This specification2 covers seamless, straight-seam welded, and heavily cold worked welded austenitic stainless steel pipe intended for high-temperature and general corrosive service.

NOTE 1—When the impact test criterion for a low-temperature service would be 15 ft·lbf [20 J] energy absorption or 15 mils [0.38 mm] lateral expansion, some of the austenitic stainless steel grades covered by this specification are accepted by certain pressure vessel or piping codes without the necessity of making the actual test. For example, Grades TP304, TP304L, and TP347 are accepted by the ASME Pressure Vessel Code, Section VIII Division 1, and by the Chemical Plant and Refinery Piping Code, ANSI B31.3, for service at temperatures as low as −425°F[−250°C] without qualification by impact tests. Other AISI stainless steel grades are usually accepted for service temperatures as low as −325°F [−200°C] without impact testing. Impact testing may, under certain circumstances, be required. For example, materials with chromium or nickel content outside the AISI ranges, and for material with carbon content exceeding 0.10 %, are required to be impact tested under the rules of ASME Section VIII Division 1 when service temperatures are lower than −50°F [−45°C].

1.2 Grades TP304H, TP309H, TP309HCb, TP310H,TP310HCb, TP316H, TP321H, TP347H, and TP348H are modifications of Grades TP304, TP309Cb, TP309S, TP310Cb,TP310S, TP316, TP321, TP347, and TP348, and are intended for service at temperatures where creep and stress rupture properties are important.

1.3 Optional supplementary requirements are provided for pipe where a greater degree of testing is desired. These supplementary requirements call for additional tests to be made and, when desired, it is permitted to specify in the order one or more of these supplementary requirements.

1.4 Table X1.1 lists the standardized dimensions of welded and seamless stainless steel pipe as shown in ANSI B36.19. These dimensions are also applicable to heavily cold worked pipe. Pipe having other dimensions is permitted to be ordered and furnished provided such pipe complies with all other requirements of this specification.

1.5 Grades TP321 and TP321H have lower strength requirements for pipe manufactured by the seamless process in nominal wall thicknesses greater than 3⁄8 in. [9.5 mm].

1.6 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.

NOTE 2—The dimensionless designator NPS (nominal pipe size) has been substituted in this standard for such traditional terms as "nominal diameter," "size," and "nominal size."

2. Referenced Documents

2.1 *ASTM Standards:* 3

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

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products

A 941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys

A 999/A 999M Specification for General Requirements for Alloy and Stainless Steel Pipe

A 1016/A 1016M Specification for General Requirements for Ferritiic Alloy Steel, Austenitic Alloy Steel, and Stainless Steel Tubes

E 112 Test Methods for Determining the Average Grain Size

E 381 Method of Macroetch Testing Steel Bars, Billets,Blooms, and Forgings

E 527 Practice for Numbering Metals and Alloys (UNS)

2.2 *ANSI Standards:4*

B1.20.1 Pipe Threads, General Purpose

B36.10 Welded and Seamless Wrought Steel Pipe

B36.19 Stainless Steel Pipe

2.3 *ASME Standard:*

ASME Boiler and Pressure Vessel Code: Section VIII5

2.4 *AWS Standard:*

A5.9 Corrosion-Resisting Chromium and Chromium- Nickel Steel Welding Rods and Electrodes6

2.5 *Other Standard:*

SAE J1086 Practice for Numbering Metals and Alloys(UNS)7

2.6 *Other Standard:*

SNT-TC-1A Personnel Qualification and Certification in Nondestructive Testing8

3. Terminology

3.1 *Definitions:*

3.1.1 The definitions in Specification A 999/A 999M and Terminology A 941 are applicable to this specification.

4. Ordering Information

4.1 Orders for material to this specification shall conform to the requirements of the current edition of Specification A 999/A 999M.

5. General Requirements

5.1 Material furnished under this specification shall conform to the applicable requirements of the current edition of Specification A 999/A 999M unless otherwise provided herein.

5.2 *Heat Treatment*:

5.2.1 All pipe shall be furnished in the heat—treated condition in accordance with the requirements of Table 2. The heat—treatment procedure, except for "H" grades, S30815, S31272, S31254, S32654, N08367, N08904, and N08926 shall consist of heating the pipe to a minimum temperature of 1900°F [1040°C] and quenching in water or rapidly cooling by other means.

