WELDING FITTINGS
FORGED FLANGES

CRANE

Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/1



CRANE



WARRANTY

If, within one year following date of delivery, any material manufactured by or trade-marked for Crane Co. proves defective, Buyer shall not return it unless requested to do so but shall immediately notify Crane Co. stating full particulars in support of his claim and, if faulty workmanship or material is involved, Crane Co. will adjust the matter fairly and promptly. Under no circumstances shall Crane Co. be obligated to allow claims for consequential damages or for any labor or other expenses incurred by reason of the use or sale of any defective material, the sole measure of damages being the price received therefor by Crane Co.

SECTION	MATERIAL		PAGES	FINDER
	INTRODUCTION		4 - 15	1
WELDING FITTINGS	Catalog Numbers	Types	16 - 17	2
	12, 13, 14, 15	90° Elbows	18 - 27	3
	12	Reducing Elbows	28 - 31	4
	17, 18	45° Elbows	32 - 37	5
	22, 23	180° Returns	38 - 41	6
		Types	42 - 43	7
	24	Tees	44 - 53	8
		Extrusions	54 - 55	9
	26, 27	Saddles	56 - 57	10
	28, 29	Shaped Nipples	58 - 59	11
	25, 32, 33	Crosses, Laterals	60 - 61	12
		Types	62 - 63	13
	36, 37	Reducers	64 - 71	14
	35	Caps	72 - 73	15
	38	Lap Joint Stub Ends	74 - 75	16
	42, 45, 46, 47	Sleeves, Backing Rings	76 - 77	17
		Pipeline	78 - 79	18
		Nuclear	80 - 81	19
		Special Metals	82 - 83	20
		Special Design	84 - 85	21
FORGED FLANGES	INTRODUCTION		86 - 87	22
	ASA	150 lb.	88 - 89	23
		300 lb.	90 - 91	24
		400 lb.	92 - 93	25
		600 lb.	94 - 95	26
		900 lb.	96 - 97	27
		1500 lb.	98 - 99	28
		2500 lb.	100 - 101	29
	OTHER	Orifice Unions	102 - 105	30
		Large Diameter	106 - 109	31
		Long Welding Necks	110	32
	SPECIAL		111	33
DESIGN DATA	INTRODUCTION		112	34
	STANDARDS AND SPECIFICATIONS		113 - 125	35
	DIMENSIONS AND PROPERTIES		126 - 146	36
	PRESSURE RATINGS		147 - 167	37
	OTHER TECHNICAL INFORMATION		168 - 173	38

Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/2

CRANE

WELDING FITTINGS
FORGED FLANGES

CRANE CO.
ST. LOUIS FITTING DIVISION

General Offices: 4100 So. Kedzie Avenue, Chicago, Illinois 60632
Plant: 1450 So. Second Street, St. Louis, Missouri 63166

SALES OFFICES IN ALL PRINCIPAL CITIES

Reprinted — 1967

Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/3

ILLUSTRATED INDEX

TECHNICAL DATA INDEX—PG 112

ELBOWS AND RETURNS

Types, Size Ranges 16


90° Elbows
Long Radius, ASA 18


90° Elbows
Long Radius, Long Tangent . 22


90° Elbows
Short Radius 24


90° Elbows
Short Radius, Long Tangent . 26


90° Elbows
Long Radius, Reducing . . 28


45° Elbows
Long Radius, ASA 32


45° Elbows
Long Radius, Long Tangent . 36


180° Returns
Long Radius, ASA 38


180° Returns
Short Radius 40

BRANCH CONNECTIONS

Types, Size Ranges 42


Tees
Straight and Reducing . . 44


Extrusions
Headers and Tees 54


Saddles
Regular Type 56


Saddles
Wrap-Around 57


Shaped Nipples
90-degree 58


Shaped Nipples
45-degree 59


Crosses
Straight and Reducing . . 60


Laterals
Reinforced and Unreinforced . 61

OTHER FITTINGS

Types, Size Ranges 62


Reducers
Concentric and Eccentric . . 64

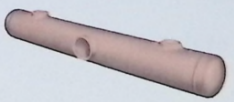

Caps 72


Stub Ends
Lap Joint Type 74


Sleeves
Butt-Welding 76


Backing Rings
Nub Type 77

SPECIAL FITTINGS


Pipe Line Fittings . . 78


Nuclear Fittings . . 80


Special Metals . . . 82
Special Design . . . 84

FLANGES

Types, Size Ranges 86


ASA Types
Welding Neck, Slip-On,
Screwed, Lap Joint.
Socket Welding, Blind . . . 88

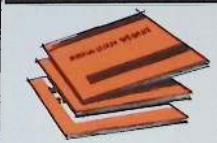

Orifice Unions
Welding Neck, Slip-On,
Screwed 102


Large Diameter
Welding Neck, Slip-On, Blind 106


Long Welding Necks . . . 110


Special Types 111

DESIGN DATA


Standards and
Specifications 113


Dimensions and
Properties 126


Pressure Ratings and
Stress Values 147


Other Technical
Information 168

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 4 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/4



World's most complete selection of welding fittings and flanges

CRANE

Variety of Fittings Unique among welding fitting producers, Crane has the equipment and skills necessary to manufacture a full product range in two completely different types of fittings: — **seamless** and **welded.** This versatility, permitting the use of either tubing or plate as raw material, makes possible "the world's most complete selection," both in regular welding fittings available from distributors' stocks, and in special fittings designed to meet unusual requirements.

Quality of Fittings The finest welding fittings ever made are produced by Crane. Hot-coining . . . scrupulously controlled forging heats . . . radiographic proof of welding quality . . . special machining of all fittings — these and other "bonus" production procedures are combined with the newest and most modern equipment, the latest techniques, and over thirty years of experience in producing every type and size and thickness of quality welding fitting.

Technical Information Crane's long experience as a welding fitting manufacturer is supplemented by forty years of dealing with fabricators, and by more than sixty years of experience with high-pressure, high-temperature piping systems. This rich background of technical knowledge is at the disposal of Crane's customers in designing and producing every type of welding fitting and flange for every type of application.

Complete Distributor Organization Crane's network of distributors reaches into every major industrial area in the country. Carrying adequate stocks of fittings and flanges, and servicing their accounts with trained sales representatives, these authorized jobbers form an intimate and indispensable link between manufacturer and consumer or contractor. Their services offer the quickest, most effective means of solving every piping problem.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 5 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/5

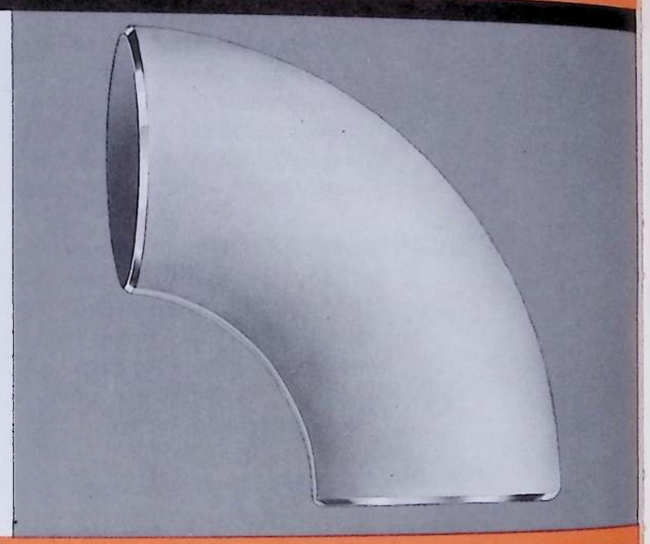
seamless fittings

The finest seamless welding fittings ever made. *Hot-coined* fittings (sized in compression) . . . dimensionally accurate from end to end. Fittings formed at controlled heat for superior metallurgical quality . . . with *specially* machined ends for quickest fit-up and welding. Produced by the newest and most modern equipment—combining latest technologies in hot forming, sizing, heat treating and machining. Available in all types of fittings; sizes through 24".



welded fittings

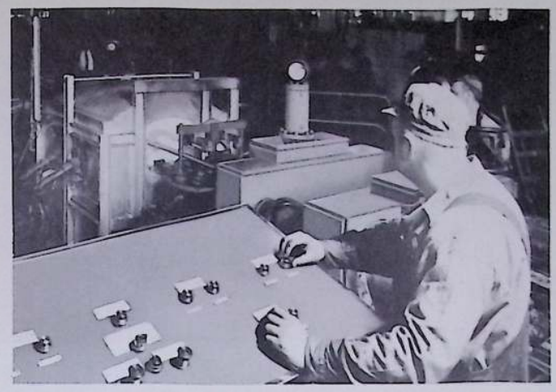
Same high quality as always . . . fully *heat-treated* and *x-rayed* in full compliance with ASTM A234. Regular fittings and long tangent "bonus" ells available from stock in all sizes through 36" (to order, through 48"). Welded-type fittings can be made in heavy wall (2", 3", 4" or more) . . . of Inconel, Hastelloy and all other weldable metals. Fittings with extra tangent lengths, reducing ells, and fittings of unusual shape are made best as welded-type fittings.



forged flanges

From selection of raw materials to inspection and testing of the finished product, the highest standards of quality are maintained. Specification requirements are scrupulously followed, with *controlled* forming of maximum radii hub fillets and full flange thickness, plus closely-held machining tolerances. Crane stock flanges are available in all types, in sizes through 24"; larger flanges to order.

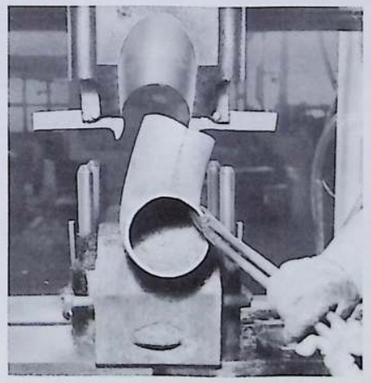




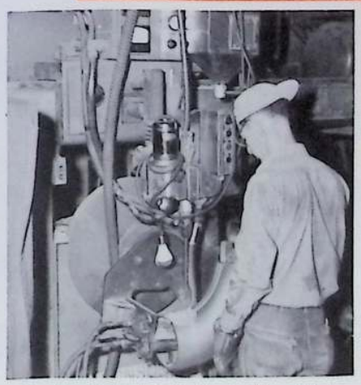
In the manufacture of Crane carbon steel seamless elbows, selected tubing conforming to ASTM Specification A106, Grade B, is hot-formed over a specially shaped mandrel which insures uniform wall thickness.



Formed fitting is conveyed to a coining press where it is hot-worked in compression to the exact diameter and configuration required. This imparts exceptional uniformity and dimensional accuracy to the fitting.



In the manufacture of Crane carbon steel welded-type fittings, firebox quality plate conforming to ASTM A-515, Grade 70, is hot-formed in compression.



The longitudinal joint is double-welded, inside and outside, by the most modern techniques and equipment, such as the automatic welding machine shown above.

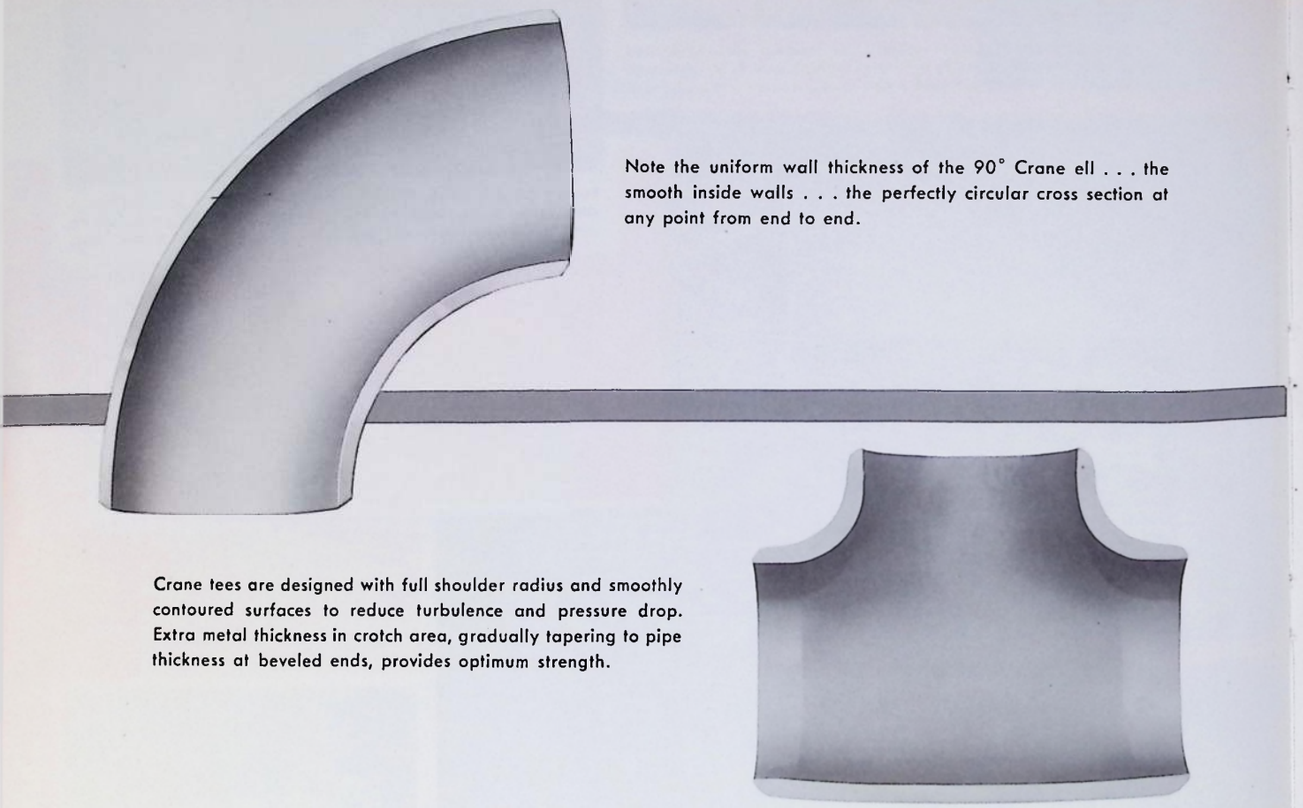


The entire elbow, deliberately made oversize in the initial forming operation, is reheated after welding, and hot-coined in compression by totally-enclosing dies.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 6 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/6

balanced design

Balanced design is the proper distribution of metal thickness and optimum geometric shape to provide a combination of strength and easy alignment for butt - welding to other components. In all Crane fittings and flanges, balanced design insures greatest possible mechanical strength against internal pressure and external loading.



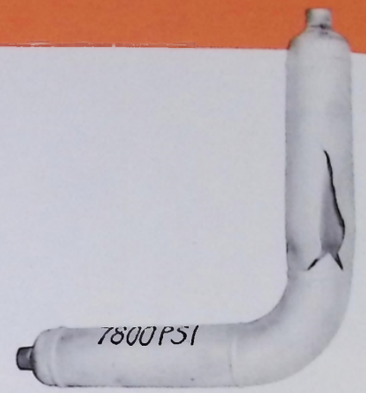
Note the uniform wall thickness of the 90° Crane ell . . . the smooth inside walls . . . the perfectly circular cross section at any point from end to end.

Crane tees are designed with full shoulder radius and smoothly contoured surfaces to reduce turbulence and pressure drop. Extra metal thickness in crotch area, gradually tapering to pipe thickness at beveled ends, provides optimum strength.



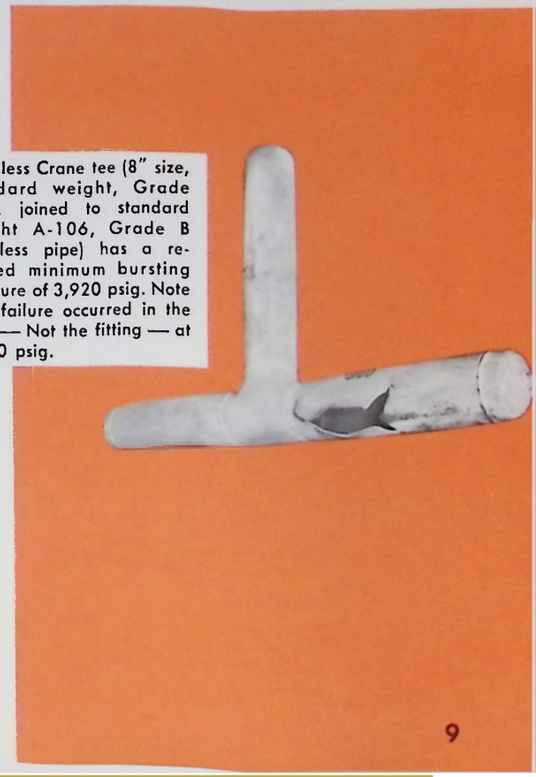
Full-sized hubs and flange thicknesses, in complete compliance with ASA standards, plus maximum hub fillet radius, assure optimum flange strength. Accurate back- or spot-facing and precisely machined gasket faces provide full bearing surfaces and guarantee joint tightness.

The required proof of design in welding fittings is the burst test—as specified by ASA B16.9. But Crane does more! Flow-characteristic tests, strain tests, and tests to determine the ability of fittings to withstand other critical factors, such as fatigue and thermal shock, are only a portion of the research activities of Crane.





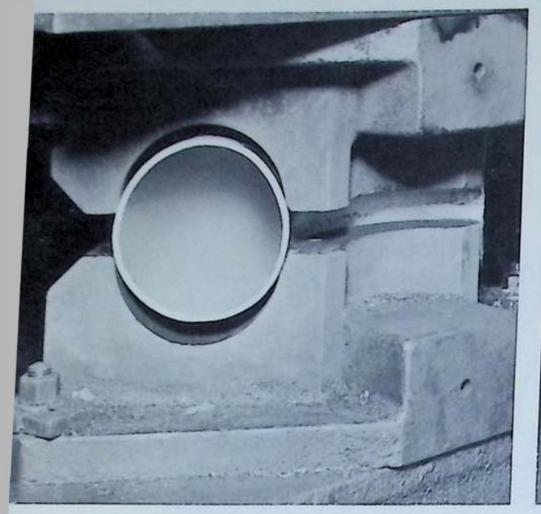
In this stress analysis test, strains produced by internal hydrostatic loads are carefully measured by electrical strain gages. Constant evaluation of test results helps in the design of safer and more efficient fittings.



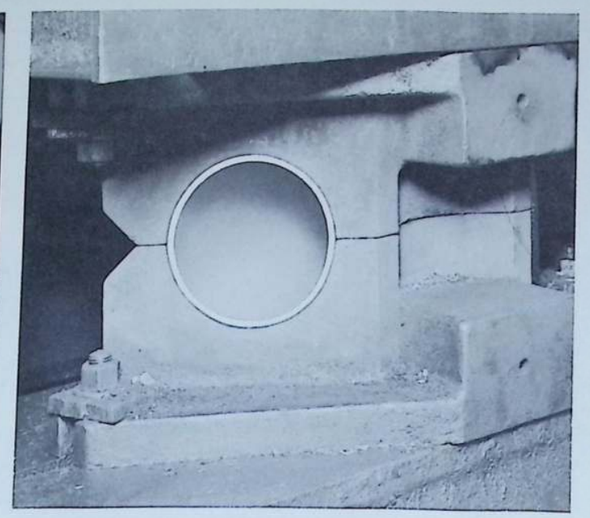
Seamless Crane tee (8" size, standard weight, Grade WPB, joined to standard weight A-106, Grade B seamless pipe) has a required minimum bursting pressure of 3,920 psig. Note that failure occurred in the pipe — Not the fitting — at 6,100 psig.

Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/7

DIMENSIONAL CONTROL for accuracy and uniformity



HOT COINING — For accurate inside and outside diameters, Crane elbows — both seamless and welded types — are deliberately made oversize, then hot-coined (sized in compression) for their entire length. As a result, fittings are circle-perfect from end to end — uniform in diameter and wall thickness. Elbows can be segmented at any point.

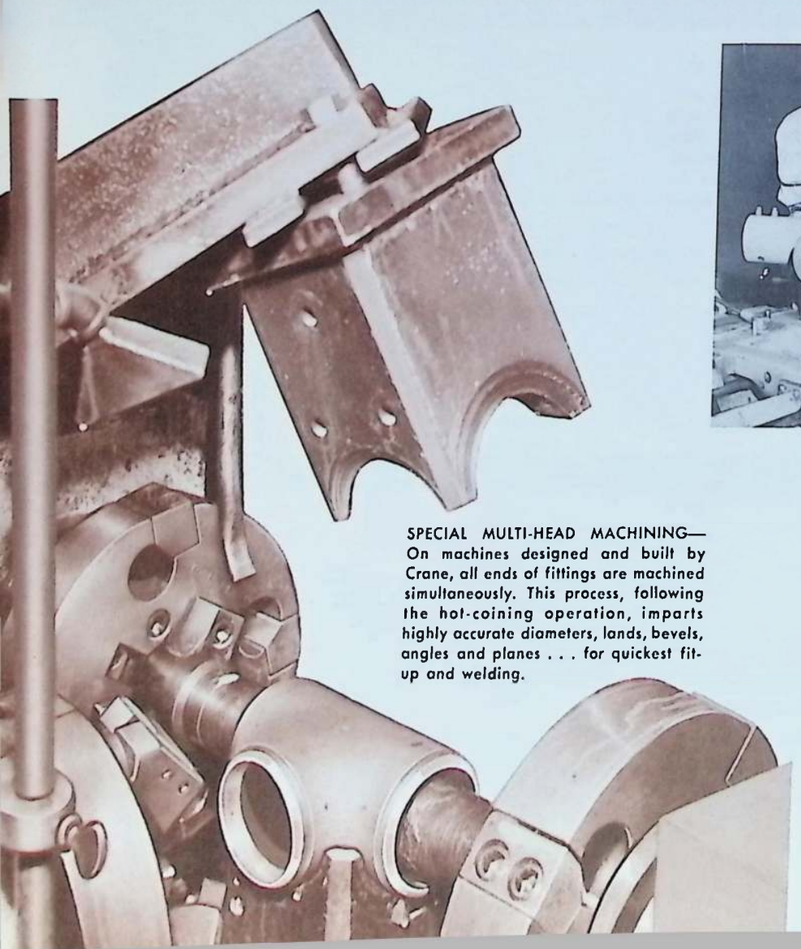




INTERNAL BORING — Internal boring equipment, designed by Crane, assures unusually close tolerances on internal surface of fitting, when required for supercritical service.



EXTERNAL MACHINING — This unique lathe, typical of modern equipment available for special fittings, machines external surface of elbow to extremely close tolerances.



SPECIAL MULTI-HEAD MACHINING — On machines designed and built by Crane, all ends of fittings are machined simultaneously. This process, following the hot-coining operation, imparts highly accurate diameters, lands, bevels, angles and planes . . . for quickest fit-up and welding.

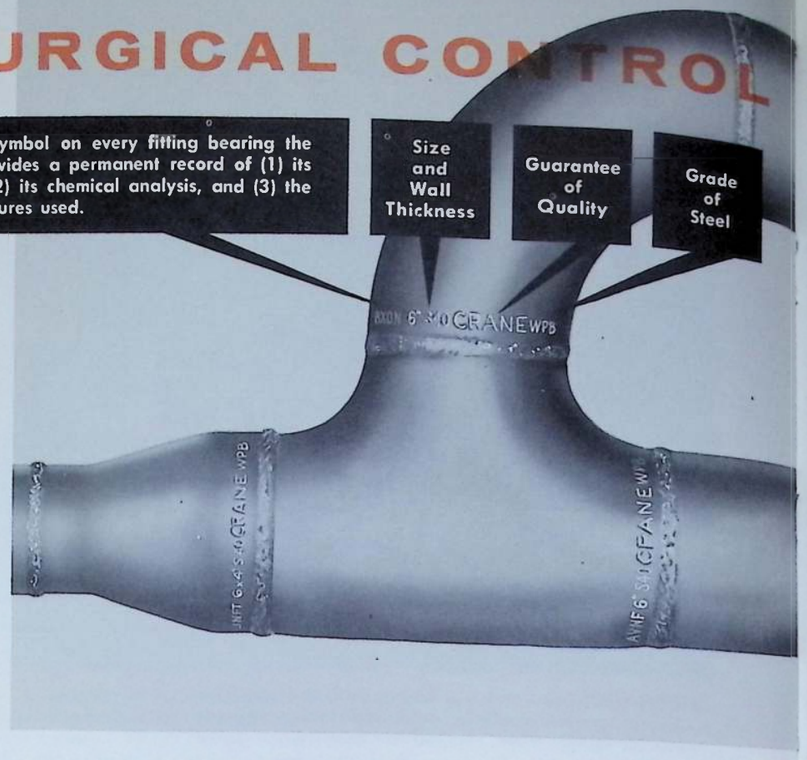
FLANGE MACHINING—At Crane, precise machining produces flanges of exceptional accuracy. This modern equipment is machining the bore of a 6" 600 lb. flange.



INSPECTING—Complete inspection utilizing a wide variety of measuring devices such as ring gages, specially constructed dial calipers, and other instruments—is made on every fitting.

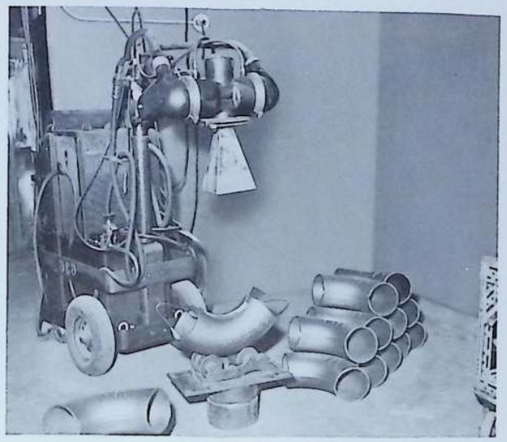
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/8

METALLURGICAL CONTROL of *stock* fittings and flanges



Close control of metallurgy is important in the production of sound, uniform fittings and flanges. Crane's plant is equipped with the most modern and efficient facilities for this purpose. Controls and checks on the metallic structure of fittings is exercised through the entire manufacturing process, from selection of raw materials to final testing and inspection.



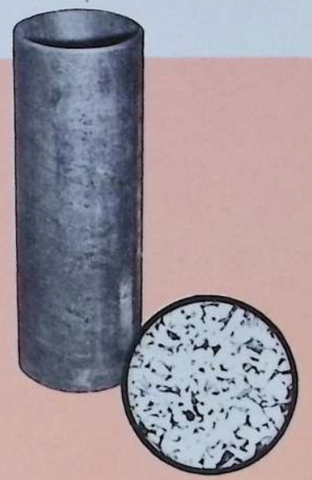


All welded type fittings are x-rayed in conformance with ASTM Specification A-234, which requires selective radiographic control for ordinary carbon steel fittings, and 100% weld x-ray for all alloy and heavy-wall fittings. Quality standards are those of Paragraph UW-51 of the ASME Boiler and Pressure Vessel Code.

Tees are selectively heated in an electrically-fired, molten salt bath furnace. The molten salt solution provides uniform and closely controlled heating.

Recording potentiometers provide close temperature control for furnaces which heat tubing or plate prior to forming and hot-coining operations.





The influence of Crane manufacturing processes on the basic metal structure is graphically indicated in this series of metallographic studies. Photomicrograph at left shows grain structure of raw material as it is received by Crane.

After hot-coining operation, photomicrograph (magnification: 100X) shows the finer grain structure achieved.

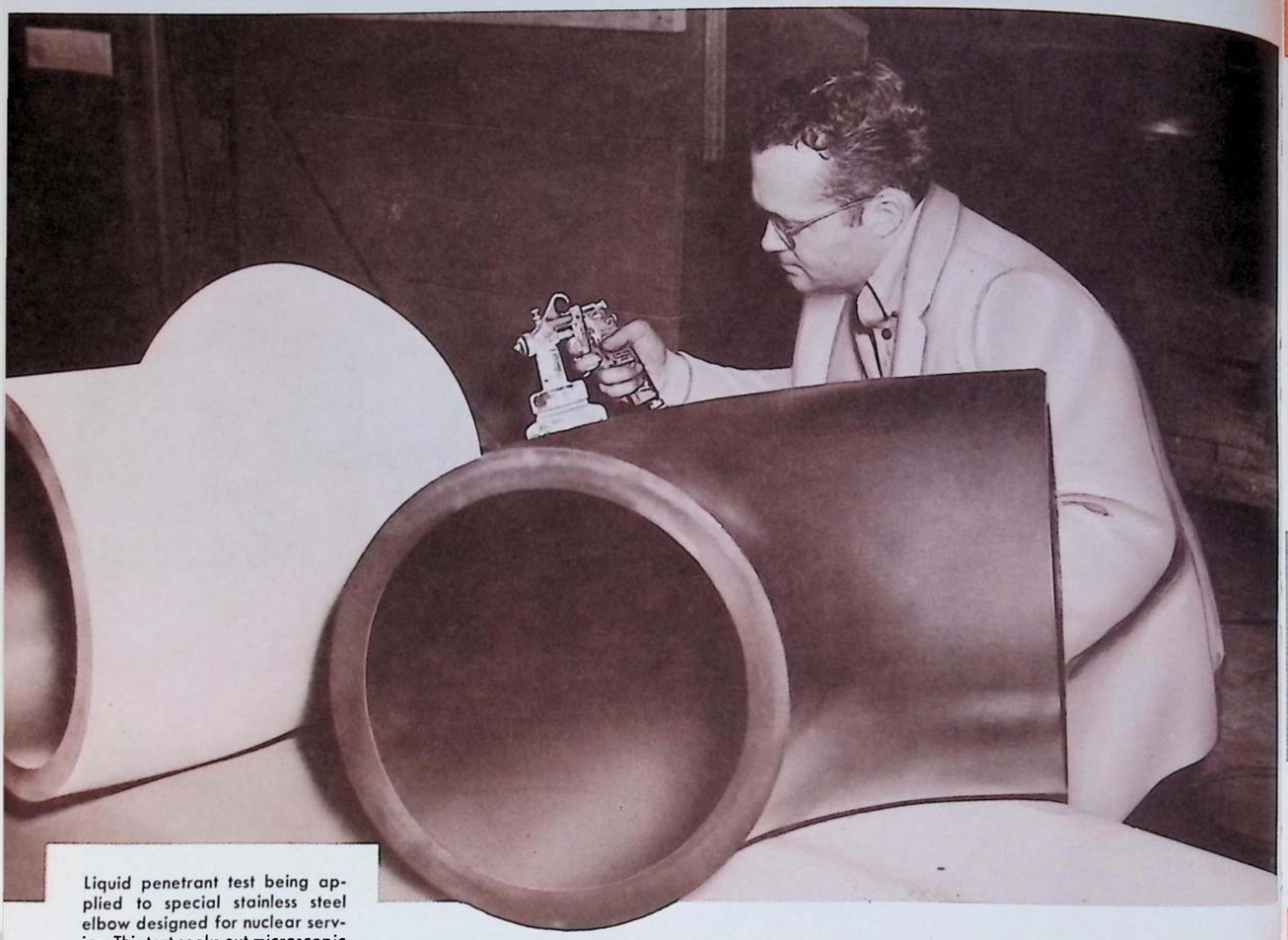




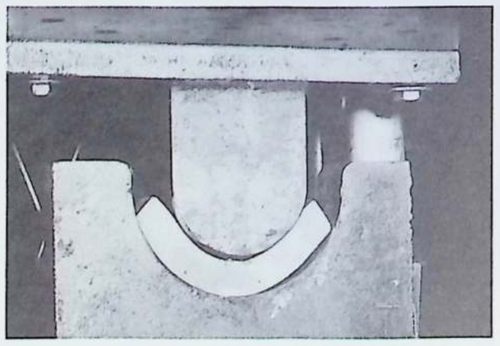
Even greater improvement in metallic properties is revealed by this photomicrograph made after the fitting has been normalized.

Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/9

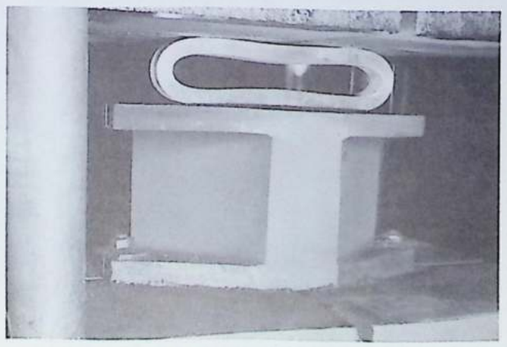
METALLURGICAL CONTROL for special fittings and flanges



Liquid penetrant test being applied to special stainless steel elbow designed for nuclear service. This test seeks out microscopic surface imperfections.

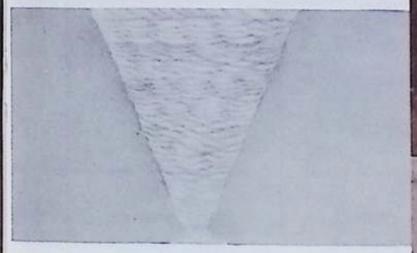


In the reverse bend test, an arc of the test ring, including the weld, is cut out and completely bent back upon itself. Bend is closely examined for signs of fissuring or other discontinuities.



Test ring cut from seamless or welded fitting is flattened, then closely examined for possible defects. This is one of many destructive tests performed.

Crane makes special fittings in a variety of sizes, configurations and materials. Because they are unusual fittings designed for unusual uses, they are subjected to a great battery of controls, tests, checks and inspections. Crane takes every precaution to insure that the fitting will meet or surpass the specifications of the customer.



Cross section of 20" O.D. x 4 1/16" wall elbow, formed from alloy plate and welded. Chemical etching of weld cross section before heat treatment reveals each of 150 weld passes required for this seam.

Magnetic particle inspection of alloy tee—a non-destructive method for detecting cracks or other discontinuities on the surface of magnetic materials.



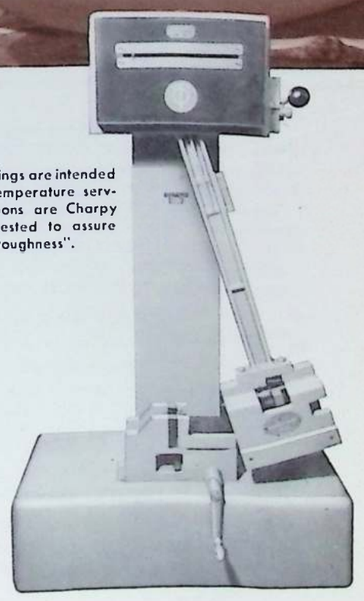


UR Reflectoscope being applied to Inconel elbow for ultrasonic verification of metal thickness and internal soundness of fitting.



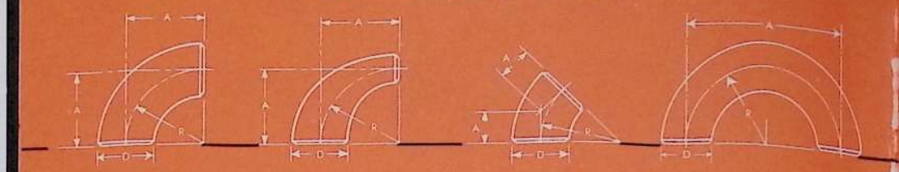
Type 316 stainless steel fitting is tested for resistance to intergranular corrosion. Chemical tests are always part of the quality verification procedures.

When fittings are intended for low temperature service, coupons are Charpy Impact Tested to assure proper "toughness".



Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/10

TYPES OF ELBOWS



CATALOG PAGE NO.			18 - 21	28 - 31	32 - 35	38 - 39	22 - 23	36 - 37	24 - 25	40 - 41	26 - 27	78 - 79
DIMENSIONS	NOMINAL PIPE SIZE RANGE	D	½" - 42"	2" - 30"[5]	½" - 42"	½" - 30"	2" - 36"	2" - 30"	1" - 42"	1" - 30"	8" - 42"	2" - 42"
	RADIUS	R	1½ D[6]	1½ D	1½ D[6]	1½ D[6]	1½ D	1½ D	1 D	1 D	1 D	3 D
	TANGENT	T	—	—	—	—	¼ D[1]	¼ D[1]	—	—	¼ D[1]	Various
	LENGTH	A	1½ D[6]	1½ D	⅝ D (approx.)	3 D	1¾ D[1]	⅞ D (approx.)	1 D	2 D	1¼ D[1]	[3]
AVAILABLE IN:	METALS[2]		Grade B Steel Wrought Iron 1¼ Cr - ½ Mo 2¼ Cr - 1 Mo 5 Cr - ½ Mo 7 Cr - ½ Mo 9 Cr - 1 Mo Stainless	Grade B Steel Wrought Iron 1¼ Cr - ½ Mo 5 Cr - ½ Mo Stainless	Grade B Steel Wrought Iron 1¼ Cr - ½ Mo 2¼ Cr - 1 Mo 5 Cr - ½ Mo 7 Cr - ½ Mo 9 Cr - 1 Mo Stainless	Grade B Steel	Grade B Steel Wrought Iron	Grade B Steel Wrought Iron	Grade B Steel	Grade B Steel	Grade B Steel	To order
	THICKNESSES[2]		Standard Extra Strong Double Ex. Stg. Light Wall Schedule Nos.	Standard Extra Strong Double Ex. Stg. Schedule Nos.	Standard Extra Strong Double Ex. Stg. Light Wall Schedule Nos.	Standard Extra Strong	Standard Extra Strong	Standard Extra Strong	Standard Extra Strong	Standard Extra Strong	Standard Extra Strong	To order
	CONSTRUCTION[4]		Seamless or Welded	Welded	Seamless or Welded	Seamless or Welded	Seamless or Welded	Welded	Seamless or Welded	Seamless or Welded	Welded	Seamless or Welded

[1] Maximum tangent length (T) = 6". [2] Other metals and other thicknesses furnished to order. [3] "Contur" Ell length varies with size and angle of fitting. [4] See individual catalog pages for details. [5] Reductions to half-size. [6] Except ½" size.

Crane's exclusive flexibility, permitting the manufacture of elbows from either pipe or plate, results in a broad, unique variety of fittings, readily adaptable to the piping designer's needs and to field requirements.

The chart above is designed to illustrate the available types of elbows and returns . . . their dimensional differences . . . and the range of sizes, thicknesses and metals carried in stock. Other thicknesses, materials, shapes and sizes are quickly made to order (see section on Special Fittings, pages 78-85).

Long and Short Radius Types

Basically, elbows are manufactured in three types:

1. **Long Radius,** in which the center-line radius of curvature is 1½ times the nominal pipe size (i.e., a 6" long radius ell has a 9" radius). This type is also called an "ASA" elbow, since its center-to-end dimension is prescribed by ASA Standard B16.9 (see page 113).
2. **Short Radius,** in which the radius is equal to the nominal pipe size (a 6" ell has a 6" radius).
3. **Special Radius** for special elbows, such as the "Contur" ell shown above, in which the radius is three times the nominal pipe size (a 20" ell has a radius of 60").

Almost every piping designer prefers the long radius elbow to the short radius, which is used only when space limitations prohibit the longer fitting. Short radius elbows, when used under cyclical or fluctuating pressure conditions, must be assigned lower working pressures than long radius fittings, due to the severe stress concentrations inherent in the more abrupt curvature (see page 113).

In addition, long radius ells have these important advantages over their short radius cousins:

1. Considerably less flow-turbulence and pressure-drop;
2. Significant savings in pipe;
3. Lower cost in sizes 12" and smaller;
4. Greater availability from distributors' stocks.

Special radius fittings are presently used almost entirely by the gas-transmission industry, where field conditions sometimes dictate the use of an elbow with extra long radius.

Elbows With Tangents

The basic types of elbows (long, short, or special radius) can usually be furnished with tangents, which are straight, integral extensions of the fitting on each end. Fittings with tangents are known as:—

Long Tangent type. These are made in long radius 90° and 45°, and in short radius 90° fittings, as shown above. In these elbows, the tangent length is equal to one-quarter of the nominal pipe size, up to a 6" maximum length. Thus, a 6" long radius ell with tangents has a radius of 9", a tangent of 1½" and a center-to-end dimension of 10½". Tangents are also available in various lengths on the "Contur" ells.

Long Tangent "bonus" ells *cost no more* than elbows without tangents, and offer an imposing array of advantages:

1. They save pipe—for example, half a foot of pipe is saved in the 12" long tangent ell. On the average, long tangent ells save 6½% of their cost in pipe alone.
2. They eliminate short welded stubs and the extra welds they require. Where necessary, the tangents can be cut to various lengths to fit the special requirements of each job.
3. They simplify installation—lining up and clamping of pipe and fitting, fitting-up of slip-on flanges, sleeving of the attaching butt-welds.
4. They can be cut to very small angles—the tangent remaining on the un-cut end will serve to space the attaching butt-welds by at least one-quarter of the nominal pipe size.
5. They remove the field butt-welds from the area of stress concentration at the throat of the fitting.
6. They permit neat, quick field replacement of ells without tangents.

Reducing Ells

The long radius ASA 90° reducing ell is made and stocked in a full size range through 30". The reducing elbow takes the place of a straight elbow and a reducer, with these advantages:

1. A weld is eliminated, reducing the cost of welding by one-third;
2. The reduction of flow-area is accomplished smoothly, thus minimizing pressure-drop and turbulence;
3. Less space is required;
4. Insulation is simplified;
5. Appearance of the piping is enhanced.

The WORLD'S MOST COMPLETE LINE OF WELDING FITTINGS is specifically designed to bring greater flexibility to piping design; to simplify field installation; and to reduce piping costs.

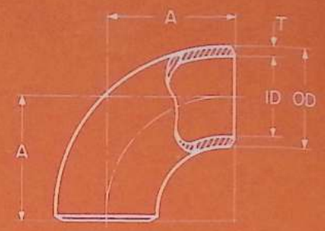
Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 11 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/11

90° ELBOWS

LONG RADIUS ASA TYPE

CAT. NO. 12BS





STANDARD WEIGHT

Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimension A	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number	Nominal Pipe Size
½	40	1½	0.840	0.622	0.109	.2	11000	½
¾	40	1⅛	1.050	0.824	0.113	.3	11001	¾
1	40	1½	1.315	1.049	0.133	.4	11002	1
1¼	40	1⅞	1.660	1.380	0.140	.6	11003	1¼
1½	40	2¼	1.900	1.610	0.145	.9	11004	1½
2	40	3	2.375	2.067	0.154	1.7	11005	2
2½	40	3¾	2.875	2.469	0.203	3.2	11006	2½
3	40	4½	3.500	3.068	0.216	4.8	11007	3
3½	40	5¼	4.000	3.548	0.226	6.5	11008	3½
4	40	6	4.500	4.026	0.237	9	11009	4
5	40	7½	5.563	5.047	0.258	15	11010	5
6	40	9	6.625	6.065	0.280	23	11011	6
8	40	12	8.625	7.981	0.322	46	11012	8
10	40	15	10.750	10.020	0.365	85	11013	10
12	—	18	12.750	12.000	0.375	121	11014	12
14	30	21	14.000	13.250	0.375	156	11015	14
16	30	24	16.000	15.250	0.375	207	11016	16
18	—	27	18.000	17.250	0.375	264	11017	18
20	20	30	20.000	19.250	0.375	335	11018	20
22	20	33	22.000	21.250	0.375	389	11019	22
24	20	36	24.000	23.250	0.375	476	11020	24
26	—	39	26.000	25.250	0.375	550	11021	26
28	—	42	28.000	27.250	0.375	625	11022	28
30	—	45	30.000	29.250	0.375	730	11023	30
32	—	48	32.000	31.250	0.375	825	11024	32
36	—	54	36.000	35.250	0.375	1059	11026	36
42	—	63	42.000	41.250	0.375	1426	11027	42

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.9 through 24". Sizes over 24" not covered by 16.9 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B), Wrought Iron, and other metals (see pages 82-85).

CONSTRUCTION: Unless otherwise specified, fittings 24" and smaller will be of seamless construction, formed from selected tubing conforming to ASTM A-106, Grade B. Fittings in larger sizes are formed from firebox quality plate conforming to ASTM A-515, Grade 70, welded and stress relieved. All welds are x-rayed, in accordance with ASTM A-234. All fittings, both seamless and welded-type, are hot-formed, hot-coined, and machine-faced and -beveled.

WORKING PRESSURES for both seamless and welded-type fittings are shown on pages 147-160.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

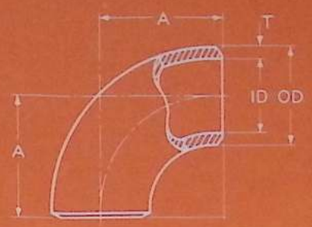
OTHER materials, sizes, and thicknesses are available. See pages 82-85.

90° ELBOWS

LONG RADIUS ASA TYPE

CAT. NO. 12BX





EXTRA STRONG

Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimension A	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number	Nominal Pipe Size
½	80	1½	0.840	0.546	0.147	.3	11030	½
¾	80	1⅛	1.050	0.742	0.154	.4	11031	¾
1	80	1½	1.315	0.957	0.179	.5	11032	1
1¼	80	1⅞	1.660	1.278	0.191	.9	11033	1¼
1½	80	2¼	1.900	1.500	0.200	1.2	11034	1½
2	80	3	2.375	1.939	0.218	2.2	11035	2
2½	80	3¾	2.875	2.323	0.276	4	11036	2½
3	80	4½	3.500	2.900	0.300	6.5	11037	3
3½	80	5¼	4.000	3.364	0.318	9	11038	3½
4	80	6	4.500	3.826	0.337	13	11039	4
5	80	7½	5.563	4.813	0.375	22	11040	5
6	80	9	6.625	5.761	0.432	36	11041	6
8	80	12	8.625	7.625	0.500	72	11042	8
10	60	15	10.750	9.750	0.500	114	11043	10
12	—	18	12.750	11.750	0.500	162	11044	12
14	—	21	14.000	13.000	0.500	205	11045	14
16	40	24	16.000	15.000	0.500	272	11046	16
18	—	27	18.000	17.000	0.500	360	11047	18
20	30	30	20.000	19.000	0.500	410	11048	20
22	30	33	22.000	21.000	0.500	517	11049	22
24	—	36	24.000	23.000	0.500	625	11050	24
26	20	39	26.000	25.000	0.500	732	11051	26
28	20	42	28.000	27.000	0.500	840	11052	28
30	20	45	30.000	29.000	0.500	970	11053	30
32	20	48	32.000	31.000	0.500	1080	11054	32
36	20	54	36.000	35.000	0.500	1407	11056	36
42	—	63	42.000	41.000	0.500	1884	11057	42

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.9 through 24". Sizes over 24" are not covered by B16.9 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B), Wrought Iron, and other metals (see pages 82-85).

CONSTRUCTION: Unless otherwise specified, fittings 24" and smaller will be of seamless construction, formed from selected tubing conforming to ASTM A-106, Grade B. Fittings in larger sizes are formed from firebox quality plate conforming to ASTM A-515, Grade 70, welded and stress relieved. All welds are x-rayed, in accordance with ASTM A-234. All fittings, both seamless and welded-type, are hot-formed, hot-coined, and machine-faced and -beveled.

WORKING PRESSURES for both seamless and welded-type fittings are shown on pages 147-160.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.

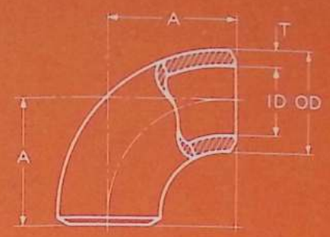
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/12

90° ELBOWS

LONG RADIUS ASA TYPE

CAT. NO. 12B*





OTHER THICKNESSES

Nominal Pipe Size	Center-to-End Dimension	Outside Diameter	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number
N.P.S.	A	OD	SCHEDULE 10*				GAS DISTRIBUTION THICKNESS			
2	3	2.375	2.157	0.109	1.2	11105	—	—	—	—
2½	3¾	2.875	2.635	0.120	1.9	11106	—	—	—	—
3	4½	3.500	3.260	0.120	2.6	11107	—	—	—	—
3½	5¼	4.000	3.760	0.120	3.5	11108	—	—	—	—
4	6	4.500	4.260	0.120	4.6	11109	4.124	0.188	7.1	11089
5	7½	5.563	5.295	0.134	8.0	11110	—	—	—	—
6	9	6.625	6.357	0.134	11	11111	6.187	0.219	18	11091
8	12	8.625	8.329	0.148	21	11112	8.187	0.219	31	11092
10	15	10.750	10.420	0.165	38	11113	10.312	0.219	50	11093
12	18	12.750	12.390	0.180	58	11114	12.250	0.250	81	11144
14	21	14.000	13.500	0.250	103	11115	13.500	0.250	103	11115
16	24	16.000	15.500	0.250	137	11116	15.500	0.250	137	11116
18	27	18.000	17.500	0.250	178	11117	17.500	0.250	178	11117
20	30	20.000	19.500	0.250	213	11118	19.500	0.250	213	11118
24	36	24.000	23.500	0.250	315	11120	23.500	0.250	315	11120
N.P.S.	A	OD	SCHEDULE 20				SCHEDULE 30			
8	12	8.625	8.125	0.250	36	11142	8.071	0.277	40	11162
10	15	10.750	10.250	0.250	58	11143	10.136	0.307	71	11163
12	18	12.750	12.250	0.250	81	11144	12.090	0.330	107	11164
18	27	18.000	—	—	—	—	17.124	0.438	312	11167
24	36	24.000	—	—	—	—	22.876	0.562	708	11170
N.P.S.	A	OD	SCHEDULE 40				SCHEDULE 60			
8	12	8.625	—	—	—	—	7.813	0.406	58	11212
12	18	12.750	11.938	0.406	131	11184	11.626	0.562	182	11214
14	21	14.000	13.124	0.438	181	11185	12.812	0.594	245	11215
18	27	18.000	16.876	0.562	400	11187	16.500	0.750	530	11217
20	30	20.000	18.812	0.594	505	11188	18.376	0.812	680	11218

*See Page 172 for further detail of Catalog Numbers.

(TABLE CONTINUED ON FOLLOWING PAGE)

90° LONG RADIUS ASA TYPE ELBOWS · OTHER THICKNESSES

(TABLE CONTINUED FROM PRECEDING PAGE)

Nominal Pipe Size	Center-to-End Dimension	Outside Diameter	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number
N.P.S.	A	OD	SCHEDULE 80				SCHEDULE 100			
8	12	8.625	—	—	—	—	7.437	0.594	85	11252
10	15	10.750	9.562	0.594	137	11233	9.312	0.719	165	11253
12	18	12.750	11.374	0.688	222	11234	11.062	0.844	273	11254
N.P.S.	A	OD	SCHEDULE 120				SCHEDULE 140			
4	6	4.500	3.624	0.438	17	11269	—	—	—	—
5	7½	5.563	4.563	0.500	30	11270	—	—	—	—
6	9	6.625	5.501	0.562	47	11271	—	—	—	—
8	12	8.625	7.187	0.719	103	11272	7.001	0.812	116	11292
10	15	10.750	9.062	0.844	194	11273	8.750	1.000	230	11073
12	18	12.750	10.750	1.000	323	11074	10.500	1.125	363	11294
N.P.S.	A	OD	SCHEDULE 160				DOUBLE EXTRA STRONG			
¾	1⅛	1.050	—	—	—	—	0.434	0.308	.7	11061
1	1½	1.315	0.815	0.250	.6	11302	0.599	0.358	.7	11062
1¼	1⅞	1.660	1.160	0.250	1	11303	0.896	0.382	1.4	11063
1½	2¼	1.900	1.338	0.281	1.8	11304	1.100	0.400	2	11064
2	3	2.375	1.687	0.344	4	11305	1.503	0.436	4.8	11065
2½	3¾	2.875	2.125	0.375	6	11306	1.771	0.552	7.1	11066
3	4½	3.500	2.624	0.438	9.5	11307	2.300	0.600	11.2	11067
3½	5¼	4.000	—	—	—	—	2.728	0.636	16.2	11068
4	6	4.500	3.438	0.531	20	11309	3.152	0.674	21.3	11069
5	7½	5.563	4.313	0.625	38	11310	4.063	0.750	38	11070
6	9	6.625	5.187	0.719	63	11311	4.897	0.864	63	11071
8	12	8.625	6.813	0.906	130	11312	6.875	0.875	120	11072
10	15	10.750	8.500	1.125	262	11313	8.750	1.000	230	11073
12	18	12.750	10.126	1.312	424	11314	10.750	1.000	323	11074
14	21	14.000	11.188	1.406	545	11315	—	—	—	—
16	24	16.000	12.812	1.594	770	11316	—	—	—	—
18	27	18.000	14.438	1.781	1090	11317	—	—	—	—
20	30	20.000	16.062	1.969	1520	11318	—	—	—	—
24	36	24.000	19.312	2.344	2510	11320	—	—	—	—

*These wall thicknesses are also known as "light gauge" or "light wall". Sizes 12" and smaller are schedule 10S from B36.19; sizes 14" and larger are schedule 10 from B36.10.

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.9 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B) and other metals (see pages 82-85).

CONSTRUCTION: Either seamless or welded-type fittings will be furnished, at the manufacturer's option. Seamless fittings are formed from selected tubing conforming to ASTM A-106, Grade B. Welded fittings are formd from firebox quality plate, conforming to ASTM A-515, Grade 70. All welds are x-rayed in accordance with ASTM A-234. All fittings, whether seamless or welded-type, are hot-formed, hot-coined, and machine-faced and -beveled.

WORKING PRESSURES for both seamless and welded-type fittings are shown on pages 147-160.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.

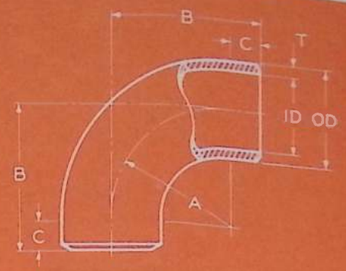
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/13

90° ELBOWS

LONG RADIUS LONG TANGENT

CAT. NO. 13BS





STANDARD WEIGHT

Nominal Pipe Size	Pipe Sched. No.	Center-to-End Dimension B	Radius A	Tangent C	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number	Nominal Pipe Size
2	40	3½	3	½	2.375	2.067	0.154	1.8	11335	2
2½	40	4⅜	3¾	⅝	2.875	2.469	0.203	3.8	11336	2½
3	40	5¼	4½	¾	3.500	3.068	0.216	5.8	11337	3
3½	40	6⅛	5¼	⅞	4.000	3.548	0.226	7.7	11338	3½
4	40	7	6	1	4.500	4.026	0.237	11	11339	4
5	40	8¾	7½	1¼	5.563	5.047	0.258	17	11340	5
6	40	10½	9	1½	6.625	6.065	0.280	29	11341	6
8	40	14	12	2	8.625	7.981	0.322	55	11342	8
10	40	17½	15	2½	10.750	10.020	0.365	95	11343	10
12	—	21	18	3	12.750	12.000	0.375	146	11344	12
14	30	24½	21	3½	14.000	13.250	0.375	185	11345	14
16	30	28	24	4	16.000	15.250	0.375	246	11346	16
18	—	31½	27	4½	18.000	17.250	0.375	316	11347	18
20	20	35	30	5	20.000	19.250	0.375	400	11348	20
22	20	38½	33	5½	22.000	21.250	0.375	468	11349	22
24	20	42	36	6	24.000	23.250	0.375	571	11350	24
26	—	45	39	6	26.000	25.250	0.375	658	11351	26
28	—	48	42	6	28.000	27.250	0.375	740	11352	28
30	—	51	45	6	30.000	29.250	0.375	852	11353	30
32	—	54	48	6	32.000	31.250	0.375	901	11354	32
36	—	60	54	6	36.000	35.250	0.375	1209	11356	36

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings through 24" conform to ASTM Specification A-234 and ASA Standard B16.9 (see pages 113-116), except for dimensions "B" and "C." Sizes over 24" not covered by B16.9. Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

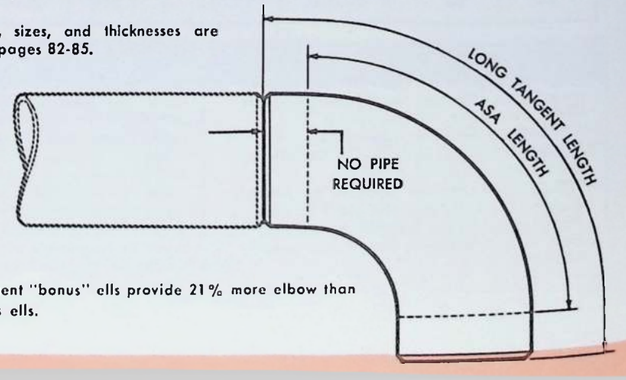
MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B), Wrought Iron, and other metals (see pages 82-85).

CONSTRUCTION: Either seamless or welded-type fittings will be furnished, at the manufacturer's option. Seamless fittings are formed from selected tubing conforming to ASTM A-106, Grade B. Welded fittings are formed from firebox quality plate, conforming to ASTM A-515, Grade 70. All welds are x-rayed in accordance with ASTM A-234. All fittings, whether seamless or welded-type, are hot-formed, hot-coined, and machine-faced and -beveled.

WORKING PRESSURES for all fittings are shown on pages 147-160.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.



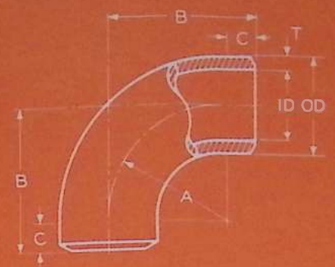
Crane Long Tangent "bonus" ells provide 21% more elbow than ASA Long Radius ells.

90° ELBOWS

LONG RADIUS LONG TANGENT

CAT. NO. 13BX





EXTRA STRONG

Nominal Pipe Size	Pipe Sched. No.	Center-to-End Dimension B	Radius A	Tangent C	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number	Nominal Pipe Size
2	80	3½	3	½	2.375	1.939	0.218	2.5	11365	2
2½	80	4⅜	3¾	⅝	2.875	2.323	0.276	5	11366	2½
3	80	5¼	4½	¾	3.500	2.900	0.300	8	11367	3
3½	80	6⅛	5¼	⅞	4.000	3.364	0.318	11	11368	3½
4	80	7	6	1	4.500	3.826	0.337	15	11369	4
5	80	8¾	7½	1¼	5.563	4.813	0.375	25	11370	5
6	80	10½	9	1½	6.625	5.761	0.432	45	11371	6
8	80	14	12	2	8.625	7.625	0.500	85	11372	8
10	60	17½	15	2½	10.750	9.750	0.500	130	11373	10
12	—	21	18	3	12.750	11.750	0.500	195	11374	12
14	—	24½	21	3½	14.000	13.000	0.500	245	11375	14
16	40	28	24	4	16.000	15.000	0.500	329	11376	16
18	—	31½	27	4½	18.000	17.000	0.500	420	11377	18
20	30	35	30	5	20.000	19.000	0.500	475	11378	20
22	30	38½	33	5½	22.000	21.000	0.500	625	11379	22
24	—	42	36	6	24.000	23.000	0.500	750	11380	24
26	20	45	39	6	26.000	25.000	0.500	873	11381	26
28	20	48	42	6	28.000	27.000	0.500	1020	11382	28
30	20	51	45	6	30.000	29.000	0.500	1131	11383	30
32	20	54	48	6	32.000	31.000	0.500	1318	11384	32
36	20	60	54	6	36.000	35.000	0.500	1606	11386	36

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings through 24" conform to ASTM Specification A-234 and ASA Standard B16.9 (see pages 113-116), except for dimensions "B" and "C." Sizes over 24" not covered by B16.9. Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

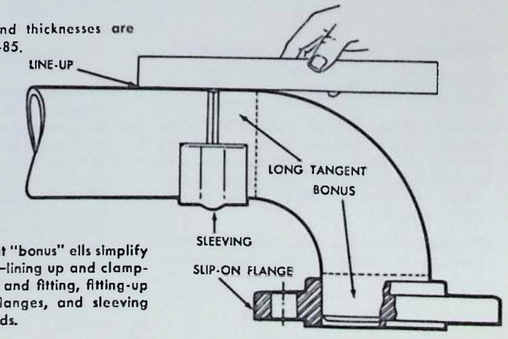
MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B), Wrought Iron, and other metals (see pages 82-85).

CONSTRUCTION: Either seamless or welded-type fittings will be furnished, at the manufacturer's option. Seamless fittings are formed from selected tubing conforming to ASTM A-106, Grade B. Welded fittings are formed from firebox quality plate, conforming to ASTM A-515, Grade 70. All welds are x-rayed in accordance with ASTM A-234. All fittings, whether seamless or welded-type, are hot-formed, hot-coined, and machine-faced and -beveled.

WORKING PRESSURES for all fittings are shown on pages 147-160.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.



Long tangent "bonus" ells simplify installation—lining up and clamping of pipe and fitting, fitting-up of slip-on flanges, and sleeving the butt welds.

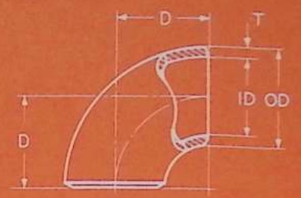
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/14

90° ELBOWS

SHORT RADIUS



CAT. NO. 14BS



STANDARD WEIGHT

Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimension D	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number	Nominal Pipe Size
1	40	1	1.315	1.049	0.133	.2	11402	1
1¼	40	1¼	1.660	1.380	0.140	.4	11403	1¼
1½	40	1½	1.900	1.610	0.145	.5	11404	1½
2	40	2	2.375	2.067	0.154	.9	11405	2
2½	40	2½	2.875	2.469	0.203	1.8	11406	2½
3	40	3	3.500	3.068	0.216	3	11407	3
3½	40	3½	4.000	3.548	0.226	4	11408	3½
4	40	4	4.500	4.026	0.237	6	11409	4
5	40	5	5.563	5.047	0.258	9.5	11410	5
6	40	6	6.625	6.065	0.280	15	11411	6
8	40	8	8.625	7.981	0.322	31	11412	8
10	40	10	10.750	10.020	0.365	55	11413	10
12	—	12	12.750	12.000	0.375	78	11414	12
14	30	14	14.000	13.250	0.375	109	11415	14
16	30	16	16.000	15.250	0.375	130	11416	16
18	—	18	18.000	17.250	0.375	165	11417	18
20	20	20	20.000	19.250	0.375	210	11418	20
24	20	24	24.000	23.250	0.375	295	11420	24
26	—	26	26.000	25.250	0.375	360	11421	26
30	—	30	30.000	29.250	0.375	490	11423	30
36	—	36	36.000	35.250	0.375	706	11426	36
42	—	48	42.000	41.250	0.375	920	11427	42

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.28 through 24". Sizes over 24" not covered by B16.28 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B). Other metals can be furnished on application. (See pages 82-85.)

CONSTRUCTION: Unless otherwise specified, fittings 24" and smaller will be of seamless construction, formed from selected tubing conforming to ASTM A-106, Grade B. Fittings in larger sizes are formed from firebox quality plate conforming to ASTM A-515, Grade 70, welded and stress relieved. All welds are x-rayed, in accordance with ASTM A-234. All fittings, both seamless and welded-type, are hot-formed, hot-coined, and machine-faced and -beveled.

WORKING PRESSURES for both seamless and welded-type fittings are shown on pages 147-160. These working pressures are subjected to the additional limitations given in ASA standard B16.28, paragraph 2.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

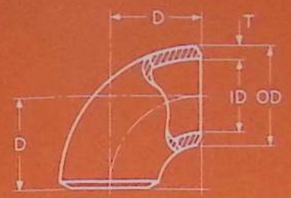
OTHER materials, sizes, and thicknesses are available. See pages 82-85.

90° ELBOWS

SHORT RADIUS



CAT. NO. 14BX



EXTRA STRONG

Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimension D	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number	Nominal Pipe Size
1	80	1	1.315	0.957	0.179	.3	11432	1
1¼	80	1¼	1.660	1.278	0.191	.6	11433	1¼
1½	80	1½	1.900	1.500	0.200	.7	11434	1½
2	80	2	2.375	1.939	0.218	1.5	11435	2
2½	80	2½	2.875	2.323	0.276	2.2	11436	2½
3	80	3	3.500	2.900	0.300	3.8	11437	3
3½	80	3½	4.000	3.364	0.318	5.5	11438	3½
4	80	4	4.500	3.826	0.337	7.8	11439	4
5	80	5	5.563	4.813	0.375	13	11440	5
6	80	6	6.625	5.761	0.432	22	11441	6
8	80	8	8.625	7.625	0.500	46	11442	8
10	60	10	10.750	9.750	0.500	71	11443	10
12	—	12	12.750	11.750	0.500	100	11444	12
14	—	14	14.000	13.000	0.500	150	11445	14
16	40	16	16.000	15.000	0.500	186	11446	16
18	—	18	18.000	17.000	0.500	236	11447	18
20	30	20	20.000	19.000	0.500	300	11448	20
24	—	24	24.000	23.000	0.500	421	11450	24
26	20	26	26.000	25.000	0.500	502	11451	26
30	20	30	30.000	29.000	0.500	650	11453	30
36	20	36	36.000	35.000	0.500	938	11456	36
42	20	48	42.000	41.000	0.500	1307	11457	42

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.28 through 24". Sizes over 24" not covered by B16.28 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B). Other metals can be furnished on application. (See pages 82-85.)

CONSTRUCTION: Unless otherwise specified, fittings 24" and smaller will be of seamless construction, formed from selected tubing conforming to ASTM A-106, Grade B. Fittings in larger sizes are formed from firebox quality plate conforming to ASTM A-515, Grade 70, welded and stress relieved. All welds are x-rayed, in accordance with ASTM A-234. All fittings, both seamless and welded-type, are hot-formed, hot-coined, and machine-faced and -beveled.

WORKING PRESSURES for both seamless and welded-type fittings are shown on pages 147-160. These working pressures are subjected to the additional limitations given in ASA Standard B16.28, paragraph 2.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.

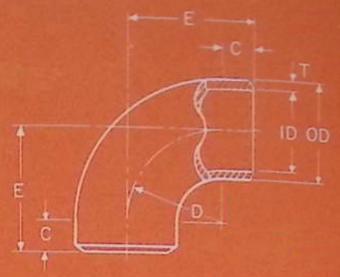
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/15

90° ELBOWS

SHORT RADIUS LONG TANGENT



CAT. NO. 15BS



STANDARD WEIGHT

Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimension E	Radius D	Tangent C	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number	Nominal Pipe Size
8	40	10	8	2	8.625	7.981	0.322	41	11712	8
10	40	12½	10	2½	10.750	10.020	0.365	74	11713	10
12	—	15	12	3	12.750	12.000	0.375	109	11714	12
14	30	17½	14	3½	14.000	13.250	0.375	140	11715	14
16	30	20	16	4	16.000	15.250	0.375	172	11716	16
18	—	22½	18	4½	18.000	17.250	0.375	218	11717	18
20	20	25	20	5	20.000	19.250	0.375	275	11718	20
24	20	30	24	6	24.000	23.250	0.375	390	11720	24
26	—	32	26	6	26.000	25.250	0.375	460	11721	26
30	—	36	30	6	30.000	29.250	0.375	609	11723	30
36	—	42	36	6	36.000	35.250	0.375	849	11726	36
42	—	34	28	6	42.000	41.250	0.375	1084	11727	42
48	—	38	32	6	48.000	47.250	0.375	1320	11728	48

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings through 24" conform to ASTM Specification A-234 and ASA Standard B16.28 (see pages 113-116), except for dimensions "C" and "E." Sizes over 24" not covered by B16.28. Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

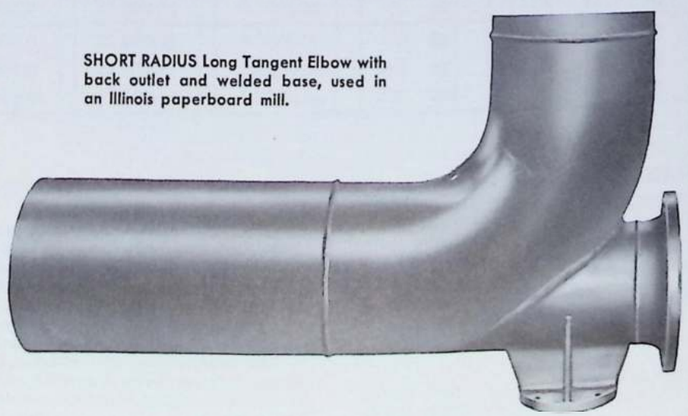
MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B). Other metals can be furnished on application. (See pages 82-85.)

CONSTRUCTION: Fittings are formed from firebox quality plate conforming to ASTM A-515, Grade 70, welded and stress relieved. Welds are x-rayed in accordance with ASTM A-234. All fittings are hot-formed, hot-coined, and machine-faced and -beveled.

WORKING PRESSURES for all fittings are shown on pages 147-160. These working pressures are subject to the additional limitations given in ASA Standard B16.28.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.



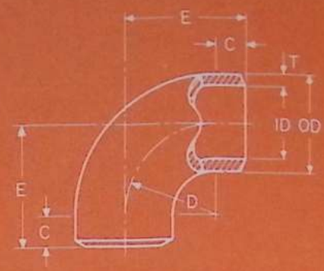
SHORT RADIUS Long Tangent Elbow with back outlet and welded base, used in an Illinois paperboard mill.

90° ELBOWS

SHORT RADIUS LONG TANGENT



CAT. NO. 15BX



EXTRA STRONG

Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimension E	Radius D	Tangent C	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number	Nominal Pipe Size
8	80	10	8	2	8.625	7.625	0.500	63	11742	8
10	60	12½	10	2½	10.750	9.750	0.500	100	11743	10
12	—	15	12	3	12.750	11.750	0.500	142	11744	12
14	—	17½	14	3½	14.000	13.000	0.500	189	11745	14
16	40	20	16	4	16.000	15.000	0.500	241	11746	16
18	—	22½	18	4½	18.000	17.000	0.500	305	11747	18
20	30	25	20	5	20.000	19.000	0.500	387	11748	20
24	—	30	24	6	24.000	23.000	0.500	546	11750	24
26	20	32	26	6	26.000	25.000	0.500	620	11751	26
30	20	36	30	6	30.000	29.000	0.500	808	11753	30
36	20	42	36	6	36.000	35.000	0.500	1128	11756	36
42	20	34	28	6	42.000	41.000	0.500	1530	11757	42
48	—	38	32	6	48.000	47.000	0.500	1930	11758	48

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings through 24" conform to ASTM Specification A-234 and ASA Standard B16.28 (see pages 113-116), except for dimensions "C" and "E." Sizes over 24" not covered by B16.28. Schedule numbers conform to ASA Standard B36.10 (see paaes 136-145).

