Designation: A1127/A1127M – 23

Standard Specification for Stainless Steel Laser and Laser-Hybrid Welded, Sharp-Cornered Profile (SCP) or Built-Up Rounded Corner Square, Rectangular, and Special Shape Structural Tube[1]

This standard is issued under the fixed designation A1127/A1127M; 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 laser or laser-hybrid welded stainless steel square, rectangular, or custom shape structural tubing for welded, riveted, or bolted construction. This tube has either a sharp-cornered profile (SCP) or is built-up tube with rounded corners. This product is used in, but not limited to, the following applications: buildings and structures, including architecturally exposed steel structures (AESS); architectural steel profiles such as curtain wall, staircases, and others; industrial; and general structural applications.

NOTE 1—The term laser fusion is also used to describe laser welding.

1.2 This tubing is manufactured from multiple pieces of plate, bar, sheet, strip, or shapes, potentially in different thicknesses by laser or laser-hybrid welding in accordance with the requirements of Specification A1069/A1069M. It is available in sizes up to 36 in. (914 mm) outside dimension, and the wall thickness tolerance is ±5 % of the specified wall thickness. Corner welds are permissible.

1.3 This specification establishes the minimum requirements for manufacturing of laser and laser hybrid welded stainless steel tube and requires the welds to, at a minimum, match the tensile and yield strength of the base metal. If base metals of different strengths are used, the lower strength base metal shall be matched.

1.4 This specification refers to Specifications A240/A240M, A276/A276M or A479/A479M for chemical requirements, but the mechanical test requirements are determined by the mechanical properties section of this standard. This standard includes four strength grades. The default strength grade 1 is determined by the base metal standard. Grades 2 through 4 are for specification of higher strength levels.

1.5 Supplementary requirements (S1 Charpy V- notch, S2 Corrosion, S3 Tensile, and S4 Bend) of an optional nature are provided. They shall apply only when specified by the purchaser.

NOTE 2—Because of the varying requirements of the end-use applications, different length tolerance, weld inspection levels, strength levels and other requirements may be specified.

NOTE 3—Product covered by this specification is manufactured in small lots on dedicated production lines. Product quality requirements are ensured through welding procedure and operator qualification at each manufacturing facility in accordance with Specification A1069/A1069M. The country of origin and base metal heat numbers are identified by wall thickness on the product test report.

1.6 The text of this specification contains notes and footnotes that provide explanatory material. Such notes and footnotes, excluding those in tables and figures, do not contain any mandatory requirements.

1.7 *Units*—This specification is expressed in both inch-pound units and in SI units; however, unless the purchase order or contract specifies the applicable M specification designation (SI units), the inch-pound units shall apply. The values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

1.8 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.9 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

[1] This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.10 on Stainless and Alloy Steel Tubular Products.

Current edition approved Nov. 1, 2023. Published December 2023. DOI: 10.1520/A1127_A1127M-23.

[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.

A240/A240M Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
A262 Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels
A276/A276M Specification for Stainless Steel Bars and Shapes
A370 Test Methods and Definitions for Mechanical Testing of Steel Products
A380/A380M Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems
A479/A479M Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels
A480/A480M Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
A484/A484M Specification for General Requirements for Stainless Steel Bars, Billets, Shapes, and Forgings
A673/A673M Specification for Sampling Procedure for Impact Testing of Structural Steel
A700 Guide for Packaging, Marking, and Loading Methods for Steel Products for Shipment
A751 Test Methods and Practices for Chemical Analysis of Steel Products
A923 Test Methods for Detecting Detrimental Intermetallic Phase in Duplex Austenitic/Ferritic Stainless Steels
A941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys
A1069/A1069M Specification for Stainless Steel Laser and Laser Hybrid Welded Bars, Plates, Sharp-Cornered Profile (SCP), and Built-up Shapes
A1084 Test Method for Detecting Detrimental Phases in Lean Duplex Austenitic/Ferritic Stainless Steels
E164 Practice for Contact Ultrasonic Testing of Weldments
E190 Test Method for Guided Bend Test for Ductility of Welds
E290 Test Methods for Bend Testing of Material for Ductility
E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

2.2 *AWS Standards:*[3]
AWS A3.0M/A3.0 Standard Welding Terms and Definition, Including Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying
AWS D1.6/D1.6M Structural Welding Code – Stainless Steel

2.3 *EN Standard:*[4]
EN 10204 Metallic Products: Types of Inspection Documents

2.4 *Federal Standard:*[5]
Fed. Std. No. 123 Marking for Shipments (Civil Agencies)

2.5 *ISO Standards:*[6]
ISO 11666 Non-destructive testing of welds—Ultrasonic testing—Acceptance levels
ISO 13919-1 Welding and Laser-beam Welded Joints-guidance on Quality Levels for Imperfections—Part 1: Steel
ISO 17640 Non-destructive testing of welds—Ultrasonic testing—Techniques, testing levels, and assessment

2.6 *SAE Standard:*[7]
SAE J 1086 Numbering Metals and Alloys

2.7 *ANSI/AISC Standard:*[8]
ANSI/AISC 370 Specification for Structural Stainless Steel Buildings

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of general terms pertaining to this specification, refer to Terminology A941.

3.1.2 Definitions of terms pertaining to welding terminology shall be those of AWS A3.0M /A3.0.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *sharp cornered profile (SCP), n*—structural component manufactured by laser or laser hybrid welding together plates at the corners, so that the sharp edge of the cut plate is retained.

4. Ordering Information

4.1 It shall be the responsibility of the purchaser to specify all requirements that are necessary for material ordered to this specification. Such requirements shall include but are not limited to the following:

4.1.1 Name of structural product [laser or laser-hybrid welded stainless steel sharp cornered profile (SCP) or built-up shape tube].

4.1.2 Shape designation and applicable dimensions, such as size, wall thickness, width, and sharp or rounded corners.

4.1.3 Length(s) in feet (meters) and length tolerance level (L1, L2, L3 or L4, default is L1).

4.1.4 Alloy UNS designation.

NOTE 4—Stainless steel alloys are identified in the ASTM standards by Unified Numbering System (UNS) number in accordance with Practice E527 and SAE J1086.

4.1.5 Quantity (weight or number of pieces).

4.1.6 ASTM specification designation and edition year, if other than the latest edition.

4.1.7 Welding procedure and operator qualification requirements (AWS, ASME, or ISO; if not specified, the choice is at the manufacturer's discretion).

NOTE 5—Product quality requirements are ensured through laser and

[3] Available from American Welding Society (AWS), 8669 NW 36 St., #130, Miami, FL 33166-6672, http://www.aws.org.
[4] Available from European Committee for Standardization (CEN), Rue de la Science 23, B-1000, Brussels, Belgium, http://www.cen.eu.
[5] Available from U.S. Government Publishing Office (GPO), 732 N. Capitol St., NW, Washington, DC 20401, http://www.gpo.gov.
[6] Available from International Organization for Standardization (ISO), ISO Central Secretariat, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, https://www.iso.org.
[7] Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096, http://www.sae.org.
[8] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.