Standard	Outside Diameter					Thickness	Length
ASTM A312		O.D. ≦	48.26mm	+0.40mm,	-0.80mm	Nominal Thickness ± 12.5%	0mm to +6mm
	48.26mm <	O.D. ≦	114.3mm	±0.80mm,			
	114.3mm <	O.D. ≦	219.08mm	+1.60mm,	-0.80mm		
	219.08mm <	O.D. ≦	457.2mm	+2.40mm,	-0.80mm		
	457.2mm <	O.D. ≦	660.4mm	+3.20mm,	-0.80mm		
	660.4mm <	O.D. ≦	836.6mm	+4.00mm,	-0.80mm		
	863.6mm <	O.D.		+4.80mm,	-0.80mm		

ASTM A312/A358/A778, ASME B36.19M/ASME B36.10M										
Nominal	Outside	Nominal Wall Thickness (mm)								
Diameter	Diameter	ASME B36.19M				ASME B36.10M				
NPS	(mm)	SCH-5S	SCH-10S	SCH-40S	SCH-80S	SCH-5	SCH-10	SCH-20	STD	XS
1/4	13.72	-	1.65	2.24	3.02	-	1.65	-	2.24	3.02
3/8	17.15	-	1.65	2.31	3.2	-	1.65	-	2.31	3.2
1/2	21.34	1.65	2.11	2.77	3.73	1.65	2.11	-	2.77	3.73
3/4	26.67	1.65	2.11	2.87	3.91	1.65	2.11	-	2.87	3.91
1	33.4	1.65	2.77	3.38	4.55	1.65	2.77	-	3.38	4.55
1 1/4	42.16	1.65	2.77	3.56	4.85	1.65	2.77	-	3.56	4.85
1 1/2	48.26	1.65	2.77	3.68	5.08	1.65	2.77	-	3.68	5.08
2	60.33	1.65	2.77	3.91	5.54	1.65	2.77	-	3.91	5.54
2 1/2	73.03	2.11	3.05	5.16	7.01	2.11	3.05	-	5.16	7.01
3	88.9	2.11	3.05	5.49	7.62	2.11	3.05	-	5.49	7.62
3 1/2	101.6	2.11	3.05	5.74	8.08	2.11	3.05	-	5.74	8.08
4	114.3	2.11	3.05	6.02	8.56	2.11	3.05	-	6.02	8.56
5	141.3	2.77	3.4	6.55	9.53	2.77	3.4	-	6.55	9.53
6	168.28	2.77	3.4	7.11	10.97	2.77	3.4	-	7.11	10.97
8	219.08	2.77	3.76	8.18	12.7	2.77	3.76	6.35	8.18	12.7
10	273.05	3.4	4.19	9.27	12.7	3.4	4.19	6.35	9.27	12.7
12	323.85	3.96	4.57	9.53	12.7	3.96	4.57	6.35	9.53	12.7
14	355.6	3.96	4.78	9.53	12.7	3.96	6.35	7.92	9.53	12.7

16	406.4	4.19	4.78	9.53	12.7	4.19	6.35	7.92	9.53	12.7
18	457.2	4.19	4.78	9.53	12.7	4.19	6.35	7.92	9.53	12.7
20	508	4.78	5.54	9.53	12.7	4.78	6.35	9.53	9.53	12.7
22	558.8	4.78	5.54	-	-	4.78	6.35	9.53	9.53	12.7
24	609.6	5.54	6.35	9.53	12.7	5.54	6.35	9.53	9.53	12.7
26	660.4	-	-	-	-	-	7.92	12.7	9.53	12.7
28	711.2	-	-	-	-	-	7.92	12.7	9.53	12.7
30	762	6.35	7.92	-	-	6.35	7.92	12.7	9.53	12.7
32	812.8	Thickness ： 6.35~30mm								
|	|									
84	2133.6									
Remark	(1)Marking：Within production capability.									
	(2)Other nominal diameter and wall thickness subject to the approval of vendor and purchaser.									
	(3)Calculating formula for the value of mass (kg/m)：304/L[W=0.02491t(D-t)], 316/L[W=0.02507t(D-t)]									