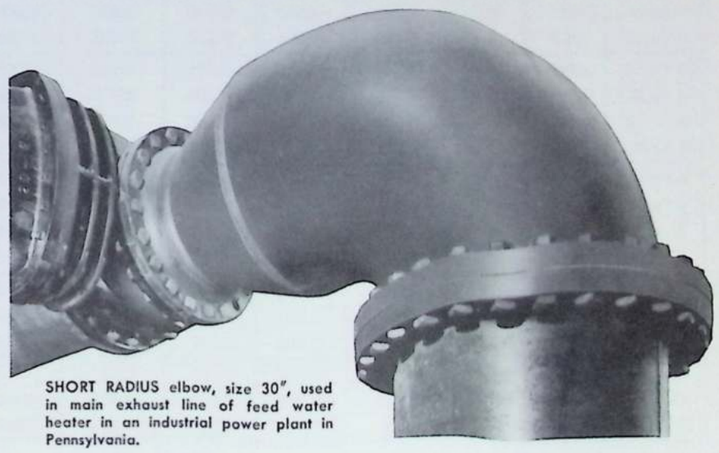
MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B). Other metals can be furnished on application. (See pages 82-85.)

CONSTRUCTION: Fittings are formed from firebox quality plate conforming to ASTM A-515, Grade 70, welded and stress relieved. Welds are x-rayed in accordance with ASTM A-234. All fittings are hot-formed, hot-coined, and machine-faced and -beveled.

WORKING PRESSURES for all fittings are shown on pages 147-160. These working pressures are subjected to the additional limitations given in ASA Standard B16.28, paragraph 2.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.



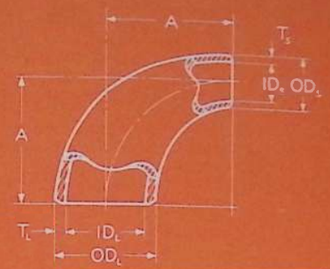
SHORT RADIUS elbow, size 30", used in main exhaust line of feed water heater in an industrial power plant in Pennsylvania.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 16 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/16

90° REDUCING ELBOWS
LONG RADIUS ASA TYPE



CAT. NO. 12BS



STANDARD WEIGHT

Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimen.	LARGE END			SMALL END			Approx. Weight (lb.)	Part Number	Nominal Pipe Size
			Outside Diam.	Inside Diam.	Wall Thkn.	Outside Diam.	Inside Diam.	Wall Thkn.			
		A	OD_L	ID_L	T_L	OD_S	ID_S	T_S			
2 x 1½	40	3	2.375	2.067	0.154	1.900	1.610	0.145	1.5	14010	2 x 1½
2 x 1¼	40	3	2.375	2.067	0.154	1.660	1.380	0.140	1.4	14011	2 x 1¼
2 x 1	40	3	2.375	2.067	0.154	1.315	1.049	0.133	1.2	14012	2 x 1
2½ x 2	40	3¾	2.875	2.469	0.203	2.375	2.067	0.154	2.8	14013	2½ x 2
2½ x 1½	40	3¾	2.875	2.469	0.203	1.900	1.610	0.145	2.5	14014	2½ x 1½
2½ x 1¼	40	3¾	2.875	2.469	0.203	1.660	1.380	0.140	2.2	14015	2½ x 1¼
3 x 2½	40	4½	3.500	3.068	0.216	2.875	2.469	0.203	4.2	14016	3 x 2½
3 x 2	40	4½	3.500	3.068	0.216	2.375	2.067	0.154	4	14017	3 x 2
3 x 1½	40	4½	3.500	3.068	0.216	1.900	1.610	0.145	3.8	14018	3 x 1½
3½ x 3	40	5¼	4.000	3.548	0.226	3.500	3.068	0.216	6	14019	3½ x 3
3½ x 2½	40	5¼	4.000	3.548	0.226	2.875	2.469	0.203	5.5	14020	3½ x 2½
3½ x 2	40	5¼	4.000	3.548	0.226	2.375	2.067	0.154	5	14021	3½ x 2
4 x 3½	40	6	4.500	4.026	0.237	4.000	3.548	0.226	8.5	14022	4 x 3½
4 x 3	40	6	4.500	4.026	0.237	3.500	3.068	0.216	8	14023	4 x 3
4 x 2½	40	6	4.500	4.026	0.237	2.875	2.469	0.203	7.5	14024	4 x 2½
4 x 2	40	6	4.500	4.026	0.237	2.375	2.067	0.154	7	14025	4 x 2
5 x 4	40	7½	5.563	5.047	0.258	4.500	4.026	0.237	14	14026	5 x 4
5 x 3½	40	7½	5.563	5.047	0.258	4.000	3.548	0.226	13	14027	5 x 3½
5 x 3	40	7½	5.563	5.047	0.258	3.500	3.068	0.216	12	14028	5 x 3
5 x 2½	40	7½	5.563	5.047	0.258	2.875	2.469	0.203	11	14029	5 x 2½
6 x 5	40	9	6.625	6.065	0.280	5.563	5.047	0.258	21	14030	6 x 5
6 x 4	40	9	6.625	6.065	0.280	4.500	4.026	0.237	20	14031	6 x 4
6 x 3½	40	9	6.625	6.065	0.280	4.000	3.548	0.226	19	14032	6 x 3½
6 x 3	40	9	6.625	6.065	0.280	3.500	3.068	0.216	17	14033	6 x 3
8 x 6	40	12	8.625	7.981	0.322	6.625	6.065	0.280	40	14034	8 x 6
8 x 5	40	12	8.625	7.981	0.322	5.563	5.047	0.258	37	14035	8 x 5
8 x 4	40	12	8.625	7.981	0.322	4.500	4.026	0.237	35	14036	8 x 4
10 x 8	40	15	10.750	10.020	0.365	8.625	7.981	0.322	76	14037	10 x 8
10 x 6	40	15	10.750	10.020	0.365	6.625	6.065	0.280	67	14038	10 x 6
10 x 5	40	15	10.750	10.020	0.365	5.563	5.047	0.258	62	14039	10 x 5

(TABLE CONTINUED ON FOLLOWING PAGE)

90° REDUCING ASA TYPE ELBOWS · STANDARD WEIGHT

(TABLE CONTINUED FROM PRECEDING PAGE)

Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimen.	LARGE END			SMALL END			Approx. Weight (lb.)	Part Number	Nominal Pipe Size
			Outside Diam.	Inside Diam.	Wall Thkn.	Outside Diam.	Inside Diam.	Wall Thkn.			
		A	OD_L	ID_L	T_L	OD_S	ID_S	T_S			
12 x 10	—	18	12.750	12.000	0.375	10.750	10.020	0.365	110	14040	12 x 10
12 x 8	—	18	12.750	12.000	0.375	8.625	7.981	0.322	102	14041	12 x 8
12 x 6	—	18	12.750	12.000	0.375	6.625	6.065	0.280	90	14042	12 x 6
14 x 12	—	21	14.000	13.250	0.375	12.750	12.000	0.375	137	14043	14 x 12
14 x 10	30-40	21	14.000	13.250	0.375	10.750	10.020	0.365	127	14044	14 x 10
14 x 8	30-40	21	14.000	13.250	0.375	8.625	7.981	0.322	115	14045	14 x 8
16 x 14	30	24	16.000	15.250	0.375	14.000	13.250	0.375	177	14046	16 x 14
16 x 12	—	24	16.000	15.250	0.375	12.750	12.000	0.375	169	14047	16 x 12
16 x 10	30-40	24	16.000	15.250	0.375	10.750	10.020	0.365	157	14048	16 x 10
18 x 16	—	27	18.000	17.250	0.375	16.000	15.250	0.375	238	14050	18 x 16
18 x 14	—	27	18.000	17.250	0.375	14.000	13.250	0.375	228	14051	18 x 14
18 x 12	—	27	18.000	17.250	0.375	12.750	12.000	0.375	218	14052	18 x 12
18 x 10	—	27	18.000	17.250	0.375	10.750	10.020	0.365	208	14053	18 x 10
20 x 18	—	30	20.000	19.250	0.375	18.000	17.250	0.375	305	14055	20 x 18
20 x 16	20-30	30	20.000	19.250	0.375	16.000	15.250	0.375	295	14056	20 x 16
20 x 14	20-30	30	20.000	19.250	0.375	14.000	13.250	0.375	280	14057	20 x 14
20 x 12	—	30	20.000	19.250	0.375	12.750	12.000	0.375	265	14058	20 x 12
20 x 10	20-40	30	20.000	19.250	0.375	10.750	10.020	0.365	250	14059	20 x 10
24 x 22	20	36	24.000	23.250	0.375	22.000	21.250	0.375	428	14066	24 x 22
24 x 20	20	36	24.000	23.250	0.375	20.000	19.250	0.375	410	14067	24 x 20
24 x 18	—	36	24.000	23.250	0.375	18.000	17.250	0.375	395	14068	24 x 18
24 x 16	20-30	36	24.000	23.250	0.375	16.000	15.250	0.375	376	14069	24 x 16
24 x 14	20-30	36	24.000	23.250	0.375	14.000	13.250	0.375	362	14070	24 x 14
24 x 12	—	36	24.000	23.250	0.375	12.750	12.000	0.375	353	14071	24 x 12
30 x 26	—	45	30.000	29.250	0.375	26.000	25.250	0.375	657	14086	30 x 26
30 x 24	—	45	30.000	29.250	0.375	24.000	23.250	0.375	646	14087	30 x 24
30 x 22	—	45	30.000	29.250	0.375	22.000	21.250	0.375	638	14088	30 x 22
30 x 20	—	45	30.000	29.250	0.375	20.000	19.250	0.375	630	14089	30 x 20
30 x 18	—	45	30.000	29.250	0.357	18.000	17.250	0.375	622	14090	30 x 18
30 x 16	—	45	30.000	29.250	0.375	16.000	15.250	0.375	614	14091	30 x 16

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.9 through 24". Sizes over 24" not covered by B16.9 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B), Wrought Iron and other metals (see pages 82-85).

CONSTRUCTION: Fittings are formed from fire-box quality plate conforming to ASTM A-515, Grade 70, welded and stress relieved. Welds are x-rayed in accordance with ASTM A-234. All fittings are hot-formed, hot-coined, and machine-faced and -beveled.

WORKING PRESSURES for all fittings are shown on pages 147-160.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

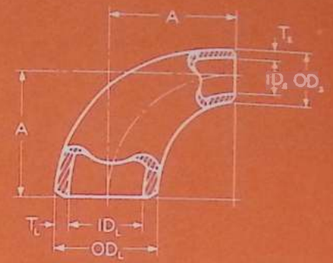
OTHER materials, sizes, and thicknesses are available. See pages 82-85.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 17 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/17

90° REDUCING ELBOWS
LONG RADIUS ASA TYPE



CAT. NO. 12BX



EXTRA STRONG

Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimen.	LARGE END			SMALL END			Approx. Weight (lb.)	Part Number	Nominal Pipe Size
		A	Outside Diam. OD_L	Inside Diam. ID_L	Wall Thkn. T_L	Outside Diam. OD_S	Inside Diam. ID_S	Wall Thkn. T_S			
2 x 1½	80	3	2.375	1.939	0.218	1.900	1.500	0.200	2	14110	2 x 1½
2 x 1¼	80	3	2.375	1.939	0.218	1.660	1.278	0.191	1.8	14111	2 x 1¼
2 x 1	80	3	2.375	1.939	0.218	1.315	0.957	0.179	1.5	14112	2 x 1
2½ x 2	80	3¾	2.875	2.323	0.276	2.375	1.939	0.218	3.8	14113	2½ x 2
2½ x 1½	80	3¾	2.875	2.323	0.276	1.900	1.500	0.200	3.5	14114	2½ x 1½
2½ x 1¼	80	3¾	2.875	2.323	0.276	1.660	1.278	0.191	3.2	14115	2½ x 1¼
3 x 2½	80	4½	3.500	2.900	0.300	2.875	2.323	0.276	6	14116	3 x 2½
3 x 2	80	4½	3.500	2.900	0.300	2.375	1.939	0.218	5.5	14117	3 x 2
3 x 1½	80	4½	3.500	2.900	0.300	1.900	1.500	0.200	5	14118	3 x 1½
3½ x 3	80	5¼	4.000	3.364	0.318	3.500	2.900	0.300	8.2	14119	3½ x 3
3½ x 2½	80	5¼	4.000	3.364	0.318	2.875	2.323	0.276	7.8	14120	3½ x 2½
3½ x 2	80	5¼	4.000	3.364	0.318	2.375	1.939	0.218	7	14121	3½ x 2
4 x 3½	80	6	4.500	3.826	0.337	4.000	3.364	0.318	11	14122	4 x 3½
4 x 3	80	6	4.500	3.826	0.337	3.500	2.900	0.300	10	14123	4 x 3
4 x 2½	80	6	4.500	3.826	0.337	2.875	2.323	0.276	10	14124	4 x 2½
4 x 2	80	6	4.500	3.826	0.337	2.375	1.939	0.218	9.2	14125	4 x 2
5 x 4	80	7½	5.563	4.813	0.375	4.500	3.826	0.337	19	14126	5 x 4
5 x 3½	80	7½	5.563	4.813	0.375	4.000	3.364	0.318	18	14127	5 x 3½
5 x 3	80	7½	5.563	4.813	0.375	3.500	2.900	0.300	16	14128	5 x 3
5 x 2½	80	7½	5.563	4.813	0.375	2.875	2.323	0.276	15	14129	5 x 2½
6 x 5	80	9	6.625	5.761	0.432	5.563	4.813	0.375	32	14130	6 x 5
6 x 4	80	9	6.625	5.761	0.432	4.500	3.826	0.337	30	14131	6 x 4
6 x 3½	80	9	6.625	5.761	0.432	4.000	3.364	0.318	28	14132	6 x 3½
6 x 3	80	9	6.625	5.761	0.432	3.500	2.900	0.300	26	14133	6 x 3
8 x 6	80	12	8.625	7.625	0.500	6.625	5.761	0.432	61	14134	8 x 6
8 x 5	80	12	8.625	7.625	0.500	5.563	4.813	0.375	57	14135	8 x 5
8 x 4	80	12	8.625	7.625	0.500	4.500	3.826	0.337	53	14136	8 x 4
10 x 8	60-80	15	10.750	9.750	0.500	8.625	7.625	0.500	98	14137	10 x 8
10 x 6	60-80	15	10.750	9.750	0.500	6.625	5.761	0.432	88	14138	10 x 6
10 x 5	60-80	15	10.750	9.750	0.500	5.563	4.813	0.375	83	14139	10 x 5

(TABLE CONTINUED ON FOLLOWING PAGE)

90° REDUCING ASA TYPE ELBOWS · EXTRA STRONG

(TABLE CONTINUED FROM PRECEDING PAGE)

Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimen.	LARGE END			SMALL END			Approx. Weight (lb.)	Part Number	Nominal Pipe Size
		A	Outside Diam. OD_L	Inside Diam. ID_L	Wall Thkn. T_L	Outside Diam. OD_S	Inside Diam. ID_S	Wall Thkn. T_S			
12 x 10	—	18	12.750	11.750	0.500	10.750	9.750	0.500	150	14140	12 x 10
12 x 8	—	18	12.750	11.750	0.500	8.625	7.625	0.500	128	14141	12 x 8
12 x 6	—	18	12.750	11.750	0.500	6.625	5.761	0.432	117	14142	12 x 6
14 x 12	—	21	14.000	13.000	0.500	12.750	11.750	0.500	180	14143	14 x 12
14 x 10	—	21	14.000	13.000	0.500	10.750	9.750	0.500	166	14144	14 x 10
14 x 8	—	21	14.000	13.000	0.500	8.625	7.625	0.500	151	14145	14 x 8
16 x 14	—	24	16.000	15.000	0.500	14.000	13.000	0.500	231	14146	16 x 14
16 x 12	—	24	16.000	15.000	0.500	12.750	11.750	0.500	221	14147	16 x 12
16 x 10	40-60	24	16.000	15.000	0.500	10.750	9.750	0.500	205	14148	16 x 10
18 x 16	—	27	18.000	17.000	0.500	16.000	15.000	0.500	320	14150	18 x 16
18 x 14	—	27	18.000	17.000	0.500	14.000	13.000	0.500	310	14151	18 x 14
18 x 12	—	27	18.000	17.000	0.500	12.750	11.750	0.500	300	14152	18 x 12
18 x 10	—	27	18.000	17.000	0.500	10.750	9.750	0.500	290	14153	18 x 10
20 x 18	—	30	20.000	19.000	0.500	18.000	17.000	0.500	400	14155	20 x 18
20 x 16	30-40	30	20.000	19.000	0.500	16.000	15.000	0.500	385	14156	20 x 16
20 x 14	—	30	20.000	19.000	0.500	14.000	13.000	0.500	365	14157	20 x 14
20 x 12	—	30	20.000	19.000	0.500	12.750	11.750	0.500	350	14158	20 x 12
20 x 10	30-60	30	20.000	19.000	0.500	10.750	9.750	0.500	325	14159	20 x 10
24 x 22	—	36	24.000	23.000	0.500	22.000	21.000	0.500	567	14166	24 x 22
24 x 20	—	36	24.000	23.000	0.500	20.000	19.000	0.500	544	14167	24 x 20
24 x 18	—	36	24.000	23.000	0.500	18.000	17.000	0.500	523	14168	24 x 18
24 x 16	—	36	24.000	23.000	0.500	16.000	15.000	0.500	499	14169	24 x 16
24 x 14	—	36	24.000	23.000	0.500	14.000	13.000	0.500	480	14170	24 x 14
24 x 12	—	36	24.000	23.000	0.500	12.750	11.750	0.500	466	14171	24 x 12
30 x 26	20	45	30.000	29.000	0.500	26.000	25.000	0.500	873	14186	30 x 26
30 x 24	—	45	30.000	29.000	0.500	24.000	23.000	0.500	865	14187	30 x 24
30 x 22	20-30	45	30.000	29.000	0.500	22.000	21.000	0.500	857	14188	30 x 22
30 x 20	20-30	45	30.000	29.000	0.500	20.000	19.000	0.500	849	14189	30 x 20
30 x 18	—	45	30.000	29.000	0.500	18.000	17.000	0.500	841	14190	30 x 18
30 x 16	20-40	45	30.000	29.000	0.500	16.000	15.000	0.500	833	14191	30 x 16

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.9 through 24". Sizes over 24" not covered by B16.9 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B), Wrought Iron, and other metals (see pages 82-85).

CONSTRUCTION: Fittings are formed from fire-box quality plate conforming to ASTM A-515, Grade 70, welded and stress relieved. Welds are x-rayed in accordance with ASTM A-234. All fittings are hot-formed, hot-coined, and machine-faced and -beveled.

WORKING PRESSURES for all fittings are shown on pages 147-160.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.

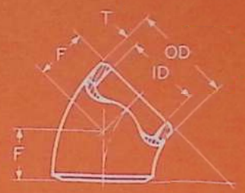
Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 18 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/18

45° ELBOWS

LONG RADIUS ASA TYPE

CAT. NO. 17BS





STANDARD WEIGHT

Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimension F	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number	Nominal Pipe Size
½	40	⅝	0.840	0.622	0.109	.1	12000	½
¾	40	7/16	1.050	0.824	0.113	.1	12001	¾
1	40	⅞	1.315	1.049	0.133	.2	12002	1
1¼	40	1	1.660	1.380	0.140	.4	12003	1¼
1½	40	1⅛	1.900	1.610	0.145	.5	12004	1½
2	40	1⅜	2.375	2.067	0.154	.9	12005	2
2½	40	1¾	2.875	2.469	0.203	1.5	12006	2½
3	40	2	3.500	3.068	0.216	2.5	12007	3
3½	40	2¼	4.000	3.548	0.226	3.5	12008	3½
4	40	2½	4.500	4.026	0.237	4.8	12009	4
5	40	3⅛	5.563	5.047	0.258	7.8	12010	5
6	40	3¾	6.625	6.065	0.280	12	12011	6
8	40	5	8.625	7.981	0.322	23	12012	8
10	40	6¼	10.750	10.020	0.365	42	12013	10
12	—	7½	12.750	12.000	0.375	61	12014	12
14	30	8¾	14.000	13.250	0.375	79	12015	14
16	30	10	16.000	15.250	0.375	103	12016	16
18	—	11¼	18.000	17.250	0.375	132	12017	18
20	20	12½	20.000	19.250	0.375	160	12018	20
22	20	13½	22.000	21.250	0.375	195	12019	22
24	20	15	24.000	23.250	0.375	238	12020	24
26	—	16	26.000	25.250	0.375	275	12021	26
30	—	18½	30.000	29.250	0.375	365	12023	30
36	—	22¼	36.000	35.250	0.375	525	12026	36
42	—	26	42.000	41.250	0.375	712	12027	42

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.9 through 24". Sizes over 24" not covered by B16.9 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B), Wrought Iron, and other metals (see pages 82-85).

CONSTRUCTION: Unless otherwise specified, fittings 24" and smaller will be of seamless construction, formed from selected tubing conforming to ASTM A-106, Grade B. Fittings in larger sizes are formed from firebox quality plate conforming to ASTM A-515, Grade 70, welded and stress relieved. All welds are x-rayed, in accordance with ASTM A-234. All fittings, both seamless and welded-type, are hot-formed, hot-coined, and machine-faced and -beveled.

WORKING PRESSURES for both seamless and welded-type fittings are shown on pages 147-160.

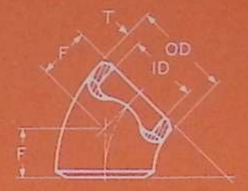
CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.

45° ELBOWS

LONG RADIUS ASA TYPE

CAT. NO. 17BX





EXTRA STRONG

Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimension F	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number	Nominal Pipe Size
½	80	⅝	0.840	0.546	0.147	.2	12030	½
¾	80	7/16	1.050	0.742	0.154	.3	12031	¾
1	80	⅞	1.315	0.957	0.179	.4	12032	1
1¼	80	1	1.660	1.278	0.191	.5	12033	1¼
1½	80	1⅛	1.900	1.500	0.200	.6	12034	1½
2	80	1⅜	2.375	1.939	0.218	1.1	12035	2
2½	80	1¾	2.875	2.323	0.276	2.1	12036	2½
3	80	2	3.500	2.900	0.300	3.5	12037	3
3½	80	2¼	4.000	3.364	0.318	4.8	12038	3½
4	80	2½	4.500	3.826	0.337	6.5	12039	4
5	80	3⅛	5.563	4.813	0.375	11	12040	5
6	80	3¾	6.625	5.761	0.432	18	12041	6
8	80	5	8.625	7.625	0.500	35	12042	8
10	60	6¼	10.750	9.750	0.500	56	12043	10
12	—	7½	12.750	11.750	0.500	80	12044	12
14	—	8¾	14.000	13.000	0.500	100	12045	14
16	40	10	16.000	15.000	0.500	131	12046	16
18	—	11¼	18.000	17.000	0.500	172	12047	18
20	30	12½	20.000	19.000	0.500	210	12048	20
22	30	13½	22.000	21.000	0.500	259	12049	22
24	—	15	24.000	23.000	0.500	302	12050	24
26	20	16	26.000	25.000	0.500	366	12051	26
30	20	18½	30.000	29.000	0.500	485	12053	30
36	20	22¼	36.000	35.000	0.500	700	12056	36
42	—	26	42.000	41.000	0.500	946	12057	42

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.9 through 24". Sizes over 24" not covered by B16.9 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B), Wrought Iron, and other metals (see pages 82-85).

CONSTRUCTION: Unless otherwise specified, fittings 24" and smaller will be of seamless construction, formed from selected tubing conforming to ASTM A-106, Grade B. Fittings in larger sizes are formed from firebox quality plate conforming to ASTM A-515, Grade 70, welded and stress relieved. All welds are x-rayed, in accordance with ASTM A-234. All fittings, both seamless and welded-type, are hot-formed, hot-coined, and machine-faced and -beveled.

WORKING PRESSURES for both seamless and welded-type fittings are shown on pages 147-160.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.

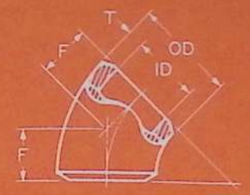
Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 19 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/19

45° ELBOWS

LONG RADIUS ASA TYPE

CAT. NO. 17B*





OTHER THICKNESSES

Nominal Pipe Size	Center-to-End Dimension	Outside Diameter	Inside Diameter	Wall Thickness	Approx. Weight (lb.)	Part Number	Inside Diameter	Wall Thickness	Approx. Weight (lb.)	Part Number
			ID	T			ID	T		
N.P.S.	F	OD	SCHEDULE 10*				GAS DISTRIBUTION THICKNESS			
2	1⅜	2.375	2.157	0.109	.6	12105	—	—	—	—
2½	1¾	2.875	2.635	0.120	.9	12106	—	—	—	—
3	2	3.500	3.260	0.120	1.3	12107	—	—	—	—
3½	2¼	4.000	3.760	0.120	1.7	12108	—	—	—	—
4	2½	4.500	4.260	0.120	2.3	12109	4.124	0.188	3.5	12099
5	3⅛	5.563	5.295	0.134	4	12110	—	—	—	—
6	3¾	6.625	6.357	0.134	5.5	12111	6.187	0.219	9	12101
8	5	8.625	8.329	0.148	10	12112	8.187	0.219	15	12102
10	6¼	10.750	10:420	0.165	19	12113	10.312	0.219	25	12103
12	7½	12.750	12.390	0.180	29	12114	12.250	0.250	40	12144
14	8¾	14.000	13.500	0.250	51	12115	13.500	0.250	51	12115
16	10	16.000	15.500	0.250	68	12116	15.500	0.250	68	12116
18	11¼	18.000	17.500	0.250	89	12117	17.500	0.250	89	12117
20	12½	20.000	19.500	0.250	106	12118	19.500	0.250	106	12118
24	15	24.000	23.500	0.250	157	12120	23.500	0.250	157	12120
N.P.S.	F	OD	SCHEDULE 20				SCHEDULE 30			
8	5	8.625	8.125	0.250	18	12142	8.071	0.277	20	12172
10	6¼	10.750	10.250	0.250	29	12143	10.136	0.307	35	12173
12	7½	12.750	12.250	0.250	40	12144	12.090	0.330	53	12174
18	11¼	18.000	—	—	—	—	17.124	0.438	156	12177
24	15	24.000	—	—	—	—	22.876	0.562	354	12180
N.P.S.	F	OD	SCHEDULE 40				SCHEDULE 60			
8	5	8.625	—	—	—	—	7.813	0.406	29	12232
12	7½	12.750	11.938	0.406	65	12214	11.626	0.562	91	12234
14	8¾	14.000	13.124	0.438	90	12215	12.812	0.594	122	12235
18	11¼	18.000	16.876	0.562	200	12217	16.500	0.750	265	12237
20	12½	20.000	18.812	0.594	252	12218	18.376	0.812	340	12238

*See Page 172 for further detail of Catalog Numbers.

(TABLE CONTINUED ON FOLLOWING PAGE)

45° LONG RADIUS ASA TYPE ELBOWS · OTHER THICKNESSES

(TABLE CONTINUED FROM PRECEDING PAGE)

Nominal Pipe Size	Center-to-End Dimension	Outside Diameter	Inside Diameter	Wall Thickness	Approx. Weight (lb.)	Part Number	Inside Diameter	Wall Thickness	Approx. Weight (lb.)	Part Number
			ID	T			ID	T		
N.P.S.	F	OD	SCHEDULE 80				SCHEDULE 100			
8	5	8.625	—	—	—	—	7.437	0.594	42	12272
10	6¼	10.750	9.562	0.594	68	12253	9.312	0.719	82	12273
12	7½	12.750	11.374	0.688	111	12254	11.062	0.844	136	12274
N.P.S.	F	OD	SCHEDULE 120				SCHEDULE 140			
4	2½	4.500	3.624	0.438	8.3	12309	—	—	—	—
5	3⅛	5.563	4.563	0.500	15	12310	—	—	—	—
6	3¾	6.625	5.501	0.562	23	12311	—	—	—	—
8	5	8.625	7.187	0.719	51	12312	7.001	0.812	58	12332
10	6¼	10.750	9.062	0.844	97	12313	8.750	1.000	115	12073
12	7½	12.750	10.750	1.000	161	12074	10.500	1.125	181	12334
N.P.S.	F	OD	SCHEDULE 160				DOUBLE EXTRA STRONG			
¾	7/16	1.050	—	—	—	—	0.434	0.308	.4	12061
1	⅞	1.315	0.815	0.250	.4	12342	0.599	0.358	.4	12062
1¼	1	1.660	1.160	0.250	.5	12343	0.896	0.382	.6	12063
1½	1⅛	1.900	1.338	0.281	1	12344	1.100	0.400	1.1	12064
2	1⅜	2.375	1.687	0.344	2	12345	1.503	0.436	2.1	12065
2½	1¾	2.875	2.125	0.375	3	12346	1.771	0.552	3.8	12066
3	2	3.500	2.624	0.438	5	12347	2.300	0.600	5.8	12067
3½	2¼	4.000	—	—	—	—	2.728	0.636	8.6	12068
4	2½	4.500	3.438	0.531	10	12349	3.152	0.674	10.8	12069
5	3⅛	5.563	4.313	0.625	18	12350	4.063	0.750	19	12070
6	3¾	6.625	5.187	0.719	30	12351	4.897	0.864	32	12071
8	5	8.625	6.813	0.906	64	12352	6.875	0.875	60	12072
10	6¼	10.750	8.500	1.125	131	12353	8.750	1.000	115	12073
12	7½	12.750	10.126	1.312	230	12354	10.750	1.000	161	12074
14	8¾	14.000	11.188	1.406	273	12355	—	—	—	—
16	10	16.000	12.812	1.594	385	12356	—	—	—	—
18	11¼	18.000	14.438	1.781	545	12357	—	—	—	—
20	12½	20.000	16.062	1.969	760	12358	—	—	—	—
24	15	24.000	19.312	2.344	1255	12360	—	—	—	—

*These wall thicknesses are also known as "light gauge" or "light wall". Sizes 12" and smaller are schedule 10S from B36.19; sizes 14" and larger are schedule 10 from B36.10.

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.9 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B) and other metals (see pages 82-85).

CONSTRUCTION: Either seamless or welded-type fittings will be furnished, at the manufacturer's option. Seamless fittings are formed from selected tubing conforming to ASTM A-106, Grade B. Welded fitting are formed from firebox quality plate, conforming to ASTM A515, Grade 70. All welds are x-rayed in accordance with ASTM A-234. All fittings, whether seamless or welded-type, are hot-formed, hot-coined, and machine-faced and -beveled.

WORKING PRESSURES for both seamless and welded-type fittings are shown on pages 147-160.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.

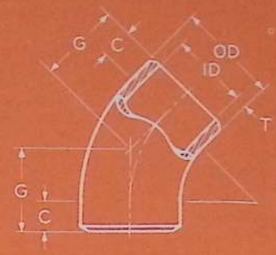
Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 20 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/20

45° ELBOWS

LONG RADIUS LONG TANGENT

CAT. NO. 18BS

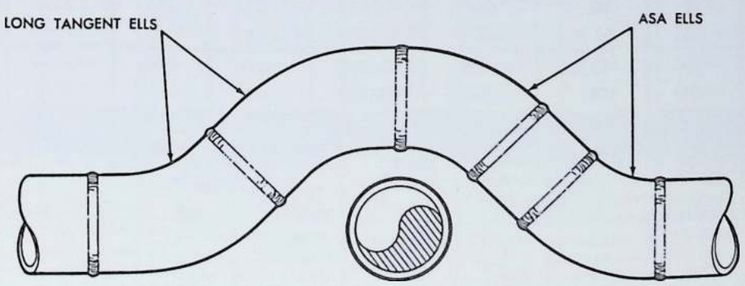




STANDARD WEIGHT

Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimension G	Tangent C	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number	Nominal Pipe Size
2	40	1⅞	½	2.375	2.067	0.154	1	12405	2
2½	40	2⅜	⅝	2.875	2.469	0.203	2	12406	2½
3	40	2¾	¾	3.500	3.068	0.216	3.2	12407	3
3½	40	3⅛	⅞	4.000	3.548	0.226	4.8	12408	3½
4	40	3½	1	4.500	4.026	0.237	6.2	12409	4
5	40	4⅜	1¼	5.563	5.047	0.258	10	12410	5
6	40	5¼	1½	6.625	6.065	0.280	15	12411	6
8	40	7	2	8.625	7.981	0.322	31	12412	8
10	40	8¾	2½	10.750	10.020	0.365	58	12413	10
12	—	10½	3	12.750	12.000	0.375	84	12414	12
14	30	12¼	3½	14.000	13.250	0.375	111	12415	14
16	30	14	4	16.000	15.250	0.375	145	12416	16
18	—	15¾	4½	18.000	17.250	0.375	185	12417	18
20	20	17½	5	20.000	19.250	0.375	226	12418	20
24	20	21	6	24.000	23.250	0.375	333	12420	24
26	—	22	6	26.000	25.250	0.375	380	12421	26
30	—	24½	6	30.000	29.250	0.375	485	12423	30

PRICE SHEETS furnished on application.
DIMENSIONS are shown in inches. Tolerances are given on page 116.
SPECIFICATIONS: Fittings through 24" conform to ASTM Specification A-234 and ASA Standard B16.9 (see pages 113-116), except for dimensions "C" and "G." Schedule numbers conform to ASA Standard B36.10 (see pages 136-145). Sizes over 24" not covered by B16.9.
MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B) and other metals (see pages 82-85).
CONSTRUCTION: Fittings are formed from firebox quality plate conforming to ASTM A-515, Grade 70, welded and stress relieved. Welds are x-rayed in accordance with ASTM A-234. All fittings are hot-formed, hot-coined, and machine-faced and -beveled.
WORKING PRESSURES for all fittings are shown on pages 147-160.
CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.
OTHER materials, sizes, and thicknesses are available. See pages 82-85.

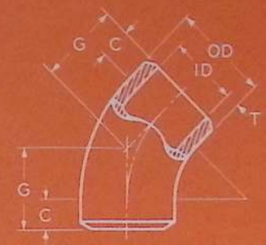


Two long tangent 45° ells (at left) used for a crossover eliminate a pipe stub and one of the welds required when ASA 45° ells (at right) are used. This is typical of piping installations in which long tangent ells save money by eliminating short sections of pipe and extra welds.

45° ELBOWS

LONG RADIUS LONG TANGENT

CAT. NO. 18BX

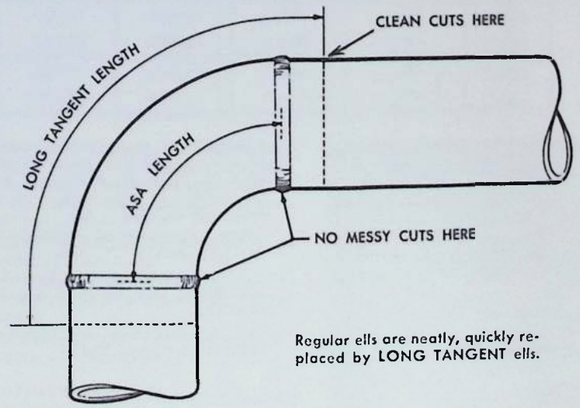


EXTRA STRONG



Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimension G	Tangent C	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number	Nominal Pipe Size
2	80	1⅞	½	2.375	1.939	0.218	1.5	12435	2
2½	80	2⅜	⅝	2.875	2.323	0.276	2.8	12436	2½
3	80	2¾	¾	3.500	2.900	0.300	4.2	12437	3
3½	80	3⅛	⅞	4.000	3.364	0.318	6.5	12438	3½
4	80	3½	1	4.500	3.826	0.337	8.5	12439	4
5	80	4⅜	1¼	5.563	4.813	0.375	14	12440	5
6	80	5¼	1½	6.625	5.761	0.432	24	12441	6
8	80	7	2	8.625	7.625	0.500	48	12442	8
10	60	8¾	2½	10.750	9.750	0.500	79	12443	10
12	—	10½	3	12.750	11.750	0.500	112	12444	12
14	—	12¼	3½	14.000	13.000	0.500	142	12445	14
16	40	14	4	16.000	15.000	0.500	186	12446	16
18	—	15¾	4½	18.000	17.000	0.500	242	12447	18
20	30	17½	5	20.000	19.000	0.500	297	12448	20
24	—	21	6	24.000	23.000	0.500	428	12450	24
26	20	22	6	26.000	25.000	0.500	504	12451	26
30	20	24½	6	30.000	29.000	0.500	649	12453	30

PRICE SHEETS furnished on application.
DIMENSIONS are shown in inches. Tolerances are given on page 116.
SPECIFICATIONS: Fittings through 24" conform to ASTM Specification A-234 and ASA Standard B16.9 (see pages 113-116), except for dimensions "C" and "G." Schedule numbers conform to ASA Standard B36.10 (see pages 136-145). Sizes over 24" not covered by B16.9.
MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B) and other metals (see pages 82-85).
CONSTRUCTION: Fittings are formed from firebox quality plate conforming to ASTM A-515, Grade 70, welded and stress relieved. Welds are x-rayed in accordance with ASTM A-234. All fittings are hot-formed, hot-coined, and machine-faced and -beveled.
WORKING PRESSURES for all fittings are shown on pages 147-160.
CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.
OTHER materials, sizes, and thicknesses are available. See pages 82-85.



Regular ells are neatly, quickly replaced by LONG TANGENT ells.

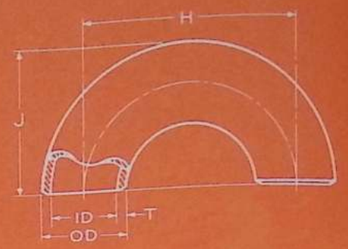
Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 21 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/21

180° RETURNS

LONG RADIUS ASA TYPE

CAT. NO. 22BS





STANDARD WEIGHT

Nominal Pipe Size	Pipe Schedule Number	Center-to-Center Dimension H	Back-to-Face J	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number	Nominal Pipe Size
½	40	3	1⅞	0.840	0.622	0.109	.3	13000	½
¾	40	2½	1 11/16	1.050	0.824	0.113	.3	13001	¾
1	40	3	2 3/16	1.315	1.049	0.133	.7	13002	1
1¼	40	3¾	2¾	1.660	1.380	0.140	1	13003	1¼
1½	40	4½	3¼	1.900	1.610	0.145	1.5	13004	1½
2	40	6	4 3/16	2.375	2.067	0.154	3	13005	2
2½	40	7½	5 3/16	2.875	2.469	0.203	6	13006	2½
3	40	9	6¼	3.500	3.068	0.216	9	13007	3
3½	40	10½	7¼	4.000	3.548	0.226	12	13008	3½
4	40	12	8¼	4.500	4.026	0.237	17	13009	4
5	40	15	10 5/16	5.563	5.047	0.258	28	13010	5
6	40	18	12 5/16	6.625	6.065	0.280	46	13011	6
8	40	24	16 5/16	8.625	7.981	0.322	90	13012	8
10	40	30	20⅜	10.750	10.020	0.365	156	13013	10
12	—	36	24⅜	12.750	12.000	0.375	236	13014	12
14	30	42	28	14.000	13.250	0.375	294	13015	14
16	30	48	32	16.000	15.250	0.375	404	13016	16
18	—	54	36	18.000	17.250	0.375	512	13017	18
20	20	60	40	20.000	19.250	0.375	617	13018	20
24	20	72	48	24.000	23.250	0.375	886	13020	24
26	—	78	52	26.000	25.250	0.375	1085	13021	26
30	—	90	60	30.000	29.250	0.375	1445	13023	30

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.9 through 24". Sizes over 24" not covered by B16.9 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B). Other metals can be furnished on application. (See pages 82-85.)

CONSTRUCTION: Fittings are of seamless construction, formed from selected tubing conforming to ASTM A-106, Grade B. All fittings are hot-formed, hot-coined, and machine-faced and -beveled.

WORKING PRESSURES for all fittings are shown on pages 147-160.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.

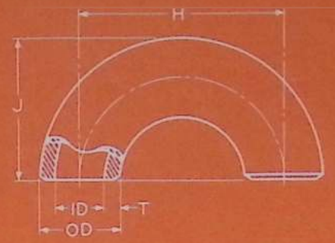


180° RETURN installed in a mid-western gas compressor station.

180° RETURNS

LONG RADIUS ASA TYPE

CAT. NO. 22BX





EXTRA STRONG

Nominal Pipe Size	Pipe Schedule Number	Center-to-Center Dimension H	Back-to-Face J	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number	Nominal Pipe Size
½	80	3	1⅞	0.840	0.546	0.147	.5	13030	½
¾	80	2½	1 11/16	1.050	0.742	0.154	.5	13031	¾
1	80	3	2 3/16	1.315	0.957	0.179	1	13032	1
1¼	80	3¾	2¾	1.660	1.278	0.191	1.5	13033	1¼
1½	80	4½	3¼	1.900	1.500	0.200	2	13034	1½
2	80	6	4 3/16	2.375	1.939	0.218	4	13035	2
2½	80	7½	5 3/16	2.875	2.323	0.276	7.5	13036	2½
3	80	9	6¼	3.500	2.900	0.300	12	13037	3
3½	80	10½	7¼	4.000	3.364	0.318	17	13038	3½
4	80	12	8¼	4.500	3.826	0.337	23	13039	4
5	80	15	10 5/16	5.563	4.813	0.375	40	13040	5
6	80	18	12 5/16	6.625	5.761	0.432	67	13041	6
8	80	24	16 5/16	8.625	7.625	0.500	138	13042	8
10	60	30	20⅜	10.750	9.750	0.500	215	13043	10
12	—	36	24⅜	12.750	11.750	0.500	300	13044	12
14	—	42	28	14.000	13.000	0.500	376	13045	14
16	40	48	32	16.000	15.000	0.500	524	13046	16
18	—	54	36	18.000	17.000	0.500	676	13047	18
20	30	60	40	20.000	19.000	0.500	824	13048	20
24	—	72	48	24.000	23.000	0.500	1183	13050	24
26	20	78	52	26.000	25.000	0.500	1440	13051	26
30	20	90	60	30.000	29.000	0.500	1900	13053	30

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.9 through 24". Sizes over 24" not covered by B16.9 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B). Other metals can be furnished on application. (See pages 82-85.)

CONSTRUCTION: Fittings are of seamless construction, formed from selected tubing conforming to ASTM A-106, Grade B. All fittings are hot-formed, hot-coined, and machine-faced and -beveled.

WORKING PRESSURES for all fittings are shown on pages 147-160.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.



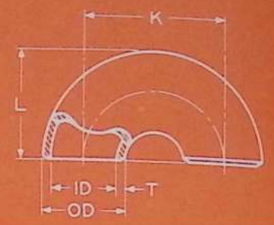
180° RETURN being welded for use in heat exchanger piping in refinery.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 22 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/22

180° RETURNS SHORT RADIUS

CAT. NO. 23BS





STANDARD WEIGHT

Nominal Pipe Size	Pipe Schedule Number	Center-to-Center Dimension K	Back-to-Face L	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number	Nominal Pipe Size
1	40	2	1 5/8	1.315	1.049	0.133	.5	13402	1
1 1/4	40	2 1/2	2 1/16	1.660	1.380	0.140	.8	13403	1 1/4
1 1/2	40	3	2 7/16	1.900	1.610	0.145	1	13404	1 1/2
2	40	4	3 3/16	2.375	2.067	0.154	1.8	13405	2
2 1/2	40	5	3 15/16	2.875	2.469	0.203	3.5	13406	2 1/2
3	40	6	4 3/4	3.500	3.068	0.216	6	13407	3
3 1/2	40	7	5 1/2	4.000	3.548	0.226	8	13408	3 1/2
4	40	8	6 1/4	4.500	4.026	0.237	12	13409	4
5	40	10	7 3/4	5.563	5.047	0.258	19	13410	5
6	40	12	9 5/16	6.625	6.065	0.280	31	13411	6
8	40	16	12 5/16	8.625	7.981	0.322	62	13412	8
10	40	20	15 3/8	10.750	10.020	0.365	110	13413	10
12	—	24	18 3/8	12.750	12.000	0.375	156	13414	12
14	30	28	21	14.000	13.250	0.375	208	13415	14
16	30	32	24	16.000	15.250	0.375	236	13416	16
18	—	36	27	18.000	17.250	0.375	296	13417	18
20	20	40	30	20.000	19.250	0.375	420	13418	20
24	20	48	36	24.000	23.250	0.375	576	13420	24
30	—	60	45	30.000	29.250	0.375	950	13423	30

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.28 through 24". Sizes over 24" not covered by B16.28 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

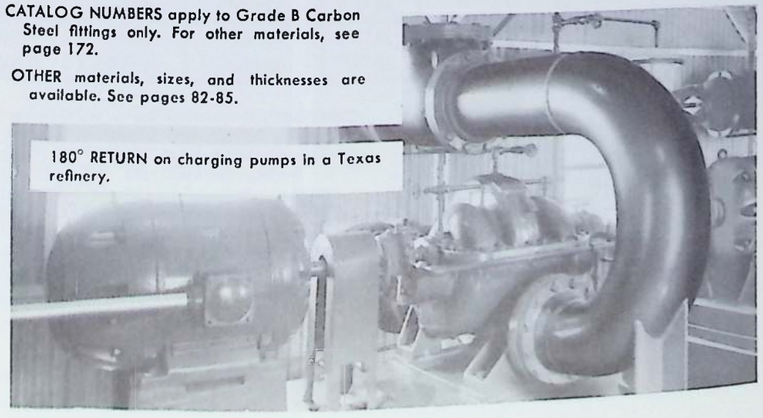
MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B). Other metals can be furnished on application. (See pages 82-85.)

CONSTRUCTION: Fittings are of seamless construction, formed from selected tubing conforming to ASTM A-106, Grade B. All fittings are hot-formed, hot-coined, and machine-faced and -beveled.

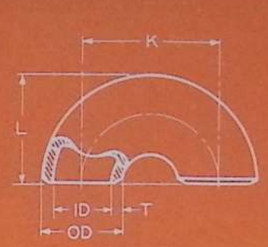
WORKING PRESSURES for all fittings are shown on pages 147-160. These working pressures are subjected to the additional limitations given in ASA Standard B16.28.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.



180° RETURN on charging pumps in a Texas refinery.





180° RETURNS SHORT RADIUS

CAT. NO. 23BX

EXTRA STRONG

Nominal Pipe Size	Pipe Schedule Number	Center-to-Center Dimension K	Back-to-Face L	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number	Nominal Pipe Size
1 1/2	80	3	2 7/16	1.900	1.500	0.200	1.5	13434	1 1/2
2	80	4	3 3/16	2.375	1.939	0.218	3	13435	2
2 1/2	80	5	3 15/16	2.875	2.323	0.276	4.5	13436	2 1/2
3	80	6	4 3/4	3.500	2.900	0.300	7.5	13437	3
3 1/2	80	7	5 1/2	4.000	3.364	0.318	11	13438	3 1/2
4	80	8	6 1/4	4.500	3.826	0.337	15	13439	4
5	80	10	7 3/4	5.563	4.813	0.375	27	13440	5
6	80	12	9 5/16	6.625	5.761	0.432	45	13441	6
8	80	16	12 5/16	8.625	7.625	0.500	92	13442	8
10	60	20	15 3/8	10.750	9.750	0.500	142	13443	10
12	—	24	18 3/8	12.750	11.750	0.500	200	13444	12
14	—	28	21	14.000	13.000	0.500	264	13445	14
16	40	32	24	16.000	15.000	0.500	320	13446	16
18	—	36	27	18.000	17.000	0.500	388	13447	18
20	30	40	30	20.000	19.000	0.500	560	13448	20
24	—	48	36	24.000	23.000	0.500	740	13450	24
30	20	60	45	30.000	29.000	0.500	1225	13453	30

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.28 through 24". Sizes over 24" not covered by B16.28 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B). Other metals can be furnished on application. (See pages 83-85.)

CONSTRUCTION: Fittings are of seamless construction, formed from selected tubing conforming to ASTM A-106, Grade B. All fittings are hot-formed, hot-coined, and machine-faced and -beveled.

WORKING PRESSURES for all fittings are shown on pages 147-160. These working pressures are subjected to the additional limitations given in ASA Standard B16.28, paragraph 2.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 83-85.



Part of a carload of flat hairpin coils made with returns.

Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/23

TYPES OF BRANCHES

		REINFORCED FITTINGS				UNREINFORCED FITTINGS		REINFORCING MEMBERS	
		INTEGRALLY REINFORCED			EXTERNALLY REINFORCED LATERALS	90° AND 45° SHAPED NIPPLES	LATERALS	SADDLES	
		TEES	EXTRUSIONS	CROSSES				REGULAR	"WRAP-AROUND" OR FULL ENCIRCLEMENT
									
CATALOG PAGE NO.		44 - 53	54 - 55	60	61	58 - 59	61	56	57
AVAILABLE IN:	NOMINAL PIPE SIZE RANGE	½" - 36"	Thru 48"	1" - 36"	1" - 36"	1" - 24"	1" - 36"	1" - 30"	1" - 30"
	METALS[1]	Grade B Steel Wrought Iron 1¼% Cr - ½% Mo 5% Cr - ½% Mo Stainless	To order	Grade B Steel	To order	Grade B Steel Wrought Iron	To order	Grade B Steel	To order
	THICKNESSES[1]	Standard Extra Strong Double Ex. Stg. Schedule Nos. Light Walls	To order	Standard Extra Strong	To order	Standard Extra Strong	To order	See text below, and thicknesses on page 56	To order
	CONSTRUCTION	Seamless[2] or Welded	Seamless[2] or Welded	Seamless[2] or Welded	Welded	Seamless	Welded	Seamless	Split Type

[1] Other metals and other thicknesses furnished to order. [2] Sizes above 20", and certain heavy-walls in smaller sizes will be made from rolled, welded and x- rayed plate.

The flexibility of Crane's forging and forming processes permits the manufacture of the broadest variety of fittings for branch connections. Shown on this page are the basic types—reinforced and unreinforced fittings, and reinforcing members—as well as their size ranges and availability from stock in various metals, thicknesses, and types of construction.

Calculation of Reinforcement

Any opening made in the main pipe (or run) of a branch connection interrupts the uniformity of "hoop" stresses in the pipe wall and results in these stresses being concentrated and intensified at the edges of the opening. Thus there is a potential weakness in branch connections, and reinforcement of the joint is often necessary. This can be accomplished in two ways—integrally by the use of heavier walls; or by the use of an external reinforcing member.

The rules for strengthening of joints are established by various codes, such as the ASA Code for Pressure Piping, the ASME Power Boiler Code, and the ASME Unfired Pressure Vessel Code; or by such manufacturing codes as ASA Standard B16.9. It is difficult to summarize the rules of these codes. In all doubtful cases, reinforced fittings should be used, or individual calculations must be made.

The reinforced fittings shown above have all been strengthened, either integrally or externally, to reinforce the nozzle joint to the full strength of the pipe to which it will be joined.

Integrally Reinforced Fittings

Tees are the most commonly used branch connections. These fittings are available from stock in a wide range of metals and thicknesses, and with full-size outlets or in reductions to one size below half-size (i.e., 4" x 4" x 1½") or beyond. The balanced design of Crane barrel-type tees provides full reinforcement . . . easy sweeping curves . . . metal thicknesses tapered to meet matching pipe dimensions. Special tees—unusual sizes and thicknesses, exotic ferrous or non-ferrous fittings, unorthodox shapes—are readily furnished to customers' specific requirements (see pages 78-85).

Extrusions can be made to order from any metal available as pipe or plate. Thicknesses depend upon design conditions, which must be noted in the inquiry. The length of the header, the number and size of nozzles and their location are at the discretion of the specifying engineer. Usually, the height of an extruded nozzle above the header is less than in tees. Size-on-size outlets, while available, are difficult and costly to manufacture, and tees are customarily used for size-on-size connections.

Crosses, made by the same process as tees, have comparable dimensions, but are stocked in a more limited range of thicknesses and metals. They can be made to order in any metal or thickness available as pipe or plate.

Externally Reinforced Fittings

Reinforced laterals, shown in this catalog, are calculated to provide reinforcement to match the full strength of the original header pipe. Since this is not always necessary, design conditions should be noted in the inquiry. Calculations can then be made to fit specific requirements.

Unreinforced Fittings

Where the thickness of the run or branch pipe is greater than required to sustain internal operating pressures, or where extra weld metal can be added to the joint to insure proper reinforcement, the nozzle opening may need no further strengthening. In such cases, one of two types of fittings may be used to form the branch connection.

Shaped nipples, available in 90° or 45° type, simplify the preparation and set-up of the nozzle joint; the contoured end of the fitting serves as a template for scribing the header. After cutting the opening, the shaped nipple is placed on top of the header and joined to the run with an ordinary nozzle weld. Shaped nipples are available from stock in a full size range, shaped to fit any run size up to and including 24" or larger, and can be furnished to order in a wide variety of metals and thicknesses.

Unreinforced laterals—When field conditions suggest the use of a prefabricated, unreinforced fitting, a welding lateral without external reinforcement may be used. Customarily furnished in the 45° type, laterals may be ordered with almost any angle between outlet and run, and in full size or in any degree of reduction. All Crane 45° unreinforced laterals are sufficiently long to permit the application of a reinforcing ring in the field, if required, and the installation of slip-on flanges on all ends of the fitting.

Reinforcing Members

Simple nozzle welds may be reinforced with welding saddles or with reinforcing rings. These are strength members only; they serve to relieve the nozzle weld of excessive tensile, bending, torque and shearing stresses, thereby compensating for the metal lost in cutting the header pipe. Reinforcing members are not intended as pressure parts; note that saddles and rings are furnished with a vent-hole to prevent welding gases from building up pressure between fitting and pipe.

Regular saddles are stocked in an even wider range of reduction than are tees. 1" through 30" outlet sizes are available to fit any header through 30" (larger header sizes to order). These fittings are more than adequate for full reinforcement of nozzle joints in pipe thicknesses through extra strong, and in most cases, in considerably heavier walls. Stocked in Grade "B" steel, regular saddles are frequently ordered in high-yield steel, in chrome-moly alloys, and in stainless steels.

"Wrap-Around" saddles follow the reinforcement design of regular saddles, but are shaped to encircle the entire header. They are furnished in halves, then positioned in the field and welded. Thus, they provide even greater strengthening of the whole nozzle area than do regular saddles. These fittings are designed to meet individual requirements and can be formed from any carbon or alloy steel. Design conditions should be noted on the inquiry.

The "Wrap-Around" saddles shown herein are split horizontally, and can be furnished either with or without alignment bars. These are narrow strips of steel welded to the edges of the bottom half of the saddle, and serve to compensate for variations in the pipe diameter and concentricity.

"Wrap-Around" saddles can be furnished with the split perpendicular to the nozzle, as shown above, or with the split in the plane of the nozzle. In addition, the perpendicularly-split type can be manufactured with nozzle diameters equal to those of the outlet pipe, which is then butt-welded directly to the neck of the saddle, rather than nozzle-welded into the header pipe.

Reinforcing rings for strengthening welded-type branch connections can be furnished to order. Customarily ordered for reinforcement of 45° branches, reinforcing rings are often specified for other angles.

Dimensions shown for reinforcing rings are calculated under the "area replacement" method prescribed by the various sections of the Code for Pressure Piping (B31), and are designed to reinforce the joint to the full strength of the original pipe. Since this is not always necessary, design conditions should be reported with each inquiry.

Split reinforcing rings are available for those cases where it is impossible to slip a seamless ring over the branch before welding.

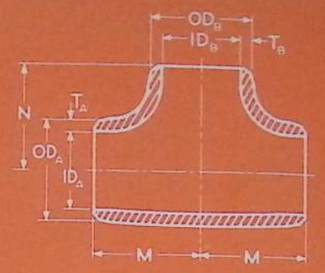
Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 24 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/24

TEES

STRAIGHT AND REDUCING

ASA TYPE





STANDARD WEIGHT

CAT. NO. 24BS

TEES STRAIGHT AND REDUCING ASA TYPE · STANDARD WEIGHT

(TABLE CONTINUED FROM PRECEDING PAGE)

Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimension		RUN			OUTLET			Approx. Weight (lb.)	Part Number
		Run	Outlet	Outside Diam.	Inside Diam.	Wall, Thkn.	Outside Diam.	Inside Diam.	Wall Thkn.		
		M	N	OD_A	ID_A	T_A	OD_B	ID_B	T_B		
½	40	1	1	0.840	0.622	0.109	0.840	0.622	0.109	.3	15000
¾	40	1⅛	1⅛	1.050	0.824	0.113	1.050	0.824	0.113	.5	15001
¾ x ¾ x ½	40	1⅛	1⅛	1.050	0.824	0.113	0.840	0.622	0.109	.4	10700
1	40	1½	1½	1.315	1.049	0.133	1.315	1.049	0.133	.8	15002
1 x 1 x ¾	40	1½	1½	1.315	1.049	0.133	1.050	0.824	0.113	.7	15300
1 x 1 x ½	40	1½	1½	1.315	1.049	0.133	0.840	0.622	0.109	.8	15301
1¼	40	1⅞	1⅞	1.660	1.380	0.140	1.660	1.380	0.140	1.5	15003
1¼ x 1¼ x 1	40	1⅞	1⅞	1.660	1.380	0.140	1.315	1.049	0.133	1.4	15302
1¼ x 1¼ x ¾	40	1⅞	1⅞	1.660	1.380	0.140	1.050	0.824	0.113	1.2	15303
1¼ x 1¼ x ½	40	1⅞	1⅞	1.660	1.380	0.140	0.840	0.622	0.109	.8	10701
1½	40	2¼	2¼	1.900	1.610	0.145	1.900	1.610	0.145	2	15004
1½ x 1½ x 1¼	40	2¼	2¼	1.900	1.610	0.145	1.660	1.380	0.140	1.9	15304
1½ x 1½ x 1	40	2¼	2¼	1.900	1.610	0.145	1.315	1.049	0.133	1.8	15305
1½ x 1½ x ¾	40	2¼	2¼	1.900	1.610	0.145	1.050	0.824	0.113	1.7	15306
1½ x 1½ x ½	40	2¼	2¼	1.900	1.610	0.145	0.840	0.622	0.109	1.2	10702
2	40	2½	2½	2.375	2.067	0.154	2.375	2.067	0.154	3	15005
2 x 2 x 1½	40	2½	2⅜	2.375	2.067	0.154	1.900	1.610	0.145	3	15307
2 x 2 x 1¼	40	2½	2¼	2.375	2.067	0.154	1.660	1.380	0.140	3	15308
2 x 2 x 1	40	2½	2	2.375	2.067	0.154	1.315	1.049	0.133	2.5	15309
2 x 2 x ¾	40	2½	1¾	2.375	2.067	0.154	1.050	0.824	0.113	2.5	15310
2½	40	3	3	2.875	2.469	0.203	2.875	2.469	0.203	5.5	15006
2½ x 2½ x 2	40	3	2¾	2.875	2.469	0.203	2.375	2.067	0.154	5.5	15311
2½ x 2½ x 1½	40	3	2⅝	2.875	2.469	0.203	1.900	1.610	0.145	5.2	15312
2½ x 2½ x 1¼	40	3	2½	2.875	2.469	0.203	1.660	1.380	0.140	5	15313
2½ x 2½ x 1	40	3	2¼	2.875	2.469	0.203	1.315	1.049	0.133	5	15314
3	40	3⅜	3⅜	3.500	3.068	0.216	3.500	3.068	0.216	7.8	15007
3 x 3 x 2½	40	3⅜	3¼	3.500	3.068	0.216	2.875	2.469	0.203	7.8	15315
3 x 3 x 2	40	3⅜	3	3.500	3.068	0.216	2.375	2.067	0.154	7.7	15316
3 x 3 x 1½	40	3⅜	2⅞	3.500	3.068	0.216	1.900	1.610	0.145	7.2	15317
3 x 3 x 1¼	40	3⅜	2¾	3.500	3.068	0.216	1.660	1.380	0.140	6.8	15318
3 x 3 x 1	40	3⅜	2⅝	3.500	3.068	0.216	1.315	1.049	0.133	6.2	15319
3½	40	3¾	3¾	4.000	3.548	0.226	4.000	3.548	0.226	10	15008
3½ x 3½ x 3	40	3¾	3⅝	4.000	3.548	0.226	3.500	3.068	0.216	10	15320
3½ x 3½ x 2½	40	3¾	3½	4.000	3.548	0.226	2.875	2.469	0.203	10	15321
3½ x 3½ x 2	40	3¾	3¼	4.000	3.548	0.226	2.375	2.067	0.154	9.5	15322
3½ x 3½ x 1½	40	3¾	3⅛	4.000	3.548	0.226	1.900	1.610	0.145	9.2	15323
4	40	4⅛	4⅛	4.500	4.026	0.237	4.500	4.026	0.237	14	15009
4 x 4 x 3½	40	4⅛	4	4.500	4.026	0.237	4.000	3.548	0.226	14	15324
4 x 4 x 3	40	4⅛	3⅜	4.500	4.026	0.237	3.500	3.068	0.216	13	15325
4 x 4 x 2½	40	4⅛	3¾	4.500	4.026	0.237	2.875	2.469	0.203	13	15326
4 x 4 x 2	40	4⅛	3½	4.500	4.026	0.237	2.375	2.067	0.154	12	15327
4 x 4 x 1½	40	4⅛	3⅜	4.500	4.026	0.237	1.900	1.610	0.145	12	15328
5	40	4⅞	4⅞	5.563	5.047	0.258	5.563	5.047	0.258	21	15010
5 x 5 x 4	40	4⅞	4⅝	5.563	5.047	0.258	4.500	4.026	0.237	21	15330
5 x 5 x 3½	40	4⅞	4½	5.563	5.047	0.258	4.000	3.548	0.226	20	15331
5 x 5 x 3	40	4⅞	4⅜	5.563	5.047	0.258	3.500	3.068	0 216	20	15332
5 x 5 x 2½	40	4⅞	4¼	5 563	5.047	0.258	2.875	2.469	0.203	20	15333
5 x 5 x 2	40	4⅞	4⅛	5.563	5.047	0.258	2.375	2.067	0.154	19	15334
6	40	5⅝	5⅝	6.625	6.065	0.280	6.625	6.065	0.280	33	15011
6 x 6 x 5	40	5⅝	5⅜	6.625	6.065	0.280	5.563	5.047	0.258	33	15335
6 x 6 x 4	40	5⅝	5⅛	6.625	6.065	0.280	4.500	4.026	0.237	32	15336
6 x 6 x 3½	40	5⅝	5	6.625	6.065	0.280	4.000	3.548	0.226	32	15337
6 x 6 x 3	40	5⅝	4⅞	6.625	6.065	0.280	3.500	3.068	0.216	31	15338
6 x 6 x 2½	40	5⅝	4¾	6.625	6.065	0.280	2.875	2.469	0.203	30	15339
8	40	7	7	8.625	7.981	0.322	8.625	7.981	0.322	73	15012
8 x 8 x 6	40	7	6⅝	8.625	7.981	0.322	6.625	6.065	0.280	73	15341
8 x 8 x 5	40	7	6⅜	8.625	7.981	0.322	5.563	5.047	0.258	58	15342
8 x 8 x 4	40	7	6⅛	8.625	7.981	0.322	4.500	4.026	0.237	57	15343
8 x 8 x 3½	40	7	6	8.625	7.981	0.322	4.000	3.548	0.226	56	15344
8 x 8 x 3	40	7	6	8.625	7.981	0.322	3.500	3.068	0.216	48	15345
10	40	8½	8½	10.750	10.020	0.365	10.750	10.020	0.365	110	15013
10 x 10 x 8	40	8½	8	10.750	10.020	0.365	8.625	7.981	0.322	108	15346
10 x 10 x 6	40	8½	7⅝	10.750	10.020	0.365	6.625	6.065	0.280	88	15347
10 x 10 x 5	40	8½	7½	10.750	10.020	0.365	5.563	5.047	0.258	86	15348
10 x 10 x 4	40	8½	7¼	10.750	10.020	0.365	4.500	4.026	0.237	84	15349
12	—	10	10	12.750	12.000	0.375	12.750	12.000	0.375	155	15014
12 x 12 x 10	—	10	9½	12.750	12.000	0.375	10.750	10.020	0.365	155	15350
12 x 12 x 8	—	10	9	12.750	12.000	0.375	8.625	7.981	0.322	125	15351
12 x 12 x 6	—	10	8⅝	12.750	12.000	0.375	6.625	6.065	0.280	122	15352
12 x 12 x 5	—	10	8½	12.750	12.000	0.375	5.563	5.047	0.258	120	15353

(TABLE CONTINUED ON FOLLOWING PAGE)

(TABLE CONTINUED ON FOLLOWING PAGE)

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 25 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/25

TEES STRAIGHT AND REDUCING ASA TYPE · STANDARD WEIGHT

(TABLE CONTINUED FROM PRECEDING PAGE)

Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimension		RUN			OUTLET			Approx. Weight (lb.)	Part Number
		Run	Outlet	Outside Diam.	Inside Diam.	Wall Thkn.	Outside Diam.	Inside Diam.	Wall Thkn.		
		M	N	OD_A	ID_A	T_A	OD_B	ID_B	T_B		
14	30	11	11	14.000	13.250	0.375	14.000	13.250	0.375	210	15015
14 x 14 x 12	—	11	10⅝	14.000	13.250	0.375	12.750	12.000	0.375	210	15355
14 x 14 x 10	30-40	11	10⅛	14.000	13.250	0.375	10.750	10.020	0.365	210	15656
14 x 14 x 8	30-40	11	9¾	14.000	13.250	0.375	8.625	7.981	0.322	200	15357
14 x 14 x 6	30-40	11	9⅜	14.000	13.250	0.375	6.625	6.065	0.280	200	15358
16	30	12	12	16.000	15.250	0.375	16.000	15.250	0.375	245	15016
16 x 16 x 14	30	12	12	16.000	15.250	0.375	14.000	13.250	0.375	245	15359
16 x 16 x 12	—	12	11⅝	16.000	15.250	0.375	12.750	12.000	0.375	245	15360
16 x 16 x 10	30-40	12	11⅛	16.000	15.250	0.375	10.750	10.020	0.365	236	15361
16 x 16 x 8	30-40	12	10¾	16.000	15.250	0.375	8.625	7.981	0.322	236	15362
16 x 16 x 6	30-40	12	10⅜	16.000	15.250	0.375	6.625	6.065	0.280	195	15363
18	—	13½	13½	18.000	17.250	0.375	18.000	17.250	0.375	300	15017
18 x 18 x 16	—	13½	13	18.000	17.250	0.375	16.000	15.250	0.375	300	15364
18 x 18 x 14	—	13½	13	18.000	17.250	0.375	14.000	13.250	0.375	300	15365
18 x 18 x 12	—	13½	12⅝	18.000	17.250	0.375	12.750	12.000	0.375	285	15366
18 x 18 x 10	—	13½	12⅛	18.000	17.250	0.375	10.750	10.020	0.365	285	15367
18 x 18 x 8	—	13½	11¾	18.000	17.250	0.375	8.625	7.981	0.322	245	15368
20	20	15	15	20.000	19.250	0.375	20.000	19.250	0.375	372	15018
20 x 20 x 18	—	15	14½	20.000	19.250	0.375	18.000	17.250	0.375	372	15369
20 x 20 x 16	20-30	15	14	20.000	19.250	0.375	16.000	15.250	0.375	372	15370
20 x 20 x 14	20-30	15	14	20.000	19.250	0.375	14.000	13.250	0.375	357	15371
20 x 20 x 12	—	15	13⅝	20.000	19.250	0.375	12.750	12.000	0.375	357	15372
20 x 20 x 10	20-40	15	13⅛	20.000	19.250	0.375	10.750	10.020	0.365	325	15373
20 x 20 x 8	20-40	15	12¾	20.000	19.250	0.375	8.625	7.981	0.322	315	15374
22	20	16½	16½	22.000	21.250	0.375	22.000	21.250	0.375	425	15019
22 x 22 x 20	20	16½	16	22.000	21.250	0.375	20.000	19.250	0.375	415	15375
22 x 22 x 18	—	16½	15½	22.000	21.250	0.375	18.000	17.250	0.375	410	15376
22 x 22 x 16	20-30	16½	15	22.000	21.250	0.375	16.000	15.250	0.375	402	15377
22 x 22 x 14	20-30	16½	15	22.000	21.250	0.375	14.000	13.250	0.375	398	15378
22 x 22 x 12	—	16½	14⅝	22.000	21.250	0.375	12.750	12.000	0.375	393	15379
22 x 22 x 10	20-40	16½	14⅛	22.000	21.250	0.375	10.750	10.020	0.365	388	15380
24	20	17	17	24.000	23.250	0.375	24.000	23.250	0.375	512	15020
24 x 24 x 20	20	17	17	24.000	23.250	0.375	20.000	19.250	0.375	512	15382
24 x 24 x 18	—	17	16½	24.000	23.250	0.375	18.000	17.250	0.375	497	15383
24 x 24 x 16	20-30	17	16	24.000	23.250	0.375	16.000	15.250	0.375	497	15384
24 x 24 x 14	20-30	17	16	24.000	23.250	0.375	14.000	13.250	0.375	495	15385
24 x 24 x 12	—	17	15⅝	24.000	23.250	0.375	12.750	12.000	0.375	493	15386
24 x 24 x 10	20-40	17	15⅛	24.000	23.250	0.375	10.750	10.020	0.365	491	15387

(TABLE CONTINUED ON FOLLOWING PAGE)

TEES STRAIGHT AND REDUCING ASA TYPE · STANDARD WEIGHT

(TABLE CONTINUED FROM PRECEDING PAGE)

Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimension		RUN			OUTLET			Approx. Weight (lb.)	Part Number
		Run	Outlet	Outside Diam.	Inside Diam.	Wall Thkn.	Outside Diam.	Inside Diam.	Wall Thkn.		
		M	N	OD_A	ID_A	T_A	OD_B	ID_B	T_B		
26	—	19½	19½	26.000	25.250	0.375	26.000	25.250	0.375	765	15021
26 x 26 x 24	—	19½	19	26.000	25.250	0.375	24.000	23.250	0.375	750	10703
26 x 26 x 22	—	19½	18½	26.000	25.250	0.375	22.000	21.250	0.375	745	10704
26 x 26 x 20	—	19½	18	26.000	25.250	0.375	20.000	19.250	0.375	740	10705
26 x 26 x 18	—	19½	17½	26.000	25.250	0.375	18.000	17.250	0.375	735	10706
26 x 26 x 16	—	19½	17	26.000	25.250	0.375	16.000	15.250	0.375	730	10707
26 x 26 x 14	—	19½	17	26.000	25.250	0.375	14.000	13.250	0.375	725	10708
26 x 26 x 12	—	19½	16⅝	26.000	25.250	0.375	12.750	12.000	0.375	720	10709
30	—	22	22	30.000	29.250	0.375	30.000	29.250	0.375	1040	15023
30 x 30 x 26	—	22	21½	30.000	29.250	0.375	26.000	25.250	0.375	1025	10710
30 x 30 x 24	—	22	21	30.000	29.250	0.375	24.000	23.250	0.375	1020	10711
30 x 30 x 22	—	22	20½	30.000	29.250	0.375	22.000	21.250	0.375	1015	10712
30 x 30 x 20	—	22	20	30.000	29.250	0.375	20.000	19.250	0.375	1010	10713
30 x 30 x 18	—	22	19½	30.000	29.250	0.375	18.000	17.250	0.375	1005	10714
30 x 30 x 16	—	22	19	30.000	29.250	0.375	16.000	15.250	0.375	1000	10715
30 x 30 x 14	—	22	19	30.000	29.250	0.375	14.000	13.250	0.375	995	10716
36	—	26½	26½	36.000	35.250	0.375	36.000	35.250	0.375	1470	15026
36 x 36 x 30	—	26½	25	36.000	35.250	0.375	30.000	29.250	0.375	1440	10717
36 x 36 x 26	—	26½	24½	36.000	35.250	0.375	26.000	25.250	0.375	1415	10718
36 x 36 x 24	—	26½	24	36.000	35.250	0.375	24.000	23.250	0.375	1400	10719
36 x 36 x 22	—	26½	23½	36.000	35.250	0.375	22.000	21.250	0.375	1385	10720
36 x 36 x 20	—	26½	23	36.000	35.250	0.375	20.000	19.250	0.375	1370	10721
36 x 36 x 18	—	26½	22½	36.000	35.250	0.375	18.000	17.250	0.375	1355	10722
36 x 36 x 16	—	26½	22	36.000	35.250	0.375	16.000	15.250	0.375	1340	17023
42	—	Dimensions on request									

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.9 through 24". Sizes over 24" not covered by B16.9 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B), Wrought Iron, and other metals (see pages 82-85).

