



Standard Specification for Steel, Structural Tubing, Cold Formed, Welded, Carbon, Zinc-Coated (Galvanized) by the Hot-Dip Process¹

This standard is issued under the fixed designation A1057/A1057M; 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 cold-formed electric resistance or electric induction welded carbon structural steel tubing in round, square, rectangular, or special shapes that are zinc-coated (galvanized) on the exterior surface only, in continuous coating lines by the hot-dip process. The tubing can be manufactured from hot-rolled or cold-rolled steel. This product is intended for applications where corrosion resistance and mechanical properties are required. This product is available in several zinc coating weights [masses], strengths, and chemical compositions.

1.2 *Units*—The values stated in either SI units or inch-pound units shall be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system is to be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

2. Referenced Documents

2.1 ASTM Standards:²

- A90/A90M Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
- A902 Terminology Relating to Metallic Coated Steel Products
- A370 Test Methods and Definitions for Mechanical Testing of Steel Products
- A500/A500M Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
- A924/A924M Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
- E29 Practice for Using Significant Digits in Test Data to

¹ This specification is under the jurisdiction of ASTM Committee A05 on Metallic-Coated Iron and Steel Products and is the direct responsibility of Subcommittee A05.11 on Sheet Specifications.

Current edition approved May 1, 2014. Published May 2014. Originally approved in 2008. Last previous edition approved in 2008 as A1057/A1057M–08. DOI: 10.1520/A1057_A1057M-08R14.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

Determine Conformance with Specifications

3. Terminology

3.1 *Definitions*—See Terminology A902 for definitions of general terminology relating to metallic-coated tube steel products.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *acrylic*—polymer based on resins prepared from a combination of acrylic and methacrylic esters, acrylic and methacrylic acids, and styrene.

3.2.1.1 *Discussion*—The polymers contain functional groups such as amide, hydroxyl, or carboxyl and form thermo-setting systems on baking by cross linking with them, or with amino or epoxy resins.

3.2.2 *de-dimpled*—The condition of the end of tubing after removal of the protrusion or deformation created by the punch cut operation.

3.2.2.1 *Discussion*—The dimple is a protrusion that is displaced from the inside diameter and is unrelated to a shear burr.

3.2.3 *structural tubing*—tubing tension tested with reported test results.

4. Dimensions

4.1 The product is available in the following sizes:

Product	Wall Thickness, max	Exterior Dimension, max
Round Tubing	0.250 in. [6.5 mm]	diameter 5.0 in. [125 mm]
Square, Rectangular, or Special Shapes	0.250 in. [6.5 mm]	periphery 16.0 in. [405 mm]

5. Classification

5.1 The tube material is available in the following designations:

5.1.1 Structural tubing steel STS 38, 48, 58, and 68.

5.1.2 The material is available as zinc-coated in several coating weights [masses] as shown in Table 1.

6. Ordering Information

6.1 Welded tubing with the coating on the exterior surface is only produced to thickness requirements expressed to 0.001 in. [0.01 mm].

TABLE 1 Weight [Mass] of Coating

Coating Designation	Minimum Requirement	
	Inch-Pound Units	oz/sq ft
ZT 20		0.20
ZT 30		0.30
ZT 50		0.50
ZT 60		0.60
	SI Units	gm/sq m
ZMT 60		60
ZMT 90		90
ZMT 150		150
ZMT 180		180

6.2 Orders for product to this specification shall include the following information, as necessary, to adequately describe the desired product.

6.2.1 Designation of product (STS)

6.2.2 Coating designation (see [Table 1](#))

6.2.3 Chemical requirements (see [Table 2](#))

6.2.4 Mechanical requirements (see [Table 3](#))

6.2.5 Chemical treated or not chemical treated

6.2.5.1 When chemical treatment is not specified, the product will be furnished as chemical treated,

6.2.6 Top coated or not top treated (applied over chemical treatment)

6.2.6.1 When “top coated” is not specified, the product will be supplied with an acrylic coating,

6.2.7 Oiled or not oiled

6.2.7.1 When oiled is not specified, the product will be provided as chemical treated.

6.2.8 End condition

6.2.8.1 When the removal of burrs is not specified, the product will be furnished with burrs,

6.2.9 Mill cut or de-dimpled end condition

6.2.9.1 When the end finish is not specified, mill cut will be furnished,

6.2.10 Dimensions (show outside diameter and wall thickness for round tubing), (outside dimensions and wall thickness for square, rectangle, or special shapes), and length

6.2.11 Quantity (length or weight)

6.2.12 Certification (if required)

6.2.13 End application

6.2.14 Copper steel, when required

NOTE 1—Typical ordering descriptions are as follows: Structural tubing, zinc-coated, designation STS Grade 38, ASTM A1057, Coating designation ZT 20, chemically treated, acrylic top coated, mill cut, 1.0 in. diameter by 0.065 wall thickness, 22 foot tubing length, order total length 1000 feet, for snow blower handles; Structural tubing, zinc-coated, STS Grade 335, ASTM A1057M, Coating designation ZMT 150, chemically treated, acrylic coated, de-dimpled ends, mill cut, 6.7 mm outside dimension by 16.5 mm wall thickness, 305 mm tubing length, order total

length 25,000 mm, for garage torque bar.

