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An American National Standard

Standard Specification for Lap Joint Flange Pipe End Applications[1]

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1. Scope

1.1 This specification covers the pipe material and wall thickness applicable to lap joint flange pipe ends, manufactured by a mechanical forming process.

1.2 The lap joint flange connection has been widely used for low-pressure systems in the marine, process piping, and similar industries.

1.3 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A53/A53M Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

A106/A106M Specification for Seamless Carbon Steel Pipe for High-Temperature Service

A135 Specification for Electric-Resistance-Welded Steel Pipe

A139/A139M Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)

A161 Specification for Seamless Low-Carbon and Carbon-Molybdenum Steel Still Tubes for Refinery (Withdrawn 1999)[3]

A178/A178M Specification for Electric-Resistance-Welded Carbon Steel and Carbon-Manganese Steel Boiler and Superheater Tubes

A199/A199M Specification for Seamless Cold-Drawn Intermediate Alloy-Steel Heat-Exchanger and Condenser Tubes (Withdrawn 1995)[3]

A200 Specification for Seamless Intermediate Alloy-Steel Still Tubes for Refinery Service (Withdrawn 1999)[3]

A209/A209M Specification for Seamless Carbon-Molybdenum Alloy-Steel Boiler and Superheater Tubes

A210/A210M Specification for Seamless Medium-Carbon Steel Boiler and Superheater Tubes

A250/A250M Specification for Electric-Resistance-Welded Ferritic Alloy-Steel Boiler and Superheater Tubes

A252 Specification for Welded and Seamless Steel Pipe Piles

A312/A312M Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes

A333/A333M Specification for Seamless and Welded Steel Pipe for Low-Temperature Service and Other Applications with Required Notch Toughness

A334/A334M Specification for Seamless and Welded Carbon and Alloy-Steel Tubes for Low-Temperature Service

A500 Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

A512 Specification for Cold-Drawn Buttweld Carbon Steel Mechanical Tubing

A519 Specification for Seamless Carbon and Alloy Steel Mechanical Tubing

A587 Specification for Electric-Resistance-Welded Low-Carbon Steel Pipe for the Chemical Industry

A589 Specification for Seamless and Welded Carbon Steel Water-Well Pipe

A672 Specification for Electric-Fusion-Welded Steel Pipe for High-Pressure Service at Moderate Temperatures

B42 Specification for Seamless Copper Pipe, Standard Sizes

B88 Specification for Seamless Copper Water Tube

B88M Specification for Seamless Copper Water Tube (Metric)

B280 Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service

B337 Specification for Seamless and Welded Titanium and Titanium Alloy Pipe (Withdrawn 1997)[3]

B338 Specification for Seamless and Welded Titanium and Titanium Alloy Tubes for Condensers and Heat Exchangers

B466/B466M Specification for Seamless Copper-Nickel Pipe and Tube

[1] This specification is under the jurisdiction of ASTM Committee F25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.11 on Machinery and Piping Systems.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

B467 Specification for Welded Copper-Nickel Pipe

2.2 *ANSI Standards:*

B31.1 Power Piping[4]

B31.3 Chemical Plant and Petroleum Refining Piping[4]

B16.5 Pipe Flanges and Flanged Fittings[4]

B16.9 Factory-Made Wrought Steel Butt-Welding Fittings[4]

B16.24 Cast Copper Alloy Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500[4]

B16.42 Ductile Iron Pipe Flanges and Flanged Fittings, Classes 150 and 300[4]

2.3 *ISO Standard:*

ISO-7005-1 Metallic Flanges Part 1: Steel Flanges[4]

ISO-7005-2 Metallic Flanges Part 2: Cast Iron Flanges[4]

ISO-7005-3 Metallic Flanges Part 3: Copper Alloy and Composite Flanges[4]

3. Terminology

3.1 *back-up flange*—the flange used to back up the lap joint to facilitate the pipe connection, also known in industry as loose, slip, plate, or spin flange.

3.2 *convoluted flange*—a back-up flange designed with a variable cross section to provide the material in the stress-related zones.

3.3 *lap joint end*—the formed pipe end to accommodate the back-up flange, commonly referred to as a Van Stone flange (see Fig. 1).

4. Dimensions and Tolerances

4.1 The lap joint end outside diameter shall be formed to the raised face flange diameter as covered under ISO Standard 7005-1, 7005-2, 7005-3, and ANSI B16.9 Table 7, Dim. G.

4.2 The back-up flange dimensions are covered under ANSI Standards B16.5, B16.24, and B16.42, and ISO Standards 7005-1, 7005-2, and 7005-3.

[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

5. Fabrication

5.1 The formed lap joint end may have a smooth or serrated face.

5.2 The back-up flange may be a different material from the lap joint end pipe as long as it conforms to the applicable piping system codes or standards.

