

No. 1654

REPORT OF THE COMMITTEE ON STANDARDIZATION OF FLANGES AND PIPE FITTINGS

TO THE COUNCIL OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS:

Your Committee on the Standardization of Flanges and Pipe Fittings has agreed on the following additions to existing standards comprised in its report known as The American Standard for Pipe Flanges, Fittings and their Bolting, issued in 1914, and herewith presents them for your consideration and action:

Standardization of angle elbows and special angle fittings: From 1 deg. to 45 deg.: use center-to-face dimensions of standard 45-deg. elbows, American Standard, and over 45 deg., use center-to-face dimensions given for 90 deg. American Standard elbows.

1 A standard to be known as American Low-Pressure Standard for 50 lb. working pressure, tabulation of flange data attached. This standard was recommended after an agreement with the Committee of the Manufacturers' Association.

2 Three standards for hydraulic fittings, to be known as:

- 800-Lb. Hydraulic American Standard
- 1200-Lb. Hydraulic American Standard
- 3000-Lb. Hydraulic American Standard.

Tabulations and data for each of these standards with joint designs are submitted for your consideration. These are given in Tables 1 to 4, inclusive, and in Figs. 1, 2, and 3.

Your Committee deems it inadvisable at this time to outline or recommend a standard for 600 lb. steam pressure with superheat, partly because there is at present no demand for fittings for this

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pressure and because your Committee feels that it should be guided somewhat by experience in the field with the pressures and temperatures now in use, namely, 300 lb. pressure and 250 to 275 deg. superheat.

Your Committee, however, is ready to advise that for 400 lb. steam pressure and not exceeding 250 deg. superheat the 800-lb. Hydraulic American Standard in steel is adequate.

These recommendations bring the work of your Committee up to date so far as any requests that they have before them for consideration are concerned.

It is the desire of the Manufacturers' Association that the standards herein outlined be made effective at the earliest possible date. Your Committee, therefore, respectfully invites your early action.

Respectfully submitted,

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TABLE 1 PROPOSED LOW-PRESSURE STANDARD FOR END FLANGES, BOLTINGS AND BODY THICKNESS, — 50 LB. WORKING PRESSURE

Size	Diameter of Flange	Flange Thickness	Bolt-Circle Diameter	Number of Bolts	Size of Bolts	Body Thickness	Size	Diameter of Flange	Flange Thickness	Bolt-Circle Diameter	Number of Bolts	Size of Bolts	Body Thickness
12	19	1 1/4	17	12	1	5/8	56	68 3/4	3	65	48	1 1/4	1 5/8
14	21	1 3/8	18 3/4	12	1	1 1/8	58	71	3 3/8	67 1/4	48	1 1/4	1 5/8
15	22 1/4	1 3/8	20	16	1	1 1/8	60	73	3 3/8	69 1/4	52	1 1/4	1 11/16
16	23 1/2	1 7/8	21 1/4	16	1	1 1/8	62	75 3/4	3 3/4	71 1/8	52	1 1/4	1 11/16
18	25	1 7/8	22 3/4	16	1	1 1/8	64	78	3 1/2	74	52	1 1/4	1 11/16
20	27 1/2	1 11/16	25	20	1	1 1/8	66	80	3 3/8	76	52	1 1/4	1 11/16
22	29 3/8	1 11/16	27 1/4	20	1	1 1/8	68	82 1/2	3 3/8	78 1/4	56	1 1/4	1 11/16
24	32	1 7/8	29 1/4	20	1	1 1/8	70	84 1/2	3 3/8	80 1/2	56	1 1/4	1 11/16
26	34 1/4	2 1/8	31 3/4	24	1	1 1/8	72	86 1/2	3 1/2	82 1/2	60	1 1/4	1 11/16
28	36 3/8	2 1/8	34	28	1	1 1/8	74	88 1/2	3 3/8	84 1/2	60	1 1/4	2
30	38 3/8	2 3/8	36	28	1	1 1/8	76	90 3/4	3 3/8	86 3/8	60	1 1/4	2 1/8
32	41 3/4	2 3/8	38 3/4	28	1	1 1/8	78	93	3 3/8	88 3/4	60	1 1/4	2 1/8
34	43 3/4	2 5/8	40 3/4	32	1	1 1/8	80	95 1/4	3 3/8	91	60	1 1/4	2 1/8
36	46	2 3/8	42 3/4	32	1	1 1/8	82	97 1/2	3 7/8	93 1/4	60	1 1/4	2 1/8
38	48 3/4	2 3/8	45 1/4	32	1 1/8	1 3/8	84	99 3/4	3 7/8	95 1/2	64	1 1/4	2 1/8
40	50 3/4	2 1/2	47 1/4	36	1 1/8	1 1/4	86	102	4	97 3/4	64	1 1/4	2 1/4
42	53	2 5/8	49 1/2	36	1 1/8	1 1/4	88	104 1/4	4	100	68	1 1/4	2 5/8
44	55 1/4	2 5/8	51 3/4	40	1 1/8	1 5/8	90	106 1/2	4 1/8	102 1/4	68	1 1/4	2 3/8
46	57 1/4	2 11/16	53 3/4	40	1 1/8	1 3/8	92	108 3/4	4 1/8	104 1/2	68	1 1/4	2 3/8
48	59 1/2	2 3/4	56	44	1 1/8	1 7/8	94	111	4 1/4	106 1/4	68	1 1/4	2 7/8
50	61 3/4	2 3/4	58 1/4	44	1 1/8	1 7/8	96	113 1/4	4 1/4	108 1/2	68	1 1/4	2 7/8
52	64	2 7/8	60 3/4	44	1 1/8	1 7/8	98	115 3/4	4 1/4	110 3/4	68	1 1/4	2 7/8
54	66 1/4	3	62 3/4	44	1 1/8	1 7/8	100	117 3/4	4 3/8	113	68	1 1/4	2 9/16

