ASME B31.3-2014

(Revision of ASME B31.3-2012)

Process Piping

ASME Code for Pressure Piping, B31

AN INTERNATIONAL PIPING CODE®

The American Society of Mechanical Engineers

ASME B31.3-2014
(Revision of ASME B31.3-2012)

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: February 27, 2015

The next edition of this Code is scheduled for publication in 2016. 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.

The Committee Pages can be found at http://cstools.asme.org/. 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.

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

CONTENTS

Figures

Tables

FOREWORD

Responding to 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.

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.

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.

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 redesignated as ASME/ANSI B31.3-1987 Edition.

Addenda to the subsequent five Editions, published at three-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, metric units of measurement were emphasized. With certain exceptions, SI metric units were listed first in the 1996 Edition and were designated as the standard. Instructions for conversion were given where metric 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 new 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 Piping. In the 2012 Edition, Tables A-1M and A-2M were added to Appendix A that give allowable design values in SI metric units, and Appendix N, Application of ASME B31.3 Internationally, was also added.

In this 2014 Edition of the Code, SI metric units are given first, with U.S. Customary units in parentheses. Table K-1 in Appendix K, and Tables C-1 and C-6 in Appendix C, are exceptions, containing only U.S. Customary units. The allowable design values in Tables A-1 and A-2 in Appendix A are given in U.S. Customary units and are the required values; the SI metric values in Tables A-1M and A-2M are for information only. Except for Tables A-1M, A-2M, C-1, C-6, and K-1, values in metric units are to be regarded as the standard, unless otherwise agreed between the contracting parties. Instructions are given in those tables for converting tabular data in U.S. Customary units to appropriate SI metric units.

Interpretations, Code Cases, and errata to the B31.3 Code on Process Piping are published on the following ASME web page: *http://cstools.asme.org/csconnect/CommitteePages.cfm?Committee=N10020400.*

ASME B31.3-2014 was approved by the American National Standards Institute on July 16, 2014.

ASME B31 COMMITTEE
Code for Pressure Piping

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

STANDARDS COMMITTEE OFFICERS

J. E. Meyer, *Chair*
J. W. Frey, *Vice Chair*
N. Lobo, *Secretary*

STANDARDS COMMITTEE PERSONNEL

R. J. T. Appleby, ExxonMobil Development Co.
C. Becht IV, Becht Engineering Co.
A. E. Beyer, Fluor Enterprises
K. C. Bodenhamer, Willbros Professional Services, Engineering
R. Bojarczuk, ExxonMobil Research & Engineering Co.
C. J. Campbell, Air Liquide
J. S. Chin, TransCanada Pipeline U.S.
D. D. Christian, Victaulic
R. P. Deubler, Fronek Power Systems, LLC
C. Eskridge, Jacobs Engineering
D. J. Fetzner, BP Exploration Alaska, Inc.
P. D. Flenner, Flenner Engineering Services
J. W. Frey, Stress Engineering Services, Inc.
D. R. Frikken, Becht Engineering Co.
R. A. Grichuk, Fluor Enterprises, Inc.
R. W. Haupt, Pressure Piping Engineering Associates, Inc.
B. P. Holbrook, Babcock Power, Inc.
G. A. Jolly, Flowserve/Gestra, USA
N. Lobo, The American Society of Mechanical Engineers
W. J. Mauro, American Electric Power
J. E. Meyer, Louis Perry & Associates, Inc.
T. Monday, Team Industries, Inc.
G. R. Petru, Enterprise Products
E. H. Rinaca, Dominion Resources, Inc.
M. J. Rosenfeld, Kiefner/Applus — RTD
J. T. Schmitz, Southwest Gas Corp.
S. K. Sinha, Lucius Pitkin, Inc.
W. J. Sperko, Sperko Engineering Services, Inc.
J. P. Swezy, Jr., Boiler Code Tech, LLC
F. W. Tatar, FM Global
K. A. Vilminot, Black & Veatch
G. Antaki, *Ex-Officio Member,* Becht Engineering Co., Inc.
L. E. Hayden, Jr., *Ex-Officio Member*
A. J. Livingston, *Ex-Officio Member,* Kinder Morgan

B31.3 PROCESS PIPING SECTION COMMITTEE

J. E. Meyer, *Chair,* Louis Perry & Associates, Inc.
R. W. Engle, *Vice Chair,* IHI E&C International Corp.
R. Mohamed, *Secretary,* The American Society of Mechanical Engineers
B. L. Agee, GE Energy
C. Becht IV, Becht Engineering Co.
R. M. Bojarczuk, ExxonMobil Research & Engineering Co.
R. D. Campbell, Bechtel National, Inc.
D. D. Christian, Victaulic
D. L. Coym, Intertek Moody
J. A. D'Avanzo, Lockwood International
C. E. Davila, Crane Energy
D. W. Diehl, Intergraph Corp.
D. R. Edwards, ConocoPhillips Co.
J. P. Ellenberger
C. H. Eskridge, Jr., Jacobs Engineering
D. J. Fetzner, BP Exploration Alaska, Inc.
P. D. Flenner, Flenner Engineering Services
D. R. Fraser, NASA Ames Research Center
D. R. Frikken, Becht Engineering Co.
B. S. Gordon, Wyatt Field Services
O. R. Greulich, NASA
R. A. Grichuk, Fluor Enterprises, Inc.
P. J. Guerrieri, Sr., Integrated Mechanical Services, Inc.
R. W. Haupt, Pressure Piping Engineering Associates, Inc.
B. K. Henon, Magnatech, LLC
J. F. Hodgins, Car-Ber Testing Services
W. M. Huitt, W. M. Huitt Co.
D. L. Ianiro, Mainthia Technologies, Inc.
W. J. Koves, Pi Engineering Software, Inc.
R. A. McLeod, Circor Instrumentation Technologies
C. J. Melo, S&B Engineers and Constructors, Ltd.
V. B. Molina III, Air Products & Chemicals, Inc.
C. A. Moore, Smith Fibercast
A. D. Nalbandian, Thielsch Engineering, Inc.
M. Nguyen, Lockwood International
K. A. Nisly-Nagele, Archer Daniels Midland Co.
C. D. Pham, SBM Offshore, Inc.
D. W. Rahoi, CCM 2000
A. P. Rangus, Bechtel
R. K. Reamey, Turner Industries Group, LLC
G. C. Reinhardt II, Team Industries, Inc.
P. E. Robinson, Parker Hannifin Corp.
K. S. Shipley, The Equity Engineering Group, Inc.
C. Y. Shyu, ExxonMobil Development Co.
R. J. Silvia, Process Engineers & Constructors, Inc.
J. L. Smith, Jacobs Engineering
J. P. Swezy, Jr., Boiler Code Tech, LLC
F. W. Tatar, FM Global
S. J. Tonkins, BP Exploration (Alaska), Inc.
Q. N. Truong, Consultant
B. K. Walker, Consolidated Nuclear Security

