



Designation: ~~A270-03a (Reapproved 2008)~~^{ε1} Designation: A270/A270M – 10

Standard Specification for Seamless and Welded Austenitic and Ferritic/Austenitic Stainless Steel Sanitary Tubing¹

This standard is issued under the fixed designation A270/A270M; 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.

This standard has been approved for use by agencies of the Department of Defense.

~~^{ε1}Note—The units statement in 1.3 was corrected editorially in October 2008.~~

1. Scope*

1.1 This specification covers grades of seamless, welded, and heavily cold worked welded austenitic and ferritic/austenitic stainless steel sanitary tubing intended for use in the dairy and food industry and having special surface finishes. Pharmaceutical quality may be requested, as a supplementary requirement.

~~1.2 This specification covers tubes in sizes up to and including 12 in. (304.8 mm) in outside diameter.~~

~~1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.~~

1.2 This specification covers tubes in sizes up to and including 12 in. [300 mm] in outside diameter.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. 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 non-conformance with the standard.

1.4 Optional supplementary requirements are provided, and when one or more of these are desired, each shall be so stated in the order.

2. Referenced Documents

2.1 ASTM Standards:²

A262 Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels

A480/A480M Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip

A923 Test Methods for Detecting Detrimental Intermetallic Phase in Duplex Austenitic/Ferritic Stainless Steels

A967 Specification for Chemical Passivation Treatments for Stainless Steel Parts

A1016/A1016M Specification for General Requirements for Ferritic Alloy Steel, Austenitic Alloy Steel, and Stainless Steel Tubes

E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

2.2 ASME Standard:

B46.1 Surface Texture (Surface Roughness, Waviness, and Lay)³

2.3 ASME Boiler and Pressure Vessel Code:

Section VIII Pressure Vessels³

2.4 Other Standard:

SAE J1086 Practice for Numbering Metals and Alloys (UNS)⁴

3. Terminology

3.1 Definition:

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.

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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, Three Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

⁴ Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, <http://www.sae.org>.

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

3.1.1 *roughness average, Ra, n*—arithmetic average surface roughness normally reported in microinches or microns; a measurement of surface roughness usually performed by moving a stylus in a straight line along the surface, although other methods may be used.

4. Ordering Information

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

- 4.1.1 Quantity (feet, metres, or number of lengths),
 - 4.1.2 Name of material (austenitic steel tube),
 - 4.1.3 Process seamless (SML), welded (WLD), or heavily cold worked (HCW),
 - 4.1.4 Size (outside diameter and average wall thickness),
 - 4.1.5 Length (specific or random),
 - 4.1.6 Surface finish (Section 13),
 - 4.1.7 Optional requirements (product analysis, see Section 9; hydrostatic or nondestructive electric test, see Section 11).
 - 4.1.8 Test report required (Certification Section of Specification A1016/A1016M),
 - 4.1.9 Specification designation,
 - 4.1.10 Special requirements, and
- 4.2 Any supplementary requirements.

5. General Requirements

5.1 Material furnished under this specification shall conform to the applicable requirements of the current edition of Specification A1016/A1016M, unless otherwise provided herein.

6. Manufacture

- 6.1 The tubes shall be manufactured by one of the following processes:
- 6.1.1 Seamless (SML) tubes shall be made by a process that does not involve welding at any stage.
 - 6.1.2 Welded (WLD) tubes shall be made using an automated welding process with no addition of filler metal during the welding process.
 - 6.1.3 Heavily cold worked (HCW) tubes shall be made by applying cold working of not less than 35 % reduction of thickness of both wall and weld to a welded tube prior to the final anneal. No filler shall be used in making the weld. Prior to cold working, the weld shall be 100 % radiographically inspected in accordance with the requirements of ASME Boiler and Pressure Vessel Code Section VIII, Division 1, latest revision, Paragraph UW 51.
- 6.2 At the manufacturer's option, tubing may be furnished either hot finished or cold finished.