CONSTRUCTION: Unless otherwise specified, fittings 20" and smaller will be of seamless construction, formed from selected tubing conforming to ASTM Specification A-106, Grade B. Fittings in larger sizes will be formed from firebox quality plate conforming to ASTM Specification A-515, Grade 70, welded and stress relieved. All welds are fully x-rayed. All fittings, both seamless and welded-type, are hot formed and machine-faced and -beveled.

WORKING PRESSURES for both seamless and welded-type fittings are shown on pages 147-160.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

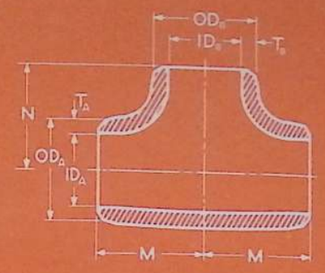
OTHER materials, sizes, and thicknesses are available. See pages 82-85.

Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/26

TEES
STRAIGHT AND REDUCING
ASA TYPE



CAT. NO. 24BX



EXTRA STRONG

Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimension		RUN			OUTLET			Approx. Weight (lb.)	Part Number
		Run	Outlet	Outside Diam.	Inside Diam.	Wall Thkn.	Outside Diam.	Inside Diam.	Wall Thkn.		
		M	N	OD_A	ID_A	T_A	OD_B	ID_B	T_B		
½	80	1	1	0.840	0.546	0.147	0.840	0.546	0.147	.3	15030
¾	80	1⅛	1⅛	1.050	0.742	0.154	1.050	0.742	0.154	.8	15031
¾ x ¾ x ½	80	1⅛	1⅛	1.050	0.742	0.154	0.840	0.546	0.147	.6	10800
1	80	1½	1½	1.315	0.957	0.179	1.315	0.957	0.179	.9	15032
1 x 1 x ¾	80	1½	1½	1.315	0.957	0.179	1.050	0.742	0.154	.8	15400
1 x 1 x ½	80	1½	1½	1.315	0.957	0.179	0.840	0.546	0.147	.7	15401
1¼	80	1⅞	1⅞	1.660	1.278	0.191	1.660	1.278	0.191	1.4	15033
1¼ x 1¼ x 1	80	1⅞	1⅞	1.660	1.278	0.191	1.315	0.957	0.179	1.4	15402
1¼ x 1¼ x ¾	80	1⅞	1⅞	1.660	1.278	0.191	1.050	0.742	0.154	1.3	15403
1¼ x 1¼ x ½	80	1⅞	1⅞	1.660	1.278	0.191	0.840	0.546	0.147	1.3	10801
1½	80	2¼	2¼	1.900	1.500	0.200	1.900	1.500	0.200	2	15034
1½ x 1½ x 1¼	80	2¼	2¼	1.900	1.500	0.200	1.660	1.278	0.191	2	15404
1½ x 1½ x 1	80	2¼	2¼	1.900	1.500	0.200	1.315	0.957	0.179	2	15405
1½ x 1½ x ¾	80	2¼	2¼	1.900	1.500	0.200	1.050	0.742	0.154	2	15406
1½ x 1½ x ½	80	2¼	2¼	1.900	1.500	0.200	0.840	0.546	0.147	2	10802
2	80	2½	2½	2.375	1.939	0.218	2.375	1.939	0.218	4	15035
2 x 2 x 1½	80	2½	2⅜	2.375	1.939	0.218	1.900	1.500	0.200	4	15407
2 x 2 x 1¼	80	2½	2¼	2.375	1.939	0.218	1.660	1.278	0.191	3.5	15408
2 x 2 x 1	80	2½	2	2.375	1.939	0.218	1.315	0.957	0.179	3.5	15409
2 x 2 x ¾	80	2½	1¾	2.375	1.939	0.218	1.050	0.742	0.154	3.2	15410
2½	80	3	3	2.875	2.323	0.276	2.875	2.323	0.276	6.8	15036
2½ x 2½ x 2	80	3	2¾	2.875	2.323	0.276	2.375	1.939	0.218	6.7	15411
2½ x 2½ x 1½	80	3	2⅝	2.875	2.323	0.276	1.900	1.500	0.200	6.5	15412
2½ x 2½ x 1¼	80	3	2½	2.875	2.323	0.276	1.660	1.278	0.191	6.2	15413
2½ x 2½ x 1	80	3	2¼	2.875	2.323	0.276	1.315	0.957	0.179	6.2	15414
3	80	3⅜	3⅜	3.500	2.900	0.300	3.500	2.900	0.300	9.3	15037
3 x 3 x 2½	80	3⅜	3¼	3.500	2.900	0.300	2.875	2.323	0.276	9.2	15415
3 x 3 x 2	80	3⅜	3	3.500	2.900	0.300	2.375	1.939	0.218	9	15416
3 x 3 x 1½	80	3⅜	2⅞	3.500	2.900	0.300	1.900	1.500	0.200	8.7	15417
3 x 3 x 1¼	80	3⅜	2¾	3.500	2.900	0.300	1.660	1.278	0.191	8	15418
3 x 3 x 1	80	3⅜	2⅝	3.500	2.900	0.300	1.315	0.957	0.179	7.5	15419

(TABLE CONTINUED ON FOLLOWING PAGE)

(TABLE CONTINUED FROM PRECEDING PAGE)

Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimension		RUN			OUTLET			Approx. Weight (lb.)	Part Number
		Run	Outlet	Outside Diam.	Inside Diam.	Wall Thkn.	Outside Diam.	Inside Diam.	Wall Thkn.		
		M	N	OD_A	ID_A	T_A	OD_B	ID_B	T_B		
3½	80	3¾	3¾	4.000	3.364	0.318	4.000	3.364	0.318	12	15038
3½ x 3½ x 3	80	3¾	3⅝	4.000	3.364	0.318	3.500	2.900	0.300	12	15420
3½ x 3½ x 2½	80	3¾	3½	4.000	3.364	0.318	2.875	2.323	0.276	11.5	15421
3½ x 3½ x 2	80	3¾	3¼	4.000	3.364	0.318	2.375	1.939	0.218	11	15422
3½ x 3½ x 1½	80	3¾	3⅛	4.000	3.364	0.318	1.900	1.500	0.200	10.5	15423
4	80	4⅛	4⅛	4.500	3.826	0.337	4.500	3.826	0.337	17.5	15039
4 x 4 x 3½	80	4⅛	4	4.500	3.826	0.337	4.000	3.364	0.318	17.5	15424
4 x 4 x 3	80	4⅛	3⅞	4.500	3.826	0.337	3.500	2.900	0.300	17	15425
4 x 4 x 2½	80	4⅛	3¾	4.500	3.826	0.337	2.875	2.323	0.276	16.5	15426
4 x 4 x 2	80	4⅛	3½	4.500	3.826	0.337	2.375	1.939	0.218	16	15427
4 x 4 x 1½	80	4⅛	3⅜	4.500	3.826	0.337	1.900	1.500	0.200	15.5	15428
5	80	4⅞	4⅞	5.563	4.813	0.375	5.563	4.813	0.375	27	15040
5 x 5 x 4	80	4⅞	4⅝	5.563	4.813	0.375	4.500	3.826	0.337	27	15430
5 x 5 x 3½	80	4⅞	4½	5.563	4.813	0.375	4.000	3.364	0.318	26	15431
5 x 5 x 3	80	4⅞	4⅜	5.563	4.813	0.375	3.500	2.900	0.300	25	15432
5 x 5 x 2½	80	4⅞	4¼	5.563	4.813	0.375	2.875	2.323	0.276	24	15433
5 x 5 x 2	80	4⅞	4⅛	5.563	4.813	0.375	2.375	1.939	0.218	23	15434
6	80	5⅜	5⅜	6.625	5.761	0.432	6.625	5.761	0.432	45	15041
6 x 6 x 5	80	5⅜	5⅜	6.625	5.761	0.432	5.563	4.813	0.375	45	15435
6 x 6 x 4	80	5⅜	5⅛	6.625	5.761	0.432	4.500	3.826	0.337	42	15436
6 x 6 x 3½	80	5⅜	5	6.625	5.761	0.432	4.000	3.364	0.318	41	15437
6 x 6 x 3	80	5⅜	4⅞	6.625	5.761	0.432	3.500	2.900	0.300	39	15438
6 x 6 x 2½	80	5⅜	4¾	6.625	5.761	0.432	2.875	2.323	0.276	38	15439
8	80	7	7	8.625	7.625	0.500	8.625	7.625	0.500	86	15042
8 x 8 x 6	80	7	6⅝	8.625	7.625	0.500	6.625	5.761	0.432	86	15441
8 x 8 x 5	80	7	6⅜	8.625	7.625	0.500	5.563	4.813	0.375	71	15442
8 x 8 x 4	80	7	6⅛	8.625	7.625	0.500	4.500	3.826	0.337	70	15443
8 x 8 x 3½	80	7	6	8.625	7.625	0.500	4.000	3.364	0.318	69	15444
8 x 8 x 3	80	7	6	8.625	7.625	0.500	3.500	2.900	0.300	69	15445
10	60	8½	8½	10.750	9.750	0.500	10.750	9.750	0.500	132	15043
10 x 10 x 8	60-80	8½	8	10.750	9.750	0.500	8.625	7.625	0.500	130	15446
10 x 10 x 6	60-80	8½	7⅝	10.750	9.750	0.500	6.625	5.761	0.432	111	15447
10 x 10 x 5	60-80	8½	7½	10.750	9.750	0.500	5.563	4.813	0.375	108	15448
10 x 10 x 4	60-80	8½	7¼	10.750	9.750	0.500	4.500	3.826	0.337	105	15449
12	—	10	10	12.750	11.750	0.500	12.750	11.750	0.500	186	15044
12 x 12 x 10	—	10	9½	12.750	11.750	0.500	10.750	9.750	0.500	184	15450
12 x 12 x 8	—	10	9	12.750	11.750	0.500	8.625	7.625	0.500	156	15451
12 x 12 x 6	—	10	8⅝	12.750	11.750	0.500	6.625	5.761	0.432	152	15452
12 x 12 x 5	—	10	8½	12.750	11.750	0.500	5.563	4.813	0.375	150	15453

(TABLE CONTINUED ON FOLLOWING PAGE)

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 27 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/27

TEES STRAIGHT AND REDUCING ASA TYPE • EXTRA STRONG

(TABLE CONTINUED FROM PRECEDING PAGE)

Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimension		RUN			OUTLET			Approx. Weight (lb.)	Part Number
		Run	Outlet	Outside Diam.	Inside Diam.	Wall Thkn.	Outside Diam.	Inside Diam.	Wall Thkn.		
		M	N	OD_A	ID_A	T_A	OD_B	ID_B	T_B		
14	—	11	11	14.000	13.000	0.500	14.000	13.000	0.500	280	15045
14 x 14 x 12	—	11	10⅝	14.000	13.000	0.500	12.750	11.750	0.500	280	15455
14 x 14 x 10	—	11	10⅛	14.000	13.000	0.500	10.750	9.750	0.500	273	15456
14 x 14 x 8	—	11	9¾	14.000	13.000	0.500	8.625	7.625	0.500	264	15457
14 x 14 x 6	—	11	9⅜	14.000	13.000	0.500	6.625	5.761	0.432	264	15458
16	40	12	12	16.000	15.000	0.500	16.000	15.000	0.500	320	15046
16 x 16 x 14	—	12	12	16.000	15.000	0.500	14.000	13.000	0.500	320	15459
16 x 16 x 12	—	12	11⅝	16.000	15.000	0.500	12.750	11.750	0.500	312	15460
16 x 16 x 10	40-60	12	11⅛	16.000	15.000	0.500	10.750	9.750	0.500	312	15461
16 x 16 x 8	40-80	12	10¾	16.000	15.000	0.500	8.625	7.625	0.500	305	15462
16 x 16 x 6	40-80	12	10⅜	16.000	15.000	0.500	6.625	5.761	0.432	290	15463
18	—	13½	13½	18.000	17.000	0.500	18.000	17.000	0.500	397	15047
18 x 18 x 16	—	13½	13	18.000	17.000	0.500	16.000	15.000	0.500	397	15464
18 x 18 x 14	—	13½	13	18.000	17.000	0.500	14.000	13.000	0.500	397	15465
18 x 18 x 12	—	13½	12⅝	18.000	17.000	0.500	12.750	11.750	0.500	382	15466
18 x 18 x 10	—	13½	12⅛	18.000	17.000	0.500	10.750	9.750	0.500	382	15467
18 x 18 x 8	—	13½	11¾	18.000	17.000	0.500	8.625	7.625	0.500	370	15468
20	30	15	15	20.000	19.000	0.500	20.000	19.000	0.500	492	15048
20 x 20 x 18	—	15	14½	20.000	19.000	0.500	18.000	17.000	0.500	492	15469
20 x 20 x 16	30-40	15	14	20.000	19.000	0.500	16.000	15.000	0.500	492	15470
20 x 20 x 14	—	15	14	20.000	19.000	0.500	14.000	13.000	0.500	477	15471
20 x 20 x 12	—	15	13⅝	20.000	19.000	0.500	12.750	11.750	0.500	477	15472
20 x 20 x 10	30-60	15	13⅛	20.000	19.000	0.500	10.750	9.750	0.500	460	15473
20 x 20 x 8	30-80	15	12¾	20.000	19.000	0.500	8.625	7.625	0.500	445	15474
22	30	16½	16½	22.000	21.000	0.500	22.000	21.000	0.500	545	15049
22 x 22 x 20	30	16½	16	22.000	21.000	0.500	20.000	19.000	0.500	541	15475
22 x 22 x 18	—	16½	15½	22.000	21.000	0.500	18.000	17.000	0.500	537	15476
22 x 22 x 16	30-40	16½	15	22.000	21.000	0.500	16.000	15.000	0.500	533	15477
22 x 22 x 14	—	16½	15	22.000	21.000	0.500	14.000	13.000	0.500	529	15478
22 x 22 x 12	—	16½	14⅝	22.000	21.000	0.500	12.750	11.750	0.500	525	15479
22 x 22 x 10	30-60	16½	14⅛	22.000	21.000	0.500	10.750	9.750	0.500	520	15480
24	—	17	17	24.000	23.000	0.500	24.000	23.000	0.500	680	15050
24 x 24 x 20	—	17	17	24.000	23.000	0.500	20.000	19.000	0.500	680	15482
24 x 24 x 18	—	17	16½	24.000	23.000	0.500	18.000	17.000	0.500	665	15483
24 x 24 x 16	—	17	16	24.000	23.000	0.500	16.000	15.000	0.500	665	15484
24 x 24 x 14	—	17	16	24.000	23.000	0.500	14.000	13.000	0.500	650	15485
24 x 24 x 12	—	17	15⅝	24.000	23.000	0.500	12.750	11.750	0.500	635	15486
24 x 24 x 10	—	17	15⅛	24.000	23.000	0.500	10.750	9.750	0.500	605	15487

(TABLE CONTINUED ON FOLLOWING PAGE)

TEES STRAIGHT AND REDUCING ASA TYPE • EXTRA STRONG

(TABLE CONTINUED FROM PRECEDING PAGE)

Nominal Pipe Size	Pipe Schedule Number	Center-to-End Dimension		RUN			OUTLET			Approx. Weight (lb.)	Part Number
		Run	Outlet	Outside Diam.	Inside Diam.	Wall Thkn.	Outside Diam.	Inside Diam.	Wall Thkn.		
		M	N	OD_A	ID_A	T_A	OD_B	ID_B	T_B		
26	20	19½	19½	26.000	25.000	0.500	26.000	25.000	0.500	890	15051
26 x 26 x 24	—	19½	19	26.000	25.000	0.500	24.000	23.000	0.500	875	10803
26 x 26 x 22	20-30	19½	18½	26.000	25.000	0.500	22.000	21.000	0.500	860	10804
26 x 26 x 20	20-30	19½	18	26.000	25.000	0.500	20.000	19.000	0.500	855	10805
26 x 26 x 18	—	19½	17½	26.000	25.000	0.500	18.000	17.000	0.500	840	10806
26 x 26 x 16	20-40	19½	17	26.000	25.000	0.500	16.000	15.000	0.500	825	10807
26 x 26 x 14	—	19½	17	26.000	25.000	0.500	14.000	13.000	0.500	810	10809
26 x 26 x 12	—	19½	16⅜	26.000	25.000	0.500	12.750	11.750	0.500	795	10809
30	20	22	22	30.000	29.000	0.500	30.000	29.000	0.500	1130	15053
30 x 30 x 26	20	22	21½	30.000	29.000	0.500	26.000	25.000	0.500	1105	10810
30 x 30 x 24	—	22	21	30.000	29.000	0.500	24.000	23.000	0.500	1090	10811
30 x 30 x 22	20-30	22	20½	30.000	29.000	0.500	22.000	21.000	0.500	1075	10812
30 x 30 x 20	20-30	22	20	30.000	29.000	0.500	20.000	19.000	0.500	1060	10813
30 x 30 x 18	—	22	19½	30.000	29.000	0.500	18.000	17.000	0.500	1045	10814
30 x 30 x 16	20-40	22	19	30.000	29.000	0.500	16.000	15.000	0.500	1030	10815
30 x 30 x 14	—	22	19	30.000	29.000	0.500	14.000	13.000	0.500	1015	10816
36	20	26½	26½	36.000	35.000	0.500	36.000	35.000	0.500	1670	15056
36 x 36 x 30	20	26½	25	36.000	35.000	0.500	30.000	29.000	0.500	1630	10817
36 x 36 x 26	20	26½	24½	36.000	35.000	0.500	26.000	25.000	0.500	1590	10818
36 x 36 x 24	—	26½	24	36.000	35.000	0.500	24.000	23.000	0.500	1565	10819
36 x 36 x 22	20-30	26½	23½	36.000	35.000	0.500	22.000	21.000	0.500	1540	10820
36 x 36 x 20	20-30	26½	23	36.000	35.000	0.500	20.000	19.000	0.500	1515	10821
36 x 36 x 18	—	26½	22½	36.000	35.000	0.500	18.000	17.000	0.500	1490	10822
36 x 36 x 16	20-40	26½	22	36.000	35.000	0.500	16.000	15.000	0.500	1465	10823
42	20	Dimensions on request									

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.9 through 24". Sizes over 24" not covered by B16.9 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B), Wrought Iron, and other metals (see pages 82-85).

CONSTRUCTION: Unless otherwise specified, fittings 20" and smaller will be of seamless construction, formed from selected tubing conforming to ASTM Specification A-106 Grade B. Fittings in larger sizes will be formed from firebox quality plate conforming to ASTM Specification A-515, Grade 70, welded and stress relieved. All welds are fully x-rayed. All fittings, both seamless and welded-type, are hot-formed and machine-faced and -beveled.

WORKING PRESSURES for both seamless and welded-type fittings are shown on pages 147-160.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.

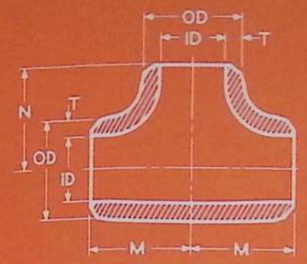
Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 28 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/28

TEES

STRAIGHT ASA TYPE



CAT. NO. 24B*



OTHER THICKNESSES

Nominal Pipe Size	Center-to-End Dimension	Outside Diameter	Inside Diameter	Wall Thickness	Approx. Weight (lb.)	Part Number	Inside Diameter	Wall Thickness	Approx. Weight (lb.)	Part Number
			ID	T			ID	T		
N.P.S.	M or N	OD	SCHEDULE 10*				GAS DISTRIBUTION THICKNESS			
2	2½	2.375	2.157	0.109	3.7	15105	—	—	—	—
2½	3	2.875	2.635	0.120	4.8	15106	—	—	—	—
3	3⅜	3.500	3.260	0.120	6.6	15107	—	—	—	—
3½	3¾	4.000	3.760	0.120	8.9	15108	—	—	—	—
4	4⅛	4.500	4.260	0.120	9.6	15109	4.124	0.188	13	15089
5	4⅞	5.563	5.295	0.134	16	15110	—	—	—	—
6	5⅜	6.625	6.357	0.134	25	15111	6.187	0.219	35	15091
8	7	8.625	8.329	0.148	45	15112	8.187	0.219	50	15092
10	8½	10.750	10.420	0.165	60	15113	10.312	0.219	70	15093
12	10	12.750	12.390	0.180	105	15114	12.250	0.250	120	15134
14	11	14.000	13.500	0.250	190	15115	13.500	0.250	190	15115
16	12	16.000	15.500	0.250	200	15116	15.500	0.250	200	15116
18	13½	18.000	17.500	0.250	280	15117	17.500	0.250	280	15117
20	15	20.000	19.500	0.250	440	15118	19.500	0.250	440	15118
24	17	24.000	23.500	0.250	675	15120	23.500	0.250	675	15120
N.P.S.	M or N	OD	SCHEDULE 20				SCHEDULE 30			
8	7	8.625	8.125	0.250	55	15132	8.071	0.277	60	15142
10	8½	10.750	10.250	0.250	75	15133	10.136	0.307	80	15143
12	10	12.750	12.250	0.250	120	15134	12.090	0.330	135	15144
N.P.S.	M or N	OD	SCHEDULE 40				SCHEDULE 60			
8	7	8.625	—	—	—	—	7.813	0.406	75	15182
12	10	12.750	11.938	0.406	150	15164	11.626	0.562	225	15184
N.P.S.	M or N	OD	SCHEDULE 80				SCHEDULE 100			
8	7	8.625	—	—	—	—	7.437	0.594	100	15212
10	8½	10.750	9.562	0.594	160	15203	9.312	0.719	180	15213
12	10	12.750	11.374	0.688	245	15204	11.062	0.844	305	15214

*See Page 172 for further detail of Catalog Numbers.

(TABLE CONTINUED ON FOLLOWING PAGE)

TEES STRAIGHT ASA TYPE · OTHER THICKNESSES

(TABLE CONTINUED FROM PRECEDING PAGE)

Nominal Pipe Size	Center-to-End Dimension	Outside Diameter	Inside Diameter	Wall Thickness	Approx. Weight (lb.)	Part Number	Inside Diameter	Wall Thickness	Approx. Weight (lb.)	Part Number
			ID	T			ID	T		
N.P.S.	M or N	OD	SCHEDULE 120				SCHEDULE 140			
4	4⅛	4.500	3.624	0.438	25	15229	—	—	—	—
5	4⅞	5.563	4.563	0.500	45	15230	—	—	—	—
6	5⅜	6.625	5.501	0.562	65	15231	—	—	—	—
8	7	8.625	7.187	0.719	115	15232	7.001	0.812	135	15252
10	8½	10.750	9.062	0.844	215	15233	8.750	1.000	240	15073
12	10	12.750	10.750	1.000	400	15074	10.500	1.125	425	15254
N.P.S.	M or N	OD	SCHEDULE 160				DOUBLE EXTRA STRONG			
½	1	0.840	—	—	—	—	0.252	0.294	.5	15060
¾	1⅛	1.050	—	—	—	—	0.434	0.308	.7	15061
1	1½	1.315	0.815	0.250	1	15272	0.599	0.358	1.2	15062
1¼	1⅞	1.660	1.160	0.250	2	15273	0.896	0.382	2.2	15063
1½	2¼	1.900	1.338	0.281	3	15274	1.100	0.400	3.3	15064
2	2½	2.375	1.687	0.344	4.5	15275	1.503	0.436	5.2	15065
2½	3	2.875	2.125	0.375	7	15276	1.771	0.552	9.8	15066
3	3⅜	3.500	2.624	0.438	11	15277	2.300	0.600	13	15067
3½	3¾	4.000	—	—	—	—	2.728	0.636	23	15068
4	4⅛	4.500	3.438	0.531	20	15279	3.152	0.674	25	15069
5	4⅞	5.563	4.313	0.625	35	15280	4.063	0.750	40	15070
6	5⅜	6.625	5.187	0.719	65	15281	4.897	0.864	65	15071
8	7	8.625	6.813	0.906	115	15282	6.875	0.875	110	15072
10	8½	10.750	8.500	1.125	265	15283	8.750	1.000	240	15073
12	10	12.750	10.126	1.312	490	15284	10.750	1.000	400	15074
14	11	14.000	11.188	1.406	785	15285	—	—	—	—
16	12	16.000	12.812	1.594	1020	15286	—	—	—	—
18	13½	18.000	14.438	1.781	1415	15287	—	—	—	—
20	15	20.000	16.062	1.969	1935	15288	—	—	—	—
24	17	24.000	19.312	2.344	3140	15290	—	—	—	—

*These wall thicknesses are also known as "light gauge" or "light wall". Sizes 12" and smaller are schedule 10S from B36.19; sizes 14" and larger are schedule 10 from B36.10.

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

REDUCING TEES can be furnished in the same sizes and with the same dimension as Standard Weight Tees (see pages 44-47). Prices, part numbers and weights on application.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.9 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B) and other metals (see pages 82-85).

CONSTRUCTION: Fittings may be furnished seamless, welded, or in block pattern. Unless specified otherwise, fittings 20" and smaller will be of seamless construction, formed from selected tubing conforming to ASTM Specification A-106, Grade B. Fittings in larger sizes will be formed from firebox quality plate conforming to ASTM Specification A-515, Grade 70, welded and stress relieved. All welds are fully X-rayed. All fittings, both seamless and welded-type, are hot-formed, and machine-faced and -beveled.

WORKING PRESSURES for both seamless and welded-type fittings are shown on pages 147-160.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 29 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/29

EXTRUDED HEADERS AND TEES



In recent years, the growing complexities of natural gas transmission piping have led to the development of a new type of welded connection: the extruded header. This consists of a heavy cylinder from which one or more nozzles are extruded by hot-working a local area on the header. The adaptability of this fabricated fitting lends itself to the solution of special header and tee problems in all industries.

Dimensions: All extruded headers or tees are designed to fit individual requirements. While great design flexibility is possible, certain limitations are recommended, as outlined on the facing page. These can sometimes be waived (i.e., full-size outlets can be furnished); however, the piping designer should recognize that such deviations will consume both time and money.

Construction: Generally speaking, seamless pipe is used in the header body. However, manufacturing limitations on seamless material often require that rolled-and-welded pipe be used for sizes above 20", for heavy wall thicknesses in most sizes, and for unusual metals.

When extrusions are formed from welded pipe, the seam-welds are made by procedures and operators qualified under Section IX of the ASME Code. In addition, all seams are 100% x-rayed and approved under the requirements of Paragraph UW-51 of Section VIII of this Code. Full penetration is, of course, assured.

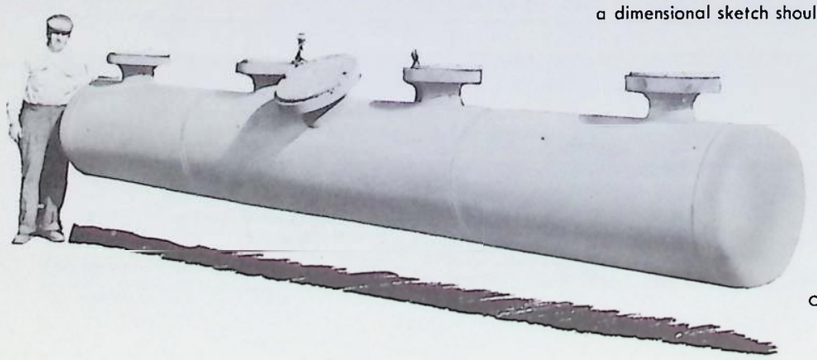
Nozzles are hot-formed, and are uniformly proportioned.

When design conditions require longer nozzles than those specified in the table on the facing page, pipe stubs of any length can be butt-welded to the outlet. Indeed, the entire header may be ordered as a shop-fabricated item, complete with beveled, capped or flanged ends, and produced under the rigid quality control standards typical of all Crane products.

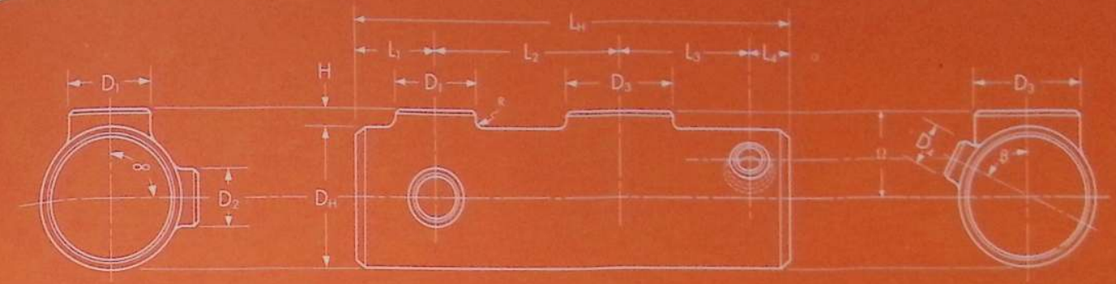
Materials: Extruded headers and tees are commonly made from material conforming to ASTM Specification A-106, Grade B, or from any of the high-yield strength pipe and plate grades such as those covered by API Standard 5LX, ASTM A-242, ASTM A-381, and ASTM A-441. However, any material intended for hot-forming and welding can be used for this purpose.

Heat Treatment: After forming and welding have been completed, extruded headers are heat-treated in accordance with the requirement for the particular metal and application involved. If special heat treatment is required, the inquiry and order should so specify.

Inquiries and Orders: Since extruded headers are designed to fit specific service conditions, complete design information must accompany inquiries and orders. On the following page is a table listing detailed items which are required from the specifying engineer. Where possible, a dimensional sketch should accompany the inquiry.



Integral, extruded outlets on a pulsation dampener being readied for shipment to a Gulf Coast transmission system. Barrel is 30" O.D. x 1¼" wall, with one 12" and four 8" nozzles.



DESIGN DATA NORMALLY REQUIRED FOR EXTRUDED HEADERS

1. **Applicable Design Code (check one):**
   ASME Code, Section I ☐; Section VIII ☐. ASA B31, Section _____
   ASA B31.8, Type A (72%) ☐; Type B (60%) ☐; Type C (50%) ☐; Type D (40%) ☐
   Other: _____
2. **Design Conditions: Pressure, _____ psig; Temperature, _____° F.**
3. **Quantity required: _____ pieces**
4. **Dimensional and other data (fill in chart below):**

Part	Adjoining Pipe			Overall Dimension		Distance from Left End of Header	Angle Between Outlet and Vertical Plane	End Preparation			
	Size	Thickness	Specification	Length	Height Above Header			Beveled	Capped	Flanged	
										Type	Pressure Rating
Header											
Outlet 1							0°				
Outlet 2											
Outlet 3											
Outlet 4											

RECOMMENDED LIMITING DIMENSIONS OF EXTRUDED HEADERS

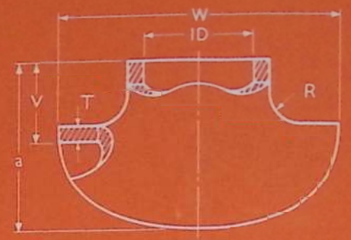
	Dimension	Recommended Limitations	Tolerances
D_H	Nominal size of header, inches	Minimum: 4"	Same as Pipe
D_1 D_2 D_3 D_4	Nominal sizes of nozzles, inches	Minimum: 2" Maximum: One size below header size. (i.e., 8" on 10")	
R	Radius of nozzle shoulder, inches	$\frac{D}{12}$; minimum, 1"	± ⅛"
H	Height of nozzle above header, inches	Nozzle Size / H: 2" / ⅝"; 2½"–3½" / ¾"; 4"–8" / 1"; 10"–12" / 1½"; 14"–18" / 2"; 20" or more / 2½"	Reference only
L_H	Overall length of header, inches	——	± ⅛"
L_1	Center of outlet to end of header, inches	Minimum: D_1	Nozzle size 10" or less ± ⅛" 12" or more ± 3/16"
L_2	Center-to-center of parallel outlets (D_1 and D_3), inches	Minimum: $D_1 + D_3$	
L_3	Center-to-center of staggered outlets (D_3 and D_4), measured parallel to header, inches	Minimum: $\sqrt{(D_3 + D_4)^2 - (.009\, D_H\, \beta)^2}$	
L_4	Center of outlet to end of header, inches	Minimum: D_4	
α	Angle between transverse nozzles (D_1 and D_2), degrees	$\frac{115(D_1 + D_2)}{D_H}$	± ½°
β	Angle between staggered outlets (D_3 and D_4), measured perpendicular to header, degrees	$\frac{115\sqrt{(D_3 + D_4)^2 - L_3^2}}{D_H}$	
Ω	Center to end	On application	ASA or MSS

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 30 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/30

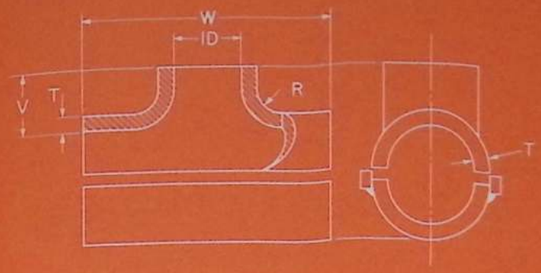
SADDLES

REGULAR TYPE





CAT. NO. 26B





SADDLES

WRAP AROUND TYPE

CAT. NO. 27B
SPECIFY TYPE

Nominal Pipe Size		Thickness	Approx. Inside Diameter of Nozzle	Overall Width	Height of Nozzle Above Header	Radius	Maximum Overall Height*	Approx. Weight (lb.)	Nominal Pipe Size
Outlet	Header	T	ID	W	V	R	a		Outlet
1	1 thru 30	3/8	1 3/8	4	7/8	1/2	2 1/4	1.6	1
1 1/4	1 1/4 thru 30	3/8	1 3/4	5	7/8	1/2	2 1/4	1.8	1 1/4
1 1/2	1 1/2 thru 30	3/8	2	5 1/2	7/8	1/2	2 1/2	2	1 1/2
2	2 thru 30	1/2	2 7/16	6	1	1/2	3 1/2	3.9	2
2 1/2	2 1/2 thru 30	1/2	2 15/16	7	1	1/2	3 3/4	5.2	2 1/2
3	3 thru 30	1/2	3 9/16	8	1	1/2	4 1/2	7.1	3
3 1/2	3 1/2 thru 30	1/2	4 1/16	8 1/2	1	1/2	4 1/2	8.1	3 1/2
4	4 thru 30	1/2	4 9/16	9	1 1/8	5/8	5 1/4	9.5	4
5	5 thru 30	1/2	5 5/8	10	1 1/8	5/8	6	12	5
6	6 thru 30	1/2	6 3/4	12	1 1/4	3/4	6 1/4	16	6
8	8 thru 30	5/8	8 3/4	16	1 5/8	1	7 1/2	38	8
10	10 thru 30	5/8	10 7/8	20	1 5/8	1	9 1/4	58	10
12	12 thru 30	5/8	12 7/8	22	1 7/8	1 1/4	9 3/4	67	12
14	14 thru 30	5/8	14 1/8	24	2 1/4	1 1/2	12	95	14
16	16 thru 30	5/8	16 1/8	26	2 1/2	1 1/2	13 1/2	109	16
18	18 thru 30	5/8	18 1/8	28	2 3/4	1 1/2	15 1/4	141	18
20	20 thru 30	5/8	20 1/8	32	3	1 1/2	17 1/2	170	20
24	24 thru 30	5/8	24 1/8	38	3	1 1/2	19	257	24
26	26 thru 30	5/8	26 1/8	42	3 1/2	1 1/2	20 1/2	274	26
28	28 and 30	5/8	28 1/8	45	3 1/2	1 1/2	21 1/2	352	28
30	30	5/8	30 1/8	49	4	1 1/2	23	413	30

*OVERALL HEIGHT of saddle varies with header size. Note that maximum height shown is that of a full-size (e.g. 12" on 12") fitting.

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances:
"V": +1/4", −0"
"W": +1/2", −0"

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 (see pages 113-116).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B). Grade A Carbon Steel, high-yield strength steel, and other metals can be furnished on application (see pages 82-85).

CONSTRUCTION: Fittings are formed from fire-box quality plate, conforming to ASTM Specification A-515, Grade 70. All fittings are hot-formed and finished with square-cut nozzle and skirt. (Note vent-hole to permit escape of welding gases.)

OTHER materials, sizes, and thicknesses are available. See pages 82-85.



View of saddle installation showing how saddle is fitted over outlet and header after nozzle weld has been completed.

Nominal Pipe Size		Thickness	Approx. Inside Diameter of Nozzle	Overall Width	Height of Nozzle Above Header	Radius	Nominal Pipe Size
Outlet	Header	T	ID	W	V	R	Outlet
1	1 thru 30	3/8	1 3/8	4	7/8	1/2	1
1 1/4	1 1/4 thru 30	3/8	1 3/4	5	7/8	1/2	1 1/4
1 1/2	1 1/2 thru 30	3/8	2	5 1/2	7/8	1/2	1 1/2
2	2 thru 30	1/2	2 7/16	6	1	1/2	2
2 1/2	2 1/2 thru 30	1/2	2 15/16	7	1	1/2	2 1/2
3	3 thru 30	1/2	3 9/16	8	1	1/2	3
3 1/2	3 1/2 thru 30	1/2	4 1/16	8 1/2	1	1/2	3 1/2
4	4 thru 30	1/2	4 9/16	9	1 1/8	5/8	4
5	5 thru 30	1/2	5 5/8	11 1/8	1 1/8	5/8	5
6	6 thru 30	1/2	6 3/4	13 1/4	1 1/4	3/4	6
8	8 thru 30	5/8	8 3/4	17 1/4	1 5/8	1	8
10	10 thru 30	5/8	10 7/8	21 1/2	1 5/8	1	10
12	12 thru 30	5/8	12 7/8	25 1/2	1 7/8	1 1/4	12
14	14 thru 30	5/8	14 1/8	28	2 1/4	1 1/2	14
16	16 thru 30	5/8	16 1/8	32	2 1/2	1 1/2	16
18	18 thru 30	5/8	18 1/8	36	2 3/4	1 1/2	18
20	20 thru 30	5/8	20 1/8	40	3	1 1/2	20
24	24 thru 30	5/8	24 1/8	48	3	1 1/2	24
26	26 thru 30	5/8	26 1/8	52	3 1/2	1 1/2	26
28	28 and 30	5/8	28 1/8	56	3 1/2	1 1/2	28
30	30	5/8	30 1/8	60	4	1 1/2	30

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances:
"V": +1/4", −0"
"W": +1/2", −0"

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 (see pages 113-116), and ASA Standard B31.8.

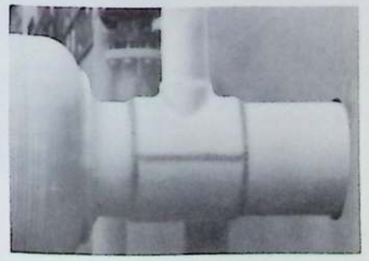
MATERIALS: Fittings can be furnished from Carbon Steel, high-yield strength steel, and other metals (see pages 82-85).

CONSTRUCTION: Saddles are hot-formed, and finished with square-cut ends and longitudinal edges. Longitudinal alignment bars are furnished tack-welded to bottom half of saddle, unless otherwise specified.

In addition to the type shown above, saddles can also be furnished with longitudinal split in the plane of the outlet.

Fittings shown above can also be made with nozzle diameters equal to outlet pipe size, for butt-welding to the outlet pipe.

WEIGHT of "Wrap-Around" saddles varies with header size, and can be furnished on application.



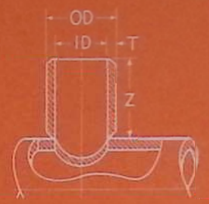
Wrap-around saddle installed in a natural gas compressor station in the midwest.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 31 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/31

SHAPED NIPPLES

90° TYPE





CAT. NO.

28BS STANDARD WEIGHT

28BX EXTRA STRONG

Nom. Pipe Size	Shaped to Fit Nom. Pipe Sizes	Length	Outside Diameter	Inside Diameter	Wall Thickness	Pipe Schedule Number	Approx. Weight (lb.)	Inside Diameter	Wall Thickness	Pipe Schedule Number	Approx. Weight (lb.)
		Z	OD	STANDARD WEIGHT				EXTRA STRONG			
				ID	T			ID	T		
2	2 thru 24	6	2.375	2.067	0.154	40	2	1.939	0.218	80	2.5
2½	2½ thru 24	6	2.875	2.469	0.203	40	3	2.323	0.276	80	4
3	3 thru 24	6	3.500	3.068	0.216	40	4	2.900	0.300	80	5.5
3½	3½ thru 24	6	4.000	3.548	0.226	40	5	3.364	0.318	80	6.5
4	4 thru 24	6	4.500	4.026	0.237	40	6	3.826	0.337	80	8
5	5 thru 24	8	5.563	5.047	0.258	40	11	4.813	0.375	80	15
6	6 thru 24	8	6.625	6.065	0.280	40	14	5.761	0.432	80	21
8	8 thru 24	8	8.625	7.981	0.322	40	22	7.625	0.500	80	33
10	10 thru 24	10	10.750	10.020	0.365	40	39	9.750	0.500	60	53
12	12 thru 24	10	12.750	12.000	0.375	—	50	11.750	0.500	—	65
14	14 thru 24	12	14.000	13.250	0.375	30	57	13.000	0.500	—	74
16	16 thru 24	12	16.000	15.250	0.375	30	65	15.000	0.500	40	84
18	18 thru 24	12	18.000	17.250	0.375	—	74	17.000	0.500	—	95
20	20 thru 24	12	20.000	19.250	0.375	20	82	19.000	0.500	30	107
24	24	12	24.000	23.250	0.375	20	98	23.000	0.500	—	130

PRICE SHEETS furnished on application.

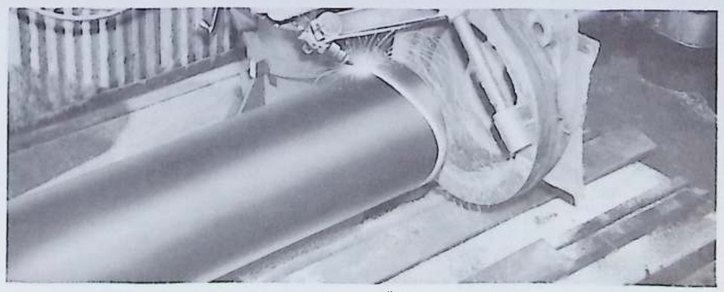
DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

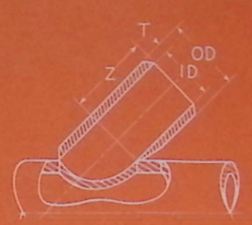
MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B) and other metals (see pages 82-85).

CONSTRUCTION: All fittings are of seamless construction, formed from selected tubing conforming to ASTM Specification A-106, Grade B. All edges are beveled for welding.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.



Automatic equipment, shown here cutting a 12" shaped nipple, insures perfect fit at nozzle weld. Machines such as this can be adapted to cut shaped nipples at any angle and for any size header.



CAT. NO.

STANDARD WEIGHT 29BS

EXTRA STRONG 29BX



SHAPED NIPPLES

45° TYPE

Nom. Pipe Size	Shaped to Fit Nom. Pipe Sizes	Length	Outside Diameter	Inside Diameter	Wall Thickness	Pipe Schedule Number	Approx. Weight (lb.)	Inside Diameter	Wall Thickness	Pipe Schedule Number	Approx. Weight (lb.)
		Z	OD	STANDARD WEIGHT				EXTRA STRONG			
				ID	T			ID	T		
2	2 thru 24	6	2.375	2.067	0.154	40	2.2	1.939	0.218	80	3
2½	2½ thru 24	6	2.875	2.469	0.203	40	3.5	2.323	0.276	80	4.5
3	3 thru 24	6	3.500	3.068	0.216	40	5	2.900	0.300	80	6.5
3½	3½ thru 24	6	4.000	3.548	0.226	40	6	3.364	0.318	80	8
4	4 thru 24	6	4.500	4.026	0.237	40	7	3.826	0.337	80	10
5	5 thru 24	8	5.563	5.041	0.258	40	13	4.813	0.375	80	18
6	6 thru 24	8	6.625	6.065	0.280	40	18	5.761	0.432	80	26
8	8 thru 24	8	8.625	7.981	0.322	40	29	7.625	0.500	80	43
10	10 thru 24	10	10.750	10.020	0.365	40	51	9.750	0.500	60	69
12	12 thru 24	10	12.750	12.000	0.375	—	66	11.750	0.500	—	87
14	14 thru 24	12	14.000	13.250	0.375	30	86	13.000	0.500	—	114
16	16 thru 24	12	16.000	15.250	0.375	30	104	15.000	0.500	40	138
18	18 thru 24	12	18.000	17.250	0.375	—	124	17.000	0.500	—	164
20	20 thru 24	12	20.000	19.250	0.375	20	144	19.000	0.500	30	191
24	24	12	24.000	23.250	0.375	20	189	23.000	0.500	—	251

PRICE SHEETS furnished on application.

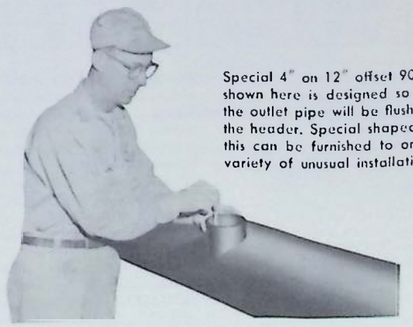
DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B) and other metals (see pages 82-85).

CONSTRUCTION: All fittings are of seamless construction, formed from selected tubing conforming to ASTM Specification A-106, Grade B. All edges are beveled for welding.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.



Special 4" on 12" offset 90° shaped nipple shown here is designed so that the side of the outlet pipe will be flush with the side of the header. Special shaped nipples such as this can be furnished to order for a great variety of unusual installations.

Crane Co.: Welding Fittings, Forged Flanges (1967)

ACL Doc 21277 · Page 32 of 92

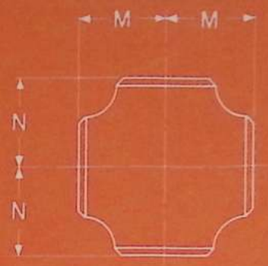
Published by AsbestosClaims.Law

asbestosclaims.law/library/21277/32

CROSSES

STRAIGHT AND REDUCING





CAT. NO.

25BS STANDARD WEIGHT

25BX EXTRA STRONG

12

Nom. Pipe Size	Center-to-End Dimension	Outside Diameter	Inside Diameter	Wall Thickness	Pipe Schedule Number	Approx. Weight (lb.)	Inside Diameter	Wall Thickness	Pipe Schedule Number	Approx. Weight (lb.)
			ID	T			ID	T		
	M, N	OD	STANDARD WEIGHT				EXTRA STRONG			
1¼	1⅞	1.660	1.380	0.140	40	1.5	1.278	0.191	80	1.8
1½	2¼	1.900	1.610	0.145	40	2.2	1.500	0.200	80	3
2	2½	2.375	2.067	0.154	40	3.5	1.939	0.218	80	4.8
2½	3	2.875	2.469	0.203	40	6.2	2.323	0.276	80	7.8
3	3⅜	3.500	3.068	0.216	40	8.5	2.900	0.300	80	10
3½	3¾	4.000	3.548	0.226	40	12	3.364	0.318	80	13
4	4⅛	4.500	4.026	0.237	40	16	3.826	0.337	80	20
5	4⅞	5.563	5.047	0.258	40	24	4.813	0.375	80	31
6	5⅝	6.625	6.065	0.280	40	37	5.761	0.432	80	51
8	7	8.625	7.981	0.322	40	80	7.625	0.500	80	98
10	8½	10.750	10.020	0.365	40	120	9.750	0.500	60	148
12	10	12.750	12.000	0.375	—	180	11.750	0.500	—	208
14	11	14.000	13.250	0.375	30	200	13.000	0.500	—	234
16	12	16.000	15.250	0.375	30	232	15.000	0.500	40	298
18	13½	18.000	17.250	0.375	—	296	17.000	0.500	—	362
20	15	20.000	19.250	0.375	20	366	19.000	0.500	30	446
24	17	24.000	23.250	0.375	20	496	23.000	0.500	—	618

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches, and apply to Straight Crosses. Tolerances are given on page 116.

REDUCING CROSSES can be furnished in the same sizes and with the same dimensions as Standard Weight Tees (see pages 44-47). Price sheets, part numbers and weights on application.

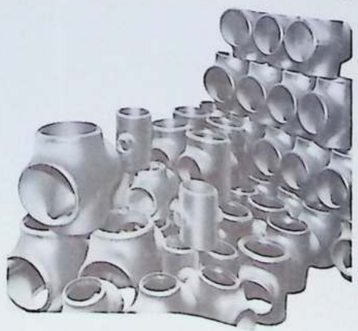
SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.9 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B) and other metals (see pages 82-85).

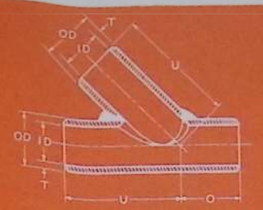
CONSTRUCTION: Fittings 20" and smaller are of seamless construction, formed from selected tubing conforming to ASTM Specification A-106, Grade B. All larger fittings will be seamless or, at the manufacturer's option, formed with two parallel longitudinal welds. All welds will be heat-treated and x-rayed in accordance with ASTM A-234. All fittings, seamless or welded-type, will be hot-formed, and machine-faced and -beveled.

WORKING PRESSURES for seamless and welded-type fittings are shown on pages 147-160.

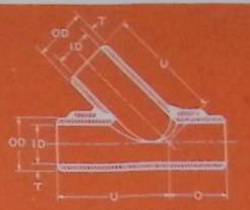
OTHER materials, sizes and thicknesses are available. See pages 82-85.



LATERALS AND REINFORCING RINGS



UNREINFORCED



REINFORCED

CAT. NO.

32BS Standard Weight 33BS

32BX Extra Strong 33BX





12

Nom. Pipe Size of Run	Center-to-End Dimension		Outside Diam.	Inside Diam.	Wall Thkn.	Pipe Sched. No.	Approx. Weight (lb.)	Required Reinforcement Area* (in.²)	Inside Diam.	Wall Thkn.	Pipe Sched. No.	Approx. Weight (lb.)	Required Reinforcement Area* (in.²)
				ID	T				ID	T			
	O	U	OD	STANDARD WEIGHT					EXTRA STRONG				
1	2½	6½	1.315	1.049	0.133	40	2.5	.2	0.957	0.179	80	3	.3
1¼	2¾	7	1.660	1.380	0.140	40	3.5	.3	1.278	0.191	80	4.5	.4
1½	3	8	1.900	1.610	0.145	40	4.5	.4	1.500	0.200	80	6	.5
2	4	8½	2.375	2.067	0.154	40	6.5	.5	1.939	0.218	80	8.8	.7
2½	4½	10	2.875	2.469	0.203	40	12	.8	2.323	0.276	80	15	1.1
3	5	11	3.500	3.068	0.216	40	16	1.1	2.900	0.300	80	22	1.4
3½	5½	12	4.000	3.548	0.226	40	22	1.3	3.364	0.318	80	30	1.8
4	6	13	4.500	4.026	0.237	40	29	1.5	3.826	0.337	80	38	2.1
5	7	14½	5.563	5.047	0.258	40	42	2.1	4.813	0.375	80	59	2.9
6	8	16½	6.625	6.065	0.280	40	61	2.7	5.761	0.432	80	89	4.1
8	10	20	8.625	7.981	0.322	40	110	4.2	7.625	0.500	80	163	6.2
10	12	23	10.750	10.020	0.365	40	175	5.9	9.750	0.500	60	233	7.9
12	13	27	12.750	12.000	0.375	—	244	7.3	11.750	0.500	—	318	9.5
14	14	30	14.000	13.250	0.375	30	281	8.0	13.000	0.500	—	366	10.5
16	16	33	16.000	15.250	0.375	30	392	9.2	15.000	0.500	40	444	12.1
18	17	36	18.000	17.250	0.375	—	472	10.4	17.000	0.500	—	632	13.7
20	18	40	20.000	19.250	0.375	20	581	11.6	19.000	0.500	30	686	15.3
24	20	46	24.000	23.250	0.375	20	781	14.0	23.000	0.500	—	1040	18.5

*Area shown is cross-sectional area sufficient to reinforce a 45° lateral to 100% working pressure (see below). This area is based on zero corrosion allowance, zero structural stability allowance and zero excess thickness in the run or branch.

PRICE SHEETS for Unreinforced Lateral, for separate Reinforcing Ring, or for complete Reinforced Lateral furnished on application.

DIMENSIONS are shown in inches, and are sufficient to permit the use of Slip-On Flanges. Tolerances are given on page 116.

REDUCING LATERALS can be furnished with the same center-to-end dimensions as shown above. Price sheets, part numbers and weights on application.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 (see pages 113-116).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B) and other metals (see pages 82-85).

CONSTRUCTION: Fittings are formed from selected seamless tubing conforming to ASTM Specification A-106, Grade B. Nozzle welds are stress relieved and x-rayed in accordance with ASTM Specification A-234. All fittings are machine-faced and -beveled. Angle of outlet will be 45° unless otherwise specified.

WORKING PRESSURES: For unreinforced laterals, the working pressures are 40% of those shown on pages 147-160; for reinforced laterals, the working pressure is the same as those shown on pages 147-160. Inquiries and orders for reinforced laterals and reinforcing rings must include following information: (a) design pressure and temperature, (b) ASTM or API material specification, (c) corrosion allowance, and (d) code compliance desired.

OTHER MATERIALS, sizes and thickness are available. See pages 82-85.

Crane Co.: Welding Fittings, Forged Flanges (1967)

ACL Doc 21277 · Page 33 of 92

Published by AsbestosClaims.Law

asbestosclaims.law/library/21277/33

OTHER TYPES OF FITTINGS

	REDUCERS		CAPS	LAP JOINT STUB ENDS	SLEEVES		BACKING RINGS		
	CONCENTRIC	ECCENTRIC			BUTT - WELDING	SLIP - COUPLING	TYPE "C"	TYPE "CC"	TYPE "CCC"
			 ½ - 1½" 2 - 36"						
CATALOG PAGE NUMBER	64 - 71	64 - 71	72 - 73	74 - 75	76	—	77	—	77
NOMINAL PIPE SIZE RANGE	¾" - 30"	¾" - 30"	½" - 36"	½" - 24"	1" - 30"	2" - 26"	½" - 42"	½" - 42"	½" - 42"
METALS	Grade B Steel Wrought Iron 1¼ Cr - ½ Mo. 5 Cr - ½ Mo Stainless	Grade B Steel Wrought Iron 1¼ Cr - ½ Mo 5 Cr - ½ Mo Stainless	Grade B Steel Wrought Iron 1¼ Cr - ½ Mo 5 Cr - ½ Mo Stainless	Grade B Steel Wrought Iron 1¼ Cr - ½ Mo 5 Cr - ½ Mo Stainless	Grade B Steel	To order	Grade B Steel 1¼ Cr - ½ Mo	To order	Grade B Steel
THICKNESSES	Standard Extra Strong Double Ex. Stg. Schedule Nos. Light Wall	Standard Extra Strong Double Ex. Stg. Schedule Nos. Light Wall	Standard Extra Strong Double Ex. Stg. Schedule Nos. Light Wall	Standard Extra Strong Double Ex. Stg. Schedule Nos.	See Catalog Page	On Application	To fit all pipe wall thicknesses	To fit all pipe wall thicknesses	To fit all pipe wall thicknesses
CONSTRUCTION	Seamless	Seamless	Seamless	Seamless	Split type	Split type	Split type	Split type	Split type

AVAILABLE IN:

13

The basic types of welding fittings shown on pages 16-17 and 42-43 are complemented by the various fittings shown here.

Reducing Fittings

Commonly, size reductions in piping systems are accomplished by the use of welding reducers, which are available in two types:

Concentric, in which the center-line is common to both ends; and

Eccentric, in which the small end is offset from the large end.

Eccentric reducers, which are more expensive than the concentric type, are used for certain special field conditions: (1) in horizontal lines, to prevent the formation of a pocket of condensate or other fluid at the point of reduction; (2) to permit nesting of piping so that each pipe hugs a floor or wall, or so that all pipes can be fastened to a common support. Note that in the eccentric type, the *inside* surface on the flat side of the fitting is a straight line; the outside surfaces are slightly offset to accommodate the different wall thicknesses at each end.

Concentric reducers are usually stocked in reductions down to two sizes below half-size; i.e., 6" x 2". Stocks of eccentric reducers are carried in reductions to size below half-size; i.e., 6" x 2½". To achieve more extreme reductions, designers and field engineers will use two reducers welded end-to-end. However, if space is limited, or if the required fittings are not immediately available, the welder may employ a cap, onto which is welded a pipe nipple (for concentric reductions) or a section of pipe shaped to fit the outer curve of the cap (for eccentric reductions). These types are not cataloged, since they are commonly field-fabricated.

Closures

Welding caps, sometimes called "heads", are used to close off the end of a piping system, or to fabricate bottles and vessels. Caps are of an ellipsoidal shape conforming to the requirements of the ASME Boiler & Pressure Vessel Code and ASA Standard B16.9. They are designed to match the pressure-resistant characteristics of comparable straight pipe.

Lap Joint Stub Ends

Lapped joints, or "Van Stone" laps, are frequently used for these advantages: (1) the flange is not welded or fastened to the pipe, which simplifies the lining-up of flange bolt-holes; (2) the fluid carried in the line does not come in contact with the flange itself, often permitting the use of carbon steel flanges on corrosion-resistant piping; (3) in lines requiring frequent replacement, the flanges can be salvaged and re-used.

Note that in this type of joint, the lapped face of the pipe forms the gasket surface, and is normally supplied with a phonographic, serrated face, similar to those on welding-neck or slip-on flanges. Other facings—ring-joint, male and female, tongue and groove, etc.—can be supplied to order. The details of lap-joint facings may be found in the Forged Flange section (see pages 86-87).

Crane lap joint stub ends are made with a full fillet radius, a square corner, and a lap thickness equal to or greater than the nominal pipe wall thickness, in full compliance with ASA B16.9.

Sleeves

Butt-weld sleeves are often used in field installations to relieve the line butt-weld of unusual external bending and tensile stresses and strains. Made in halves, they are clamped around the pipe so that the recess in the sleeve fits over the butt-weld, then welded together.

Sleeves are used as mechanical reinforcement and are not intended as pressure containing parts. Note that a vent-hole is provided to prevent welding gases from building up pressure under the sleeve.

Sleeves are also available to fit over slip-type couplings, serving as a seal. These are further illustrated and described in the section on Special Fittings (pages 78-85).

Backing Rings

Backing rings (or "back-up" rings, or "chill" rings) are commonly specified in piping systems operating under severe service conditions. Inserted in the adjoining ends of pipes to be butt-welded, they prevent weld-metal icicles, spatter and globules from forming inside the pipe during welding. Proper weld penetration will fuse the ring into the pipe so that it becomes a permanent part of the piping system.

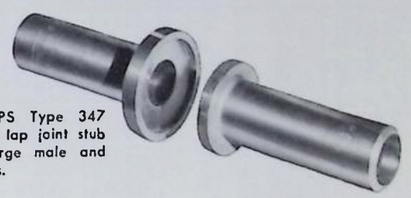
Backing rings are stocked in two types:

Type "C" contains a series of small nubs or protrusions, approximately 1/16" high, on the outer surface of the ring. These space the pipe ends properly for welding, and prevent the ring from slipping into the pipe;

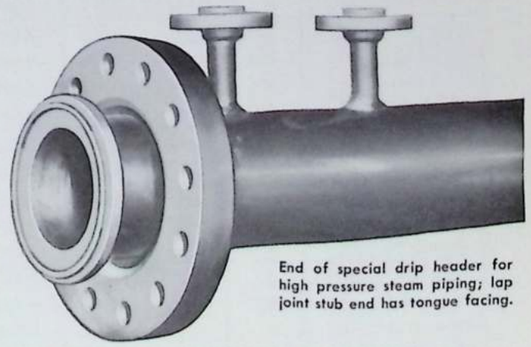
Type "CCC" is equipped with a series of spot-welded pins, ¾" long, in place of the nubs. These serve the same purpose as the nubs, and may be knocked off as the weld pass approaches.

Also available, but not stocked, is Type "CC," furnished with ⅛" high spacer pins.

All types of backing rings are of the split type; i.e., made with a small gap in the circumference of the ring, to provide flexibility in matching the ring to the inside of the pipe.



One inch IPS Type 347 stainless steel lap joint stub ends with large male and female facings.



