Design Criteria	13
Part 2	Pressure Design of Piping Components	22
303	General	22
304	Pressure Design of Components	22
Part 3	Fluid Service Requirements for Piping Components	34
305	Pipe	34
306	Fittings, Bends, Miters, Laps, and Branch Connections	34
307	Valves and Specialty Components	36
308	Flanges, Blanks, Flange Facings, and Gaskets	36
309	Bolting	37
Part 4	Fluid Service Requirements for Piping Joints	37
310	General	37
311	Welded Joints	37
312	Flanged Joints	38
313	Expanded Joints	38
314	Threaded Joints	38
315	Tubing Joints	39
316	Caulked Joints	39
317	Soldered and Brazed Joints	39
318	Special Joints	40
Part 5	Flexibility and Support	40
319	Piping Flexibility	40
320	Analysis of Sustained Loads	44
321	Piping Support	46
Part 6	Systems	48
322	Specific Piping Systems	48

Chapter III	Materials	50
323	General Requirements	50
325	Materials — Miscellaneous	61
Chapter IV	Standards for Piping Components	62
326	Dimensions and Ratings of Components	62
Chapter V	Fabrication, Assembly, and Erection	66
327	General	66
328	Welding and Brazing	66
330	Preheating	74
331	Heat Treatment	75
332	Bending and Forming	81
333	Brazing and Soldering	82
335	Assembly and Erection	82
Chapter VI	Inspection, Examination, and Testing	85
340	Inspection	85
341	Examination	85
342	Examination Personnel	92
343	Examination Procedures	93
344	Examination Methods	93
345	Testing	95
346	Records	98
Chapter VII	Nonmetallic Piping and Piping Lined With Nonmetals	99
A300	General Statements	99
Part 1	Conditions and Criteria	99
A301	Design Conditions	99
A302	Design Criteria	99
Part 2	Pressure Design of Piping Components	101
A303	General	101
A304	Pressure Design of Piping Components	101
Part 3	Fluid Service Requirements for Piping Components	103
A305	Pipe	103
A306	Fittings, Bends, Miters, Laps, and Branch Connections	103
A307	Valves and Specialty Components	103
A308	Flanges, Blanks, Flange Facings, and Gaskets	103
A309	Bolting	104
Part 4	Fluid Service Requirements for Piping Joints	104
A310	General	104
A311	Bonded Joints in Plastics	104
A312	Flanged Joints	104
A313	Expanded Joints	104
A314	Threaded Joints	104
A315	Tubing Joints	105
A316	Caulked Joints	105
A318	Special Joints	105

Part 5	Flexibility and Support	105
A319	Flexibility of Nonmetallic Piping and Piping Lined With Nonmetals	105
A321	Piping Support	107
Part 6	Systems	107
A322	Specific Piping Systems	107
Part 7	Materials	108
A323	General Requirements	108
A325	Materials — Miscellaneous	109
Part 8	Standards for Piping Components	110
A326	Dimensions and Ratings of Components	110
Part 9	Fabrication, Assembly, and Erection	110
A327	General	110
A328	Bonding of Plastics	110
A329	Fabrication of Piping Lined With Nonmetals	116
A332	Bending and Forming	116
A334	Joining Nonplastic Piping	117
A335	Assembly and Erection	117
Part 10	Inspection, Examination, and Testing	118
A340	Inspection	118
A341	Examination	118
A342	Examination Personnel	119
A343	Examination Procedures	119
A344	Examination Methods	119
A345	Testing	119
A346	Records	120
Chapter VIII	Piping for Category M Fluid Service	121
M300	General Statements	121
Part 1	Conditions and Criteria	121
M301	Design Conditions	121
M302	Design Criteria	121
Part 2	Pressure Design of Metallic Piping Components	121
M303	General	121
M304	Pressure Design of Metallic Components	121
Part 3	Fluid Service Requirements for Metallic Piping Components	121
M305	Pipe	121
M306	Metallic Fittings, Bends, Miters, Laps, and Branch Connections	122
M307	Metallic Valves and Specialty Components	122
M308	Flanges, Blanks, Flange Facings, and Gaskets	122
M309	Bolting	123
Part 4	Fluid Service Requirements for Metallic Piping Joints	123
M310	Metallic Piping, General	123
M311	Welded Joints in Metallic Piping	123
M312	Flanged Joints in Metallic Piping	123
M313	Expanded Joints in Metallic Piping	123
M314	Threaded Joints in Metallic Piping	123

