



# Standard Specification for Steel Tubes, Low-Carbon or High-Strength Low-Alloy, Tapered for Structural Use<sup>1</sup>

This standard is issued under the fixed designation A 595; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

## 1. Scope\*

1.1 This specification covers three grades of seam-welded, round, tapered steel tubes for structural use. Grades A and B are of low-carbon steel or high-strength low-alloy steel composition and Grade C is of weather-resistant steel composition.

1.2 This tubing is produced in welded sizes in a range of diameters from 2 $\frac{3}{8}$  to 30 in. (63.5 to 762.0 mm) inclusive. Wall thicknesses range from 0.1046 to 0.375 in. (2.66 to 9.53 mm). Tapers are subject to agreement with the manufacturer.

1.3 The values stated in inch-pound units are to be regarded as the standard.

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products

A 588/A 588M Specification for High-Strength Low-Alloy Structural Steel with 50 ksi [345 MPa] Minimum Yield Point to 4-in. [100-mm] Thick

A 606 Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance

A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products

G 101 Guide for Estimating the Atmospheric Corrosion Resistance of Low-Alloy Steels

## 3. Ordering Information

3.1 The inquiry and order should indicate the following:

3.1.1 Large and small diameters (in.), length (ft), wall thickness (in.), and taper (in./ft);

3.1.2 (see Table 1 and Table 2);

3.1.3 Extra test material requirements, if any; and

3.1.4 Supplementary requirements, if any.

## 4. General Requirements for Delivery

4.1 Required date of shipment or date of receipt, and

4.2 Special shipping instructions, if any.

## 5. Manufacture

5.1 Tube steel shall be hot-rolled aluminum-semikilled or fine-grained killed sheet or plate manufactured by one or more of the following processes: open-hearth, basic-oxygen, or electric-furnace.

5.2 Tubes shall be made from trapezoidal sheet or plate that is preformed and then seam welded. Tubes shall be brought to final size and properties by roll compressing cold on a hardened mandrel.

## 6. Chemical Composition

6.1 Steel shall conform to the requirements for chemical composition as prescribed in Table 1 and chemical analysis shall be in accordance with Test Methods, Practices, and Terminology A 751.

6.2 For Grade C material, the atmospheric corrosion-resistance index, calculated on the basis of the chemical composition of the steel, as described in Guide G 101, shall be 6.0 or higher.

NOTE 1—The user is cautioned that the Guide G 101 predictive equation for calculation of an atmospheric corrosion-resistance index has been verified only for the composition limits stated in that guide.

6.3 When required by the purchase order, the manufacturer shall supply guidance concerning corrosion resistance that is satisfactory to the purchaser.

## 7. Mechanical Properties

### 7.1 Tension Test:

7.1.1 *Requirements*—The material as represented by the test specimens shall conform to the requirements as to tensile properties as prescribed in Table 2.

### 7.1.2 Number of Tests:

7.1.2.1 For coil—One or more tension tests as defined in Table 2 shall be made from the large end of one tube produced from each coil when the trapezoidal sheets are made from coil.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel, and Related Alloys, and is the direct responsibility of Subcommittee A01.09 on Carbon Steel Tubular Products.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

**TABLE 1 Chemical Requirements**

Element	Composition, %											
	Grade A				Grade B				Grade C <sup>A</sup>			
	Heat		Product		Heat		Product		Heat		Product	
Carbon	min	max	min	max	min	max	min	max	min	max	min	max
Manganese	0.15	0.25	0.12	0.29	0.15	0.25	0.12	0.29	—	0.12	—	0.15
Phosphorus	0.30	0.90	0.26	0.94	0.40	1.35	0.35	1.40	0.20	0.50	0.17	0.53
Sulfur	—	0.035	—	0.045	—	0.035	—	0.045	.07	0.15	0.06	0.16
Silicon	—	0.035	—	0.045	—	0.035	—	0.045	—	0.025	—	0.035
Copper	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	0.25	0.75	0.19	0.81
Chromium	—	—	—	—	—	—	—	—	0.25	0.55	0.22	0.58
Nickel	—	—	—	—	—	—	—	—	0.30	1.25	0.24	1.31
	—	—	—	—	—	—	—	—	—	0.65	—	0.68

<sup>A</sup> Alternately, chemical requirements shall comply with either Table number 1 of Specification A 588/A 588M or Table number 1 of Specification A 606 including the requirements for Type 4 under Scope.

<sup>B</sup> Silicon or silicon in combination with aluminum must be sufficient to ensure uniform mechanical properties. Silicon shall not be greater than 0.04 % in order that high-quality galvanizing can be ensured.