W. L. Weeks, Lummus Technology
J. L. Welch, T. D. Williamson, Inc.
G. E. Woods, GCS Consulting Services, Inc.
S. Biyuan, *Delegate,* PetroChina Pipeline Co.
F. Zhang, *Delegate,* SINOPEC Engineering Incorporation
G. C. Glover, *Contributing Member,* KBR
J. C. Luf, *Contributing Member,* Jacobs Engineering
J. T. Wier, *Honorary Member*

B31.3 INTERNATIONAL REVIEW GROUP

R. W. Engle, *Chair,* IHI E&C International Corp.
A. Ali, AES Arabia Ltd.
A. T. Balloch, A&S Consultants
D. W. Bikker, Du Pont de Nemours (Nederland) B.V.
G. Evans, BP Exploration
R. Gopalakrishnan, Samsung Saudi Arabia Co. Ltd.
P. Govindaraj, Dow Benelux B.V.
S. Govindaraj, Dow Chemical International Private Ltd.
M. Guidara, Engineering Procurement & Project Management S.A.
J. M. Hamedi, Santos GLNG
S. LaForge, Total France
J. K. Lambert, Welding Codes and Standards Consultant
H. W. Lange, Lisega AG
J. Langeland, Talisman Energy Norge AS
M. S. Mokhtar, SBM Offshore, Inc.
T. J. Naughton, Jacobs Engineering
A. Rokhsativand, Pars Oil & Gas Co.
W. Y. Sam, Shell Sarawak Berhad — Deepwater Engineering
C. E. Sandino, Atlaspro Engenharia
P. Shriwal, Consolidated Contractors Engineering
R. Sils, Santos Ltd.
H. Van Leengoed, Jacobs Nederland B.V.
R. Verstegen, Dow Benelux B.V.

B31.3 SUBGROUP ON DESIGN

R. M. Bojarczuk, *Chair,* ExxonMobil Research & Engineering Co.
D. L. Ianiro, *Vice Chair,* Mainthia Technologies, Inc.
D. Arnett, Fluor Enterprises, Inc.
J. P. Breen, Becht Engineering Co.
S. Butler, Shell Global Solutions
D. W. Diehl, Intergraph Corp.
D. R. Edwards, ConocoPhillips Co.
J. P. Ellenberger
R. W. Haupt, Pressure Piping Engineering Associates, Inc.
W. J. Koves, Pi Engineering Software, Inc.
E. M. Kvarda, Swagelok
R. A. Leishear, Savannah River National Laboratory
C. Nath, DuPont Engineering
K. A. Nisly-Nagele, Archer Daniels Midland Co.
C. D. Pham, SBM Offshore, Inc.
M. S. Sandacz, UOP LLC
T. C. Scrivner, ExxonMobil Engineering Europe Ltd.
K. S. Shipley, The Equity Engineering Group, Inc.
S. Stelmar, Hyspan Precision Products, Inc.
M. Stewart, URS Corp.
B. Swartz, SIG
S. B. Tewell, WFI International, Inc.
S. Tucky, CSA Group
B. K. Walker, Consolidated Nuclear Security
G. E. Woods, GCS Consulting Services, Inc.
S. LaForge, *Contributing Member,* Total France
H. W. Lange, *Contributing Member,* Lisega AG
J. C. Luf, *Contributing Member,* Jacobs Engineering
M. S. Mokhtar, *Contributing Member,* SBM Offshore, Inc.
R. P. Singh, *Contributing Member,* CB&I Lummus Private Ltd.
C. N. Trivedi, *Contributing Member,* GAIL (India) Ltd.

B31.3 SUBGROUP ON EDIT

D. J. Fetzner, *Chair,* BP Exploration Alaska, Inc.
C. Becht IV, Becht Engineering Co.
R. W. Engle, IHI E&C International Corp.
D. R. Frikken, Becht Engineering Co.
J. E. Meyer, Louis Perry & Associates, Inc.
R. J. Silvia, Process Engineers & Constructors, Inc.