NOTE

- 1 For sizes 10 in. and smaller, use regular 125-lb. American Standard flange dimensions and templates.
- 2 For sizes 12 in. and larger, use 125-lb. American Standard flange diameters, bolt circles, and number of bolts, using bolt diameters as shown above, thereby maintaining interchangeability with 125-lb. American Standard flanges.
- 3 Screwed companion flanges should not be thinner than 125-lb. American Standard thickness.

TABLE 2 800-LB. HYDRAULIC AMERICAN STANDARD FLANGES AND FLANGED FITTINGS, 12 IN. AND SMALLER, FOR FULL-WEIGHT WROUGHT PIPE, SEMI-STEEL AND CAST STEEL. (See Fig. 1)

800 Lb. Cold Water Working Pressure — Hydrostatic (no shock)
500 Lb. Cold Water Working Pressure — Shock
800 Lb. Air or Gas Working Pressure — Temperature Not Exceeding 100 Deg. Fahr.

Table with columns for Size (1/2 to 12) and rows for various fitting types (A-N). The table contains numerical values for each cell, representing dimensions or specifications for different pipe sizes and material types.

These fittings are recommended for pump columns, oil-transmission lines, gas lines and other hydraulic service where shock is negligible for a maximum working pressure of 800 lb. and a maximum temperature of 100 deg. Fahr. When subject to shock they are recommended for a maximum working pressure of 500 lb. The diameter of port is nominal size. Reducing fittings carry same dimensions center to face as straight-size fittings corresponding to largest opening. Flanges may be attached to the pipe by any of the following methods: Screw flanges; lap flanges; shrunks; opened or riveted flanges; flanges welded to pipe. Flanges on fittings and valves, also all companion flanges except those for lap joint, should be furnished with 3/8-in. raised face, as shown in dimension table, Fig. 2, unless otherwise specified. Bolt holes are 1/8 in. larger in diameter than bolts. Bolt holes straddle center lines. Unless otherwise specified, bolt holes in cast-steel fittings should be spot-faced. Square-head bolts with hexagonal nuts are recommended. Hexagonal nuts on sizes 3 in. and smaller can be conveniently pulled up with open-end wrenches with minimum-design heads. Hexagonal nuts on sizes 9 in. and larger can be conveniently pulled up with box wrenches. When flanges are screwed, shrunks, opened or riveted on the pipe, it is recommended that the end of the pipe and flange be re-reamed. Gaskets extending from the inside of the pipe to the inside edge of the bolts are recommended. The ultimate compressive strength of the gasket must be sufficient to prevent its being crushed when the bolts are pulled up. Where long-radius elbows are desired, the use of pipe bends is recommended.