End of special drip header for high pressure steam piping; lap joint stub end has tongue facing.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 34 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/34

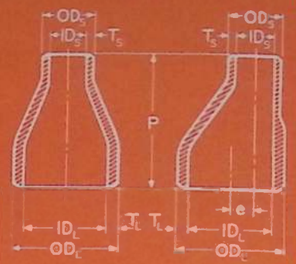
REDUCERS

CONCENTRIC AND ECCENTRIC ASA TYPE

CAT. NO. 37BS



CAT. NO. 36BS



STANDARD WEIGHT

Nominal Pipe Size	Pipe Schedule Number	Overall Length	Offset (Eccen. only)	LARGE END			SMALL END			Approx. Weight (lb.)	Part Number	
				Outside Diam.	Inside Diam.	Wall Thkn.	Outside Diam.	Inside Diam.	Wall Thkn.			
		P	e	OD_L	ID_L	T_L	OD_S	ID_S	T_S		Conc.	Eccen.
¾ x ½*	40	1½	*	1.050	0.824	0.113	0.840	0.622	0.109	.2	16000	—
1 x ¾	40	2	0.112	1.315	1.049	0.133	1.050	0.824	0.113	.2	16001	16701
1 x ½	40	2	0.213	1.315	1.049	0.133	0.840	0.622	0.109	.2	16002	16702
1 x ⅜	40	2	0.278	1.315	1.049	0.133	0.675	0.493	0.091	.2	10740	10760
1¼ x 1	40	2	0.166	1.660	1.380	0.140	1.315	1.049	0.133	.5	16003	16703
1¼ x ¾	40	2	0.278	1.660	1.380	0.140	1.050	0.824	0.113	.5	16004	16704
1¼ x ½	40	2	0.379	1.660	1.380	0.140	0.840	0.622	0.109	.4	16005	16705
1½ x 1¼	40	2½	0.115	1.900	1.610	0.145	1.660	1.380	0.140	.6	16006	16706
1½ x 1	40	2½	0.281	1.900	1.610	0.145	1.315	1.049	0.133	.6	16007	16707
1½ x ¾	40	2½	0.393	1.900	1.610	0.145	1.050	0.824	0.113	.6	16008	16708
1½ x ½	40	2½	0.494	1.900	1.610	0.145	0.840	0.622	0.109	.5	16009	16709
2 x 1½	40	3	0.228	2.375	2.067	0.154	1.900	1.610	0.145	1	16010	16710
2 x 1¼	40	3	0.343	2.375	2.067	0.154	1.660	1.380	0.140	.9	16011	16711
2 x 1	40	3	0.509	2.375	2.067	0.154	1.315	1.049	0.133	.9	16012	16712
2 x ¾	40	3	0.621	2.375	2.067	0.154	1.050	0.824	0.113	.9	16013	16713
2½ x 2	40	3½	0.201	2.875	2.469	0.203	2.375	2.067	0.154	1.5	16014	16714
2½ x 1½	40	3½	0.429	2.875	2.469	0.203	1.900	1.610	0.145	1.5	16015	16715
2½ x 1¼	40	3½	0.544	2.875	2.469	0.203	1.660	1.380	0.140	1.5	16016	16716
2½ x 1	40	3½	0.710	2.875	2.469	0.203	1.315	1.049	0.133	1.3	16017	16717
3 x 2½	40	3½	0.300	3.500	3.068	0.216	2.875	2.469	0.203	2	16018	16718
3 x 2	40	3½	0.501	3.500	3.068	0.216	2.375	2.067	0.154	2	16019	16719
3 x 1½	40	3½	0.729	3.500	3.068	0.216	1.900	1.610	0.145	1.8	16020	16720
3 x 1¼	40	3½	0.844	3.500	3.068	0.216	1.660	1.380	0.140	1.5	16021	16721
3 x 1*	40	3½	*	3.500	3.068	0.216	1.315	1.049	0.133	1.5	16022	—
3½ x 3	40	4	0.240	4.000	3.548	0.226	3.500	3.068	0.216	3	16023	16723
3½ x 2½	40	4	0.540	4.000	3.548	0.226	2.875	2.469	0.203	2.8	16024	16724
3½ x 2	40	4	0.741	4.000	3.548	0.226	2.375	2.067	0.154	2.5	16025	16725
3½ x 1½	40	4	0.969	4.000	3.548	0.226	1.900	1.610	0.145	2.3	16026	16726
3½ x 1¼	40	4	1.084	4.000	3.548	0.226	1.660	1.380	0.140	2.2	16027	16727

(TABLE CONTINUED ON FOLLOWING PAGE)

REDUCERS CONCENTRIC & ECCENTRIC ASA TYPE · STANDARD WEIGHT

(TABLE CONTINUED FROM PRECEDING PAGE)

Nomina Pipe Size	Pipe Schedule Number	Overall Length	Offset (Eccen. only)	LARGE END			SMALL END			Approx. Weight (lb.)	Part Number	
				Outside Diam.	Inside Diam.	Wall Thkn.	Outside Diam.	Inside Diam.	Wall Thkn.			
		P	e	OD_L	ID_L	T_L	OD_S	ID_S	T_S		Conc.	Eccen.
4 x 3½	40	4	0.239	4.500	4.026	0.237	4.000	3.548	0.226	3.5	16028	16728
4 x 3	40	4	0.479	4.500	4.026	0.237	3.500	3.068	0.216	3.3	16029	16729
4 x 2½	40	4	0.779	4.500	4.026	0.237	2.875	2.469	0.203	3.2	16030	16730
4 x 2	40	4	0.980	4.500	4.026	0.237	2.375	2.067	0.154	3	16031	16731
4 x 1½	40	4	1.208	4.500	4.026	0.237	1.900	1.610	0.145	2.8	16032	16732
4 x 1¼*	40	4	*	4.500	4.026	0.237	1.660	1.380	0.140	2.7	16033	—
4 x 1*	40	4	*	4.500	4.026	0.237	1.315	1.049	0.133	2.7	16034	—
5 x 4	40	5	0.510	5.563	5.047	0.258	4.500	4.026	0.237	6	16035	16735
5 x 3½	40	5	0.749	5.563	5.047	0.258	4.000	3.548	0.226	5.8	16036	16736
5 x 3	40	5	0.989	5.563	5.047	0.258	3.500	3.068	0.216	5.5	16037	16737
5 x 2½	40	5	1.289	5.563	5.047	0.258	2.875	2.469	0.203	5.2	16038	16738
5 x 2	40	5	1.490	5.563	5.047	0.258	2.375	2.067	0.154	5	16039	16739
5 x 1½*	40	5	*	5.563	5.047	0.258	1.900	1.610	0.145	4.8	16040	—
6 x 5	40	5½	0.509	6.625	6.065	0.280	5.563	5.047	0.258	8.5	16041	16741
6 x 4	40	5½	1.019	6.625	6.065	0.280	4.500	4.026	0.237	8.2	16042	16742
6 x 3½	40	5½	1.258	6.625	6.065	0.280	4.000	3.548	0.226	8	16043	16743
6 x 3	40	5½	1.498	6.625	6.065	0.280	3.500	3.068	0.216	7.5	16044	16744
6 x 2½	40	5½	1.798	6.625	6.065	0.280	2.875	2.469	0.203	7	16045	16745
6 x 2*	40	5½	*	6.625	6.065	0.280	2.375	2.067	0.154	6.2	16046	—
8 x 6	40	6	0.958	8.625	7.981	0.322	6.625	6.065	0.280	14	16047	16747
8 x 5	40	6	1.467	8.625	7.981	0.322	5.563	5.047	0.258	13	16048	16748
8 x 4	40	6	1.977	8.625	7.981	0.322	4.500	4.026	0.237	12	16049	16749
8 x 3½	40	6	2.216	8.625	7.981	0.322	4.000	3.548	0.226	12	16050	16750
8 x 3*	40	6	*	8.625	7.981	0.322	3.500	3.068	0.216	11	16051	—
10 x 8	40	7	1.019	10.750	10.020	0.365	8.625	7.981	0.322	22	16052	16752
10 x 6	40	7	1.978	10.750	10.020	0.365	6.625	6.065	0.280	21	16053	16753
10 x 5	40	7	2.487	10.750	10.020	0.365	5.563	5.047	0.258	19	16054	16754
10 x 4	40	7	2.997	10.750	10.020	0.365	4.500	4.026	0.237	18	16055	16755
10 x 3*	40	7	*	10.750	10.020	0.365	3.500	3.068	0.216	17	16057	—
12 x 10	—	8	0.990	12.750	12.000	0.375	10.750	10.020	0.365	32	16058	16758
12 x 8	—	8	2.010	12.750	12.000	0.375	8.625	7.981	0.322	30	16059	16759
12 x 6	—	8	2.968	12.750	12.000	0.375	6.625	6.065	0.280	27	16060	16760
12 x 5	—	8	3.477	12.750	12.000	0.375	5.563	5.047	0.258	25	16061	16761
12 x 4	—	8	3.987	12.750	12.000	0.375	4.500	4.026	0.237	24	16062	16762
14 x 12	—	13	0.625	14.000	13.250	0.375	12.750	12.000	0.375	56	16063	16763
14 x 10	30-40	13	1.615	14.000	13.250	0.375	10.750	10.020	0.365	54	16064	16764
14 x 8	30-40	13	2.635	14.000	13.250	0.375	8.625	7.981	0.322	52	16065	16765
14 x 6	30-40	13	3.593	14.000	13.250	0.375	6.625	6.065	0.280	50	16066	16766
16 x 14	30	14	1.000	16.000	15.250	0.375	14.000	13.250	0.375	74	16067	16767
16 x 12	—	14	1.625	16.000	15.250	0.375	12.750	12.000	0.375	72	16068	16768
16 x 10	30-40	14	2.615	16.000	15.250	0.375	10.750	10.020	0.365	70	16069	16769
16 x 8	30-40	14	3.635	16.000	15.250	0.375	8.625	7.981	0.322	68	16070	16770
16 x 6	30-40	14	4.592	16.000	15.250	0.375	6.625	6.065	0.280	66	16071	16771

(TABLE CONTINUED ON FOLLOWING PAGE)

Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/35

REDUCERS CONCENTRIC & ECCENTRIC ASA TYPE · STANDARD WEIGHT

(TABLE CONTINUED FROM PRECEDING PAGE)

Nominal Pipe Size	Pipe Schedule Number	Overall Length	Offset (Eccen. only)	LARGE END			SMALL END			Approx. Weight (lb.)	Part Number	
				Outside Diam.	Inside Diam.	Wall Thkn.	Outside Diam.	Inside Diam.	Wall Thkn.			
		P	e	OD_L	ID_L	T_L	OD_S	ID_S	T_S		Conc.	Eccen.
18 x 16	—	15	1.000	18.000	17.250	0.375	16.000	15.250	0.375	92	16072	16772
18 x 14	—	15	2.000	18.000	17.250	0.375	14.000	13.250	0.375	89	16073	16773
18 x 12	—	15	2.625	18.000	17.250	0.375	12.750	12.000	0.375	86	16074	16774
18 x 10	—	15	3.615	18.000	17.250	0.375	10.750	10.020	0.365	83	16075	16775
18 x 8	—	15	4.634	18.000	17.250	0.375	8.625	7.981	0.322	81	16076	16776
20 x 18	—	20	1.000	20.000	19.250	0.375	18.000	17.250	0.375	132	16077	16777
20 x 16	20-30	20	2.000	20.000	19.250	0.375	16.000	15.250	0.375	129	16078	16778
20 x 14	20-30	20	3.000	20.000	19.250	0.375	14.000	13.250	0.375	126	16079	16779
20 x 12	—	20	3.625	20.000	19.250	0.375	12.750	12.000	0.375	123	16080	16780
20 x 10	20-40	20	4.615	20.000	19.250	0.375	10.750	10.020	0.365	120	16081	16781
22 x 20	20	20	1.000	22.000	21.250	0.375	20.000	19.250	0.375	148	16082	16782
22 x 18	—	20	2.000	22.000	21.250	0.375	18.000	17.250	0.375	145	16083	16783
22 x 16	20-30	20	3.000	22.000	21.250	0.375	16.000	15.250	0.375	142	16084	16784
22 x 14	20-30	20	4.000	22.000	21.250	0.375	14.000	13.250	0.375	139	16085	16785
22 x 12	—	20	4.625	22.000	21.250	0.375	12.750	12.000	0.375	136	16086	16786
22 x 10	20-40	20	5.615	22.000	21.250	0.375	10.750	10.020	0.365	133	16087	16787
24 x 20	20	20	2.000	24.000	23.250	0.375	20.000	19.250	0.375	160	16089	16789
24 x 18	—	20	3.000	24.000	23.250	0.375	18.000	17.250	0.375	155	16090	16790
24 x 16	20-30	20	4.000	24.000	23.250	0.375	16.000	15.250	0.375	150	16091	16791
24 x 14	20-30	20	5.000	24.000	23.250	0.375	14.000	13.250	0.375	146	16092	16792
24 x 12	—	20	5.625	24.000	23.250	0.375	12.750	12.000	0.375	142	16093	16793
24 x 10	20-40	20	6.615	24.000	23.250	0.375	10.750	10.020	0.365	139	16094	16794
26 x 24	—	24	1.000	26.000	25.250	0.375	24.000	23.250	0.375	212	10741	10761
26 x 20	—	24	3.000	26.000	25.250	0.375	20.000	19.250	0.375	204	10743	10763
26 x 18	—	24	4.000	26.000	25.250	0.375	18.000	17.250	0.375	196	10744	10764
28 x 26	—	24	1.000	28.000	27.250	0.375	26.000	25.250	0.375	232	10745	10765
28 x 24	—	24	2.000	28.000	27.250	0.375	24.000	23.250	0.375	225	10746	10766
28 x 20	—	24	4.000	28.000	27.250	0.375	20.000	19.250	0.375	218	10748	10768
30 x 28	—	24	1.000	30.000	29.250	0.375	28.000	27.250	0.375	252	10749	10769
30 x 26	—	24	2.000	30.000	29.250	0.375	26.000	25.250	0.375	244	10750	10770
30 x 24	—	24	3.000	30.000	29.250	0.375	24.000	23.250	0.375	236	10751	10771

*CONCENTRIC type only.

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.9 through 24". Sizes over 24" not covered by B16.9 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

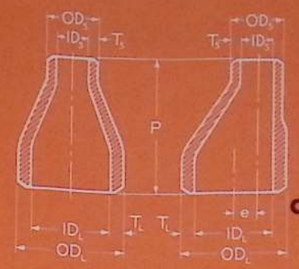
MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B), Wrought Iron, and other metals (see pages 82-85).

CONSTRUCTION: All fittings 24" and smaller will be of seamless construction, formed either from selected tubing conforming to ASTM Specification A-106, Grade B, or from firebox quality plate conforming to ASTM Specification A-212, Grade B. Larger fittings are formed from firebox quality plate (ASTM Specification A-515, Grade 70), rolled, welded, and stress relieved. All fittings, both seamless and welded-type, are hot-formed, and machine-faced and -beveled.

WORKING PRESSURES for both seamless and welded-type fittings are shown on pages 147-160.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.



EXTRA STRONG

CAT. NO. 36BX



CAT. NO. 37BX

REDUCERS

CONCENTRIC AND ECCENTRIC ASA TYPE

Nominal Pipe Size	Pipe Schedule Number	Overall Length	Offset (Eccen. only)	LARGE END			SMALL END			Approx. Weight (lb.)	Part Number	
				Outside Diam.	Inside Diam.	Wall Thkn.	Outside Diam.	Inside Diam.	Wall Thkn.			
		P	e	OD_L	ID_L	T_L	OD_S	ID_S	T_S		Conc.	Eccen.
¾ x ½*	80	1½	*	1.050	0.742	0.154	0.840	0.546	0.147	.4	16100	—
1 x ¾	80	2	0.107	1.315	0.957	0.179	1.050	0.742	0.154	.4	16101	16801
1 x ½	80	2	0.206	1.315	0.957	0.179	0.840	0.546	0.147	.3	16102	16802
1 x ⅜	80	2	0.267	1.315	0.957	0.179	0.675	0.423	0.126	.3	10840	10860
1¼ x 1	80	2	0.161	1.660	1.278	0.191	1.315	0.957	0.179	.6	16103	16803
1¼ x ¾	80	2	0.268	1.660	1.278	0.191	1.050	0.742	0.154	.6	16104	16804
1¼ x ½	80	2	0.366	1.660	1.278	0.191	0.840	0.546	0.147	.5	16105	16805
1½ x 1¼	80	2½	0.111	1.900	1.500	0.200	1.660	1.278	0.191	.8	16106	16806
1½ x 1	80	2½	0.272	1.900	1.500	0.200	1.315	0.957	0.179	.8	16107	16807
1½ x ¾	80	2½	0.379	1.900	1.500	0.200	1.050	0.742	0.154	.7	16108	16808
1½ x ½	80	2½	0.477	1.900	1.500	0.200	0.840	0.546	0.147	.7	16109	16809
2 x 1½	80	3	0.219	2.375	1.939	0.218	1.900	1.500	0.200	1.2	16110	16810
2 x 1¼	80	3	0.330	2.375	1.939	0.218	1.660	1.278	0.191	1.1	16111	16811
2 x 1	80	3	0.491	2.375	1.939	0.218	1.315	0.957	0.179	1	16112	16812
2 x ¾	80	3	0.598	2.375	1.939	0.218	1.050	0.742	0.154	1	16113	16813
2½ x 2	80	3½	0.192	2.875	2.323	0.276	2.375	1.939	0.218	2	16114	16814
2½ x 1½	80	3½	0.411	2.875	2.323	0.276	1.900	1.500	0.200	1.8	16115	16815
2½ x 1¼	80	3½	0.522	2.875	2.323	0.276	1.660	1.278	0.191	1.8	16116	16816
2½ x 1	80	3½	0.683	2.875	2.323	0.276	1.315	0.957	0.179	1.8	16117	16817
3 x 2½	80	3½	0.289	3.500	2.900	0.300	2.875	2.323	0.276	2.5	16118	16818
3 x 2	80	3½	0.481	3.500	2.900	0.300	2.375	1.939	0.218	2.5	16119	16819
3 x 1½	80	3½	0.700	3.500	2.900	0.300	1.900	1.500	0.200	2.2	16120	16820
3 x 1¼	80	3½	0.811	3.500	2.900	0.300	1.660	1.278	0.191	2.2	16121	16821
3 x 1*	80	3½	*	3.500	2.900	0.300	1.315	0.957	0.179	2.2	16122	—
3½ x 3	80	4	0.232	4.000	3.364	0.318	3.500	2.900	0.300	3.8	16123	16823
3½ x 2½	80	4	0.521	4.000	3.364	0.318	2.875	2.323	0.276	3.8	16124	16824
3½ x 2	80	4	0.713	4.000	3.364	0.318	2.375	1.939	0.218	3.5	16125	16825
3½ x 1½	80	4	0.932	4.000	3.364	0.318	1.900	1.500	0.200	3.2	16126	16826
3½ x 1¼*	80	4	*	4.000	3.364	0.318	1.660	1.278	0.191	3.2	16127	—

(TABLE CONTINUED ON FOLLOWING PAGE)

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 36 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/36

REDUCERS CONCENTRIC & ECCENTRIC ASA TYPE · EXTRA STRONG

(TABLE CONTINUED FROM PRECEDING PAGE)

Nominal Pipe Size	Pipe Schedule Number	Overall Length	Offset (Eccen. only)	LARGE END			SMALL END			Approx. Weight (lb.)	Part Number	
		P	e	Outside Diam. OD_L	Inside Diam. ID_L	Wall Thkn. T_L	Outside Diam. OD_S	Inside Diam. ID_S	Wall Thkn. T_S		Conc.	Eccen.
4 x 3½	80	4	0.231	4.500	3.826	0.337	4.000	3.364	0.318	4.5	16128	16828
4 x 3	80	4	0.463	4.500	3.826	0.337	3.500	2.900	0.300	4.2	16129	16829
4 x 2½	80	4	0.752	4.500	3.826	0.337	2.875	2.323	0.276	4	16130	16830
4 x 2	80	4	0.944	4.500	3.826	0.337	2.375	1.939	0.218	4	16131	16831
4 x 1½	80	4	1.163	4.500	3.826	0.337	1.900	1.500	0.200	3.8	16132	16832
4 x 1¼*	80	4	*	4.500	3.826	0.337	1.660	1.278	0.191	3.5	16133	—
5 x 4	80	5	0.493	5.563	4.813	0.375	4.500	3.826	0.337	7.8	16135	16835
5 x 3½	80	5	0.724	5.563	4.813	0.375	4.000	3.364	0.318	7.5	16136	16836
5 x 3	80	5	0.956	5.563	4.813	0.375	3.500	2.900	0.300	7.2	16137	16837
5 x 2½	80	5	1.245	5.563	4.813	0.375	2.875	2.323	0.276	6.8	16138	16838
5 x 2	80	5	1.437	5.563	4.813	0.375	2.375	1.939	0.218	6.5	16139	16839
6 x 5	80	5½	0.474	6.625	5.761	0.432	5.563	4.813	0.375	11	16141	16841
6 x 4	80	5½	0.967	6.625	5.761	0.432	4.500	3.826	0.337	11	16142	16842
6 x 3½	80	5½	1.198	6.625	5.761	0.432	4.000	3.364	0.318	11	16143	16843
6 x 3	80	5½	1.430	6.625	5.761	0.432	3.500	2.900	0.300	10	16144	16844
6 x 2½	80	5½	1.719	6.625	5.761	0.432	2.875	2.323	0.276	10	16145	16845
6 x 2*	80	5½	*	6.625	5.761	0.432	2.375	1.939	0.218	9	16146	—
8 x 6	80	6	0.932	8.625	7.625	0.500	6.625	5.761	0.432	18	16147	16847
8 x 5	80	6	1.406	8.625	7.625	0.500	5.563	4.813	0.375	18	16148	16848
8 x 4	80	6	1.899	8.625	7.625	0.500	4.500	3.826	0.337	18	16149	16849
8 x 3½	80	6	2.130	8.625	7.625	0.500	4.000	3.364	0.318	17	16150	16850
8 x 3*	80	6	*	8.625	7.625	0.500	3.500	2.900	0.300	17	16151	—
10 x 8	60-80	7	1.063	10.750	9.750	0.500	8.625	7.625	0.500	28	16152	16852
10 x 6	60-80	7	1.995	10.750	9.750	0.500	6.625	5.761	0.432	26	16153	16853
10 x 5	60-80	7	2.469	10.750	9.750	0.500	5.563	4.813	0.375	25	16154	16854
10 x 4	60-80	7	2.962	10.750	9.750	0.500	4.500	3.826	0.337	24	16155	16855
12 x 10	—	8	1.000	12.750	11.750	0.500	10.750	9.750	0.500	42	16158	16858
12 x 8	—	8	2.063	12.750	11.750	0.500	8.625	7.625	0.500	40	16159	16859
12 x 6	—	8	2.995	12.750	11.750	0.500	6.625	5.761	0.432	38	16160	16860
12 x 5	—	8	3.469	12.750	11.750	0.500	5.563	4.813	0.375	35	16161	16861
12 x 4	—	8	3.962	12.750	11.750	0.500	4.500	3.826	0.337	33	16162	16862
14 x 12	—	13	0.625	14.000	13.000	0.500	12.750	11.750	0.500	74	16163	16863
14 x 10	—	13	1.625	14.000	13.000	0.500	10.750	9.750	0.500	72	16164	16864
14 x 8	—	13	2.688	14.000	13.000	0.500	8.625	7.625	0.500	70	16165	16865
14 x 6	—	13	3.620	14.000	13.000	0.500	6.625	5.761	0.432	68	16166	16866
16 x 14	—	14	1.000	16.000	15.000	0.500	14.000	13.000	0.500	95	16167	16867
16 x 12	—	14	1.625	16.000	15.000	0.500	12.750	11.750	0.500	93	16168	16868
16 x 10	40-60	14	2.265	16.000	15.000	0.500	10.750	9.750	0.500	91	16169	16869
16 x 8	40-80	14	3.688	16.000	15.000	0.500	8.625	7.625	0.500	89	16170	16870
16 x 6	40-80	14	4.620	16.000	15.000	0.500	6.625	5.761	0.432	87	16171	16871

(TABLE CONTINUED ON FOLLOWING PAGE)

(TABLE CONTINUED FROM PRECEDING PAGE)

Nominal Pipe Size	Pipe Schedule Number	Overall Length	Offset (Eccen. only)	LARGE END			SMALL END			Approx. Weight (lb.)	Part Number	
		P	e	Outside Diam. OD_L	Inside Diam. ID_L	Wall Thkn. T_L	Outside Diam. OD_S	Inside Diam. ID_S	Wall Thkn. T_S		Conc.	Eccen.
18 x 16	—	15	1.000	18.000	17.000	0.500	16.000	15.000	0.500	121	16172	16872
18 x 14	—	15	2.000	18.000	17.000	0.500	14.000	13.000	0.500	118	16173	16873
18 x 12	—	15	2.625	18.000	17.000	0.500	12.750	11.750	0.500	115	16174	16874
18 x 10	—	15	3.625	18.000	17.000	0.500	10.750	9.750	0.500	112	16175	16875
18 x 8	—	15	4.688	18.000	17.000	0.500	8.625	7.625	0.500	109	16176	16876
20 x 18	—	20	1.000	20.000	19.000	0.500	18.000	17.000	0.500	172	16177	16877
20 x 16	30-40	20	2.000	20.000	19.000	0.500	16.000	15.000	0.500	168	16178	16878
20 x 14	—	20	3.000	20.000	19.000	0.500	14.000	13.000	0.500	164	16179	16879
20 x 12	—	20	3.625	20.000	19.000	0.500	12.750	11.750	0.500	160	16180	16880
20 x 10	30-60	20	4.625	20.000	19.000	0.500	10.750	9.750	0.500	154	16181	16881
22 x 20	30	20	1.000	22.000	21.000	0.500	20.000	19.000	0.500	192	16182	16882
22 x 18	—	20	2.000	22.000	21.000	0.500	18.000	17.000	0.500	189	16183	16883
22 x 16	30-40	20	3.000	22.000	21.000	0.500	16.000	15.000	0.500	186	16184	16884
22 x 14	—	20	4.000	22.000	21.000	0.500	14.000	13.000	0.500	183	16185	16885
22 x 12	—	20	4.625	22.000	21.000	0.500	12.750	11.750	0.500	180	16186	16886
22 x 10	30-60	20	5.625	22.000	21.000	0.500	10.750	9.750	0.500	177	16187	16887
24 x 20	—	20	2.000	24.000	23.000	0.500	20.000	19.000	0.500	204	16189	16889
24 x 18	—	20	3.000	24.000	23.000	0.500	18.000	17.000	0.500	200	16190	16890
24 x 16	—	20	4.000	24.000	23.000	0.500	16.000	15.000	0.500	196	16191	16891
24 x 14	—	20	5.000	24.000	23.000	0.500	14.000	13.000	0.500	192	16192	16892
24 x 12	—	20	5.625	24.000	23.000	0.500	12.750	11.750	0.500	188	16193	16893
24 x 10	—	20	6.625	24.000	23.000	0.500	10.750	9.750	0.500	184	16194	16894
26 x 24	—	24	1.000	26.000	25.000	0.500	24.000	23.000	0.500	280	10841	10861
26 x 20	20-30	24	3.000	26.000	25.000	0.500	20.000	19.000	0.500	272	10843	10863
26 x 18	—	24	4.000	26.000	25.000	0.500	18.000	17.000	0.500	264	10844	10864
28 x 26	20	24	1.000	28.000	27.000	0.500	26.000	25.000	0.500	307	10845	10865
28 x 24	—	24	2.000	28.000	27.000	0.500	24.000	23.000	0.500	299	10846	10866
28 x 20	20-30	24	4.000	28.000	27.000	0.500	20.000	19.000	0.500	291	10848	10868
30 x 28	20	24	1.000	30.000	29.000	0.500	28.000	27.000	0.500	333	10849	10869
30 x 26	20	24	2.000	30.000	29.000	0.500	26.000	25.000	0.500	325	10850	10870
30 x 24	—	24	3.000	30.000	29.000	0.500	24.000	23.000	0.500	317	10851	10871

*CONCENTRIC type only.

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.9 through 24". Sizes over 24" not covered by B16.9 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B), Wrought Iron, and other metals (see pages 82-85).

CONSTRUCTION: All fittings 24" and smaller will be of seamless construction formed either from selected tubing conforming to ASTM Specification A-106, Grade B, or from Firebox quality plate conforming to ASTM Specification A-212, Grade B. Larger fittings are formed from firebox quality plate (ASTM Specification A-515, Grade 70), rolled, welded, and stress relieved. All fittings, both seamless and welded-type, are hot-formed, and machine-faced and -beveled.

WORKING PRESSURES for both seamless and welded-type fittings are shown on pages 147-160.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.

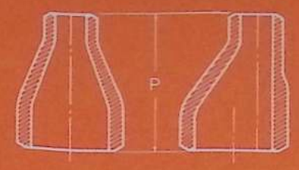
Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 37 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/37

REDUCERS

CONCENTRIC AND ECCENTRIC ASA TYPE

CAT. NO. 36B*





OTHER THICKNESSES

Nominal Pipe Size							Overall Length	Range of Approximate Weights (lb.)	
Large End	Small End: Range of Sizes						P	SCHEDULE 10*	GAS DISTR. THKN.
2	1½	1¼	1	¾	—	—	3	.59–.49	—
2½	2	1½	1¼	1	—	—	3½	.90–.81	—
3	2½	2	1½	1¼	1	—	3½	1.3–1.1	—
3½	3	2½	2	1½	1¼	—	4	1.6–1.3	—
4	3½†	3†	2½†	2†	1½†	1†	4	1.8–1.4	3.0–2.2
5	4	3½	3	2½	2	—	5	2.8–2.4	—
6	5†	4	3½†	3†	2½†	2†	5½	3.9–3.1	6.8–5.1
8	6	5†	4	3½†	3†	—	6	5.7–4.7	8.7–7.5
10	8	6	5†	4	—	—	7	9.4–7.9	13–11
12	10	8	6	5†	4	—	8	14–11	19–16
14	12	10	8	6	—	—	13	33–28	33–28
16	14	12	10	8	6	—	14	46–35	46–35
18	16	14	12	10	8	—	15	56–44	56–44
20	18	16	14	12	10	—	20	83–67	83–67
24	20	18	16	14	12	10	20	97–78	97–78
Large End	Small End: Range of Sizes						P	SCHEDULE 20	SCHEDULE 30
8	6†	5†	4†	3½†	3†	—	6	10–8.3	11–9.1
10	8	6†	5†	4†	—	—	7	15–12	17–14
12	10	8	6†	5†	4†	—	8	20–17	26–21
14	12	10	8	6†	—	—	13	43–38	—
16	14	12	10	8	6†	—	14	57–47	—
18	16	14	12	10	8	—	15	63–54	90–75
Large End	Small End: Range of Sizes						P	SCHEDULE 40	SCHEDULE 60
8	6†	5†	4†	3½†	3†	—	6	—	16–13
12	10	8	6†	5†	4†	—	8	31–24	43–34
14	12	10	8	6†	—	—	13	63–51	86–75
16	14	12	10	8	6†	—	14	—	112–90
18	16	14	12	10	8	—	15	117–94	154–124
20	18	16	14	12	10	—	20	190–154	254–207
24	20	18	16	14	12	10	20	245–199	337–282

*See Page 172 for further detail of Catalog Numbers.

(TABLE CONTINUED ON FOLLOWING PAGE)

REDUCERS CONCENTRIC & ECCENTRIC ASA TYPE · OTHER THICKNESSES

(TABLE CONTINUED FROM PRECEDING PAGE)

Nominal Pipe Size							Overall Length	Range of Approximate Weights (lb.)	
Large End	Small End: Range of Sizes						P	SCHEDULE 80	SCHEDULE 100
8	6†	5†	4†	3½†	3†	—	6	—	22–18
10	8	6†	5†	4†	—	—	7	31–26	37–31
12	10	8	6†	5†	4†	—	8	51–40	61–48
14	12	10	8	6†	—	—	13	106–84	129–104
16	14	12	10	8	6†	—	14	142–111	172–135
18	16	14	12	10	8	—	15	192–153	233–186
20	18	16	14	12	10	—	20	316–257	387–314
24	20	18	16	14	12	—	20	421–341	520–437
Large End	Small End: Range of Sizes						P	SCHEDULE 120	SCHEDULE 140
4	3½†	3†	2½†	2†	1½†	1†	4	6.1–4.6	—
5	4	3½†	3†	2½†	2†	—	5	9.6–8.0	—
6	5	4	3½†	3†	2½†	2†	5½	15–12	—
8	6†	5†	4†	3½†	3†	—	6	24–21	28–23
10	8	6	5	4	—	—	7	42–34	—
12	10	8	6	5	4	—	8	—	81–63
14	12	10	8	6†	—	—	13	150–117	168–134
16	14	12	10	8	6†	—	14	200–166	230–181
18	16	14	12	10	8	—	15	273–218	311–246
20	18	16	14	12	10	—	20	450–373	513–422
24	20	18	16	14	12	10	20	605–498	687–558
Large End	Small End: Range of Sizes						P	SCHEDULE 160	DBL. EX. STR.
1	¾	½	⅜†	—	—	—	2	.46–.34	.65–.56
1¼	1	¾	½	—	—	—	2	.64–.57	.87–.81
1½	1¼	1	¾	½	—	—	2½	.95–.76	1.2–1.0
2	1½	1¼	1	¾	—	—	3	1.6–1.5	1.9–1.8
2½	2	1½	1¼	1	—	—	3½	2.6–2.3	3.4–3.1
3	2½	2	1½	1¼	1	—	3½	3.7–3.1	4.7–4.1
3½	3	2½	2	1½	1¼	—	4	—	6.9–5.9
4	3½†	3	2½	2	1½	1	4	6.4–5.1	8.2–6.2
5	4	3½†	3	2½	2	—	5	12–10	14–11
6	5	4	3½†	3	2½	2	5½	19–14	21–17
8	6	5	4	3½†	3	—	6	31–23	31–23
10	8	6	5	4	—	—	7	58–50	55–50
12	10	8	6	5	4	—	8	96–78	80–73

*These wall thicknesses are also known as "light gauge" or "light wall". Sizes 12" and smaller are schedule 10S from B36.19; sizes 14" and larger are schedule 10 from B36.10.

†When designated wall thickness does not apply to small end of reducer, thickness must be specified by the customer.

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.9 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B), and other metals (see pages 82-85).

CONSTRUCTION: All fittings 24" and smaller will be of seamless construction, formed either from selected tubing conforming to ASTM Specification A-106, Grade B, or from firebox quality plate conforming to ASTM Specification A-515, Grade 70. Larger fittings are formed from firebox quality plate (ASTM Specification A-212, Grade B), rolled, welded, and stress relieved. All fittings, both seamless and welded-type, are hot-formed, and machine-faced and -beveled.

WORKING PRESSURES for both seamless and welded-type fittings are shown on pages 147-160.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.

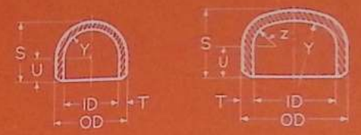
Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 38 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/38

CAPS

ASA AND ASME TYPE

CAT. NO. 35BS





SIZES ½" THRU 1½"

SIZES 2" AND LARGER

STANDARD WEIGHT

Nominal Pipe Size	Pipe Schedule Number	Overall Length S	Length of Tangent U	Radii y	Radii z	Approx. Volume (cu. in.)	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number	Nominal Pipe Size
½	40	1	3 7/64	5/16	—	—	0.840	0.622	0.109	.06	17400	½
¾	40	1	4 7/64	13/32	—	—	1.050	0.824	0.113	.1	17401	¾
1	40	1½	2 7/32	17/32	—	—	1.315	1.049	0.133	.2	17402	1
1¼	40	1½	4 3/64	1 1/16	—	—	1.660	1.380	0.140	.4	17403	1¼
1½	40	1½	3 5/64	1 3/16	—	—	1.900	1.610	0.145	.4	17404	1½
2	40	1½	4 1/64	1 23/32	1 5/32	3.3	2.375	2.067	0.154	.6	17405	2
2½	40	1½	1 9/32	2 7/64	3 5/64	5	2.875	2.469	0.203	.9	17406	2½
3	40	2	2 9/32	2 17/32	2 1/32	11.1	3.500	3.068	0.216	1.4	17407	3
3½	40	2½	1 1/4	2 31/32	2 5/32	19.1	4.000	3.548	0.226	2.2	17408	3½
4	40	2½	1 7/64	3 25/64	5 7/64	24	4.500	4.026	0.237	3	17409	4
5	40	3	1 9/32	4 1/4	1 1/8	45.4	5.563	5.047	0.258	4.5	17410	5
6	40	3½	1 27/64	5 1/32	1 13/32	76	6.625	6.065	0.280	7.2	17411	6
8	40	4	1 11/32	6 35/64	1 5/64	147	8.625	7.981	0.322	12	17412	8
10	40	5	1 5/8	8 17/64	2 25/64	287	10.750	10.020	0.365	18	17413	10
12	—	6	2 1/64	9 7/8	2 7/8	502	12.750	12.000	0.375	27	17414	12
14	30	6½	2 11/64	10 7/8	3 1/8	664	14.000	13.250	0.375	33	17415	14
16	30	7	2 1/32	12 3/8	3 5/8	933	16.000	15.250	0.375	42	17416	16
18	—	8	2 27/64	14	4 1/8	1380	18.000	17.250	0.375	55	17417	18
20	20	9	2 51/64	15 5/8	4 5/8	1948	20.000	19.250	0.375	68	17418	20
22	20	10	3 3/16	17 1/4	5 1/8	2654	22.000	21.250	0.375	86	17419	22
24	20	10½	3 1/16	18 7/8	5 5/8	3302	24.000	23.250	0.375	96	17420	24
26	—	10½	2 5/16	21 3/8	6 1/8	3813	26.000	25.250	0.375	102	17421	26
28	—	10½	1 3/4	22 1/2	6 7/8	4354	28.000	27.250	0.375	119	17422	28
30	—	10½	1	24	7 1/2	4927	30.000	29.250	0.375	132	17423	30
34	—	10½	2 1/8	28 5/8	5 5/8	6161	34.000	33.250	0.375	166	17425	34
36	—	10½	1 7/16	30 1/16	5 7/8	6822	36.000	35.250	0.375	192	17426	36

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings through 24" conform to ASTM Specification A-234 and ASA Standard B16.9 (see pages 113-116), and to the ASME Boiler Construction Code. Sizes over 24" not covered by B16.9. Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B), Wrought Iron, and other metals (see pages 82-85).

CONSTRUCTION: All fittings 2" and larger are hot-formed from firebox quality plate conforming to ASTM A-515, Grade 70. Smaller fittings are machined from bar stock conforming to ASTM Specification A-107, Grades 1025 or 1030. All fittings are machine-faced and -beveled.

WORKING PRESSURES for all fittings are shown on pages 147-160.

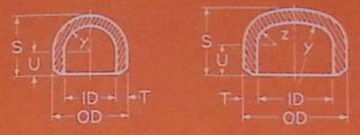
CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.

CAPS

ASA AND ASME TYPE

CAT. NO. 35BX



SIZES ½" THRU 1½"

SIZES 2" AND LARGER



EXTRA STRONG

Nominal Pipe Size	Pipe Schedule Number	Overall Length S	Length of Tangent U	Radii y	Radii z	Approx. Volume (cu. in.)	Outside Diameter OD	Inside Diameter ID	Wall Thickness T	Approx. Weight (lb.)	Part Number	Nominal Pipe Size
½	80	1	3 7/64	9/32	—	—	0.840	0.546	0.147	.06	17430	½
¾	80	1	4 7/64	3/8	—	—	1.050	0.742	0.154	.1	17431	¾
1	80	1½	2 7/32	3 1/64	—	—	1.315	0.957	0.179	.2	17432	1
1¼	80	1½	4 3/64	4 1/64	—	—	1.660	1.278	0.191	.4	17433	1¼
1½	80	1½	3 5/64	3/4	—	—	1.900	1.500	0.200	.5	17434	1½
2	80	1½	3 7/64	1 21/32	2 1/32	3.1	2.375	1.939	0.218	.8	17435	2
2½	80	1½	1 1/32	2 1/32	5 3/64	4	2.875	2.323	0.276	1	17436	2½
3	80	2	4 5/64	2 29/64	2 9/32	9	3.500	2.900	0.300	2	17437	3
3½	80	2½	1 3/32	2 7/8	6 1/64	16.2	4.000	3.364	0.318	2.8	17438	3½
4	80	2½	3 1/32	3 9/32	1 1/64	20.3	4.500	3.826	0.337	3.5	17439	4
5	80	3	1 7/32	4 1/8	1 1/8	39.3	5.563	4.813	0.375	5.8	17440	5
6	80	3½	1 13/32	4 7/8	1 15/64	65.6	6.625	5.761	0.432	9.2	17441	6
8	80	4	1 11/32	6 3/8	1 5/8	126	8.625	7.625	0.500	15	17442	8
10	60	5	1 5/8	8 1/8	2 1/4	265	10.750	9.750	0.500	25	17443	10
12	—	6	2 1/64	9 3/4	2 3/4	471	12.750	11.750	0.500	35	17444	12
14	—	6½	2 11/64	10 3/4	3	628	14.000	13.000	0.500	43	17445	14
16	40	7	2 1/32	12 1/4	3 1/2	886	16.000	15.000	0.500	54	17446	16
18	—	8	2 27/64	13 7/8	4	1319	18.000	17.000	0.500	73	17447	18
20	30	9	2 51/64	15 1/2	4 1/2	1873	20.000	19.000	0.500	90	17448	20
22	30	10	3 3/16	17 1/8	5	2563	22.000	21.000	0.500	115	17449	22
24	—	10½	3 1/16	18 3/4	5 1/2	3264	24.000	23.000	0.500	127	17450	24
26	20	10½	2 5/16	21 1/4	6	3697	26.000	25.000	0.500	144	17451	26
28	20	10½	1 3/4	22 3/8	6 3/4	4065	28.000	27.000	0.500	160	17452	28
30	20	10½	1	24	7 1/2	4600	30.000	29.000	0.500	177	17453	30
34	20	10½	2 1/4	28 1/2	5 1/2	5732	34.000	33.000	0.500	223	17455	34
36	20	10½	1 9/16	30 9/16	5 3/4	6369	36.040	35.000	0.500	258	17456	36

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings through 24" conform to ASTM Specification A-234 and ASA Standard B16.9 (see pages 113-116), and to the ASME Boiler Construction Code. Sizes over 24" not covered by B16.9. Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B), Wrought Iron, and other metals (see pages 82-85).

CONSTRUCTION: All fittings 2" and larger are hot-formed from firebox quality plate conforming to ASTM A-515, Grade 70. Smaller fittings are machined from bar stock conforming to ASTM Specification A-107, Grades 1025 or 1030. All fittings are machine-faced and -beveled.

WORKING PRESSURES for all fittings are shown on pages 147-160.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.

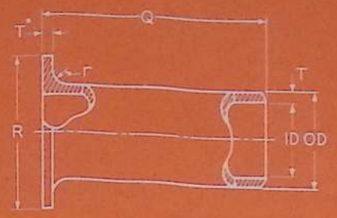
Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 39 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/39

LAP JOINT STUB ENDS

ASA TYPE

CAT. NO. 38BS





STANDARD WEIGHT

Nom. Pipe Size	Pipe Sched. No.	Overall Length	Lap Diameter	Fillet Radius	Outside Diameter	Inside Diameter	Lap* and Wall Thickness	Tolerances of OD of Barrel		Approx. Weight (lb.)	Part Number
		Q	R	r	OD	ID	T	Plus	Minus		
½	40	3	1 3/8	1/8	0.840	0.622	0.109	0.056	0.031	.4	17910
¾	40	3	1 11/16	1/8	1.050	0.824	0.113	0.056	0.031	.5	17911
1	40	4	2	1/8	1.315	1.049	0.133	0.061	0.031	.8	17912
1¼	40	4	2½	3/16	1.660	1.380	0.140	0.056	0.031	1.1	17913
1½	40	4	2 7/8	¼	1.900	1.610	0.145	0.066	0.031	1.2	17914
2	40	6	3 5/8	5/16	2.375	2.067	0.154	0.081	0.031	2.2	17915
2½	40	6	4 1/8	5/16	2.875	2.469	0.203	0.091	0.031	3.5	17916
3	40	6	5	3/8	3.500	3.068	0.216	0.096	0.031	4.8	17917
3½	40	6	5½	3/8	4.000	3.548	0.226	0.096	0.031	6	17918
4	40	6	6 3/16	7/16	4.500	4.026	0.237	0.093	0.031	7.2	17919
5	40	8	7 5/16	7/16	5.563	5.047	0.258	0.120	0.031	13	17920
6	40	8	8½	½	6.625	6.065	0.280	0.118	0.031	16	17921
8	40	8	10 5/8	½	8.625	7.981	0.322	0.118	0.031	23	17922
10	40	10	12¾	½	10.750	10.020	0.365	0.163	0.031	41	17923
12	—	10	15	½	12.750	12.000	0.375	0.163	0.031	47	17924
14	30	12	16¼	½	14.000	13.250	0.375	0.170	0.031	61	17925
16	30	12	18½	½	16.000	15.250	0.375	0.180	0.031	73	17926
18	—	12	21	½	18.000	17.250	0.375	0.190	0.031	85	17927
20	20	12	23	½	20.000	19.250	0.375	0.240	0.031	100	17928
24	20	12	27¼	½	24.000	23.250	0.375	0.240	0.031	115	17930

*MINIMUM THICKNESS.

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.9 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

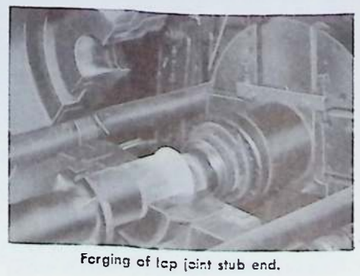
MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B), Wrought Iron, and other metals (see pages 82-85). Grade A Carbon Steel fittings can be furnished on application.

CONSTRUCTION: All fittings are of seamless construction, formed from selected tubing conforming to ASTM Specification A-106, Grade B. Fittings are hot-formed and machine-faced and -beveled. Standard facing (shown above) is furnished with phonographic finish. Other facings and finishes on application.

WORKING PRESSURES for all fittings are shown on pages 147-160.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.

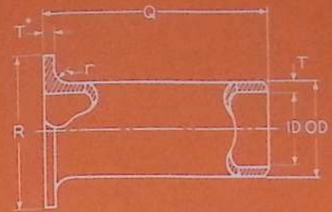


Forging of lap joint stub end.

LAP JOINT STUB ENDS

ASA TYPE

CAT. NO. 38BX



EXTRA STRONG



Nom. Pipe Size	Pipe Sched. No.	Overall Length	Lap Diameter	Fillet Radius	Outside Diameter	Inside Diameter	Lap* and Wall Thickness	Tolerances of OD of Barrel		Approx. Weight (lb.)	Part Number
		Q	R	r	OD	ID	T	Plus	Minus		
½	80	3	1 3/8	1/8	0.840	0.546	0.147	0.056	0.031	.4	17940
¾	80	3	1 11/16	1/8	1.050	0.742	0.154	0.056	0.031	.8	17941
1	80	4	2	1/8	1.315	0.957	0.179	0.061	0.031	.9	17942
1¼	80	4	2½	3/16	1.660	1.278	0.191	0.056	0.031	1.2	17943
1½	80	4	2 7/8	¼	1.900	1.500	0.200	0.066	0.031	1.8	17944
2	80	6	3 5/8	5/16	2.375	1.939	0.218	0.081	0.031	3.2	17945
2½	80	6	4 1/8	5/16	2.875	2.323	0.276	0.091	0.031	4.5	17946
3	80	6	5	3/8	3.500	2.900	0.300	0.096	0.031	6.5	17947
3½	80	6	5½	3/8	4.000	3.364	0.318	0.096	0.031	7.8	17948
4	80	6	6 3/16	7/16	4.500	3.826	0.337	0.093	0.031	9.8	17949
5	80	8	7 5/16	7/16	5.563	4.813	0.375	0.120	0.031	17	17950
6	80	8	8½	½	6.625	5.761	0.432	0.118	0.031	23	17951
8	80	8	10 5/8	½	8.625	7.625	0.500	0.118	0.031	32	17952
10	60	10	12¾	½	10.750	9.750	0.500	0.163	0.031	53	17953
12	—	10	15	½	12.750	11.750	0.500	0.163	0.031	63	17954
14	—	12	16¼	½	14.000	13.000	0.500	0.170	0.031	80	17955
16	40	12	18½	½	16.000	15.000	0.500	0.180	0.031	95	17956
18	—	12	21	½	18.000	17.000	0.500	0.190	0.031	120	17957
20	30	12	23	½	20.000	19.000	0.500	0.240	0.031	130	17958
24	—	12	27¼	½	24.000	23.000	0.500	0.240	0.031	150	17960

*MINIMUM THICKNESS.

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Fittings conform to ASTM Specification A-234 and ASA Standard B16.9 (see pages 113-116). Schedule numbers conform to ASA Standard B36.10 (see pages 136-145).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B), Wrought Iron, and other metals (see pages 82-85). Grade A Carbon Steel fittings can be furnished on application.

CONSTRUCTION: All fittings are of seamless construction, formed from selected tubing conforming to ASTM Specification A-106, Grade B. Fittings are hot-formed and machine-faced and -beveled. Standard facing (shown above) is furnished with phonographic finish. Other facings and finishes on application.

WORKING PRESSURES for all fittings are shown on pages 147-160.

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, and thicknesses are available. See pages 82-85.



Lap joint illustrating loose, swivel-type flange used.

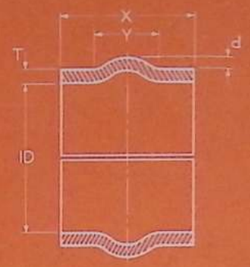
Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 40 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/40

SLEEVES

BUTT WELDING TYPE

CAT. NO. 42B





Nominal Pipe Size	Thickness T	Overall Length X	Width of Recess Y	Depth of Recess d	Inside Diameter* ID	Approx. Weight (lb.)	Part Number	Nominal Pipe Size
1	3/16	2	3/4	1/8	1.315	.5	17570	1
1 1/4	1/4	2 1/2	3/4	1/8	1.660	1	17571	1 1/4
1 1/2	1/4	2 1/2	3/4	1/8	1.900	1.2	17572	1 1/2
2	1/4	3	1	1/8	2.375	1.8	17573	2
2 1/2	1/4	3	1 1/8	3/16	2.875	2	17574	2 1/2
3	3/8	3	1 3/8	1/4	3.500	3.8	17575	3
3 1/2	3/8	3 1/2	1 1/2	1/4	4.000	5	17576	3 1/2
4	3/8	4	1 5/8	3/8	4.500	6.5	17577	4
5	3/8	5	1 3/4	3/8	5.563	11	17578	5
6	3/8	6	2 1/8	3/8	6.625	17	17579	6
8	1/2	8	2 1/8	3/8	8.625	33	17580	8
10	1/2	10	2 1/8	3/8	10.750	50	17581	10
12	1/2	12	2 1/8	1/2	12.750	66	17582	12
14	1/2	12	2 1/8	1/2	14.000	79	17583	14
16	1/2	12	2 1/8	1/2	16.000	90	17584	16
18	1/2	12	2 1/8	1/2	18.000	101	17585	18
20	1/2	12	2 1/8	1/2	20.000	112	17586	20
22	1/2	12	2 1/8	1/2	22.000	122	17587	22
24	1/2	12	2 1/8	1/2	24.000	133	17588	24
26	1/2	12	2 1/8	1/2	26.000	144	17589	26
30	1/2	12	2 1/8	1/2	30.000	166	17590	30

*MINIMUM DIMENSION.

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches.

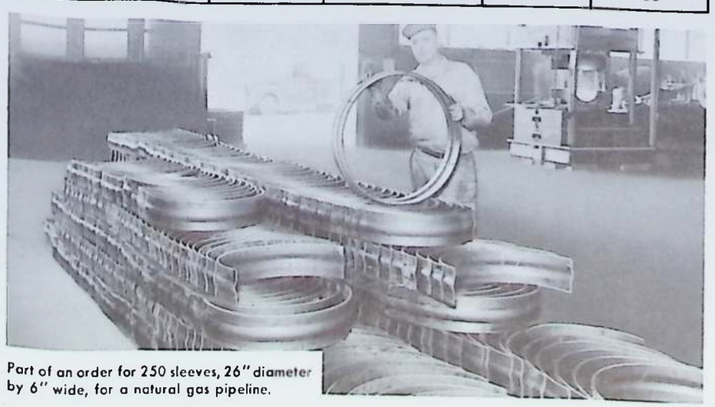
SPECIFICATIONS: Fittings conform to ASTM Specification A-234 (see pages 113-116).

MATERIALS: Fittings are stocked in Carbon Steel (ASTM A-234, Grade B). Grade A Carbon Steel and other metals can be furnished on application.

CONSTRUCTION: Fittings are hot-formed from firebox quality plate conforming to ASTM Specification A-515, Grade 70. Ends of sleeves are square-cut; longitudinal edges are beveled. (Note vent-hole to permit escape of welding gasses.)

CATALOG NUMBERS apply to Grade B Carbon Steel fittings only. For other materials, see page 172.

OTHER materials, sizes, lengths, and thicknesses are available. See pages 82-85.



Part of an order for 250 sleeves, 26" diameter by 6" wide, for a natural gas pipeline.

BACKING RINGS

NUB TYPE

TYPE "C" CAT. NO. 45B Specify Bore

TYPE "CC" CAT. NO. 46B Specify Bore

TYPE "CCC" CAT. NO. 47B Specify Bore



Nominal Pipe Size	Outside Diameter For Std. IPS OD	Outside Diameter For X. S. IPS OD	Width of Nub S	Height of Type "C" Nub B	Width of Ring W	Thkn. of Ring T	Number of Nubs Type "C"	Number of Nubs Types "CC" and "CCC"	Approx. Weight Per 100 Pieces (lb.)	Nominal Pipe Size
3/4	0.824	0.742	1/8	3/64	5/8	3/32	3	3	3	3/4
1	1.049	0.957	1/8	3/64	5/8	3/32	3	3	4	1
1 1/4	1.380	1.278	1/8	3/64	5/8	3/32	3	3	6	1 1/4
1 1/2	1.610	1.500	1/8	3/64	5/8	3/32	3	3	7	1 1/2
2	2.067	1.939	3/16	3/64	5/8	3/32	3	3	8	2
2 1/2	2.469	2.323	3/16	3/64	5/8	3/32	3	3	12	2 1/2
3	3.068	2.900	3/16	3/64	5/8	3/32	3	3	13	3
3 1/2	3.548	3.364	3/16	3/64	5/8	3/32	3	3	18	3 1/2
4	4.026	3.826	3/16	3/64	5/8	3/32	4	3	20	4
5	5.047	4.813	3/16	1/16	1	1/8	5	4	50	5
6	6.065	5.761	3/16	1/16	1	1/8	5	4	59	6
8	7.981	7.625	3/16	1/16	1	1/8	6	4	80	8
10	10.020	9.750	3/16	1/16	1	1/8	9	4	103	10
12	12.000	11.750	3/16	1/16	1	1/8	9	5	120	12
14	13.250	13.000	3/16	1/16	1	1/8	9	5	130	14
16	15.250	15.000	3/16	1/16	1	1/8	12	5	150	16
18	17.250	17.000	3/16	1/16	1	1/8	12	6	180	18
20	19.250	19.000	3/16	1/16	1	1/8	12	6	190	20
22	21.250	21.000	3/16	1/16	1	1/8	15	6	210	22
24	23.250	23.000	3/16	1/16	1	1/8	15	6	230	24
26	25.250	25.000	3/16	1/16	1	1/8	18	6	250	26
28	27.250	27.000	3/16	1/16	1	1/8	18	6	280	28
30	29.250	29.000	3/16	1/16	1	1/8	18	6	300	30
36	35.250	35.000	3/16	1/16	1	1/8	21	6	350	36

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches.

MATERIALS: Rings are stocked in carbon steel and low chrome-moly alloys. Other metals on application.

CONSTRUCTION: Rings are of split type, to insure a snug fit.



Pipe and fitting showing installation of nub-type backing ring. Note how nubs serve to space the beveled ends for welding and to center the ring between bevels.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 41 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/41

PIPELINE FITTINGS

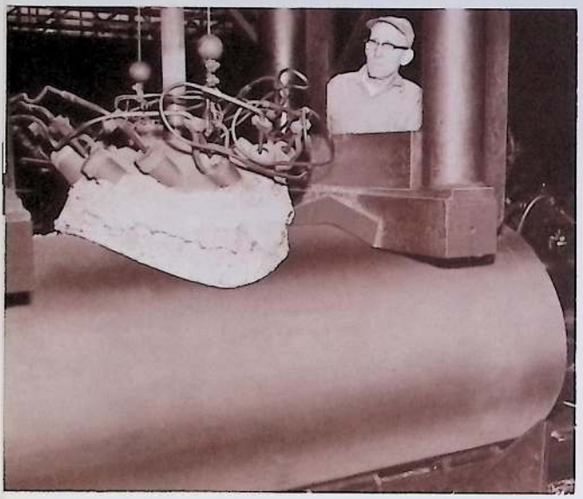




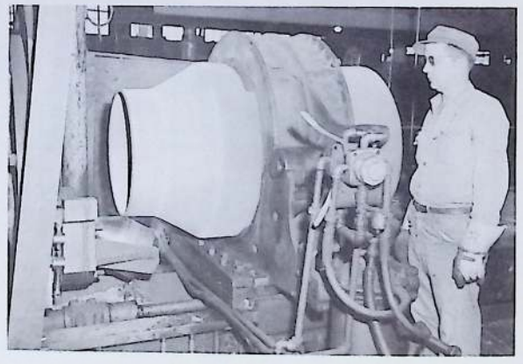
Increased pipeline pressures and unusual operating conditions, both in the line and in compressor and pumping stations, have led to the development of pipeline fittings of unorthodox shapes and materials. Crane's flexible manufacturing processes, plus sizeable stocks of high-yield strength metals lend themselves ideally to this situation.

Long tangent 90° and 45° elbows, reducing 90° elbows, and straight and reducing tees are stocks in all sizes . . . nozzle reinforcing members are available in a variety of types . . . "Contur" and other extra long radius ells are furnished with or without tangents and to any angle . . . extrusions are tailor-made to fit field conditions and can be fully fabricated as "bottles" or pulsation dampeners . . . special fittings of all sorts are designed and fabricated to solve individual pipeline problems.

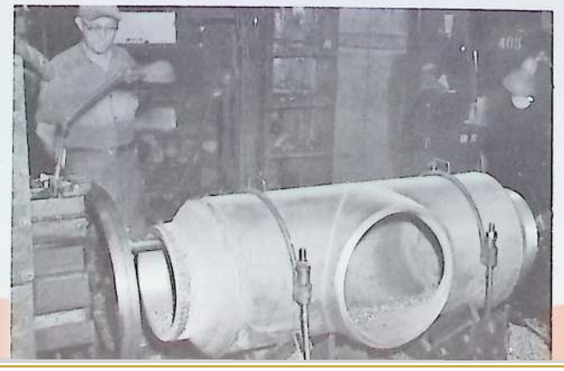
Crane's research, engineering, production and sales departments stand ready to serve you.



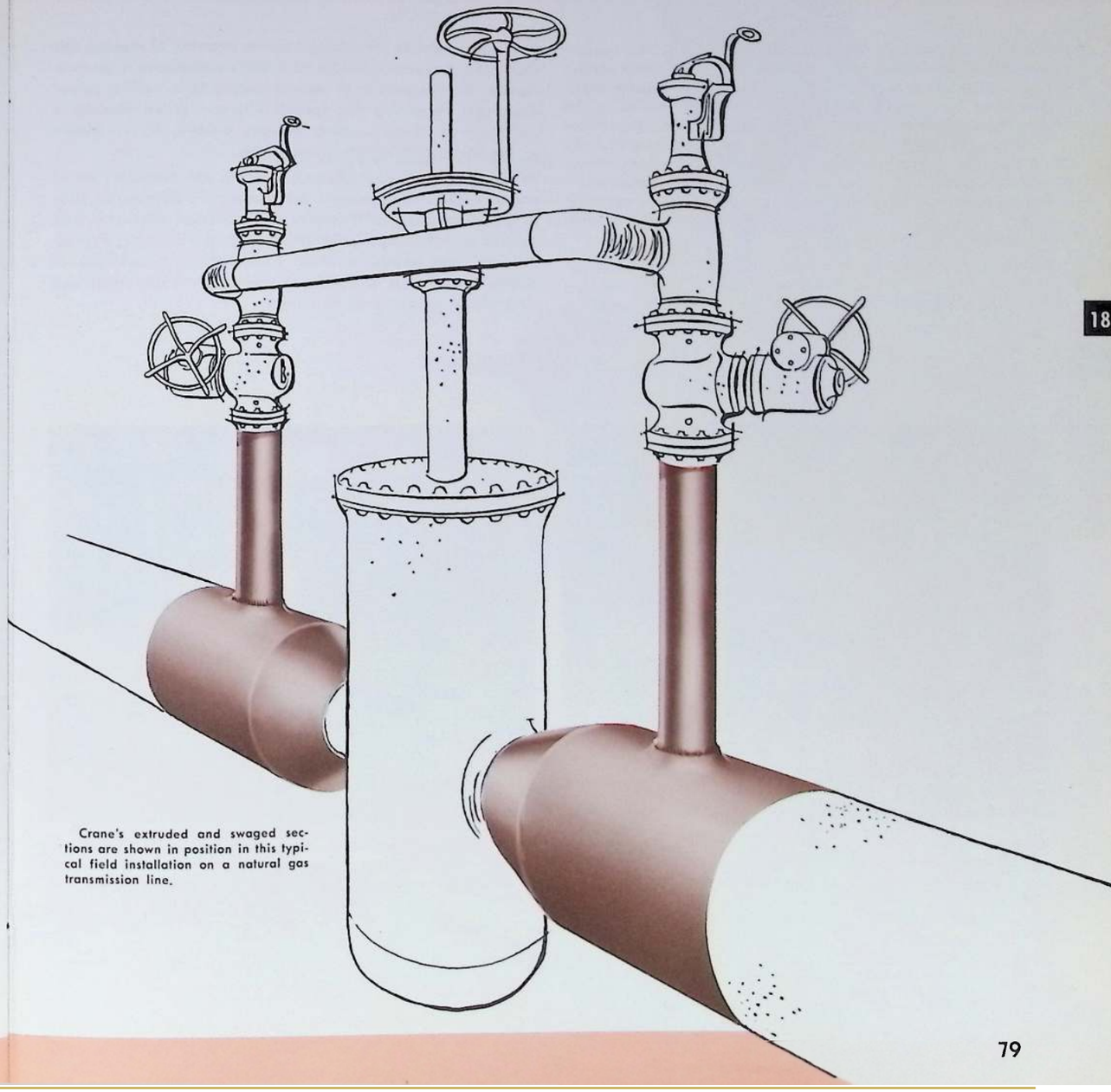
Extrusion equipment, shown here in position on a heavy-wall pipe cylinder, provides controlled heating of the nozzle area while the outlet is formed.



Hot forming operation produces the swage, or taper, at the end of one unit of a special fabricated section intended for gas transmission service.



Special machining equipment, shown here in an internal machining operation, insures accurate diameters, bevels, and lands on special pipeline headers.



Crane's extruded and swaged sections are shown in position in this typical field installation on a natural gas transmission line.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 42 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/42

NUCLEAR FITTINGS



Stainless-clad ell for atomic-powered marine piping.



Tee for sodium system, Enrico Fermi plant.



Primary coolant elbow for nuclear-powered maritime service.



Stator sleeve for "canned" motor pump.

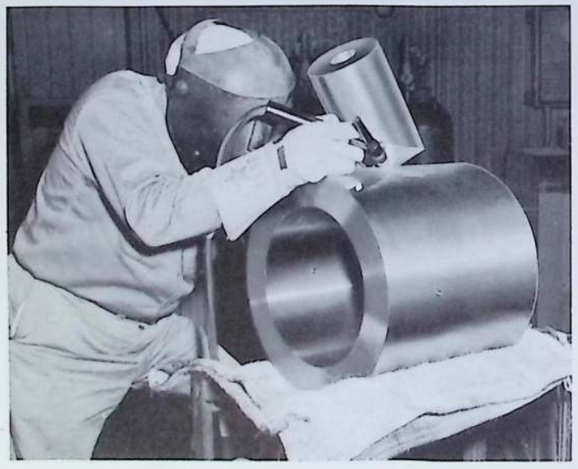


Primary coolant pipe section for marine vessel.

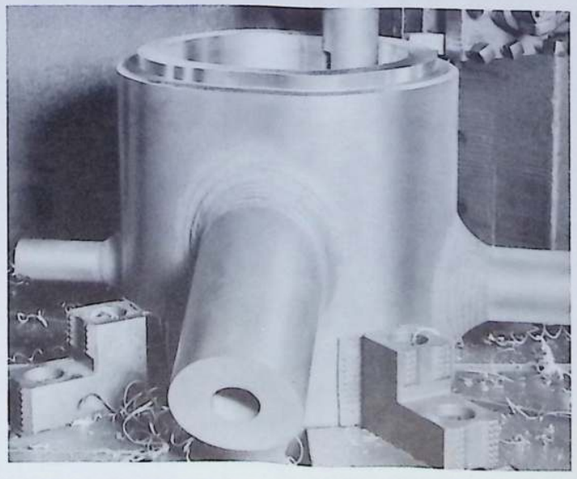
Crane's experience in the production of fittings for nuclear installations dates back to the early days of the modern Atomic Age — back to the Manhattan Project, the crash program which developed the world's first atomic bomb, as well as to the prototypes of the first marine nuclear-power plants. As nuclear research and development expanded, Crane continued to make substantial contributions to this new science, with quality fittings and fabricated piping for a variety of atomic installations. Today, piping by Crane can be found in inland and seagoing atomic power plants . . . in many nuclear piping systems which are "firsts" in their fields.

Because of its critical nature, nuclear piping must be produced to the most stringent specifications. Crane is one of the very few companions in the nation with the experience, technical skill, personnel and production facilities capable of meeting this challenge. A typical example of Crane's procedures is the production, illustrated here, of Inconel laterals for a nuclear power prototype. Producing this special fitting required forming a cylinder from plate, welding a seam, welding forged outlets to the body, and precision machining.

At Crane, fittings and fabricated piping are produced under a system of quality control which reduces the chances of error to an absolute minimum. Quality of the finished product is then verified by a thorough system of testing and inspection, destructive and non-destructive alike. Crane offers a multitude of quality control tests to check the metallurgical soundness and dimensional accuracy of its fittings.



Experienced welders and special facilities, such as high frequency starting and current decay equipment, are required to produce the high quality welds specified for nuclear fittings. Crane utilizes every modern welding technique, including special techniques of its own, to meet the close specifications for piping of such a critical nature.



When welding is completed, the fitting is finished on one of many machines in Crane's shops. In the case of nuclear fittings, tolerances are extremely exacting, and the inside and outside diameters of the fitting can be machined throughout to thousandths of an inch.

Inspection procedures begin with the production of the raw material, continue at every stage of manufacture, and culminate with the final checking of dimensions, surface condition, and cleanliness . . . precisely as stipulated by the customer.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 43 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/43

SPECIAL METALS

Crane's exclusive combination of manufacturing processes — utilizing either plate or seamless pipe as raw material — permits great flexibility in offering fittings of special metals. Not only can fittings of unusual shapes be produced, but raw material procurement is simplified . . . equipment is more easily adopted . . . production time is frequently reduced.

In the Design Data section of this book, various metals are described and differentiated (pages 117-122), and the raw material specifications for welding fittings listed (pages 123-125). Discussed here is the availability of these metals, from stock or to order. Bear in mind, however, that Crane welding fittings are not limited to the analyses shown — we invite inquiries for regular or special fittings of any commercially-made material which can be formed and welded.



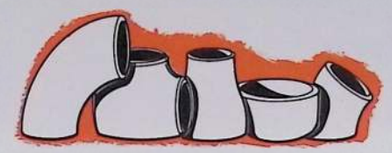
CARBON STEEL — All fittings listed in this catalog are stocked in Grade B steel (i.e., ASTM A-234, Grade WPB). Currently, there is a limited demand for other grades of carbon steel fittings, such as Grade A, Grade C, or fittings for low-temperature service (Grade WPLC); however, these fittings can usually be furnished from stock.



HIGH-YIELD — Few finished fittings are stocked in high-yield strength steel. However, raw material is stocked in thicknesses from ⅜" through 1½", and can be used to make all types of fittings. Production time, while varying with the type and quantity of fittings ordered, is generally a matter of a few weeks at most.

Raw material stocks conform to API 5LX, ASTM A-381, ASTM A-242 or ASTM A-441, and usually consist of both high-strength carbon steels and high-strength low alloys, such as "Tri-Ten" steel, a proprietary low-alloy grade having admirable forming and welding characteristics. Pipe and fittings made from these metals are in common use today in gas or oil transmission systems where high yield strengths (42,000 to 56,000 psi) are economically desirable for high line pressures.

All fittings containing welds are x-rayed along the entire length of the seam, in compliance with paragraph UW-51 of the ASME Unfired Pressure Vessel Code.



CHROME-MOLY STEELS—Three grades of chrome-moly fittings conforming to ASTM A-234 can be furnished:

1¼% Cr-½% Mo (Grade WP11)
2¼% Cr- 1% Mo (Grade WP22)
4-6% Cr-½% Mo (Grade WP5)
9% Cr- 1% Mo (Grade WP9)*

These fittings are stocked in standard and extra strong weights and in sizes through 12", all the more commonly specified types being represented. Long radius ells in larger sizes are also available off the shelf. Sizes, types and thicknesses not in stock can be readily manufactured, since complete raw material stocks are maintained in thicknesses through 1½".

Fittings of 2¼% Cr-1% Mo and 7% Cr-½% Mo are not usually carried in finished stock. However, a full range of 2¼% Cr raw material is stocked in thicknesses through 1½", and 7% Cr through ½". From these, fittings can be quickly produced to order. Other chrome-moly alloys, and carbon-moly fittings, can be furnished upon request.

All fittings of Grades WP1 or WP12, as a final heat treatment are tempered at 1200° F minimum, or normalized if of welded construction. All fittings with higher chrome content are fully annealed. In all grades, when chrome-moly or carbon-moly fittings contain welds, the seams are fully x-rayed and approved in accordance with ASME Paragraph UW-51.

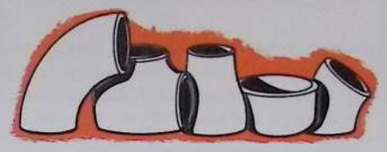


STAINLESS STEELS — Ample stocks of stainless steel welding fittings conforming to ASTM A-403 are carried in three basic analyses: Type 304; Type 316; Type 347. Sizes range from ½" through 6", except in the case of long radius ells, which are stocked through 12".

Usually Types 304 and 316 can be obtained in all three grades: Regular, L (low carbon) and the new H grade. Schedules 10S, 40S and 80S are normally stocked. In addition, Crane's emphasis on special, heavy wall fittings has led to the stocking of many unusual thicknesses of stainless steel raw material, from which special fittings can be quickly manufactured.

Schedule 5S is generally furnished to order, neither raw material nor finished fittings being stocked.

*Not covered by A-234



WROUGHT IRON — Wrought iron welding fittings in both standard and extra strong weights are stocked in all types of ASA fittings, and in addition, in long tangent ells, reducing ells, and short radius ells. All types of ells, and caps, are carried in sizes through 24"; all other wrought iron fittings are stocked in sizes through 12".



OTHER METALS — Fittings of relatively common metals, such as aluminum, nickel, copper, etc., can be readily furnished; production is limited only by availability of raw materials from the various mills. The same is true of less common metals, such as the various grades of Hastelloy; Inconel, Monel and titanium; chrome-copper-nickel and rare types of stainless steel; Yoloy; copper-base alloys and other unusual analyses.

CLADDING OR COATING — In many cases, carbon steel pipe and fittings can be plated or clad with erosion or corrosion resistant metals at costs which are less than those of solid alloy or non-ferrous piping.

The processes used and the availability of lined welding fittings is outlined below. Field-welding procedures for installing plated or clad fittings will be furnished on request.

Electro-plating can be used to line the inside or the outside of all types of welding fittings. Generally speaking, any pure non-ferrous metal can be used. The more common of these, and the maximum depth of plating which is usually furnished, are as follows:

Chromium	—.010"
Nickel	—.040" for 6" and smaller fittings .090" for 8" and larger fittings
Copper or lead	—.125"

Cladding is possible for most types of welding fittings, and for all except the lighter walls and smallest sizes. The most common clad fittings are those of carbon steel with a ⅛" to ¼" alloy cladding, such as stainless steel or Inconel, integrally bonded to the parent metal. The alloy surface can be placed on the inside or the outside of the fitting.

Weld-plating is the lining of fittings by depositing a layer of weld metal on the inside or outside of the fitting. A variety of metals can be used for this purpose, limited only by accessibility of the surface to be plated. Weld-plating can be used to provide the entire lining of a carbon steel fitting, or to provide selective thickness for fittings lined by electro-plating or cladding.

Lining of welding fittings with non-metallic materials is a specialty performed by a number of contractors. Plastic linings for gas distribution piping; glass or rubber lined fittings for the chemical industry; cement-lined items for oil piping—these are but some of the kinds of coating which are available to order.

Coated fittings. When so specified, fittings can be furnished with various protective coatings. Most common is galvanizing, which can be applied to carbon steel or wrought iron, either at the factory or by local galvanizers at or near the job site.

Special protective coatings for unusual corrosive conditions can also be applied. Inquiries should stipulate the exact coating required, or exact conditions for which the fittings are to be prepared.

Inquiries are invited. Crane's Technical Services Department will be glad to provide advice on welding techniques and procedures which may be used to join plated or clad fittings to pipe, valves, and other components.



Prepared for final inspection, these fittings are made of stainless clad carbon steel and more exotic metals such as Hastelloy and titanium, demonstrating the scope of Crane's ability to handle special metals.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 44 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/44

SPECIAL DESIGN

Illustrated below are examples of the many special fittings manufactured by Crane for a variety of applications. Fittings for special purposes can be produced in a wide range of sizes, shapes, wall thicknesses, metals and alloys. Quality is assured by Crane's sound practical experience, metallurgical knowledge, skill in the use of the latest welding techniques (many of them developed by Crane) and the careful quality control exercised at every stage of manufacture, from raw material to finished product. Crane will be happy to offer advice and recommendations on the type of fittings best suited to your individual requirements.



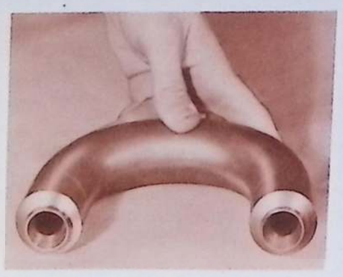
6" special "flat-back" return bend, made with 4¾" radius on each end and 13" center-to-center dimension. These fittings were also produced with 9¾" centers. Material: carbon steel. Service: heat exchanger piping.



One of an order for twelve 20" O.D. x 4" wall short radius elbows made from 2¼% chrome 1% moly alloy steel. Service: hot reheat piping for 2300 psig, 1050° F.



36" O.D. extra strong short radius 90° ell with 18" tangent on one end only. Also produced with 18" tangents on both ends. Material: A-201-B steel.



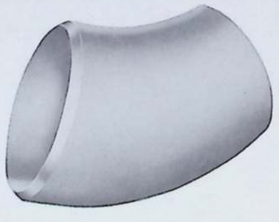
1½" O.D. x .400" wall return bend with 5¼" center-to-center dimension. Material: low carbon steel. Service: heat exchanger piping.