7. Heat Treatment

- 7.1 All material shall be furnished in the heat-treated condition. The heat treatment procedure, except for S31803, S32003, S32205, S32750, N08926 and N08367, shall consist of heating the material to a minimum temperature of 1900 °F (1040 °C) and quenching in water or rapid cooling by other means.
- 7.2 N08926 shall be heat-treated to a minimum temperature of 2010 °F (1100 °C) followed by quenching in water or rapidly cooling by other means. UNS N08367 should be solution annealed from 2025 °F (1110 °C) minimum followed by rapid quenching.
- 7.3 S31803 and S32205 shall be heat-treated in a temperature range of 1870 °F (1020 °C) to 2010 °F (1100 °C) followed by quenching in water or rapidly cooling by other means.
- 7.4 S32750 shall be heat-treated in a temperature range of 1880 °F (1025 °C) to 2060 °F (1125 °C) followed by quenching in water or rapidly cooling by other means.
- 7.5 S32003 shall be heat-treated in a temperature range of 1850 °F (1010 °C) to 2010 °F (1100 °C).

8. Chemical Composition

8.1 An analysis of either one length of flat-rolled stock or one tube shall be made for each heat. The chemical composition thus determined shall conform to the requirements given in Table 1.

9. Product Analysis

- 9.1 When requested by the purchaser, product analysis tolerance in Specification A480/A480M shall apply. The product analysis tolerance is not applicable to the carbon content for material with a specified maximum carbon of 0.04 % or less.
- 9.2 If the original test for product analysis fails, retests of two additional lengths of flat-rolled stock 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 1) shall be rejected or, at the option of the producer, each length of flat-rolled stock or tube may be individually tested for acceptance. Lengths of flat rolled stock or tubes that do not meet the requirements of the specification shall be rejected.



TABLE 1 Chemical Requirements

Element	Grade	TP 304	TP 304L	...	S31254	TP 316	TP 316L	...	N08926	N089367	...	S31803	S32205	...	S32750	2003
	UNS Designation ^A	S30400	S30403	S31254	S31600	S31603	N08926	N089367	S31803	S32205	S32750	S32205	S32750	S32003		
Carbon, max		0.08	0.035 ^B	0.020	0.08	0.035 ^B	0.020	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030 max
Manganese, max		2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	1.20	2.00	2.00	1.20	2.00 max	2.00 max
Phosphorus, max		0.045	0.045	0.030	0.045	0.045	0.030	0.040	0.030	0.030	0.035	0.030	0.035	0.030	0.030	0.030
Sulfur, max		0.030	0.030	0.010	0.030	0.030	0.010	0.030	0.020	0.020	0.020	0.020	0.020	0.020	0.020 max	0.020 max
Silicon, max		1.00	1.00	0.80	1.00	1.00	0.50	1.00	1.00	1.00	0.80	1.00	0.80	1.00 max	1.00 max	1.00 max
Nickel		8.0–11.0	8.0–12.0	17.5–18.5	10.0–14.0	10.0–14.0	24.0–26.0	23.5–25.5	4.5–6.5	4.5–6.5	6.0–8.0	4.5–6.5	6.0–8.0	3.0–4.0	3.0–4.0	3.0–4.0
Chromium		18.0–20.0	18.0–20.0	19.5–20.5	16.0–18.0	16.0–18.0	19.0–21.0	20.0–22.0	21.0–23.0	22.0–23.0	24.0–26.0	21.0–23.0	22.0–23.0	19.5–22.5	19.5–22.5	19.5–22.5
Molybdenum		6.0–6.5	2.00–3.00	2.00–3.00	6.0–7.0	6.0–7.0	2.5–3.5	3.0–3.5	3.0–5.0	2.5–3.5	3.0–3.5	1.5–2.0	1.5–2.0	1.5–2.0
Nitrogen ^C		0.18–0.22	...	...	0.15–0.25	0.18–0.25	0.08–0.20	0.14–0.20	0.24–0.32	0.08–0.20	0.14–0.20	0.24–0.32	0.14–0.20	0.14–0.20
Copper		0.50–1.00	...	...	0.50–1.5	0.75 max	...	...	0.50 max	...	...	0.50 max	0.50 max	0.50 max

^A New designation established in accordance with Practice E527 and SAE J 1086.

^B For small diameter or thin walls or both, where many drawing passes are required, a carbon maximum of 0.040 % is necessary in grades TP304L and TP316L. Small outside diameter tubes are defined as those less than 0.500 in. [12.7 mm] in outside diameter and light wall tubes as those less than 0.049 in. [1.24 mm] in average wall thickness (0.044 in. [1.12 mm] in minimum wall thickness).

^C The method of analysis for nitrogen shall be a matter of agreement between the purchaser and manufacturer.

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