

American National Standard for Stainless Steel Pipe (ANSI/ASME B36.19M-1985)

FOREWORD

(This Foreword is not part of ANSI/ASME B36.19M-1985)

This Standard for corrosion resistant piping, designated categorically as *stainless*, is based on the same principles that formed the background for the development of ANSI/ASME B36.10M, Welded and Seamless Wrought Steel Pipe, and reference is made to this source of information.

The wall thicknesses shown for Schedules 40S and 80S are identical with those of Schedules 40 and 80 in ANSI/ASME B36.10M except in the 12 in. size in Schedule 40S and the 10 in. and 12 in. sizes in Schedule 80S. The thickness for these three sizes corresponds to wall thicknesses of Standard wall and Extra-Strong wall.

The more recent development of the highly alloyed stainless steels has brought about a minor conflict with convention. With these newer materials, the need for standards is just as great and the present types of threads are just as satisfactory, but the basic cost of the metal is much higher and the art of fusion welding has developed concurrently. The character of stainless steel permits the design of thin-wall piping systems without fear of early failure due to corrosion, and the use of fusion welding to join such piping has eliminated the necessity of threading it. For these reasons, the wall thickness dimensions shown under Schedule 10S have been developed, based on the conventional formula, but then modified to correspond to the nearest Birmingham Wire Gage (B.W.G.) number.

Following publication of the 1949 edition there developed a demand for a still lighter wall pipe. A Schedule 5S was determined cooperatively by representatives of chemical companies, processing industries, and manufacturers of welding fittings. This was endorsed by the ASA Chemical Industry Correlating Committee and the Manufacturers Standardization Society of the Valve and Fittings Industry. The new schedule was included in the revised standard which was approved by ASA (now ANSI) on April 7, 1952.

In 1956 it was recommended that the wall thickness of 12 in. 5S be lessened, and a new revision of the standard was issued shortly after its approval by ASA (now ANSI) on February 27, 1957. In this fourth edition, dimensions were expanded beyond 12 in. pipe size by inclusion of, and reference to, ASTM Specification A 409. This revision was approved by ASA (now ANSI) on October 29, 1965.

The B36 Standards Committee membership was asked in March 1970 for recommendations as to what action should be taken on ANSI B36.19-1965 since, according to ANSI procedures, this standard was due for revision or reaffirmation. The B36 Standards Committee recommended reaffirmation. This action was approved by the Secretariat and by the American National Standards Institute on May 26, 1971.

In 1975 the B36 Standards Committee undertook a review of the standard, considering its acceptability and usefulness. The results were favorable; some editorial refinements and updating were proposed along with the incorporation of factors for conversion to SI (metric) units. The revision was approved by the Standards Committee, the Secretariat, and subsequently the American National Standards Institute on October 4, 1976.

This standard was revised in 1984 to include SI metric dimensions. The outside diameter and wall thicknesses were converted to millimeters by multiplying the inch dimensions by 25.4. Outside diameters larger than 16 in. were rounded to the nearest 1 mm, and outside

diameters 16 in. and smaller were rounded to the nearest 0.1 mm. Wall thicknesses were rounded to the nearest 0.01 mm. These converted and rounded SI metric dimensions were added in Table 2A. A formula to calculate the SI metric plain end mass, kg/m, using SI metric diameters and thicknesses, was added to Section 5. The SI metric plain end mass was calculated for each size and thickness, and added in Table 3A.

These changes in the standard were approved by the Standards Committee, the Sponsor, and the American National Standards Institute, and it was designated an American National Standard on October 7, 1985.

AMERICAN NATIONAL STANDARD/AMERICAN SOCIETY of MECHANICAL ENGINEERS

STAINLESS STEEL PIPE

1 SCOPE

This Standard covers the standardization of dimensions of welded and seamless wrought stainless steel pipe.

The word *pipe* is used as distinguished from *tube* to apply to tubular products of dimensions commonly used for pipeline and piping systems. Pipe dimensions of sizes 12 and smaller have outside diameters numerically larger than the corresponding size. In contrast, the outside diameters of tubes are numerically identical to the size number for all sizes.

