



Standard Specification for Seamless Cold-Drawn Low-Carbon Steel Heat-Exchanger and Condenser Tubes¹

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1. Scope

1.1 This specification² covers minimum-wall-thickness, seamless cold-drawn low-carbon steel tubes for tubular heat exchangers, condensers, and similar heat transfer apparatus.

1.2 This specification covers tubes $\frac{1}{8}$ to 3 in. [3.2 to 76.2 mm], inclusive, in outside diameter.

NOTE 1—Tubing smaller in outside diameter and having a thinner wall than indicated in this specification is available. Mechanical property requirements do not apply to tubing smaller than $\frac{1}{8}$ in. [3.2 mm] in outside diameter or with a wall thickness under 0.015 in. [0.4 mm].

1.3 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 are not exact equivalents; therefore, each system must be used independently of the other. Combining values from the two systems may result in nonconformance with the specification. The inch-pound units shall apply unless the “M” designation of this specification is specified in the order.

2. Referenced Documents

2.1 *ASTM Standards*:³

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

3. Ordering Information

3.1 Orders for material under this specification should include the following, as required, to describe the desired material adequately:

- 3.1.1 Quantity (feet, metres, or number of lengths),
- 3.1.2 Name of material (seamless tubes),
- 3.1.3 Manufacture (cold-drawn),

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² For ASME Boiler and Pressure Vessel Code applications see related Specification SA-179 in Section II of that Code.

³ 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.

- 3.1.4 Size (outside diameter and minimum wall thickness),
- 3.1.5 Length (specific or random),
- 3.1.6 Optional requirements (product analysis, Section 9, flange test, 11.3),
- 3.1.7 Test report required (Certification Section of Specification A450/A450M),
- 3.1.8 Specification number, and
- 3.1.9 Special requirements.

4. General Requirements

4.1 Material furnished under this specification shall conform to the applicable requirements of the current edition of Specification A450/A450M, unless otherwise provided herein.

5. Manufacture

5.1 Tubes shall be made by the seamless process and shall be cold drawn.

6. Heat Treatment

6.1 Tubes shall be heat treated after the final cold draw pass at a temperature of 1200°F [650°C] or higher.

7. Surface Condition

7.1 Finished tubes shall be free of scale. A slight amount of oxidation will not be considered as scale.

8. Chemical Composition

8.1 The steel shall conform to the following requirements as to chemical composition:

Carbon, %	0.06–0.18
Manganese, %	0.27–0.63
Phosphorus, max, %	0.035
Sulfur, max, %	0.035

8.2 Supplying an alloy grade that specifically requires the addition of any element other than those listed in 8.1 is not permitted.

9. Product Analysis

9.1 When requested on the purchase order, a product analysis shall be made by the supplier from 1 tube per 250 pieces or when tubes are identified by heat, one tube per heat shall be analyzed. The chemical composition thus determined shall conform to the requirements specified.

9.2 If the original test for product analysis fails, retests of two additional billets or tubes shall be made. Both retests, for the elements in question, shall meet the requirements of the specification; otherwise all remaining material in the heat or lot (Note 2) shall be rejected or, at the option of the producer, each billet or tube may be individually tested for acceptance. Billets or tubes which do not meet the requirements of the specification shall be rejected.

NOTE 2—A lot consists of 250 tubes.

10. Hardness Requirements

10.1 The tubes shall have a hardness number not exceeding 72 HRB.

11. Mechanical Tests Required

11.1 *Flattening Test*—One flattening test shall be made on specimens from each of two tubes from each lot (Note 2) or fraction thereof.

11.2 *Flaring Test*—One flaring test shall be made on specimens from each of two tubes from each lot (Note 2) or fraction thereof.

11.3 *Flange Test*—When specified as a substitute for the flaring test, for tubes having a wall thickness (actual mean wall) less than 10 % of the outside diameter, one test shall be made on specimens from each of two tubes from each lot (Note

2) or fraction thereof. For tubes other than specified above, the flange test shall not be required.

11.4 *Hardness Test*—Rockwell hardness tests shall be made on specimens from two tubes from each lot. The term *lot* applies to all tubes, prior to cutting, of the same nominal diameter and wall thickness which are produced from the same heat of steel. When final heat treatment is in a batch-type furnace, a lot shall include only those tubes of the same size and the same heat which are heat treated in the same furnace charge. When the final heat treatment is in a continuous furnace, a lot shall include all tubes of the same size and heat, heat treated in the same furnace at the same temperature, time at heat, and furnace speed.

11.5 *Hydrostatic Test*—Each tube shall be subjected to the hydrostatic test, or, instead of this test, a nondestructive electric test may be used when specified by the purchaser.

12. Product Marking

12.1 In addition to the marking prescribed in Specification A450/A450M, the marking shall include the name and order number of the purchaser.