7. Zinc Coating Requirements

7.1 Zinc Coating Weight [Mass]

7.1.1 The coating weight [mass] shall conform to requirements shown in [Table 1](#) for the specified coating designation. The thickness of the tube includes both the base metal and the coating. See Specification [A924/A924M](#) for thickness tolerances of hot dip coated product.

7.1.2 The coating weight [mass] per unit area on the outside surface of the tubing shall be determined in accordance with Test Method [A90/A90M](#) using a test specimen whose length is 4 in. [100 mm] minimum. Two tests shall be taken from one length of tubing selected from each lot of 500 pieces or fraction thereof. Both tests shall conform to the requirements. If the results of any test specimen does not conform to the requirements of the specification, two additional tests from the same lot shall be made, each of which shall conform to the specified requirements.

7.2 Coating Adhesion

7.2.1 Specimens subjected to the flattening test of Specification [A500/A500M](#) shall exhibit no delamination (flaking or peeling) of the zinc coating.

7.3 Zinc Bath Analysis

7.3.1 The coating bath metal shall not contain less than 99 % zinc. In addition, the bath shall not contain more than 0.005 % lead.

7.3.2 To promote the adhesion of the coating, the composition of the coating bath is adjusted with additions of aluminum in the range of 0.05 to 0.25 %. Such aluminum is intentionally added directly to the molten bath or through the use of a master alloy containing aluminum.

8. Chemical Composition

8.1 Base Metal

8.1.1 The base metal shall be manufactured using the open hearth, basic oxygen, or electric furnace process.

8.1.2 The heat analysis shall conform to the requirements of [Table 2](#) for STS Grades 38, 48, 58, and 68.

8.1.3 When specified on the order, a report of the heat analysis shall be reported to the purchaser or his representative.

8.1.4 See Specification [A924/A924M](#) for chemical analysis procedures and product analysis tolerances.

9. Mechanical Properties

9.1 The zinc coated mechanical tubing shall conform to the mechanical property requirements of [Table 3](#).

TABLE 2 Chemical Requirements Composition, % Heat Analysis element, max^{A,B}

Designation	C	Mn	P	S	Al	Si	Cu	Ni	Cr	Mo	V	Cb	Ti
STS													
Grade 38[265]	0.18	1.35	0.035	0.035	...	...	0.20	0.20	0.15	0.06	0.008	0.008	0.025
Grade 48[335]	0.18	1.35	0.035	0.035	...	...	0.20	0.20	0.15	0.06	0.008	0.008	0.025
Grade 58[405]	0.25	1.35	0.035	0.035	...	...	0.20	0.20	0.15	0.06	0.008	0.008	0.025
Grade 68 [475]	0.25	1.35	0.035	0.035	...	...	0.20	0.20	0.15	0.06	0.008	0.008	0.025

^AWhen an ellipsis (...) appears in this table, there is no requirement, but the analysis shall be reported. B

^BWhen copper steel is specified, the limit for copper is 0.20 % minimum.

TABLE 3 Mechanical Requirements

Designation STS	Yield Strength	Tensile Strength	
	min, ksi [MPa]	Elongation in 2 in. [50mm] min, ksi [MPa]	min, %
Grade 38	38 [265]	45 [310]	23 ^A
Grade 48	48 [330]	55 [380]	20 ^A
Grade 58	58 [400]	65 [450]	18 ^B
Grade 68	68 [465]	75 [518]	15 ^B

^AApplies to specified wall thicknesses (t) of 0.120 in. [3.0mm] and over. For wall thicknesses under .120 in. [3.0mm], the minimum elongation shall be calculated using this formula: Elongation, in. = 56t + 17.5 Elongation, mm = 2.32t + 1.75 The value for elongation shall be rounded to the nearest percent in accordance with Practice E29.

^BApplies to specified wall thicknesses of 0.120 in. [3.0mm] and over. For wall thicknesses under 0.120 in., [3.0mm], the minimum elongation shall be subject to agreement between the manufacturer and the purchaser.

9.2 Tests for mechanical properties shall be conducted in accordance with the methods in Specification A924/A924M except that the requirements of Test Methods A370 for the preparation of tubing-test specimens shall apply.

10. Weld Test

10.1 The integrity of the weld shall be determined in conjunction with the flattening test described in Specification A500/A500M.

11. Other Requirements

11.1 The product manufactured in accordance with this specification shall also conform to the following requirements which are found in Specification A500/A500M:

(1) Flattening Test

(2) Permissible Variations in Dimensions

(3) Special Shape Structural Tubing

(4) Number of Tests

(5) Retests

(6) Test Methods

(7) Inspection

(8) Rejection

(9) Certification

(10) Product Marking

(11) Packing, Marking, and Loading

(12) Government Procurement

12. Keywords

12.1 cold formed tubing; one-side zinc-coated; structural tubing; tubing; zinc coated

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org). Permission rights to photocopy the standard may also be secured from the ASTM website (www.astm.org/COPYRIGHT/).