The wall thicknesses for sizes 14 through 22 inclusive of Schedule 10S, for size 12 of Schedule 40S, and for sizes 10 and 12 of Schedule 80S are not the same as those of ANSI/ASME B36.10M. The suffix "S" in the Schedule Number is used to differentiate B36.19M pipe from B36.10M pipe. ANSI/ASME B36.10M includes other pipe thicknesses which are also commercially available with stainless steel material.

2 SIZE

The size of all pipe in Tables 2 through 3A is identified by the nominal pipe size.

The manufacture of pipe in the inch nominal sizes of 1/8-12 inclusive is based on a standardized outside diameter (O.D.). This O.D. was originally selected so that pipe with a standard O.D. and having a wall thickness which was typical of the period would have an inside diameter (I.D.) approximately equal to the nominal size. Although there is no such relation between the existing standard thicknesses — O.D. and nominal size — these nominal sizes and standard O.D.'s continue in use as "standard."

The manufacture of pipe in nominal sizes of 14 and larger proceeds on the basis of an O.D. corresponding to the nominal size.

3 MATERIALS

The dimensional standards for pipe described here are for products covered in the ASTM specifications listed in Table 1.

4 PERMISSIBLE VARIATIONS

Variations in dimensions differ depending upon the method of manufacture employed in making the pipe to the various specifications listed in Table 1. Permissible variations for dimensions are indicated in each specification.

5 WEIGHTS

The nominal weights¹ of steel pipe are calculated values and are tabulated in Table 3. The nominal plain end weight, lb/ft, is calculated using the following formula:

$$W_{pe} = 10.68(D - t)t$$

where

W_{pe} = nominal plain end weight rounded to the nearest 0.01 lb/ft

D = outside diameter to the nearest 0.001 in. (The symbol D is to be used for O.D. only in mathematical equations or formulas.)

t = specified wall thickness rounded to the nearest 0.001 in.

The nominal plain end mass, kg/m, is calculated using the following formula:

$$W_{pe} = 0.02466(D - t)t$$

¹The different grades of stainless steel have different specific densities and hence may weigh more or less than the values listed in this table would indicate [see Table 3, General Note (c)].

TABLE 1 SPECIFICATIONS FOR PIPE WITH ASTM DESIGNATIONS AND TITLES OF STANDARD SPECIFICATIONS

ASTM Designation	Title
A 312	Specification for Seamless and Welded Austenitic Stainless Steel Pipe
A 358	Specification for Electric-Fusion-Welded Austenitic Chromium-Nickel Alloy Steel Pipe for High-Temperature Service
A 376	Specification for Seamless Austenitic Steel Pipe for High-Temperature Central-Station Service
A 409	Specification for Welded Large Diameter Austenitic Steel Pipe for Corrosive or High-Temperature Service

where

W_{pe} = nominal plain end mass rounded to the nearest 0.01 kg/m

D = outside diameter to the nearest 0.1 mm for outside diameters which are 16 in. and smaller and 1.0 mm for outside diameters larger than 16 in. (The symbol D is to be used for O.D. only in mathematical equations or formulas.)

t = specified wall thickness rounded to the nearest 0.01 mm

NOTE: 1 in. = 25.4 mm; 1 lb/ft = 1.4895 kg/m.

6 PIPE THREADS

Unless otherwise specified, the threads of threaded pipe shall conform to ANSI/ASME B1.20.1, Pipe Threads, General Purpose (Inch).

Schedules 5S and 10S wall thicknesses do not permit threading in accordance with ANSI/ASME B1.20.1.

7 WALL THICKNESS SELECTION

When the selection of wall thickness depends primarily upon capacity to resist internal pressure under given conditions, the designer shall compute the exact value of wall thickness suitable for conditions for which the pipe is required as prescribed in detail in the ASME Boiler and Pressure Vessel Code, ANSI/ASME B31 Code for Pressure Piping, or other similar codes, whichever governs the construction. A thickness will then be selected from the schedules of nominal thickness contained in Tables 2 and 2A to suit the value computed to fulfill the conditions for which the pipe is desired.