B31.3 SUBGROUP ON FABRICATION, EXAMINATION, AND TESTING

C. H. Eskridge, Jr., *Chair,* Jacobs Engineering
R. D. Campbell, *Vice Chair,* Bechtel National, Inc.
D. A. Bingham, Los Alamos National Labs
K. J. Chizen, NDE Level III
A. C. Collins, JCM Industries, Inc.
M. G. Collins, ConocoPhillips
T. Dang, Chevron Energy Technology Co.
P. D. Flenner, Flenner Engineering Services
B. S. Gordon, Wyatt Field Services
J. F. Hodgins, Car-Ber Testing Services
C. Larsen, Team Industrial Services
D. H. Markman, Enerpipe Systems, Inc.
M. W. May, Chevron Energy Technology Co., USA
R. A. McLeod, Circor Instrumentation Technologies
A. D. Nalbandian, Thielsch Engineering, Inc.
R. K. Reamey, Turner Industries Group, LLC
G. C. Reinhardt II, Team Industries, Inc.
L. G. Richardson, Hi-Tech Testing Services, Inc.
R. A. Sierra, R. A. Sierra, LLC
W. J. Sperko, Sperko Engineering Services, Inc.
J. P. Swezy, Jr., Boiler Code Tech, LLC
S. W. Vail, Bechtel National, Inc.
L. S. Varone, Shaw Group
C. T. Widder, Tessenderlo Kerley Services, Inc.
K. Armstrong, *Contributing Member,* PCL Industrial Constructors, Inc.
A. T. Balloch, *Contributing Member,* A&S Consultants
J. K. Lambert, *Contributing Member,* Welding Codes and Standards Consultant
P. P. Buddhadeo, *Contributing Member,* Bechtel India Private Ltd.
A. Rokhsativand, *Contributing Member,* Pars Oil & Gas Co.
R. K. Srivastava, *Contributing Member,* Larsen & Toubro Ltd.

B31.3 SUBGROUP ON GENERAL REQUIREMENTS

D. D. Christian, *Chair,* Victaulic
S. S. Cimorelli, DuPont
D. L. Coym, Intertek Moody
J. A. D'Avanzo, Lockwood International
C. E. Davila, Crane Energy
G. Evans, BP Exploration
C. J. Melo, S&B Engineers and Constructors, Ltd.
C. Y. Shyu, ExxonMobil Development Co.
G. Trinker, Victaulic Co.
J. L. Welch, T. D. Williamson, Inc.
T. D. Wills, Jr., Praxair, Inc.
A. Ali, *Contributing Member,* AES Arabia Ltd.
J. Langeland, *Contributing Member,* Talisman Energy Norge AS
R. Nanda, *Contributing Member,* Engineers India Ltd.
C. E. Sandino, *Contributing Member,* Atlaspro Engenharia
P. Shriwal, *Contributing Member,* Consolidated Contractors Engineering
H. Van Leengoed, *Contributing Member,* Jacobs Nederland B.V.

B31.3 SUBGROUP ON HIGH PRESSURE PIPING

F. W. Tatar, *Chair,* FM Global
B. T. Bounds, WorleyParsons
D. R. Fraser, NASA Ames Research Center
O. R. Greulich, NASA
M. H. Nguyen, Lockwood International
H. Tiwari, FMC Technologies, Inc.
Q. N. Truong, Consultant
M. C. Warren, Xcel Energy
W. L. Weeks, Lummus Technology
S. Govindaraj, *Contributing Member,* Dow Chemical International Private Ltd.
A. Jettley, *Contributing Member,* Bechtel India Private Ltd.

B31.3 SUBGROUP ON HIGH PURITY SYSTEMS

V. B. Molina III, *Chair,* Air Products & Chemicals, Inc.
W. F. Daprile, Eli Lilly & Co.
R. Foster, Hose Master, LLC
P. J. Guerrieri, Sr., Integrated Mechanical Services, Inc.
B. K. Henon, Magnatech, LLC
W. M. Huitt, W. M. Huitt Co.
J. M. Krance, Swagelok Co.
P. E. Robinson, Parker Hannifin Corp.
S. Garg, *Contributing Member,* Punj Lloyd Ltd.
T. J. Naughton, *Contributing Member,* Jacobs Engineering

B31.3 SUBGROUP ON MATERIALS

B. L. Agee, *Chair,* GE Energy
S. J. Tonkins, *Vice Chair,* BP Exploration (Alaska), Inc.
C. Chang, Bechtel National, Inc.
R. A. Grichuk, Fluor Enterprises, Inc.
L. K. Hovey, Fluor Corp.
T. Jacobs, Jacobs Engineering
M. Katcher, Haynes International
D. W. Rahoi, CCM 2000
A. Raza, Pi Engineering, Inc.
C. Reichert
M. Senatore, Sandvik
M. Sindelar, Lokring Technology
J. L. Smith, Jacobs Engineering
S. Tang, Swagelok Co.
A. Yasemi, Cenovus Energy, Inc.
D. W. Bikker, *Contributing Member,* Du Pont de Nemours (Nederland) B.V.
S. Biswas, *Contributing Member,* CH2M Hill
R. Goel, *Contributing Member,* CB&I
R. Gopalakrishnan, *Contributing Member,* Samsung Saudi Arabia Co. Ltd.
P. Govindaraj, *Contributing Member,* Dow Benelux B.V.
M. Guidara, *Contributing Member,* Engineering Procurement & Project Management, S.A.
W. Jianyu, *Contributing Member,* SINOPEC Shanghai Engineering Corp.
A. Kumar, *Contributing Member,* Larsen & Toubro Ltd.
R. K. Mittal, *Contributing Member,* GAIL India Ltd.
W. Y. Sam, *Contributing Member,* Shell Sarawak Berhad — Deepwater Engineering
K. Songlin, *Contributing Member,* SINOPEC Engineering, Inc.

B31.3 SUBGROUP ON NON-METALLIC PIPING

J. M. Kalnins, *Chair,* Crane ChemPharma Flow Solutions — Resistoflex
J. R. Paschal, *Vice Chair,* Paschal Engineering & Forensic Consulting, Inc.
J. Becker, ISCO Industries
M. A. Clark, Nibco, Inc.
J. D. Eisenman, Maverick Applied Science, Inc.
M. McDaniel, The Dow Chemical Co.
D. A. McGriff, ISCO Industries, LLC
T. R. McPherson, IPS Corp.
A. J. Miloser, Charlotte Pipe & Foundry Co.
C. A. Moore, Smith Fibercast
J. D. Roach, IPS Corp.
N. J. Rollins, Harrington Industrial Plastics
F. R. Volgstadt, Volgstadt & Associates, Inc.
T. Wraight, Spears Manufacturing Co.
D. Yanik, Crane ResistoFlex
R. Hariharan, *Contributing Member,* COWI
R. Muruganantham, *Contributing Member,* Larsen & Toubro Ltd.
P. Sanyal, *Contributing Member,* Bechtel India Private Ltd.
R. Sils, *Contributing Member,* Santos Ltd.

