



## ASTM A270 Standard Specification

Seamless and Welded Austenitic and Ferritic/Austenitic  
Stainless Steel Sanitary Tubing

### Scope

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.

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

For more info please visit <https://www.octalsteel.com/astm-a270-sanitary-pipe>

**Table 1 - Chemical Requirements**

Grade	TP 304	TP304L	...	TP316	TP316L	...	...	...	...	...	2003
UNS	S30400	S30403	S31254	S31600	S31603	N08926	N08367	S31803	S32205	S32750	S32003
Designation <sup>A</sup>											
Element	Composition, %										
<b>Carbon, max</b>	0.08	0.035 <sup>B</sup>	0.020	0.08	0.035 <sup>B</sup>	0.020	0.030	0.030	0.030	0.030	0.030 max
<b>Manganese, max</b>	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	1.20	2.00 max
<b>Phosphorus, max</b>	0.045	0.045	0.030	0.045	0.045	0.030	0.040	0.030	0.030	0.035	0.030
<b>Sulfur, max</b>	0.030	0.030	0.010	0.030	0.030	0.010	0.030	0.020	0.020	0.020	0.020 max
<b>Silicon, max</b>	1.00	1.00	0.80	1.00	1.00	0.50	1.00	1.00	1.00	0.80	1.00 max
<b>Nickel</b>	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	3.0-4.0
<b>Chromium</b>	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	19.5-22.5
<b>Molybdenum</b>	...	...	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	1.5-2.0
<b>Nitrogen<sup>C</sup></b>	...	...	0.18-0.22	...	...	0.15-0.25	0.18-0.25	0.08-0.20	0.14-0.20	0.24-0.32	0.14-0.20
<b>Copper</b>	...	...	0.50-1.00	...	...	0.50-1.5	0.75 max	...	...	0.50 max	

A: New designation established in accordance with Practice E 527 and SAE J 1086.

B: For small diameter or thin walls or both, where many 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. (12.7mm) in outside diameter and light wall those less than 0.049 (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.



**Table 2 - Mechanical Properties**

Grade	UNS Designation	Tensile Strength, min, ksi [MPa]	Yield Strength, min, ksi [MPa] <sup>B</sup>	Elongation in 2 in. min, %	Rockwell Hardness Number, max.
TP304	S30400	75 [515]	30 [205]	35	B90
TP304L	S30403	70 [485]	25 [170]	35	B90
TP316	S31600	75 [515]	30 [205]	35	B90
TP316L	S31603	70 [485]	25 [170]	35	B90
	S31803	90 [620]	65 [450]	25	C30.5
2205	S32205	95 [655]	70 [485]	25	C30.5
2507	S32750	116 [800]	80 [550]	15	C32
2003	S32003	90 [620]	65 [450]	25	C30

**Mechanical Tests Required**

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.

**Hydrostatic or Nondestructive Electric Test**

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.

**Table 3 - Quantity of Tubes in a Lot Heat Treated by the Continuous Process**

Size of Tube Size of Lot	Size of Lot
2 in. (50.8 mm) and over in outside diameter and 0.200 in. (5.1 mm) and over in wall thickness not more than 50 tubes	not more than 50 tubes
Less than 2 in. (50.8 mm) but over 1 in. (25.4 mm) in outside diameter or over 1 in. (25.4 mm) in outside diameter and under 0.200 in. (5.1 mm) in wall thickness. not more than 75 tubes	not more than 75 tubes
1 in. (25.4 mm) or less in outside diameter not more than 125 tubes	not more than 125 tubes

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 ° (1040 °C) and quenching in water or rapid cooling by other means.



**Table 4 - Dimension Tolerances**

Size, Outside Diameter, in. (mm)	Permissible Variations in Outside Diameter, in. (mm)		Permissible Variations in Outside Diameter, in. (mm) <sup>A</sup>	
	Over	Under	Over	Under
1.000 (25.4) and under	0.005 (0.13)	0.005 (0.13)	1/8 (3.2)	0
Over 1 (25.4) to 2 (50.8)	0.008 (0.20)	0.008 (0.20)	1/8 (3.2)	0
Over 2 (50.8) to 3 (76.2)	0.010 (0.25)	0.010 (0.25)	1/8 (3.2)	0
Over 3 (76.2) to 4 (101.6)	0.015 (0.38)	0.015 (0.38)	1/8 (3.2)	0
Over 4 (101.6) to 5 1/2 (139.7), excl	0.015 (0.38)	0.015 (0.38)	3/16 (4.8)	0
5 1/2 (139.7) to 8 (203.2). excel	0.030 (0.76)	0.030 (0.76)	3/16 (4.8)	0
8 (203.2) to 12 (304.8)	0.050 (1.27)	0.050 (1.27)	3/16 (4.8)	0

A: The cut tolerances do not apply to Pharmaceutical Tubing.

Variations shall apply:

- For tubes with a specified wall thickness of 0.049 in. (1.24 mm) and greater, variations in outside diameter from those specified shall not exceed the amount prescribed in Table 2. For tubes with a specified wall thickness less than 0.049 in. (1.24 mm), the diameter tolerances shall be a matter for agreement by the manufacturer and the purchaser.
- When tubing > 4 in. (101.6 mm) outside 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 outside diameter at any cross section shall deviate from the specified outside 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.
- When tubing >4 in. (101.6 mm) outside 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 outside diameter at any cross section shall deviate from the specified outside 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.
- The wall thickness at any point shall not vary more than 12.5 %, from the specified wall thickness.
- Variations in length shall meet the requirements in Table 2 except when the Pharmaceutical Quality Tubing (Supplementary Requirement S2) is specified.

**Surface Finishes**

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

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

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

Finish No. 120—No. 120 grit.

Finish No. 180—No. 180 grit.

Finish No. 240—No. 240 grit.

Other mechanically polished finishes may be agreed upon between the purchaser and manufacturer.

Electropolished Finish—A bright reflective finish produced by electropolishing. The manufacturer may use other polishing operations prior to electropolishing.

Maximum Roughness Average (Ra) Surface Finish— The customer may specify a maximum Ra on the inside surface, outside surface, or both. The measurement of surface roughness shall be in accordance with ASME B46.1.

When no agreement is made regarding Ra measurement of longitudinally polished tube, disputes shall be resolved using measurements made in accordance with ASME B46.1.

The manufacturer shall select a manufacturing method to produce the specified finish. The operations may or may not include polishing.

The buyer may specify the polishing type for either the inside surface, outside surface or both for the final desired effect.