Designation: A1120/A1120M – 21

Standard Specification for Electric-Resistance-Welded Carbon Steel Boiler, Superheater, Heat-Exchanger, and Condenser Tubes with Textured Surface[1]

This standard is issued under the fixed designation A1120/A1120M; 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 average or minimum wall thickness electric resistance welded (ERW) tubing to be used for boilers, heat exchangers, condensers, and similar heat-transfer apparatus.

1.2 The tubing sizes and thicknesses usually furnished to the specification are 0.375 in. [9.5 mm] inside diameter (ID) to 1.5 in. [38 mm] outside diameter (OD) and 0.020 to 0.079 in. [0.5 to 2 mm], inclusive, in wall thickness. Tubing having other dimensions may be furnished provided such tubes comply with all other requirements of this specification.

1.3 The steel materials shall have the *(1)* external tube surface, *(2)* internal tube surface, or *(3)* both internal and external tube surfaces textured to improve heat transfer or fluid flow or both. Textured surface(s) are produced by cold forming a specified configuration on the surface(s) of base strip material before welding.

1.4 Optional supplementary requirements are provided and, when desired, shall be so stated on the purchase order.

1.5 *Units*—The values stated in either SI units or inch-pound 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. The inch-pound units shall apply unless the "M" designation (SI) of the product specification is specified in the order.

1.6 *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.*

1.7 *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]

A450/A450M Specification for General Requirements for Carbon and Low Alloy Steel Tubes

A941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys

E140 Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness

E213 Practice for Ultrasonic Testing of Metal Pipe and Tubing

E273 Practice for Ultrasonic Testing of the Weld Zone of Welded Pipe and Tubing

E384 Test Method for Microindentation Hardness of Materials

2.2 *ASME Standard:*[3]

Section VIII Para UW-51

3. Terminology

3.1 *Definitions*—For definitions of general terms used in this specification, refer to Terminology A941.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *plain cylindrical ring gauges, n*—cylindrical metal ring whose inside diameter is furnished to gauge tolerance.

[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 A01.09 on Carbon Steel Tubular Products.

Current edition approved Nov. 1, 2021. Published December 2021. DOI: 10.1520/A1120_A1120M-21.

[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.

[3] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, http://www.asme.org.

3.2.2 *plain ending, n*—portion of the tube that has no surface texture.

3.2.3 *primary character, n*—largest texture impressed on material.

3.2.4 *primary pattern, n*—combination of primary characters.

3.2.5 *secondary character, n*—fine-cut texture impressed on material.

3.2.6 *secondary pattern, n*—combination of secondary characters.

3.2.7 *textured surface, n*—impressing a series of characters or textures into the material with the intent of improving heat transfer and fluid flow characteristics in the final welded tube.

3.3 *Symbols:*

3.3.1 *D*—Outside tube diameter-nominal.

3.3.2 *D1*—Inside tube diameter.

3.3.3 *ID1*—Top of primary character to bottom of secondary character; see Fig. 1 cross-section A-A for view of primary character and secondary character pattern.

3.3.4 *ID2*—Top of primary character to top of secondary character.

3.3.5 *ID3*—Top of secondary character to top of secondary character.

3.3.6 *ID4*—Top of primary character to bottom of primary character at intersection of the base (each on opposite sides of the tube).

3.3.7 *ID5*—Top of primary character to top of primary character (each on opposite sides of the tube).

3.3.8 *ID6*—Top of secondary character to bottom of secondary character.

3.3.9 P_a—Angle of the primary character unit (if any).

3.3.10 P_b—Angle of the secondary character unit (if any).

3.3.11 P_d—Primary character center spacing.

3.3.12 P_{hi}—Primary character height (inside).

3.3.13 P_{ho}—Primary character height (outside).

3.3.14 S_c—Secondary character center spacing.

3.3.15 S_d—Secondary character diameter.

3.3.16 S_{hi}—Secondary character height (inside).

3.3.17 S_{ho}—Secondary character height (outside).

3.3.18 *W*—Wall thickness (no pattern).

3.3.19 *W1*—Wall thickness peak inside to valley outside (secondary character).

3.3.20 *W2*—Wall thickness valley inside to peak outside (secondary character)

3.3.21 *W3*—Wall thickness base of primary character.

3.3.22 *W4*—Wall thickness in wall of the primary character.

4. Ordering Information

4.1 It is the responsibility of the purchaser to specify all requirements that are necessary for product ordered under this specification. Such requirements may include, but are not limited to:

4.1.1 Quantity (feet, metres, or number of lengths),

4.1.2 Name of material (electric-resistance-welded tubes),

4.1.3 Size (outside diameter and minimum or average wall thickness),

4.1.4 Length (specific or random),

4.1.5 Optional requirements (product analysis, hydrostatic or nondestructive electric test, crush test, and bar coding),

4.1.6 Test report required (see Certification section of Specification A450/A450M),

4.1.7 Specification designation, and

4.1.8 Special requirements and any supplementary requirements selected.

4.2 Additional requirements may include the various inside or outside diameters (Fig. 1), textured wall thickness values (see Fig. 2), and length of untextured sections if required; effective diameter and wall thickness of the modified section; number of secondary textured character units per unit length; number of primary textured character units per unit length; and the total tube length.

5. Materials and Manufacture

5.1 The steel shall be killed.

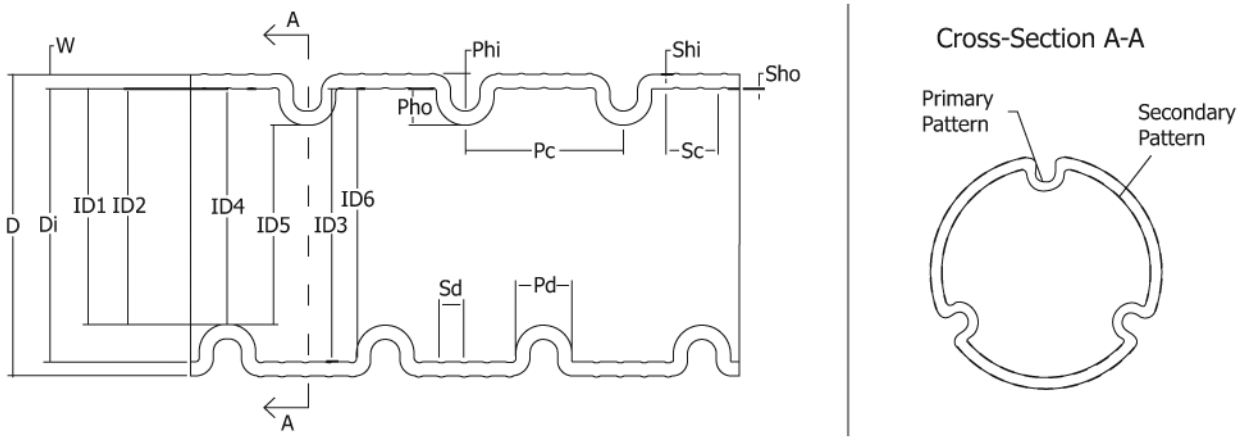

FIG. 1 Views of Representative Textured Tube Showing Variables that Describe Possible Primary and Secondary Texturizations that May be Applied to Inside Surface of Tube, Outside Surface of Tube, or Both Inside and Outside Surfaces of Tube