M315	Tubing Joints in Metallic Piping	123
M316	Caulked Joints	123
M317	Soldered and Brazed Joints	123
M318	Special Joints in Metallic Piping	123
Part 5	Flexibility and Support of Metallic Piping	123
M319	Flexibility of Metallic Piping	123
M320	Analysis of Sustained Loads	123
M321	Piping Support	123
Part 6	Systems	124
M322	Specific Piping Systems	124
Part 7	Metallic Materials	124
M323	General Requirements	124
M325	Materials — Miscellaneous	124
Part 8	Standards for Piping Components	124
M326	Dimensions and Ratings of Components	124
Part 9	Fabrication, Assembly, and Erection of Metallic Piping	125
M327	General	125
M328	Welding of Metals	125
M330	Preheating of Metals	125
M331	Heat Treatment of Metals	125
M332	Bending and Forming of Metals	125
M335	Assembly and Erection of Metallic Piping	125
Part 10	Inspection, Examination, Testing, and Records of Metallic Piping	125
M340	Inspection	125
M341	Examination	125
M342	Examination Personnel	126
M343	Examination Procedures	126
M344	Examination Methods	126
M345	Testing	126
M346	Records	126
Parts 11–20	Corresponding to Chapter VII	126
MA300	General Statements	126
Part 11	Conditions and Criteria	126
MA301	Design Conditions	126
MA302	Design Criteria	126
Part 12	Pressure Design of Nonmetallic Piping Components	126
MA303	General	126
MA304	Pressure Design of Nonmetallic Components	126
Part 13	Fluid Service Requirements for Nonmetallic Piping Components	126
MA305	Pipe	126
MA306	Nonmetallic Fittings, Bends, Miters, Laps, and Branch Connections	126
MA307	Valves and Specialty Components	127
MA308	Flanges, Blanks, Flange Facings, and Gaskets	127
MA309	Bolting	127
Part 14	Fluid Service Requirements for Nonmetallic Piping Joints	127

MA310	General	127
MA311	Bonded Joints	127
MA312	Flanged Joints	127
MA313	Expanded Joints	127
MA314	Threaded Joints	127
MA315	Tubing Joints in Nonmetallic Piping	127
MA316	Caulked Joints	127
MA318	Special Joints	127
Part 15	Flexibility and Support of Nonmetallic Piping	127
MA319	Piping Flexibility	127
MA321	Piping Support	127
Part 16	Nonmetallic and Nonmetallic-Lined Systems	127
MA322	Specific Piping Systems	127
Part 17	Nonmetallic Materials	127
MA323	General Requirements	127
Part 18	Standards for Nonmetallic and Nonmetallic-Lined Piping Components	128
MA326	Dimensions and Ratings of Components	128
Part 19	Fabrication, Assembly, and Erection of Nonmetallic and Nonmetallic-Lined Piping	128
MA327	General	128
MA328	Bonding of Plastics	128
MA329	Fabrication of Piping Lined With Nonmetals	128
MA332	Bending and Forming	128
MA334	Joining Nonplastic Piping	128
MA335	Assembly and Erection	128
Part 20	Inspection, Examination, Testing, and Records of Nonmetallic and Nonmetallic-Lined Piping	128
MA340	Inspection	128
MA341	Examination	128
MA342	Examination Personnel	128
MA343	Examination Procedures	128
MA344	Examination Methods	128
MA345	Testing	128
MA346	Records	128
Chapter IX	High Pressure Piping	129
K300	General Statements	129
Part 1	Conditions and Criteria	130
K301	Design Conditions	130
K302	Design Criteria	130
Part 2	Pressure Design of Piping Components	132
K303	General	132
K304	Pressure Design of High Pressure Components	133
Part 3	Fluid Service Requirements for Piping Components	136
K305	Pipe	136
K306	Fittings, Bends, and Branch Connections	136
K307	Valves and Specialty Components	136

K308	Flanges, Blanks, Flange Facings, and Gaskets	137
K309	Bolting	137
Part 4	Fluid Service Requirements for Piping Joints	137
K310	General	137
K311	Welded Joints	137
K312	Flanged Joints	137
K313	Expanded Joints	138
K314	Threaded Pipe Joints	138
K315	Tubing Joints	138
K316	Caulked Joints	138
K317	Soldered and Brazed Joints	138
K318	Special Joints	138
Part 5	Flexibility and Support	139
K319	Flexibility	139
K320	Analysis of Sustained Loads	139
K321	Piping Support	139
Part 6	Systems	139
K322	Specific Piping Systems	139
Part 7	Materials	139
K323	General Requirements	139
K325	Miscellaneous Materials	143
Part 8	Standards for Piping Components	143
K326	Requirements for Components	143
Part 9	Fabrication, Assembly, and Erection	144
K327	General	144
K328	Welding	144
K330	Preheating	147
K331	Heat Treatment	147
K332	Bending and Forming	148
K333	Brazing and Soldering	149
K335	Assembly and Erection	150
Part 10	Inspection, Examination, and Testing	150
K340	Inspection	150
K341	Examination	150
K342	Examination Personnel	153
K343	Examination Procedures	153
K344	Examination Methods	153
K345	Leak Testing	154
K346	Records	155
Chapter X	High Purity Piping	157
U300	General Statements	157
Part 1	Conditions and Criteria	157
U301	Design Conditions	157
Part 2	Pressure Design of Piping Components	157
U304	Pressure Design of Components	157

