

GP 03-18-01	Piping Fabrication Shop or Field	August 2008
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Piping Fabrication Shop or Field

GP 03-18-01

Scope

[I] This Global Practice (GP) covers the fabrication, inspection, and shop testing of piping.

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1. Required References

This Section lists the Practices, codes, standards, specifications, and publications that shall be used with this document. Unless otherwise specified herein, use the latest edition.

1.1. Global Practices–ExxonMobil Engineering Practices

GP 03-19-01	Piping Erection, Leak Testing, Flushing, and Cleaning
GP 18-07-01	Welding Procedures
GP 18-10-01	Additional Requirements for Materials
GP 20-01-01	Inspection of Equipment and Materials
GP 20-01-03	Quality Programs

1.2. ASME–American Society of Mechanical Engineers

ASME B1.20.1	Pipe Threads, General Purpose (Inch)
ASME B16.25	Buttwelding Ends
ASME B31.3	Process Piping
ASME SEC V	BPVC Section V - Nondestructive Examination

2. Additional Requirements

- 1) [*] This Section lists the additional Practices, codes, standards, specifications, and publications that shall be used with this document only where specified. Unless otherwise specified herein, use the latest edition.
- 2) [*] [I] Fabrication of all piping shall be performed in accordance with [ASME B31.3](#), [ASME B31.1](#), or [ASME SEC I](#) as applicable, and with the additional requirements of this GP and the quality program requirements of [GP 20-01-03](#).
- 3) [I] When compliance with any code or standard by a local jurisdiction is mandatory, the requirements prescribed therein shall also be met.

2.1. Global Practices–ExxonMobil Engineering Practices

GP 18-04-01	Postweld Heat Treatment of Equipment Handling Alkaline Solutions
GP 18-12-01	Positive Material Identification
GP 19-01-01	Paint and Protective Coatings

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2.2. API–American Petroleum Institute

API RP 941	Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petrochemical Plants
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2.3. ASME–American Society of Mechanical Engineers

ASME B31.1	Power Piping
ASME SEC I	BPVC Section I - Rules for Construction of Power Boilers

2.4. AWS–American Welding Society

AWS D1.1/D1.1M	Structural Welding Code - Steel
AWS D10.10/D10.10M	Recommended Practices for Local Heating of Welds in Piping and Tubing

2.5. CEN–European Committee for Standardization

CEN EN 462-1	Non-Destructive Testing - Image Quality of Radiographs - Part 1: Image Quality Indicators (Wire Type) - Determination of Image Quality Value
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2.6. DIN–Deutsches Institut für Normung

DIN 54109	Non-Destructive Testing; Image Quality of Radiographs; Concepts, Image Quality Indicators, Determination of Image Quality Value
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2.7. JIS–Japanese Industrial Standards

JSA Z 3104	Methods of Radiographic Examination for Welded Joints in Steel
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2.8. PFI–Pipe Fabrication Institute

PFI ES-24	Pipe Bending Methods, Tolerances, Process and Material Requirements
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3. Definitions

Term	[I] Description
Combustible Liquids	High flash liquids [flash points 100°F (38°C) or higher] when handled at temperatures more than 15°F (8°C) below their flash point.
Dangerous Materials	As used herein, includes the following: Toxic materials, such as phenol, hydrogen sulfide, chlorine Highly corrosive materials, such as acids, caustic and other similar materials Flammable materials (including light hydrocarbons lighter than 68 degrees API) Combustible liquids Boiler feedwater and steam, in systems requiring ASME Class 300 and higher ratings Oxygen in concentrations greater than 35 percent
Flammable Liquids	Low flash liquids [flash point below 100°F (38°C)], and high flash liquids [flash point 100°F (38°C) or higher] when handled at temperatures above or within 15°F (8°C) of their flash points.
Flammable Materials	(Including hydrocarbons lighter than 68 degrees API). Flammable liquids; hydrocarbon vapors; and other vapors, such as hydrogen and carbon disulfide, that are readily ignitable when released to atmosphere.
Hydrogen Service	Equipment is in hydrogen service when the design temperature is greater than the CS curve in API RP 941 for the given hydrogen partial pressure.
Inspector	Refers to the Owner's Representative.
Non-Dangerous Materials	As used herein, include all materials not listed as Dangerous Materials.
Small Piping Connections	Any branch connection NPS 2 (50 mm) or less.
Toxic Materials	Fluid may be considered "toxic" when the (Industrial Hygiene) Respiratory Exposure Hazard Class is R-1, R-2, or R-3, as specified in the Environmental, Equipment, Exposure Review (EEER), or as otherwise specified by the Owner.
Utility Services	Category D fluid services as defined in ASME B31.3 .
Wet H₂S	Defined as greater than 50 wppm of H ₂ S in a water phase (determined by using the total amount of sulfide in the water phase) or ≥ 0.05 psia (0.34 kPa abs) H ₂ S partial pressure in the gas phase with liquid water present.

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4. Small Piping Documentation

[I] The following information for small piping connections shall be shown on the Engineering Drawings:

- 1) Specific location and orientation of small piping connections.
- 2) Connection size and schedule.
- 3) Valve or fitting type.
- 4) Designation of connections to be gusseted, and specifications to be used for gussets.
- 5) Special welding requirements.
- 6) Temporary valves and nipples that are used only during pressure testing shall be indicated on the drawings.

5. Attachment Materials

[A] [R] Unless otherwise specified or approved by the Owner's Engineer, lugs, brackets, insulation supports, or other attachments that must be welded to piping shall be of similar nominal chemical composition as the piping component to which they are attached, except for gusseting of small branch connections. P1 material may be used for attachments to P3 through P5 materials that are not in hydrogen service.

6. Bends, Miter Bends, and Elbows

- 1) [R] Pipe bends shall comply with the following requirements:
 - a) Bending shall be in accordance with PFI ES-24.
 - b) [A] The centerline radius of pipe bends shall be equal to at least three times the nominal pipe diameter. Proposals to use smaller radius pipe bends shall be submitted to Purchaser for approval by the Owner's Engineer.
- 2) [R] Miter bends may be used where the pipe diameter exceeds NPS 12 (300 mm) and shall comply with the following:
 - a) Bends exceeding 45 degrees shall be at least three-piece (two miter cuts), with not less than four times the pipe wall thickness between the centerlines of the welds at the crotch, or 1 in. (25 mm), whichever is greater.
 - b) Bends shall have a centerline radius at least equal to the nominal pipe size.
 - c) The maximum miter angle (half the change of directions) shall be 22¹/₂ degrees up to 200 psig (1380 kPa) design pressure, 15 degrees up to 400 psig (2760 kPa), and 11¹/₄ degrees over 400 psig (2760 kPa).
- 3) [A] [R] Buttwelding elbows shall be of the long radius type, unless otherwise approved by the Owner's Engineer.

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