24" O.D. x ½" wall special 30° "Contur" ell, with 72" radius and 8" tangents. Material: X-52 high-yield steel. Service: natural gas transmission lines.



16" O.D. x 1.625" minimum wall stainless steel short radius 102° elbow with tangent on one end only. Service: nuclear reactor coolant piping.



24" O.D. x 21" O.D. special 45° reducing ell. Material: 1¼% chrome ½% moly alloy steel. Service: chemical process piping.



12¾" O.D. x 1½" wall long radius, long tangent 45° elbow with 6" extruded side outlet. Ends of fitting counter-bored to .875" wall.



16" x 6" x 6" special wye-fitting with 1" minimum wall thickness. Material: T304 stainless steel. Service: chemical process piping.



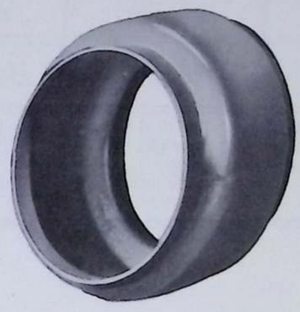
18" x 14" x 14" Schedule 60 special Y-branch fabricated from pipe, eccentric reducers and 30° ells. Material: 1¼% chrome ½% moly alloy steel. Service: hot reheat steam piping.



26" x 20" x 20" special wye, with 1¾" wall thickness. Inside of crotch reinforced with 3" thick plate. Material: 2¼% chrome 1% moly alloy steel. Service: hot reheat steam piping.



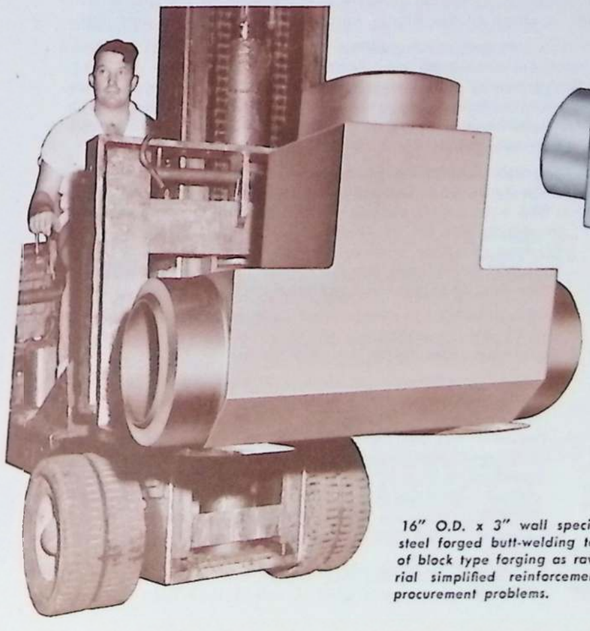
30" x 24" Venturi type reducer with tangents on both ends. Material: ½" thick carbon steel. Service: natural gas transmission.



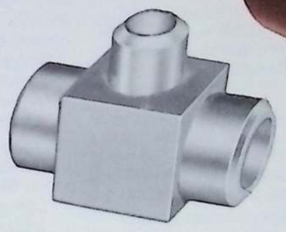
Welding sleeve with special recess to fit over 26" slip-type coupling. Material: carbon steel.



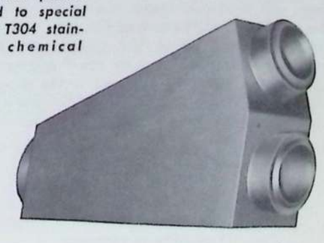
12" on 24" wrap-around saddle fabricated from ⅝" thick Grade B carbon steel. Note split through nozzle in place of conventional split along sides of fitting. Service: natural gas transmission piping.



16" O.D. x 3" wall special alloy steel forged butt-welding tee. Use of block type forging as raw material simplified reinforcement and procurement problems.



4" x 4" x 2½" block pattern forged tee machined to special tolerances. Material: T304 stainless steel. Service: chemical piping.



12" x 8" x 8" forged fitting illustrates flexibility of manufacture when special design, special thickness, and special metals are required.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 45 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/45

TYPES OF FLANGES

		A. S. A. TYPES				A. S. A. TYPES (Cont.)					
		WELDING NECK	SLIP - ON	SCREWED or THREADED	LAP JOINT or VAN STONE	BLIND	SOCKET WELDING	ORIFICE FLANGE UNIONS	LIGHT WEIGHT SLIP - ONS	LARGE DIAMETER	LONG WELDING NECKS
											
CATALOG PAGE NO.		88 - 101	88 - 101	88 - 101	88 - 101	88 - 101	88 - 101	102 - 105	106	107 - 109	110
AVAILABLE IN:	NOMINAL PIPE SIZE RANGE	½" - 24"	½" - 24"	½" - 24"	½" - 24"	½" - 24"	½" - 24"	1" - 24"	6" - 72"	26" & larger	1" - 24"
	PRESSURE RATINGS	150 - 2500 lb.	150 - 2500 lb.	150 - 2500 lb.	150 - 2500 lb.	150 - 2500 lb.	150 - 2500 lb.	300 - 1500 lb.	—	Various	150 - 2500 lb.
	METALS	Gr I or II Steel Wrought Iron Alloy Stainless Aluminum	Gr I or II Steel Wrought Iron Alloy Stainless Aluminum	Gr I or II Steel Wrought Iron Alloy Stainless Aluminum	Gr I or II Steel Wrought Iron Alloy Stainless Aluminum	Gr I or II Steel Wrought Iron Alloy Stainless Aluminum	Gr I or II Steel Wrought Iron Alloy Stainless Aluminum	Gr I or II Steel	Gr I or II Steel	Gr I or II Steel	Gr I or II Steel

Crane forged steel flanges are produced in a wide variety of types, sizes, pressure ratings and metals, the most common of which are illustrated above and described here. In addition to the varieties carried in stocks, special flanges of all types are available to order (see page 111).

ASA Flanges

Most forged steel flanges correspond to the requirements of the American Standards Association (ASA Standard B16.5), and the two governing ASTM Specifications (ASTM A-181 for 150 lb. and 300 lb. pressure ratings, and ASTM A-105 for 400 lb. through 2500 lb. pressure ratings). The following types are manufactured and stocked:

Welding neck flanges, available in all pressure ratings and sizes, are butt-welded to the end of the pipe, and are usually specified when service conditions are severe and excellent workmanship necessary. Since the inside diameter of the flange must match that of the pipe, the flange bore should be specified in ordering.

Slip-on flanges, also available in most pressure ratings and sizes, are a popular type due to their ease of application. This flange slips over the end of the pipe and is usually set so that the flange face is about ⅜" beyond the end of the pipe. This permits double-welding of the flange—one strength fillet weld to join the hub of the flange to the pipe, and a seal fillet weld inside the flange at the end of the pipe. Where operating conditions permit, the seal weld is omitted.

Slip-on flanges are most frequently used at lower pressure—150 lb. or 300 lb. primary service pressure ratings. Many pipe designers are reluctant to use slip-ons for higher pressures, since (1) the joint between flange and pipe is not as strong as in the welding neck type; and (2) the junction of the flange and pipe is more susceptible to corrosion.

Screwed or threaded flanges are attached to the pipe like any other screwed fittings, and may be back-welded to seal the joint between pipe and flange. Although still available in most sizes and pressure ratings, screwed flanges today are used almost exclusively in smaller pipe sizes and at low pressures.

Lap joint or Van Stone flanges are used on piping equipped with lap joint stub ends or with lapped pipe. They may be used at all pressures and are available in a full size range. These flanges slip over the pipe, and are not welded or otherwise fastened to it; bolting pressure is transmitted to the gasket by the pressure of the flange against the back of the pipe lap.

Lap joint flanges have certain special advantages: (1) freedom to swivel around the pipe facilitates the lining up of opposing flange bolt holes; (2) lack of contact with the fluid in the pipe often permits the use of inexpensive carbon steel flanges with corrosion resistant pipe or tubing; (3) in systems which erode or corrode quickly, the flanges may be salvaged for re-use.

Socket-welding flanges contain a recess in the back of the flange to receive the end of the pipe, which is attached by a fillet weld around the hub of the flange. Since socket-welding connections are not as strong as butt-welded joints, the use of this type of flange is almost always confined to 4" and smaller sizes, and to the lower pressure ratings. Its chief advantage lies in the ease of preparation and installation.

Blind flanges, available in all sizes and pressure ratings, are solid forgings used to close off the end of a piping system and to gain easy access to the interior of the line.

Reducing flanges are stocked in both slip-on and screwed types, and are available to order in welding neck type. They are specified by showing both the nominal pipe dimension of the small end and the outside diameter of the flange. Thus, for a 6" to 4" pipe reduction, a 150-lb. reducing flange should be specified as 4" x 11" O.D. 150-lb. reducing slip-on (or screwed) flange. This type of flange is available in all sizes and pressure ratings.

Other Types

In addition to the ASA flanges, the following types are carried in stock:-

Orifice flanges are used for measuring fluid flow in piping systems. Their design conforms to the recommendations of the American Gas Association's Committee on Gas Measurement. Commonly furnished as either welding neck or slip-on type, they may also be ordered as screwed flanges. Orifice unions are available in 300-lb. and heavier pressure ratings.

Each orifice flange is equipped with two radially-drilled, tapped holes for metering, and with jack-screws to facilitate separation of the joint for removal of the orifice metering plate. Orifice flanges, unless otherwise specified, are furnished in pairs as a flange union, complete with bolts, nuts, and jack-screws—but without the orifice plate. Gaskets are supplied with raised face flange unions, but not for ring-joint faced flanges, which use an integral gasket and orifice plate.

Light weight slip-on flanges, drilled to 125-lb. ASA Standards but of lighter construction than the regular slip-on type, are available for low-pressure systems.

Large diameter flanges, in sizes beyond the ASA range, are available for special installations. Dimensions given herein are those most commonly used; however, flanges and rolled rings for large diameter pipe or for vessels and tanks can readily be made to other specifications.

Long welding necks are used primarily for outlets for vessels and tanks. Drilled to ASA standards, they are forged with long, heavy-wall, straight hubs, and finished with square cut ends.

Flange Facings

Unless otherwise specified, 150-lb. and 300-lb. flanges in all types except lap joint (or Van Stone) flanges are furnished with a 1/16" raised face (which is included in the flange thickness dimension). Heavier pressure ratings are machined with a ¼" raised face, in addition to the designated flange thickness.

When so ordered, these flange types can be furnished with a variety of other facings, such as male and female, ring joint, tongue and groove, etc. Details of these facings are shown on pages 130-133.

Lap joint flanges are machined with a flat face and a fillet radius to accommodate the back of the pipe lap.

Flange Finishes

Gasket surface of all raised face flanges, unless otherwise requested, will be machined with a spiral serrated finish. This surface, together with other gasket surface finishes which can be furnished to order, is described as follows:

Stock finish, for flange sizes 12" and smaller, is produced with a 1/16" round-nosed tool at a feed of 1/32" per revolution. For sizes 14" and larger, the finish will be made with a ⅛" round-nosed tool at a feed of 3/64" per revolution.

Concentric serrated finish is produced by using a 90°-included-angle "V" tool, making concentric grooves 1/64" deep and 1/32" apart.

Phonographic finish is produced by using a 90°-included-angle "V" tool, making a spiral groove 1/64" deep with a feed of 1/32".

Smooth or plane finish is produced by tools cutting at speeds and feeds which leave no definite tool marks.

Cold water finish, equivalent to a ground surface, is produced by using a wide tool at high speeds. The resulting finish may be described as mirror-like, and is primarily intended for use without gaskets.

All lap joint flanges, unless otherwise specified, are machined with a smooth surface.

Back-facing — All Crane flanges are either back-faced or finished by spot-facing the back of the flange around each bolt hole.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 46 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/46

CRANE

150-lb. ASA FLANGES

FORGED FLANGES IMPROVE PIPING DESIGNS AND REDUCE COSTS



WELDING NECK

CAT. NO. 62BO1



CAT. NO. 63BO1
SLIP ON



SCREWED

CAT. NO. 64BO1



LAP JOINT

CAT. NO. 65BO1



SOCKET WELDING

CAT. NO. 67BO1



BLIND

CAT. NO. 66BO1

Nom. Pipe Size	Flange Outside Diam.	Flange Thkn.	Raised Face Diam.	Bore			Length thru Hub			Drilling			Depth of Socket
				Welding Neck, and Socket Wldg. Face	Slip-On, and Socket Welding	Lap Joint	Welding Neck	Slip-On, Screwed, and Socket Welding	Lap Joint	No. of Holes	Diam. of Holes	Diam. of Bolt Circle	
	O	T	A	B	C	D	F	G	H		J	K	L
½	3½	7/16	1 3/8	0.62	0.88	0.90	1 7/8	5/8	5/8	4	5/8	2 3/8	3/8
¾	3 7/8	½	1 11/16	0.82	1.09	1.11	2 1/16	5/8	5/8	4	5/8	2 3/4	7/16
1	4¼	9/16	2	1.05	1.36	1.38	2 3/16	1 1/16	1 1/16	4	5/8	3 1/8	½
1¼	4 5/8	5/8	2½	1.38	1.70	1.72	2¼	1 3/16	1 3/16	4	5/8	3½	9/16
1½	5	1 1/16	2 7/8	1.61	1.95	1.97	2 7/16	7/8	7/8	4	5/8	3 7/8	5/8
2	6	¾	3 5/8	2.07	2.44	2.46	2½	1	1	4	¾	4 ¾	1 1/16
2½	7	7/8	4 1/8	2.47	2.94	2.97	2¾	1 1/8	1 1/8	4	¾	5½	¾
3	7½	1 5/16	5	3.07	3.57	3.60	2¾	1 3/16	1 3/16	4	¾	6	1 3/16
3½	8½	1 5/16	5½	3.55	4.07	4.10	2 13/16	1¼	1¼	8	¾	7	7/8
4	9	1 5/16	6 3/16	4.03	4.57	4.60	3	1 5/16	1 5/16	8	¾	7½	1 5/16
5	10	1 5/16	7 5/16	5.05	5.66	5.69	3½	1 7/16	1 7/16	8	7/8	8½	1 5/16
6	11	1	8½	6.07	6.72	6.75	3½	1 9/16	1 9/16	8	7/8	9½	1 1/16
8	13½	1 1/8	10 5/8	7.98	8.72	8.75	4	1¾	1¾	8	7/8	11 ¾	1¼
10	16	1 3/16	12¾	10.02	10.88	10.92	4	1 15/16	1 15/16	12	1	14¼	1 5/16
12	19	1¼	15	12.00	12.88	12.92	4½	2 3/16	2 3/16	12	1	17	1 9/16
14	21	1 3/8	16¼	13.25	14.14	14.18	5	2¼	3 1/8	12	1 1/8	18 ¾	1 5/8
16	23½	1 7/16	18½	15.25	16.16	16.19	5	2½	3 7/16	16	1 1/8	21¼	1¾
18	25	1 9/16	21	17.25	18.18	18.20	5½	2 11/16	3 13/16	16	1¼	22 ¾	1 15/16
20	27½	1 11/16	23	19.25	20.20	20.25	5 1/16	2 7/8	4 1/16	20	1¼	25	2 1/8
24	32	1 7/8	27¼	23.25	24.25	24.25	6	3¼	4 3/8	20	1 3/8	29½	2½

Diam. of Hub		Lap Joint Fillet Radius	Approx. Weight (lb.)				Part Numbers						Nom. Pipe Size
At Base	At Chamfer		Welding Neck	Slip-On, Screwed, and Socket Welding	Blind	Lap Joint	Welding Neck	Slip-On	Blind	Lap Joint	Screwed	Socket Welding	
M	N	r											
1 3/16	0.84	1/8	2	2	2	2	21000	22000	23000	24000	25000	29510	½
1½	1.05	1/8	2	2	2	2	21001	22001	23001	24001	25001	29511	¾
1 15/16	1.32	1/8	2	2	2	2	21002	22002	23002	24002	25002	29512	1
2 5/16	1.66	3/16	3	3	3	3	21003	22003	23003	24003	25003	29513	1¼
2 9/16	1.90	¼	4	3	3	3	21004	22004	23004	24004	25004	29514	1½
3 1/16	2.38	5/16	6	5	4	5	21005	22005	23005	24005	25005	29515	2
3 5/16	2.88	5/16	8	7	7	7	21006	22006	23006	24006	25006	29516	2½
4¼	3.50	3/8	10	8	9	8	21007	22007	23007	24007	25007	29517	3
4 13/16	4.00	3/8	12	11	13	11	21008	22008	23008	24008	25008	29518	3½
5 5/16	4.50	7/16	15	13	17	13	21009	22009	23009	24009	25009	29519	4
6 7/16	5.56	7/16	19	15	20	15	21010	22010	23010	24010	25010	29520	5
7 9/16	6.63	½	24	19	26	19	21011	22011	23011	24011	25011	29521	6
9 11/16	8.63	½	39	30	45	30	21012	22012	13012	24012	25012	29522	8
12	10.75	½	52	43	70	43	21013	22013	23013	24013	25013	29523	10
14 3/8	12.75	½	80	64	110	64	21014	22014	23014	24014	25014	29524	12
15 3/4	14.00	½	102	85	131	99	21015	22015	23015	24015	25015	29525	14
18	16.00	½	127	93	170	128	21016	22016	23016	24016	25016	29526	16
19 7/8	18.00	½	140	120	209	146	21017	22017	23017	24017	25017	29527	18
22	20.00	½	170	155	272	185	21018	22018	23018	24018	25018	29528	20
26 1/8	24.00	½	260	210	411	260	21020	22020	23020	24020	25020	29530	24

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Flanges conform to ASTM Specification A-181 and to ASA Standard B16.5 (see pages 113-116), except socket welding flanges 3½" and larger, which are not covered by the ASA Standard.

MATERIALS: Flanges are stocked in Forged Carbon Steel (ASTM A-181, Grade I or II), and other metals (see page 111).

REDUCING FLANGES: In ordering, specify smaller pipe size and outside diameter of flange. E.g., for a 6" to 4" reduction, specify a 4 x 11" O. D. 150 lb. slip-on (or screwed) reducing flange.

FACING AND FINISH: See pages 86-87.

BEVEL of welding neck flange: See page 116.

GASKET dimensions: See pages 130-131.

SMALLER BORE: See page 134 for minimum dimensions.

BOLTING dimensions: See page 135.

PRESSURE-TEMPERATURE RATINGS: See pages 161-167.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 47 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/47

CRANE

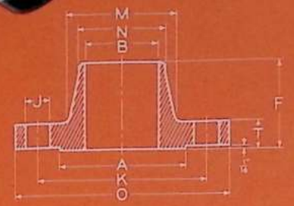
300-lb. ASA FLANGES

FORGED FLANGES IMPROVE PIPING DESIGNS AND REDUCE COSTS



WELDING NECK

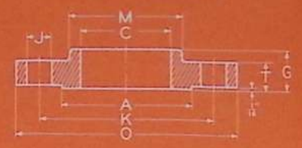
CAT. NO. 62BO3





SLIP ON

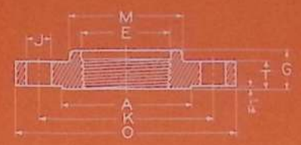
CAT. NO. 63BO3





SCREWED

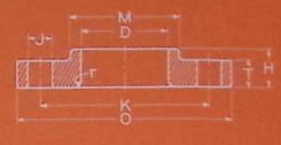
CAT. NO. 64BO3





LAP JOINT

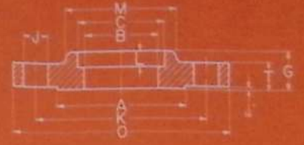
CAT. NO. 65BO3





SOCKET WELDING

CAT. NO. 67BO3





BLIND

CAT. NO. 66BO3



Nom. Pipe Size	Flange Outside Diam.	Flange Thkn.	Raised Face Diam.	Bore				Length thru Hub			Drilling			Depth of Socket
				Welding Neck, and Socket Wldg. Face	Slip-On, and Socket Welding	Lap Joint	Screwed	Welding Neck	Slip-On, Screwed, and Socket Welding	Lap Joint	No. of Holes	Diam. of Holes	Diam. of Bolt Circle	
	O	T	A	B	C	D	E	F	G	H		J	K	L
½	3¾	9/16	1⅜	0.62	0.88	0.90	0.93	2 1/16	⅞	⅞	4	⅝	2⅝	⅜
¾	4⅝	⅝	1 11/16	0.82	1.09	1.11	1.14	2¼	1	1	4	¾	3¼	7/16
1	4⅞	11/16	2	1.05	1.36	1.38	1.41	2 7/16	1 1/16	1 1/16	4	¾	3½	½
1¼	5¼	¾	2½	1.38	1.70	1.72	1.75	2 9/16	1 1/16	1 1/16	4	¾	3⅞	9/16
1½	6⅛	13/16	2⅞	1.61	1.95	1.97	1.99	2 11/16	1 3/16	1 3/16	4	⅞	4½	⅝
2	6½	⅞	3⅝	2.07	2.44	2.46	2.50	2¾	1 5/16	1 5/16	8	¾	5	11/16
2½	7½	1	4⅛	2.47	2.94	2.97	3.00	3	1½	1½	8	⅞	5⅞	¾
3	8¼	1⅛	5	3.07	3.57	3.60	3.63	3⅛	1 11/16	1 11/16	8	⅞	6⅝	13/16
3½	9	1 3/16	5½	3.55	4.07	4.10	4.13	3 3/16	1¾	1¾	8	⅞	7¼	⅞
4	10	1¼	6 3/16	4.03	4.57	4.60	4.63	3⅜	1⅞	1⅞	8	⅞	7⅞	1 5/16
5	11	1⅜	7 5/16	5.05	5.66	5.69	5.69	3⅞	2	2	8	⅞	9¼	—
6	12½	1 7/16	8½	6.07	6.72	6.75	6.75	3⅞	2 1/16	2 1/16	12	⅞	10⅝	—
8	15	1⅝	10⅝	7.98	8.72	8.75	8.75	4⅜	2 7/16	2 7/16	12	1	13	—
10	17½	1⅞	12¾	10.02	10.88	10.92	10.88	4⅝	2⅝	3¾	16	1⅛	15¼	—
12	20½	2	15	12.00	12.88	12.92	12.94	5⅛	2⅞	4	16	1¼	17¾	—
14	23	2⅛	16¼	13.25	14.14	14.18	14.19	5⅜	3	4⅜	20	1¼	20¼	—
16	25½	2¼	18½	15.25	16.16	16.19	16.19	5¾	3¼	4¾	20	1⅜	22½	—
18	28	2⅜	21	17.25	18.18	18.20	18.19	6¼	3½	5⅛	24	1⅜	24¾	—
20	30½	2½	23	19.25	20.20	20.25	20.19	6⅜	3¾	5½	24	1⅜	27	—
24	36	2¾	27¼	23.25	24.25	24.25	24.19	6⅝	4 3/16	6	24	1⅝	32	—

Diam. of Hub		Lap Joint Fillet Radius	Approx. Weight (lb.)				Part Numbers						Nom. Pipe Size
At Base	At Chamfer		Welding Neck	Slip-On, Screwed, and Socket Welding	Blind	Lap Joint	Welding Neck	Slip-On	Blind	Lap Joint	Screwed	Socket Welding	
M	N	r											
1½	0.84	⅛	4	3	2	3	21200	22200	23200	24200	25200	29700	½
1⅞	1.05	⅛	4	3	3	3	21201	22201	23201	24201	25201	29701	¾
2⅛	1.32	⅛	4	3	4	3	21202	22202	23202	24202	25202	29702	1
2½	1.66	3/16	6	4	6	4	21203	22203	23203	24203	25203	29703	1¼
2¾	1.90	¼	8	6	7	6	21204	22204	23204	24204	25204	29704	1½
3 5/16	2.38	5/16	9	7	8	7	21205	22205	23205	24205	25205	29705	2
3 15/16	2.88	5/16	12	10	12	10	21206	22206	23206	24206	25206	29706	2½
4⅝	3.50	⅜	15	13	16	13	21207	22207	23207	24207	25207	29707	3
5¼	4.00	⅜	18	17	21	17	21208	22208	23208	24208	25208	29708	3½
5¾	4.50	7/16	25	22	27	22	21209	22209	23209	24209	25209	29709	4
7	5.56	7/16	32	28	35	28	21210	22210	23210	24210	25210	—	5
8⅛	6.63	½	42	39	50	39	21211	22211	23211	24211	25211	—	6
10¼	8.63	½	67	58	81	58	21212	22212	23212	24212	25212	—	8
12⅝	10.75	½	91	81	127	91	21213	22213	23213	24213	25213	—	10
14¾	12.75	½	138	115	184	139	21214	22214	23214	24214	25214	—	12
16¾	14.00	½	186	164	236	189	21215	22215	23215	24215	25215	—	14
19	16.00	½	246	220	307	240	21216	22216	23216	24216	25216	—	16
21	18.00	½	305	280	390	305	21217	22217	23217	24217	25217	—	18
23⅛	20.00	½	378	325	492	375	21218	22218	23218	24218	25218	—	20
27⅝	24.00	½	545	490	754	530	21220	22220	23220	24220	25220	—	24

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Flanges conform to ASTM Specification A-181 and to ASA Standard B16.5 (see pages 113-116), except socket welding flanges 3½″ and larger, which are not covered by the ASA Standard.

MATERIALS: Flanges are stocked in Forged Carbon Steel (ASTM A-181, Grade I or II), and other metals (see page 111).

REDUCING FLANGES: In ordering, specify smaller pipe size and outside diameter of flange. E.g., for a 6″ to 4″ reduction, specify a 4 x 12½″ O. D. 300 lb. slip-on (or screwed) reducing flange.

FACING AND FINISH: See pages 86-87.

BEVEL of welding neck flange: See page 116.

GASKET dimensions: See pages 130-131.

SMALLER BORE: See page 134 for minimum dimensions.

BOLTING dimensions: See page 135.

PRESSURE-TEMPERATURE RATINGS: See pages 161-167.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 48 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/48

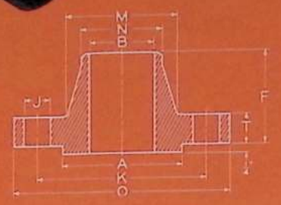
CRANE

400-lb. ASA FLANGES

FORGED FLANGES IMPROVE PIPING DESIGNS AND REDUCE COSTS

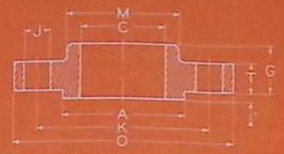
CAT. NO. 62B04 — WELDING NECK





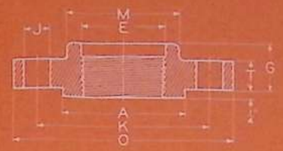
CAT. NO. 63B04 — SLIP ON





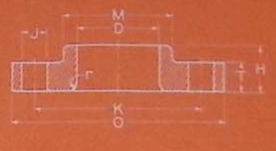
CAT. NO. 64B04 — SCREWED





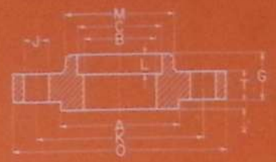
CAT. NO. 65B04 — LAP JOINT





CAT. NO. 67B04 — SOCKET WELDING





CAT. NO. 66B04 — BLIND





Nom. Pipe Size	Flange Outside Diam.	Flange Thkn.*	Raised Face Diam.	Bore				Length thru Hub*			Drilling			Depth of Socket
				Welding Neck, and Socket Wldg. Face	Slip-On, and Socket Welding	Lap Joint	Screwed	Welding Neck	Slip-On, Screwed, and Socket Welding	Lap Joint	No. of Holes	Diam. of Holes	Diam. of Bolt Circle	
	O	T	A	B	C	D	E	F	G	H		J	K	L
½	3¾	9/16	1⅜	0.55	0.88	0.90	0.93	2 1/16	⅞	⅞	4	⅝	2⅝	⅜
¾	4⅝	⅝	1 11/16	0.74	1.09	1.11	1.14	2¼	1	1	4	¾	3¼	7/16
1	4⅞	11/16	2	0.96	1.36	1.38	1.41	2 7/16	1 1/16	1 1/16	4	¾	3½	½
1¼	5¼	13/16	2½	1.28	1.70	1.72	1.75	2⅝	1⅛	1⅛	4	¾	3⅞	9/16
1½	6⅛	⅞	2⅞	1.50	1.95	1.97	1.99	2¾	1¼	1¼	4	⅞	4½	⅝
2	6½	1	3⅝	1.94	2.44	2.46	2.50	2⅞	1 7/16	1 7/16	8	¾	5	11/16
2½	7½	1⅛	4⅛	2.32	2.94	2.97	3.00	3⅛	1⅝	1⅝	8	⅞	5⅞	¾
3	8¼	1¼	5	2.90	3.57	3.60	3.63	3¼	1 13/16	1 13/16	8	⅞	6⅝	13/16
3½	9	1⅜	5½	3.36	4.07	4.10	4.13	3⅜	1 15/16	1 15/16	8	1	7¼	⅞
4	10	1⅜	6 3/16	3.83	4.57	4.60	4.63	3½	2	2	8	1	7⅞	1 5/16
5	11	1½	7 3/16	4.81	5.66	5.69	5.69	4	2⅛	2⅛	8	1	9¼	—
6	12½	1⅝	8½	5.76	6.72	6.75	6.75	4 1/16	2¼	2¼	12	1	10⅝	—
8	15	1⅞	10⅝	7.63	8.72	8.75	8.75	4⅝	2 1/16	2 1/16	12	1⅛	13	—
10	17½	2⅛	12¾	9.75	10.88	10.92	10.88	4⅞	2⅞	4	16	1¼	15¼	—
12	20½	2¼	15	11.75	12.88	12.92	12.94	5⅜	3⅛	4¼	16	1⅜	17¾	—
14	23	2⅜	16¼	13.00	14.14	14.18	14.19	5⅞	3 5/16	4⅝	20	1⅜	20¼	—
16	25½	2½	18½	15.00	16.16	16.19	16.19	6	3 1/16	5	20	1½	22½	—
18	28	2⅝	21	17.00	18.18	18.20	18.19	6½	3⅞	5⅜	24	1½	24¾	—
20	30½	2¾	23	19.00	20.20	20.25	20.19	6⅝	4	5¾	24	1⅝	27	—
24	36	3	27¼	23.00	24.25	24.25	24.19	6⅞	4½	6¼	24	1⅞	32	—

Diam. of Hub		Lap Joint Fillet Radius	Approx. Weight (lb.)				Part Numbers						Nom. Pipe Size
At Base	At Chamfer		Welding Neck	Slip-On, Screwed, and Socket Welding	Blind	Lap Joint	Welding Neck	Slip-On	Blind	Lap Joint	Screwed	Socket Welding	
M	N	r											
1½	0.84	⅛	6	3	2	3	21530	22500	23500	24500	25500	29810	½
1⅞	1.05	⅛	6	3	3	3	21531	22501	23501	24501	25501	29811	¾
2⅛	1.32	⅛	6	4	4	4	21532	22502	23502	24502	25502	29812	1
2½	1.66	3/16	7	6	6	6	21533	22503	23503	24503	25503	29813	1¼
2¾	1.90	¼	10	7	8	7	21534	22504	23504	24504	25504	29814	1½
3 5/16	2.38	5/16	12	9	10	9	21535	22505	23505	24505	25505	29815	2
3 15/16	2.88	5/16	18	13	15	12	21536	22506	23506	24506	25506	29816	2½
4⅝	3.50	⅜	23	16	20	15	21537	22507	23507	24507	25507	29817	3
5¼	4.00	⅜	26	21	29	20	21538	22508	23508	24508	25508	29818	3½
5¾	4.50	7/16	35	26	33	25	21429	22409	23409	24409	25409	29819	4
7	5.56	7/16	43	31	44	29	21430	22410	23410	24410	25410	—	5
8⅛	6.63	½	57	44	61	42	21431	22411	23411	24411	25411	—	6
10¼	8.63	½	89	67	100	64	21432	22412	23412	24412	25412	—	8
12⅝	10.75	½	126	91	155	112	21433	22413	23413	24413	25413	—	10
14¾	12.75	½	177	129	226	152	21434	22414	23414	24414	25414	—	12
16¾	14.00	½	233	191	310	210	21435	22415	23415	24415	25415	—	14
19	16.00	½	294	253	398	280	21436	22416	23416	24416	25416	—	16
21	18.00	½	360	310	502	345	21437	22417	23417	24417	25417	—	18
23⅛	20.00	½	445	378	621	420	21438	22418	23418	24418	25418	—	20
27⅜	24.00	½	640	539	936	615	21440	22420	23420	24420	25420	—	24

*Dimensions do not include ¼" raised face.

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Sizes ½" through 3½" are identical with 600 lb. flanges. Tolerances are given on page 116.

SPECIFICATIONS: Flanges conform to ASTM Specification A-105 and to ASA Standard B16.5 (see pages 113-116), except socket welding flanges which are not covered by the ASA Standard.

MATERIALS: Flanges are stocked in Forged Carbon Steel (ASTM A-105, Grade I or II), and other metals (see page 111).

REDUCING FLANGES: In ordering, specify smaller pipe size and outside diameter of flange. E.g., for a 6" to 4" reduction, specify a 4 x 12½" O.D. 400 lb. slip-on (or screwed) reducing flange.

FACING AND FINISH: See pages 86-87.

BEVEL of welding neck flange: See page 116.

GASKET dimensions: See pages 130-131.

SMALLER BORE: See page 134 for minimum dimensions.

BOLTING dimensions: See page 135.

PRESSURE-TEMPERATURE RATINGS: See pages 161-167.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 49 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/49

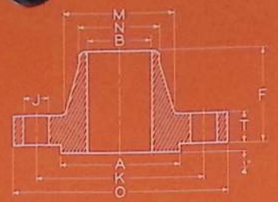
CRANE

600-lb. ASA FLANGES

FORGED FLANGES IMPROVE PIPING DESIGNS AND REDUCE COSTS

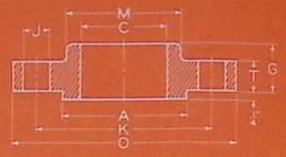
CAT. NO. 62B06 — WELDING NECK





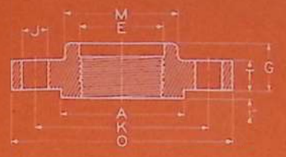
CAT. NO. 63B06 — SLIP ON





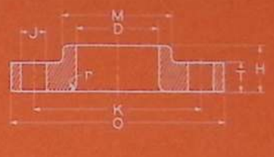
CAT. NO. 64B06 — SCREWED





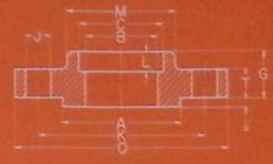
CAT. NO. 65B06 — LAP JOINT





CAT. NO. 67B06 — SOCKET WELDING





CAT. NO. 66B06 — BLIND





Nom. Pipe Size	Flange Outside Diam.	Flange Thkn.*	Raised Face Diam.	Bore				Length thru Hub*			Drilling			Depth of Socket
				Welding Neck, and Socket Wldg. Face	Slip-On, and Socket Welding	Lap Joint	Screwed	Welding Neck	Slip-On, Screwed, and Socket Welding	Lap Joint	No. of Holes	Diam. of Holes	Diam. of Bolt Circle	
	O	T	A	B	C	D	E	F	G	H		J	K	L
½	3¾	9/16	1⅜	0.55	0.88	0.90	0.93	2 1/16	⅞	⅞	4	⅝	2⅝	⅜
¾	4⅝	⅝	1 11/16	0.74	1.09	1.11	1.14	2¼	1	1	4	¾	3¼	7/16
1	4⅞	11/16	2	0.96	1.36	1.38	1.41	2 7/16	1 1/16	1 1/16	4	¾	3½	½
1¼	5¼	13/16	2½	1.28	1.70	1.72	1.75	2⅝	1⅛	1⅛	4	¾	3⅞	9/16
1½	6⅛	⅞	2⅞	1.50	1.95	1.97	1.99	2¾	1¼	1¼	4	⅞	4½	⅝
2	6½	1	3⅝	1.94	2.44	2.46	2.50	2⅞	1 7/16	1 7/16	8	¾	5	1 1/16
2½	7½	1⅛	4⅛	2.32	2.94	2.97	3.00	3⅛	1⅝	1⅝	8	⅞	5⅞	¾
3	8¼	1¼	5	2.90	3.57	3.60	3.63	3¼	1 13/16	1 13/16	8	⅞	6⅝	1 3/16
3½	9	1⅜	5½	3.36	4.07	4.10	4.13	3⅜	1 15/16	1 15/16	8	1	7¼	⅞
4	10¾	1½	6 5/16	3.83	4.57	4.60	4.63	4	2⅛	2⅛	8	1	8½	1 5/16
5	13	1¾	7 5/16	4.81	5.66	5.69	5.69	4½	2⅜	2⅜	8	1⅛	10½	—
6	14	1⅞	8½	5.76	6.72	6.75	6.75	4⅝	2⅝	2⅝	12	1⅛	11½	—
8	16½	2 3/16	10⅝	7.63	8.72	8.75	8.75	5¼	3	3	12	1¼	13¾	—
10	20	2½	12¾	9.75	10.88	10.92	10.88	6	3⅜	4⅜	16	1⅜	17	—
12	22	2⅝	15	11.75	12.88	12.92	12.94	6⅛	3⅝	4⅝	20	1⅜	19¼	—
14	23¾	2¾	16¼	13.00	14.14	14.18	14.19	6½	3 11/16	5	20	1½	20¾	—
16	27	3	18½	15.00	16.16	16.19	16.19	7	4 3/16	5½	20	1⅝	23¾	—
18	29¼	3¼	21	17.00	18.18	18.20	18.19	7¼	4⅝	6	20	1¾	25¾	—
20	32	3½	23	19.00	20.20	20.25	20.19	7½	5	6½	24	1¾	28½	—
24	37	4	27¼	23.00	24.25	24.25	24.19	8	5½	7¼	24	2	33	—

Diam. of Hub		Lap Joint Fillet Radius	Approx. Weight (lb.)				Part Numbers						Nom. Pipe Size
At Base	At Chamfer		Welding Neck	Slip-On, Screwed, and Socket Welding	Blind	Lap Joint	Welding Neck	Slip-On	Blind	Lap Joint	Screwed	Socket Welding	
M	N	r											
1½	0.84	⅛	6	3	2	3	21530	22500	23500	24500	25500	29810	½
1⅞	1.05	⅛	6	3	3	3	21531	22501	23501	24501	25501	29811	¾
2⅛	1.32	⅛	6	4	4	4	21532	22502	23502	24502	25502	29812	1
2½	1.66	3/16	7	6	6	6	21533	22503	23503	24503	25503	29813	1¼
2¾	1.90	¼	10	7	8	7	21534	22504	23504	24504	25504	29814	1½
3 5/16	2.38	5/16	12	9	10	9	21535	22505	23505	24505	25505	29815	2
3 15/16	2.88	5/16	18	13	15	12	21536	22506	23506	24506	25506	29816	2½
4⅝	3.50	⅜	23	16	20	15	21537	22507	23507	24507	25507	29817	3
5¼	4.00	⅜	26	21	29	20	21538	22508	23508	24508	25508	29828	3½
6	4.50	7/16	42	37	41	36	21539	22509	23509	24509	25509	29829	4
7 7/16	5.56	7/16	68	63	68	61	21540	22510	23510	24510	25510	—	5
8¾	6.63	½	81	80	86	78	21541	22511	23511	24511	25511	—	6
10¾	8.63	½	117	115	139	112	21542	22512	23512	24512	25512	—	8
13½	10.75	½	189	177	231	195	21543	22513	23513	24513	25513	—	10
15¾	12.75	½	226	215	295	240	21544	22514	23514	24514	25514	—	12
17	14.00	½	347	259	378	290	21545	22515	23515	24515	25515	—	14
19½	16.00	½	481	366	527	400	21546	22516	23516	24516	25516	—	16
21½	18.00	½	555	476	665	469	21547	22517	23517	24517	25517	—	18
24	20.00	½	690	612	855	604	21548	22518	23518	24518	25518	—	20
28¼	24.00	½	977	876	1175	866	21550	22520	23520	24520	25520	—	24

*Dimensions do not include ¼" raised face.

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Sizes ½" through 3½" are identical with 400 lb. flanges. Tolerances are given on page 116.

SPECIFICATIONS: Flanges conform to ASTM Specification A-105 and to ASA Standard B16.5 (see pages 113-116), except socket welding flanges 3½" and larger, which are not covered by the ASA Standard.

MATERIALS: Flanges are stocked in Forged Carbon Steel (ASTM A-105, Grade I or II), and other metals (see page 111).

REDUCING FLANGES: In ordering, specify smaller pipe size and outside diameter of flange. E.g., for a 6" to 4" reduction, specify a 4 x 14" O.D. 600 lb. slip-on (or screwed) reducing flange.

FACING AND FINISH: See pages 86-87.

BEVEL of welding neck flanges: See page 116.

GASKET dimensions: See pages 130-131.

SMALLER BORE: See page 134 for minimum dimensions.

BOLTING dimensions: See page 135.

PRESSURE-TEMPERATURE RATINGS: See pages 161-167.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 50 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/50

CRANE

900-lb. ASA FLANGES

FORGED FLANGES IMPROVE PIPING DESIGNS AND REDUCE COSTS



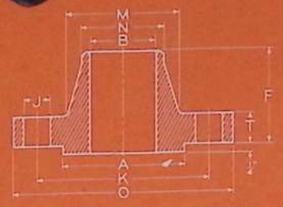
WELDING NECK

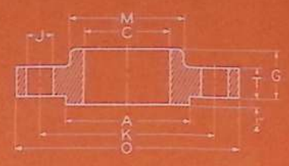
CAT. NO. 62B09



SLIP ON

CAT. NO. 63B09







SCREWED

CAT. NO. 64B09



LAP JOINT

CAT. NO. 65B09



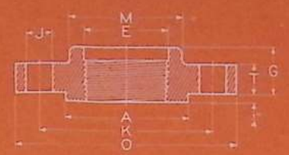
SOCKET WELDING

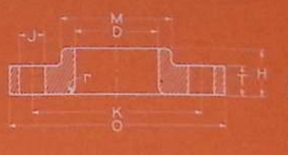
CAT. NO. 67B09

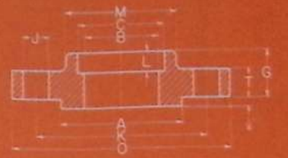


BLIND

CAT. NO. 66B09









Nom. Pipe Size	Flange Outside Diam.	Flange Thkn.*	Raised Face Diam.	Bore: Welding Neck, and Socket Wldg. Face	Bore: Slip-On, and Socket Welding	Bore: Lap Joint	Bore: Screwed	Length thru Hub*: Welding Neck	Length thru Hub*: Slip-On, Screwed, and Socket Welding	Length thru Hub*: Lap Joint	Drilling: No. of Holes	Drilling: Diam. of Holes	Drilling: Diam. of Bolt Circle	Depth of Socket
	O	T	A	B	C	D	E	F	G	H		J	K	L
½	4¾	⅞	1⅜	Must be specified by Purchaser	0.88	0.90	0.93	2⅜	1¼	1¼	4	⅞	3¼	⅜
¾	5⅛	1	1 1⁄16		1.09	1.11	1.14	2¾	1⅜	1⅜	4	⅞	3½	7⁄16
1	5⅞	1⅛	2		1.36	1.38	1.41	2⅞	1⅝	1⅝	4	1	4	½
1¼	6¼	1⅛	2½		1.70	1.72	1.75	2⅞	1⅝	1⅝	4	1	4⅜	9⁄16
1½	7	1¼	2⅞		1.95	1.97	1.99	3¼	1¾	1¾	4	1⅛	4⅞	⅝
2	8½	1½	3⅝		2.44	2.46	2.50	4	2¼	2¼	8	1	6½	1 1⁄16
2½	9⅝	1⅝	4⅛		2.94	2.97	3.00	4⅛	2½	2½	8	1⅛	7½	¾
3	9½	1½	5		3.57	3.60	3.63	4	2⅛	2⅛	8	1	7½	—
4	11½	1¾	6 3⁄16		4.57	4.60	4.63	4½	2¾	2¾	8	1¼	9¼	—
5	13¾	2	7 5⁄16		5.66	5.69	5.69	5	3⅛	3⅛	8	1⅜	11	—
6	15	2 3⁄16	8½		6.72	6.75	6.75	5½	3⅜	3⅜	12	1¼	12½	—
8	18½	2½	10⅝		8.72	8.75	8.75	6⅜	4	4½	12	1½	15½	—
10	21½	2¾	12¾		10.88	10.92	10.88	7¼	4¼	5	16	1½	18½	—
12	24	3⅛	15		12.88	12.92	12.94	7⅞	4⅝	5⅝	20	1½	21	—
14	25¼	3⅜	16¼		14.14	14.18	14.19	8⅜	5⅛	6⅛	20	1⅝	22	—
16	27¾	3½	18½		16.16	16.19	16.19	8½	5¼	6½	20	1¾	24¼	—
18	31	4	21		18.18	18.20	18.19	9	6	7½	20	2	27	—
20	33¾	4¼	23		20.20	20.25	20.19	9¾	6¼	8¼	20	2⅛	29½	—
24	41	5½	27¼		24.25	24.25	24.19	11½	8	10½	20	2⅝	35½	—

Diam. of Hub: At Base	Diam. of Hub: At Chamfer	Lap Joint Fillet Radius	Approx. Weight (lb.): Welding Neck	Approx. Weight (lb.): Slip-On, Screwed, and Socket Welding	Approx. Weight (lb.): Blind	Approx. Weight (lb.): Lap Joint	Part Numbers: Welding Neck	Part Numbers: Slip-On	Part Numbers: Blind	Part Numbers: Lap Joint	Part Numbers: Screwed	Part Numbers: Socket Welding	Nom. Pipe Size
M	N	r											
1½	0.84	⅛	9	9	4	9	Varies with Bore of Flange	22660	23670	24700	25650	Varies with Bore of Flange	½
1¾	1.05	⅛	9	9	6	9		22661	23671	24701	25651		¾
2 1⁄16	1.32	⅛	9	9	9	9		22662	23672	24702	25652		1
2½	1.66	3⁄16	10	10	10	10		22663	23673	24703	25653		1¼
2¾	1.90	¼	14	14	14	14		22664	23674	24704	25654		1½
4⅛	2.38	5⁄16	25	25	25	25		22665	23675	24705	25655		2
4⅞	2.88	5⁄16	36	36	35	35		22666	23676	24706	25656		2½
5	3.50	⅜	32	31	32	30		22607	23607	24607	25607	—	3
6¼	4.50	7⁄16	51	53	54	51		22609	23609	24609	25609	—	4
7½	5.56	7⁄16	86	83	87	81		22610	23610	24610	25610	—	5
9¼	6.63	½	110	108	113	105		22611	23611	24611	25611	—	6
11¾	8.63	½	187	172	197	188		22612	23612	24612	25612	—	8
14½	10.75	½	268	245	290	277		22613	23613	24613	25613	—	10
16½	12.75	½	372	326	413	371		22614	23614	24614	25614	—	12
17¾	14.00	½	562	380	494	397		22615	23615	24615	25615	—	14
20	16.00	½	685	459	619	488		22616	23616	24616	25616	—	16
22¼	18.00	½	924	647	880	670		22617	23617	24617	25617	—	18
24½	20.00	½	1164	792	1107	868		22618	23618	24618	25618	—	20
29½	24.00	½	2107	1480	2099	1659		22620	23620	24620	25620	—	24

*Dimensions do not include ¼" raised face.

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Sizes ½" through 2½" are identical with 1500 lb. flanges. Tolerances are given on page 116.

SPECIFICATIONS: Flanges conform to ASTM Specification A-105 and to ASA Standard B16.5 (see pages 113-116), except socket welding flanges which are not covered by the ASA Standard.

MATERIALS: Flanges are stocked in Forged Carbon Steel (ASTM A-105, Grade I or II), and other metals (see page 111).

REDUCING FLANGES: In ordering, specify smaller pipe size and outside diameter of flange. E.g., for a 6" to 4" reduction, specify a 4 x 15" O.D. 900 lb. slip-on (or screwed) reducing flange.

FACING AND FINISH: See pages 86-87.

BEVEL of welding neck flange: See page 116.

GASKET Dimensions: See pages 130-131.

SMALLER BORE: See page 134 for minimum dimensions.

BOLTING dimensions: See page 135.

PRESSURE-TEMPERATURE RATINGS: See pages 161-167.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 51 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/51

CRANE

1500-lb. ASA FLANGES

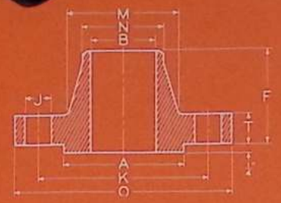
FORGED FLANGES IMPROVE PIPING DESIGNS AND REDUCE COSTS

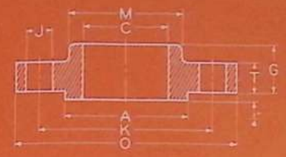


CAT. NO. 62B15 — WELDING NECK



SLIP ON — CAT. NO. 63B15







SCREWED — CAT. NO. 64B15



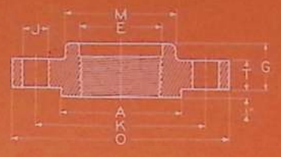
LAP JOINT — CAT. NO. 65B15

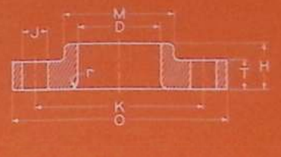


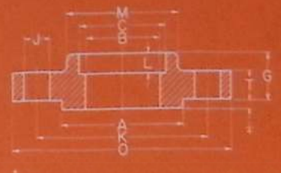
SOCKET WELDING — CAT. NO. 67B15

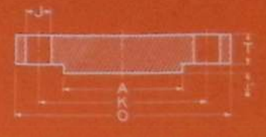


BLIND — CAT. NO. 66B15









Nom. Pipe Size	Flange Outside Diam.	Flange Thkn.*	Raised Face Diam.	Bore				Length thru Hub*			Drilling			Depth of Socket
				Welding Neck, and Socket Wldg. Face	Slip-On, and Socket Welding	Lap Joint	Screwed	Welding Neck	Slip-On, Screwed, and Socket Welding	Lap Joint	No. of Holes	Diam. of Holes	Diam. of Bolt Circle	
	O	T	A	B	C	D	E	F	G	H		J	K	L
½	4¾	⅞	1⅜		0.88	0.90	0.93	2⅜	1¼	1¼	4	⅞	3¼	⅜
¾	5⅛	1	1 1/16		1.09	1.11	1.14	2¾	1⅜	1⅜	4	⅞	3½	7/16
1	5⅞	1⅛	2		1.36	1.38	1.41	2⅞	1⅝	1⅝	4	1	4	½
1¼	6¼	1⅛	2½		1.70	1.72	1.75	2⅞	1⅝	1⅝	4	1	4⅜	9/16
1½	7	1¼	2⅞		1.95	1.97	1.99	3¼	1¾	1¾	4	1⅛	4⅞	⅝
2	8½	1½	3⅝		2.44	2.46	2.50	4	2¼	2¼	8	1	6½	11/16
2½	9⅝	1⅝	4⅛		2.94	2.97	3.00	4⅛	2½	2½	8	1⅛	7½	¾
3	10½	1⅞	5		3.57	3.60	3.63	4⅝	2⅞	2⅞	8	1¼	8	—
4	12¼	2⅛	6 3/16		4.57	4.60	4.63	4⅞	3 1/16	3 1/16	8	1⅜	9½	—
5	14¾	2⅞	7 5/16		5.66	5.69	5.69	6⅛	4⅛	4⅛	8	1⅝	11½	—
6	15½	3¼	8½		6.72	6.75	6.75	6¾	4 1/16	4 1/16	12	1½	12½	—
8	19	3⅜	10⅝		8.72	8.75	8.75	8⅜	5⅝	5⅝	12	1¾	15½	—
10	23	4¼	12¾		10.88	10.92	10.88	10	6¼	7	12	2	19	—
12	26½	4⅞	15		12.88	12.92	12.94	11⅛	7⅛	8⅝	16	2⅛	22½	—
14	29½	5¼	16¼		—	14.18	—	11¾	—	9½	16	2⅜	25	—
16	32½	5¾	18½		—	16.19	—	12¼	—	10¼	16	2⅝	27¾	—
18	36	6⅜	21		—	18.20	—	12⅞	—	10⅞	16	2⅞	30½	—
20	38¾	7	23		—	20.25	—	14	—	11½	16	3⅛	32¾	—
24	46	8	27¼		—	24.25	—	16	—	13	16	3⅜	39	—

Must be specified by Purchaser

Diam. of Hub		Lap Joint Fillet Radius	Approx. Weight (lb.)				Part Numbers						Nom. Pipe Size
At Base	At Chamfer		Welding Neck	Slip-On, Screwed, and Socket Welding	Blind	Lap Joint	Welding Neck	Slip-On	Blind	Lap Joint	Screwed	Socket Welding	
M	N	r											
1½	0.84	⅛	9	9	4	9		22660	23670	24700	25650		½
1¾	1.05	⅛	9	9	6	9		22661	23671	24701	25651		¾
2 1/16	1.32	⅛	9	9	9	9		22662	23672	24702	25652		1
2½	1.66	3/16	10	10	10	10		22663	23673	24703	25653		1¼
2¾	1.90	¼	14	14	14	14		22664	23674	24704	25654		1½
4⅛	2.38	5/16	25	25	25	25		22665	23675	24705	25655		2
4⅞	2.88	5/16	36	36	35	35		22666	23676	24706	25656		2½
5¼	3.50	⅜	48	48	48	47		22667	23677	24707	25657	—	3
6⅜	4.50	7/16	73	73	73	75		22669	23679	24709	25659	—	4
7¾	5.56	7/16	132	132	142	138		22670	23680	24710	25660	—	5
9	6.63	½	164	164	159	170		22671	23681	24711	25661	—	6
11½	8.63	½	273	258	302	286		22672	23682	24712	25662	—	8
14½	10.75	½	454	436	507	485		22673	23683	24713	25663	—	10
17¾	12.75	½	690	667	775	749		22674	23684	24714	25664	—	12
19½	14.00	½	940	—	975	890		—	23685	24715	—	—	14
21¾	16.00	½	1250	—	1300	1150		—	23686	24716	—	—	16
23½	18.00	½	1625	—	1750	1475		—	23687	24717	—	—	18
25¼	20.00	½	2050	—	2225	1775		—	23688	24718	—	—	20
30	24.00	½	3325	—	3625	2825		—	23690	24720	—	—	24

Varies with Bore of Flange

*Dimensions do not include ¼" raised face.

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Sizes ½" through 2½" are identical with 900 lb. flanges.

Tolerances are given on page 116.

SPECIFICATIONS: Flanges conform to ASTM Specification A-105 and to ASA Standard B16.5 (see pages 113-116).

MATERIALS: Flanges are stocked in Forged Carbon Steel (ASTM A-105, Grade I or II), and other metals (see page 111).

REDUCING FLANGES: In ordering, specify smaller pipe size and outside diameter of flange. E.g., for a 6" to 4" reduction, specify a 4 x 15½" O.D. 1500 lb. slip-on (or screwed) reducing flange.

FACING AND FINISH: See pages 86-87.

BEVEL of welding neck flange: See page 116.

GASKET dimensions: See pages 130-131.

SMALLER BORE: See page 134 for minimum dimensions.

BOLTING dimensions: See page 135.

PRESSURE-TEMPERATURE RATINGS: See pages 161-167.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 52 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/52

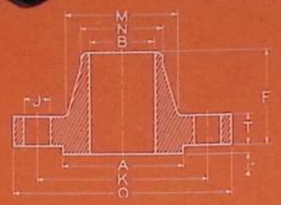
CRANE

2500-lb. ASA FLANGES

FORGED FLANGES IMPROVE PIPING DESIGNS AND REDUCE COSTS

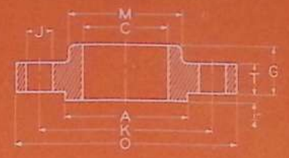
CAT. NO. 62B25 — WELDING NECK





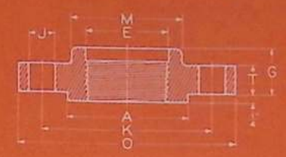
SLIP ON — CAT. NO. 63B25





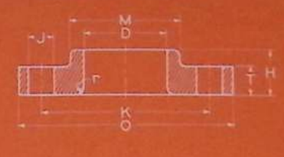
SCREWED — CAT. NO. 64B25





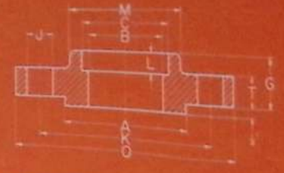
LAP JOINT — CAT. NO. 65B25





SOCKET WELDING — CAT. NO. 67B25





BLIND — CAT. NO. 66B25





Nom. Pipe Size	Flange Outside Diam.	Flange Thkn.*	Raised Face Diam.	Bore				Length thru Hub*			Drilling			Depth of Socket
				Welding Neck, and Socket Wldg. Face	Slip-On, and Socket Welding	Lap Joint	Screwed	Welding Neck	Slip-On, Screwed, and Socket Welding	Lap Joint	No. of Holes	Diam. of Holes	Diam. of Bolt Circle	
	O	T	A	B	C	D	E	F	G	H		J	K	L
½	5¼	1³⁄₁₆	1⅜	Must be specified by Purchoser	0.88	0.90	0.93	2⅞	1⁹⁄₁₆	1⁹⁄₁₆	4	⅞	3½	⅜
¾	5½	1¼	1¹¹⁄₁₆		1.09	1.11	1.14	3⅛	1¹¹⁄₁₆	1¹¹⁄₁₆	4	⅞	3¾	⁷⁄₁₆
1	6¼	1⅜	2		1.36	1.38	1.41	3½	1⅞	1⅞	4	1	4¼	½
1¼	7¼	1½	2½		1.70	1.72	1.75	3¾	2¹⁄₁₆	2¹⁄₁₆	4	1⅛	5⅛	⁹⁄₁₆
1½	8	1¾	2⅞		1.95	1.97	1.99	4⅜	2⅜	2⅜	4	1¼	5¾	⅝
2	9¼	2	3⅝		2.44	2.46	2.50	5	2¾	2¾	8	1⅛	6¾	¹¹⁄₁₆
2½	10½	2¼	4⅛		2.94	2.97	3.00	5⅝	3⅛	3⅛	8	1¼	7¾	¾
3	12	2⅝	5		3.57	3.60	3.63	6⅝	3⅝	3⅝	8	1⅜	9	—
4	14	3	6³⁄₁₆		4.57	4.60	4.63	7½	4¼	4¼	8	1⅝	10¾	—
5	16½	3⅝	7⁵⁄₁₆		5.66	5.69	5.69	9	5⅛	5⅛	8	1⅞	12¾	—
6	19	4¼	8½		6.72	6.75	6.75	10¾	6	6	8	2⅛	14½	—
8	21¾	5	10⅝		8.72	8.75	8.75	12½	7	7	12	2⅛	17¼	—
10	26½	6½	12¾		10.88	10.92	10.88	16½	9	9	12	2⅝	21¼	—
12	30	7¼	15		12.88	12.92	12.94	18¼	10	10	12	2⅞	24⅜	—

Diam. of Hub		Lap Joint Fillet Radius	Approx. Weight (lb.)				Part Numbers						Nom. Pipe Size
At Base	At Chamfer		Welding Neck	Slip-On, Screwed, and Socket Welding	Blind	Lap Joint	Welding Neck	Slip-On	Blind	Lap Joint	Screwed	Socket Welding	
M	N	r											
1¹¹⁄₁₆	0.84	⅛	8	7	7	7	Varies with Bore of Flange	22720	23730	24800	25710	Varies with Bore of Flange	½
2	1.05	⅛	9	9	10	8		22721	23731	24801	25711		¾
2¼	1.32	⅛	13	12	12	12		22722	23732	24802	25712		1
2⅞	1.66	³⁄₁₆	20	18	18	17		22723	23733	24803	25713		1¼
3⅛	1.90	¼	28	25	25	24		22724	23734	24804	25714		1½
3¾	2.38	⁵⁄₁₆	42	38	39	37		22725	23735	24805	25715		2
4½	2.88	⁵⁄₁₆	52	55	56	53		22726	23736	24806	25716		2½
5¼	3.50	⅜	94	83	86	80		22727	23737	24807	25717	—	3
6½	4.50	⁷⁄₁₆	146	127	133	122		22729	23739	24809	25719	—	4
8	5.56	⁷⁄₁₆	244	210	223	204		22730	23740	24810	25720	—	5
9¼	6.63	½	378	323	345	314		22731	23741	24811	25721	—	6
12	8.63	½	576	485	533	471		22732	23742	24812	25722	—	8
14¾	10.75	½	1068	925	1025	897		22733	23743	24813	25723	—	10
17⅜	12.75	½	1608	1300	1464	1262		22734	23744	24814	25724	—	12

*Dimensions do not include ¼" raised face.

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Flanges conform to ASTM Specification A-105 and to ASA Standard B16.5 (see pages 113-116), except socket welding and slip-on flanges which are not covered by the ASA Standard.

MATERIALS: Flanges are stocked in Forged Carbon Steel (ASTM A-105, Grade I or II), and other metals (see page 111).

REDUCING FLANGES: In ordering, specify smaller pipe size and outside diameter of flange. E.g., for a 6" to 4" reduction, specify a 4 x 19" O.D. 2500 lb. slip-on (or screwed) reducing flange.

FACING AND FINISH: See pages 86-87.

BEVEL of welding neck flange: See page 116.

GASKET dimensions: See pages 130-131.

SMALLER BORE: See page 134 for minimum dimensions.

BOLTING dimensions: See page 135.

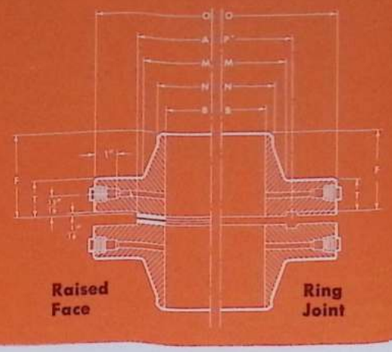
PRESSURE-TEMPERATURE RATINGS: See pages 161-167.

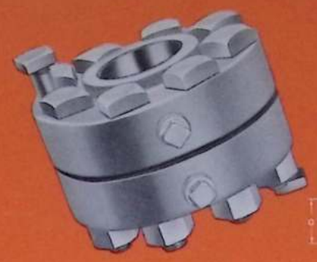
Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 53 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/53

ORIFICE FLANGE UNIONS

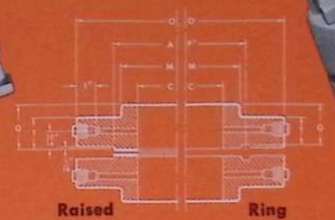


WELDING NECK
CAT. NO. 72B03



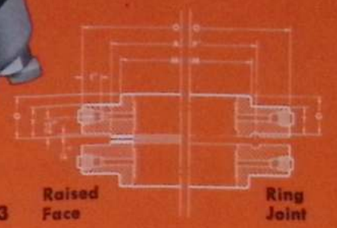


SLIP-ON
CAT. NO. 73B03





SCREWED
CAT. NO. 74B03



Nom. Pipe Size	Flange Outside Diam.	Flange Thickness		Raised Face Diam.	Bore		Length thru Hub				Drilling			Bolting		
							Welding Neck		Slip-On & Scrd.						Length	
		Raised Face	Ring Joint		Wldg. Neck	Slip-On	Raised Face	Ring Joint	Raised Face	Ring Joint	No. of Holes	Diam. of Holes	Diam. of Bolt Circle	Diam.	Raised Face	Ring Joint
	O	T	T	A	B	C	F	F	G	G		J	K			
300 LB.																
1	4⅞	1½	1¼	2 13/16	1.049	1.36	3¼	3	1⅞	1⅝	4	1/16	3½	⅝	4	4¾
1¼	5¼	1½	1¼	3 3/16	1.380	1.70	3 5/16	3 1/16	1 13/16	1 9/16	4	1/16	3⅞	⅝	4	4¾
1½	6⅛	1½	1¼	3 11/16	1.610	1.95	3⅜	3⅛	1⅞	1⅝	4	13/16	4½	¾	4¼	5
2	6½	1½	1¼	4 5/16	2.067	2.44	3⅜	3⅛	1 15/16	1 1/16	8	1/16	5	⅝	4	4¾
2½	7½	1½	1¼	5 1/16	2.469	2.94	3½	3¼	2	1¾	8	13/16	5⅞	¾	4¼	5
3	8¼	1½	1¼	5 13/16	3.068	3.57	3½	3¼	2 1/16	1 13/16	8	13/16	6⅝	¾	4¼	5
4	10	1½	1¼	7 1/16	4.026	4.57	3⅝	3⅜	2⅛	1⅞	8	13/16	7⅞	¾	4¼	5
5	11	1½	1⅜	8 3/16	5.047	5.66	4	3⅞	2⅛	2	8	⅞	9¼	¾	4¼	5½
6	12½	1½	1 7/16	9 3/4	6.065	6.72	3 15/16	3⅞	2⅛	2 1/16	12	⅞	10⅝	¾	4¼	5½
8	15	1⅝	1⅝	12	7.981	8.72	4⅜	4⅜	2 7/16	2 7/16	12	1	13	⅞	4½	6
10	17½	1⅞	1⅞	14⅛	10.020	10.88	4⅝	4⅝	2⅝	2⅝	16	1⅛	15¼	1	5½	6½
12	20½	2	2	16½	12.000	12.88	5⅛	5⅛	2⅞	2⅞	16	1¼	17¾	1⅛	5½	7
14	23	2⅛	2⅛	19	13.250	14.14	5⅝	5⅝	3	3	20	1¼	20¼	1⅛	6	7
16	25½	2¼	2¼	21⅛	15.250	16.16	5¾	5¾	3¼	3¼	20	1⅜	22½	1¼	6½	8
18	28	2⅜	2⅜	23⅜	17.250	18.18	6¼	6¼	3½	3½	24	1⅜	24¾	1¼	6½	8
20	30½	2½	2½	25⅝	19.250	20.20	6⅜	6⅜	3¾	3¾	24	1⅜	27	1¼	7	8
24	36	2¾	2¾	30⅜	23.250	24.25	6⅝	6⅝	4 3/16	4 3/16	24	1⅝	32	1½	7½	9

Diam. of Hub		Approx. Wgt. per Union (lbs.)				Part Number of Orifice Flange Union						Nom. Pipe Size
At Base	At Chamfer	Welding Neck		Slip-On & Screwed		Welding Neck		Slip-On		Screwed		
		Raised Face	Ring Joint	Raised Face	Ring Joint	Raised Face	Ring Joint	Raised Face	Ring Joint	Raised Face	Ring Joint	
M	N											
300 LB.												
2⅛	1.32	18	20	15	17	28302	28332	28352	28372	28392	28412	1
2½	1.66	21	23	17	20	28303	28333	28353	28373	28393	28413	1¼
2¾	1.90	28	30	24	28	28304	28334	28354	28374	28394	28414	1½
3 5/16	2.38	33	36	27	31	28305	28335	28355	28375	28395	28415	2
3 15/16	2.88	43	46	36	42	28306	28336	28356	28376	28396	28416	2½
4⅝	3.50	48	52	42	48	28307	28337	28357	28377	28397	28417	3
5¾	4.50	68	73	60	66	28309	28339	28359	28379	28399	28419	4
7	5.56	78	89	69	80	28310	28340	28360	28380	28400	28420	5
8⅛	6.63	100	115	94	110	28311	28341	28361	28381	28401	28421	6
10¼	8.63	155	180	135	160	28312	28342	28362	28382	28402	28422	8
12⅝	10.75	220	255	200	230	28313	28343	28363	28383	28403	28423	10
14¾	12.75	330	380	280	325	28314	28344	28364	28384	28404	28424	12
16¾	14.00	425	485	395	450	28315	28345	28365	28385	28405	28425	14
19	16.00	590	660	465	535	28316	28346	28366	28386	28406	28426	16
21	18.00	750	830	610	690	28317	28347	28367	28387	28407	28427	18
23⅛	20.00	910	1025	740	840	28318	28348	28368	28388	28408	28428	20
27⅝	24.00	1350	1500	1125	1300	28320	28350	28370	28390	28410	28430	24

*Detailed dimensions of ring joint facings are given on pages 132-133.

400 lb. and 600 lb. orifice flange unions (see pages 104-105) in sizes 3" and smaller are identical with 300 lb. unions, except for bolting (see below). Sizes 14" and larger on application.

900 lb. orifice flange unions (see pages 104-105) in sizes 2½" and smaller are identical with 1500 lb. unions. Sizes 14" and larger on application.

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are given on page 116.

SPECIFICATIONS: Flanges conform to ASTM Specification A-105 (see pages 113-116), and to AGA recommendations.

MATERIALS: Unions are stocked in Forged Carbon Steel (ASTM A-105, Grade I or II). Other metals available (see page 111).

CONSTRUCTION: Flanges are furnished as complete unions, unless otherwise specified.

300 lb. raised-face unions are equipped with carbon steel square-head machine bolts and jack-screws with hex nuts; two asbestos gaskets; and carbon steel pipe plugs for tapped openings.

All other raised-face unions are equipped with alloy steel studs and heavy hex nuts; carbon steel jack-screws; two asbestos gaskets; and carbon steel pipe plugs for tapped openings.

Ring-joint faced unions are similarly equipped, except that no gaskets or rings are furnished.

ORIFICE PLATES are not furnished.

FACING AND FINISH: See pages 86-87.

BEVEL of welding neck flanges: See page 116.

GASKET DIMENSIONS: See pages 130-131.

SMALLER BORE: See page 134 for minimum dimensions.

BOLTING DIMENSIONS: See page 135.

PRESSURE-TEMPERATURE RATINGS: See pages 161-167.