Part 3	Fluid Service Requirements for Piping Components	157
U306	Fittings, Bends, Miters, Laps, and Branch Connections	157
U307	Valves and Specialty Components	157
U308	Flanges, Blanks, Flange Facings, and Gaskets	158
Part 4	Fluid Service Requirements for Piping Joints	158
U311	Welded Joints	158
U314	Threaded Joints	158
U315	Tubing Joints	158
Part 5	Flexibility and Support	158
U319	Piping Flexibility	158
Part 6	Systems	159
Part 7	Metallic Materials	159
Part 8	Standards for Piping Components	159
Part 9	Fabrication, Assembly, and Erection	159
U327	General	159
U328	Welding	159
U330	Preheating	160
U331	Heat Treatment	160
U332	Bending and Forming	160
U333	Brazing and Soldering	160
U335	Assembly and Erection	160
Part 10	Inspection, Examination, and Testing	161
U340	Inspection	161
U341	Examination	161
U342	Examination Personnel	162
U343	Examination Procedures	162
U344	Examination Methods	162
U345	Testing	163
U346	Records	163
Part 11	High Purity Piping in Category M Fluid Service	163
UM300	General Statements	163
UM307	Metallic Valves and Specialty Components	164
UM322	Specific Piping Systems	164
UM328	Welding of Materials	164
UM335	Assembly and Erection of Metallic Piping	164
UM341	Examination	164
UM345	Testing	164
Appendices		
A	Allowable Stresses and Quality Factors for Metallic Piping and Bolting Materials	165
B	Stress Tables and Allowable Pressure Tables for Nonmetals	398
C	Physical Properties of Piping Materials	406
E	Reference Standards	430
F	Guidance and Precautionary Considerations	435
G	Safeguarding	443

H	Sample Calculations for Branch Reinforcement	445
J	Nomenclature	453
K	Allowable Stresses for High Pressure Piping	470
L	Aluminum Alloy Pipe Flanges	500
M	Guide to Classifying Fluid Services	503
N	Application of ASME B31.3 Internationally	505
Q	Quality System Program	509
R	Use of Alternative Ultrasonic Acceptance Criteria	510
S	Piping System Stress Analysis Examples	513
V	Allowable Variations in Elevated Temperature Service	528
W	High-Cycle Fatigue Assessment of Piping Systems	531
X	Metallic Bellows Expansion Joints	536
Z	Preparation of Technical Inquiries and Suggestions for Code Revision	540

Figures

300.1.1-1	Diagram Illustrating Application of ASME B31.3 Piping at Equipment	3
302.3.5-1	Stress Range Factor, f	19
304.2.1-1	Nomenclature for Pipe Bends	24
304.2.3-1	Nomenclature for Miter Bends	24
304.3.3-1	Branch Connection Nomenclature	26
304.3.4-1	Extruded Outlet Header Nomenclature	
304.5.3-1	Blanks	33
319.4.4-1	Moments in Bends	44
319.4.4-2	Moments in Branch Connections	45
323.2.2-1	Minimum Temperatures Without Impact Testing for Carbon Steel Materials	53
323.2.2-2	Reduction in Lowest Exemption Temperature for Steels Without Impact Testing	54
328.3.2-1	Typical Backing Rings and Consumable Inserts	68
328.4.2-1	Typical Butt Weld End Preparation	68
328.4.2-2	Trimming and Permitted Misalignment	68
328.4.3-1	Preparation for Branch Connections	69
328.5.2-1	Fillet and Socket Weld Sizes	70
328.5.2-2	Minimum Attachment Weld Dimensions for Double-Welded Slip-On and Socket Welding Flanges	71
328.5.2-3	Minimum Attachment Weld Dimensions for Socket Welding Components Other Than Flanges	71
328.5.4-1	Typical Welded Branch Connections	72
328.5.4-2	Acceptable Details for Branch Attachment Welds	72
328.5.4-3	Acceptable Details for Branch Attachments Suitable for 100% Radiography	72
328.5.4-4	Acceptable Details for Integrally Reinforced Branch Connections	73
328.5.5-1	Typical Details for Fabricated Laps	74
335.3.3-1	Typical Threaded Joints Using Straight Threads	83
341.3.2-1	Typical Weld Imperfections	87
A328.5.3-1	Thermoplastic Solvent Cemented Joint	114
A328.5.4-1	Thermoplastic Heat Fusion Joints	115
A328.5.5-1	Thermoplastic Electrofusion Joints	115
A328.5.6-1	Fully Tapered Thermosetting Adhesive Joint	116