B31.3 PROCESS PIPING, INDIA INTERNATIONAL WORKING GROUP

R. P. Singh, *Chair,* CB&I Lummus Private Ltd.
A. Kumar, *Vice Chair,* Larsen & Toubro Ltd.
R. Mohamed, *Secretary,* The American Society of Mechanical Engineers
S. Biswas, CH2M Hill
S. Garg, Punj Lloyd Ltd.
R. Goel, CB&I
R. Hariharan, COWI
A. Jettley, Bechtel India Private Ltd.
A. Meghani, Petroleum & Natural Gas Regulatory Board
R. K. Mittal, GAIL India Ltd.
R. Muruganantham, Larsen & Toubro Ltd.
R. Nanda, Engineers India Ltd.
P. P. Buddhadeo, Bechtel India Private Ltd.
P. Sanyal, Bechtel India Private Ltd.
C. N. Trivedi, GAIL (India) Ltd.
D. D. Christian, *Contributing Member,* Victaulic
M. Sharma, *Contributing Member,* ASME India Private Ltd.
R. K. Srivastava, *Alternate,* Larsen & Toubro Ltd.

B31 FABRICATION AND EXAMINATION COMMITTEE

J. P. Swezy, Jr., *Chair,* Boiler Code Tech, LLC
F. Huang, *Secretary,* The American Society of Mechanical Engineers
R. D. Campbell, Bechtel National, Inc.
D. Couch, Electric Power Research Institute
R. J. Ferguson, Metallurgist
P. D. Flenner, Flenner Engineering Services
S. Gingrich, URS Corp.
J. Hainsworth
A. D. Nalbandian, Thielsch Engineering, Inc.
R. J. Silvia, Process Engineers & Constructors, Inc.
W. J. Sperko, Sperko Engineering Services, Inc.
P. L. Vaughan, ONEOK Partners
K. Wu, Stellar Energy Systems

B31 MATERIALS TECHNICAL COMMITTEE

R. A. Grichuk, *Chair,* Fluor Enterprises, Inc.
N. Lobo, *Secretary,* The American Society of Mechanical Engineers
W. P. Collins, WPC Sol, LLC
R. P. Deubler, Fronek Power Systems, LLC
C. H. Eskridge, Jr., Jacobs Engineering
G. A. Jolly, Flowserve/Gestra, USA
C. J. Melo, S&B Engineers & Constructors, Ltd.
M. L. Nayyar, NICE
M. B. Pickell, Willbros Engineers, Inc.
D. W. Rahoi, CCM 2000
R. A. Schmidt, Canadoil
H. R. Simpson, Stantec
J. L. Smith, Jacobs Engineering
Z. Djilali, *Contributing Member,* Sonatrach

B31 MECHANICAL DESIGN TECHNICAL COMMITTEE

G. A. Antaki, *Chair,* Becht Engineering Co., Inc.
J. C. Minichiello, *Vice Chair,* Bechtel National, Inc.
R. Lucas, *Secretary,* The American Society of Mechanical Engineers
D. Arnett, Fluor Enterprises, Inc.
C. Becht IV, Becht Engineering Co.
R. Bethea, Huntington Ingalls Industries — Newport News Shipbuilding
J. P. Breen, Becht Engineering Co.
P. Cakir-Kavcar, Bechtel Corp. — Oil, Gas & Chemicals
N. F. Consumo, Sr., Nuclear Engineer
J. P. Ellenberger
D. J. Fetzner, BP Exploration Alaska, Inc.
D. Fraser, NASA Ames Research Center
J. A. Graziano, Consultant
R. W. Haupt, Pressure Piping Engineering Associates, Inc.
B. P. Holbrook, Babcock Power, Inc.
W. J. Koves, Pi Engineering Software, Inc.
R. A. Leishear, Savannah River National Laboratory
G. D. Mayers, Alion Science & Technology
J. F. McCabe, General Dynamics Electric Boat
T. Q. McCawley, TQM Engineering PC
J. E. Meyer, Louis Perry & Associates, Inc.
A. W. Paulin, Paulin Resource Group
R. A. Robleto, KBR
M. J. Rosenfeld, Kiefner/Applus — RTD
T. Sato, Japan Power Engineering and Inspection Corp.
G. Stevick, Berkeley Engineering and Research, Inc.
H. Kosasayama, *Delegate,* JGC Corp.
E. C. Rodabaugh, *Honorary Member,* Consultant

B31 CONFERENCE GROUP

A. Bell, Bonneville Power Administration
R. A. Coomes, Commonwealth of Kentucky, Department of Housing/Boiler Section
D. H. Hanrath
C. J. Harvey, Alabama Public Service Commission
D. T. Jagger, Ohio Department of Commerce
K. T. Lau, Alberta Boilers Safety Association
R. G. Marini, New Hampshire Public Utilities Commission
I. W. Mault, Manitoba Department of Labour
A. W. Meiring, Fire and Building Boiler and Pressure Vessel Division/Indiana
R. F. Mullaney, Boiler and Pressure Vessel Safety Branch/Vancouver
P. Sher, State of Connecticut
M. E. Skarda, Arkansas Department of Labor
D. A. Starr, Nebraska Department of Labor
D. J. Stursma, Iowa Utilities Board
R. P. Sullivan, The National Board of Boiler and Pressure Vessel Inspectors
J. E. Troppman, Division of Labor/State of Colorado Boiler Inspections
W. A. M. West, Lighthouse Assistance, Inc.
T. F. Wickham, Rhode Island Department of Labor

(14)

INTRODUCTION

The ASME B31 Code for Pressure Piping consists of a number of individually published Sections, each an American National Standard, under the direction of ASME Committee B31, Code for Pressure Piping.

