

Specification for Shop-welded Tanks for Storage of Production Liquids

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Specification for Shop-welded Tanks for Storage of Production Liquids

1 Scope

1.1 General

1.1.1 This specification covers material, design, fabrication, and testing requirements for new shop-fabricated vertical, cylindrical, aboveground, welded steel storage tanks in the standard sizes and capacities, and for internal pressures approximately atmospheric, given in Table 1.

1.1.2 This specification is designed to provide the oil production industry with tanks of adequate safety and reasonable economy for use in the storage of crude petroleum and other liquids commonly handled and stored by the production segment of the industry. This specification is for the convenience of purchasers and manufacturers in ordering and fabricating tanks.

1.1.3 Only tanks built to the requirements stated in this specification may be identified as 12F tanks. Tanks built to dimensions other than listed in Table 1 are outside the scope of this specification.

1.1.4 This specification has requirements given in two alternate systems of units. The manufacturer shall comply with the US Customary (USC) units. The SI unit equivalent is provided for convenience.

NOTE Per API document style, SI unit values appear first, followed by their USC equivalents in parentheses.

1.2 Compliance

1.2.1 The manufacturer is responsible for complying with all the provisions of this specification. The purchaser may make any investigation necessary to satisfy himself or herself of manufacturer compliance and may reject any material that does not comply with this specification. The purchaser may wish to avail himself or herself of this right and furnish their own inspection independently of any supervisory inspection furnished by the manufacturer.

1.2.2 This specification is not intended to cover storage tanks that are to be erected in areas subject to regulations more stringent than the requirements contained in this specification. When this document is specified for such tanks, it should be followed insofar as it does not conflict with regulatory requirements.

1.2.3 Once the tank has been placed into service, it should be maintained according to API 12R1, API 653, or an owner program specifically designed for tank maintenance.

2 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any addenda) applies.

AISC¹ *American Institute of Steel Construction Manual*, 15th Edition

API Specification 5L, *Specification for Line Pipe*

API 12R1, *Recommended Practice for Setting, Maintenance, Inspection, Operation, and Repair of Tanks in Production Service*

¹ American Institute of Steel Construction, 130 East Randolph, Suite 2000, Chicago, Illinois 60601, www.aisc.org

API Standard 650, *Welded Tanks for Oil Storage*

API Recommended Practice 652, *Lining of Aboveground Petroleum Storage Tank Bottoms*

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

API Standard 2000, *Venting Atmospheric and Low-pressure Storage Tanks: Nonrefrigerated and Refrigerated*

ASCE ² 7-16, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*

ASME ³ Boiler and Pressure Vessel Code, Section IX, *Welding, Brazing, and Fusing Qualifications*

ASME B16.5, *Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard*

ASME B16.11, *Forged Steel Fittings, Socket-Welding and Threaded*

ASTM ⁴ A6/A6M, *General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use*

ASTM A36/A36M, *Standard Specification for Carbon Structural Steel*

ASTM A53/A53M, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless*

ASTM A105/A105M, *Standard Specification for Carbon Steel Forgings for Piping Applications*

ASTM A106/A106M, *Standard Specification for Seamless Carbon Steel Piping for High-Temperature Service*

ASTM A181/A181M, *Standard Specification for Carbon Steel Forgings, for General-Purpose Piping*

ASTM A307, *Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength*

ASTM A333/A333M, *Standard Specification for Seamless and Welded Steel Pipe for Low-Temperature Service and Other Applications with Required Notch Toughness*

ASTM A350/A350M, *Standard Specification for Carbon and Low-Alloy Steel Forgings Requiring Notch Toughness Testing for Piping Components*

ASTM A516/A516M, *Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service*

ASTM A573/A573M, *Standard Specification for Structural Carbon Steel Plates of Improved Toughness*

ASTM A1011/A1011M, *Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength*

ASTM F2329/F2329M, *Standard Specification for Zinc Coating, Hot Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners*

ASTM F3125/F3125M, *Standard Specification for High Strength Structural Bolts, Steel, and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions*

² American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, Virginia 20191, www.asce.org

³ ASME International, 3 Park Avenue, New York, New York 10016-5990, www.asme.org

⁴ ASTM International, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428, www.astm.org



