



Standard Specification for Seamless and Welded Austenitic Stainless Steel Sanitary Tubing¹

This standard is issued under the fixed designation A 270; 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—Values for Silicon in TP 316 and TP 316L in Table 1 were editorially corrected in June 1999.

^{ε2} NOTE—Paragraph 1.2 was editorially updated August 2000.

^{ε3} NOTE—Paragraph 1.2 was editorially updated October 2000.

1. Scope

1.1 This specification covers grades of seamless and welded 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 9 in. (203.2 mm) in outside diameter.

1.3 The values stated in inch-pound units are to be regarded as 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:

A 262 Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels²

A 450/A 450M Specification for General Requirements for Carbon, Ferritic Alloy, and Austenitic Alloy Steel Tubes³

A 967 Specification for Chemical Passivation Treatments for Stainless Steel Parts²

2.2 ANSI/ASME Standard:

B46.1 Surface Texture (Surface Roughness, Waviness, and Lay⁴

3. Terminology

3.1 Definition:

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

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

4.1.2 Name of material (seamless or welded tubes),

4.1.3 Size (outside diameter and average wall thickness),

4.1.4 Length (specific or random),

4.1.5 Surface finish (Section 14),

4.1.6 Optional requirements (product analysis, see Section 9; hydrostatic or nondestructive electric test, see Section 11).

4.1.7 Test report required (Certification Section of Specification A 450/A 450M),

4.1.8 Specification designation,

4.1.9 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 A 450/A 450M, unless otherwise provided herein.

6. Manufacture

6.1 The tubes shall be made by the seamless or welded process.

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 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.

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 Steel Tubing.

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² Annual Book of ASTM Standards, Vol 01.03.

³ Annual Book of ASTM Standards, Vol 01.01.

⁴ Available from American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036.

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 (1107°C) minimum followed by rapid quenching.

8. Chemical Composition

8.1 The steel shall conform to the requirements as to chemical composition as prescribed in Table 1.

9. Product Analysis

9.1 When requested by the purchaser, analyses of one billet per heat or two lengths of flat-rolled stock per heat or two tubes from each heat or from each lot of 250 tubes or fraction thereof shall be made. The chemical composition thus determined shall conform to the requirements specified.

9.2 If the analysis of one of these test specimens does not conform to the requirements specified, an analysis of two billets or two lengths of flat-rolled stock from the same heat or an analysis of two tubes from the same lot may be made, each of which shall conform to the requirements specified.

10. Mechanical Tests Required

10.1 *Reverse Flattening Test*—For welded tubes, one reverse flattening test shall be made on a specimen from each 1500 ft (457 m) of finished tubing.

11. Hydrostatic or Nondestructive Electric Test

11.1 Each tube shall be subjected to the nondestructive electric test or the hydrostatic test. The type of test to be used shall be at the option of the manufacturer, unless otherwise specified in the purchase order.

12. Permissible Variations in Dimensions

12.1 The following variations in dimensions shall apply, unless pharmaceutical tubing (Supplementary Requirement S2) is specified. When S2 is specified, the dimensions of Table S2.3 shall apply.

12.1.1 Variations in outside diameter and length from those specified shall not exceed the amount prescribed in Table 2 for tubes with specified wall thicknesses of 0.049 in. (1.24 mm) and over. For tubes specified with wall thicknesses under 0.049 in. (1.24 mm), the diameter tolerances shall be a matter for agreement by the manufacturer and the purchaser.

12.1.2 When tubing >4 in. (101.6 mm) diameter is ordered, additional ovality may be required for thin wall tubing. Thin wall tubing applies when the specified wall is less than 0.150 in. (3.81 mm). When thin wall tubing is ordered, the maximum and minimum diameter at any cross section shall deviate from the specified diameter by no more than twice the permissible variation in outside diameter given in Table 2; however, the mean diameter at that cross section must still be within the given permissible variation.

12.1.3 The wall thickness at any point shall not vary more than 12½ %, over and under, from the average wall thickness specified.

13. Surface Finishes

13.1 The following surface finishes may be specified:

13.1.1 *Mill Finish*—A finish without additional polishing or operations intended to smooth the surface.

13.1.2 *Mechanically Polished Surface Finish*—The purchaser may specify one of the following finish numbers for a mechanically polished surface:

13.1.2.1 *Finish No. 80*—A ground finish produced by polishing a tube with an abrasive media impregnated with No. 80 grit.

13.1.2.2 *Finish No. 120*—A ground finish produced by polishing a tube with an abrasive media impregnated with No. 120 grit.

13.1.2.3 *Finish No. 180*—A ground finish produced by polishing a tube with an abrasive media impregnated with No. 180 grit.

13.1.2.4 *Finish No. 240*—A ground finish produced by polishing a tube with an abrasive media impregnated with No. 240 grit.

TABLE 1 Chemical Requirements

Element	Grade	TP 304	TP 304L	...	TP 316	TP 316L	...	...
	UNS Designation ^A	S30400	S30403	S31254	S31600	S31603	N08926	N08367
Composition, %								
Carbon, max		0.08	0.035 ^B	0.020	0.08	0.035 ^B	0.020	0.030
Manganese, max		2.00	2.00	1.00	2.00	2.00	2.00	2.00
Phosphorus, max		0.040	0.040	0.030	0.040	0.040	0.03	0.040
Sulfur, max		0.030	0.030	0.010	0.030	0.030	0.01	0.030
Silicon, max		0.75	0.75	1.00	0.75	0.75	0.5	1.00
Nickel		8.00–11.0	8.00–13.00	17.5–18.5	10.00–14.00	10.00–15.00	24.00–26.00	23.50–25.50
Chromium		18.00–20.00	18.00–20.00	19.5–20.5	16.00–18.00	16.00–18.00	19.00–21.00	20.00–22.00
Molybdenum		6.0–6.5	2.00–3.00	2.00–3.00	6.0–7.0	6.00–7.00
Nitrogen ^C		0.18–0.22	...	...	0.15–0.25	0.18–0.25
Copper		0.50–1.00	...	...	0.5–1.5	0.75 max

^ANew designation established in accordance with ASTM E 527 and SAE J 1086, Practice for Numbering Metals and Alloys (UNS).

^BFor 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).

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