



Designation: A 595 – 04a

## 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 ( $\epsilon$ ) 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:

<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.

Current edition approved Sept. 1, 2004. Published September 2004. Originally approved in 1969. Last previous edition approved in 2004 as A 595 – 04.

<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.

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 given in **Tables 1 and 3**. 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 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:*

\*A Summary of Changes section appears at the end of this standard.

**TABLE 1 Chemical Requirements**

Elements	Composition by Heat Analysis, %												
	Grade A				Grade B				Grade C				
	Carbon Steel	HSLA SS	HSLAS CI1	HSLAS CI2	Carbon Steel	HSLA SS	HSLAS CI1	HSLAS CI2	A 606	A 588/A	A 588/B	A 588/C	A 588/K
Carbon	0.015–0.25	0.25 max	0.23 max	0.15 max	0.015–0.25	0.25 max	0.26 max	0.15 max	0.22 max	0.19 max	0.20 max	0.15 max	0.17 max
Manganese	0.30–0.90	1.35 max	1.35 max	1.35 max	0.40–1.35	1.35 max	1.50 max	1.50 max	1.25 max <sup>A</sup>	0.80–1.25	0.75–1.35	0.80–1.35	0.50–1.20
Phosphorous	0.035 max	0.035 max	0.04 max	0.04 max	0.035 max	0.035 max	0.04 max	0.04 max	<sup>A</sup>	0.04 max	0.04 max	0.04 max	0.04 max
Sulfur	0.035 max	0.04 max	0.04 max	0.04 max	0.035 max	0.04 max	0.04 max	0.04 max	0.04 max	0.05 max	0.05 max	0.05 max	0.05 max
Silicon	0.040 max <sup>B</sup>	0.040 max <sup>B</sup>	0.040 max <sup>B</sup>	0.040 max <sup>B</sup>	0.040 max <sup>B</sup>	0.040 max <sup>B</sup>	0.040 max <sup>B</sup>	0.040 max <sup>B</sup>	<sup>A</sup>	0.30–0.65	0.15–0.50	0.15–0.40	0.25–0.50
Copper <sup>C,D</sup>	...	0.20 max	0.20 max	0.20 max	...	0.20 max	0.20 max	0.20 max	<sup>A</sup>	0.25–0.40	0.20–0.40	0.20–0.50	0.30–0.50
Chromium <sup>C,E</sup>	...	0.15 max	0.15 max	0.15 max	...	0.15 max	0.15 max	0.15 max	<sup>A</sup>	0.40–0.65	0.40–0.70	0.30–0.50	0.40–0.70
Nickel <sup>C</sup>	...	0.20 max	0.20 max	0.20 max	...	0.20 max	0.20 max	0.20 max	<sup>A</sup>	0.40 max	0.50 max	0.25–0.50	0.40 max
Molybdenum <sup>C,E</sup>	...	0.06 max	0.06 max	0.06 max	...	0.06 max	0.06 max	0.06 max	...	<sup>A</sup>	<sup>A</sup>	<sup>A</sup>	0.10 max
Vanadium <sup>F</sup>	...	0.008 max	0.01 min	0.01 min	...	0.008 max	0.01 min	0.01 min	...	0.02–0.10	0.01–0.10	0.01–0.10	<sup>A</sup>
Columbium <sup>F</sup>	...	0.008 max	0.005 min	0.005 min	...	0.008 max	0.005 min	0.005 min	...	<sup>A</sup>	<sup>A</sup>	<sup>A</sup>	0.005–0.05
Nitrogen	...	<sup>A</sup>	<sup>A</sup>	<sup>A</sup>	...	<sup>A</sup>	<sup>A</sup>	<sup>A</sup>	...	...	...	...	...
Aluminum <sup>B</sup>	<sup>A</sup>	<sup>A</sup>	<sup>A</sup>	<sup>A</sup>	<sup>A</sup>	<sup>A</sup>	<sup>A</sup>	<sup>A</sup>	...	...	...	...	...

<sup>A</sup>There is no limit; however, the analysis shall be reported.

<sup>B</sup>Silicon or silicon in combination with aluminum must be sufficient to ensure uniform mechanical properties. Their sum shall be greater than or equal to 0.020 %.

<sup>C</sup>For HSLA steels the sum of copper, nickel, chromium, and molybdenum shall not exceed 0.50 % on heat analysis. When one of these elements are specified by the purchaser, the sum does not apply, in which case only the individual limits of the remaining elements shall apply.

<sup>D</sup>For HSLA steels when copper is specified, the copper limit is a minimum requirement. When copper steel is not specified, the copper limit is a maximum requirement.

<sup>E</sup>For SS steel the sum of chromium and molybdenum shall not exceed 0.16 % on heat analysis. When one or more of these elements are specified by the purchaser, the sum does not apply, in which case the individual limit on the remaining unspecified element shall apply.

<sup>F</sup>For HSLA steels vanadium and columbium minimums may be satisfied separately or by combining their values, in which event the sum shall exceed the combined minimums.