13. Keywords

13.1 cold drawn tube; condenser tubes; heat exchanger tubes; low carbon steel; seamless tube

EXPLANATORY NOTES

NOTE 1—For purposes of design, the following tensile properties may be assumed:

Tensile strength, min, ksi [MPa]	47 [325]
Yield strength, min, ksi [MPa]	26 [180]
Elongation in 2 in. or 50 mm, min, %	35

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换热器及冷凝器用无缝冷拔低碳钢管子



SA-179/SA-179M



(与 ASTM 规范 A 179/A 179M—90a 完全等同)

1 适用范围

1.1 本标准适用于管式换热器、冷凝器及类似传热设备用最小壁厚的无缝冷拔低碳钢管子。

1.2 本标准适用于外径为 $\frac{1}{8}$ ~ 3in. (3.2 ~ 76.2mm) 的管子。

注 1: 可以用比本标准规定的外径稍小, 并壁厚较薄的管子。力学性能要求不适用于外径小于 $\frac{1}{8}$ in. (3.2mm) 或壁厚小于 0.015in. (0.4mm) 的管子。

1.3 无论经英寸—磅或 SI 单位表示的数值都应视为是标准值。在本标准中, SI 单位在括号内列出。由于两种单位制的数值不可能精确地相等, 故必须独立地分别采用两种单位制。如混用两种单位制, 将导致与本标准的不一致。除非在订单中规定使用本标准中的“M”标志(SI 单位), 否则, 一律用英寸—磅单位制。

2 引用标准

2.1 ASTM标准

A 450/A 450M 碳钢, 铁素体合金钢和奥氏体合金钢管子通用要求

3 一般要求

3.1 按本标准提供的材料, 除在这里另有规定外, 应符合现行版本 A 450/A 450M 标准的适用要求。

4 订货须知

4.1 符合本标准的材料订货单应按需要包括下列各项, 并确切地说明所需要的材料。

- 4.1.1 数量(英尺, 米或根数)。
- 4.1.2 材料名称(无缝管)。
- 4.1.3 制造(冷拔)。
- 4.1.4 尺寸(外径及最小壁厚)。

4.1.5 长度(定尺或不定尺)。

4.1.6 选择性的要求(成品分析, 第 9 节; 卷边试验, 第 11.3 条)。

4.1.7 试验报告要求(见 A 450/A 450M 标准中合格证书这一节)。

4.1.8 标准号。

4.1.9 特殊要求。

5 制造

5.1 管子应为无缝、并由冷拔制造。

6 热处理

6.1 管子在最后一道冷拔后应经 1200°F (650°C) 或更高温度的热处理。

7 表面状态

7.1 成品管应无氧化皮。少量的氧化层将不认为是氧化皮。

8 化学成分

8.1 钢的化学成分应符合下述要求:

C, %	0.06 ~ 0.18
Mn, %	0.27 ~ 0.63
P, %	≤ 0.035
S, %	≤ 0.035

8.2 不允许添加任何非 8.1 条中列出的元素成分来供应特殊需要的合金钢等级管。

9 成品分析

9.1 当买方订货单要求时, 供方应作成品分析, 每 250 根取一根, 或当管子以炉号鉴定时, 每一炉号取一根。由此测定的化学成分应符合规定的要求。

9.2 若原有成品分析不合格,则外加两个钢坯或管子进行复试。对于有问题的元素两个复试都必须满足标准的要求,否则该炉号或该批(注2)的所有剩余材料应拒收,或生产厂选择,可对每一钢坯或管子作逐一的验收试验。不符合标准要求的钢坯或管子应拒收。

注2:每批是250根管子。

10 硬度要求

10.1 管子的洛氏硬度值不得超过72HRB。

11 力学试验要求

11.1 压扁试验——每批(注2)或其余数中取两根管子,分别取样各作一个压扁试验。

11.2 扩口试验——每批(注2)或其余数中取两根管子,分别取样各作一个扩口试验。

11.3 卷边试验——当规定作为替代扩口试验时,对于管子壁厚(实际平均壁厚)小于外径的10%的,每批(注2)或其余数中取两根管子,分别取样各作一个卷边试验。当管子不同于上述规

定时,不要求作卷边试验。

11.4 硬度试验——从每批两根管子的试样上作洛氏硬度试验。名词“批”适用于切割前的同一炉钢,同一公称直径及壁厚的管子。当最终热处理是在周期炉中进行时,该批只包括同一尺寸及同一炉号在相同炉料进行热处理的那些管子。当最终热处理是在连续炉中进行时,该批应包括同一尺寸,同一炉号及在同一炉内以相同温度、相同加热时间和相同加热速度作热处理的所有管子。

11.5 水压试验——每根管子均应做水压试验,或当买方指定时,可用无损电测试验取代。

12 产品标志

12.1 除A 450/A 450M标准中规定的标志外,尚应包括买方名称和订货单号。

解释性注解

注:对设计来说,可采用下列拉伸性能:

抗拉强度 ksi(MPa)	≥47(325)
屈服强度 ksi(MPa)	≥26(180)
伸长率(标距2in.或50mm), %	≥35

