Welding Guidelines for the Chemical, Oil, and Gas Industries

Downstream Segment

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Suggested revisions are invited and should be submitted to the Standards Department, API, 1220 L Street, NW, Washington, DC 20005, standards@api.org.

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Welding Guidelines for the Chemical, Oil, and Gas Industries

1 Scope

1.1 This recommended practice (RP) provides supplementary guidelines and practices for welding and welding related topics for shop and field fabrication, repair and modification of the following:

a) pressure-containing equipment such as pressure vessels, heat exchangers, piping, heater tubes, and pressure boundaries of rotating equipment and attachments welded thereto;

b) tanks and attachments welded thereto;

c) nonremovable internals for process equipment;

d) structural items attached and related to process equipment;

e) other equipment or component item when referenced by an applicable purchase document.

1.2 This document is general in nature and is intended to augment the welding requirements of ASME *BPVC* Section IX and similar codes, standards, specifications and practices such as those listed in Section 2. The intent of this document is to be inclusive of chemical, oil and gas industry standards, although there are many areas not covered herein, e.g. pipeline welding and offshore structural welding are intentionally not covered.

1.3 This document is based on industry experience and any restrictions or limitations may be waived or augmented by the purchaser.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies. Other codes and standards are specified by the purchaser.

API 510, *Pressure Vessel Inspection Code: Maintenance, Inspection, Rating, Repair, and Alteration*

API 570, *Piping Inspection Code: Inspection, Repair, Alteration, and Rerating of In-service Piping Systems*

API Standard 610, *Centrifugal Pumps for Petroleum, Petrochemical, and Natural Gas Industries*

API Standard 617, *Axial and Centrifugal Compressors and Expander-compressors for Petroleum, Chemical, and Gas Industry Services*

API Standard 620, *Design and Construction of Large, Welded Low-pressure Storage Tanks*

API Standard 650, *Welded Tanks for Oil Storage*

API Standard 653, *Tank Inspection, Repair, Alteration and Reconstruction*

API Recommended Practice 934-A, *Materials and Fabrication of 2 1/4/3Cr-1Mo, Alloy Steel Heavy Wall Pressure Vessels for High Temperature, High Pressure Hydrogen Service*, Second Edition

API Recommended Practice 934-C, *Materials and Fabrication of 1-1/4CR-1/2Mo Steel Heavy Wall Pressure Vessels for High Pressure Hydrogen Service Operating at or Below 825 °F (441 °C)*

API Technical Report 938-C, *Use of Duplex Stainless Steels in the Oil Refining Industry*, First Edition

ASME *Boiler and Pressure Vessel Code (BPVC)* [1], *Section II, Part C: Specifications for Welding Rods, Electrodes, and Filler Metals*

ASME *BPVC*, *Section VIII: Recommended Guidelines for the Care of Power Boilers*

ASME *BPVC*, *Section IX: Welding and Brazing Qualifications*

ASME B31.3, *Process Piping*

ASTM A262 [2], *Standard Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels*

ASTM A370, *Standard Test Methods and Definitions for Mechanical Testing of Steel Products*

ASTM A578, *Standard Specification for Straight-Beam Ultrasonic Examination of Rolled Steel Plates for Special Applications*

ASTM A833, *Standard Practice for Indentation Hardness of Metallic Materials by Comparison Hardness Testers*

ASTM E92, *Standard Test Method for Vickers Hardness of Metallic Materials*

AWS A3.0 [3], *Standard Definitions*

AWS A4.2M (ISO 8249:2000 MOD), *Standard Procedures for Calibrating Magnetic Instruments to Measure the Delta Ferrite Content of Austenitic and Duplex Ferritic-Austenitic Stainless Steel Weld Metal*

AWS A4.3, *Standard Method for Determination of the Diffusible Hydrogen Content of Martensitic, Bainitic and Ferritic Steel Weld Metal Produced by Arc Welding*

AWS A4.4M, *Standard Procedures for Determination of Moisture Content of Welding Fluxes and Welding Electrode Flux Coverings*

AWS A5.32/A5.32M, *Specification for Welding Shielding Gases*

AWS A5.XX, *Series of Filler Metal Specifications*

AWS D1.1, *Structural Welding Code—Steel*

AWS D1.6, *Structural Welding Code—Stainless Steel*

AWS D10.8, *RP for Welding of CrMo Steel Piping and Tubing*

NACE MR 0103 [4], *Standard Material Requirements—Materials Resistant to Sulfide Stress Cracking in Corrosive Petroleum Refining Environments*

NACE RP 0472, *Standard Recommended Practice: Methods and Controls to Prevent In-service Environmental Cracking of Carbon Steel Weldments in Corrosive Petroleum Refining Environments*

National Board NB-23 [5], *National Board Inspection Code*

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1 ASME International, 3 Park Avenue, New York, New York 10016-5990, www.asme.org.
2 ASTM International, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428, www.astm.org.
3 American Welding Society, 550 NW LeJeune Road, Miami, Florida 33126, www.aws.org.
4 NACE International (formerly the National Association of Corrosion Engineers), 1440 South Creek Drive, Houston, Texas 77218-8340, www.nace.org.
5 National Board of Boiler and Pressure Vessel Inspectors, 1055 Crupper Avenue, Columbus, Ohio 43229, www.nationalboard.org.