**TABLE 2 Tensile Requirements**

	Grade A	Grade B	Grade C
Yield point, min, ksi (MPa)	55 (380)	60 (410)	60 (410)
Ultimate tensile strength, min, ksi (MPa)	65 (450)	70 (480)	70 (480)
Elongation in 2 in. (50.8 mm), min %	23.0	21.0	21.0

7.1.2.2 For plate—One or more tension tests as defined in Table 2 shall be made from the large end of one tube on a lot produced from a single heat of plate product of uniform thickness.

7.1.3 *Test Locations and Orientations*—Samples shall be taken at least 1 in. (25 mm) from the longitudinal seam weld.

#### 7.1.4 Test Method:

7.1.4.1 Tension tests shall be made in accordance with Test Methods and Definitions A 370. The yield strength corresponding to a permanent offset of 0.2 % of the gage length of the specimen or to a total extension of 0.5% of the gage length under load shall be determined in accordance with Test Methods and Definitions A 370.

7.1.4.2 The ultimate tensile strength shall be determined in accordance with the Tensile Strength of Test Methods and Definitions A 370.

7.1.5 Each test shall be identified as to the heat number of the basic material.

## 8. Dimensions and Tolerances

8.1 *Length*—The length shall be the specified length with a tolerance of + $\frac{3}{4}$  in. (19.0 mm) or  $-\frac{1}{4}$  in. (6.4 mm).

8.2 *Diameter*—The outside diameter shall conform to the specified dimensions with a tolerance of  $\pm\frac{1}{16}$  in. (1.6 mm) as measured by girthing.

8.3 *Wall Thickness*—The tolerance for wall thickness exclusive of the weld area shall be +10 % or  $-5$  % of the nominal wall thickness specified.

8.4 *Straightness*—The permissible variation for straightness of the tapered tube shall be  $\frac{1}{8}$  in. multiplied by the number of feet of total length divided by 5 (1:480).

## 9. Rework and Retreatment

9.1 In case any test fails to meet the requirements of Section 7, the manufacturer may elect to retreat, rework, or otherwise

eliminate the condition responsible for failure to meet the specified requirements. Thereafter the material remaining from the respective class originally represented may be tested and shall comply with all requirements of this specification.

9.2 Imperfections in the outer surface, such as cracks, scabs, or excessive weld projections, shall be classed as injurious defects when their depth or projection exceeds 15 % of the wall thickness or when the imperfections materially affect the appearance of the tube.

9.2.1 Injurious defects having a depth not in excess of  $3\frac{1}{3}$  % of the wall thickness, as stated in Table 3, may be repaired by welding subject to the following conditions: (1) scabs shall be completely removed by chipping or grinding to sound metal, and (2) the repair weld shall be made using suitable electrodes.

9.2.2 Excessive projected weld metal shall be removed to produce a commercial finish.

## 10. Inspection

10.1 Inspection of material shall be made as agreed upon between the purchaser and the seller as part of the purchase contract.

## 11. Rejection and Rehearing

11.1 Each length of tubing received from the manufacturer may be inspected by the purchaser, and if it does not meet the requirements of this specification based on the inspection and test method as outlined in the specification, the length may be rejected and the manufacturer shall be notified. Disposition of rejected tubing shall be a matter of agreement between the manufacturer and the purchaser.

**TABLE 3 Thickness Class**

Class	Thickness	
	in.	mm
1	0.1046 through 0.140	2.66 through 3.56
2	0.141 through 0.190	3.58 through 4.83
3	0.191 through 0.280	4.85 through 7.11
4	0.281 through 0.375	7.14 through 9.53



11.2 Tubing found in fabrication or in installation to be unsuitable for the intended use, under the scope and requirements of this specification, may be set aside and the manufacturer notified. Such tubing shall be subject to mutual investigation as to the nature and severity of the deficiency and the forming or installation, or both, conditions involved. Disposition shall be a matter for agreement.

## 12. Certification and Reports

12.1 Upon request of the purchaser in the contract or order, a manufacturer's certification that the material was manufactured and tested in accordance with this specification together with a report of the chemical and tension tests shall be furnished.

## 13. Product Marking

13.1 Each tapered tube shall be legibly marked by rolling, die stamping, ink printing, or paint stenciling to show the following information: thickness, taper, large diameter, small diameter, length, and the specification number, Grade A, B, or C.

13.2 *Bar Coding*—In addition to the requirements in 13.1, bar coding is acceptable as a supplemental identification method. The purchaser may specify in the order a specific bar coding system to be used.

## 14. Keywords

14.1 carbon steel tube; steel tube

## SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this specification since the last issue, A 595 – 98 (2002), that may impact the use of this specification. (Approved January 1, 2004)

(1) The title of the standard was revised.

(2) 1.1 was revised.

(3) 7.1.2 was revised.

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