**TABLE 2 DIMENSIONS OF WELDED AND SEAMLESS STAINLESS STEEL
PIPE — CUSTOMARY UNITS**

Inch Nominal Pipe Size	Outside Diameter, in.	Nominal Wall Thickness, in.			
		Schedule 5S (1)	Schedule 10S (1)	Schedule 40S	Schedule 80S
1/8	0.405	...	0.049	0.068	0.095
1/4	0.540	...	0.065	0.088	0.119
3/8	0.675	...	0.065	0.091	0.126
1/2	0.840	0.065	0.083	0.109	0.147
3/4	1.050	0.065	0.083	0.113	0.154
1	1.315	0.065	0.109	0.133	0.179
1 1/4	1.660	0.065	0.109	0.140	0.191
1 1/2	1.900	0.065	0.109	0.145	0.200
2	2.375	0.065	0.109	0.154	0.218
2 1/2	2.875	0.083	0.120	0.203	0.276
3	3.500	0.083	0.120	0.216	0.300
3 1/2	4.000	0.083	0.120	0.226	0.318
4	4.500	0.083	0.120	0.237	0.337
5	5.563	0.109	0.134	0.258	0.375
6	6.625	0.109	0.134	0.280	0.432
8	8.625	0.109	0.148	0.322	0.500
10	10.750	0.134	0.165	0.365	0.500 (2)
12	12.750	0.156	0.180	0.375 (2)	0.500 (2)
14	14.000	0.156	0.188 (2)	...	...
16	16.000	0.165	0.188 (2)	...	...
18	18.000	0.165	0.188 (2)	...	...
20	20.000	0.188	0.218 (2)	...	...
22	22.000	0.188	0.218 (2)	...	...
24	24.000	0.218	0.250	...	...
30	30.000	0.250	0.312	...	...

GENERAL NOTES:

- (a) 1 in. = 25.4 mm
(b) For tolerances, see Section 4.

NOTES:

- (1) Schedules 5S and 10S wall thicknesses do not permit threading in accordance with ANSI/ASME B1.20.1.
(2) These dimensions do not conform to ANSI/ASME B36.10M.

TABLE 2A DIMENSIONS OF WELDED AND SEAMLESS STAINLESS STEEL
PIPE — SI UNITS

Inch Nominal Pipe Size	Outside Diameter, mm	Nominal Wall Thickness, mm			
		Schedule 5S (1)	Schedule 10S (1)	Schedule 40S	Schedule 80S
1/8	10.3	...	1.24	1.73	2.41
1/4	13.7	...	1.65	2.24	3.02
3/8	17.1	...	1.65	2.31	3.20
1/2	21.3	1.65	2.11	2.77	3.73
3/4	26.7	1.65	2.11	2.87	3.91
1	33.4	1.65	2.77	3.38	4.55
1 1/4	42.2	1.65	2.77	3.56	4.85
1 1/2	48.3	1.65	2.77	3.68	5.08
2	60.3	1.65	2.77	3.91	5.54
2 1/2	73.0	2.11	3.05	5.16	7.01
3	88.9	2.11	3.05	5.49	7.62
3 1/2	101.6	2.11	3.05	5.74	8.08
4	114.3	2.11	3.05	6.02	8.56
5	141.3	2.77	3.40	6.55	9.53
6	168.3	2.77	3.40	7.11	10.97
8	219.1	2.77	3.76	8.18	12.70
10	273.1	3.40	4.19	9.27	12.70 (2)
12	323.9	3.96	4.57	9.53 (2)	12.70 (2)
14	355.6	3.96	4.78 (2)	...	...
16	406.4	4.19	4.78 (2)	...	...
18	457	4.19	4.78 (2)	...	...
20	508	4.78	5.54 (2)	...	...
22	559	4.78	5.54 (2)	...	...
24	610	5.54	6.35	...	...
30	762	6.35	7.92	...	...

