

ASTM A312 Stainless Steel Pipe Specification

Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes

ASTM A312 pipe is common use stainless pipe for industries.
 It covers diameters from 1/8" to 30" and thickness from SCH 10S to SCH 80S.
 General use material grades are TP304/304L, TP316/316L.

Chemical Requirements of ASTM A312

Grade	UNS Designation ^A	Chemical Composition, %								
		Carbon	Manganese	Phosphorous	Sulfur	Silicon	Chromium	Nickel	Molybdenum	Nitrogen ^C
TP304	S30400	0.08	2.00	0.045	0.030	1.00	18.0-20.0	8.0-11.0
TP304L	S30403	0.035 ^D	2.00	0.045	0.030	1.00	18.0-20.0	8.0-13.0
TP316	S31600	0.08	2.00	0.045	0.030	1.00	16.0-18.0	11.0-14.0	2.00-3.00	...
TP316L	S31603	0.035 ^D	2.00	0.045	0.030	1.00	16.0-18.0	10.0-14.0	2.00-3.00	...
TP321	S32100	0.08	2.00	0.045	0.030	1.00	17.0-19.0	9.0-12.0		0.10

^A New designation established in accordance with Practice E527 and SAE J1086.

^B Maximum, unless otherwise indicated. Where ellipses (...) appear in this table, there is no requirement and analysis for the element

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

^D 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. [1.20 mm] in average wall thickness (0.044 in. [1.10 mm] in minimum wall thickness).

A312 pipe Manufacturing Types

ASTM A312 stainless steel pipe and tube covers following manufacturing types (Including hot finished or cold finished):

- Seamless Pipe (SMLS): It covers stainless steel seamless pipe or tube in hot rolling or cold drawn.
- Welded Pipe (WLD): Welded by an automatic welding process that does not add filler metal when welding.
- Cold Worked Pipe (HCW pipe): The heavy cold-worked pipe that apply cold working of not less than 35% reduction in thickness of both wall, and welded to the welded pipe prior to final annealing. Do not use fillers during welding.
- Welded and HCW pipe: Welded pipe and HCW pipe of 14 and smaller than NPS 14 shall have a single longitudinal weld.
 After approval by the purchaser, the welded pipe and HCW pipe with an NPS greater than NPS 14 shall have a single longitudinal weld or shall be manufactured by forming and welding two longitudinal sections of flat stock.
 So each welds are to be tested, inspected, inspected or treated.

Mechanical Properties of ASTM A312 Pipe

Tensile Requirements			
Grade	UNS Designation	Tensile STrength, min ksi [MPa]	Yield Strength, min ksi [MPa]
TP304	S30400	75 [515]	30 [205]
TP304L	S30403	70 [485]	25 [170]
TP316	S31600	75 [515]	30 [205]
TP316L	S31603	70 [485]	25 [170]
TP321	S32100		
Welded		75 [515]	30 [205]
Seamless			
≤3/8 in.		75 [515]	30 [205]
>3/8 in.		70 [485]	25 [170]

Mechanical Test

It includes heat treated condition, Transverse or Longitudinal Tension Test or Flatten Test.

Transverse or Longitudinal Tension Test

For lots of not more than 100 pipes, one specimen shall be taken for tensile testing. For lots of more than 100 pipes, two specimens shall be taken from two pipes for tensile testing.

Flatten Test

For material heat treated in batch furnace, (by quenching after hot forming or in a batch-type furnace equipped with recording pyrometers and automatically controlled within a 30°C or less range) 5% of steel pipe should be taken from each heat treated lot flattening test.

For material heat treated in the continuous furnace, sufficient number of pipe to constitute 5% of the lot, but in any case not less 2 lengths for flattening test.

Annealing Requirements

Grade	Heat Treating Temperature ^B	Cooling/ Testing Requirements
TP304/ TP304L	1900° F [1040°C]	C
TP316/ TP316L	1900° F [1040°C]	C

B: Minimum, unless otherwise stated

C: Quenched in water or rapidly cooled by other means, at a rate sufficient to prevent re-precipitation of carbides, as demonstrable by the capability of pipes. heat treated by either separate solution annealing or by direct quenching, of passing Practices A262, Practice E. The manufacturer is not required to run the test unless it is specified on the purchase order (see Supplementary Requirement S7). Note that Practices A262 requires the test to be performed on sensitized specimens in the low-carbon and stabilized types and on specimens representative of the as-shipped condition for other types. In the case of low-carbon types containing 3% or more molybdenum, the applicability of the sensitizing treatment prior to testing shall be a matter for negotiation between the seller and the purchaser.

ASTM A312 stainless steel tube shall be furnished in heat treatment condition comply to above table. For seamless types, shall be following hot forming while the temperature of the tube is not less than the minimum solution treatment temperature specified in this table, A312 stainless steel pipe shall be individually quenched in water or rapidly cooled by other means (direct quenched).

ASTM A312 Stainless Steel Tube Tolerance

Wall Thickness

Permitted Variations in Wall thickness (%)		
Tolerance, % from Nominal		
NPS Designator	Over	Under
1/8 to 2 1/2., all t/D ratios	20.0	12.5
3 to 18 incl., t/D up to 5% incl.	22.5	12.5
3 to 18 incl., t/D > 5%	15.0	12.5
20 and larger, welded, all t/D ratios	17.5	12.5
20 and larger, seamless, t/D up to 5% incl.	22.5	12.5
20 and larger, seamless, t/D > 5%	15.0	12.5

where:

t=Nominal Wall Thickness

D=Ordered Outside Diameter

Outer Diameter

Permitted Variation in Outside Diameter (mm)		Length (mm)
OD	Tolerance	Tolerance
10.29 - 48.26	+0.40/-0.80	+6/-0
48.26 - 114.30	+0.80/-0.80	
114.30 - 219.08	+1.60/-0.80	
219.08 - 457.20	+2.40/-0.80	

Length Variations

- Unless otherwise specified, all size from NPS 1/8 to NPS 8 are available in a maximum length of 24 ft. And a length range from 15 to 24 ft. Short length are acceptable, but the number and minimum length are agreed upon by the purchaser and the manufacturer.
- If a certain cut length is required, the required length should be specified in the order. The pipe shall not be longer than the specified length and the pipe length shall not exceed 1/4 inch [6 mm].
- Unless otherwise specified, Joints are not allowed to have .

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