5.3 Convoluted back-up flanges may be used if they comply with the applicable piping system codes or standards.

6. Pipe Materials and Limitations

6.1 Table 1 contains a list of materials that have been found to have acceptable forming qualities to produce a lap joint end.

7. Finish, Appearance and Repairs

7.1 The lap joint flange pipe connection shall be produced in accordance with accepted shop practices and shall be free from burrs and cracks, which would affect the suitability for the intended service.

7.2 Pipe/tube repairs are permitted in accordance with the applicable ASTM specification.

8. Dimensional Limitations (see Tables 2-4)

8.1 Interpolation is allowable for sizes not covered.

8.2 The limitations are based on current technology subject to amendment to equipment or process developments, or both.

9. Allowable Pressure and Temperature

9.1 The allowable pressures and temperatures shall be in accordance with ANSI B31.1 and B31.3, and the individual limitations imposed by the back-up flange, gasket, pipe, and fasteners in accordance with ANSI B16.5.

10. Keywords

10.1 lap joint flange; loose flange joint; slip flange joint; spin flange joint; Van Stone flange

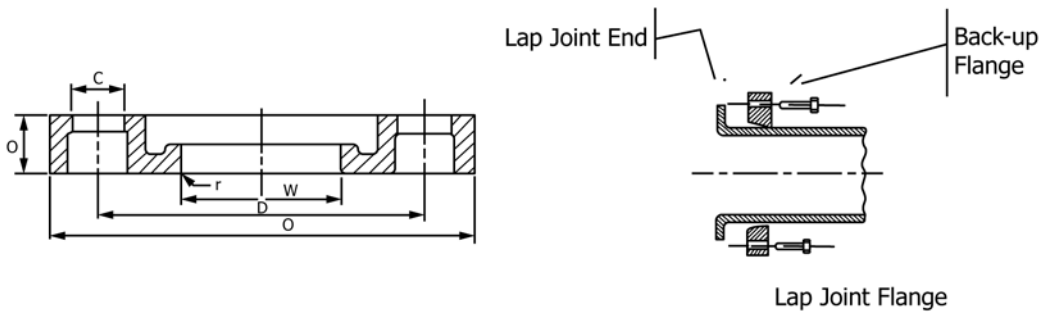

FIG. 1 Lap Joint End

TABLE 1 Materials Having Acceptable Forming Qualities to Produce a Lap Joint End

Material	ASTM Material Specifications
Copper	B88
	B280
Copper nickel	B466/B466M
	B467
Titanium[A]	B337 Grades 1 and 2
	B338 Grades 1 and 2
Steel[B]	A53/A53M
	A135
	A161 low carbon
	A199/A199M Grade T11
	A209/A209M Grade T1
	A250/A250M Grade T16
	A333/A333M Grade 1
	A500 Grade A
	A519 Grade 1010
	A589 Grade A
	A106/A106M Grade B
	A139/A139M Grade A
	A178/A178M
	A200 Grade T36
	A210/A210M Grade A-1
	A252 Grade 1
	A334/A334M Grade 1
	A512 Grade MT 1010
	A587
	A672 Grade A4
Stainless steel	A312/A312M TP 304
	A312/A312M TP 304L
	A312/A312M TP 309S
	A312/A312M TP 310S
	A312/A312M TP 316
	A312/A312M TP 316L
	A312/A312M TP 317
	A312/A312M TP 321
	A312/A312M TP 347

[A] Titanium run pipe must be commercially pure (99.1 %).
[B] Steel shall be hot formed in the temperature range from 850 to 1000°C (from 1562 to 1832°F). Under these conditions, no subsequent stress relieving is required.

TABLE 2 Lap Joint Flange—Dimensional Limitations for Tube (SI Units)

NOTE 1—Key: $10 \leq$ maximum wall in mm. $2 \leq$ minimum wall in mm.

Tube Diameter, mm	Material			
	Carbon Steel	Stainless Steel	Copper Nickel	Titanium
21.3	3.0	3.0	3.0	2.4
	1.0	1.0	1.0	1.0
26.9	3.7	3.5	4.0	2.4
	1.0	1.0	1.0	1.0
33.7	4.0	3.7	4.5	3.1
	1.5	1.5	1.5	1.5
42.4	5.5	4.7	5.5	3.1
	1.5	1.5	1.5	1.5
48.3	6.2	5.0	6.0	3.1
	1.5	1.5	1.5	1.5
60.3	7.0	5.0	6.0	3.1
	1.5	1.5	1.5	1.5
76.1	8.0	5.8	6.0	3.4
	1.5	1.5	1.5	1.5
88.9	8.8	5.8	6.0	3.4
	1.5	1.5	1.5	1.5
114.3	9.5	5.8	6.0	3.4
	1.5	1.5	1.5	1.5
139.7	9.5	5.8	6.0	3.8
	1.5	1.5	1.5	1.5
168.3	9.5	5.8	6.0	3.8
	1.5	1.5	1.5	1.5
219.1	9.5	5.8	6.0	4.2
	1.5	1.5	1.5	1.5
273	9.5	5.8	6.0	4.7
	2.0	2.0	2.0	2.0
323.9	10.3	5.8	6.4	5.1
	2.0	2.0	2.0	2.0
355.6	10.3	5.8		5.3
	2.0	2.0		2.0
406.4	10.3	5.8		5.3
	2.0	2.0		2.0

TABLE 3 Lap Joint Flange—Dimensional Limitations for Tube (Inches-Pound Units)

NOTE 1—Key: 0.375 ≤ maximum wall in inches. 0.06 ≤ minimum wall in inches.

