Gas Transmission and Distribution Piping Systems

ASME Code for Pressure Piping, B31
Date of Issuance: January 4, 2013

The next edition of this Code is scheduled for publication in 2014. 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.

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.

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 assumes 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
Three Park Avenue, New York, NY 10016-5990

Copyright © 2013 by
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
All rights reserved
Printed in U.S.A.
CONTENTS

Foreword .............................................................................. viii
Committee Roster ..................................................................... x
Introduction ........................................................................... xiv
Summary of Changes ................................................................ xvi

General Provisions and Definitions
801 General ................................................................. 1
802 Scope and Intent ..................................................... 1
803 Piping Systems Definitions .................................... 2
804 Piping Systems Component Definitions ................... 4
805 Design, Fabrication, Operation, and Testing Terms and
Definitions .......................................................... 6
806 Quality Assurance .................................................. 12
807 Training and Qualification of Personnel ....................... 12

Chapter I Materials and Equipment
810 Materials and Equipment ........................................... 14
811 Qualification of Materials and Equipment .................. 14
812 Materials for Use in Low Temperature Applications ...... 15
813 Marking ............................................................ 15
814 Material Specifications ............................................ 15
815 Equipment Specifications ......................................... 16
816 Transportation of Line Pipe ..................................... 16
817 Conditions for the Reuse of Pipe ............................... 16

Table
817.1.3-1 Tensile Testing .................................................. 17

Chapter II Welding
820 Welding ........................................................... 19
821 General ............................................................ 19
822 Preparation for Welding .......................................... 19
823 Qualification of Procedures and Welders .................. 19
824 Preheating .......................................................... 20
825 Stress Relieving ..................................................... 20
826 Weld Inspection Requirements ................................. 21
827 Repair or Removal of Defective Welds in Piping Intended
 to Operate at Hoop Stress Levels of 20% or More of
the Specified Minimum Yield Strength ......................... 22

Chapter III Piping System Components and Fabrication Details
830 Piping System Components and Fabrication Details ..... 23
831 Piping System Components ....................................... 23
832 Expansion and Flexibility ......................................... 29
833 Design for Longitudinal Stress ................................. 30
834 Supports and Anchorage for Exposed Piping ............ 33
835 Anchorage for Buried Piping .................................... 33

Tables
831.4.2-1 Reinforcement of Welded Branch Connections, Special
Requirements ......................................................... 28
832.2-1 Thermal Expansion or Contraction of Piping
Materials ............................................................... 30
832.5-1 Modulus of Elasticity for Carbon and Low Alloy Steel ................................. 31

Chapter IV Design, Installation, and Testing
840 Design, Installation, and Testing .................................................... 35
841 Steel Pipe ........................................................................ 37
842 Other Materials ................................................................. 50
843 Compressor Stations ............................................................ 58
844 Pipe-Type and Bottle-Type Holders ....................................... 61
845 Control and Limiting of Gas Pressure .................................... 62
846 Valves .................................................................................. 67
847 Vaults .................................................................................. 68
848 Customers’ Meters and Regulators ....................................... 69
849 Gas Service Lines ............................................................... 70

Tables
841.1.6-1 Basic Design Factor, $F$ .................................................. 40
841.1.6-2 Design Factors for Steel Pipe Construction .................... 40
841.1.7-1 Longitudinal Joint Factor, $E$ ........................................ 41
841.1.8-1 Temperature Derating Factor, $T$, for Steel Pipe .......... 41
841.1.11-1 Pipeline Cover Requirements ....................................... 43
841.2.3-1 Pipeline Field Cold Bend Requirements ....................... 44
841.3.2-1 Test Requirements for Steel Pipelines and Mains to Operate at Hoop Stresses of 30% or More of the Specified Minimum Yield Strength of the Pipe ........ 48
841.3.3-1 Maximum Hoop Stress Permissible During an Air or Gas Test ........................................................................ 49
842.1.1-1 Standard Thickness Selection Table for Ductile Iron Pipe ................................................................. 51
842.2.2-1 Wall Thickness and Standard Dimension Ratio for Thermoplastic Pipe ......................................................... 53
842.2.3-1 Diameter and Wall Thickness for Reinforced Thermosetting Plastic Pipe ......................................................... 53
842.2.9-1 Nominal Values for Coefficients of Thermal Expansion of Thermoplastic Pipe Materials ..................................... 55
844.3-1 Design Factors, $F$ .......................................................... 61
844.3-2 Minimum Clearance Between Containers and Fenced Boundaries ..................................................................... 61
845.2.2-1 Maximum Allowable Operating Pressure for Steel or Plastic Pipelines or Mains .................................................... 62
845.2.3-1 Maximum Allowable Operating Pressure for Pipelines Operating at 100 psig (690 kPa) or More .................... 63
845.2.3-2 Maximum Allowable Operating Pressure for Pipelines Operating at Less Than 100 psig (690 kPa) ............. 63

Chapter V Operating and Maintenance Procedures
850 Operating and Maintenance Procedures Affecting the Safety of Gas Transmission and Distribution Facilities .......................................................... 74
851 Pipeline Maintenance ............................................................... 76
852 Distribution Piping Maintenance ............................................. 82
853 Miscellaneous Facilities Maintenance ..................................... 85
854 Location Class and Changes in Number of Buildings Intended for Human Occupancy ......................................................... 88
855 Pipeline Service Conversions .................................................. 89
856 Odorization ........................................................................... 90
857 Uprating ............................................................................... 91
<table>
<thead>
<tr>
<th>Appendix</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandatory Appendix K</td>
<td>Criteria for Cathodic Protection</td>
<td>165</td>
</tr>
<tr>
<td>Nonmandatory Appendix L</td>
<td>Determination of Remaining Strength of Corroded Pipe</td>
<td>167</td>
</tr>
<tr>
<td>Nonmandatory Appendix M</td>
<td>Gas Leakage Control Criteria</td>
<td>168</td>
</tr>
<tr>
<td>Nonmandatory Appendix N</td>
<td>Recommended Practice for Hydrostatic Testing of Pipelines in Place</td>
<td>175</td>
</tr>
<tr>
<td>Nonmandatory Appendix O</td>
<td>Preparation of Technical Inquiries</td>
<td>177</td>
</tr>
<tr>
<td>Nonmandatory Appendix P</td>
<td>Nomenclature for Figures</td>
<td>178</td>
</tr>
<tr>
<td>Mandatory Appendix Q</td>
<td>Scope Diagrams</td>
<td>179</td>
</tr>
<tr>
<td>Nonmandatory Appendix R</td>
<td>Estimating Strain in Dents</td>
<td>182</td>
</tr>
<tr>
<td>Index</td>
<td></td>
<td>183</td>
</tr>
</tbody>
</table>