A328.5.7-1	Thermosetting Wrapped Joints	116
K323.3.3-1	Example of an Acceptable Impact Test Specimen	143
K328.4.3-1	Pipe Bored for Alignment: Trimming and Permitted Misalignment	147
K328.5.4-1	Some Acceptable Welded Branch Connections Suitable for 100% Radiography	148
U304.5.3-1	Blanks	158
U328.4.2-1	Modified Pipe End Preparations	160
U335.7.1-1	Face Seal Joints	161
U335.8-1	Hygienic Clamp Joint Assembly	161
U335.8-2	Hygienic Clamp Types	162
U335.8-3	Hygienic Ferrules	162
H301-1	Illustrations for SI Units Examples in Appendix H	446
H311-1	Illustrations for U.S. Customary Units Examples in Appendix H	450
M-1	Guide to Classifying Fluid Services	504
R307-1	Surface and Subsurface Flaws	511
S301.1-1	Example 1: Simple Code-Compliant Model	513
S302.1-1	Example 2: Lift-Off Model	518
S303.1-1	Example 3: Moment Reversal Model	522
 Tables		
300.4-1	Status of Appendices in ASME B31.3	10
302.3.3-1	Increased Casting Quality Factors, E_c	16
302.3.3-2	Acceptance Levels for Castings	17
302.3.4-1	Longitudinal Weld Joint Quality Factor, E_j	18
302.3.5-1	Weld Joint Strength Reduction Factor, W	20
304.1.1-1	Values of Coefficient Y for $t < D/6$	23
304.4.1-1	ASME BPVC References for Closures	31
308.2.1-1	Permissible Sizes/Rating Classes for Slip-On Flanges Used as Lapped Flanges	36
314.2.1-1	Minimum Schedule of Components With External Threads	39
323.2.2-1	Requirements for Low Temperature Toughness Tests for Metals	51
323.2.2-2	Tabular Values for Minimum Temperatures Without Impact Testing for Carbon Steel Materials	55
323.2.2-3	Tabular Values for Reduction in Lowest Exemption Temperature for Steels Without Impact Testing	57
323.3.1-1	Impact Testing Requirements for Metals	58
323.3.4-1	Charpy Impact Test Temperature Reduction	59
323.3.5-1	Minimum Required Charpy V-Notch Impact Values	60
326.1.1-1	Component Standards	63
330.1.1-1	Preheat Temperatures	76
331.1.1-1	Postweld Heat Treatment	77
331.1.2-1	Alternate Postweld Heat Treatment Requirements for Carbon and Low Alloy Steels, P-Nos. 1 and 3	78
331.1.3-1	Exemptions to Mandatory Postweld Heat Treatment	79
341.3.2-1	Acceptance Criteria for Welds — Visual and Radiographic Examination	88
	Criterion Value Notes for Table 341.3.2-1	89
A323.2.2-1	Requirements for Low Temperature Toughness Tests for Nonmetals	109
A323.4.2-1	Recommended Temperature Limits for Reinforced Thermosetting Resin Pipe	109