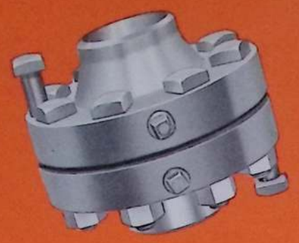
PRESSURE TAP OPENINGS — ½" PIPE TAPS
½" DRILL — for sizes 4" and over
⅜" DRILL — for size 3"
¼" DRILL — for sizes 2½" and under

OTHER SIZES, materials, and heavier pressure ratings on application.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 54 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/54

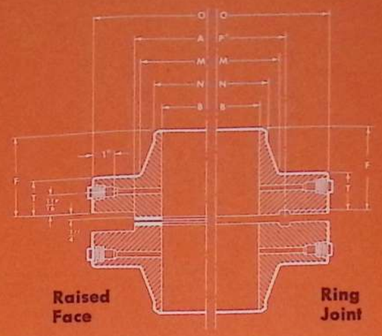
CRANE

ORIFICE FLANGE UNIONS



WELDING NECK

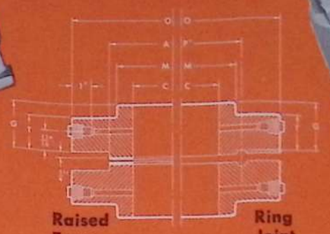
CAT. NO. 72B*





SLIP-ON

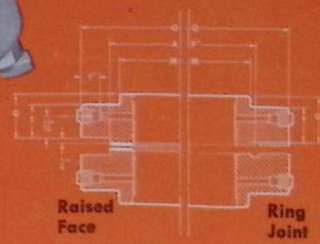
CAT. NO. 73B*





SCREWED

CAT. NO. 74B*



Nom. Pipe Size	Flange Outside Diam.	Flange Thickness		Raised Face Diam.	Bore		Length thru Hub				Drilling			Bolting		
							Welding Neck		Slip-On & Scrd.						Length	
		Raised Face	Ring Joint		Wldg. Neck	Slip-On	Raised Face	Ring Joint	Raised Face	Ring Joint	No. of Holes	Diam. of Holes	Diam. of Bolt Circle	Diam.	Raised Face	Ring Joint
	O	T	T	A	B	C	F	F	G	G		J	K			
400 LB.																
4	10	1 3/8	1 3/8	6 3/16	Must be specified by Purchaser	4.57	3 1/2	3 1/2	2	2	8	1	7 7/8	7/8	5 1/2	6
5	11	1 1/2	1 1/2	7 5/16		5.66	4	4	2 1/8	2 1/8	8	1	9 1/4	7/8	5 3/4	6 1/4
6	12 1/2	1 5/8	1 5/8	8 1/2		6.72	4 1/16	4 1/16	2 1/4	2 1/4	12	1	10 5/8	7/8	6 1/4	6 1/2
8	15	1 7/8	1 7/8	10 3/8		8.72	4 3/8	4 3/8	2 11/16	2 11/16	12	1 1/8	13	1	6 3/4	7 1/4
10	17 1/2	2 1/8	2 1/8	12 3/4		10.88	4 7/8	4 7/8	2 7/8	2 7/8	16	1 1/4	15 1/4	1 1/8	7 5/8	8
12	20 1/2	2 1/4	2 1/4	15		12.88	5 3/8	5 3/8	3 1/8	3 1/8	16	1 3/8	17 3/4	1 1/4	8	8 1/2
600 LB.																
4	10 3/4	1 1/2	1 1/2	6 3/16	Must be specified by Purchaser	4.57	4	4	2 1/8	2 1/8	8	1	8 1/2	7/8	5 3/4	6 1/4
5	13	1 3/4	1 3/4	7 5/16		5.66	4 1/2	4 1/2	2 3/8	2 3/8	8	1 1/8	10 1/2	1	6 1/2	7
6	14	1 7/8	1 7/8	8 1/2		6.72	4 5/8	4 5/8	2 5/8	2 5/8	12	1 1/8	11 1/2	1	6 3/4	7 1/4
8	16 1/2	2 3/16	2 3/16	10 5/8		8.72	5 1/4	5 1/4	3	3	12	1 1/4	13 3/4	1 1/8	7 5/8	8 1/4
10	20	2 1/2	2 1/2	12 3/4		10.88	6	6	3 3/8	3 3/8	16	1 3/8	17	1 1/4	8 1/2	9
12	22	2 5/8	2 5/8	15		12.88	6 1/8	6 1/8	3 5/8	3 5/8	20	1 3/8	19 1/4	1 1/4	9	9 1/4
900 LB.																
3	9 1/2	1 1/2	1 1/2	5	Must be specified by Purchaser	3.57	4	4	2 1/8	2 1/8	8	1	7 1/2	7/8	5 3/4	6 1/4
4	11 1/2	1 3/4	1 3/4	6 3/16		4.57	4 1/2	4 1/2	2 3/4	2 3/4	8	1 1/4	9 1/4	1 1/8	7	7 1/4
5	13 3/4	2	2	7 5/16		5.66	5	5	3 1/8	3 1/8	8	1 3/8	11	1 1/4	7 1/2	8
6	15	2 3/16	2 3/16	8 1/2		6.72	5 1/2	5 1/2	3 3/8	3 3/8	12	1 1/4	12 1/2	1 1/8	7 5/8	8 1/4
8	18 1/2	2 1/2	2 1/2	10 5/8		8.72	6 3/8	6 3/8	4	4	12	1 1/2	15 1/2	1 3/8	9	9 1/4
10	21 1/2	2 3/4	2 3/4	12 3/4		10.88	7 1/4	7 1/4	4 1/4	4 1/4	16	1 1/2	18 1/2	1 3/8	9 1/4	9 3/4
12	24	3 1/8	3 1/8	15		12.88	7 7/8	7 7/8	4 5/8	4 5/8	20	1 1/2	21	1 3/8	10	10 3/4
1500 LB.																
1	5 7/8	1 3/8	1 1/4	2	Must be specified by Purchaser	1.36	3 1/8	3	1 7/8	1 3/4	4	1	4	7/8	5 1/2	5 3/4
1 1/4	6 1/4	1 3/8	1 1/4	2 1/2		1.70	3 1/8	3	1 7/8	1 3/4	4	1	4 3/8	7/8	5 1/2	5 3/4
1 1/2	7	1 3/8	1 1/4	2 7/8		1.95	3 3/8	3 1/4	1 7/8	1 3/4	4	1 1/8	4 7/8	1	5 3/4	6
2	8 1/2	1 1/2	1 1/2	3 5/8		2.44	4	4	2 1/4	2 1/4	8	1	6 1/2	7/8	5 3/4	6 1/4
2 1/2	9 5/8	1 5/8	1 5/8	4 1/8		2.94	4 1/8	4 1/8	2 1/2	2 1/2	8	1 1/8	7 1/2	1	6 1/4	6 3/4
3	10 1/2	1 7/8	1 7/8	5		3.57	4 3/8	4 3/8	2 7/8	2 7/8	8	1 1/4	8	1 1/8	7	7 5/8
4	12 1/4	2 1/8	2 1/8	6 3/16		4.57	4 7/8	4 7/8	3 5/16	3 5/16	8	1 3/8	9 1/2	1 1/4	7 3/4	8 1/4
5	14 3/4	2 7/8	2 7/8	7 5/16		5.66	6 1/8	6 1/8	4 1/8	4 1/8	8	1 5/8	11 1/2	1 1/2	9 3/4	10 1/4
6	15 1/2	3 1/4	3 1/4	8 1/2		6.72	6 3/4	6 3/4	4 11/16	4 11/16	12	1 1/2	12 1/2	1 3/8	10 1/4	11
8	19	3 5/8	3 5/8	10 5/8		8.72	8 3/8	8 3/8	5 5/8	5 5/8	12	1 3/4	15 1/2	1 5/8	11 1/2	12 1/2
10	23	4 1/4	4 1/4	12 3/4		10.88	10	10	6 1/4	6 1/4	12	2	19	1 7/8	13 1/4	14 1/4
12	26 1/2	4 7/8	4 7/8	15		12.88	11 1/8	11 1/8	7 1/8	7 1/8	16	2 1/8	22 1/2	2	14 3/4	16

*See Page 172 for further detail of Catalog Numbers.

(See footnotes on pages 102-103)

Diam. of Hub		Approx. Wgt. per Union (lbs.)				Part Number of Orifice Flange Union						Nom. Pipe Size
At Base	At Chamfer	Welding Neck		Slip-On & Screwed		Welding Neck		Slip-On		Screwed		
M	N	Raised Face	Ring Joint	Raised Face	Ring Joint	Raised Face	Ring Joint	Raised Face	Ring Joint	Raised Face	Ring Joint	
400 LB.												
5 3/4	4.50	83	92	65	74	Varies with Bore of Flange		28479	28489	28499	28509	4
7	5.56	99	110	75	85			28480	28490	28500	28510	5
8 1/8	6.63	135	145	110	120			28481	28491	28501	28511	6
10 1/4	8.63	205	225	165	180			28482	28492	28502	28512	8
12 3/8	10.75	300	325	235	255			28483	28493	28503	28513	10
14 3/4	12.75	420	445	330	355			28484	28494	28504	28514	12
600 LB.												
6	4.50	97	110	87	98	Varies with Bore of Flange		28559	28569	28579	28589	4
7 7/16	5.56	155	170	145	160			28560	28570	28580	28590	5
8 3/4	6.63	195	210	190	205			28561	28571	28581	28591	6
10 3/4	8.63	285	305	275	295			28562	28572	28582	28592	8
13 1/2	10.75	450	485	410	445			28563	28573	28583	28593	10
15 3/4	12.75	540	580	490	530			28564	28574	28584	28594	12
900 LB.												
5	3.50	75	84	65	74	Varies with Bore of Flange		28637	28647	28657	28667	3
6 1/4	4.50	125	140	130	145			28639	28649	28659	28669	4
7 1/2	5.56	205	225	200	215			28640	28650	28660	28670	5
9 1/4	6.63	260	290	260	285			28641	28651	28661	28671	6
11 3/4	8.63	420	450	410	435			28642	28652	28662	28672	8
14 1/2	10.75	610	660	580	620			28643	28653	28663	28673	10
16 1/2	12.75	760	820	760	820			28644	28654	28664	28674	12
1500 LB.												
2 1/16	1.32	29	28	26	26	Varies with Bore of Flange		28762	28782	28802	28822	1
2 1/2	1.66	31	31	29	29			28763	28783	28803	28823	1 1/4
2 3/4	1.90	38	40	36	38			28764	28784	28804	28824	1 1/2
4 1/8	2.38	63	72	63	71			28765	28785	28805	28825	2
4 7/8	2.88	90	100	90	100			28766	28786	28806	28826	2 1/2
5 1/4	3.50	120	135	120	135			28767	28787	28807	28827	3
6 3/8	4.50	180	195	180	195			28769	28789	28809	28829	4
7 3/4	5.56	320	345	320	340			28770	28790	28810	28830	5
9	6.63	405	440	405	435			28771	28791	28811	28831	6
11 1/2	8.63	630	730	600	680			28772	28792	28812	28832	8
14 1/2	10.75	1100	1175	1050	1125			28773	28793	28813	28833	10
17 3/4	12.75	1675	1825	1475	1550			28774	28794	28814	28834	12

**See Page 172 for further detail of Catalog Numbers.

(See footnotes on pages 102-103)

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 55 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/55

CRANE

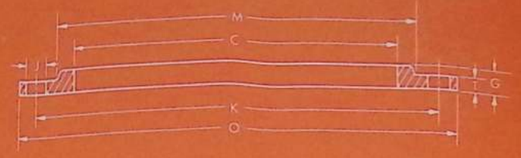
FORGED FLANGES IMPROVE

LARGE DIAMETER FLANGES

LIGHT-WEIGHT SLIP-ON

CAT. NO. 78BO1





Nom. Pipe Size	Flange Outside Diameter	Flange Thickness	Bore	Length thru Hub	Diameter of Hub	Drilling			Approx. Weight (lb.)	Nom. Pipe Size
						No. of Holes	Diam. of Holes	Diam. of Bolt Circle		
	O	T	C	G	M		J	K		
6	11	9/16	Must be specified by Purchaser	1 1/4	7 9/16	8	7/8	9 1/2	13	6
8	13 1/2	9/16		1 1/4	9 11/16	8	7/8	11 3/4	18	8
10	16	11/16		1 1/4	12	12	1	14 1/4	26	10
12	19	11/16		1 1/4	14 3/8	12	1	17	42	12
14	21	3/4		1 1/4	15 3/4	12	1 1/8	18 3/4	44	14
16	23 1/2	3/4		1 1/4	18	16	1 1/8	21 1/4	58	16
18	25	3/4		1 1/4	19 7/8	16	1 1/4	22 3/4	59	18
20	27 1/2	3/4		1 1/4	22	20	1 1/4	25	70	20
22	29 1/2	1		1 3/4	24 1/4	20	1 3/8	27 1/4	75	22
24	32	1		1 3/4	26 1/8	20	1 3/8	29 1/2	115	24
26	34 1/4	1		1 3/4	28 1/2	24	1 3/8	31 3/4	125	26
28	36 1/2	1		1 3/4	30 1/2	28	1 3/8	34	140	28
30	38 3/4	1		1 3/4	32 1/2	28	1 3/8	36	150	30
32	41 3/4	1 1/8		1 3/4	34 3/4	28	1 5/8	38 1/2	205	32
34	43 3/4	1 1/8		1 3/4	36 3/4	32	1 5/8	40 1/2	220	34
36	46	1 1/8		1 3/4	38 3/4	32	1 5/8	42 3/4	235	36
38	48 3/4	1 1/8		1 3/4	40 3/4	32	1 5/8	45 1/4	258	38
40	50 3/4	1 1/8		1 3/4	43	36	1 5/8	47 1/4	273	40
42	53	1 1/4		1 3/4	45	36	1 5/8	49 1/2	313	42
44	55 1/4	1 1/4		2 1/4	47	40	1 5/8	51 3/4	363	44
46	57 1/4	1 1/4		2 1/4	49	40	1 5/8	53 3/4	378	46
48	59 1/2	1 3/8		2 1/2	51	44	1 5/8	56	442	48
50	61 3/4	1 3/8		2 1/2	53	44	1 7/8	58 1/4	470	50
52	64	1 3/8		2 1/2	55	44	1 7/8	60 1/2	495	52
54	66 1/4	1 3/8		2 1/2	57	44	1 7/8	62 3/4	522	54
60	73	1 1/2		2 3/4	63	52	1 7/8	69 1/4	665	60
66	80	1 1/2		2 3/4	69	52	1 7/8	76	781	66
72	86 1/2	1 1/2		2 3/4	75	60	1 7/8	82 1/2	872	72

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are comparable to ASA flanges (see page 116).

SPECIFICATIONS: Flanges conform to ASTM Specification A-181. Flange diameter and drilling conform to ASA B16.1, and in sizes 24" and smaller, to ASA B16.5, and MSS SP44, 150 lb. pressure rating. These flanges are the same as AWWA C207, Class D.

MATERIALS: Flanges are stocked in Carbon Steel (ASTM A-181, Grade I or II). Other metals are available on application.

FACING AND FINISH: See pages 86-87.

GASKETS: Full face gaskets are recommended for this type of flange; however ring gaskets may also be used.

BOLTING: Carbon steel bolts are recommended.

OTHER types, sizes, and metals are available on inquiry.

PRESSURE-TEMPERATURE RATINGS:
12" and smaller: 175 psi at atmospheric temperature.
14" and larger: 150 psi at atmospheric temperature.

PART NUMBERS on application.

LARGE DIAMETER FLANGES

125 & 250 lb. AMER. STD.



Welding Neck

CAT. NO.
82BO1 125# 85BO1
82BO2 250# 85BO2

Slip-On



Nom. Pipe Size	Flange Outside Diam.	Flange Thkn.	Raised Face Diam.	Bore		Lgth. thru Hub		Diam. of Hub		Drilling			Approx. Weight (lb.)			Nom. Pipe Size
				Wldg. Neck	Slip-On	Wldg. Neck	Slip-On	At Base	At Chamfer	No. of Holes	Diam. of Holes	Diam. of Bolt Circle	Wldg. Neck	Slip-On	Blind	
	O	T	A	B	C	F	G	M	N		J	K				
125 LB. AMERICAN STANDARD																
26	34 1/4	2	—	Must be specified by purchaser	26 1/4	5	3 3/8	28 1/2	26	24	1 3/8	31 3/4	275	250	520	26
28	36 1/2	2 1/16	—		28 1/4	5 1/16	3 7/16	30 3/4	28	28	1 3/8	34	310	280	610	28
30	38 3/4	2 1/8	—		30 1/4	5 1/8	3 1/2	32 3/4	30	28	1 3/8	36	355	320	710	30
32	41 3/4	2 1/4	—		32 1/4	5 1/4	3 5/8	35	32	28	1 5/8	38 1/2	430	395	870	32
34	43 3/4	2 5/16	—		34 1/4	5 5/16	3 11/16	37	34	32	1 5/8	40 1/2	460	420	980	34
36	46	2 3/8	—		36 1/4	5 3/8	3 3/4	39 1/4	36	32	1 5/8	42 3/4	520	475	1110	36
38	48 3/4	2 3/8	—		38 1/4	5 3/8	3 3/4	41 3/4	38	32	1 5/8	45 1/4	600	555	1250	38
40	50 3/4	2 1/2	—		40 1/4	5 1/2	3 7/8	43 3/4	40	36	1 5/8	47 1/4	650	600	1430	40
42	53	2 5/8	—		42 1/4	5 5/8	4	46	42	36	1 5/8	49 1/2	740	680	1640	42
44	55 1/4	2 5/8	—		44 1/4	5 5/8	4	48	44	40	1 5/8	51 3/4	790	730	1780	44
46	57 1/4	2 11/16	—		46 1/4	5 11/16	4 1/16	50	46	40	1 5/8	53 3/4	840	770	1960	46
48	59 1/2	2 3/4	—		48 1/4	5 3/4	4 1/8	52 1/4	48	44	1 5/8	56	910	840	2160	48
250 LB. AMERICAN STANDARD																
26	38 1/4	2 13/16	32 7/16	Must be specified by purchaser	26 1/4	5 13/16	4 3/4	30 1/2	26	28	1 7/8	34 1/2	560	555	910	26
28	40 3/4	2 15/16	34 15/16		28 1/4	5 13/16	5	33	28	28	1 7/8	37	660	670	1080	28
30	43	3	37 3/16		30 1/4	6	5	35 1/4	30	28	1 7/8	39 1/4	735	740	1230	30
32	45 1/4	3 1/8	39 7/16		32 1/4	6 1/8	5 1/8	37 1/2	32	28	1 7/8	41 1/2	830	840	1420	32
34	47 1/2	3 1/4	41 7/16		34 1/4	6 1/4	5 1/4	39 1/2	34	28	1 7/8	43 1/2	925	935	1630	34
36	50	3 3/8	43 11/16		36 1/4	6 3/8	5 3/8	41 1/2	36	32	2 1/8	46	1015	1020	1870	36
38	52 1/4	3 7/16	45 11/16		38 1/4	6 7/16	5 1/2	43 1/2	38	32	2 1/8	48	1110	1115	2080	38
40	54 1/2	3 9/16	47 15/16		40 1/4	6 9/16	5 1/2	45 3/4	40	36	2 1/8	50 1/4	1215	1230	2350	40
42	57	3 11/16	50 7/16		42 1/4	6 13/16	5 5/8	47 3/4	42	36	2 1/8	52 3/4	1384	1350	2660	42
44	59 1/4	3 3/4	52 11/16		44 1/4	7	5 3/4	49 3/4	44	36	2 1/8	55	1495	1465	2920	44
46	61 1/2	3 7/8	54 15/16		46 1/4	7 1/8	5 7/8	51 3/4	46	40	2 1/8	57 1/4	1610	1585	3260	46
48	65	4	58 7/16		48 1/4	7 1/4	6	54	48	40	2 1/8	60 3/4	1915	1885	3760	48

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are comparable to ASA flanges (see page 116).

SPECIFICATIONS: Flanges conform to ASTM Specification A-181, Flange diameter, thickness, and drilling of 125 lb. and 250 lb. American Standard flanges conform to Cast Iron Standard ASA B16.1 and B16.2 respectively. 125 lb. American Standard flanges are also the same as AWWA Class E flanges.

MATERIALS: Flanges are stocked in Carbon Steel (ASTM A-181, Grade I or II). Other metals are available on application.

FACING AND FINISH: See pages 86-87.

GASKETS: Either full face or ring gaskets may be used.

BOLTING: Carbon Steel bolts are recommended.

OTHER types, sizes, and metals are available on inquiry.

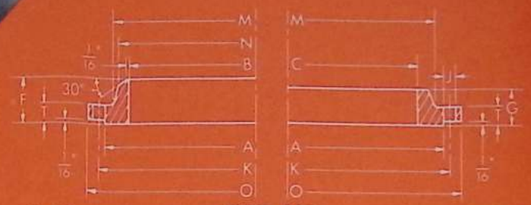
PRESSURE-TEMPERATURE RATINGS: 125 lb. and 250 lb. American Standard flanges have the same pressure rating as ASA B16.1, and B16.2, respectively.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 56 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/56

LARGE DIAMETER FLANGES

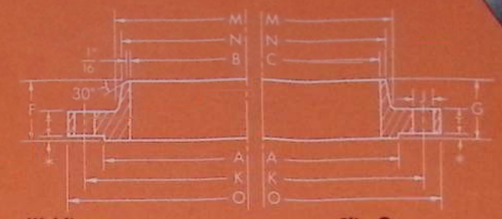
150 & 300 lb. ASME





Welding Neck — Slip-On

CAT. NO.
83BO1 150# 86BO1
83BO3 300# 86BO3



Welding Neck — Slip-On

CAT. NO. 84B* — **CAT. NO. 87B***



LARGE DIAMETER FLANGES

MSS SP-44 PIPE LINE

Nom. Pipe Size	Flange Outside Diam.	Flange Thickness			Raised Face Diam.	Bore		Lgth. thru Hub		Diam. of Hub		Drilling			Approx. Weight (lb.)			Nom. Pipe Size
		Wldg. Neck	Slip-On	Blind		Wldg. Neck	Slip-On	Wldg. Neck	Slip-On	At Base	At Chamfer	No. of Holes	Diam. of Holes	Diam. of Bolt Circle	Wldg. Neck	Slip-On	Blind	
	O	T	T	T	A	B	C	F	G	M	N		J	K				
150 LB. ASME																		
26	31½	1⅜	1⅜	1⅞	29	Must be specified by purchaser	26¼	3⅜	2¾	27⅝	Must be specified by purchaser	28	⅞	29⅞	134	117	407	26
28	33½	1⅜	1⅜	2	31		28¼	3⅜	2¾	29⅝		28	⅞	31⅞	145	126	492	28
30	35¾	1⅜	1⅜	2⅛	33¼		30¼	3⅝	2¾	31⅞		36	⅞	34⅛	174	146	596	30
32	37¾	1⅜	1⅜	2¼	35¼		32¼	3⅝	2¾	33⅞		36	⅞	36⅛	187	154	705	32
34	40¼	1½	1¾	2⅜	37⅜		34¼	3¾	3⅜	35⅞		36	1	38⅜	220	217	844	34
36	42¼	1½	1¾	2½	39⅜		36¼	3¾	3⅜	37⅞		36	1	40⅜	233	231	981	36
38	44¼	1¾	2	2⅝	41⅜		38¼	4⅛	3¾	39⅞		36	1	42⅜	276	273	1130	38
40	46¼	1¾	2	2¾	43⅜		40¼	4⅛	4	41⅞		40	1	44⅜	294	294	1294	40
42	49	2	2⅜	2⅞	45¾		42¼	4½	4⅜	44⅛		40	1⅛	46⅞	387	406	1514	42
44	51	2	2⅜	3	47¾		44¼	4½	4⅜	46⅛		40	1⅛	48⅞	404	420	1714	44
46	53	2	2⅜	3⅛	49¾		46¼	4½	4⅝	48⅛		40	1⅛	50⅞	422	451	1931	46
48	55	2¼	2⅜	3⅜	51¾		48¼	4⅞	4⅞	50⅛		44	1⅛	52⅞	485	509	2244	48
300 LB. ASME																		
26	32¾	2½	2½	2¾	29½	Must be specified by purchaser	26¼	5	4½	27⅞	Must be specified by purchaser	28	1⅛	30⅝	275	255	636	26
28	34¾	2½	2½	2⅞	31½		28¼	5	4½	29⅞		28	1⅛	32⅝	295	274	752	28
30	37	2⅝	2⅝	3	33¾		30¼	5¼	4¾	32⅛		32	1⅛	34⅞	350	325	892	30
32	39	2¾	2¾	3¼	35¾		32¼	5½	5	34⅛		36	1⅛	36⅞	393	363	1091	32
34	41	2⅞	2⅞	3⅜	37¾		34¼	5¾	5⅛	36⅛		40	1⅛	38⅞	431	395	1230	34
36	43¾	3⅛	3⅛	3⅝	40¼		36¼	6⅛	5⅝	38½		40	1¼	41½	551	513	1500	36
38	45¾	3⅛	3⅛	3¾	42¼		38¼	6⅛	5⅝	40½		40	1¼	43½	579	541	1702	38
40	47¾	3¼	3¼	4	44¼		40¼	6¼	5⅞	42½		44	1¼	45½	632	591	1981	40
42	50	3½	3½	4⅛	46½		42¼	6½	6⅛	44¾		48	1¼	47¾	733	695	2237	42
44	52¾	3¾	3¾	4⅜	48⅞		44¼	6¾	6¾	46¾		44	1⅜	50¼	876	849	2639	44
46	54¾	4¼	4¼	4¾	50⅞		46¼	7¼	7¼	48¾		48	1⅜	52¼	1007	978	3082	46
48	56¾	4¼	4¼	4¾	52⅞		48¼	7¼	7¼	50¾		48	1⅜	54¼	1050	1021	3318	48

PRICE SHEETS furnished on application.
DIMENSIONS are shown in inches. Tolerances are comparable to ASA flanges (see page 116).
SPECIFICATIONS: Flanges conform to ASTM Specification A-181, and current ASME Code.
MATERIALS: Flanges are stocked in Carbon Steel (ASTM A-181, Grade I and II). Other metals are available on application.

FACING AND FINISH: See pages 86-87.
GASKETS: Compressed asbestos composition gaskets are to be used.
BOLTING: Alloy stud bolts are to be used.
OTHER types, sizes, and metals are available on inquiry.
PRESSURE-TEMPERATURE RATINGS:
150 lb. flanges: 175 psi at —20° to 650° F., 150 psi at 750° F.
300 lb. flanges: 350 psi at —20° to 650° F., 300 psi at 750° F.

Note These pressure ratings apply to welding neck flanges with bore equal to nominal pipe size.

Nom. Pipe Size	Flange Outside Diam.	Flange Thkn.*	Raised Face Diam.	Bore		Lgth. thru Hub*	Diam. of Hub			Drilling			Approx. Wt. (lb.)		Nom. Pipe Size
				Wldg. Neck	Slip-On		At Base	At Chamfer		No. of Holes	Diam. of Holes	Diam. of Bolt Circle	Wldg. Neck	Slip-On	
								Wldg. Neck	Slip-On						
	O	T	A	B	C	F, G	M	N	N		J	K			
300 LB.															
26	38¼	3⅛	29½	Must be specified by purchaser	26¼	7¼	28⅜	26¼	27⅛	28	1¾	34½	675	575	26
28	40¾	3⅜	31½		28¼	7¾	30½	28¼	29⅛	28	1¾	37	820	725	28
30	43	3⅝	33¾		30¼	8¼	32⅝	30¼	31⅜	28	1⅞	39¼	940	820	30
32	45¼	3⅞	36		32¼	8¾	34⅛	32¼	33¼	28	2	41½	1035	900	32
34	47½	4	38		34¼	9⅛	36⅞	34⅝	35⅝	28	2	43½	1210	1085	34
36	50	4⅛	40¼		36¼	9½	39	36⅝	37⅜	32	2⅛	46	1315	1210	36
400 LB.															
26	38¼	3½	29½	Must be specified by purchaser	26¼	7⅜	28⅝	26⅝	27⅝	28	1⅞	34½	755	655	26
28	40¾	3¾	31½		28¼	8⅛	30⅛	28⅝	29⅜	28	2	37	890	785	28
30	43	4	33¾		30¼	8⅝	32⅛	30⅝	31½	28	2⅛	39¼	1010	910	30
32	45¼	4¼	36		32¼	9⅛	35	32⅜	33⅜	28	2⅛	41½	1160	1035	32
34	47½	4⅜	38		34¼	9½	37⅜	34⅜	35⅝	28	2⅛	43½	1315	1160	34
36	50	4½	40¼		36¼	9⅞	39⅜	36⅞	37¾	32	2⅛	46	1490	1340	36
600 LB.															
26	40	4¼	29½	Must be specified by purchaser	26¼	8¾	29⅞	26⅞	27¹³⁄₁₆	28	2	36	1035	960	26
28	42¼	4⅜	31½		28¼	9¼	31⅝	28½	29¹⁵⁄₁₆	28	2⅛	38	1185	1085	28
30	44½	4½	33¾		30¼	9¾	33¹⁵⁄₁₆	30½	32⅛	28	2⅛	40¼	1315	1185	30
32	47	4⅝	36		32¼	10¼	36⅛	32½	34⅜	28	2⅜	42½	1515	1390	32
34	49	4¾	38		34¼	10⅝	38⅝	34⅜	36⅝	28	2⅜	44½	1665	1515	34
36	51¾	4⅞	40¼		36¼	11⅛	40⅝	36⅞	38⅞	28	2⅝	47	1765	1615	36
900 LB.															
26	42¾	5½	29½	Must be specified by purchaser	26¼	11¼	30½	26⅝	28⅜	20	2⅛	37½	1590	1540	26
28	46	5⅝	31½		28¼	11¾	32¾	28¹¹⁄₁₆	30¹³⁄₁₆	20	3⅛	40¼	1870	1820	28
30	48½	5⅞	33¾		30¼	12¼	35	30¾	33	20	3⅛	42¾	2170	2095	30
32	51¾	6¼	36		32¼	13	37¼	32¾	35⅜	20	3⅜	45½	2600	2525	32
34	55	6½	38		34¼	13¾	39⅝	34¹³⁄₁₆	37⅜	20	3⅜	48¼	3055	2980	34
36	57½	6¾	40¼		36¼	14¼	41⅞	36⅞	39⅜	20	3⅜	50¾	3485	3385	36

*Includes 1/16" raised face of 300 lb. flanges; does not include ¼" raised face of 400, 600, and 900 lb. flanges.
PRICE SHEETS furnished on application.
DIMENSIONS are shown in inches. Tolerances are comparable to ASA flanges (see page 116).
SPECIFICATIONS: Flanges conform to ASTM Specification A-105, Grade II and to MSS SP-44.
MATERIALS: Flanges are stocked in Carbon Steel (ASTM A-105, Grade II).
FACING AND FINISH: See pages 86-87.
BOLTING: Heat treated carbon steel bolt studs for 300 lb. and 400 lb. flanges and alloy steel bolt studs for 600 lb. and 900 lb. flanges are to be used.
OTHER types, sizes, and metals are available on inquiry.
PRESSURE-TEMPERATURE RATINGS: When used with compressed asbestos composition gaskets, the ratings given on pages 161-167 apply.

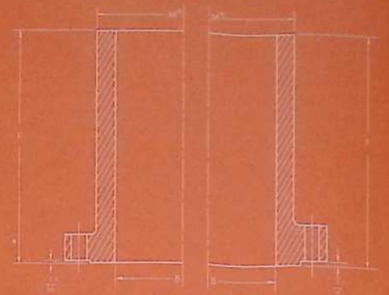
*See Page 172 for further detail of Catalog Numbers.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 57 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/57

LONG WELDING NECKS

CAT. NO. 79B**





150- and 300-lb. | 400-lb. and Heavier

Nom. Size and Bore	150-LB.			300-LB.		400-LB.		600-LB.		900-LB.		1500-LB.		2500-LB.	
	Length thru Hub	Diam. of Hub*	Approx. Weight (lb.)	Length thru Hub	Approx. Weight (lb.)	Length thru Hub	Approx. Weight (lb.)	Length thru Hub	Approx. Weight (lb.)	Length thru Hub	Approx. Weight (lb.)	Length thru Hub	Approx. Weight (lb.)	Length thru Hub	Approx. Weight (lb.)
B	F	M*		F		F		F		F		F		F	
1	9	2	8	9	10	9	11	9	11	9	15	9	15	9	20
1¼	9	2⅜	10	9	14	9	14	9	14	9	18	9	18	9	30
1½	9	2⅝	12	9	17	9	17	9	17	9	23	9	23	9	38
2	9	3¼	16	9	19	9	21	9	21	9	44	9	44	9	55
2½	9	3¾	21	9	28	9	29	9	29	12	72	12	72	12	85
3	9	4¼	24	9	36	9	38	9	38	12	65	12	84	12	125
3½	9	4⅞	31	9	45	9	48	9	48	—	—	—	—	—	—
4	12	5½	47	12	54	12	67	12	80	12	98	12	118	12	185
5	12	6½	57	12	86	12	90	12	128	12	143	12	195	12	300
6	12	7¾	77	12	108	12	115	12	158	12	199	12	235	12	450
8	12	9¾	103	12	150	12	160	12	215	12	310	12	366	12	600
10	12	12	150	12	218	12	230	12	343	12	356	12	594	12	1045
12	12	14⅜	205	12	289	12	301	12	409	12	541	12	872	12	1420
14	12	16	221	12	342	12	357	12	432	12	568	12	1030	—	—
16	12	18	254	12	426	12	443	12	564	12	670	12	1335	—	—
18	12	20	278	12	493	12	513	12	654	12	949	12	1750	—	—
20	12	22	324	12	575	12	602	12	840	12	1040	12	2130	—	—
24	12	26¼	439	12	823	12	856	12	1100	12	1775	12	3180	—	—

*Dimension "M" is given here for 150 lb. long welding necks only. For 300 lb. and higher pressure ratings, outside diameter of the neck is the same as dimension "M" of ASA flanges of comparable pressure rating (see pages 90-101).

PRICE SHEETS furnished on application.

DIMENSIONS are shown in inches. Tolerances are comparable to those of ASA flanges (see page 116).

**See Page 172 for further detail of Catalog Numbers.

SPECIFICATIONS: Long welding necks conform to ASTM Specification A-181 in 150 lb. and 300 lb. pressure ratings, and to ASTM Specification A-105 in 400 lb. and heavier pressure ratings. Except as shown above, long welding necks conform dimensionally to ASA Standard B16.5.

MATERIALS: Long welding necks are available in Carbon Steel and other metals (see page 111).

FACING AND FINISH: See pages 86-87.

GASKET DIMENSIONS: See pages 130-131.

BOLTING DIMENSIONS: See page 135.

PRESSURE-TEMPERATURE RATINGS: See pages 161-167.

OTHER sizes, materials, and shapes on application.

SPECIAL FITTINGS

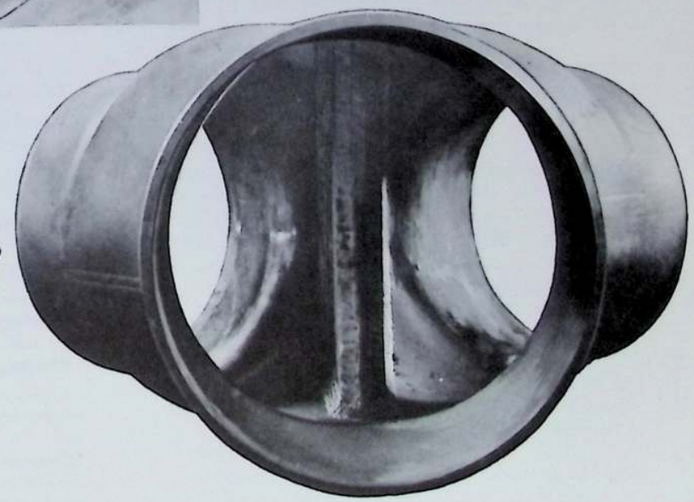
Unusual designs . . . exotic metals . . . special types and shapes and pressure ratings—all can be furnished to your exact requirements from a plant kept flexible enough to meet tight delivery schedules. Modern equipment and rigid production standards insure a quality product for every need.



This 12" 1.42" wall type 347 stainless Tee was made for a West Coast Refiner.

Below is a 26" x 20" x 20" carbon steel Wye. Wall is .906" on this fitting now on Cold Reheat Service in a Midwestern Power Plant.





A sample of the special fittings Crane can produce: 14" 1½" wall type 347 stainless 90° Ell with ½" tangents both ends.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 58 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/58

DESIGN DATA INDEX

Requirements for the design, manufacture, assembly and use of piping systems and components are not only complex, but are scattered throughout dozens of books: —ASTM Specifications, ASA Standards and Codes, ASME Codes, and piping design handbooks. In the following sixty-one pages, much of this design information has been digested for the convenience of the piping engineer. The index on this page outlines the basic subjects covered.

This technical data supplements the information given in the preceding sections of the catalog, providing a guide for the engineer in the entire field of welded piping.

Crane Engineering and Research Departments will welcome an opportunity to assist in design problems beyond the scope of this book.

STANDARDS AND SPECIFICATIONS

Fittings and Flanges
- Manufacturing Standards 113
- Tolerances and Bevels 116

Pipe
- Manufacturing Standards 117
- Physical and Chemical Requirements 120

Piping Components
- Comparison Chart 123

DIMENSIONS AND PROPERTIES

Fittings and Flanges
- Dimensional Chart 126
- Dimensions of Combinations 128
- Flange Facings and Gaskets 130
- Minimum Flange Bores 134
- Flange Bolting 135

Pipe
- Dimensions 136
- Design Properties 138

Valves
- Design Dimensions 146

PRESSURE RATINGS

Fittings and Pipe
- Method of Calculation 147
- Working Pressures:
  - Power Piping, Industrial Gas and Air, District Heating 149
  - Oil Refinery, Oil Pipeline, Refrigeration 152
- Stress Values:
  - Power Piping, Industrial Gas and Air, District Heating 158
  - Oil Refinery, Refrigeration 159

Flanges
- Method of Calculation 161
- Working Pressures 161

OTHER TECHNICAL INFORMATION

General Design Formulas 168

Fluid Flow
- Pressure Drop 169
- Equivalent Resistance 170

Welding
- Special Bevels 171
- Welding Processes 172

Conversion Tables ..... Inside Back Cover

FITTINGS AND FLANGES

MANUFACTURING STANDARDS

Various code bodies have written the standards which govern the design, dimensions, manufacturing procedures, pressure ratings and quality control requirements for both welding fittings and forged steel flanges. Among these are (1) the American Standards Association (ASA), sponsored by the American Society of Mechanical Engineers and other groups; (2) the American Society for Testing Materials (ASTM), and (3) the Manufacturers' Standardization Society of the Valve and Fitting Industry (MSS).

All welding fittings and flanges manufactured by Crane conform to one or another of these specifications. On those pages devoted to individual types and sizes of fittings and flanges, footnotes identify the applicable manufacturing standard.

The more commonly-used specifications and standards for both fittings and flanges are discussed below. For more detailed information, reference should be made to the individual publications of the code bodies.

WELDING FITTINGS

A.S.T.M. Specifications

Basically, the ASTM specifications govern materials, methods of manufacture, quality controls and marking of factory-made, wrought steel welding fittings. There are three such specifications:

A-234—Carbon steel and ferritic alloy steel fittings;

A-403—Stainless (austenitic) steel fittings;

A-420—Carbon and alloy steel fittings for low-temperature service.

All three follow the same pattern, modified only to the extent necessary for the particular material or service involved. In general, their outline and content are as follows:

Scope

These specifications cover only wrought steel butt-welding and socket-welding fittings. Cast fittings are specifically excluded.

A-234 covers three grades of carbon steel, one grade of carbon-molybdenum, and four grades of low to medium (1% through 5%) chromium- molybdenum steels.

A-403 establishes fourteen grades of austenitic steels, including the more popular grades 304, 316, and 347. Austenitic (commonly referred to as stainless) materials are used for a variety of applications, based on their properties of strength at very high temperatures; excellent impact properties, even at extremely low temperatures; and superior resistance to many corrosive fluids.

A-420 lists four material grades for low temperature service down to –150° F. In the range between –150° and –325° F, the materials in A-403 are more suitable.

Materials

In each specification, the varying material grades are intended to cope with varying service conditions. Each grade is identified by a symbol, and for each grade there is a choice of raw material shapes and forms. For instance, the most popular grade of carbon steel welding fitting shown in A-234 is designated by the symbol "WPB". These fittings are made from high-strength, mild carbon steel, and are intended for use with seamless pipe conforming to ASTM A-106, Grade B. For this grade of welding fitting, the permissible raw material shapes are pipe conforming to A-106, Grade B; plate conforming to A515, Grade 70; forgings made to ASTM A-105, Grade II; or bar stock manufactured under ASTM A-107, Grade 1025 or 1030.

These raw material forms all have comparable physical and chemical properties, thus permitting the choice of the best possible raw material form for a particular fitting. For example, fittings 1½" and smaller are usually formed from pipe, bar stock or forgings; fittings in sizes 2" to 24", from either pipe or plate; and larger sizes, above 24", customarily from plate.

A listing of welding fitting materials, their grade symbols, and permissible raw materials, is given on pages 123-125.

Manufacture

These sections list approved forging or shaping operations. Detailed instructions for welding, and the control of welding quality, are given. Specifically, a fusion-welded seam in a fitting must be:

1. Welded by welders, welding operators and welding procedures qualified under Section IX of the ASME Boiler and Pressure Vessel Code;
2. Heat-treated in accordance with detailed requirements listed in each section;
3. Radiographically examined and approved in accordance with paragraph UW-51 of Section VIII of the ASME Code, on the following basis:

   A-234 and A-420:

   a. For carbon steel fittings in standard and extra strong wall thicknesses, a minimum of 4% of all fittings in any lot must be selected at random, and radiographed throughout the entire length of each weld;

Crane Co.: Welding Fittings, Forged Flanges (1967)

ACL Doc 21277 · Page 59 of 92

Published by AsbestosClaims.Law

asbestosclaims.law/library/21277/59

b. For carbon steel fittings heavier than extra strong, and for alloy steel fittings in any thickness, every fitting must be radiographically examined throughout the entire length of its welded seam.

A-403:

a. All standard weight or heavier fittings must be radiographically examined throughout the length of each weld;
b. No radiography is required for light-wall (schedule 5S or 10S) fittings.

Tensile and Chemical Properties

These, of course, are established by the ASTM specification for the raw material used to manufacture the fitting. In the case of fittings conforming to A-420, Charpy impact tests are required to verify physical suitability under low-temperature operating conditions.

Heat Treatment

Since mechanical properties may be altered in the process of manufacture, various heat treatments are specified. For example:

A-234 requires normalizing to refine the grain, when fittings are finished at temperatures above 1800° F. This minimizes grain growth, and results in a better combination of mechanical properties.

A-403, covering stainless steels, specifies a carbide solution treatment to inhibit intergranular corrosion.

A-420 decrees normalizing of all fittings, regardless of forming temperatures, to improve the low-temperature impact qualities.

Marking

All specifications require the permanent marking of each fitting with the manufacturer's name or trademark; the size; the nominal wall thickness or schedule number; and the identification symbol for the material grade. This marking is the user's guarantee that the fitting has been made in full compliance with the ASTM specification.

A.S.A. and M.S.S. Standards

ASA and MSS standards are designed to cover fitting dimensions and tolerances, and fitting strength and pressure ratings. In this group, the basic standard (complementing ASTM A-234 and cross-referenced to that specification) is ASA B16.9, titled "Steel Butt-Welding Fittings". Other standards of the ASA and those of the MSS are written to supplement B16.9. The more important provisions of all are summarized below:

Scope

The range of ASA and MSS standards is as follows:

ASA B16.9: Steel butt-welding fittings, sizes ½" through 24".

ASA B16.25: Preparation of beveled ends.

ASA B16.28: Wrought steel butt-welding short radius elbows and returns, sizes 1" through 24".

MSS SP-43: Light-wall stainless steel fittings, ¾" through 24".

MSS SP-48: Carbon steel fittings, sizes 26", 30", 34" and 36".

MSS DS-11: 90° and 45° elbows, sizes 22", 28" and 32".

Pressure Ratings

ASA B16.9 requires that fittings be designed and manufactured so that they are at least equal in strength to the seamless pipe to which they will be joined, and stipulates that pressure ratings of the fittings shall be identical with those of seamless pipe. Bursting tests of prototypes of all fittings are required to prove adequacy of design.

MSS SP-43 lists specific pressure-temperature ratings for the light-wall stainless steel fitting thicknesses of Schedule 5S and 10S.

MSS SP-48 contains provisions comparable to ASA B16.9, equating the larger fittings covered by this standard to welded pipe with a joint factor of 1.00.

ASA B16.28, covering only short radius fittings, contains requirements similar to those of B16.9, except for the important reservation that "when the service conditions involve pulsating pressures, the peak pressure generated shall not exceed 80% of that calculated to be permissible for steady state conditions." This down-rating of short radius ells and returns is necessary because of high stress-concentration in the throat of bends with sharp radius of curvature.

MSS DS-11 does not stipulate working pressures. However, for the sizes covered by this standard, Midwest designs for pressure ratings in accordance with ASA B16.9.

Since all of these standards relate the working pressures of welding fittings to those permitted for seamless pipe; calculations must be worked out by means of formulas and rules set up by the ASA Code for Pressure Piping, B31. Pressure-temperature ratings for various sizes, thicknesses and metals, for most of the applicable sections of B-31, have been calculated for both pipe and welding fittings, and will be found on pages 147-160.

Dimensions and Tolerances

These standards (except B16.25) establish specific over-all dimensions and tolerances for the welding fittings they cover.

On the individual tabular pages of this catalog, footnotes indicate the dimensional standards which apply to each type of fitting.

Tolerances for diameters, thicknesses and over-all dimensions of welding fittings as prescribed by these standards, are given in the table on page 116.

ASA B16.25 defines the dimensional details of the welding ends of fittings. Commonly used bevels are shown on page 116; special bevels and their uses may be found on page 171.

MANUFACTURING STANDARDS, Fittings and Flanges

FORGED STEEL FLANGES

A.S.T.M. Specifications

Currently, five ASTM specifications govern the manufacture of forged steel flanges. Each covers forged or rolled steel pipe flanges, forged fittings, and valves and parts, in the following categories:

A-105—Carbon steel, for high-temperature service;
A-181—Carbon steel, for general service;
A-182—Alloy-steel, for high-temperature service;
A-350—Carbon- and alloy-steel for low-temperature service;
A-404—Alloy-steel, specially heat-treated for high-temperature service.

As in the case of welding fittings, each of the flange specifications have the same general format. A brief discussion of their basic provisions follows:

Scope

A-105 defines two grades of carbon steel material, and generally is applied to flanges having primary ratings of 400 lb. or more.

A-181 also covers two grades of carbon steel, but is intended for lower pressures. Carbon steel flanges with 150 lb. and 300 lb. primary pressure ratings are customarily made to this specification.

A-182 establishes twenty-four grades of alloy flanges, ten ferritic and fourteen austenitic. Selection of the particular grade, of course, depends on service conditions.

A-350 covers four grades of carbon and alloy-steel flanges for low-temperature service, and in addition permits the use of austenitic alloys covered by A-182 for low-temperature installations.

A-404 contains a single grade of ferritic alloy steel, which must be specially heat-treated for high-temperature use.

Materials

As in the case of welding fittings, each material grade is identified by a symbol, and each permits a limited choice of raw material shapes and forms, all with comparable characteristics.
Material specifications and symbols for forged steel flanges are listed on pages 123-125.

Manufacture

All five specifications have identical requirements for forging of flanges. The raw material (bar, ingot, bloom or billet) shall be brought as nearly as practicable to the finished shape by hot-working, which shall cause the metal to flow in the direction most favorable for resisting the stresses encountered in service.

Heat-Treatment

All specifications except A-181 require heat-treatment after forging. Details of this requirement vary with each material.

Chemical Properties

The chemical composition of each material grade is prescribed in the specifications. Analysis of each heat of steel by the steel manufacturer is required.

Tensile Properties

Tensile properties of flanges must be determined after forging and heat-treating. One test must be made from each heat of steel used, and from each heat-treatment batch. Test specimens must be taken from the forging, or from test blanks that have undergone the same heat-treatment and approximately the same working as the finished product.

Marking

Permanent identification symbols, comparable to those required for welding fittings, are prescribed by the ASTM specifications. This marking serves as the user's guarantee that the flange conforms to the requirements of the applicable specification.

A.S.A. and M.S.S. Standards

Complementing the ASTM specifications are the standards written by the ASA and the MSS. Two of them are of primary importance: ASA B16.5, and MSS SP-44. Their provisions are outlined below:

Scope

ASA B16.5, "Steel Pipe Flanges and Flanged Fittings", is known as the American Steel Flange Standard, and establishes requirements for sizes ½" through 24", and primary pressures of 150 lb., 300 lb., 400 lb., 600 lb., 900 lb., 1500 lb. and 2500 lb. Both carbon steel and alloy material are included in this document.

MSS SP-44, "Steel Pipe Line Flanges" was written to provide a standard for flange sizes larger than those shown in ASA B16.5. Intended for use with thin-wall, high-strength line pipe, the pressure ratings of these flanges correspond to those of B16.5, at ambient temperatures.

Pressure Ratings

ASA B16.5 contains pressure ratings for different flange materials for a wide range of operating temperatures. These ratings have been tabulated on pages 161-167.
Pressure ratings of flanges governed by MSS SP-44 are the same as those given by B16.5

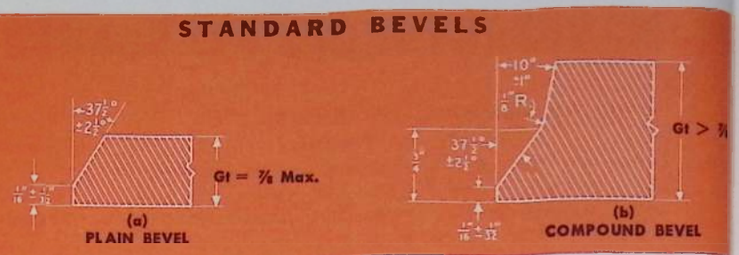
Dimensions and Tolerances

Dimensions of all flanges covered by ASA B16.5 are shown on pages 88-101; for MSS SP-44 flanges, see page 109.
Tolerances for all flanges may be found on page 116. ASA B16.5 contains supplementary information on gaskets and bolting; such data is given on pages 130-135.
Beveled ends of welding neck flanges are also prescribed by B16.5, and are identical with the geometry shown in ASA B16.25. Common bevels are pictured on page 116; special bevels on page 171.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 60 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/60

TOLERANCES AND BEVELS

STANDARD BEVELS



SOURCE: ASA B16.28, ASA B16.25, ASA B16.9, ASA B16.5. For other types of bevels, see page 171.

WELDING FITTING TOLERANCES

Nom. Pipe Size	All Fittings			All Ells, Tees, Crosses	Reducers	Return Bends			Caps	Lap Joint Stub Ends				
	O.D. at Bevel	I.D. at Bevel	Wall Thkn.	Center-to-End	End-to-End	Center-to-Center	Back-to-Face	End Alignm't.	Overall Length	O.D. of Lap	Thkn. of Lap	Lap Fillet Radius	Face-to-End	O.D. of Barrel
½-2½	+1/16, −1/32	±1/32	Not less than 87½% of nominal thickness	±1/16	±1/16	±1/4	±1/4	±1/32	±1/8	+0, −1/32	+1/16, −0	+0, −1/32	±1/16	See pages 74-75
3-3½	+1/16, −1/16	±1/16		±1/16	±1/16	±1/4	±1/4	±1/32	±1/8	+0, −1/32	+1/16, −0	+0, −1/32	±1/16	
4	+1/16, −1/16	±1/16		±1/16	±1/16	±1/4	±1/4	±1/32	±1/8	+0, −1/32	+1/16, −0	+0, −1/16	±1/16	
5-8	+3/32, −1/16	±1/16		±1/16	±1/16	±1/4	±1/4	±1/32	±1/4	+0, −1/32	+1/16, −0	+0, −1/16	±1/16	
10-18	+3/32, −1/8	±1/8		±3/32	±3/32	±3/8	±1/4	±1/16	±1/4	+0, −1/16	+1/16, −0	+0, −1/16	±3/32	
20-24	+1/4, −3/16	±3/16		±3/32	±3/32	±3/8	±1/4	±1/16	±1/4	+0, −1/16	+1/16, −0	+0, −1/16	±3/32	
26-30	+1/4, −3/16	±3/16		±1/8	±3/16	—	—	—	±3/8	—	—	—	—	
32-42	+1/4, −3/16	±3/16		±3/16	±3/16	—	—	—	±3/8	—	—	—	—	

SOURCE: ASA B16.28, ASA B16.9; MSS SP-43, SP-48, MSS DS-11. Normal production tolerances for Midwest fittings are closer than those shown.

FORGED FLANGE TOLERANCES

Dimension		Welding Neck	Slip-On or Socket Wldg.	Screwed	Lap Joint	Blind
Outside Diameter	Flange OD 24" or less	±1/16	±1/16	±1/16	±1/16	±1/16
	Flange OD over 24"	±1/8	±1/8	±1/8	±1/8	±1/8
Inside Diameter	Pipe size 10" and less	±1/32	+1/32, −0*	Within Limits on Thread Gauge	+1/32, −0	—
	Pipe size 12" to 18"	±1/16	+1/16, −0*		+1/16, −0	—
	Pipe size 20" and over	+1/8, −1/16	+1/16, −0*		+1/16, −0	—
Flange Thickness	Pipe size 18" and less	+1/8, −0	+1/8, −0	+1/8, −0	+1/8, −0	+1/8, −0
	Pipe size 20" and over	+3/16, −0	+3/16, −0	+3/16, −0	+3/16, −0	+3/16, −0
Raised Face Diameter	1/16" raised face	±1/32	±1/32	±1/32	—	±1/32
	All others, except ring joint	±1/64	±1/64	±1/64	—	±1/64
Drilling	Bolt circle	±1/16	±1/16	±1/16	±1/16	±1/16
	Bolt hole spacing	±1/32	±1/32	±1/32	±1/32	±1/32
Eccentricity	Bolt circle and bore	1/32 max.	1/32 max.	1/32 max.	1/32 max.	—
	Facing and bore	1/32 max.	1/32 max.	1/32 max.	1/32 max.	—
Length through Hub	Pipe size 10" and less	±1/16	—	—	—	—
	Pipe size 12" and over	±1/8	—	—	—	—
	Pipe size 18" and less	—	+1/8, −1/32	+1/8, −1/32	+1/8, −1/32	—
	Pipe size 20" and over	—	+3/16, −1/16	+3/16, −1/16	+3/16, −1/16	—
Diameter of Hub at Base	Pipe size 12" and less	—	+3/32, −1/16	+3/32, −1/16	+3/32, −1/16	—
	Pipe size 14" and over	—	±1/8	±1/8	±1/8	—
	Diameter 24" and less	±1/16	—	—	—	—
	Diameter over 24"	±1/8	—	—	—	—
Diameter of Hub at Bevel	Pipe size 5" and less	+3/32, −1/32	—	—	—	—
	Pipe size 6" and over	+3/32, −1/32	—	—	—	—
Thickness of Hub at Bevel	All sizes of welding neck flanges	−12½% of Matching Nominal Pipe Wall Thickness				

SOURCE: ASA B16.5, AGA, and, where not specified otherwise, commercial practices. Normal production tolerances for Midwest flanges are closer than those shown. Tolerance of I.D. at back of socket welding flange. Tolerance at face of socket welding flange same as for I.D. of welding neck flange. TOLERANCES shown in inches.

PIPE SPECIFICATION DIGEST

The American Society for Testing Materials (ASTM) and the American Petroleum Institute (API) issue specifications for ferrous and non-ferrous pipe. Below and on the next two pages are a convenient digest of the more frequently used specifications for carbon and alloy steel and non-ferrous materials.

Supplementing this information, physical and chemical properties established by the various specifications are tabulated on pages 120-122, and finally, the charts on pages 123-125 permit an immediate comparison of specifications for all the major components of a welded piping system:—pipe, tubing, welding fittings, forged flanges, and welding rod.



CARBON STEEL PIPE

Carbon steel pipe is by far the most widely used in piping systems today. The relatively low cost of this pipe, and its excellent forming and welding properties, demand its use except for extreme conditions.

A-53 For general service, the most commonly used pipe is manufactured to ASTM Specification A-53. This pipe can be obtained either black or galvanized, in the following grades:

Furnace-Butt-Welded (4" and smaller)
Electric-Resistance-Welded, Grade A
Electric-Resistance-Welded, Grade B
Seamless, Grade A
Seamless, Grade B

Generally, the standard weight wall thickness in welded grades is furnished with threaded ends and with one coupling provided for each length of pipe. Common terminology for this end preparation is T&C (threaded and coupled). Extra strong weight in welded grades and in all seamless grades is furnished with plain ends.

Butt-welded pipe is less expensive, but cannot be used for the same working pressures as electric-resistance-weld and seamless. The latter are recommended for all higher pressure applications, and for pipe which will be further fabricated (i.e., bent, coiled, flanged, etc.).

It is often difficult to procure A-53 in weights heavier than extra strong, and A-106 pipe (see below) is generally stipulated for the heavier wall thicknesses.

A-83 In the past, ASTM A-83 was commonly specified in ordering 1½" and smaller nominal pipe sizes, since seamless A-53 or A-106 pipe could not be obtained. Today, the situation has changed, and the smaller sizes are available in A-53 and A-106.

A-106 Carbon steel pipe for high-temperature, high-pressure service is customarily ordered to ASTM Specification A-106, which covers three grades of seamless pipe of varying tensile strength:

Grade A ..... 48,000 psi min.
Grade B ..... 60,000 psi min.
Grade C ..... 70,000 psi min.

Although the physical and chemical properties for Grades A and B are comparable to those for A-53 pipe, and the types of testing required by both specifications are similar, the tests prescribed for A-106 are more stringent and are applied to smaller lots of pipe. Therefore, A-106 is preferred for exacting services.

Grades A and B are obtainable in most sizes and schedule numbers. Grade B has slightly higher carbon and manganese contents than Grade A, and most A-106 pipe today is specified and available from stock as Grade B.

Grade C, is a relative newcomer, has still higher carbon content, and is available only by special agreement with the mill.

A-120 ASTM Specification A-120 covers black or galvanized welded and seamless steel pipe in sizes 12" and smaller, for ordinary uses in handling steam, water, gas, or air. The pipe is not intended for use at medium or high temperatures, nor for close coiling or bending. The specification requires no physical testing of the pipe beyond hydrostatic testing, and there are no chemical requirements whatsoever. Standard weight pipe is furnished either plain end or threaded; extra strong is usually furnished only with plain ends.

A-134 In sizes 16" and larger, and in thicknesses up to and including ¾", electric-fusion-welded pipe with either straight or spiral seam may be ordered to ASTM A-134. Plate conforming to ASTM A-285, A-283, or A-245 is recommended, although other weldable quality raw materials may be used. The strength of the weld and overlay, made in accordance with American Welding Society Qualification Procedures, must be equal to the minimum tensile strength prescribed for the plate.

A-135 General purpose pipe, not exceeding 30" in diameter and made by electric-resistance-welding, is covered by ASTM Specification A-135.

This specification provides for two grades, A and B. Ends may be specified as plain, beveled, or threaded.

A-139 Also available for ordinary service is electric-fusion-welded pipe in sizes 4" and larger with wall thicknesses up to ⅝", made to ASTM Specification A-139, which provides for either straight or spiral seam. The grades of steel available, A and B, are pipe mill grades; their mechanical properties may differ from standard plate grades.

Welding procedures used to produce A-139 pipe must conform to the American Welding Society Standard Qualification Procedure. Tensile tests of the production welds, including the overlay, shall show the same strength as the parent material.

A-155 Generally, carbon steel electric-fusion-welded pipe conforming to ASTM A-155 is furnished commercially only in sizes 16" and larger, although the specification places no restriction on the size range. It is mainly used for high-pressure service, and is suitable for bending, flanging, and similar forming operations.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 61 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/61

PIPE SPECIFICATION DIGEST (cont.)

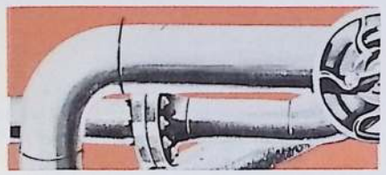
The manual or automatic fusion welds in A-155 pipe must be of the double-welded type (metal deposited on both the inside and outside surfaces of the joint), and made by operators and procedures qualified in accordance with the rules of Section IX of the ASME Boiler Code.

The seven grades of carbon steel A-155 pipe are manufactured from plate of either flange or firebox quality. Each of these grades has two classes: Class 1 pipe, which is radiographed through the length of the weld and heat-treated, and Class 2 pipe, which is not radiographed and is heat-treated only for wall thicknesses ¾" and over. The purchaser must select the grade and quality of plate and the class of pipe that is suitable for the service conditions encountered.

Supplementary requirements may be specified for A-155 pipe requiring special consideration, and may include an additonal number of check analyses, and tension and bend tests, plus hardness testing and magnetic particle examination.

API-5L The American Petroleum Institute issues Specification 5L covering steel, open-hearth iron, and wrought iron line pipe, suitable for use in conveying water, oil or gas in both the petroleum and natural gas industries. Steel pipe under this specification may be butt-welded, electric-welded, or seamless. Seamless and electric-welded steel pipe may be furnished in Grades A or B.

Tensile strength, yield-point requirements, chemical analyses, and elongation requirements of API-5L steel pipe are generally simlar to the ASTM Specification A-53.



HIGH-YIELD STRENGTH PIPE

High-yield strength pipe for high-pressure transmission lines has been developed because of the cost advantage of using lighter-weight pipe for these long, cross-country lines. This pipe must be readily weldable in the field; therefore, carbon steels or high strength, low alloy steels are preferred.

Usually, carbon steel pipe can be obtained with yield-points up to 42,000 or 46,000 psi. Above this, high yield strength is usually achieved by cold expansion of carbon steels, on in some cases, by chemistry.

Since welding fittings do not lend themselves to cold working, the extra strength required is usually gained by chemistry or by the use of heavier wall sections.

API-5LX The American Petroleum Institute and the American Gas Association jointly developed Specification API-5LX for high-yield strength line pipe. In this, grades of pipe are designated by the letter "X", followed by the first two digits of the specified minimum yield strength of the pipe material. Complete requirements are given in the specification for the X42, X46, and X52 grades; however, intermediate and higher strength grades (such as X60) are available, subject to agreement between the purchaser and manufacturer as to chemical, tensile, and yield requirements.

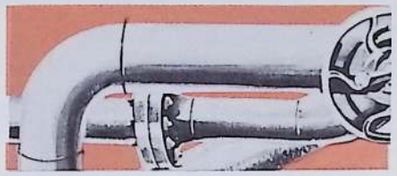
Pipe 6" or larger can be manufactured to Specificaton API-5LX by the seamless process or by a mill-welding process, such as electric-flash welding, electric-resistance welding, and submerged-arc welding. The pipe may be cold-expanded (i.e., cold-worked) to obtain the desired yield strength.

A-381 This specification covers 16" and larger, welded high strength pipe for high-pressure transmisson service. A-381 pipe is welded by the double submerged-arc technique. The pipe is suitable for bending, flanging, and similar operations and is quite frequently used as the raw material for high-yield strength welding fittings.

Six classes of pipe, designated by the letter "Y", followed by the first two digits of the specified minimum yield strength of the material are covered: Y35, Y42, Y46, Y48, Y50 and Y52.

Among the permissible high strength materials from which this pipe can be made is plate conforming to ASTM Specification A-242. Also acceptable is a new specification, ASTM A-441, which covers high strength, low alloy steel plate containing small quantities of vanadium. Plate conforming to A-441 also meets the broader requirements of A-242.

A number of steels bearing trade names, such as "Tri-Ten" comply with A-242 and A-441, and are used because of their excellent welding and forming characteristics.

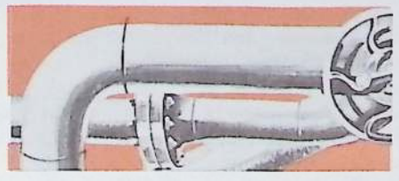


WROUGHT IRON PIPE

A-72 Wrought iron pipe to ASTM Specification A-72 has been widely used in medium- and low-pressure installations, and is preferred by many engineers for maritime, underground, condensate, and radiant heating piping. It is fabricated from a two-component metal, in which thread-like fibers of iron silicate (a glass-like slag) are embedded in a matrix of highly refined iron. This composition gives wrought iron increased resistance to some types of corrosion and fatigue, and increased ability to take on and hold protective coatings, such as galvanizing or paint.

Although the outside diameter of wrought iron pipe is identical with that of steel pipe, the wall thicknesses of wrought iron pipe are slightly thicker to compensate for the difference in weights per cubic foot of wrought-steel and wrought-iron.

Wrought iron pipe is made only in butt- and lap-welded types, and is commonly available only in standard, extra strong, and double extra strong weights. Lap-welded pipe may be flanged, lapped, bent or coiled, but the butt-welded type is not suitable for flanging or lapping, and is not recommended for coiling or bending in sizes larger than 1 ¼".



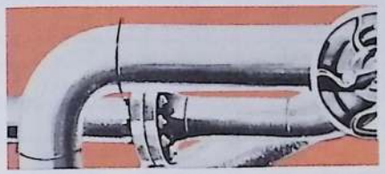
CHROME-MOLY PIPE

The additon of chromium and molybdenum to steel as alloying elements to inhibit graphitization and oxidation, and to increase high-temperature strength, has advanced the useful temperature limits of piping systems. However, the use of chromium as an alloying element is not without its drawbacks. Chrome steels have a pronounced tendency to air-harden, particularly when the amount of chromium is 2% or more. In such cases, special care in fabricaton, special welding procedures, and carefully controlled annealing are necessary.

A-155 The eight alloy grades of electric-fusion welded pipe shown in ASTM Specification A-155 carry the same general requirements as those listed above for carbon steel grades, except that Class 2 pipe must be heat-treated in all wall thicknesses. The alloy grades of A-155 pipe are similar to the corresponding grades shown in A-335 and may be used for comparable service conditions.

A-335 Altogether, twelve grades of high-temperature seamless piping suitable for bending, flanging, and fusion welding are covered by A-335. There are ten grades of chrome-moly, plus one grade of carbon moly, and one grade of silicon-moly.

Besides the regular testing procedures required by this specification, supplementary tests may be requested by the purchaser for additional check analyses and flattening tests, plus transverse tests, etching tests, and photomicrographs at the purchaser's expense.



CHROME-NICKEL (STAINLESS STEEL) PIPE

Special consideration must be given the ordinary 18% chrome-8% nickel steels when they are to be welded, hot-formed or used for corrosion-resistance. At temperatures from 800° to 1500° F, chromium carbides are formed along the grain boundaries with a consequent reduction of corrosion-resistance properties. This, however, can be minimized by the addition to the steel of small amounts of stabilizing elements, such as columbium or titanium, or by other methods.

In present common use are two grades of stainless steel pipe—regular grade and L grade. Regular grade, having a maximum carbon content of .08% has a higher strength at elevated temperatures, but is susceptible to intergranular corrosion. Consequently, the second grade, L, was developed; in this grade the carbon content is limited to .03%. This serves to reduce intergranular corrosion; however, the low carbon content of the L grade decreases the tensile strength at elevated temperatures.

Recently, a new grade, H, has been introduced. This grade, which has a carbon content of .04% to .10%, is also susceptible to intergranular corrosion, as is the regular grade, but its higher range of carbon content assures the required high-temperature strength which would not be consistently obtainable with the lower carbon range of the regular grade.

A-312 This ASTM specification covers seamless and automatic-welded (without the addition of filler metal) chrome-nickel pipe and is generally commercially available in sizes 8" and smaller. The steel is made by the electric furnace process, and the pipe is furnished pickled, free from scale, and passivated. Supplementary requirements similar to those established under Specification A-106 can be stipulated for A-312 pipe.

Fifteen grades of austenitic stainless steel (identified as grades TP304, TP304H, TP304L, TP309, TP310, TP316, TP316H, TP316L, TP317, TP321, TP321H, TP347, TP347H, TP348, and TP348H) are available.

A-358 This specification covers electric-fusion welded chromium-nickel steel pipe and is commercially produced in sizes 8" and larger. The pipe is made from A-240 chromium nickel plate in seven grades (Types 304, 309S, 310S, 316, 321, 347, and 348).

Radiographic examination of the weld joint is not a specification requirement, but, of course, can be specified by the purchaser.

A-376 Seamless austenitic steel pipe for high-temperature power plant service is covered by this specification. There are ten grades to choose from (TP304, TP304H, TP316, TP316H, TP321, TP321H, TP347, TP347H, TP348, and 16-8-2H).

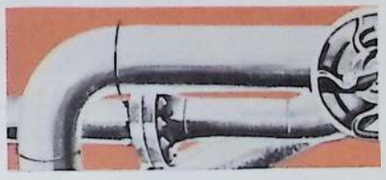


LOW-TEMPERATURE PIPE

A-333 Specification A-333 establishes requirements for six grades of steel pipe for low-temperature service—one carbon steel and three nickel grades; however, other grades of less commonly used steel may be furnished to the general requirements of this specification, when agreed upon by the purchaser and manufacturer.

Pipe conforming to A-333 may be either the open-hearth or electric-furnace process, in seamless construction, or welded without addition of filler metal.

The suitability of pipe for low-temperature operation is best determined by impact testing. The carbon steel grade of A-333 pipe is required to pass a Charpy impact test of 15 ft.-lbs. at -50° F, and the nickel-steel grades must have Charpy impact of 15 ft.-lbs. at -150° F.