Rules for each Section reflect the kinds of piping installations considered during its development, as follows:

B31.1 Power Piping: piping typically found in electric power generating stations, in industrial and institutional plants, geothermal heating systems, and central and district heating and cooling systems

B31.3 Process Piping: piping typically found in petroleum refineries; chemical, pharmaceutical, textile, paper, semiconductor, and cryogenic plants; and related processing plants and terminals

B31.4 Pipeline Transportation Systems for Liquids and Slurries: piping transporting products that are predominately liquid between plants and terminals and within terminals, pumping, regulating, and metering stations

B31.5 Refrigeration Piping and Heat Transfer Components: piping for refrigerants and secondary coolants

B31.8 Gas Transmission and Distribution Piping Systems: piping transporting products that are predominately gas between sources and terminals, including compressor, regulating, and metering stations; gas gathering pipelines

B31.9 Building Services Piping: piping typically found in industrial, institutional, commercial, and public buildings, and in multi-unit residences, which does not require the range of sizes, pressures, and temperatures covered in B31.1

B31.12 Hydrogen Piping and Pipelines: piping in gaseous and liquid hydrogen service and pipelines in gaseous hydrogen service

This is the B31.3 Process Piping Code Section. Hereafter, in this Introduction and in the text of this Code Section B31.3, where the word *Code* is used without specific identification, it means this Code Section.

It is the owner's responsibility to select the Code Section that most nearly applies to a proposed piping installation. Factors to be considered by the owner include limitations of the Code Section; jurisdictional requirements; and the applicability of other codes and standards. All applicable requirements of the selected Code Section shall be met. For some installations, more than one Code Section may apply to different parts of the installation. The owner is also responsible for imposing requirements supplementary to those of the Code if necessary to assure safe piping for the proposed installation.

Certain piping within a facility may be subject to other codes and standards, including but not limited to

– ANSI Z223.1 National Fuel Gas Code: piping for fuel gas from the point of delivery to the connection of each fuel utilization device

– NFPA Fire Protection Standards: fire protection systems using water, carbon dioxide, halon, foam, dry chemicals, and wet chemicals

– NFPA 99 Health Care Facilities: medical and laboratory gas systems

– building and plumbing codes, as applicable, for potable hot and cold water, and for sewer and drain systems

The Code sets forth engineering requirements deemed necessary for safe design and construction of pressure piping. While safety is the basic consideration, this factor alone will not necessarily govern the final specifications for any piping installation. The Code is not a design handbook. The requirements of this Code generally employ a simplified approach. Many decisions that must be made to produce a sound piping installation are not described in detail by this Code. The Code does not eliminate the need for sound engineering judgments by the owner and the 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 the following:

(a) references to acceptable material specifications and component standards, including dimensional requirements and pressure–temperature ratings

(b) requirements for design of components and assemblies, including piping supports

(c) requirements and data for evaluation and limitation of stresses, reactions, and movements associated with pressure, temperature changes, and other forces

(d) guidance and limitations on the selection and application of materials, components, and joining methods

(e) requirements for the fabrication, assembly, and erection of piping

(f) requirements for examination, inspection, and testing of piping

ASME Committee B31 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. New editions are published at intervals of two years.

Code users will note that paragraphs in the Code are not necessarily numbered consecutively. Such discontinuities result from following a common outline, insofar as practical, for all Code Sections. In this way, corresponding material is correspondingly numbered in most Code Sections, thus facilitating reference by those who have occasion to use more than one Section.

It is intended that this edition of Code Section B31.3 not be retroactive. Unless agreement is specifically made between contracting parties to use another issue, or the regulatory body having jurisdiction imposes the use of another issue, the latest edition issued at least 6 months prior to the original contract date for the first phase of activity covering a piping installation shall be the governing document for all design, materials, fabrication, erection, examination, and testing for the piping until the completion of the work and initial operation.

Users of this Code are cautioned against making use of Code revisions without assurance that they are acceptable to the proper authorities in the jurisdiction where the piping is to be installed.

The B31 Committee has established an orderly procedure to consider requests for interpretation and revision of Code requirements. To receive consideration, such request must be in writing and must give full particulars in accordance with Appendix Z.

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.

A Case is the prescribed form of reply 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 as part of a Case supplement.

Code Cases remain available for use until annulled by the ASME B31 Standards Committee.

A request for revision of the Code will be placed on the Committee's agenda. Further information or active participation on the part of the proponent may be requested during consideration of a proposed revision.

Materials ordinarily are listed in the stress tables only when sufficient usage in piping within the scope of the Code has been shown. Requests for listing shall include evidence of satisfactory usage and specific data to permit establishment of allowable stresses, 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. 323.1.2.)

ASME B31.3-2014
SUMMARY OF CHANGES

Following approval by the B31 Committee and ASME, and after public review, ASME B31.3-2014 was approved by the American National Standards Institute on July 16, 2014.