TABLE 3 1200-LB. HYDRAULIC AMERICAN STANDARD FLANGES AND FLANGED FITTINGS, 12 IN. AND SMALLER, FOR EXTRA STRONG WROUGHT PIPE, SEMI-STEEL AND CAST STEEL. (See Fig. 1)

1200 Lb. Cold Water Working Pressure — Hydrostatic (no shock)
 800 Lb. Cold Water Working Pressure — Shock
 1200 Lb. Air or Gas Working Pressure — Temperature Not Exceeding 100 Deg. Fahr.

See Fig. 1	Size	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	6	7	8	9	10	12
A	Inside diameter of port.....	1 1/2	1 3/4	2	2 1/4	2 1/2	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	5	5 1/2	6	6 1/2	7	7 1/2
B	Center to face, ell, tee, cross.....	3 3/4	4	4 1/2	5	5 1/2	6 1/2	7	7 1/2	7 3/4	8 1/2	9	9 1/2	10 1/2	11	11 1/2	12 1/2	13 1/2	14 1/2
C	Face to face, tee, cross, reducer.....	7	8	8 1/2	9 1/2	10	11 1/2	12 1/2	13	13 1/2	14 1/2	15 1/2	16 1/2	17 1/2	18 1/2	19 1/2	20 1/2	21 1/2	22 1/2
D	Center to face, 45-deg. ell.....	2 1/2	3	3 1/2	4	4 1/2	5 1/2	6	6 1/2	6 3/4	7 1/2	7 3/4	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2	14 1/2
E	Center to face, lateral.....	7	8	8 1/2	9 1/2	10	11 1/2	12 1/2	13	13 1/2	14 1/2	15 1/2	16 1/2	17 1/2	18 1/2	19 1/2	20 1/2	21 1/2	22 1/2
F	Center to face, lateral.....	2	2 1/2	2 3/4	3 1/4	3 1/2	4 1/4	4 1/2	4 3/4	5 1/4	5 1/2	5 3/4	6 1/4	6 1/2	6 3/4	7 1/4	7 1/2	7 3/4	8 1/4
G	Face to face, lateral.....	9	10 1/2	11 1/2	13	14 1/2	16	17 1/2	19	21	23	25 1/2	27 1/2	29	31 1/2	35	37 1/2	40	43 1/2
H	Diameter of flange.....	4 1/2	5 1/2	6	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2	14 1/2	15 1/2	16 1/2	18 1/2	20	21 1/2	24
K	Thickness of flange } Semi-steel	1 1/2	1 3/4	2	2 1/4	2 1/2	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	5	5 1/2	6 1/2	7 1/2	8 1/2	9
L	Diameter of raised face.....	1 1/2	1 3/4	2	2 1/4	2 1/2	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	5	5 1/2	6 1/2	7 1/2	8 1/2	9
M	Height of raised face.....	1 1/2	1 3/4	2	2 1/4	2 1/2	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	5	5 1/2	6 1/2	7 1/2	8 1/2	9
N	Minimum metal thickness } Semi-steel	1 1/2	1 3/4	2	2 1/4	2 1/2	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	5	5 1/2	6 1/2	7 1/2	8 1/2	9
	Diameter of bolt circle.....	3	3 3/4	4	4 1/2	4 3/4	5 1/2	6	6 1/2	6 3/4	7 1/2	7 3/4	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2	14 1/2
	Number of bolts.....	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Diameter of bolts.....	2 1/2	3	3 1/2	3 3/4	4	4 1/2	4 3/4	5 1/4	5 1/2	5 3/4	6 1/4	6 1/2	6 3/4	7 1/4	7 1/2	7 3/4	8 1/4	8 1/2
	Length of bolts } Semi-steel	2 1/2	3	3 1/2	3 3/4	4	4 1/2	4 3/4	5 1/4	5 1/2	5 3/4	6 1/4	6 1/2	6 3/4	7 1/4	7 1/2	7 3/4	8 1/4	8 1/2
	Length of bolts } Cast steel.....	2 1/2	3	3 1/2	3 3/4	4	4 1/2	4 3/4	5 1/4	5 1/2	5 3/4	6 1/4	6 1/2	6 3/4	7 1/4	7 1/2	7 3/4	8 1/4	8 1/2

