

# Specification for Bolted Tanks for Storage of Production Liquids

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# Specification for Bolted Tanks for Storage of Production Liquids

## 1 Scope

### 1.1 Purpose

This specification provides the oil production industry with safe, economical tanks for storing liquids.

### 1.2 Scope

This specification establishes minimum requirements for material, design, fabrication, erection, inspection, and marking of vertical, cylindrical, aboveground, unanchored, closed- and open-top, bolted storage tanks in standard sizes designed for the loads specified in Section 5.

## 2 Normative References

The following documents are referenced by this specification. For dated references, only the edition cited applies:

AISC 360-16<sup>1</sup>, *Specification for Structural Steel Buildings*

API Standard 12R1, *Installation, Operation, Maintenance, Inspection, and Repair of Tanks in Production Service*, 6<sup>th</sup> Edition

API Specification 5L, *Line Pipe*, 46<sup>th</sup> Edition

API Specification 6A, *Specification for Wellhead and Christmas Tree Equipment*, 20<sup>th</sup> Edition

API Specification 12F, *Specification for Shop-Welded Tanks for Storage of Production Liquids*, 13<sup>th</sup> Edition

API Standard 650, *Welded Steel Tanks for Oil Storage*, 12<sup>th</sup> Edition, Addendum 2

API Standard 2000, *Venting Atmospheric and Low-pressure Storage Tanks*, 7<sup>th</sup> Edition

ASCE 7-16<sup>2</sup>, *Minimum Design Loads for Buildings and Other Structures*

ASME B1.1-2003<sup>3</sup>, *Unified Inch Screw Threads, (UN and UNR Thread Form)*

ASME B16.11-2016, *Forged Fittings, Socket-Welding and Threaded*

ASME B18.2.1-2012, *Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)*

ASME B18.2.2-2015, *Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)*

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<sup>1</sup> American Institute of Steel Construction, 130 East Randolph, Suite 2000, Chicago, Illinois 60601, [www.aisc.org](http://www.aisc.org).

<sup>2</sup> American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, Virginia 20191, [www.asce.org](http://www.asce.org).

<sup>3</sup> ASME International, 2 Park Avenue, New York, New York 10016-5990, [www.asme.org](http://www.asme.org).

ASTM A36/A36M-14<sup>4</sup>, *Standard Specification for Carbon Structural Steel*

ASTM A53/A53M-18, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless*

ASTM A105/A105M-18, *Standard Specification for Carbon Steel Forgings for Piping Applications*

ASTM A106/A106M-18, *Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service*

ASTM A123/A123M-17, *Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products*

ASTM A153/A153M, *Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*

ASTM A181/A181M-14, *Standard Specification for Carbon Steel Forgings, for General-Purpose Piping*

ASTM A216/A216M, *Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service*

ASTM A307-14, *Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength*

ASTM A350/A350M-18, *Standard Specification for Carbon and Low-Alloy Steel Forgings, Requiring Notch Toughness Testing for Piping Components*

ASTM A572/A572M-18, *Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel*

ASTM A992/A992M, *Standard Specification for Structural Steel Shapes*

ASTM A1011/A1011M-18, *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 B695-04, *Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel*

SAE J429-2014<sup>5</sup>, *Mechanical and Material Requirements for Externally Threaded Fasteners*

### **3 Terms and Definitions**

#### **3.1**

##### **stave**

A stave is a plate or sheet component of the tank shell.

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<sup>4</sup> ASTM International, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428, [www.astm.org](http://www.astm.org).

<sup>5</sup> SAE International, 400 Commonwealth Drive, Warrendale, Pennsylvania 15096, [www.sae.org](http://www.sae.org).

## **4 Material**

### **4.1 Finish**

Materials other than bolts and nuts shall be mill finish unless the purchaser specifies paint, galvanizing, or other coating. Galvanizing of plates, sheets, and structural shapes shall be done after fabrication and comply with ASTM A123.

### **4.2 Plates**

Plates shall comply with ASTM A36 or A572. Manufacturers shall order plates by nominal thickness.

### **4.3 Sheets**

Sheets shall comply with ASTM A1011 Grade 36. Sheets with yield strength greater than 36 ksi shall be used if the purchaser and the manufacturer agree. Manufacturers shall order sheets by weight or thickness.

### **4.4 Structural Shapes**

Structural shapes shall comply with ASTM A36, A572, or A992.

### **4.5 Piping**

Pipe shall comply with API 5L Grade A or B, ASTM A53, or ASTM A106.

### **4.6 Flanges**

Cast steel flanges (for non-welded use only) shall comply with ASTM A216. Forged steel flanges shall comply with ASTM A181, A105, or A350.

### **4.7 Couplings**

Couplings shall comply with API 5L Grade B or ASME B16.11. Couplings for threaded connections may be supplied with or without recess.

## **4.8 Bolts and Nuts Used in the Tank Bottom, Shell, and Roof**

### **4.8.1 Bolts**

Bolts shall be square head or hex head and comply with ASME B18.2.1, or, if the purchaser specifies, round head. Bolts shall be  $\frac{1}{2}$  in. diameter and no longer than  $1\frac{1}{2}$  in.

Round-head bolts shall have a ribbed neck or fin neck to prevent turning upon tightening. The head height shall be 0.25 in. to 0.27 in., with a diameter of 1 in. to 1.06 in. Ribbed-neck bolts shall have at least 16 ribs with a length of 0.186 in. to 0.206 in. and an outside diameter of 0.540 in. to 0.550 in. Fin-neck bolts shall have four radial fins equally spaced under the head. The longitudinal length of the fins shall be 0.156 in. to 0.187 in., and their outside diameter 0.675 in. to 0.695 in.

If the purchaser specifies, the head of the bolt shall be encapsulated with polyvinylidene fluoride (PVDF), ABS, or polyester, and a sealing ring shall be molded under the head of the bolt.