GENERAL NOTES:

- (a) 25.4 mm = 1 in.
(b) For tolerances, see Section 4.

NOTES:

- (1) Schedules 5S and 10S wall thicknesses do not permit threading in accordance with ANSI/ASME B1.20.1.
(2) These dimensions do not conform to ANSI/ASME B36.10M.

**TABLE 3 NOMINAL WEIGHTS OF STEEL PIPE, PLAIN ENDS —
CUSTOMARY UNITS**

Inch Nominal Pipe Size	Weight of Steel Pipe, Plain Ends, lb/ft			
	Schedule 5S	Schedule 10S	Schedule 40S	Schedule 80S
1/8	...	0.19	0.24	0.31
1/4	...	0.33	0.42	0.54
3/8	...	0.42	0.57	0.74
1/2	0.54	0.67	0.85	1.09
3/4	0.69	0.86	1.13	1.47
1	0.87	1.40	1.68	2.17
1 1/4	1.11	1.81	2.27	3.00
1 1/2	1.28	2.09	2.72	3.63
2	1.61	2.64	3.65	5.02
2 1/2	2.48	3.53	5.79	7.66
3	3.03	4.33	7.58	10.25
3 1/2	3.48	4.97	9.11	12.51
4	3.92	5.61	10.79	14.98
5	6.36	7.77	14.62	20.78
6	7.60	9.29	18.97	28.57
8	9.93	13.40	28.55	43.39
10	15.19	18.65	40.48	54.74
12	20.98	24.17	49.56	65.42
14	23.07	27.73	...	...
16	27.90	31.75	...	...
18	31.43	35.76	...	...
20	39.78	46.06	...	...
22	43.80	50.71	...	...
24	55.37	63.41	...	...
30	79.43	98.93	...	...

GENERAL NOTES:

- (a) 1 lb/ft = 1.4895 kg/m
- (b) Weights are given in pounds per linear foot and are for carbon steel pipe with plain ends.
- (c) The different grades of stainless steel permit considerable variations in weight. The ferritic stainless steels may be about 5% less, and the austenitic stainless steels about 2% greater than the values shown in this table, which are based on weights for carbon steel.

TABLE 3A NOMINAL WEIGHTS OF STEEL PIPE, PLAIN ENDS —
SI UNITS

Inch Nominal Pipe Size	Weight of Steel Pipe, Plain Ends, kg/m			
	Schedule 5S	Schedule 10S	Schedule 40S	Schedule 80S
1/8	...	0.28	0.37	0.47
1/4	...	0.49	0.63	0.80
3/8	...	0.63	0.84	1.10
1/2	0.80	1.00	1.27	1.62
3/4	1.03	1.28	1.69	2.20
1	1.30	2.09	2.50	3.24
1 1/4	1.65	2.70	3.39	4.47
1 1/2	1.91	3.11	4.05	5.41
2	2.40	3.93	5.44	7.48
2 1/2	3.69	5.26	8.63	11.41
3	4.51	6.45	11.29	15.27
3 1/2	5.18	7.40	13.57	18.63
4	5.84	8.36	16.07	22.32
5	9.47	11.57	21.77	30.97
6	11.32	13.84	28.26	42.56
8	14.79	19.96	42.55	64.64
10	22.63	27.78	60.31	96.01
12	31.25	36.00	73.88	132.08
14	34.36	41.30	...	...
16	41.56	47.29	...	...
18	46.81	53.26	...	...
20	59.25	68.61	...	...
22	65.24	75.53	...	...
24	82.47	94.45	...	...
30	118.31	147.36	...	...

GENERAL NOTES:

- (a) 1.4895 kg/m = 1 lb/ft
- (b) Weights are given in kilograms per meter and are for carbon steel pipe with plain ends.
- (c) The different grades of stainless steel permit considerable variations in weight. The ferritic stainless steels may be about 5% less, and the austenitic stainless steels about 2% greater than the values shown in this table, which are based on weights for carbon steel.