

ASME B31.4-2022
(Revision of ASME B31.4-2019)

Pipeline Transportation Systems for Liquids and Slurries

ASME Code for Pressure Piping, B31

AN INTERNATIONAL PIPING CODE®



**The American Society of
Mechanical Engineers**

ASME B31.4-2022
(Revision of ASME B31.4-2019)

Pipeline Transportation Systems for Liquids and Slurries

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 8, 2022

The next edition of this Code is scheduled for publication in 2025. 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 on the Committee web page and under <https://go.asme.org/Interpretations>. Periodically certain actions of the ASME B31 Committee may be published as Cases. Cases are published on the ASME website under the B31 Committee Page at <http://go.asme.org/B31committee> as they are issued.

Errata to codes and standards may be posted on the ASME website under the Committee Pages of the associated codes and standards 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 <https://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 international code or standard was developed under procedures accredited as meeting the criteria for American National Standards and it is an American National Standard. 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," "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.

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 © 2022 by
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
All rights reserved
Printed in U.S.A.

CONTENTS

Foreword		vi
Committee Roster		viii
Correspondence With the B31 Committee		x
Introduction		xii
Summary of Changes		xiv
Chapter I	Scope and Definitions	1
400	General Statements	1
Chapter II	Design	11
401	Loads	11
402	Calculation of Stresses	13
403	Criteria for Pipelines	15
404	Criteria for Fittings, Assemblies, and Other Components (Alternatively, Criteria for Components)	21
Chapter III	Materials	34
423	Materials — General Requirements	34
425	Materials Applied to Miscellaneous Parts	35
Chapter IV	Dimensional Requirements	39
426	Dimensional Requirements for Standard and Nonstandard Piping Components	39
Chapter V	Construction, Welding, and Assembly	41
434	Construction	41
435	Assembly of Piping Components	54
Chapter VI	Inspection and Testing	55
436	Inspection	55
437	Testing	56
Chapter VII	Operation and Maintenance Procedures	59
450	Operation and Maintenance Procedures Affecting the Safety of Liquid and Slurry Transportation Piping Systems	59
451	Pipeline Operation and Maintenance	60
452	Pump Station, Terminal, and Storage Facilities Operation and Maintenance	70
453	Corrosion Control	71
454	Emergency Plan	71
455	Records	72
456	Qualifying a Piping System for a Higher Operating Pressure	72
457	Abandoning a Piping System	73
Chapter VIII	Corrosion Control	74
460	General	74
461	External Corrosion Control for Buried or Submerged Pipelines	74
462	Internal Corrosion Control	77

463	External Corrosion Control for Pipelines Exposed to Atmosphere	78
464	Pipelines in Arctic Environments	79
465	Pipelines in High-Temperature Service	79
466	External Corrosion Control for Thermally Insulated Pipelines	80
467	Stress Corrosion and Other Phenomena	81
468	Records	81
Chapter IX	Offshore Liquid Pipeline Systems	82
A400	General Statements	82
A401	Loads	83
A402	Calculation of Stresses	85
A403	Criteria for Pipelines	89
A404	Criteria for Fittings, Assemblies, and Other Components (Alternatively, Criteria for Components)	89
A405	Pipe	90
A406	Other Design Considerations	90
A423	Materials — General Requirements	91
A434	Construction	91
A436	Inspection	92
A437	Testing	93
A450	Operation and Maintenance Procedures Affecting the Safety of Liquid and Slurry Transportation Piping Systems	93
A451	Pipeline Operation and Maintenance	93
A452	Pump Station, Terminal, and Storage Facilities Operation and Maintenance	95
A454	Emergency Plan	95
A460	General	95
A461	External Corrosion Control for Buried or Submerged Pipelines	95
A463	External Corrosion Control for Pipelines Exposed to Atmosphere	96
Chapter X	Carbon Dioxide Pipeline Systems	97
B400	General Statements	97
B423	Materials — General Requirements	97
B434	Construction	97
B437	Testing	97
B451	Pipeline Operation and Maintenance	98
B454	Emergency Plan	98
Chapter XI	Slurry And Process Water Pipeline Systems	99
C400	General Statements	99
C401	Loads	99
C403	Criteria for Pipelines	99
C404	Criteria for Fittings, Assemblies, and Other Components (Alternatively, Criteria for Components)	100
C423	Materials — General Requirements	100
C426	Dimensional Requirements for Standard and Nonstandard Piping Components	100
C434	Construction	100
C437	Testing	102
C451	Pipeline Operation and Maintenance	102
C454	Emergency Plan	102

C457	Abandoning a Piping System	102
C460	General	102
C461	External Corrosion Control for Buried or Submerged Pipelines	102
C468	Records	102

Mandatory Appendix

I	Referenced Standards	103
---	--------------------------------	-----

Nonmandatory Appendices

A	Submittal of Technical Inquiries to the B31 Pressure Piping Committee	107
B	Publications That May Be of Informational Benefit	108

Figures

400.1.1-1	Diagram Showing Scope of ASME B31.4 Excluding Carbon Dioxide Pipeline Systems (See Figure 400.1.1-2)	3
400.1.1-2	Diagram Showing Scope of ASME B31.4 for Carbon Dioxide Pipeline Systems	4
400.1.1-3	Diagram Showing Scope of ASME B31.4 for Slurry Pipeline Systems	5
404.3.3.1-1	Reinforced Extruded Outlets	24
404.3.4-1	Welding Details for Openings With Complete Encirclement Types of Reinforcement	26
404.3.4-2	Welding Details for Openings With Localized-Type Reinforcement	27
404.3.4-3	Welding Details for Openings Without Reinforcement Other Than That in Header and Branch Walls	28
404.3.5-1	Reinforcement of Branch Connections	30
434.8.6-1	Acceptable Butt Welded Joint Design for Equal Wall Thicknesses	46
434.8.6-2	Acceptable Butt Welded Joint Design for Unequal Wall Thicknesses	47
434.8.6-3	Recommended Attachment Details of Flanges	48
451.6.2.2-1	Type I Interaction	63
451.6.2.2-2	Type II Interaction	63
451.6.2.9-1	Hot-Tap Fitting Sleeve or Pressure Containing (Type B) Sleeve End Fillet Weld Design	69

Tables

403.2.1-1	Weld Joint Factors Applicable to Common Pipe Specifications	16
403.3.1-1	Allowable Values for Pipeline System Stresses	17
404.3.4-1	Design Criteria for Welded Branch Connections	28
423.1-1	Material Standards and Specifications	36
426.1-1	Dimensional Standards	40
434.6-1	Minimum Cover for Buried Pipelines	43
451.6.2.9-1	Acceptable Pipeline Repair Methods (Nonindented, Nonwrinkled, and Nonbuckled Pipe)	65
451.6.2.9-2	Acceptable Pipeline Repair Methods for Dents, Buckles, Ripples, Wrinkles, Leaking Couplings, and Defective Prior Repairs	67
A402.3.2-1	Design Factors for Offshore Pipeline Systems	87
C423.1-1	Material Standards	101
C423.1-2	Material Standards Not Applicable for Slurry Piping Systems From Table 423.1-1	101
C426.1-2	Dimensional Standards Not Applicable for Slurry Piping Systems From Table 426.1-1	101