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

Page	*Location*	*Change*
xviii	Introduction	Revised
1	300	Subparagraphs (b)(1) and (c)(3) revised
2–8	300.2	(1) In definition of *fluid service*, subparagraph (b) revised (2) Definitions of *heat treatment* and *weld coupon* revised (3) Definition of *integrally reinforced branch connection fitting* added
9	Table 300.4	Entry for Appendix P deleted
10	301.2.2	Subparagraph (a) revised
12–14	302.2	Revised in its entirety
	302.3.2	In subparagraphs (b) and (d), first paragraph revised
15–17	Table 302.3.3C	(1) MSS SP-93 added to General Note (2) Note (2) revised
	302.3.5	In subparagraph (d), nomenclature for S_L added
18	302.3.6	Subparagraph (a) revised
21	Table 304.1.1	Revised
24	Fig. 304.3.3	General Note revised
29	304.7.2	First paragraph revised
30	305.2.3	Revised
32	306.6	Added
36	319.1.2	Last paragraph deleted
	319.2	Revised
37	319.2.3	Subparagraph (b) revised
	319.2.4	First paragraph revised
38, 39	319.4.4	Revised
	319.5	Revised
43	321.1.4	Subparagraph (b) revised
46–48	323.2.2	Revised

Page	*Location*	*Change*
	Table 323.2.2	(1) Under Type of Material, first two entries revised (2) Note (5) revised
50	Table 323.2.2A	Straddle head revised
51	Fig. 323.2.2B	Title and General Notes revised
52	Table 323.3.1	Item numbers revised
54, 55	323.4.2	Subparagraph (b) revised
57–59	Table 326.1	Revised
63–71	328.5.4	(1) Subparagraphs (b) and (c) revised (2) Subparagraph (i) added
	Fig. 328.5.4F	Added
	328.7	Added
	330	Revised in its entirety
	Table 330.1.1	Revised in its entirety
	331	Revised
	331.1	Revised in its entirety
	Table 331.1.1	Revised in its entirety
	Table 331.1.2	Added
72, 73	Table 331.1.3	Added
74	332.1	Footnote 1 added
76	335.9	Revised
77, 78	341.3.1	Subparagraph (a) revised
	341.3.2	Revised
	341.3.3	Revised
79–81	Table 341.3.2	(1) Title revised (2) Under Weld Imperfection, fourth and ninth entries revised (3) Last two columns deleted (4) Criterion Value Notes revised (5) Note (7) deleted (6) Notes (8) and (9) redesignated as (7) and (8), respectively (7) Note (9) added
83, 84	341.4.4	Subparagraph (c) revised
	342.1	Revised
85	344.3	Revised in its entirety
	344.4	Revised in its entirety
87	345.2.1	Subparagraph (a) revised
	345.2.2	Subparagraph (a) revised
88, 89	345.4.2	Revised
	345.5.4	Subparagraph (b) revised

Page	*Location*	*Change*
96	A319.2.3	Revised
102	Table A326.1	Under Nonmetallic Pipes and Tubes, ASTM F423, F491, F492, F546, F599, and F781 deleted
107	A335.4.1	Revised
111	M300	Revised
	M302	Revised in its entirety
112	M306.1	Revised in its entirety
	M306.2	Revised
	M306.4.2	Revised
	M307	Revised in its entirety
	M308.3	Revised
	M308.4	Revised
113, 114	M311.2	Revised
	M320	Added
	M321	Revised
	M322	Revised in its entirety
	M323.1	Revised
	M323.1.2	Added
	M326.1.2	Revised
115	M335.10	Added
	M341.4	Subparagraph (b) revised
	M345	Revised
116	MA302.3	Revised in its entirety
	MA303	Revised
	MA305	Revised
	MA306	Revised
	MA307	Revised
	MA308	Revised
	MA309	Revised
117	MA314.1	Revised
	MA323	Revised
	MA323.1.2	Added
	MA323.4.3	Revised
	MA327	Revised
	MA332	Revised
118	MA341.1	Revised
	MA341.4	Paragraph MA341.2 redesignated as MA341.4

Page	*Location*	*Change*
	MA342	Revised
	MA343	Revised
	MA345	Revised
121	K302.3.3	Subparagraph (b) revised
124	K304.7.2	First paragraph revised
125	K304.8.1	Footnote 7 revised
130	K323.2.1	Revised
	K323.2.3	Revised
	K323.2.4	Revised
136, 137	K330.1	Revised in its entirety
139	K341.3.3	Revised
140	Table K341.3.2	Second and third column heads revised
143	K345.4.2	Revised
145	U315.1	Revised
	Chapter X, Part 5	Revised in its entirety
146	U328	Revised in its entirety
	U335.8	Revised
147	Fig. U335.8A	Fig. U335.8 redesignated as Fig. U335.8A and revised
148	Fig. U335.8B	Added
	Fig. U335.8C	Added
149	U344.8	Revised in its entirety
152–154	Specification Index for Appendix A	(1) Title of ASTM A126 revised (2) ASTM A696, A813, A814, B668, and B709 added
155–157	Notes for Tables A-1, A-1M, A-1A, A-1B, A-2, and A-2M	(1) General Note (b) revised (2) General Note (d) corrected by errata to include M20 (3) General Note (e) revised (4) General Note (f) added (5) Note (1) corrected by errata to include Tables A-1M and A-2M (6) Notes (18), (23), and (42a) deleted (7) Notes (42), (48), and (65) revised (8) Note (46) redesignated as (7) and new Note (46) added (9) Note (74) revised
159	Table A-1	Under Iron, Castings, for A395, Grade added
160	Table A-1	Under Carbon Steel, Pipes and Tubes, for both API 5L A25 rows, first A53 A, and A139 A, Notes revised

