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Additional Requirements for Materials

GP 18-10-01

Scope

[I] This Global Practice (GP) covers special materials requirements relating to the fabrication of equipment in the areas of hardness testing, carbon steel chemistry requirements, hydrostatic and wash water quality, impact testing, and protection of equipment.

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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 03-15-01	Pressure Relief Valves
GP 09-04-01	Atmospheric Storage Tanks
GP 09-06-01	Refrigerated Storage Tanks

1.2. API–American Petroleum Institute

API 579-1	Fitness-for-Service
API RP 941	Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petrochemical Plants
API STD 661	Air-Cooled Heat Exchangers for General Refinery Services

1.3. ASME–American Society of Mechanical Engineers

ASME B31.3	Process Piping
ASME SEC II A	BPVC Section II A - Materials Part A - Ferrous Material Specifications
ASME SEC II C	BPVC Section II C - Materials Part C - Specifications for Welding Rods, Electrodes, and Filler Metals
ASME SEC VIII D1	BPVC Section VIII - Rules for Construction of Pressure Vessels - Division 1
ASME SEC VIII D2	BPVC Section VIII - Rules for Construction of Pressure Vessels - Division 2 Alternative Rules
ASME SEC IX	BPVC Section IX - Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators

1.4. ASTM–American Society for Testing and Materials

ASTM A 833	Standard Practice for Indentation Hardness of Metallic Materials by Comparison Hardness Testers
ASTM A 956	Standard Test Method for Leeb Hardness Testing of Steel Products

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1.5. BSI–British Standards Institution

BSI BS EN 1011-2	Welding - Recommendations for Welding of Metallic Materials - Part 2: Arc Welding of Ferritic Steels
BSI BS EN 13445	Unfired Pressure Vessels
BSI PD 5500	Specification for Unfired Fusion Welded Pressure Vessels

1.6. NACE–National Association of Corrosion Engineers

NACE MR0103	Materials Resistant to Sulfide Stress Cracking in Corrosive Petroleum Refining Environments
NACE MR0175/ISO 15156	Petroleum and Natural Gas Industries Materials for Use in H ₂ S-Containing Environments in Oil and Gas Production
NACE TM0284	Evaluation of Pipeline and Pressure Vessel Steels for Resistance to Hydrogen-Induced Cracking

1.7. SNCT and AFIAP

COD AP	French Code for the Manufacture of Unfired Pressure Vessels
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1.8. STOOMWEZEN (Netherlands)

STOOMWEZEN	Rules for Equipment Under Pressure
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2. Definitions

Term	[I] Description
Critical Exposure Temperature (CET)	[*] Defined as the lowest metal temperature derived from either the operating or atmospheric conditions. The CET may be a single temperature at an operating pressure or an envelope of temperatures and pressures. The CET is determined for different types of equipment including pressure vessels, piping, and machinery as defined herein.
CET for Machinery	The CET for machinery pressure containing components to be supplied by the Owner's Engineer.

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Term	[I] Description
CET for Piping	The CET for systems constructed to ASME B31.3 is defined as the lowest metal temperature at which a component will be subject to either 30 percent of the maximum allowable working pressure (MAWP) at ambient temperature or a combined total longitudinal stress due to pressure, weight effects, and displacement strains that do not exceed 55.2 MPa (8 ksi). The CET for piping is determined from the anticipated process and atmospheric conditions.
CET for Pressure Vessels (including heat exchangers and pressure storage spheres)	The CET for pressure vessels is determined from the anticipated process and atmospheric conditions. The CET is defined as the lowest metal temperature at which a component will be subjected to a general primary membrane tensile stress greater than 55.2 MPa (8 ksi). The CET may also be defined according to the following options: 1. The minimum metal temperature at which a component could be subjected to a pressure greater than 40 percent of the design pressure for vessels constructed to ASME SEC VIII D1. 2. The minimum metal temperature at which a component could be subjected to a pressure greater than 35 percent of the design pressure for vessels constructed to ASME SEC VIII D1, with a 3.5 safety factor as recognized in the 1999 addenda. 3. The minimum metal temperature at which a component could be subjected to a pressure greater than 30 percent of the design pressure for vessels constructed to ASME SEC VIII D2. 4. For pressure vessels designed to a higher allowable stress than that permitted in these codes, the CET may be taken as the lowest metal temperature at which the vessel will be subjected to a pressure no greater than 25 percent of the design pressure or a membrane stress of no greater than 55.2 MPa (8 ksi).
Hardness Test	A single hardness reading in the weld metal, base metal, or HAZ.
Heat Affected Zone (HAZ)	The zone of the base metal affected by the heat input of welding.
Hydrogen Service	Equipment is in hydrogen service when the design temperature is greater than the carbon steel (CS) curve in API RP 941 for the given hydrogen partial pressure.
Inspector	As used in this GP, refers to the Owner's Representative.

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Term	[I] Description
Stainless Steel	A steel that meets one of the following descriptions: 1. Martensitic or ferritic chromium stainless steels containing more than 10 percent chromium (typically AISI 400 series). 2. Austenitic chromium-nickel stainless steels containing more than 16 percent chromium and more than 6 percent nickel (typically AISI 300 series). This also includes the super austenitic stainless steels (with 6 percent Mo) and the alloys with nominally 20 percent Cr and 35 percent Ni such as Incoloy 825 or Alloy 20. 3. Duplex ferritic-austenitic stainless steels containing approximately 15 to 30 percent chromium and 2 to 8 percent nickel (typically the 2205 and 2507 alloys).
Wet H₂S Service	Equipment is in wet H ₂ S service when any one of the conditions in NACE MR0175/ISO 15156 is met.
Wet H₂S Service Alternate Downstream Case	Equipment is in wet H ₂ S service when any one of the conditions in NACE MR0103 , Paragraph 1.3.5.1 is met.

3. Portable Hardness Testing for Fabrication

3.1. Personnel and Procedure Qualification

[R] Personnel performing hardness testing shall demonstrate their capabilities to the satisfaction of the Inspector. Qualification of the hardness testing personnel, including training and experience, shall be made available to the Inspector.

3.2. Testing Equipment

[A] [R] A list of acceptable hardness testers is shown in Table 1. The Owner's Engineer shall approve any hardness tester not listed in Table 1.

Table 1: Acceptable Hardness Testers

Brinell Type Hardness Testers		Dynamic/Rebound Type Hardness Tester
Telebrineller Teleweld, Inc. 416 North Park St. Streator, IL 61364	Newage Calibrated Pin Tester Newage Ind., Inc. 2300 Maryland Rd. Willow Grove, PA 19090	EQUOTIP EQUOTIP Associates 140 Industry Drive Pittsburgh, PA 15275
Minibrineller	L.C. Eitzen Brinell Meter	
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