These fittings are recommended for pump columns, oil-transmission lines, gas lines and other hydraulic service where shock is negligible for a maximum working pressure of 1200 lb. and a maximum temperature of 100 deg. Fahr. Where subject to shock they are recommended for a maximum working pressure of 800 lb. The diameter of port is approximately the same as the inside diameter of Extra Strong Pipe. Reducing fittings may be used to connect to the pipe by any of the following methods: Screw flanges; lap flanges; shrunk, peened or riveted flanges; flanges welded to pipe. Flanges may be attached to the pipe by any of the following methods: Screw flanges; lap flanges; shrunk, peened or riveted flanges; flanges welded to pipe. Flanges on fittings and valves, also all companion flanges except those for lap joint, should be furnished with 1/4-in. raised face, as shown in dimension table, Fig. 2, unless otherwise specified. Bolt holes are 1/8 in. larger in diameter than bolts. Bolt holes straddle center lines. Unless otherwise specified, bolt holes in cast-steel fittings should be spot-faced. Square-head bolts, with hexagonal nuts are recommended. Hexagonal nuts on sizes 8 in. and smaller can be conveniently pulled up with open-end wrenches with minimum design heads. Hexagonal nuts on sizes 9 in. and larger can be conveniently pulled up with box wrenches. When flanges are screwed, shrunk, peened or riveted on the pipe, it is recommended that the end of the pipe and flange be refaced. Gaskets extending from the inside of the pipe to the inside edge of the bolts are recommended. The ultimate compressive strength of the gasket must be sufficient to prevent its being crushed when the bolts are pulled up. Where long-radius elbows are desired, the use of pipe bends is recommended.

TABLE 4 3000-LB. HYDRAULIC AMERICAN STANDARD FLANGES AND FLANGED FITTINGS, 12 IN. AND SMALLER, FOR DOUBLE EXTRA STRONG WROUGHT PIPE, CAST STEEL. (See Fig. 1)

3000 Lb. Cold Water Working Pressure — Hydrostatic (no shock)
 2000 Lb. Cold Water Working Pressure — Shock
 3000 Lb. Air or Gas Working Pressure — Temperature Not Exceeding 100 Deg. Fahr.

See Fig. 1	Size	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	6	7	8	9	10	12
A	Inside diameter of port.....	3 3/4	4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2	14 1/2	15 1/2	16 1/2	17 1/2	18 1/2	20 1/2	24 1/2
B	Center to face, ell, tee, cross.....	3 3/4	4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2	14 1/2	15 1/2	16 1/2	17 1/2	18 1/2	20 1/2	24 1/2
C	Face to face, tee, cross, reducer.....	7	8	9	10	11 1/2	13	14	15 1/2	17	18	20	22	24	26	29	31	33	35
D	Center to face, 45-deg. ell.....	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7	7 1/2	8	8 1/2	9	9 1/2	10	11	11
E	Center to face, lateral.....	7	8	9	10	11	12 1/2	13 1/2	14 1/2	16	17 1/2	19 1/2	21	22 1/2	24 1/2	27 1/2	29 1/2	31 1/2	34 1/2
F	Center to face, lateral.....	9	10 1/2	11 1/2	13	14 1/2	16	17 1/2	19	21	23	25 1/2	27 1/2	29	31 1/2	35	37 1/2	40	43 1/2
G	Face to face, lateral.....	4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2	14 1/2	15 1/2	16 1/2	17 1/2	18 1/2	20	21 1/2	24
H	Diameter of flange.....	4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2	14 1/2	15 1/2	16 1/2	17 1/2	18 1/2	20	21 1/2	24
K	Thickness of flange.....	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
L	Diameter of raised face.....	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
M	Height of raised face.....	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16	1/16
N	Minimum metal thickness.....	3/16	3/16	3/16	3/16	3/16	3/16	3/16	3/16	3/16	3/16	3/16	3/16	3/16	3/16	3/16	3/16	3/16	3/16
	Diameter of bolt circle.....	3	3 3/8	4	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8
	Number of bolts.....	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Diameter of bolts.....	1/2	5/8	3/4	7/8	1	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
	Length of bolts.....	2 1/2	3	3 1/4	4	4 1/4	4 1/4	4 1/4	4 1/4	4 1/4	4 1/4	4 1/4	4 1/4	4 1/4	4 1/4	4 1/4	4 1/4	4 1/4	4 1/4