NON-FERROUS PIPE

Non-ferrous pipe is used for many extreme conditions, i.e., for very low temperatures, for very high temperatures, for corrosive conditions beyond the abilities of ferrous materials. The most common non-ferrous pipe materials are nickel, copper, and aluminum, and their many alloyed compositions, such as Monel, Inconel, Hastelloy, Red Brass, Yellow Brass, Cupro-Nickel. Space does not permit individual discussion of the numerous specifications, but the physicals and chemicals are all listed on page 122. On page 125, the piping component comparison chart gives a convenient cross-reference of comparable flange, pipe, tube, and welding fitting specifications.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 62 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/62

PHYSICAL AND CHEMICAL PROPERTIES OF PIPE

CARBON STEEL

MATERIAL	ASTM or API SPECIFICATION	TENSILE STRENGTH (Minimum 1000 psi)	YIELD STRENGTH (Minimum 1000 psi)	ELONG. IN 2" Min. ⊙ %	C	Mn	P	S	Si	Cr	Mo
					Percent: Maximum, or Minimum-Maximum ▲						
Grade A	A53-A	48	30	21 to 35			.110				
	A106-A	48	30	20 to 35	.25	.27-.93	.048	.058	.10 Min.		
	A135-A	48	30	21 to 35			.050	.060			
	A139-A	48	30	21 to 35		.30-1.00	.040	.050			
	A155-C50*	50 min.-65 max.	27	30	.22‡	.80	.040	.040			
	A155-C55*	55 min.-70 max.	30	29	.30‡	.80	.040	.040			
	API-5L-A	48	30	21 to 35	.22	.90	.040	.050			
Grade B	A53-B	60	35	18 to 30			.110				
	A106-B	60	35	12 to 30	.30	.29-1.06	.048	.058	.10 Min.		
	A135-B	60	35	18 to 30			.050	.060			
	A139-B	60	35	18 to 30	.30	.30-1.00	.040	.050			
	A155-KC65*	65 min.-79 max.	35	21 to 24	.33‡	1.00	.035	.040	.13-.33		
	A155-KC70*	70 min.-87 max.	38	19 to 22	.35‡	1.00	.035	.040	.13-.33		
	API-5L-B	60	35	18 to 30	.27	1.15	.040	.050			
Grade C	A106-C	70	40	12 to 30	.35	.29-1.06	.048	.058	.10 Min.		
Low Temperature	A333-1	55	30	20 to 35	.30	.40-1.06	.050	.060			
	A333-6	60	35	12 to 30	.30	.29-1.06	.048	.058	.10 Min.		
High-Yield	A381-Y35	60	35	26	.32	1.32	.050	.050			
	A381-Y42	68	42	25	.32	1.32	.050	.050			
	A381-Y46	70	46	23	.32	1.32	.050	.050			
	A381-Y48	72	48	21	.32	1.32	.050	.050			
	A381-Y50	72	50	21	.32	1.32	.050	.050			
	A381-Y52	75	52	20	.32	1.32	.050	.050			
	API-5LX-X42	60	42	20 to 25	.29	1.25	.040	.050			
	API-5LX-X46	63	46	17 to 23	.32	1.35	.040	.050			
	API-5LX-X52	66	52	14 to 22	.32	1.35	.040	.050			

WROUGHT IRON

	A72	42	25	9 to 12		.06					

CARBON MOLY STEEL

½ Mo	A155-CM70*	70 min.-88 max.	40	20 to 23	.27‡	.90	.035	.040	.13-.32		.41-.64
	A335-P1	55	30	14 to 30	.10-.20	.30-.80	.045	.045	.10-.50		.44-.65
	A369-FP1	55	30	14 to 30	.10-.20	.30-.80	.045	.045	.10-.50		.44-.65

CHROME MOLY STEEL

½ Cr-½ Mo	A155-½ CR*	65 min.-85 max.	40	21 to 24	.21	.36-.84	.035	.040	.13-.32	.46-.85	.4-.7
	A335-P2	55	30	14 to 30	.10-.20	.30-.61	.045	.045	.10-.30	.50-.81	.44-.65
	A369-FP2	55	30	14 to 30	.10-.20	.30-.61	.045	.045	.10-.30	.50-.81	.44-.65
1 Cr-½ Mo	A155-1 CR*	60 min.-85 max.	35	21 to 24	.17	.36-.69	.035	.040	.13-.32	.74-1.21	.4-.7
	A335-P12	60	30	14 to 30	.15	.30-.61	.045	.045	.50	.80-1.25	.44-.65
	A369-FP12	60	30	14 to 30	.15	.30-.61	.045	.045	.50	.80-1.25	.44-.65
1¼ Cr-½ Mo	A155-1¼ CR	60 min.-88 max.	35	21 to 24	.17	.36-.69	.035	.040	.48-1.02	.94-1.56	.4-.7
	A335-P11	60	30	14 to 30	.15	.30-.60	.030	.030	.50-1.00	1.00-1.50	.44-.65
	A369-FP11	60	30	14 to 30	.15	.30-.60	.030	.030	.50-1.00	1.00-1.50	.44-.65
2¼ Cr-1 Mo	A155-2¼ CR	60 min.-88 max.	30	17 to 20	.15	.27-.63	.035	.035	.50	1.88-2.62	.85-1.15
	A335-P22	60	30	14 to 30	.15	.30-.60	.030	.030	.50	1.90-2.60	.87-1.13
	A369-FP22	60	30	14 to 30	.15	.30-.60	.030	.030	.50	1.90-2.60	.87-1.13
5 Cr-½ Mo	A155-5 CR	60 min.-80 max.	30	20	.15	.30-.60	.040	.030	.50	4-6	.45-.65
	A335-P5	60	30	14 to 30	.15	.30-.60	.030	.030	.50	4-6	.45-.65
	A369-FP5	60	30	14 to 30	.15	.30-.60	.030	.030	.50	4-6	.45-.65
7 Cr-½ Mo	A335-P7	60	30	14 to 30	.15	.30-.60	.030	.030	.50-1.00	6-8	.44-.65
	A369-FP7	60	30	14 to 30	.15	.30-.60	.030	.030	.50-1.00	6-8	.44-.65
9 Cr-1 Mo	A335-P9	60	30	14 to 30	.15	.30-.60	.030	.030	.25-1.00	8-10	.90-1.10
	A369-FP9	60	30	14 to 30	.15	.30-.60	.030	.030	.50-1.00	8-10	.90-1.10

(TABLE CONTINUED ON FOLLOWING PAGE)

* Manufactured from firebox quality plate.
‡ Dependent on wall thickness and/or diameter.
⊙ Two values indicate the range of minimum values depending on wall thickness, direction of testing, and/or type of test specimen.
▲ All single values are maximum (unless noted otherwise); two values separated by a hyphen (-) indicate the minimum-maximum values.

PHYSICAL AND CHEMICAL PROPERTIES OF PIPE

(CONTINUED FROM PRECEDING PAGE)

LOW TEMPERATURE FERRITIC ALLOY STEEL

MATERIAL	ASTM SPECIFICATION	TENSILE STRENGTH (Minimum 1000 psi)	YIELD STRENGTH (Minimum 1000 psi)	ELONG. IN 2" Min. ⊙ %	C	Mn	P	S	Si	Ni	Cr	OTHER ELEMENTS
					Percent: Maximum, or Minimum-Maximum ▲							
3½Ni	A333-3	65	35	14 to 30	.19	.31-.64	.050	.05	.18-.37	3.18-3.82		
Cr-Cu-Ni-Al Low Alloy Steel	A333-4	60	35	12 to 30	.12	.5-1.05	.040	.04	.08-.37	.47-.98	.44-1.01	Cu .4-.75 Al .04-.3
2¼Ni	A333-7	65	35	14 to 30	.19	.90	.04	.05	.13-.32	2.03-2.57		
3Ni	A333-8	100	75	16 to 22	.13	.90	.045	.045	.13-.32	8.40-9.60		

STAINLESS AUSTENITIC STEEL

Type 304 18Cr-8Ni	A312-TP304	70‡	30	20 to 35	.08	2	.040	.03	.75	8-11	18-20	
	A358-304	75	30	40	.08	2	.045	.03	1.00	8-12	18-20	
	A376-TP304	70‡	30	20 to 35	.08	2	.030	.03	.75	8-11	18-20	
	A312-TP304H	75	30	20 to 35	.04-.1	2	.040	.03	.75	8-11	18-20	
	A376-TP304H	75	30	20 to 35	.04-.1	2	.030	.03	.75	8-11	18-20	
	A312TP304L	70	25	20 to 35	.04‡	2	.040	.03	.75	8-13	18-20	
Type 309 25Cr-12Ni	A312-TP309	75	30	20 to 35	.15	2	.040	.03	.75	12-15	22-24	
	A358-309	75	30	40	.08	2	.045	.03	1.00	12-15	22-24	
Type 310 25Cr-20Ni	A312-TP310	75	30	20 to 35	.15	2	.040	.03	.75	19-22	24-26	
	A358-310	75	30	40	.08	2	.045	.03	1.50	19-22	24-26	
Type 316 16Cr-13Ni-2½ Mo	A312-TP316	75	30	20 to 35	.08	2	.040	.03	.75	11-14	16-18	Mo 2-3
	A358-316	75	30	40	.08	2	.045	.03	1.00	10-14	16-18	Mo 2-3
	A376-TP316	75	30	20 to 35	.08	2	.030	.03	.75	11-14	16-18	Mo 2-3
	A312-TP316H	75	30	20 to 35	.04-.1	2	.040	.03	.75	11-14	16-18	Mo 2-3
	A376-TP316H	75	30	20 to 35	.04-.1	2	.030	.03	.75	11-14	16-18	Mo 2-3
	A312-TP316L	70	25	20 to 35	.04‡	2	.040	.03	.75	10-15	16-18	Mo 2-3
Type 317 16Cr-13Ni-3½ Mo	A312-TP317	75	30	20 to 35	.08	2	.040	.03	.75	11-14	18-20	Mo 3-4
Type 321 18Cr-8Ni-Ti	A312-TP321	75	30	20 to 35	.08	2	.040	.03	.75	9-13	17-20	(a)
	A358-321	75	30	40	.08	2	.045	.03	1.00	9-12	17-19	(b)
	A376-TP321	75	30	20 to 35	.08	2	.030	.03	.75	9-13	17-20	(a)
	A312-TP321H	75	30	20 to 35	.04-.1	2	.040	.03	.75	9-13	17-20	(c)
	A376-TP321H	75	30	20 to 35	.04-.1	2	.030	.03	.75	9-13	17-20	(c)
Type 347 18Cr-8Ni-Ta-Cb	A312-TP347	75	30	20 to 35	.08	2	.040	.03	.75	9-13	17-20	(d)
	A358-347	75	30	40	.08	2	.045	.03	1.00	9-13	17-19	(d)
	A376-TP347	75	30	20 to 35	.08	2	.030	.03	.75	9-13	17-20	(d)
	A312-TP347H	75	30	20 to 35	.04-.1	2	.040	.03	.75	9-13	17-20	(e)
	A376-TP347H	75	30	20 to 35	.04-.1	2	.030	.03	.75	9-13	17-20	(e)
Type 348 18Cr-8Ni-Cb	A312-TP348	75	30	20 to 35	.08	2	.040	.03	.75	9-13	17-20	(d); Ta .1
	A358-348	75	30	40	.08	2	.045	.03	1.00	9-13	17-19	(f); Ta .1
	A376-TP348	75	30	20 to 35	.08	2	.030	.03	.75	9-13	17-20	(d); Ta .1
	A312-TP348H	75	30	20 to 35	.04-.1	2	.040	.03	.75	9-13	17-20	(e); Ta .1
16 Cr 8Ni 2 Mo	A376, 16-8-2H	75	30	20 to 35	.05-.10	2	.03	.03	0.75	7.5-9.0	14.5-16.5	1.5-2.0 Mo

(TABLE CONTINUED ON FOLLOWING PAGE)

‡ Dependent on wall thickness and/or diameter.
⊙ Two values indicate the range of minimum values depending on wall thickness, direction of testing, and/or type of test specimen.
▲ All single values are maximum (unless noted otherwise); two values separated by a hyphen (-) indicate the minimum-maximum values.
(a) The titanium content shall be not less than five times the carbon content, nor more than 0.60 per cent.
(b) The titanium content shall be not less than five times the carbon content, nor more than 0.70 per cent.
(c) The titanium content shall be not less than four times the carbon content, nor more than 0.60 per cent.
(d) The columbium plus tantalum content shall be not less than ten times the carbon content, nor more than 1.00 per cent.
(e) The columbium plus tantalum content shall be not less than eight times the carbon content, nor more than 1.00 per cent.
(f) The columbium plus tantalum content shall be not less than ten times the carbon content, nor more than 1.10 per cent.



Laboratory technician testing metal sample for presence of chromium.



Determination of tensile properties by pulling metal specimen in tensile machine.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 63 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/63

PHYSICAL AND CHEMICAL PROPERTIES OF PIPE

(CONTINUED FROM PRECEDING PAGE)

NICKEL AND NICKEL BASE ALLOYS

MATERIAL	ASTM SPECIFICATION	Tensile Strength	Yield Strength	ELONG. IN 2"	Ni	Cu	Fe	Mn	Si	C	Cr	S	OTHER ELEMENTS
		Minimum (1000 psi)		Min. %	Percent: Maximum, or Minimum-Maximum ⊙								
Nickel	B161	55	‡12	40	99 Min.	.25	.4	.35	.35	.15		.01	
Nickel (Low Carbon)	B161	50	‡10	40	99 Min.	.25	.4	.35	.35	.02		.01	
Monel Ni-Cu Alloy	B165	70	‡25	35	63-70	Remainder	2.5	2	.5	.3		.024	
Inconel Ni-Cr-Fe	B167	75‡	25‡	35	72 Min.	.5	6-10	1	.5	.15	14-17	.015	
Hastelloy B Ni-Mo	B333	‡90	45	‡35	Remainder		4-6	1	1	.05	1	.03	Mo 26-30 V .2-.4 P .025 Co 2.50
Hastelloy C Ni-Mo-Cr	B334	‡90	45	‡20	Remainder		4-7	1	1	.08	14.5-16.5	.03	Mo 15-17 Co 2.5 P .04 W 3-4.5 V .35

COPPER AND COPPER BASE ALLOYS

MATERIAL	ASTM SPECIFICATION	Tensile Strength	Yield Strength	ELONG. IN 2"	Ni	Cu	Fe	Mn	Si	P	Pb	Zn	Al
		Minimum (1000 psi)		Min. %	Percent: Maximum, or Minimum-Maximum ⊙								
Pure Copper	B42	36⊠	30	Not Given		99.9 Min.				.04			
Red Brass 85% Cu-15% Zn	B43	Not Given	Not Given	Not Given		84-86	.05				.06	Rem.	
Yellow Brass 70% Cu-30% Zn	B135-2	54▲	Not Given	Not Given		68.5-71.5	.05				.07	Rem.	
Silicon Bronze 95% Cu-3% Si	B315-A7	50	15-29	35			.25	.5-1.35	2.8-3.6		.05		
Aluminum Bronze 91% Cu-9% Al	B169-C	50●	20	30		90-93	.50						7-9
Cupro-Nickel 70% Cu-30% Ni	B111 (70 Cu-30 Ni)	52■	18	Not Given	29-33	65 Min.	.4-.7	1			.05	1	

ALUMINUM AND ALUMINUM BASE ALLOYS

MATERIAL	ASTM SPECIFICATION	Tensile Strength	Yield Strength	ELONG. IN 2"	Al	Cu	Fe	Mn	Si	Mg	Cr	Zn	Ti
		Minimum (1000 psi)		Min. %	Percent: Maximum, or Minimum-Maximum ⊙								
99.6% Pure Aluminum	B345-1060	9▲	2.5	Not Given	99.6 Min.	.05	.35	.03	.25	.03		.05	.03
Aluminum Base Manganese Alloy	B241-3003	14▲	6	Not Given	Remainder	.2	.7	1-1.5	.6			.1	
	B345-3003	14▲	5	Not Given	Remainder	.2	.7	1-1.5	.6			.1	
Aluminum Base Magnesium Alloy	B345-5052	25▲	10	Not Given	Remainder	.1	Fe + Si =.45	.1	Fe + Si =.45	2.2-2.8	.15-.35	.1	
	B345-5154	30▲	11	12	Remainder	.1	Fe + Si =.45	.1	Fe + Si =.45	3.1-3.9	.15-.35	.2	.20
Aluminum Base Magnesium Silicon Heat Treatable Alloy	B241-6061	38*	35	10	Remainder	.15-.4	.7	.15	.4-.8	.8-1.2	.15-.35	.25	.15
	B345-6061	26♦	16	14	Remainder	.15-.4	.7	.15	.4-.8	.8-1.2	.15-.35	.25	.15
	B241-6062	38*	35	10	Remainder	.15-.4	.7	.15	.4-.8	.8-1.2	.04-.14	.25	.15
	B345-6062	26♦	16	14	Remainder	.15-.4	.7	.15	.4-.8	.8-1.2	.04-.14	.25	.15
	B345-6063	30Ⅰ	25	8	Remainder	.10	.35	.1	.2-.6	.45-.9	.1	.1	.10

▲ Drawn.
○ Soft.
□ Annealed.
⊠ For pipe 2½" to 12", inclusive.
‡ Dependent on wall thickness and/or diameter.
△ 0 Temper.
♦ H112 temper, 1" and over.
* T6 temper, 1" and over.
Ⅰ T6.
♦ T4.
⊙ All single values are maximum (unless noted otherwise); two values separated by a hyphen (-) indicate the minimum-maximum values.

PIPING COMPONENT SPECIFICATIONS

On these pages are listed comparable ASTM (and API) specifications for the basic components of welded piping systems. Both the specification number and the grade of metal are shown; for example, ASTM Specification A-106, Grade B, is indicated in the table as A106-B. In some cases, other specifications exist and may be required for special piping installations; however, those shown are in most frequent use today.

Also tabulated are the permissible raw material specifications which are used in the manufacture of welding fittings. Selection from among these is at the discretion of the fitting manufacturer.

MATERIAL		PIPING COMPONENTS			
		Pipe	Tubing	Welding Fittings*	Flanges
CARBON STEEL	Grade A	A53-A A106-A A135-A A139-A A155-C50, C55 API-5L-A	A83-A A161 A178-A A179 A192 A226	A234-WPA	A105-I, II A181-I, II
	Grade B	A53-B A106-B A135-B A139-B A155-KC65, KC70 API-5L-B	A178-C A210	A234-WPB	A105-I, II A181-I, II
	Grade C	A106-C		A234-WPC	A105-I, II A181-I, II
	Low Temperature	A333-1 & 6	A334-1 & 6	A420-WPLO	A350-LF1
	High Yield	A381 API-5LX-X42, X46, X52		Grade WPY42⊙△ to Grade WPY52⊙△	A105-II
WROUGHT IRON		A72		Grade WPWI⊙	A73
CARBON MOLY STEEL	½ Mo	A155-CM70 A335-P1 A369-FP1	A209-T1, T1a, T1b A250-T1, T1a, T1b	A234-WP1	A182-F1
CHROME MOLY STEEL	½ Cr-½ Mo	A155-½CR A335-P2 A369-FP2		Grade WP2⊙	
	1 Cr-½ Mo	A155-1CR A335-P12 A369-FP12	A213-T12	A234-WP12	A182-F12
	1¼ Cr-½ Mo	A155-1¼CR A335-P11 A369-FP11	A200-T11 A213-T11	A234-WP11	A182-F11
	2¼Cr-1 Mo	A155-2¼CR A335-P22 A369-FP22	A200-T22 A213-T22	A234-WP22	A182-F22
	5 Cr-½ Mo	A155-5CR A335-P5 A369-FP5	A200-T5 A213-T5	A234-WP5	A182-F5
	7 Cr-½ Mo	A335-P7 A369-FP7	A200-T7 A213-T7	Grade WP7⊙	A182-F7
	9 Cr-1 Mo	A335-P9 A369-FP9	A200-T9 A213-T9	Grade WP9⊙	A182-F9

RAW MATERIAL FOR WELDING FITTINGS			
Pipe	Plate	Forgings	Bar
A106-A	A285-B, C	A105-I	A107-1008 to A107-1022†
A106-B	A515 Grade 65 or 70	A105-II	A107-1025 & A107-1030†
A106-C	‡	‡	‡
A333-1&6	A300-1	A350-LF1	
A106-B A381	A212-B A242 A441		
A72	A42	A73	
A335-P1	A204-B	A182-F1	
A335-P2	A387-A		
A335-P12	A387-B	A182-F12	
A335-P11	A387-C	A182-F11	
A335-P22	A387-D	A182-F22	
A335-P5	A357	A182-F5	
A335-P7	‡	A182-F7	
A335-P9	‡	A182-F9	

*When fittings are of welded construction, the fitting manufacturer shall supplement the grade symbol marking with the letter "W".
†A-107 steel may be used only for 2" and smaller fittings, and must be of open-hearth quality.
‡No ASTM specification has been written. However, materials having chemical and physical properties comparable to the other materials listed may be used.
⊙No ASTM specification has been written. The welding fitting grade symbol is that recommended by MSS Standard SP-25, and the raw materials shown are those commonly used.
△The numerals in these grade symbols are the first two numbers of the minimum guaranteed yield strength of the fittings. Fittings having other minimum yield strengths may be similarly designated by using the applicable numerals.
●No ASTM specification has been written for welding rod of this composition. The symbol used has been generally adopted by welding rod manufacturers.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 64 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/64

PIPING COMPONENT SPECIFICATIONS

MATERIAL		PIPING COMPONENTS				RAW MATERIAL FOR WELDING FITTINGS			
		Pipe	Tubing	Welding Fittings*	Flanges	Pipe	Plate	Forgings	Bar
LOW TEMPERATURE FERRITIC STEEL	3½ Ni	A333-3	A334-3	A420-WPL3	A350-LF3	A333-3	A300-3	A350-LF3	
	Cr-Cu-Ni-Al Low Alloy Steel	A333-4		A420-WPL4	A350-LF4	A333-4	A300-5	A350-LF4	
	2¼ Ni	A333-7	A334-7			A333-7	‡	‡	
	9 Ni	A333-8	A334-8			A333-8			
STAINLESS AUSTENITIC STEEL	Type 304 18 Cr-8 Ni	A312-TP304 A358-304 A376-TP304	A213-TP304 A249-TP304 A269-TP304 A271-TP304	A403-WP304	A182-F304	A312-TP304	A240-304	A182-F304	A276-304
		A312-TP304H A376-TP304H	A213-TP304H A249-TP304H A271-TP304H	A403-WP304H	A182-F304H	A312-TP304H	A240-304 †	A182-F304H	A276-304 †
		A312-TP304L	A213-TP304L A249-TP304L A269-TP304L	A403-WP304L	A182-F304L	A312-TP304L ϕ	A240-304L ϕ	A182-F304L	A276-304L ϕ
	Type 309 25 Cr-12 Ni	A312-TP309 A358-309	A249-TP309	A403-WP309	A314-309	A312-TP309	A240-309S	A314-309	A276-309S
	Type 310 25 Cr-20 Ni	A312-TP310 A358-310	A213-TP310 A249-TP310	A403-WP310	A182-F310	A312-TP310	A240-310S	A182-F310	A276-310S
	Type 316 16 Cr-13 Ni-2½ Mo	A312-TP316 A358-316 A376-TP316	A213-TP316 A249-TP316 A269-TP316	A403-WP316	A182-F316	A312-TP316	A240-316	A182-F316	A276-316
		A312-TP316H A376-TP316H	A213-TP316H A249-TP316H	A403-WP316H	A182-F316H	A312-TP316H	A240-316 †	A182-F316H	A276-316 †
		A312-TP316L	A213-TP316L A249-TP316L A269-TP316L	A403-WP316L	A182-F316L	A312-TP316L	A240-316L ϕ	A182-F316L	A276-316L ϕ
	Type 317 16 Cr-13 Ni-3½ Mo	A312-TP317	A249-TP317 A269-TP317	A403-WP317	A314-317	A312-TP317	A240-317	A314-317	A276-⊕
	Type 321 18 Cr-8 Ni-Ti	A312-TP321 A358-321 A376-TP321	A213-TP321 A249-TP321 A269-TP321 A271-TP321	A403-WP321	A182-F321	A312-TP321	A240-321	A182-F321	A276-321
		A312-TP321H A376-TP321H	A213-TP321H A249-TP321H A271-TP321H	A403-WP321H	A182-F321H	A312-TP321H	A240-321 †	A182-F321H	A276-321 †
	Type 347 18 Cr-8 Ni-Ta-Cb	A312-TP347 A358-347 A376-TP347	A213-TP347 A249-TP347 A269-TP347 A271-TP347	A403-WP347	A182-F347	A312-TP347	A240-347	A182-F347	A276-347
		A312-TP347H A376-TP347H	A213-TP347H A249-TP347H A271-TP347H	A403-WP347H	A182-F347H	A312-TP347H	A240-347 †	A182-F347H	A276-347 †
	Type 348 18 Cr-8 Ni-Cb	A312-TP348 A358-348 A376-TP348	A213-TP348 A249-TP348 A269-TP348	A403-WP348	A182-F348	A312-TP348	A240-348	A182-F348	A276-348
		A312-TP348H	A213-TP348H A249-TP348H	A403-WP348H	A182-F348H	A312-TP348H	A240-348 †	A182-F348H	A276-348 †
	16 Cr 8 Ni 2 Mo	A376							

*When fittings are of welded construction, the fitting manufacturer shall supplement the grade symbol marking with the letter "W".

‡No ASTM specification has been written. However, materials having chemical and physical properties comparable to the other materials listed may be used.

■Controversy exists as to the appropriate rod for welding this alloy. It is suggested that the welding rod manufacturer be contacted for specific recommendations.

†Except carbon content shall be 0.04 to 0.10%.

ϕExcept minimum Tensile Strength shall be 65 on psi min., yield strength 25,000 psi min.

⊕Same as type 316 except Molybdenum shall be 3 to 4% and chromium 18.00 to 20.00.

PIPING COMPONENT SPECIFICATIONS

MATERIAL		PIPING COMPONENTS				RAW MATERIAL FOR WELDING FITTINGS			
		Pipe	Tubing	Welding Fittings*⊙	Flanges	Pipe	Plate	Forgings	Bar
NICKEL AND NICKEL BASE ALLOYS	Nickel	B161		B366, WPN	▲	B161	B162	▲	B160
	Nickel (Low Carbon)	B161		B366, WPNL	▲	B161	B162	▲	B160
	Monel Ni-Cu	B165		B366, WPNC	▲	B165	B127	▲	B164
	Inconel Ni-Cr-Fe	B167		B366, WPNCI	▲	B167	B168	▲	B166
	Hastelloy B Ni-Mo	‡		B366, WPHB	▲		B333	▲	B335
	Hastelloy C Ni-Mo-Cr	‡		B366, WPHC	▲		B334	▲	B336
TITANIUM	99.3% Ti 99.2% Ti 99.0% Ti 98.0% Ti	B337-1 B337-2 B337-3 B337-4	B338-1 B338-2 B338-3 B338-4	B363, WPT1 B363, WPT2 B363, WPT3 Grade WPT4	■	B337-1 B337-2 B337-3 B337-4	B265-1 B265-2 B265-3 B265-4	B381-1 B381-2 B381-3 B381-4	B348-1 B348-2 B348-3 B348-4
COPPER AND COPPER BASE ALLOYS	Pure Copper	B42		Grade WPCU	■	B42	B152-OF	B283	B124-12
	Red Brass 85% Cu 15% Zn	B43	B111	Grade WPRB	▲	B43	B36-3	▲	B36-3
	Yellow Brass 70% Cu 30% Zn	‡	B135-2	Grade WPYB	▲		B36-6	▲	B36-6
	Silicon Bronze 95% Cu 3% Si	B315-A-7	B315-A-7	Grade WPSB	■	B315-A-7	B96-A B97-A	B283	B124-7
	Aluminum Bronze 91% Cu 9% Al	‡			▲		B169-C	▲	B124-11a
	Cupro-Nickel 70% Cu 30% Ni	‡	B111-70 Cu-30 Ni	Grade WPCN	▲		B122-5	▲	B122-5
ALUMINUM AND ALUMINUM BASE ALLOYS	99.6% Pure Aluminum	B345-1060	B210-1060 B234-1060	B361-WP1060	▲	B210-1060 B234-1060	B209-1060	▲	B211-1060
	Commercially Pure Low Strength Aluminum Alloy	‡		B361-WP1100	■		B209-1100	B247-1100	B211-1100 B221-1100
	Aluminum Base Manganese Alloy	B241-3003 B345-3003	B210-3003 B234-3003	B361-WP3003	■	B210-3003 B234-3003 B241-3003	B209-3003	B247-3003	B221-3003
	Aluminum Base Magnesium Alloy	B345-5052	B210-5052 B234-5052	B361-WP5052	▲	B210-5052	B209-5052	▲	B211-5052
		B345-5154		B361-WP5154	▲		B209-5154	▲	B221-5154
	Aluminum Base Magnesium Silicon Heat Treatable Alloy	B241-6061 B345-6061	B210-6061 B234-6061	B361-WP6061	■	B210-6061 B234-6061 B241-6061	B209-6061	B247-6061	B211-6061 B221-6061
		B241-6062 B345-6062	B210-6062 B234-6062	B361-WP6062	▲	B210-6062 B234-6062 B241-6062	‡	▲	B221-6062
		B241-6063	B210-6063	B361-WP6063	▲	B210-6063 B241-6063	‡	▲	B221-6063

*When fittings are of welded construction, the fitting manufacturer shall supplement the grade symbol marking with the letter "W".

‡No ASTM specification has been written. However, materials having chemical and physical properties comparable to the other materials listed may be used.

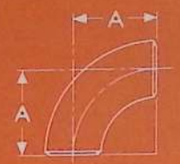
⊙Where no ASTM specification has been written, the welding fitting grade symbol is that recommended by MSS Standard SP-25, and the raw materials shown are those commonly used.

■No ASTM specification has been written for flanges. Refer to specification for forging.

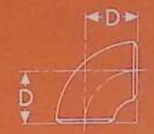
▲No ASTM specification has been written for flanges or forgings. Refer to specification for bar stock, which may be used as raw material for flanges and forgings.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 65 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/65

FITTING AND FLANGE DIMENSIONS



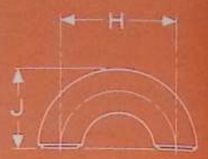
LONG RADIUS ASA 90° ELL



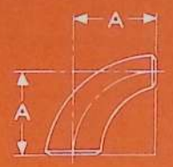
SHORT RADIUS 90° ELL



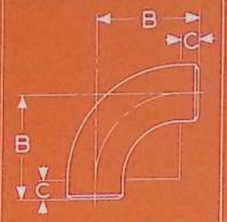
LONG RADIUS ASA 45° ELL



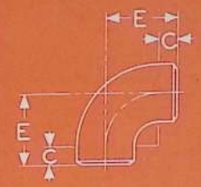
LONG RADIUS ASA 180° RETURN



LONG RADIUS ASA REDUCING ELL



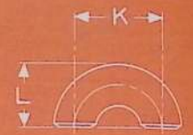
LONG RADIUS LONG TANG. 90° ELL



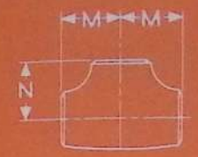
SHORT RADIUS LONG TANG. 90° ELL



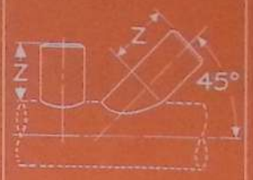
LONG RADIUS LONG TANG. 45° ELL



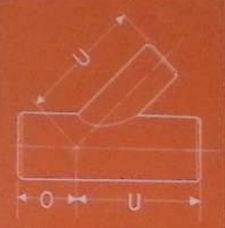
SHORT RADIUS 180° RETURN



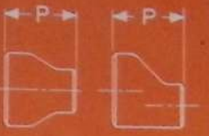
STRAIGHT TEE



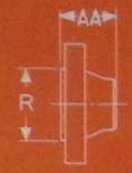
90° AND 45° SHAPED NIPPLE



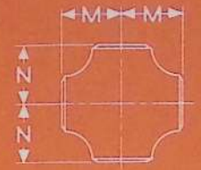
REINF. AND UNREINF. 45° LATERAL



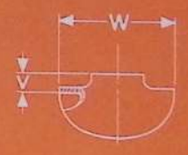
CONCENTRIC AND ECCENTRIC REDUCER



WELDING NECK FLANGE



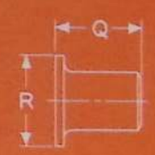
STRAIGHT CROSS



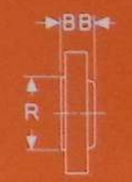
REGULAR SADDLE



CAP



LAP JOINT STUB END



SLIP-ON AND SCREWED FLANGE

Nom. Pipe Size	A	B	C	D	E	F	G	H	J	K	L	M & N	O	P★	Q	R	S	U	V	W	Z
½	1½	—	—	—	—	⅝	—	3	1⅞	—	—	1	—	—	3	1⅜	1	—	—	—	—
¾	1⅛	—	—	—	—	7/16	—	2½	1 11/16	—	—	1⅛	—	1½	3	1 11/16	1	—	—	—	—
1	1½	—	—	1	—	⅞	—	3	2 3/16	2	1⅝	1½	2½	2	4	2	1½	6½	⅞	4	—
1¼	1⅞	—	—	1¼	—	1	—	3¾	2¾	2½	2 1/16	1⅞	2¾	2	4	2½	1½	7	⅞	5	—
1½	2¼	—	—	1½	—	1⅛	—	4½	3¼	3	2 7/16	2¼	3	2½	4	2⅞	1½	8	⅞	5½	—
2	3	3½	½	2	—	1⅜	1⅞	6	4 3/16	4	3 3/16	2½	4	3	6	3⅝	1½	8½	1	6	6
2½	3¾	4⅜	⅝	2½	—	1¾	2⅜	7½	5 3/16	5	3 15/16	3	4½	3½	6	4⅛	1½	10	1	7	6
3	4½	5¼	¾	3	—	2	2¾	9	6¼	6	4¾	3⅜	5	3½	6	5	2	11	1	8	6
3½	5¼	6⅛	⅞	3½	—	2¼	3⅛	10½	7¼	7	5½	3¾	5½	4	6	5½	2½	12	1	8½	6
4	6	7	1	4	—	2½	3½	12	8¼	8	6¼	4⅛	6	4	6	6 3/16	2½	13	1⅛	9	6
5	7½	8¾	1¼	5	—	3⅛	4⅜	15	10 5/16	10	7¾	4⅞	7	5	8	7 5/16	3	14½	1⅛	10	8
6	9	10½	1½	6	—	3¾	5¼	18	12 5/16	12	9 5/16	5⅝	8	5½	8	8½	3½	16½	1¼	12	8
8	12	14	2	8	10	5	7	24	16 5/16	16	12 5/16	7	10	6	8	10⅝	4	20	1⅝	16	8
10	15	17½	2½	10	12½	6¼	8¾	30	20⅜	20	15⅜	8½	12	7	10	12¾	5	23	1⅝	20	10
12	18	21	3	12	15	7½	10½	36	24⅜	24	18⅜	10	13	8	10	15	6	27	1⅞	22	10
14	21	24½	3½	14	17½	8¾	12¼	42	28	28	21	11	14	13	12	16¼	6½	30	2¼	24	12
16	24	28	4	16	20	10	14	48	32	32	24	12	16	14	12	18½	7	33	2½	26	12
18	27	31½	4½	18	22½	11¼	15¾	54	36	36	27	13½	17	15	12	21	8	36	2¾	28	12
20	30	35	5	20	25	12½	17½	60	40	40	30	15	18	20	12	23	9	40	3	32	12
22	33	38½	5½	—	—	13½	—	—	—	—	—	16½	—	20	—	—	10	—	—	—	—
24	36	42	6	24	30	15	21	72	48	48	36	17	20	20	12	27¼	10½	46	3	38	12
26	39	45	6	26	32	16	22	78	52	—	—	19½	—	24	—	—	10½	—	3½	42	—
30	45	51	6	30	36	18½	24½	90	60	60	45	22	—	24	—	—	10½	—	4	49	—
36	54	60	6	36	42	22¼	—	—	—	—	—	26½	—	—	—	—	10½	—	—	—	—

DIMENSIONS ARE SHOWN IN INCHES. TOLERANCES ARE GIVEN ON PAGE 116. ★LARGE END DETERMINES LENGTH.

Nom. Pipe Size	A A*							B B*						
	150 lb.	300 lb.	400 lb.	600 lb.	900 lb.	1500 lb.	2500 lb.	150 lb.	300 lb.	400 lb.	600 lb.	900 lb.	1500 lb.	2500 lb.
½	1⅞	2 1/16	2 5/16	2 5/16	2⅝	2⅝	3⅛	⅜	⅞	1⅛	1⅛	1½	1½	1 13/16
¾	2 1/16	2¼	2½	2½	3	3	3⅜	⅝	1	1¼	1¼	1⅝	1⅝	1 15/16
1	2 3/16	2 7/16	2 11/16	2 11/16	3⅛	3⅛	3¾	1 1/16	1 1/16	1 5/16	1 5/16	1⅞	1⅞	2⅛
1¼	2¼	2 9/16	2⅞	2⅞	3⅛	3⅛	4	1 3/16	1 1/16	1⅜	1⅜	1⅞	1⅞	2 5/16
1½	2 7/16	2 11/16	3	3	3½	3½	4⅝	⅞	1 3/16	1½	1½	2	2	2⅝
2	2½	2¾	3⅛	3⅛	4¼	4¼	5¼	1	1 5/16	1 11/16	1 11/16	2½	2½	3
2½	2¾	3	3⅜	3⅜	4⅜	4⅜	5⅞	1⅛	1½	1⅞	1⅞	2¾	2¾	3⅜
3	2¾	3⅛	3½	3½	4¼	4⅞	6⅞	1 3/16	1 11/16	2 1/16	2 1/16	2⅜	3⅛	3⅞
3½	2 13/16	3 3/16	3⅝	3⅝	—	—	—	1¼	1¾	2 3/16	2 3/16	—	—	—
4	3	3⅜	3¾	4¼	4¾	5⅛	7¾	1 5/16	1⅞	2¼	2⅜	3	3 13/16	4½
5	3½	3⅞	4¼	4¾	5¼	6⅜	9¼	1 7/16	2	2⅜	2⅝	3⅜	4⅜	5⅜
6	3½	3⅞	4 5/16	4⅞	5¾	7	11	1 9/16	2 1/16	2½	2⅞	3⅝	4 15/16	6¼
8	4	4⅜	4⅞	5½	6⅝	8⅝	12¾	1¾	2 7/16	2 15/16	3¼	4¼	5⅞	7¼
10	4	4⅝	5⅛	6¼	7½	10¼	16¾	1 15/16	2⅝	3⅛	3⅝	4½	6½	9¼
12	4½	5⅛	5⅝	6⅜	8⅛	11⅜	18½	2 3/16	2⅞	3⅜	3⅞	4⅞	7⅜	10¼
14	5	5⅝	6⅛	6¾	8⅝	12	—	2¼	3	3 9/16	3 15/16	5⅜	—	—
16	5	5¾	6¼	7¼	8¾	12½	—	2½	3¼	3 15/16	4 7/16	5½	—	—
18	5½	6¼	6¾	7½	9¼	13⅛	—	2 11/16	3½	4⅛	4⅞	6¼	—	—
20	5 11/16	6⅜	6⅞	7¾	10	14¼	—	2⅞	3¾	4¼	5¼	6½	—	—
22	—	—	—	—	—	—	—	—	—	—	—	—	—	—
24	6	6⅝	7⅛	8¼	11¾	16¼	—	3¼	4 3/16	4¾	5¾	8¼	—	—
26	—	—	—	—	—	—	—	—	—	—	—	—	—	—
30	—	—	—	—	—	—	—	—	—	—	—	—	—	—
36	—	—	—	—	—	—	—	—	—	—	—	—	—	—

DIMENSIONS ARE SHOWN IN INCHES. TOLERANCES ARE GIVEN ON PAGE 116. *INCLUDES RAISED FACE.

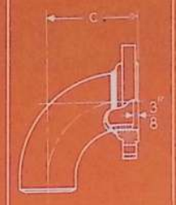
Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 66 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/66

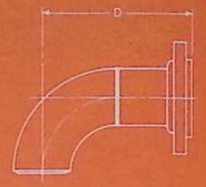
COMBINATION DIMENSIONS

FLANGES AND ELBOWS









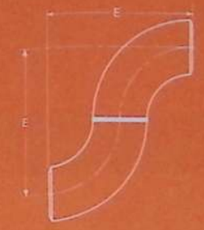
Nom. Pipe Size	150 LB. WELDING NECK FLG. with:				300 LB. WELDING NECK FLG. with:				SLIP-ON FLANGE with:*		LAP JOINT STUB and FLANGE with:			
	Long Radius 90° Elbow		Short Radius 90° Elbow		Long Radius 90° Elbow		Short Radius 90° Elbow		Long Radius, Long Tangent 90° Ell	Short Radius, Long Tangent 90° Ell	Long Radius 90° Elbow		Short Radius 90° Elbow	
	ASA Type	Long Tangent	Regular Type	Long Tangent	ASA Type	Long Tangent	Regular Type	Long Tangent			ASA Type	Long Tangent	Regular Type	Long Tangent
	A	A	A	A	B	B	B	B	C	C	D	D	D	D
½	3⅜	—	—	—	3⁹⁄₁₆	—	—	—	—	—	4½	—	—	—
¾	3¹³⁄₁₆	—	—	—	3⅜	—	—	—	—	—	4⅛	—	—	—
1	3¹¹⁄₁₆	—	3¹³⁄₁₆	—	3¹⁵⁄₁₆	—	3⁷⁄₁₆	—	—	—	5½	—	5	—
1¼	4⅛	—	3½	—	4⁷⁄₁₆	—	3¹³⁄₁₆	—	—	—	5⅞	—	5¼	—
1½	4¹¹⁄₁₆	—	3¹⁵⁄₁₆	—	4¹⁵⁄₁₆	—	4³⁄₁₆	—	—	—	6¼	—	5½	—
2	5½	6	4½	—	5¾	6¼	4¾	—	3⅞	—	9	9½	8	—
2½	6½	7⅛	5¼	—	6¾	7⅜	5½	—	4¾	—	9¾	10⅜	8½	—
3	7¼	8	5¾	—	7⅝	8⅜	6⅛	—	5⅜	—	10½	11¼	9	—
3½	8¹⁄₁₆	8¹⁵⁄₁₆	6⁵⁄₁₆	—	8⁷⁄₁₆	9⁵⁄₁₆	6¹¹⁄₁₆	—	6½	—	11¼	12⅛	9½	—
4	9	10	7	—	9⅜	10⅜	7⅜	—	7⅜	—	12	13	10	—
5	11	12¼	8½	—	11⅜	12⅝	8⅞	—	9⅛	—	15½	16¾	13	—
6	12½	14	9½	—	12⅞	14⅜	9⅞	—	10⅞	—	17	18½	14	—
8	16	18	12	—	16⅜	18⅜	12⅜	—	14⅜	—	20	22	16	—
10	19	21½	14	—	19⅝	22⅛	14⅝	—	17⅞	—	25	27½	20	—
12	22½	25½	16½	—	23⅛	26⅛	17⅛	—	21⅜	—	28	31	22	—
14	26	29½	19	22½	26⅝	30⅛	19⅝	23⅛	24⅞	17⅞	33	36½	26	29½
16	29	33	21	25	29¾	33¾	21¾	25¾	28⅜	20⅜	36	40	28	32
18	32½	37	23½	27½	33¼	37¾	24¼	28¾	31⅞	22⅞	39	43½	30	34½
20	35¹¹⁄₁₆	40¹¹⁄₁₆	25¹¹⁄₁₆	30¹¹⁄₁₆	36⅜	41⅜	26⅜	31⅜	35⅜	25⅜	42	47	32	37
22	—	—	—	—	—	—	—	—	—	—	—	—	—	—
24	42	48	30	36	42⅝	48⅝	30⅝	36⅝	42⅜	30⅜	48	54	36	42
26	Flange length not standard								45⅜	32⅜	—	—	—	—
30									51⅜	36⅜	—	—	—	—
36									60⅜	42⅜	—	—	—	—

*Slip-On flanges can also be used with no-tangent elbows, but generally a portion of the inside of the flange hub must be removed in order to set the flange back on the fitting.

DIMENSIONS are shown in inches, and are based on the use of commonly accepted welding procedures, without backing rings. Detailed dimensions of all components are given on pages 126-127.

90° AND 45° ELBOW OFFSETS

COMBINATION DIMENSIONS





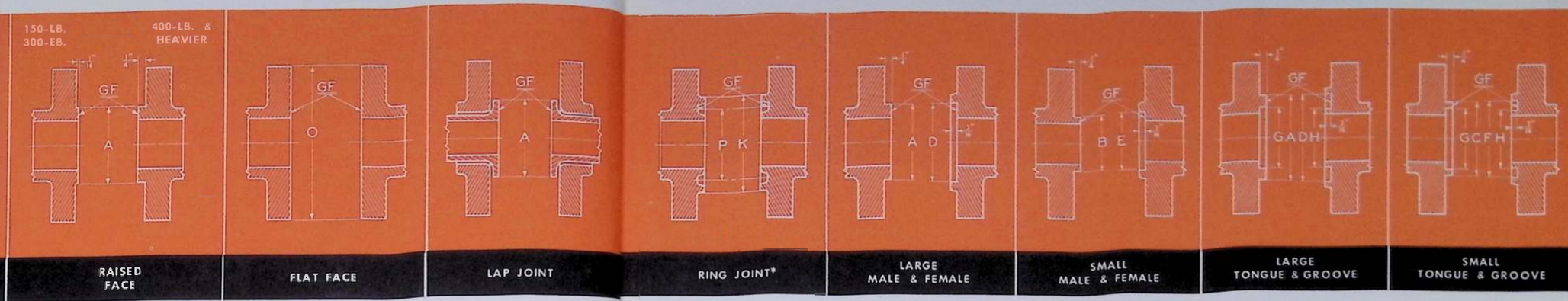
Nom. Pipe Size	LONG RADIUS ASA 90° ELL with:				L.R., LONG TANGENT 90° ELL with:			S.R., REG. 90° ELL with:		S.R., L.T. 90° ELL with:	LONG RADIUS ASA 45° ELL with:				L.R., LONG TANG. 45° ELL with:	
	Long Radius 90° Elbow		Short Radius 90° Elbow		Long Radius, Long Tang. 90° Ell	Short Radius 90° Elbow		Short Radius 90° Elbow		Short Radius, Long Tang. 90° Ell	Long Radius ASA 45° Ell		Long Radius, Long Tangent 45° Ell		Long Radius, Long Tangent 45° Ell	
	ASA Type	Long Tang.	Reg. Type	Long Tang.		Reg. Type	Long Tang.	Reg. Type	Long Tang.							
	E	E	E	E	E	E	E	E	E	E	F	G	F	G	F	G
½	3	—	—	—	—	—	—	—	—	—	⅞	2⅛	—	—	—	—
¾	2¼	—	—	—	—	—	—	—	—	—	⅝	1½	—	—	—	—
1	3	—	2½	—	—	—	—	2	—	—	1¼	3	—	—	—	—
1¼	3¾	—	3⅛	—	—	—	—	2½	—	—	1⁷⁄₁₆	3⁷⁄₁₆	—	—	—	—
1½	4½	—	3¾	—	—	—	—	3	—	—	1⁹⁄₁₆	3¹³⁄₁₆	—	—	—	—
2	6	6½	5	—	7	5½	—	4	—	—	1¹⁵⁄₁₆	4¹¹⁄₁₆	2⁵⁄₁₆	5⁹⁄₁₆	2⅝	6⅜
2½	7½	8⅛	6¼	—	8¾	6⅞	—	5	—	—	2½	6	2¹⁵⁄₁₆	7⅛	3⅜	8⅛
3	9	9¾	7½	—	10½	8¼	—	6	—	—	2¹³⁄₁₆	6¹³⁄₁₆	3⅜	8⅛	3⅞	9⅜
3½	10½	11⅜	8¾	—	12¼	9⅝	—	7	—	—	3⅜	7¹¹⁄₁₆	3¹³⁄₁₆	9⁵⁄₁₆	4⅞	10¹¹⁄₁₆
4	12	13	10	—	14	11	—	8	—	—	3⁹⁄₁₆	8⅝	4¼	10¼	4¹⁵⁄₁₆	11¹⁵⁄₁₆
5	15	16¼	12½	—	17½	13¾	—	10	—	—	4⅞	10¹¹⁄₁₆	5⅝	12¹³⁄₁₆	6³⁄₁₆	14¹⁵⁄₁₆
6	18	19½	15	—	21	16½	—	12	—	—	5⅝	12¹³⁄₁₆	6⅜	15⅜	7⅛	17¹⁵⁄₁₆
8	24	26	20	22	28	22	24	16	18	20	7⅛	17⅛	8½	20½	9⅞	23⅞
10	30	32½	25	27½	35	27½	30	20	22½	25	8¹³⁄₁₆	21⅝	10⅜	25⅝	12⅜	29⅞
12	36	39	30	33	42	33	36	24	27	30	10⅜	25⅝	12¾	30¾	14⅞	35⅞
14	42	45½	35	38½	49	38½	42	28	31½	35	12⅜	29⅞	14⅞	35⅞	17⅜	41¹³⁄₁₆
16	48	52	40	44	56	44	48	32	36	40	14⅛	34⅛	17	41	19¹³⁄₁₆	47¹³⁄₁₆
18	54	58½	45	49½	63	49½	54	36	40½	45	15¹⁵⁄₁₆	38⅞	19⅛	46⅛	22¼	53¾
20	60	65	50	55	70	55	60	40	45	50	17¹¹⁄₁₆	42¹¹⁄₁₆	21⅜	51⅜	24¾	59¾
22	66	71½	—	—	77	—	—	—	—	—	19⅛	46⅛	—	—	—	—
24	72	78	60	66	84	66	72	48	54	60	21⅜	51⅜	25⅞	61⅞	29¹¹⁄₁₆	71¹¹⁄₁₆
26	78	84	65	71	90	71	77	52	58	64	22⅝	54⅝	26⅞	64⅞	31⅛	75⅛
30	90	96	75	81	102	81	87	60	66	72	26⅜	63⅜	30⅜	73⅜	34⅝	83⅝
36	108	114	90	96	120	96	102	72	78	84	31⅞	75¹⁵⁄₁₆	—	—	—	—

SLIP-ON AND LAP JOINT combination dimensions will apply regardless of flange pressure rating.

TANGENT LENGTH of Long Tangent elbows may be shortened by torch-cutting to provide intermediate dimensions.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 67 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/67

FLANGE FACING AND GASKET DIMENSIONS



RAISED FACE • FLAT FACE • LAP JOINT

Nom. Pipe Size	Flange Facings		Gasket Dimensions									Nom. Pipe Size
	Outside Diameter		Outside Diameter							Full Face Type	Inside Diameter	
	Raised Face, Lap Joint	Flat Face	Flat Ring Type								Flat Ring or Full Face Type	
	A	O	150 lb.	300 lb.	400 lb.	600 lb.	900 lb.	1500 lb.	2500 lb.			
½	1⅜	Same as flange outside diameter See pages 88-101	1⅞	2⅛	2⅛	2⅛	2½	2½	2¾	Same as flange outside diameter See pages 88-101	27/32	½
¾	1 11/16		2¼	2⅝	2⅝	2⅝	2¾	2¾	3		1 1/16	¾
1	2		2⅝	2⅞	2⅞	2⅞	3⅛	3⅛	3⅜		1 5/16	1
1¼	2½		3	3¼	3¼	3¼	3½	3½	4⅛		1 21/32	1¼
1½	2⅞		3⅜	3¾	3¾	3¾	3⅞	3⅞	4⅝		1 29/32	1½
2	3⅝		4⅛	4⅜	4⅜	4⅜	5⅝	5⅝	5¾		2⅜	2
2½	4⅛		4⅞	5⅛	5⅛	5⅛	6½	6½	6⅝		2⅞	2½
3	5		5⅜	5⅞	5⅞	5⅞	6⅝	6⅞	7¾		3½	3
3½	5½		6⅜	6½	6⅜	6⅜	—	—	—		4	3½
4	6 3/16		6⅞	7⅛	7	7⅝	8⅛	8¼	9¼		4½	4
5	7 5/16		7¾	8½	8⅜	9½	9¾	10	11		5 5/16	5
6	8½		8¾	9⅞	9¾	10½	11⅜	11⅛	12½		6⅝	6
8	10⅝		11	12⅛	12	12⅝	14⅛	13⅞	15¼		8⅝	8
10	12¾		13⅜	14¼	14⅛	15¾	17⅛	17⅛	18¾		10¾	10
12	15		16⅛	16⅝	16½	18	19⅝	20½	21⅝		12¾	12
14	16¼		17¾	19⅛	19	19⅜	20½	22¾	—		14	14
16	18½		20¼	21¼	21⅛	22¼	22⅝	25¼	—		16	16
18	21		21⅜	23½	23⅜	24⅛	25⅛	27¾	—		18	18
20	23		23⅞	25¾	25½	26⅞	27½	29¾	—		20	20
24	27¼		28¼	30½	30¼	31⅛	33	35½	—		24	24

DIMENSIONS are shown in inches, and conform to ASA Standards B16.5 and B16.21, where applicable.

GASKET FACING is indicated on the facing sketches by "GF."

1/16" RAISED FACE is standard for 150 and 300 lb. Welding Neck, Slip-on, Screwed and Blind Flanges, and is included in the flange thickness.

¼" RAISED FACE is standard for 400 lb. and heavier Welding Neck, Slip-on, Screwed and Blind Flanges, and is **not** included in the flange thickness.

LAP JOINT flanges are commonly furnished without a raised face, the rolled lap on the pipe itself forming a raised contact surface.

FINISH: Raised Face, Male, Female or Tongue face—see pages 86-87. Groove face—grooves over 1" in width, as above; 1" wide or less, smooth finish. Ring Joint face—smooth finish.

TOLERANCE of ± 1/64" is allowed on inside and outside diameter on all facings.

When small male and female gaskets are required, purchaser must specify inside diameter of pipe.

MALE & FEMALE • TONGUE & GROOVE

Nom. Pipe Size	Flange Facings								Gasket Dimensions					Nom. Pipe Size
	Outside Diameter						Inside Diam.		Outside Diameter			Inside Diam.		
	Large Male; Large Tongue	Small Male	Small Tongue	Large Female; Large Groove	Small Female	Small Groove	Large Tongue; Small Tongue	Large Groove; Small Groove	Lrg. Male & Female; Lrg. Tongue & Groove	Small Male & Female	Small Tongue & Groove	Large Male & Female	Large or Small Tongue & Groove	
	A	B	C	D	E	F	G	H						
½	1⅜	2 3/32	1⅜	1 7/16	2 5/32	1 7/16	1	1 5/16	1⅜	2 3/32	1⅜	27/32	1	½
¾	1 1/16	1 5/16	1 1/16	1¾	1	1¾	1 5/16	1¼	1 1/16	1 5/16	1 1/16	1 1/16	1 5/16	¾
1	2	1 3/16	1⅞	2 1/16	1¼	1 15/16	1½	1 7/16	2	1 3/16	1⅞	1 5/16	1½	1
1¼	2½	1½	2¼	2 9/16	1 9/16	2 5/16	1⅞	1 13/16	2½	1½	2¼	1 21/32	1⅞	1¼
1½	2⅞	1¾	2½	2 15/16	1 13/16	2 9/16	2⅛	2 1/16	2⅞	1¾	2½	1 29/32	2⅛	1½
2	3⅝	2¼	3¼	3 1/16	2 5/16	3 5/16	2⅞	2 13/16	3⅜	2¼	3¼	2⅜	2⅞	2
2½	4⅛	2 1/16	3¾	4 3/16	2¾	3 13/16	3⅜	3 5/16	4⅛	2 1/16	3¾	2⅞	3⅜	2½
3	5	3 5/16	4⅝	5 1/16	3⅜	4 1/16	4¼	4 3/16	5	3 5/16	4⅝	3½	4¼	3
3½	5½	3 13/16	5⅛	5 9/16	3⅞	5 5/16	4¾	4 11/16	5½	3 13/16	5⅛	4	4¾	3½
4	6 3/16	4 5/16	5 1/16	6¼	4⅜	5¾	5 3/16	5⅛	6 3/16	4 5/16	5 1/16	4½	5 3/16	4
5	7 5/16	5⅜	6 13/16	7⅜	5 7/16	6⅞	6 5/16	6¼	7 5/16	5⅜	6 13/16	5 5/16	6 5/16	5
6	8½	6⅜	8	8 9/16	6 7/16	8 1/16	7½	7 7/16	8½	6⅜	8	6⅜	7½	6
8	10⅝	8⅜	10	10 11/16	8 7/16	10 1/16	9⅜	9 5/16	10⅝	8⅜	10	8⅜	9⅜	8
10	12¾	10½	12	12 13/16	10 9/16	12 1/16	11¼	11 3/16	12¾	10½	12	10¾	11¼	10
12	15	12½	14¼	15 1/16	12 9/16	14 5/16	13½	13 7/16	15	12½	14¼	12¾	13½	12
14	16¼	13¾	15½	16 5/16	13 13/16	15 5/16	14¾	14 11/16	16¼	13¾	15½	14	14¾	14
16	18½	15¾	17⅝	18 9/16	15 13/16	17 11/16	16¾	16 11/16	18½	15¾	17⅝	16	16¾	16
18	21	17¾	20⅛	21 1/16	17 13/16	20 3/16	19¼	19 3/16	21	17¾	20⅛	18	19¼	18
20	23	19¾	22	23 1/16	19 13/16	22 1/16	21	20 15/16	23	19¾	22	20	21	20
24	27¼	23¾	26¼	27 5/16	23 13/16	26 5/16	25¼	25 5/16	27¼	23¾	26¼	24	25¼	24

*See detailed dimensions on pages 132-133.

DIMENSIONS are shown in inches, and conform to ASA Standards B16.5 and B16.21, where applicable.

GASKET FACING is indicated on the facing sketches by "GF."

1/16" RAISED FACE is standard for 150 and 300 lb. Welding Neck, Slip-on, Screwed and Blind Flanges, and is included in the flange thickness.

¼" RAISED FACE is standard for 400 lb. and heavier Welding Neck, Slip-on, Screwed and Blind Flanges, and is **not** included in the flange thickness.

LAP JOINT flanges are commonly furnished without a raised face, the rolled lap on the pipe itself forming a raised contact surface.

FINISH: Raised Face, Male, Female or Tongue face—see pages 86-87. Groove face—grooves over 1" in width, as above; 1" wide or less, smooth finish. Ring Joint face—smooth finish.

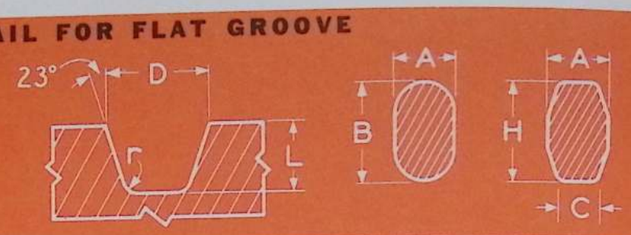
TOLERANCE of ± 1/64" is allowed on inside and outside diameter on all facings.

When small male and female gaskets are required, purchaser must specify inside diameter of pipe.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 68 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/68

RING JOINT DIMENSIONS

DETAIL FOR FLAT GROOVE



Nominal Pipe Size	Pitch Diameter of Ring & Groove	Diameter of Raised Face	GROOVE		RING					Approximate distance between flanges when joint is compressed				Nominal Pipe Size
							Height		Width of Flat on Octagonal Ring					
			Width	Depth	Ring Number	Width	Oval	Octagonal						
	P†	K†	D	L		A	B	H	C	150 lb.	300 lb.	400 lb.	600 lb.	
150 LB.														
1 1¼	1⅞ 2¼	2½ 2⅞	1½ 1½	¼ ¼	R15 R17	5/16 5/16	9/16 9/16	½ ½	0.206 0.206	5/32 5/32	— —	— —	— —	1 1¼
1½ 2	2⅝ 3¼	3¼ 4	1½ 1½	¼ ¼	R19 R22	5/16 5/16	9/16 9/16	½ ½	0.206 0.206	5/32 5/32	— —	— —	— —	1½ 2
2½ 3 3½	4 4½ 5⅛	4¾ 5¼ 6⅛	1½ 1½ 1½	¼ ¼ ¼	R25 R29 R33	5/16 5/16 5/16	9/16 9/16 9/16	½ ½ ½	0.206 0.206 0.206	5/32 5/32 5/32	— — —	— — —	— — —	2½ 3 3½
4 5 6	5⅞ 6¾ 7⅜	6¾ 7⅝ 8⅝	1½ 1½ 1½	¼ ¼ ¼	R36 R40 R43	5/16 5/16 5/16	9/16 9/16 9/16	½ ½ ½	0.206 0.206 0.206	5/32 5/32 5/32	— — —	— — —	— — —	4 5 6
8 10 12	9¾ 12 15	10¾ 13 16	1½ 1½ 1½	¼ ¼ ¼	R48 R52 R56	5/16 5/16 5/16	9/16 9/16 9/16	½ ½ ½	0.206 0.206 0.206	5/32 5/32 5/32	— — —	— — —	— — —	8 10 12
14 16 18	15⅜ 17⅞ 20⅜	16¾ 19 21½	1½ 1½ 1½	¼ ¼ ¼	R59 R64 R68	5/16 5/16 5/16	9/16 9/16 9/16	½ ½ ½	0.206 0.206 0.206	⅛ ⅛ 7/16	— — —	— — —	— — —	14 16 18
20 24	22 26½	23½ 28	1½ 1½	¼ ¼	R72 R76	5/16 5/16	9/16 9/16	½ ½	0.206 0.206	⅛ ⅛	— —	— —	— —	20 24
300, 400, 600 LB.														
½ ¾ 1	1 11/32 1 11/16 2	2 2½ 2¾	9/32 11/32 1½	7/32 ¼ ¼	R11 R13 R16	¼ 5/16 5/16	7/16 9/16 9/16	3/8 ½ ½	0.170 0.206 0.206	— — —	⅛ 5/32 5/32	⅛ 5/32 5/32	⅛ 5/32 5/32	½ ¾ 1
1¼ 1½ 2	2⅜ 2 1/16 3¼	3⅛ 3⅝ 4¼	1½ 1½ 1½	¼ ¼ 5/16	R18 R20 R23	5/16 5/16 7/16	9/16 9/16 1 1/16	½ ½ ⅝	0.206 0.206 0.305	— — —	5/32 5/32 7/32	5/32 5/32 5/16	5/32 5/32 5/16	1¼ 1½ 2
2½ 3 3½	4 4⅞* 5 3/16	5 5¾ 6¼	1 5/32 1 5/32 1 5/32	5/16 5/16 5/16	R26 R31* R34	7/16 7/16 7/16	1 1/16 1 1/16 1 1/16	⅝ ⅝ ⅝	0.305 0.305 0.305	— — —	7/32 7/32 7/32	5/16 5/16 5/16	5/16 5/16 5/16	2½ 3 3½
4 5 6	5⅞ 7⅛ 8 5/16	6⅞ 8¼ 9½	1 5/32 1 5/32 1 5/32	5/16 5/16 5/16	R37 R41 R45	7/16 7/16 7/16	1 1/16 1 1/16 1 1/16	⅝ ⅝ ⅝	0.305 0.305 0.305	— — —	7/32 7/32 7/32	7/32 7/32 7/32	5/16 5/16 5/16	4 5 6
8 10 12	10⅜ 12¾ 15	11⅞ 14 16¼	1 5/32 1 5/32 1 5/32	5/16 5/16 5/16	R49 R53 R57	7/16 7/16 7/16	1 1/16 1 1/16 1 1/16	⅝ ⅝ ⅝	0.305 0.305 0.305	— — —	7/32 7/32 7/32	7/32 7/32 7/32	5/16 5/16 5/16	8 10 12
14 16 18	16½ 18½ 21	18 20 22⅝	1 5/32 1 5/32 1 5/32	5/16 5/16 5/16	R61 R65 R69	7/16 7/16 7/16	1 1/16 1 1/16 1 1/16	⅝ ⅝ ⅝	0.305 0.305 0.305	— — —	7/32 7/32 7/32	7/32 7/32 7/32	5/16 5/16 5/16	14 16 18
20 24	23 27¼	25 29½	1 7/32 2 1/32	3/8 7/16	R73 R77	½ ⅝	¾ ⅞	1 1/16 1 3/16	0.341 0.413	— —	7/32 ¼	7/32 ¼	5/16 7/32	20 24

†See flange drawing on page 131.
*For 3" lap joint stub ends, 300, 400, and 600 lb. pressure ratings, P=4⅜", and ring number is R30.
DIMENSIONS are shown in inches, and conform to ASA Standards B16.5 and B16.20.

TOLERANCES
P (of groove) ± .005"
P (of ring) ± .007"
D ± .008"
L + 1/64" −0"
A ± .008"
B ± 1/64"
H ± 1/64"
C ± .008"
FLAT BOTTOMED GROOVE, as shown in detail above, will be furnished unless otherwise specified.
CORNER RADIUS "r" is
1/32" for groove width 1 3/32" and smaller,
1/16" for groove width 1/2" to 2 5/32",
3/32" for groove width 7/8" and larger.