	Material			
Tube Diameter, in.	Carbon Steel	Stainless Steel	Copper Nickel	Titanium
⅞	0.120	0.120	0.120	0.094
	0.040	0.040	0.040	0.040
1	0.145	0.138	0.158	0.094
	0.040	0.040	0.040	0.040
1¼	0.158	0.145	0.177	0.123
	0.060	0.060	0.060	0.060
1½	0.217	0.185	0.216	0.123
	0.060	0.060	0.060	0.060
2	0.245	0.200	0.235	0.123
	0.060	0.060	0.060	0.060
2½	0.275	0.200	0.235	0.123
	0.060	0.060	0.060	0.060
3	0.315	0.200	0.235	0.136
	0.060	0.060	0.060	0.060
4	0.346	0.200	0.235	0.136
	0.060	0.060	0.060	0.060
5	0.375	0.200	0.235	0.136
	0.060	0.060	0.060	0.060
6	0.375	0.200	0.235	0.151
	0.060	0.060	0.060	0.060
7	0.375	0.200	0.235	0.151
	0.060	0.060	0.060	0.060
8	0.375	0.200	0.235	0.167
	0.060	0.060	0.060	0.060
10	0.375	0.200	0.235	0.186
	0.080	0.080	0.080	0.080
12	0.406	0.200	0.250	0.203
	0.080	0.080	0.080	0.080

TABLE 4 Lap Joint Flange—Dimensional Limitations for Pipe

NOTE 1—Key—Nearest pipe schedule to max wall (where applicable) ≥ Schedule 40. 0.375 ≤ maximum wall in inches. 0.08 ≤ minimum wall in inches.

	Material							
Pipe Diameter (NPS)	Carbon Steel		Stainless Steel		Copper and Copper Nickel[A]	Titanium		
½	Schedule 40	0.120	Schedule 40	0.120	0.120	Schedule 10	0.094	
		0.040		0.040	0.040		0.040	
¾	Schedule 40	0.145	Schedule 40	0.138	0.158	Schedule 10	0.094	
		0.040		0.040	0.040		0.040	
1	Schedule 40	0.158	Schedule 40	0.145	0.177	Schedule 10	0.123	
		0.060		0.060	0.060		0.060	
1¼	Schedule 40	0.217	Schedule 40	0.185	0.216	Schedule 10	0.123	
		0.060		0.060	0.060		0.060	
1½	Schedule 40	0.245	Schedule 40	0.200	0.235	Schedule 10	0.123	
		0.060		0.060	0.060		0.060	
2	Schedule 40	0.275	Schedule 40	0.200	0.235	Schedule 10	0.123	
		0.060		0.060	0.060		0.060	
2½	Schedule 40	0.315	Schedule 40	0.230	0.235	Schedule 10	0.136	
		0.060		0.060	0.060		0.060	
3	Schedule 40	0.346	Schedule 40	0.230	0.235	Schedule 10	0.136	
		0.060		0.060	0.060		0.060	
4	Schedule 40	0.375	Schedule 10	0.230	0.235	Schedule 10	0.136	
		0.060		0.060	0.060		0.060	
5	Schedule 40	0.375	Schedule 10	0.230	0.235	Schedule 10	0.151	
		0.060		0.060	0.060		0.060	
6	Schedule 40	0.375	Schedule 10	0.230	0.235	Schedule 10	0.151	
		0.060		0.060	0.060		0.060	
8	Schedule 40	0.375	Schedule 10	0.230	0.235	Schedule 10	0.167	
		0.060		0.060	0.060		0.060	
10	Schedule 40	0.375	Schedule 10	0.230	0.235	Schedule 10	0.186	
		0.080		0.080	0.080		0.080	
12	Schedule 40	0.406	Schedule 10	0.230	0.250	Schedule 10	0.203	
		0.080		0.080	0.080		0.080	
14	standard wall	0.406	Schedule 10S	0.230	0.250	Schedule 10S	0.212	
		0.080		0.080	0.080		0.080	
16	standard wall	0.406	Schedule 10S	0.230	0.250	Schedule 10S	0.212	
		0.080		0.080	0.080		0.080	

[A] For copper-nickel, nearest pipe class to maximum pipe wall is Class 200.