Page	*Location*	*Change*
162	Table A-1	For A671 CK75, A672 N75, and A691 CMS-75, Material revised for all six rows
164, 165	Table A-1	(1) Under Plates, Bars, Shapes, and Sheets, A696 B and C added (2) For both A299 rows, Grade added
172, 173	Table A-1	(1) Under Low and Intermediate Alloy Steel, Plates, for A645, Grade added
176, 177	Table A-1	(1) Under Stainless Steel, Pipes and Tubes, for the first A312 and A376 TP321 rows, stress value for 850°F revised (2) A213 TP316Ti added
180, 181	Table A-1	(1) A249 and A312 904L added (2) A813 and A814 S31254 added (3) A249 and A312 S31254 added (two rows for each) (4) A312, A358, A813, and A814 N08367 added (two rows for each) (5) A789 and A790 S32101 added (two rows for each) (6) A789 and A790 2205 added
182, 183	Table A-1	(1) A789 and A790 S32906 added (two rows for each) (2) For A789 S32750, Product Form added and stress values revised (3) For A790 2507, Product Form and Grade added, and stress values revised
184, 185	Table A-1	(1) Under Plates and Sheets, A240 904L added (2) A240 201LN added (3) Two rows for A240 S31254 added (4) Two rows for A240 N08367 added (5) Two rows for A240 S32101 added (6) A240 2205 added (7) Two rows for A240 S32906 added (8) A240 2507 added
186, 187	Table A-1	(1) Under Forgings and Fittings, A182 F904L added (2) A182 F44, A403 WPS31254, and A403 CRS31254 added (3) A182 F62, A403 WP6XN, and A403 CR6XN added (4) A815 S32101 added (5) A182 and A815 2205 added (6) A182 F53, A815 WPS32750, and A815 CRS32750 added
188, 189	Table A-1	(1) Under Bar, A479 904L added (2) A479 S31254 added (3) A479 N08367 added

Page	*Location*	*Change*
		(4) A479 S32101 added (5) A479 2205 added (6) A479 S32906 added (7) A479 S32750 added
194, 195	Table A-1	(1) Under Nickel and Nickel Alloy, Pipes and Tubes, for B407 and B514 N08810, stress values for 1,550°F through 1,650°F revised (2) For B407 N08811, stress value for 1,050°F revised (3) B668 N08028 added
196, 197	Table A-1	(1) B626 N06059 added (2) B619, B622, and B626 N10362 added (3) Under Plates and Sheets, for B409 N08810 and N08811, stress values for 1,550°F through 1,650°F revised
198, 199	Table A-1	(1) B709 N08028 added (2) B575 N10362 added (3) Under Forgings and Fittings, for B366 N02201 and N02200, Condition and Size Range added (4) For B564 N02200, Notes revised
200, 201	Table A-1	(1) For B564 N08810, stress values for 1,550°F through 1,650°F revised (2) For B564 N08811, stress values for 1,100°F through 1,550°F and 1,650°F revised (3) For B366 N08810, Size added, Notes revised, and stress values for 1,550°F through 1,650°F revised (4) For B366 N08811, Size added, Notes revised, and stress values for 1,100°F through 1,550°F and 1,650°F revised (5) For B366 N04400 and N06600, Condition and Size added (6) For B366 N06030, Notes added (7) For B366 N08800, Condition revised, and Size and Notes added (8) For B366 N08020, Size and Notes added (9) For B366 N08825, Condition revised, and Size and Notes added (10) For B366 N06002, Condition and Size added, and Notes revised (11) For B366 N08031, Condition revised and Notes added (12) For B366 N10276, Notes added (13) For B366 N10001, Condition and Size added, and Notes revised (14) For B366 N06022, Condition and Size added (15) For B366 N06059, Condition revised and Notes added

Page	*Location*	*Change*
		(16) For B366 N06200, Notes added (17) B366, B462, and B564 N10362 added (18) For B366 N10665, N10675, and N06230, Notes added
202, 203	Table A-1	(1) Under Rod and Bar, for B408 N08810, stress values for 1,050°F through 1,650°F revised (2) For B408 N08811, stress values for 1,550°F through 1,650°F revised (3) B574 N10362 added
211	Table A-1	Under Aluminum Alloy, Forgings and Fittings, all Notes entries revised
212	Table A-1M	For A395, Grade added
213–321	Table A-1M	(1) Straddle head revised (2) Column head for lowest metal temperature corrected by errata to read Min. Temp. to 40
214	Table A-1M	For both API 5L A25 rows, first A53 A, and A139 A, Notes revised
220, 221	Table A-1M	(1) A696 B and C added (2) For both A299 rows, Grade added
228	Table A-1M	For A645, Grade added
234–237	Table A-1M	A213 TP316Ti added
242–245	Table A-1M	A249 and A312 904L added
246–249	Table A-1M	(1) A312, A358, A813, and A814 N08367 added (two rows for each) (2) For A789 S32750, Min. Temp., Min. Yield Strength, and stress values revised (3) For A790 S32750, Grade added, and Min. Temp., Min. Yield Strength, and stress values revised
250–253	Table A-1M	(1) A240 904L added (2) A240 201LN added (3) Two rows for A240 N08367 added (4) A240 2507 added
258–261	Table A-1M	(1) A182 F904L added (2) A182 F62, A403 WP6XN, and A403 CR6XN added (3) A182 F53, A815 WPS32750, and A815 CRS32750 added
262–265	Table A-1M	(1) A479 904L added (2) A479 N08367 added (3) A479 S32750 added
266–270	Table A-1M	In eighth column head, Note (7) reference added by errata