These fittings are recommended for hydraulic services where shock is negligible for a maximum working pressure of 3000 lb. and a maximum temperature of 100 deg. Fahr. Where subject to shock they are recommended for a maximum working pressure of 2000 lb. The diameter of port is approximately the same as the inside diameter of Double Extra Strong Pipe. Reducing fittings carry same dimensions center to face as straight-size fittings corresponding to largest opening. Flanges may be attached to the pipe by either of the following methods: Screw flanges; flanges welded to pipe. Screw flanges are furnished with plain face and are threaded with 1-in. raised face. Hexagonal nuts are recommended. Hexagonal nuts on sizes 6 in. and larger can be conveniently pulled up with open-end wrenches with minimum-design heads. If hexagonal nuts on sizes 6 in. and larger can be conveniently pulled up with box wrenches. Gaskets extending from the inside of the pipe to the inside edge of the bolts are recommended. The ultimate compressive strength of the gasket must be sufficient to prevent its being crushed when the bolts are pulled up. Soft metallic gaskets at least 1/8 in. thick are recommended. Where long-radius elbows are desired, the use of pipe bends is recommended.

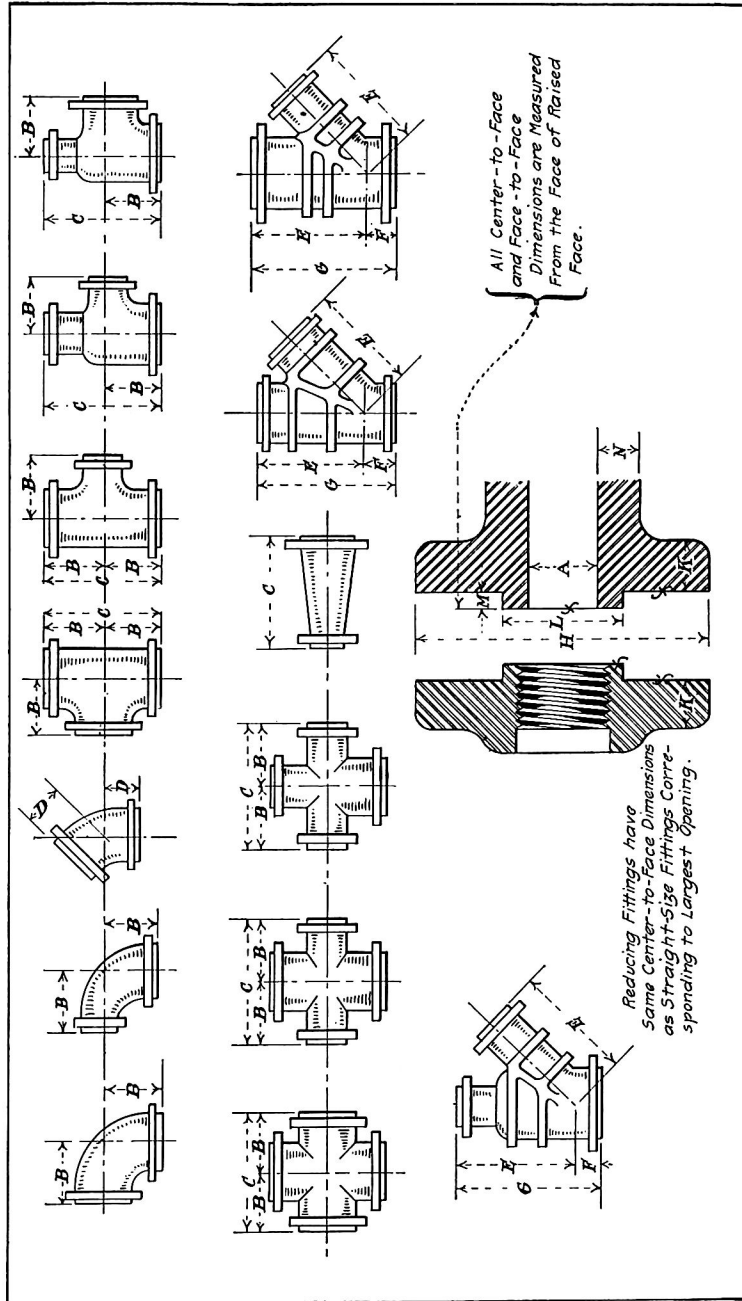


FIG. 1 HYDRAULIC AMERICAN STANDARD FLANGES AND FLANGED FITTINGS DIMENSIONED IN TABLES 2, 3 AND 4

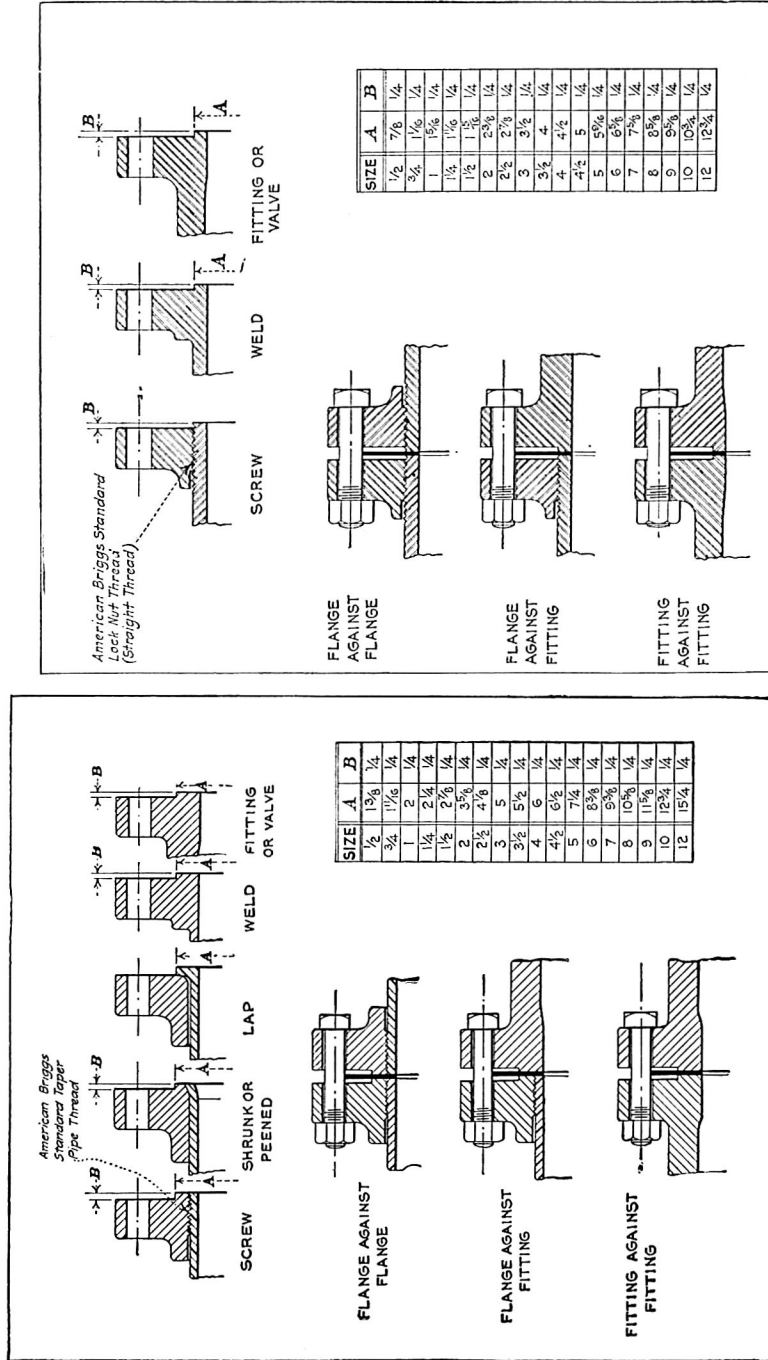


FIG. 3 FLANGE JOINTS AND METHODS OF ATTACHING FLANGES TO PIPE, 3000-LB. HYDRAULIC AMERICAN STANDARD

FIG. 2 FLANGE JOINTS AND METHODS OF ATTACHING FLANGES TO PIPE, 800-LB. AND 1200-LB. HYDRAULIC AMERICAN STANDARD