A323.4.3-1	Recommended Temperature Limits for Thermoplastics Used as Linings	109
A326.1-1	Component Standards	111
A341.3.2-1	Acceptance Criteria for Bonds	118
K302.3.3-1	Acceptable Severity Levels for Steel Castings	132
K305.1.2-1	Required Ultrasonic or Eddy Current Examination of Pipe and Tubing for Longitudinal Defects	136
K323.3.1-1	Impact Testing Requirements	142
K323.3.5-1	Minimum Required Charpy V-Notch Impact Values	144
K326.1.1-1	Component Standards	145
K341.3.2-1	Acceptance Criteria for Welds	151
	Criterion Value Notes for Table K341.3.2-1	152
	Specification Index for Appendix A	166
A-1	Basic Allowable Stresses in Tension for Metals — SI Units	174
A-1C	Basic Allowable Stresses in Tension for Metals — U.S. Customary Units	284
A-2	Basic Casting Quality Factors, E_c	364
A-3	Basic Quality Factors for Longitudinal Weld Joints in Pipes and Tubes, E_j	366
A-4	Design Stress Values for Bolting Materials — SI Units	372
A-4C	Design Stress Values for Bolting Materials — U.S. Customary Units	388
	Specification Index for Appendix B	399
B-1	Hydrostatic Design Stresses (HDS) and Recommended Temperature Limits for Thermoplastic Pipe — SI Units	400
B-1C	Hydrostatic Design Stresses (HDS) and Recommended Temperature Limits for Thermoplastic Pipe — U.S. Customary Units	402
B-2	Listed Specification for Laminated Reinforced Thermosetting Resin Pipe	403
B-3	Listed Specifications for Filament Wound and Centrifugally Cast Reinforced Thermosetting Resin and Reinforced Plastic Mortar Pipe	403
B-4	Allowable Pressures and Recommended Temperature Limits for Concrete Pipe	404
B-5	Allowable Pressures and Recommended Temperature Limits for Borosilicate Glass Pipe	404
B-6	Allowable Pressures and Recommended Temperature Limits for PEX-AL-PEX and PE-AL-PE Pipe	405
C-1	Thermal Expansion Data — SI Units	408
C-1C	Thermal Expansion Data — U.S. Customary Units	414
C-2	Thermal Expansion Coefficients, Nonmetals	419
C-3	Moduli of Elasticity for Metals — SI Units	421
C-3C	Moduli of Elasticity for Metals — U.S. Customary Units	424
C-4	Modulus of Elasticity for Nonmetals	428
	Specification Index for Appendix K	471
K-1	Allowable Stresses in Tension for Metals for Chapter IX — SI Units	474
K-1C	Allowable Stresses in Tension for Metals for Chapter IX — U.S. Customary Units	486
L301.1-1	Pressure–Temperature Ratings — SI Units	501
L301.1-1C	Pressure–Temperature Ratings — U.S. Customary Units	501
L303.2-1	Aluminum Bolting Materials	502
R308-1	Acceptance Criteria for Surface Flaws	512
R308-2	Acceptance Criteria for Subsurface Flaws	512
S301.1-1	Example 1: Pressure–Temperature Combinations	514
S301.3-1	Example 1: Generic Pipe Stress Model Input	514

S301.3-2	Example 1: Element Connectivity, Type, and Lengths	515
S301.5-1	Example 1: Operating Load Case Results: Internal Loads and Deflections	516
S301.5-2	Example 1: Operating Load Case Results: Reactions on Supports and Anchors	516
S301.6-1	Example 1: Sustained Forces, Moments, and Stresses [Allowable $S_h = 130.8$ MPa (19.0 ksi)]	517
S301.7-1	Example 1: Displacement Stress Range [Allowable, Eq. (1a), $S_A = 205.2$ MPa (29.75 ksi)]	517
S302.2-1	Example 2: Pressure–Temperature Combinations	519
S302.3-1	Example 2: Generic Pipe Stress Model Input: Component Connectivity, Type, and Lengths	519
S302.5-1	Example 2: Results for Operating Case: Reactions on Support and Anchors	520
S302.6.2-1	Example 2: Sustained Load Condition Listing	520
S302.6.3-1	Example 2: Sustained Forces, Moments, and Stresses for Sustained Condition 3 With Node 50’s Y+ Support Inactive [Allowable $S_h = 127$ MPa (18.4 ksi): Fails]	521
S303.1-1	Example 3: Pressure–Temperature Combinations	522
S303.3-1	Example 3: Generic Pipe Stress Model Input: Component Connectivity, Type, and Lengths	523
S303.7-1	Example 3: Operating Case 1: Displacement Stress Range [Allowable $S_A = 364$ MPa (52.7 ksi): Passes]	525
S303.7-2	Example 3: Operating Case 2: Displacement Stress Range [Eq. (1b) Allowable $S_A = 364$ MPa (52.7 ksi): Passes]	526
S303.7-3	Example 3: Moment Reversal Load Combination Considering Operating Cases 1 and 2, Total Strain Based: Displacement Stress Range [Eq. (1b) Allowable $S_A = 364$ MPa (52.7 ksi): Fails]	527
W301-1	Gamma Function Evaluation	532
W302.1-1	Fatigue Material Coefficients (-3σ)	533
W302.1-2	Fatigue Material Coefficients (-2σ)	533
W302.1-3	Optional Fatigue Material Coefficients When $N_{ti} > 10^7$	534
W302.1-4	Environmental Fatigue Factors for Carbon Steel Piping, $T \leq 93^\circ\text{C}$ (200°F)	534
Index	541
Notes for Index	557

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