AWS ⁵ D1.1, *Structural Welding Code—Steel*

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

CSA ⁶ G40.21, *General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel*

IBC ⁷ *International Building Code*, 2018 Edition

NACE ⁸ SP0178-2007, *Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to Be Lined for Immersion Service*

OSHA ⁹ 29 CFR1910, *Occupational Safety and Health Administration Subpart D – Walking-Working Surfaces*

PIP ¹⁰ STF05501, *Fixed Ladders and Cages Details*

PIP STF05520, *Pipe Railing for Walking and Working Surface Details*

PIP STF05521, *Details for Angle Railings for Walking and Working Surfaces*

3 Terms and Definitions

For the purposes of this document, the following definitions apply.

3.1

bottom shell course

The shell course welded directly to the tank bottom.

3.2

butt joint

A joint type in which the butting ends of one or more workpieces are aligned in approximately the same plane.

3.2.1 double-welded butt joint

A joint between two abutting parts lying in approximately the same plane and welded from both sides. A joint with filler metal added from one side only is considered equivalent to a double-welded butt joint when means are provided for accomplishing complete penetration and reinforcement on both sides of the joint.

3.2.2 single-welded butt joint with backing

A joint between two abutting parts lying in approximately the same plane and welded from one side only, with a backing strip, bar, or other suitable material.

3.3

design pressure

The pressure/vacuum permitted in the tank during normal in-breathing and out-breathing of the tank in accordance with API 2000, Annex A.

3.4

fillet weld

A weld of approximately triangular cross section joining two surfaces approximately at right angles to each other, as in a lap joint, tee joint, or corner joint.

⁵ American Welding Society, 550 NW LeJeune Road, Miami, Florida 33126, www.aws.org.

⁶ Canadian Standards Association, 8501 East Pleasant Valley Road, Independence, OH 44131-55126, www.csagroup.org.

⁷ International Code Council, 500 New Jersey Avenue, NW, 6th Floor, Washington, District of Columbia 20001, www.iccsafe.org.

⁸ National Association of Corrosion Engineers, 15835 Park Ten Place, Houston Texas 77084, www.nace.org.

⁹ Code of Federal Regulations Title 29 – Labor, Part 1910, Occupational Safety and Health Administration, www.gpo.gov.

¹⁰ Process Industry Practices, 3925 West Braker Lane (R4500), Austin, Texas 78759, www.pip.org.

3.5**full-fillet weld**

A fillet weld whose size is equal to the thickness of the thinner member joined.

3.6**groove weld**

A weld in a groove on a workpiece surface, between workpiece edges, between workpiece surfaces, or between workpiece edges and surfaces.

NOTE Grooves may be square, V (single or double), or U (single or double).

3.7**maximum pressure**

The maximum internal pressure permitted in the tank, under the effects of loading and load combinations stated in Section 5.

3.8**maximum vacuum**

The maximum internal vacuum permitted in the tank, under the effects of loading and load combinations stated in Section 5.

3.9**operating pressure**

The pressure at which the tank operates without the overpressure protection devices opening.

3.10**remote location**

The location for a tank that is sufficiently distant from any occupied buildings and public areas so that hazards associated with exposure to an external tank fire (e.g. thermal radiation, projectiles, pool fire due to inventory release, etc.) cannot reach them. Public areas include those facilities not owned/operated as part of the tank operations, but rather in use by the general public, such as roads deeded, dedicated, or otherwise permanently appropriated to the public for public use, occupied buildings, or other public infrastructure.

3.11**self-anchored tank**

Tanks that use their self-weight and the stored product to resist overturning forces.

3.12**tack weld**

A weld made to hold parts of a weldment in proper alignment until the final welds are made.

3.13**throat**

The shortest distance between the weld root and the face of a fillet weld.

4 Materials**4.1 General**

4.1.1 Materials listed in this section have been selected to provide adequate strength and reasonable service life. Other materials having mechanical properties equal to or greater than these listed may be used by agreement between the purchaser and the manufacturer. Where higher-strength materials are used, the minimum thicknesses called for in this specification shall not be reduced.

4.1.2 The use of rimmed or capped steels is not permitted.