Page	*Location*	*Change*
272–275	Table A-1M	(1) For B407 and B514 N08810, stress values for 600°C, 625°C, 750°C, and 800°C through 900°C revised (2) B668 N08028 added
280–283	Table A-1M	(1) For B409 N08810, stress values for 350°C through 550°C, 600°C, 625°C, 750°C, and 800°C through 900°C revised (2) For B409 N08811, stress values for 400°C, 550°C through 650°C, 700°C, and 775°C through 900°C revised
284–287	Table A-1M	(1) B709 N08028 added (2) For B366 N02201, Condition and Size added
288–291	Table A-1M	(1) For B366 N02200, Condition and Size added (2) For B564 N02200, Notes revised (3) For three B366 rows, Condition added (4) For four B366 rows, Condition revised (5) For nine B366 rows, Size added (6) For ten B366 rows, Notes revised
292–295	Table A-1M	(1) For B366 N06022, Condition added (2) For B366 N06059, Condition revised (3) For five B366 rows, Notes revised
318, 319	Table A-1M	For all B361 rows, Notes revised
320, 321	Table A-1M	For all B361 rows, Notes revised
324	Table A-1B	(1) Under Stainless Steel, A249 added (2) For A312, last row added (3) A813 and A814 added
325	Table A-1B	(1) Under Nickel and Nickel Alloy, B668 added (2) Under Aluminum Alloy, B361 revised
326, 327	Table A-2	(1) Under Carbon Steel, for A194 2HM, Product Form revised (2) Under Alloy Steel, for A194 4, 7, and 7M, Min. Temp. revised (3) A194 4L, 7L, and 7ML added
328	Table A-2	Under Stainless Steel, for fourth group of rows, Class/Condition/Temper revised
330	Table A-2	For A193 B8M and A320 B8M, Class/Condition/Temper revised
336–339	Table A-2M	(1) For A194 2HM, Product Form revised (2) For A194 4, 7, and 7M, Min. Temp. and Max. Use Temp. revised (3) A194 4L, 7L, and 7ML added

Page	*Location*	*Change*
337–349	Table A-2M	Column head for lowest metal temperature corrected by errata to read Min. Temp. to 40
358	Note for Appendix C Tables	Revised
359–361	Table C-1	Revised in its entirety
362–365	Table C-2	Added
	Table C-3	Deleted
368, 369	Table C-6	Under Ferrous Metals, first Material entry revised
372–375	Table D300	Note (1) redesignated as General Note and subsequent Notes renumbered
376–381	Appendix E	Revised
384	F323.2	Added
386	F335.9	Subparagraph (d) added
398–408	Appendix J	Revised
412	Appendix K	A694 added to Specification Index
413	Notes for Appendix K Table	(1) General Note (b) revised (2) Former Notes (2), (6), and (18) changed to General Notes (3) Notes renumbered (4) Note (9) [formerly Note (21)] revised
414–425	Table K-1	(1) Notes renumbered (2) Under Carbon Steel, Forgings and Fittings, A694 F42 through F70 added (3) For all right-hand pages, column head for lowest metal temperature corrected by errata to read Min. Temp. to 100
427, 428	L303.3	Revised in its entirety
432	Appendix P	Deleted
448, 449	V304	Revised
451	X302.1	Revised

NOTES:
(1) The interpretations to ASME B31.3 issued between April 30, 2012 and December 16, 2013 follow the last page of this edition as a separate supplement, Interpretations Volume 24.
(2) After the interpretations, a separate supplement containing Cases 180, 181, 185, 191, and 193 follows.

PROCESS PIPING

Chapter I
Scope and Definitions

(14) 300 GENERAL STATEMENTS

(a) Identification. This Process Piping Code is a Section of the American Society of Mechanical Engineers Code for Pressure Piping, ASME B31, an American National Standard. It is published as a separate document for convenience of Code users.

(b) Responsibilities

(1) Owner. The owner of a piping installation shall have overall responsibility for compliance with this Code, and for establishing the requirements for design, construction, examination, inspection, and testing that will govern the entire fluid handling or process installation of which the piping is a part. The owner is also responsible for designating piping in Category D, Category M, High Pressure, and High Purity Fluid Services, and for determining if a specific Quality System is to be employed. [See paras. 300(d)(4) through (7) and Appendix Q.] Where applicable, the owner shall consider requirements imposed by the authority having jurisdiction regarding the piping installation.

(2) Designer. The designer is responsible to the owner for assurance that the engineering design of piping complies with the requirements of this Code and with any additional requirements established by the owner.

(3) Manufacturer, Fabricator, and Erector. The manufacturer, fabricator, and erector of piping are responsible for providing materials, components, and workmanship in compliance with the requirements of this Code and of the engineering design.

(4) Owner's Inspector. The owner's Inspector (see para. 340) is responsible to the owner for ensuring that the requirements of this Code for inspection, examination, and testing are met. If a Quality System is specified by the owner to be employed, the owner's Inspector is responsible for verifying that it is implemented.

(c) Intent of the Code

(1) It is the intent of this Code to set forth engineering requirements deemed necessary for safe design and construction of piping installations.

(2) This Code is not intended to apply to the operation, examination, inspection, testing, maintenance, or repair of piping that has been placed in service. The provisions of this Code may optionally be applied for those purposes, although other considerations may also be necessary.

(3) The Code generally employs a simplified approach for many of its requirements. A designer capable of applying a more complete and rigorous analysis consistent with the design criteria of this Code shall have the latitude of applying such analysis in the development of designs and fabrications. The designer shall provide details of design, construction, examination, and testing, along with calculations consistent with the design criteria of this Code. The details shall be documented in the engineering design and their validity accepted by the owner.

(4) Piping elements should, insofar as practicable, conform to the specifications and standards listed in this Code. Piping elements neither specifically approved nor specifically prohibited by this Code may be used provided they are qualified for use as set forth in applicable Chapters of this Code.

(5) The engineering design shall specify any unusual requirements for a particular service. Where service requirements necessitate measures beyond those required by this Code, such measures shall be specified by the engineering design. Where so specified, the Code requires that they be accomplished.

(6) Compatibility of materials with the service and hazards from instability of contained fluids are not within the scope of this Code. See para. F323.

(d) Determining Code Requirements

(1) Code requirements for design and construction include fluid service requirements, which affect selection and application of materials, components, and joints. Fluid service requirements include prohibitions, limitations, and conditions, such as temperature limits or a requirement for safeguarding (see Appendix G). Code requirements for a piping system are the most restrictive of those that apply to any of its elements.

(2) For metallic piping not designated by the owner as Category M, High Pressure, or High Purity Fluid