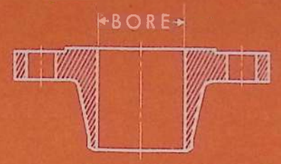
(CONTINUED ON FOLLOWING PAGE)

(CONTINUED FROM PRECEDING PAGE)

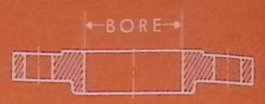
Nominal Pipe Size	Pitch Diameter of Ring & Groove	Diameter of Raised Face	GROOVE		RING					Approx. distance between flanges when joint is comp.	Nominal Pipe Size
							Height		Width of Flat on Octagonal Ring		
			Width	Depth	Ring Number	Width	Oval	Octagonal			
	P†	K†	D	L		A	B	H	C		
900 LB.											
½ ¾	1 9/16 1¾	2⅜ 2⅝	1 1/32 1 1/32	¼ ¼	R12 R14	5/16 5/16	9/16 9/16	½ ½	0.206 0.206	5/32 5/32	½ ¾
1 1¼ 1½	2 2⅜ 2 1/16	2 13/16 3 3/16 3⅝	1 1/32 1 1/32 1 1/32	¼ ¼ ¼	R16 R18 R20	5/16 5/16 5/16	9/16 9/16 9/16	½ ½ ½	0.206 0.206 0.206	5/32 5/32 5/32	1 1¼ 1½
2 2½ 3	3¾ 4¼ 4⅞	4⅞ 5⅜ 6⅛	1 5/32 1 5/32 1 5/32	5/16 5/16 5/16	R24 R27 R31	7/16 7/16 7/16	1 1/16 1 1/16 1 1/16	⅝ ⅝ ⅝	0.305 0.305 0.305	⅛ ⅛ 5/32	2 2½ 3
4 5 6	5⅞ 7⅛ 8 5/16	7⅛ 8½ 9½	1 5/32 1 5/32 1 5/32	5/16 5/16 5/16	R37 R41 R45	7/16 7/16 7/16	1 1/16 1 1/16 1 1/16	⅝ ⅝ ⅝	0.305 0.305 0.305	5/32 5/32 5/32	4 5 6
8 10 12	10⅝ 12⅞ 15	12⅛ 14¼ 16½	1 5/32 1 5/32 1 5/32	5/16 5/16 5/16	R49 R53 R57	7/16 7/16 7/16	1 1/16 1 1/16 1 1/16	⅝ ⅝ ⅝	0.305 0.305 0.305	5/32 5/32 5/32	8 10 12
14 16 18	16½ 18½ 21	18⅜ 20⅝ 23⅜	2 1/32 2 1/32 2 5/32	7/16 7/16 ½	R62 R66 R70	⅝ ⅝ ¾	⅞ ⅞ 1	1 3/16 1 3/16 1 5/16	0.413 0.413 0.485	5/32 5/32 3/16	14 16 18
20 24	23 27¼	25½ 30⅜	2 5/32 1 1/16	½ ⅝	R74 R78	¾ 1	1 1 3/16	1 5/16 1¼	0.485 0.681	3/16 7/32	20 24
1500 LB.											
½ ¾	1 9/16 1¾	2⅜ 2⅝	1 1/32 1 1/32	¼ ¼	R12 R14	5/16 5/16	9/16 9/16	½ ½	0.206 0.206	5/32 5/32	½ ¾
1 1¼ 1½	2 2⅜ 2 1/16	2 13/16 3 3/16 3⅝	1 1/32 1 1/32 1 1/32	¼ ¼ ¼	R16 R18 R20	5/16 5/16 5/16	9/16 9/16 9/16	½ ½ ½	0.206 0.206 0.206	5/32 5/32 5/32	1 1¼ 1½
2 2½ 3	3¾ 4¼ 5⅜	4⅞ 5⅜ 6⅝	1 5/32 1 5/32 1 5/32	5/16 5/16 5/16	R24 R27 R35	7/16 7/16 7/16	1 1/16 1 1/16 1 1/16	⅝ ⅝ ⅝	0.305 0.305 0.305	⅛ ⅛ ⅛	2 2½ 3
4 5 6	6⅜ 7⅝ 8 5/16	7⅝ 9 9¾	1 5/32 1 5/32 1 7/32	5/16 5/16 ⅜	R39 R44 R46	7/16 7/16 ½	1 1/16 1 1/16 ¾	⅝ ⅝ 1 1/16	0.305 0.305 0.341	⅛ ⅛ ⅛	4 5 6
8 10 12	10⅝ 12¾ 15	12½ 14⅝ 17¼	2 1/32 2 1/32 2 9/32	7/16 7/16 9/16	R50 R54 R58	⅝ ⅝ ⅞	⅞ ⅞ 1 ⅛	1 3/16 1 3/16 1 1/16	0.413 0.413 0.583	5/32 5/32 3/16	8 10 12
14 16 18	16½ 18½ 21	19¼ 21½ 24⅛	1 1/16 1 3/16 1 3/16	⅝ 1 1/16 1 1/16	R63 R67 R71	1 1 ⅛ 1 ⅛	1 3/16 1 7/16 1 7/16	1¼ 1 3/8 1 3/8	0.681 0.780 0.780	7/32 3/16 5/16	14 16 18
20 24	23 27¼	26½ 31¼	1 5/16 1 7/16	1 1/16 1 3/16	R75 R79	1¼ 1 3/8	1 5/16 1¾	1½ 1 5/8	0.879 0.977	⅜ 7/16	20 24
2500 LB.											
½ ¾ 1	1 1/16 2 2⅜	2 5/16 2⅞ 3¼	1 1/32 1 1/32 1 1/32	¼ ¼ ¼	R13 R16 R18	5/16 5/16 5/16	9/16 9/16 9/16	½ ½ ½	0.206 0.206 0.206	5/32 5/32 5/32	½ ¾ 1
1¼ 1½ 2	2 27/32 3¼ 4	4 4½ 5¼	1 5/32 1 5/32 1 5/32	5/16 5/16 5/16	R21 R23 R26	7/16 7/16 7/16	1 1/16 1 1/16 1 1/16	⅝ ⅝ ⅝	0.305 0.305 0.305	⅛ ⅛ ⅛	1¼ 1½ 2
2½ 3 4	4⅜ 5 6 3/16	5⅞ 6⅝ 8	1 7/32 1 7/32 2 1/32	⅜ ⅜ 7/16	R28 R32 R38	½ ½ ⅝	¾ ¾ ⅞	1 1/16 1 1/16 1 3/16	0.341 0.341 0.413	⅛ ⅛ 5/32	2½ 3 4
5 6 8	7½ 9 11	9½ 11 13⅜	2 5/32 2 5/32 2 9/32	½ ½ 9/16	R42 R47 R51	¾ ¾ ⅞	1 1 1 ⅛	1 5/16 1 5/16 1 1/16	0.485 0.485 0.583	5/32 5/32 3/16	5 6 8
10 12	13½ 16	16¾ 19½	1 3/16 1 3/16	1 1/16 1 1/16	R55 R60	1 ⅛ 1¼	1 7/16 1 5/16	1 3/8 1½	0.780 0.879	¼ 5/16	10 12

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 69 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/69

FLANGE BORES
MINIMUM



WELDING NECK



SLIP-ON
OR SCREWED

WELDING NECK FLANGES

Nominal Pipe Size	Inside Pipe Diameter				Minimum Finished Bore							Nominal Pipe Size
	Standard	Extra Strong	Schedule 160	Double Ex. Stg.	150 lb.	300 lb.	400 lb.	600 lb.	900 lb.	1500 lb.	2500 lb.	
½	0.622	0.546	0.464	0.252	*	*	*	*	*	*	*	½
¾	0.824	0.742	0.612	0.434	*	*	*	*	*	*	*	¾
1	1.049	0.957	0.815	0.599	*	*	*	*	*	*	*	1
1¼	1.380	1.278	1.160	0.896	*	*	*	*	*	*	*	1¼
1½	1.610	1.500	1.338	1.100	*	*	*	*	*	*	*	1½
2	2.067	1.939	1.687	1.503	1.50	1.81	1.53	1.53	*	*	*	2
2½	2.469	2.323	2.125	1.771	2.21	2.21	2.21	2.21	*	*	*	2½
3	3.068	2.900	2.624	2.300	2.80	2.80	2.21	2.21	2.21	2.15	2.13	3
3½	3.548	3.364	—	2.728	3.30	3.34	3.34	3.34	—	—	—	3½
4	4.026	3.826	3.438	3.152	3.78	3.75	3.75	3.37	3.12	3.09	3.09	4
5	5.047	4.813	4.313	4.063	4.75	4.75	4.75	4.31	4.00	3.93	3.63	5
6	6.065	5.761	5.187	4.897	5.71	5.65	5.65	4.78	4.78	4.78	4.62	6
8	7.981	7.625	6.813	6.875	7.59	7.40	7.40	6.81	6.81	6.81	6.13	8
10	10.020	9.750	8.500	8.750	9.43	9.43	9.43	9.00	8.34	8.15	8.13	10
12	12.000	11.750	10.126	10.750	11.34	11.25	11.25	10.62	10.12	10.12	9.50	12
14	13.250	13.000	11.188	—	12.78	12.71	12.71	12.50	12.50	12.50	—	14
16	15.250	15.000	12.812	—	14.71	14.69	14.50	14.19	14.50	14.50	—	16
18	17.250	17.000	14.438	—	17.00	16.88	16.50	16.50	16.50	16.50	—	18
20	19.250	19.000	16.062	—	19.00	18.81	18.50	18.37	18.50	18.50	—	20
24	23.250	23.000	19.312	—	23.00	22.88	22.50	22.50	22.50	22.50	—	24

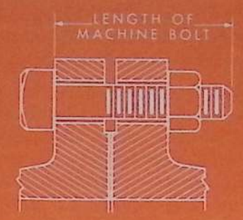
SLIP-ON FLANGES

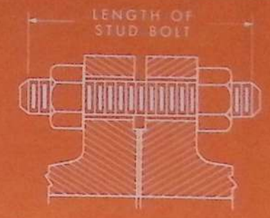
Nominal Pipe Size	Outside Pipe Diameter	Minimum Finished Bore						REDUCING SCREWED FLGS.	
		150 lb.	300 lb.	400 lb.	600 lb.	900 lb.	1500 lb.	Nominal Pipe Size	Smallest Size Tapping For Hub Flange
½	0.840	*	*	*	*	*	*	½	*
¾	1.050	*	*	*	*	*	*	¾	*
1	1.315	*	*	*	*	*	*	1	½
1¼	1.660	1.34	1.40	1.40	1.40	1.40	1.40	1¼	½
1½	1.900	1.68	1.68	1.68	1.68	1.68	1.68	1½	½
2	2.375	2.18	2.18	2.18	2.18	1.87	1.87	2	1
2½	2.875	2.62	2.65	2.65	2.65	2.21	2.21	2½	1¼
3	3.500	3.18	3.18	3.18	3.18	2.96	3.00	3	1¼
3½	4.000	3.68	3.68	3.43	3.68	—	—	3½	1½
4	4.500	4.18	4.18	4.18	3.87	3.93	4.00	4	1½
5	5.563	5.25	5.21	5.21	5.25	5.25	4.71	5	1½
6	6.625	6.28	6.31	6.31	6.31	6.31	6.46	6	2½
8	8.625	8.31	8.00	8.00	8.37	8.56	8.37	8	3
10	10.750	10.40	10.40	10.40	10.40	9.00	9.00	10	3½
12	12.750	12.46	12.40	12.40	12.43	11.00	11.00	12	3½
14	14.000	13.53	13.62	13.00	13.00	13.00	13.00	14	3½
16	16.000	15.62	15.00	15.00	15.00	15.00	15.00	16	4
18	18.000	17.00	17.00	17.00	17.00	17.00	17.00	18	4
20	20.000	19.00	19.00	19.00	19.00	19.00	19.00	20	4
24	24.000	23.00	23.00	23.00	23.00	23.00	23.00	24	4

*These sizes are made from solid forgings, and can be bored to any diameter.
DIMENSIONS are shown in inches.

SMALLER BORES for reducing screwed flanges will be furnished as blind flanges tapped as required.

Inside and outside pipe diameters are shown for convenient references.





BOLT AND STUD
DIMENSIONS

Nominal Pipe Size	150 LB. FLANGES				300 LB. FLANGES				400 LB. FLANGES			Nominal Pipe Size
	Number of Bolts	Diam. of Bolts	Length Mach. Bolts	Length Stud Bolts	Number of Bolts	Diam. of Bolts	Length Mach. Bolts	Length Stud Bolts	Number of Bolts	Diam. of Bolts	Length of Stud Bolts	
½	4	½	1¾	2¼	4	½	2	2½	4	½	3	½
¾	4	½	2	2¼	4	⅝	2½	2¾	4	⅝	3¼	¾
1	4	½	2	2½	4	⅝	2½	3	4	⅝	3½	1
1¼	4	½	2¼	2½	4	⅝	2¾	3	4	⅝	3¾	1¼
1½	4	½	2¼	2¾	4	¾	3	3½	4	¾	4	1½
2	4	⅝	2¾	3	8	⅝	3	3¼	8	⅝	4	2
2½	4	⅝	3	3¼	8	¾	3¼	3¾	8	¾	4½	2½
3	4	⅝	3	3½	8	¾	3½	4	8	¾	4¾	3
3½	8	⅝	3	3½	8	¾	3¾	4¼	8	⅞	5¼	3½
4	8	⅝	3	3½	8	¾	3¾	4¼	8	⅞	5¼	4
5	8	¾	3¼	3¾	8	¾	4	4½	8	⅞	5½	5
6	8	¾	3¼	3¾	12	¾	4¼	4¾	12	⅞	5¾	6
8	8	¾	3½	4	12	⅞	4¾	5¼	12	1	6½	8
10	12	⅞	3¾	4½	16	1	5¼	6	16	1⅛	7¼	10
12	12	⅞	4	4½	16	1⅛	5¾	6½	16	1¼	7¾	12
14	12	1	4¼	5	20	1⅛	6	6¾	20	1¼	8	14
16	16	1	4½	5¼	20	1¼	6½	7¼	20	1⅜	8½	16
18	16	1⅛	4¾	5¾	24	1¼	6¾	7½	24	1⅜	8¾	18
20	20	1⅛	5¼	6	24	1¼	7	8	24	1½	9½	20
24	20	1¼	5¾	6¾	24	1½	7¾	9	24	1¾	10½	24

Nominal Pipe Size	600 LB. FLANGES			900 LB. FLANGES			1500 LB. FLANGES			2500 LB. FLANGES			Nominal Pipe Size
	Number of Bolts	Diam. of Bolts	Length of Stud Bolt	Number of Bolts	Diam. of Bolts	Length of Stud Bolts	Number of Bolts	Diam. of Bolts	Length of Stud Bolts	Number of Bolts	Diam. of Bolts	Length of Stud Bolts	
½	4	½	3	4	¾	4	4	¾	4	4	¾	4¾	½
¾	4	⅝	3¼	4	¾	4¼	4	¾	4¼	4	¾	4¾	¾
1	4	⅝	3½	4	⅞	4¾	4	⅞	4¾	4	⅞	5¼	1
1¼	4	⅝	3¾	4	⅞	4¾	4	⅞	4¾	4	1	5¾	1¼
1½	4	¾	4	4	1	5¼	4	1	5¼	4	1⅛	6½	1½
2	8	⅝	4	8	⅞	5½	8	⅞	5½	8	1	6¾	2
2½	8	¾	4½	8	1	6	8	1	6	8	1⅛	7½	2½
3	8	¾	4¾	8	⅞	5½	8	1⅛	6¾	8	1¼	8½	3
3½	8	⅞	5¼	—	—	—	—	—	—	—	—	—	3½
4	8	⅞	5½	8	1⅛	6½	8	1¼	7½	8	1½	9¾	4
5	8	1	6¼	8	1¼	7¼	8	1½	9½	8	1¾	11½	5
6	12	1	6½	12	1⅛	7½	12	1⅜	10	8	2	13½	6
8	12	1⅛	7½	12	1⅜	8½	12	1⅜	11¼	12	2	15	8
10	16	1¼	8¼	16	1⅜	9	12	1⅞	13¼	12	2½	19	10
12	20	1¼	8½	20	1⅜	9¾	16	2	14¾	12	2¾	21	12
14	20	1⅜	9	20	1½	10½	16	2¼	16	—	—	—	14
16	20	1½	9¾	20	1⅝	11	16	2½	17½	—	—	—	16
18	20	1⅝	10½	20	1⅞	12¾	16	2¾	19¼	—	—	—	18
20	24	1⅝	11¼	20	2	13½	16	3	21	—	—	—	20
24	24	1⅞	12¾	20	2½	17	16	3½	24	—	—	—	24

DIMENSIONS are shown in inches, and conform to ASA Standard B16.5.
LENGTH of machine bolt includes height of point; length of stud bolt does not include height of points.
LENGTH shown is for raised-face flange joint.

For lapped joint or special flange facings, length should be revised in accordance with Appendix "F" of ASA Standard B16.5.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 70 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/70

PIPE DIMENSIONS AND PROPERTIES

PIPE DIMENSIONS

In the tables on these two pages are given the outside diameters and wall thicknesses of pipe sizes most commonly used today. These are obtained from four sources, and fall into five classifications:

Iron Pipe Sizes, historically used to describe pipe wall thicknesses, are now prescribed by ASA Standard B36.10. All grades of pipe and welding fittings are obtainable in standard and extra strong weights; double extra strong, while less common, is also generally available in all sizes shown.

Although 3½" double extra strong and wall thicknesses for 42" size are not covered by ASA B36.10, they are in common use and are shown here for convenience.

Stainless Steel Pipe Schedules are designated by two standards: ASA Standard B36.19, and ASTM Specification A-409. Drafted primarily to establish two wall thicknesses for light weight stainless steel pipe (5S and 10S), these schedule numbers also include 40S and 80S, which are identical with standard and extra strong iron pipe sizes through 12" nominal pipe size.

14" and larger pipe in Schedules 5S and 10S are not included in B36.19, but are given in A-409.

Light Gauge (also known as "light wall" and "schedule 10") is a commonly accepted designation for a range of thicknesses which correspond to ASA B36.19, Schedule 10S in sizes ¾" through 12", and to ASA B36.10, Schedule 10, in sizes 14" through 24".

Gas Distribution (or "light weight") thicknesses are not as yet covered by an accepted code. However, they are well recognized, and are increasingly used by gas companies for non-corrosive installations where lighter wall thicknesses than standard weight are more than ample for design conditions.

Pipe Schedule Numbers, established by ASA B36.10, are in common use today in all industries. These thicknesses were originally drafted to supplement and extend the old iron pipe sizes, and actually duplicate them in standard and extra strong weights, as is indicated by the figures set in gray panels in the table below.

All decimal thicknesses shown are nominal or average wall dimensions. Customarily, steel pipe specifications limit the minimum wall thickness to not less than 87½% of the nominal thickness.

Not shown in the tables here are wall thicknesses for wrought iron pipe and fittings, which are set down in ASA B36.10. Due to the lighter density of wrought iron pipe, its thickness is slightly greater (0.001" to 0.010" depending on pipe size) than the corresponding thickness for carbon and alloy steel pipe shown under "Iron Pipe Sizes" in the tables.

Nom. Pipe Size	Outside Diameter	IRON PIPE SIZES — ASA STD. B36.10			STAINLESS STEEL PIPE SCHEDULES — ASA B36.19 or ASTM A-409				Light Gauge	Gas Distribution	Nom. Pipe Size
		Std.	Ex. Stg.	Dbl. Ex. Stg.	5S	10S	40S	80S			
⅛	0.405	0.068	0.095			0.049	0.068	0.095			⅛
¼	0.540	0.088	0.119			0.065	0.088	0.119			¼
⅜	0.675	0.091	0.126			0.065	0.091	0.126			⅜
½	0.840	0.109	0.147	0.294	0.065	0.083	0.109	0.147			½
¾	1.050	0.113	0.154	0.308	0.065	0.083	0.113	0.154	0.083		¾
1	1.315	0.133	0.179	0.358	0.065	0.109	0.133	0.179	0.109		1
1¼	1.660	0.140	0.191	0.382	0.065	0.109	0.140	0.191	0.109		1¼
1½	1.900	0.145	0.200	0.400	0.065	0.109	0.145	0.200	0.109		1½
2	2.375	0.154	0.218	0.436	0.065	0.109	0.154	0.218	0.109		2
2½	2.875	0.203	0.276	0.552	0.083	0.120	0.203	0.276	0.120		2½
3	3.500	0.216	0.300	0.600	0.083	0.120	0.216	0.300	0.120		3
3½	4.000	0.226	0.318	0.636	0.083	0.120	0.226	0.318	0.120		3½
4	4.500	0.237	0.337	0.674	0.083	0.120	0.237	0.337	0.120	0.188	4
5	5.563	0.258	0.375	0.750	0.109	0.134	0.258	0.375	0.134		5
6	6.625	0.280	0.432	0.864	0.109	0.134	0.280	0.432	0.134	0.219	6
8	8.625	0.322	0.500	0.875	0.109	0.148	0.322	0.500	0.148	0.219	8
10	10.750	0.365	0.500	1.000	0.134	0.165	0.365	0.500	0.165	0.219	10
12	12.750	0.375	0.500	1.000	0.156	0.180	0.375	0.500	0.180	0.250	12
14	14.000	0.375	0.500		0.156	0.188			0.250	0.250	14
16	16.000	0.375	0.500		0.165	0.188			0.250	0.250	16
18	18.000	0.375	0.500		0.165	0.188			0.250	0.250	18
20	20.000	0.375	0.500		0.188	0.218			0.250	0.250	20
22	22.000	0.375	0.500		0.188	0.218			0.250	0.250	22
24	24.000	0.375	0.500		0.218	0.250			0.250	0.250	24
26	26.000	0.375	0.500								26
28	28.000	0.375	0.500								28
30	30.000	0.375	0.500		0.250	0.312					30
32	32.000	0.375	0.500								32
34	34.000	0.375	0.500								34
36	36.000	0.375	0.500								36
42	42.000	0.375	0.500								42

DIMENSIONS are shown in inches.

PIPE PROPERTIES

On the following eight pages are tabulated the design properties of pipe—detailed dimensions, weights, areas, etc. These are shown not only for all of the pipe thicknesses listed below, but also for other sizes and thicknesses which as yet do not appear in standards, but which are frequently used for pipe and fittings made from plate. Note that many of these are American Petroleum Institute thicknesses, originally shown only in API Standards 5L and 5LX. These have recently been incorporated into ASA B36.10.

The pipe data shown herein have been calculated from the formulas shown on page 168.

The tables on pipe properties include a column showing the approximate weight of welding rod required for a butt-weld. Electrode weights given are for hand-welds, and include scrap-end, spatter and flux-coat losses, as well as the 1/16" overlay or reinforcement required by the various Code bodies. Figures are based on ASA type bevels with backing rings, and will, of course, vary with the procedure used and the operator's technique.

Nom. Pipe Size	Outside Diameter	CARBON AND ALLOY STEEL PIPE SCHEDULES — ASA STD. B36.10										Nom. Pipe Size
		10	20	30	40	60	80	100	120	140	160	
⅛	0.405				0.068		0.095					⅛
¼	0.540				0.088		0.119					¼
⅜	0.675				0.091		0.126					⅜
½	0.840				0.109		0.147				0.188	½
¾	1.050				0.113		0.154				0.219	¾
1	1.315				0.133		0.179				0.250	1
1¼	1.660				0.140		0.191				0.250	1¼
1½	1.900				0.145		0.200				0.281	1½
2	2.375				0.154		0.218				0.344	2
2½	2.875				0.203		0.276				0.375	2½
3	3.500				0.216		0.300				0.438	3
3½	4.000				0.226		0.318					3½
4	4.500				0.237		0.337		0.438		0.531	4
5	5.563				0.258		0.375		0.500		0.625	5
6	6.625				0.280		0.432		0.562		0.719	6
8	8.625		0.250	0.277	0.322	0.406	0.500	0.594	0.719	0.812	0.906	8
10	10.750		0.250	0.307	0.365	0.500	0.594	0.719	0.844	1.000	1.125	10
12	12.750		0.250	0.330	0.406	0.562	0.688	0.844	1.000	1.125	1.312	12
14	14.000	0.250	0.312	0.375	0.438	0.594	0.750	0.938	1.094	1.250	1.406	14
16	16.000	0.250	0.312	0.375	0.500	0.656	0.844	1.031	1.219	1.438	1.594	16
18	18.000	0.250	0.312	0.438	0.562	0.750	0.938	1.156	1.375	1.562	1.781	18
20	20.000	0.250	0.375	0.500	0.594	0.812	1.031	1.281	1.500	1.750	1.969	20
22	22.000	0.250	0.375	0.500		0.875	1.125	1.375	1.625	1.875	2.125	22
24	24.000	0.250	0.375	0.562	0.688	0.969	1.219	1.531	1.812	2.062	2.344	24
26	26.000	0.312	0.500									26
28	28.000	0.312	0.500	0.625								28
30	30.000	0.312	0.500	0.625								30
32	32.000	0.312	0.500	0.625	0.688							32
34	34.000	0.312	0.500	0.625	0.688							34
36	36.000	0.312	0.500	0.625	0.750							36
42	42.000		0.500	0.625	0.750							42

DIMENSIONS are shown in inches.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 71 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/71

PIPE DIMENSIONS AND PROPERTIES

SEE TEXT ON PAGE 137

ABBREVIATIONS:

STD—Standard
XS—Extra Strong
XXS—Double Extra Strong
L—Light Gauge
G—Gas Distribution
API—American Petroleum Institute

Nom. Pipe Size	WALL THICKNESS			DIMENSIONS			WEIGHTS		AREAS				PROPERTIES			Approx. Weight of Welding Rods
	Iron Pipe Size	Sch. No.	Other	Outside Diam.	Inside Diam.	Wall Thkn.	Plain End Pipe	Water in Pipe	Surface		Cross-Sectional		Moment of Inertia	Section Modulus	Radius of Gyration	
									Outside	Inside	Flow	Metal				
in.				in.	in.	in.	lb. per ft.	lb. per ft.	ft.² per ft.	ft.² per ft.	in.²	in.²	in.⁴	in.³	in.	lb.
1/8		10S		.405	.307	.049	.186	.032	.106	.0804	.0740	.0548	.0009	.0044	.1270	—
	STD	40	API	.405	.269	.068	.244	.025	.106	.0705	.0568	.0720	.0011	.0053	.1215	—
	XS	80	API	.405	.215	.095	.314	.016	.106	.0563	.0364	.0925	.0012	.0060	.1146	—
1/4		10S		.540	.410	.065	.330	.057	.141	.1073	.1320	.0970	.0028	.0103	.1695	—
	STD	40	API	.540	.364	.088	.424	.045	.141	.0955	.1041	.1250	.0033	.0123	.1628	—
	XS	80	API	.540	.302	.119	.535	.031	.141	.0794	.0716	.1574	.0038	.0139	.1547	—
3/8		10S		.675	.545	.065	.423	.101	.177	.1427	.2333	.1245	.0059	.0174	.2160	—
	STD	40	API	.675	.493	.091	.567	.083	.177	.1295	.1910	.1670	.0073	.0216	.2090	—
	XS	80	API	.675	.423	.126	.738	.061	.177	.1106	.1405	.2173	.0086	.0255	.1991	.04
1/2		5S		.840	.710	.065	.538	.171	.220	.1859	.3959	.1583	.0120	.0285	.2750	—
		10S		.840	.674	.083	.671	.154	.220	.1765	.3568	.1974	.0143	.0340	.2693	—
	STD	40	API	.840	.622	.109	.850	.132	.220	.1637	.3040	.2503	.0171	.0407	.2613	—
	XS	80	API	.840	.546	.147	1.087	.101	.220	.1433	.2340	.3200	.0201	.0478	.2505	.05
		160		.840	.464	.188	1.311	.073	.220	.1215	.1691	.3856	.0222	.0528	.2399	.1
	XXS		API	.840	.252	.294	1.714	.022	.220	.0660	.0499	.5043	.0242	.0577	.2192	.2
3/4		5S		1.050	.920	.065	.684	.288	.275	.2409	.6648	.2011	.0245	.0467	.3490	—
		10S	L	1.050	.884	.083	.857	.266	.275	.2314	.6138	.2522	.0297	.0566	.3430	—
	STD	40	API	1.050	.824	.113	1.130	.230	.275	.2168	.5330	.3326	.0370	.0705	.3337	—
	XS	80	API	1.050	.742	.154	1.473	.187	.275	.1948	.4330	.4335	.0448	.0853	.3214	.05
		160		1.050	.612	.219	1.944	.127	.275	.1602	.2942	.5717	.0528	.1005	.3038	.1
	XXS		API	1.050	.434	.308	2.440	.063	.275	.1137	.1479	.7180	.0579	.1103	.2840	.2
1		5S		1.315	1.185	.065	.868	.478	.344	.3102	1.1029	.2552	.0500	.0760	.4425	—
		10S	L	1.315	1.097	.109	1.404	.409	.344	.2872	.9448	.4129	.0756	.1150	.4282	—
	STD	40	API	1.315	1.049	.133	1.678	.374	.344	.2740	.8640	.4939	.0873	.1328	.4205	.08
	XS	80	API	1.315	.957	.179	2.171	.311	.344	.2520	.7190	.6388	.1056	.1606	.4066	.1
		160		1.315	.815	.250	2.840	.226	.344	.2134	.5217	.8364	.1252	.1903	.3868	.3
	XXS		API	1.315	.599	.358	3.659	.122	.344	.1570	.2818	1.0760	.1405	.2136	.3613	.4
1 1/4		5S		1.660	1.530	.065	1.107	.796	.434	.4006	1.8381	.3257	.1037	.1250	.5644	—
		10S	L	1.660	1.442	.109	1.806	.708	.434	.3775	1.6330	.5314	.1606	.1934	.5499	—
	STD	40	API	1.660	1.380	.140	2.272	.647	.434	.3620	1.4950	.6685	.1947	.2346	.5397	.1
	XS	80	API	1.660	1.278	.191	2.996	.555	.434	.3356	1.2830	.8815	.2418	.2913	.5237	.2
		160		1.660	1.160	.250	3.764	.457	.434	.3029	1.0570	1.1070	.2833	.3421	.5063	.3
	XXS		API	1.660	.896	.382	5.214	.273	.434	.2331	6305	1.5340	.3411	.4110	.4716	.5
1 1/2		5S		1.900	1.770	.065	1.274	1.066	.497	.4634	2.4610	.3751	.1579	.1662	.6492	—
		10S	L	1.900	1.682	.109	2.085	.963	.497	.4403	2.2219	.6139	.2469	.2599	.6344	—
	STD	40	API	1.900	1.610	.145	2.717	.882	.497	.4213	2.0361	.8001	.3099	.3262	.6226	.1
	XS	80	API	1.900	1.500	.200	3.631	.765	.497	.3927	1.7672	1.0689	.3912	.4118	.6052	.2
		160		1.900	1.338	.281	4.858	.609	.497	.3503	1.4060	1.4299	.4823	.5077	.5809	.4
	XXS		API	1.900	1.100	.400	6.408	.412	.497	.2903	.9502	1.8859	.5678	.5977	.5489	.6

(CONTINUED ON FOLLOWING PAGE)

(CONTINUED FROM PRECEDING PAGE)

Nom. Pipe Size	WALL THICKNESS			DIMENSIONS			WEIGHTS		AREAS				PROPERTIES			Approx. Weight of Welding Rods
	Iron Pipe Size	Sch. No.	Other	Outside Diam.	Inside Diam.	Wall Thkn.	Plain End Pipe	Water in Pipe	Surface		Cross-Sectional		Moment of Inertia	Section Modulus	Radius of Gyration	
									Outside	Inside	Flow	Metal				
in.				in.	in.	in.	lb. per ft.	lb. per ft.	ft.² per ft.	ft.² per ft.	in.²	in.²	in.⁴	in.³	in.	lb.
2		5S		2.375	2.245	.065	1.60	1.71	.622	.588	3.958	.472	.315	.265	.817	—
		10S	L	2.375	2.157	.109	2.64	1.58	.622	.565	3.654	.776	.500	.421	.803	—
	STD	40	API	2.375	2.067	.154	3.65	1.45	.622	.540	3.355	1.075	.666	.561	.787	.2
	XS	80	API	2.375	1.939	.218	5.02	1.28	.622	.507	2.953	1.477	.868	.731	.766	.3
				2.375	1.875	.250	5.67	1.20	.622	.492	2.761	1.669	.955	.805	.756	.4
		160		2.375	1.687	.344	7.46	.97	.622	.442	2.235	2.195	1.164	.980	.728	.6
	XXS		API	2.375	1.503	.436	9.03	.77	.622	.393	1.774	2.656	1.312	1.104	.703	.8
2 1/2		5S		2.875	2.709	.083	2.47	2.50	.753	.709	5.764	.728	.710	.494	.988	—
		10S	L	2.875	2.635	.120	3.53	2.36	.753	.690	5.453	1.038	.988	.687	.976	—
	STD	40	API	2.875	2.469	.203	5.79	2.07	.753	.646	4.788	1.704	1.530	1.064	.947	.3
	XS	80	API	2.875	2.323	.276	7.66	1.83	.753	.610	4.238	2.254	1.924	1.339	.924	.5
		160		2.875	2.125	.375	10.01	1.54	.753	.556	3.547	2.945	2.353	1.638	.894	.7
	XXS		API	2.875	1.771	.552	13.70	1.07	.753	.463	2.464	4.028	2.871	1.997	.844	1.3
3		5S		3.500	3.334	.083	3.03	3.78	.916	.873	8.730	.891	1.301	.744	1.208	—
		10S	L	3.500	3.260	.120	4.33	3.62	.916	.853	8.346	1.272	1.821	1.041	1.196	—
			API	3.500	3.250	.125	4.52	3.60	.916	.851	8.300	1.329	1.900	1.086	1.195	—
			API	3.500	3.188	.156	5.58	3.46	.916	.835	7.982	1.639	2.298	1.313	1.184	.2
			API	3.500	3.124	.188	6.65	3.32	.916	.818	7.665	1.956	2.691	1.538	1.173	.3
	STD	40	API	3.500	3.068	.216	7.58	3.20	.916	.802	7.393	2.228	3.017	1.724	1.164	.4
			API	3.500	3.000	.250	8.68	3.06	.916	.785	7.184	2.553	3.388	1.936	1.152	.5
			API	3.500	2.938	.281	9.65	2.94	.916	.769	6.780	2.842	3.819	2.182	1.142	.6
	XS	80	API	3.500	2.900	.300	10.25	2.86	.916	.761	6.605	3.016	3.892	2.225	1.136	.6
		160		3.500	2.624	.438	14.31	2.34	.916	.687	5.407	4.214	5.044	2.882	1.094	1.2
	XXS		API	3.500	2.300	.600	18.58	1.80	.916	.601	4.155	5.466	5.993	3.424	1.047	1.8
3 1/2		5S		4.000	3.834	.083	3.47	5.00	1.047	1.004	11.545	1.021	1.960	.980	1.385	—
		10S	L	4.000	3.760	.120	4.97	4.81	1.047	.984	11.103	1.463	2.754	1.377	1.372	—
			API	4.000	3.750	.125	5.18	4.79	1.047	.982	11.044	1.522	2.859	1.430	1.371	—
			API	4.000	3.688	.156	6.41	4.63	1.047	.966	10.682	1.884	3.485	1.743	1.360	.3
			API	4.000	3.624	.188	7.71	4.48	1.047	.950	10.315	2.251	4.130	2.065	1.350	.4
	STD	40	API	4.000	3.548	.226	9.11	4.28	1.047	.929	9.886	2.680	4.788	2.394	1.337	.5
			API	4.000	3.500	.250	10.02	4.17	1.047	.916	9.621	2.945	5.201	2.601	1.329	.6
			API	4.000	3.438	.281	11.17	4.02	1.047	.900	9.283	3.283	5.715	2.858	1.319	.7
	XS	80	API	4.000	3.364	.318	12.51	3.85	1.047	.880	8.888	3.678	6.280	3.140	1.307	.8
	XXS▲			4.000	2.728	.636	22.85	2.53	1.047	.716	5.845	6.721	9.848	4.924	1.210	2.4
4		5S		4.500	4.334	.083	3.92	6.39	1.178	1.135	14.752	1.152	2.810	1.249	1.562	—
		10S	L	4.500	4.260	.120	5.61	6.18	1.178	1.115	14.253	1.651	3.962	1.761	1.550	—
			API	4.500	4.250	.125	5.84	6.15	1.178	1.113	14.186	1.718	4.115	1.829	1.548	—
			API	4.500	4.188	.156	7.24	5.97	1.178	1.096	13.775	2.129	5.029	2.235	1.537	.4
			API,G	4.500	4.124	.188	8.56	5.80	1.178	1.082	13.357	2.547	5.850	2.600	1.525	.5
			API	4.500	4.062	.219	10.02	5.62	1.178	1.063	12.959	2.945	6.768	3.008	1.516	.6
	STD	40	API	4.500	4.026	.237	10.79	5.51	1.178	1.055	12.730	3.174	7.231	3.214	1.510	.6
			API	4.500	4.000	.250	11.35	5.45	1.178	1.049	12.566	3.338	7.560	3.360	1.505	.7
			API	4.500	3.938	.281	12.67	5.27	1.178	1.031	12.180	3.724	8.332	3.703	1.495	.8
			API	4.500	3.876	.312	14.00	5.12	1.178	1.013	11.799	4.105	9.045	4.020	1.482	.9
	XS	80	API	4.500	3.826	.337	14.98	4.98	1.178	1.002	11.497	4.407	9.610	4.271	1.477	.9
		120		4.500	3.624	.438	18.98	4.47	1.178	.949	10.315	5.589	11.648	5.177	1.444	1.5
				4.500	3.500	.500	21.36	4.16	1.178	.916	9.621	6.283	12.771	5.676	1.425	1.8
		160		4.500	3.438	.531	22.52	4.02	1.178	.900	9.283	6.621	13.275	5.900	1.416	2.0
	XXS		API	4.500	3.152	.674	27.54	3.38	1.178	.826	7.803	8.101	15.284	6.793	1.374	3.0
5		5S		5.563	5.345	.109	6.35	9.72	1.456	1.399	22.438	1.868	7.126	2.562	1.929	—
		10S	L	5.563	5.295	.134	7.77	9.54	1.456	1.386	22.021	2.285	8.422	3.028	1.920	.3
			API	5.563	5.251	.156	9.02	9.39	1.456	1.375	21.656	2.650	9.699	3.487	1.913	.4
			API	5.563	5.187	.188	10.80	9.16	1.456	1.358	21.131	3.175	11.485	4.129	1.902	.5
			API	5.563	5.125	.219	12.51	8.94	1.456	1.342	20.629	3.677	13.145	4.726	1.891	.6
	STD	40	API	5.563	5.047	.258	14.62	8.66	1.456	1.321	20.006	4.300	15.162	5.451	1.878	.7
			API	5.563	5.001	.281	15.86	8.52	1.456	1.309	19.643	4.663	16.305	5.862	1.870	.8
			API	5.563	4.939	.312	17.51	8.31	1.456	1.293	19.159	5.147	17.807	6.402	1.860	1.0
			API	5.563	4.875	.344	19.19	8.09	1.456	1.276	18.666	5.640	19.281	6.932	1.849	1.2
	XS	80	API	5.563	4.813	.375	20.78	7.87	1.456	1.260	18.194	6.112	20.669	7.431	1.839	1.4
		120		5.563	4.563	.500	27.04	7.08	1.456	1.195	16.353	7.953	25.737	9.253	1.799	2.3
		160		5.563	4.313	.625	32.96	6.32	1.456	1.129	14.610	9.696	30.040	10.800	1.760	3.2
	XXS		API	5.563	4.063	.750	38.55	5.62	1.456	1.064	12.966	11.340	33.628	12.090	1.722	3.3

▲3½" pipe size with 0.636" wall, though not defined in B36.10-1959, is commercially considered double extra strong in this size.

(CONTINUED ON FOLLOWING PAGE)

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 72 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/72

(CONTINUED FROM PRECEDING PAGE)

Nom. Pipe Size	WALL THICKNESS			DIMENSIONS			WEIGHTS		AREAS				PROPERTIES			Approx. Weight of Welding Rods
	Iron Pipe Size	Sch. No.	Other	Outside Diam.	Inside Diam.	Wall Thkn.	Plain End Pipe	Water in Pipe	Surface		Cross-Sectional		Moment of Inertia	Section Modulus	Radius of Gyration	
									Outside	Inside	Flow	Metal				
in.				in.	in.	in.	lb. per ft.	lb. per ft.	ft.² per ft.	ft.² per ft.	in.²	in.²	in.⁴	in.³	in.	lb.
6		5S		6.625	6.407	.109	7.59	14.0	1.73	1.68	32.24	2.23	11.84	3.57	2.30	—
		10S	L	6.625	6.357	.134	9.29	13.7	1.73	1.66	31.75	2.73	14.38	4.34	2.29	.4
			API	6.625	6.249	.188	12.93	13.3	1.73	1.64	30.70	3.80	19.71	5.95	2.28	.6
			API,G	6.625	6.187	.219	15.02	13.1	1.73	1.62	30.10	4.41	22.66	6.84	2.27	.8
			API	6.625	6.125	.250	17.02	12.8	1.73	1.61	29.50	5.01	25.55	7.71	2.26	1.0
				6.625	6.071	.277	18.86	12.6	1.73	1.59	28.95	5.54	28.00	8.46	2.25	1.1
	STD	40	API	6.625	6.065	.280	18.97	12.5	1.73	1.59	28.90	5.58	28.14	8.50	2.24	1.1
			API	6.625	6.001	.312	21.05	12.3	1.73	1.57	28.28	6.19	30.91	9.33	2.23	1.3
			API	6.625	5.937	.344	23.09	12.0	1.73	1.55	27.68	6.79	33.51	10.14	2.22	1.6
	XS	80	API	6.625	5.875	.375	25.10	11.8	1.73	1.54	27.10	7.37	36.20	10.90	2.21	1.8
			API	6.625	5.761	.432	28.57	11.3	1.73	1.51	26.07	8.40	40.49	12.22	2.19	2.2
				6.625	5.625	.500	32.79	10.8	1.73	1.48	24.85	9.63	45.60	13.78	2.16	3.0
		120		6.625	5.501	.562	36.42	10.3	1.73	1.47	23.77	10.74	49.91	15.07	2.15	3.2
		160		6.625	5.187	.719	45.34	9.2	1.73	1.36	21.13	13.34	59.03	17.82	2.10	5.1
	XXS		API	6.625	4.897	.864	53.16	8.1	1.73	1.28	18.83	15.64	66.33	20.02	2.06	5.8
8		5S		8.625	8.407	.109	9.91	24.0	2.26	2.20	55.51	2.92	26.44	6.13	3.01	—
		10S	L	8.625	8.329	.148	13.40	23.6	2.26	2.18	54.49	3.94	35.45	8.22	3.00	.4
			API	8.625	8.249	.188	16.90	23.2	2.26	2.16	53.43	5.00	44.42	10.30	2.98	.7
			API	8.625	8.219	.203	18.30	23.1	2.26	2.15	53.05	5.38	47.65	11.05	2.98	.8
			API,G	8.625	8.187	.219	19.64	22.9	2.26	2.15	52.63	5.80	51.32	11.90	2.97	1.0
		20	API	8.625	8.125	.250	22.36	22.5	2.26	2.13	51.85	6.58	57.74	13.39	2.96	1.2
		30	API	8.625	8.071	.277	24.70	22.2	2.26	2.12	51.17	7.26	63.35	14.69	2.95	1.3
			API	8.625	8.001	.312	27.72	21.8	2.26	2.10	50.28	8.15	70.60	16.37	2.94	1.6
	STD	40	API	8.625	7.981	.322	28.55	21.6	2.26	2.09	50.03	8.40	72.49	16.81	2.94	1.7
			API	8.625	7.937	.344	30.40	21.4	2.26	2.08	49.49	8.94	76.81	17.81	2.93	1.9
			API	8.625	7.875	.375	33.10	21.1	2.26	2.06	48.69	9.74	83.10	19.27	2.92	2.1
		60		8.625	7.813	.406	35.66	20.8	2.26	2.04	47.95	10.48	88.75	20.58	2.91	2.3
			API	8.625	7.749	.438	38.33	20.4	2.26	2.03	47.16	11.27	94.75	21.97	2.90	2.7
	XS	80	API	8.625	7.625	.500	43.39	19.8	2.26	2.01	45.67	12.76	105.70	24.51	2.88	3.6
		100		8.625	7.437	.594	50.93	18.8	2.26	1.95	43.44	14.99	121.48	28.17	2.85	4.6
				8.625	7.375	.625	53.40	18.5	2.26	1.93	42.72	15.71	126.49	29.33	2.84	5.1
		120		8.625	7.187	.719	60.69	17.6	2.26	1.88	40.57	17.86	140.67	32.62	2.81	6.7
		140		8.625	7.001	.812	67.79	16.7	2.26	1.83	38.50	19.93	153.74	35.65	2.78	7.3
	XXS		API	8.625	6.875	.875	72.42	16.1	2.26	1.80	37.13	21.30	161.98	37.56	2.76	8.0
		160		8.625	6.813	.906	74.71	15.8	2.26	1.78	36.46	21.97	165.94	38.48	2.76	8.2
10		5S		10.750	10.482	.134	15.19	37.4	2.81	2.74	86.29	4.47	62.94	11.71	3.75	.6
		10S	L	10.750	10.420	.165	18.65	36.9	2.81	2.73	85.26	5.50	76.81	14.29	3.74	.8
			API	10.750	10.374	.188	21.12	36.7	2.81	2.72	84.56	6.20	86.54	16.10	3.74	1.0
			API	10.750	10.344	.203	22.86	36.5	2.81	2.71	84.05	6.71	93.26	17.35	3.73	1.1
			API,G	10.750	10.312	.219	24.63	36.2	2.81	2.70	83.52	7.24	100.46	18.69	3.72	1.2
		20	API	10.750	10.250	.250	28.04	35.9	2.81	2.68	82.50	8.26	113.52	21.12	3.71	1.4
			API	10.750	10.192	.279	31.20	35.3	2.81	2.66	81.58	9.18	125.88	23.42	3.70	1.7
		30	API	10.750	10.136	.307	34.24	35.0	2.81	2.65	80.69	10.07	137.44	25.57	3.69	2.0
			API	10.750	10.062	.344	38.26	34.5	2.81	2.63	79.51	11.25	152.27	28.33	3.68	2.4
	STD	40	API	10.750	10.020	.365	40.48	34.1	2.81	2.62	78.85	11.91	160.71	29.90	3.67	2.7
			API	10.750	9.874	.438	48.28	33.2	2.81	2.58	76.57	14.91	188.82	35.13	3.65	3.6
	XS	60, 80S	API	10.750	9.750	.500	54.74	32.3	2.81	2.55	74.66	16.10	211.94	39.43	3.63	4.5
		80		10.750	9.562	.594	64.40	31.1	2.81	2.50	71.81	18.95	245.21	45.62	3.60	6.0
		100		10.750	9.312	.719	77.00	29.5	2.81	2.44	68.10	22.66	286.43	53.29	3.56	8.3
				10.750	9.250	.750	80.10	29.1	2.81	2.42	67.20	23.56	296.16	55.10	3.54	8.5
		120		10.750	9.062	.844	89.27	27.9	2.81	2.37	64.49	26.27	324.54	60.38	3.52	9.0
				10.750	9.000	.875	92.28	27.6	2.81	2.36	63.62	27.14	333.46	62.04	3.50	9.8
	XXS	140		10.750	8.750	1.000	104.13	26.1	2.81	2.29	60.13	30.63	367.81	68.43	3.46	13
		160		10.750	8.500	1.125	115.65	24.6	2.81	2.22	56.75	34.01	399.42	74.31	3.43	15
				10.750	8.250	1.250	126.82	23.2	2.81	2.16	53.45	37.31	428.17	79.66	3.39	17

(CONTINUED ON FOLLOWING PAGE)

(CONTINUED FROM PRECEDING PAGE)

Nom. Pipe Size	WALL THICKNESS			DIMENSIONS			WEIGHTS		AREAS				PROPERTIES			Approx. Weight of Welding Rods
	Iron Pipe Size	Sch. No.	Other	Outside Diam.	Inside Diam.	Wall Thkn.	Plain End Pipe	Water in Pipe	Surface		Cross-Sectional		Moment of Inertia	Section Modulus	Radius of Gyration	
									Outside	Inside	Flow	Metal				
in.				in.	in.	in.	lb. per ft.	lb. per ft.	ft.² per ft.	ft.² per ft.	in.²	in.²	in.⁴	in.³	in.	lb.
12		5S		12.750	12.438	.156	21.0	52.6	3.34	3.26	121.5	6.17	122.4	19.2	4.45	.8
		10S	L	12.750	12.390	.180	24.2	52.2	3.34	3.24	120.6	7.11	140.4	22.0	4.44	1.0
			API	12.750	12.344	.203	27.2	52.0	3.34	3.23	119.9	7.99	157.2	24.7	4.43	1.3
			API	12.750	12.312	.219	29.3	51.7	3.34	3.22	119.1	8.52	167.6	26.3	4.43	1.4
		20	API,G	12.750	12.250	.250	33.4	51.3	3.34	3.21	118.0	9.84	192.3	30.2	4.42	1.7
			API	12.750	12.188	.281	37.4	50.6	3.34	3.19	116.7	11.01	214.1	33.6	4.41	2.0
			API	12.750	12.126	.312	41.5	50.1	3.34	3.17	115.5	12.19	236.0	37.0	4.40	2.4
		30	API	12.750	12.090	.330	43.8	49.7	3.34	3.16	114.8	12.88	248.5	39.0	4.39	2.6
			API	12.750	12.062	.344	45.5	49.7	3.34	3.16	114.5	13.46	259.0	40.7	4.38	2.8
	STD	40S	API	12.750	12.000	.375	49.6	48.9	3.34	3.14	113.1	14.58	279.3	43.8	4.37	3.0
		40	API	12.750	11.938	.406	53.6	48.5	3.34	3.13	111.9	15.74	300.3	47.1	4.37	3.5
			API	12.750	11.874	.438	57.5	48.2	3.34	3.11	111.0	16.95	321.0	50.4	4.35	4.3
	XS	80S	API	12.750	11.750	.500	65.4	46.9	3.34	3.08	108.4	19.24	361.5	56.7	4.33	5.3
		60		12.750	11.626	.562	73.2	46.0	3.34	3.04	106.2	21.52	400.5	62.8	4.31	6.4
				12.750	11.500	.625	80.9	44.9	3.34	3.01	103.8	23.81	438.7	68.8	4.29	7.5
		80		12.750	11.374	.688	88.6	44.0	3.34	2.98	101.6	26.07	475.7	74.6	4.27	8.6
				12.750	11.250	.750	96.2	43.1	3.34	2.94	99.4	28.27	510.7	80.1	4.25	10
		100		12.750	11.062	.844	107.3	41.6	3.34	2.90	96.1	31.57	562.2	88.2	4.22	11
	XXS			12.750	11.000	.875	110.9	41.1	3.34	2.88	95.0	32.64	578.5	90.7	4.21	12
		120		12.750	10.750	1.000	125.5	39.3	3.34	2.81	90.8	36.91	641.7	100.7	4.17	15
		140		12.750	10.500	1.125	139.7	37.5	3.34	2.75	86.6	41.08	700.7	109.9	4.13	18
				12.750	10.250	1.250	153.6	35.8	3.34	2.68	82.5	45.16	755.5	118.5	4.09	20
		160		12.750	10.126	1.312	160.3	34.9	3.34	2.65	80.5	47.14	781.3	122.6	4.07	22
				12.750	10.000	1.375	167.2	34.0	3.34	2.62	78.5	49.14	807.2	126.6	4.05	24
				12.750	9.750	1.500	180.4	32.4	3.34	2.55	74.7	53.01	853.8	133.9	4.01	28
14		5S		14.000	13.688	.156	23.0	63.7	3.67	3.58	147.2	6.78	162.6	23.2	4.90	.9
		10S		14.000	13.624	.188	27.7	63.1	3.67	3.57	145.8	8.16	194.6	27.8	4.88	1.1
			API	14.000	13.580	.210	30.9	62.8	3.67	3.55	144.8	9.10	216.2	30.9	4.87	1.4
			API	14.000	13.562	.219	32.2	62.6	3.67	3.55	144.5	9.48	225.1	32.2	4.87	1.5
		10	API,L,G	14.000	13.500	.250	36.7	62.1	3.67	3.54	143.0	10.82	256.0	36.6	4.86	1.8
			API	14.000	13.438	.281	41.2	61.5	3.67	3.52	141.8	12.11	285.2	40.7	4.85	2.2
		20	API	14.000	13.376	.312	45.7	60.9	3.67	3.50	140.5	13.42	314.4	44.9	4.84	2.6
			API	14.000	13.312	.344	50.2	60.3	3.67	3.48	139.2	14.76	344.3	49.2	4.83	3.1
	STD	30	API	14.000	13.250	.375	54.6	59.7	3.67	3.47	137.9	16.05	372.8	53.2	4.82	3.6
		40	API	14.000	13.124	.438	63.4	58.5	3.67	3.44	135.3	18.66	429.6	61.4	4.80	4.5
			API	14.000	13.062	.469	67.8	58.0	3.67	3.42	134.0	19.94	456.8	65.3	4.79	5.2
	XS		API	14.000	13.000	.500	72.1	57.4	3.67	3.40	132.7	21.21	483.8	69.1	4.78	5.8
		60		14.000	12.812	.594	85.0	55.8	3.67	3.35	128.9	25.02	563.1	80.4	4.74	7.6
				14.000	12.750	.625	89.3	55.3	3.67	3.34	127.7	26.26	588.5	84.1	4.73	8.2
		80		14.000	12.500	.750	106.1	51.2	3.67	3.27	122.7	31.22	687.5	98.2	4.69	9.4
		100		14.000	12.250	.875	122.7	51.1	3.67	3.21	117.9	36.08	780.1	111.4	4.65	13
				14.000	12.124	.938	130.8	50.0	3.67	3.17	115.4	38.49	825.1	117.9	4.63	15
				14.000	12.000	1.000	138.8	49.0	3.67	3.14	113.1	40.84	868.0	124.0	4.61	16
		120		14.000	11.812	1.094	150.8	47.5	3.67	3.09	109.6	44.36	930.2	132.9	4.58	18
				14.000	11.750	1.125	154.7	47.0	3.67	3.08	108.4	45.50	950.3	135.8	4.57	20
		140		14.000	11.500	1.250	170.2	45.0	3.67	3.01	103.9	50.07	1027.5	146.8	4.53	22
		160		14.000	11.250	1.375	185.4	43.1	3.67	2.94	99.4	54.54	1099.5	157.1	4.49	26
				14.000	11.188	1.406	189.1	42.6	3.67	2.93	98.3	55.63	1116.9	159.6	4.48	27
				14.000	11.000	1.500	200.2	41.2	3.67	2.88	95.0	58.90	1166.5	166.6	4.45	31
				14.000	10.000	2.000	256.3	34.0	3.67	2.62	78.5	75.40	1394.9	199.3	4.30	50
				14.000	9.750	2.125	269.5	32.3	3.67	2.55	74.7	79.28	1442.1	206.0	4.26	55
				14.000	9.600	2.200	277.3	31.4	3.67	2.51	72.4	81.56	1468.8	209.8	4.24	58
				14.000	9.000	2.500	307.1	27.6	3.67	2.36	63.6	90.32	1563.7	223.4	4.16	71

(CONTINUED ON FOLLOWING PAGE)

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 73 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/73

(CONTINUED FROM PRECEDING PAGE)

Nom. Pipe Size	WALL THICKNESS			DIMENSIONS			WEIGHTS		AREAS				PROPERTIES			Approx. Weight of Welding Rods
	Iron Pipe Size	Sch. No.	Other	Outside Diam.	Inside Diam.	Wall Thkn.	Plain End Pipe	Water in Pipe	Surface		Cross-Sectional		Moment of Inertia	Section Modulus	Radius of Gyration	
									Outside	Inside	Flow	Metal				
in.				in.	in.	in.	lb. per ft.	lb. per ft.	ft.² per ft.	ft.² per ft.	in.²	in.²	in.⁴	in.³	in.	lb.
16		5S		16.000	15.670	.165	28	83.5	4.19	4.10	192.9	8.21	257	32.2	5.60	1.1
		10S		16.000	15.624	.188	32	83.0	4.19	4.09	191.7	9.34	292	36.5	5.59	1.3
			API	16.000	15.562	.219	37	82.5	4.19	4.07	190.2	10.86	338	42.3	5.58	1.7
		10	API,L,G	16.000	15.500	.250	42	82.1	4.19	4.06	189.0	12.40	385	48.1	5.57	2.0
			API	16.000	15.438	.281	47	81.2	4.19	4.04	187.0	13.90	430	53.8	5.56	2.5
		20	API	16.000	15.376	.312	52	80.4	4.19	4.03	185.7	15.38	473	59.2	5.55	2.9
	STD		API	16.000	15.312	.344	57	80.0	4.19	4.01	184.1	16.94	519	64.9	5.54	3.5
		30	API	16.000	15.250	.375	63	79.1	4.19	4.00	182.6	18.41	562	70.3	5.53	4.2
			API	16.000	15.124	.438	73	78.2	4.19	3.96	180.0	21.42	650	81.2	5.51	5.1
	XS		API	16.000	15.062	.469	78	77.0	4.19	3.94	178.2	22.88	691	86.3	5.49	5.9
		40	API	16.000	15.000	.500	83	76.5	4.19	3.93	176.7	24.35	732	91.5	5.48	6.7
				16.000	14.750	.625	103	74.1	4.19	3.86	170.9	30.19	893	111.7	5.44	9.4
		60		16.000	14.688	.656	108	73.4	4.19	3.85	169.4	31.62	933	116.6	5.43	11
				16.000	14.500	.750	122	71.5	4.19	3.80	165.1	35.93	1047	130.9	5.40	12
		80		16.000	14.312	.844	137	69.7	4.19	3.75	160.9	40.19	1157	144.7	5.37	14
				16.000	14.000	1.000	160	66.7	4.19	3.66	153.9	47.12	1331	166.4	5.31	18
		100		16.000	13.938	1.031	165	66.0	4.19	3.65	152.6	48.49	1366	170.7	5.30	20
		120		16.000	13.562	1.219	192	62.6	4.19	3.55	144.5	56.60	1556	194.6	5.24	25
		140		16.000	13.500	1.250	197	62.1	4.19	3.53	143.1	57.92	1586	198.3	5.23	26
				16.000	13.124	1.438	224	58.6	4.19	3.44	135.3	65.79	1761	220.1	5.17	31
		160		16.000	13.000	1.500	232	57.4	4.19	3.40	132.7	68.33	1816	227.0	5.15	33
				16.000	12.812	1.594	245	55.8	4.19	3.35	129.0	72.14	1894	236.8	5.12	37
18		5S		18.000	17.670	.165	31	106.2	4.71	4.63	245.2	9.24	368	40.8	6.31	1.2
		10S		18.000	17.624	.188	36	105.7	4.71	4.61	243.9	10.52	417	46.4	6.30	1.5
		10	API,L,G	18.000	17.500	.250	47	104.6	4.71	4.58	241.0	13.96	550	61.1	6.28	2.2
			API	18.000	17.438	.281	49	104.0	4.71	4.56	240.0	14.49	570	63.4	6.27	2.8
		20	API	18.000	17.376	.312	59	102.7	4.71	4.55	237.1	17.34	678	75.4	6.25	3.3
			API	18.000	17.312	.344	65	102.0	4.71	4.53	235.4	19.08	744	82.6	6.24	3.9
	STD		API	18.000	17.250	.375	71	101.2	4.71	4.51	233.7	20.76	807	89.6	6.23	4.8
			API	18.000	17.188	.406	76	100.6	4.71	4.50	232.0	22.44	869	96.6	6.22	5.3
		30	API	18.000	17.124	.438	82	99.5	4.71	4.48	229.5	24.95	963	107.0	6.21	5.8
	XS		API	18.000	17.062	.469	88	99.0	4.71	4.47	228.6	25.83	993	110.3	6.20	6.6
			API	18.000	17.000	.500	93	98.2	4.71	4.45	227.0	27.49	1053	117.0	6.19	7.5
		40		18.000	16.876	.562	105	97.2	4.71	4.42	224.0	30.85	1177	130.9	6.17	8.9
		60		18.000	16.750	.625	116	95.8	4.71	4.39	220.5	34.15	1290	143.2	6.14	11
				18.000	16.500	.750	138	92.5	4.71	4.32	213.8	40.64	1515	168.3	6.10	15
		80		18.000	16.124	.938	171	88.4	4.71	4.22	204.2	50.28	1835	203.9	6.04	19
				18.000	16.000	1.000	182	87.2	4.71	4.19	201.1	53.41	1935	215.0	6.02	20
		100		18.000	15.688	1.156	208	83.7	4.71	4.11	193.3	61.18	2182	242.3	5.97	26
				18.000	15.500	1.250	224	81.8	4.71	4.06	188.7	65.78	2319	257.7	5.94	29
		120		18.000	15.250	1.375	244	79.2	4.71	3.99	182.7	71.82	2498	277.5	5.90	33
				18.000	15.000	1.500	265	76.6	4.71	3.93	176.7	77.75	2668	296.5	5.86	38
		140		18.000	14.876	1.562	274	75.3	4.71	3.89	173.8	80.66	2750	305.5	5.84	41
		160		18.000	14.438	1.781	309	71.0	4.71	3.78	163.7	90.75	3020	335.5	5.77	49
20 (Continued on next page)		5S		20.000	19.634	.188	40	131.0	5.24	5.14	302.4	11.70	574	57.4	7.00	1.7
		10S		20.000	19.564	.218	46	130.2	5.24	5.12	300.6	13.55	663	66.3	6.99	2.1
		10	API,L,G	20.000	19.500	.250	53	130.0	5.24	5.11	299.0	15.52	759	75.9	6.98	2.5
			API	20.000	19.438	.281	59	128.6	5.24	5.09	296.8	17.41	846	84.6	6.97	3.2
			API	20.000	19.376	.312	66	127.7	5.24	5.07	294.9	19.30	935	93.5	6.96	3.9
			API	20.000	19.312	.344	72	127.0	5.24	5.06	292.9	21.24	1026	102.6	6.95	4.6
	STD	20	API	20.000	19.250	.375	79	126.0	5.24	5.04	291.1	23.12	1113	111.3	6.94	5.0
			API	20.000	19.188	.406	85	125.4	5.24	5.02	289.2	24.99	1200	120.0	6.93	6.0
			API	20.000	19.124	.438	92	125.1	5.24	5.01	288.0	26.95	1290	129.0	6.92	6.8
	XS	30	API	20.000	19.062	.469	98	123.6	5.24	4.99	285.4	28.78	1373	137.3	6.91	7.6
			API	20.000	19.000	.500	104	122.8	5.24	4.97	283.5	30.63	1457	145.7	6.90	8.3
		40		20.000	18.812	.594	123	120.4	5.24	4.92	277.9	36.21	1706	170.6	6.86	11

(CONTINUED ON FOLLOWING PAGE)

(CONTINUED FROM PRECEDING PAGE)

Nom. Pipe Size	WALL THICKNESS			DIMENSIONS			WEIGHTS		AREAS				PROPERTIES			Approx. Weight of Welding Rods
	Iron Pipe Size	Sch. No.	Other	Outside Diam.	Inside Diam.	Wall Thkn.	Plain End Pipe	Water in Pipe	Surface		Cross-Sectional		Moment of Inertia	Section Modulus	Radius of Gyration	
									Outside	Inside	Flow	Metal				
in.				in.	in.	in.	lb. per ft.	lb. per ft.	ft.² per ft.	ft.² per ft.	in.²	in.²	in.⁴	in.³	in.	lb.
20 (Continued from preceding page)		60		20.000	18.750	.625	129	119.5	5.24	4.91	276.1	38.04	1787	178.7	6.85	12
				20.000	18.376	.812	167	114.9	5.24	4.81	265.2	48.95	2257	225.7	6.79	17
				20.000	18.000	1.000	203	110.3	5.24	4.71	254.5	59.69	2702	270.2	6.73	24
		80		20.000	17.938	1.031	209	109.4	5.24	4.70	252.7	61.44	2771	277.1	6.72	26
				20.000	17.500	1.250	250	104.3	5.24	4.58	240.5	73.63	3249	324.9	6.64	31
		100		20.000	17.438	1.281	256	103.4	5.24	4.56	238.8	75.34	3317	331.7	6.63	32
		120		20.000	17.000	1.500	296	98.3	5.24	4.45	227.0	87.18	3755	375.5	6.56	43
		140		20.000	16.500	1.750	341	92.6	5.24	4.32	213.8	100.33	4217	421.7	6.48	54
		160		20.000	16.062	1.969	379	87.8	5.24	4.20	202.6	111.54	4587	458.7	6.41	64
22		5S		22.000	21.624	.188	44	159.1	5.76	5.66	367.3	12.88	766	69.7	7.71	1.8
		10S		22.000	21.564	.218	51	158.2	5.76	5.65	365.2	14.92	885	80.4	7.70	2.4
		10	API,L,G	22.000	21.500	.250	58	157.4	5.76	5.63	363.1	17.18	1010	91.8	7.69	3.0
			API	22.000	21.438	.281	65	156.5	5.76	5.61	361.0	19.17	1131	102.8	7.68	3.6
			API	22.000	21.376	.312	72	155.6	5.76	5.60	358.9	21.26	1250	113.6	7.67	4.3
			API	22.000	21.312	.344	80	154.7	5.76	5.58	356.7	23.40	1373	124.8	7.66	5.0
	STD	20	API	22.000	21.250	.375	87	153.7	5.76	5.56	354.7	25.48	1490	135.4	7.65	5.8
			API	22.000	21.188	.406	94	152.9	5.76	5.55	352.6	27.54	1607	146.1	7.64	6.6
			API	22.000	21.124	.438	101	151.9	5.76	5.53	350.5	29.67	1725	156.8	7.62	7.5
	XS	30	API	22.000	21.062	.469	108	150.9	5.76	5.51	348.4	31.72	1839	167.2	7.61	8.4
			API	22.000	21.000	.500	115	150.2	5.76	5.50	346.4	33.77	1953	177.5	7.61	9.3
				22.000	20.750	.625	143	146.6	5.76	5.43	338.2	41.97	2400	218.2	7.56	13
		60		22.000	20.500	.750	170	143.1	5.76	5.37	330.1	50.07	2829	257.2	7.52	18
				22.000	20.250	.875	197	139.6	5.76	5.30	322.1	58.07	3245	295.0	7.47	21
				22.000	20.000	1.000	224	136.2	5.76	5.24	314.2	65.97	3645	331.4	7.43	27
		80		22.000	19.750	1.125	251	132.8	5.76	5.17	306.4	73.78	4029	366.3	7.39	32
				22.000	19.500	1.250	277	129.5	5.76	5.10	298.6	81.48	4400	400.0	7.35	38
		100		22.000	19.250	1.375	303	126.2	5.76	5.04	291.0	89.09	4758	432.6	7.31	45
		120		22.000	19.000	1.500	329	122.9	5.76	4.97	283.5	96.60	5103	463.9	7.27	52
				22.000	18.750	1.625	354	119.6	5.76	4.91	276.1	104.02	5432	493.8	7.23	58
		140		22.000	18.250	1.875	403	113.3	5.76	4.78	261.6	118.55	6054	550.3	7.15	74
		160		22.000	17.750	2.125	451	107.2	5.76	4.65	247.4	132.68	6626	602.4	7.07	90
24		5S		24.000	23.564	.218	55	188.9	6.28	6.17	436.1	16.29	1152	96.0	8.41	2.6
		10, 10S	API,L,G	24.000	23.500	.250	63	187.9	6.28	6.15	435.0	18.67	1320	110.0	8.40	3.0
			API	24.000	23.438	.281	71	186.9	6.28	6.14	431.5	20.94	1472	122.7	8.38	3.9
			API	24.000	23.376	.312	79	185.9	6.28	6.12	430.0	23.20	1630	136.0	8.38	4.7
			API	24.000	23.312	.344	87	184.9	6.28	6.10	426.8	25.57	1789	149.1	8.36	5.5
	STD	20	API	24.000	23.250	.375	95	183.9	6.28	6.09	424.6	27.83	1942	161.9	8.35	6.0
			API	24.000	23.188	.406	102	182.9	6.28	6.07	422.3	30.09	2095	174.6	8.34	7.2
			API	24.000	23.124	.438	110	181.9	6.28	6.05	420.0	32.42	2252	187.7	8.33	8.2
			API	24.000	23.062	.469	118	180.9	6.28	6.04	417.7	34.67	2401	200.1	8.32	9.2
	XS	30	API	24.000	23.000	.500	125	180.0	6.28	6.02	416.0	36.90	2550	213.0	8.31	10
				24.000	22.876	.562	141	178.0	6.28	5.99	411.0	41.40	2840	237.0	8.28	12
				24.000	22.750	.625	156	176.1	6.28	5.96	406.5	45.90	3137	261.4	8.27	15
		40		24.000	22.624	.688	171	174.1	6.28	5.92	402.0	50.39	3426	285.5	8.25	18
				24.000	22.500	.750	186	172.1	6.28	5.89	397.6	54.78	3705	308.8	8.22	20
				24.000	22.126	.937	231	166.6	6.28	5.79	384.5	67.89	4521	376.8	8.16	24
		60		24.000	22.062	.969	238	165.6	6.28	5.78	382.3	70.11	4657	388.1	8.15	25
				24.000	22.000	1.000	246	164.8	6.28	5.76	380.1	72.26	4788	399.0	8.14	29
		80		24.000	21.562	1.219	297	158.2	6.28	5.64	365.2	87.24	5676	473.0	8.07	37
		100		24.000	21.500	1.250	304	157.4	6.28	5.63	363.1	89.34	5797	483.0	8.05	39
				24.000	21.000	1.500	361	150.2	6.28	5.50	346.4	106.03	6740	561.7	7.97	51
				24.000	20.938	1.531	367	149.3	6.28	5.48	344.3	108.07	6847	570.6	7.96	52
		120		24.000	20.376	1.812	430	141.4	6.28	5.33	326.1	126.30	7823	651.9	7.87	67
		140		24.000	19.876	2.062	483	134.4	6.28	5.20	310.3	142.10	8627	718.9	7.79	86
		160		24.000	19.312	2.344	542	126.9	6.28	5.06	292.9	159.47	9458	788.2	7.70	110

(CONTINUED ON FOLLOWING PAGE)

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 74 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/74

(CONTINUED FROM PRECEDING PAGE)

Nom. Pipe Size	WALL THICKNESS			DIMENSIONS			WEIGHTS		AREAS				PROPERTIES			Approx. Weight of Welding Rods
	Iron Pipe Size	Sch. No.	Other	Outside Diam.	Inside Diam.	Wall Thkn.	Plain End Pipe	Water in Pipe	Surface		Cross-Sectional		Moment of Inertia	Section Modulus	Radius of Gyration	
									Outside	Inside	Flow	Metal				
in.				in.	in.	in.	lb. per ft.	lb. per ft.	ft.² per ft.	ft.² per ft.	in.²	in.²	in.⁴	in.³	in.	lb.
26			API	26.000	25.500	.250	67	221.4	6.81	6.68	510.7	19.85	1646	126.6	9.10	3.5
			API	26.000	25.438	.281	77	220.3	6.81	6.66	508.2	22.70	1877	144.4	9.09	4.2
		10	API	26.000	25.376	.312	86	219.2	6.81	6.64	505.8	25.18	2076	159.7	9.08	5.0
			API	26.000	25.312	.344	94	218.2	6.81	6.63	503.2	27.73	2280	175.4	9.07	6.0
	STD		API	26.000	25.250	.375	103	217.1	6.81	6.61	500.7	30.19	2478	190.6	9.06	6.9
			API	26.000	25.188	.406	111	216.0	6.81	6.59	498.3	32.64	2673	205.6	9.05	7.8
			API	26.000	25.124	.438	120	214.9	6.81	6.58	495.8	35.17	2874	221.1	9.04	8.8
	XS	20	API	26.000	25.062	.469	128	213.7	6.81	6.56	493.3	37.62	3066	235.8	9.03	9.9
			API	26.000	25.000	.500	136	212.8	6.81	6.54	490.9	40.06	3259	250.7	9.02	11
				26.000	24.876	.562	153	210.5	6.81	6.51	486.0	44.91	3635	279.6	9.00	13
				26.000	24.750	.625	169	208.6	6.81	6.48	481.1	49.82	4013	308.7	8.98	16
				26.000	24.500	.750	202	204.4	6.81	6.41	471.4	59.49	4744	364.9	8.93	22
				26.000	24.250	.875	235	200.2	6.81	6.35	461.9	69.07	5458	419.9	8.89	25
				26.000	24.000	1.000	267	196.1	6.81	6.28	452.4	78.54	6149	473.0	8.85	32
				26.000	23.750	1.125	299	192.1	6.81	6.22	443.0	87.91	6813	524.1	8.80	38
				26.000	23.500	1.250	330	187.9	6.81	6.15	433.7	97.19	7461	573.9	8.76	46
				26.000	23.250	1.375	362	184.1	6.81	6.09	424.6	106.37	8088	622.2	8.72	53
				26.000	23.000	1.500	393	180.1	6.81	6.02	415.5	115.45	8695	668.8	8.68	61
28			API	28.000	27.500	.250	74	257.3	7.33	7.20	594.0	21.80	2098	149.8	9.81	3.8
			API	28.000	27.438	.281	83	256.1	7.33	7.18	591.3	24.47	2350	167.8	9.80	4.6
		10	API	28.000	27.376	.312	92	255.0	7.33	7.17	588.6	27.14	2601	185.8	9.79	5.4
			API	28.000	27.312	.344	102	253.8	7.33	7.15	585.9	29.89	2858	204.1	9.78	6.4
	STD		API	28.000	27.250	.375	111	252.6	7.33	7.13	583.2	32.54	3105	221.8	9.77	7.4
			API	28.000	27.188	.406	120	251.5	7.33	7.12	580.6	35.20	3351	239.4	9.76	8.4
			API	28.000	27.124	.438	129	250.3	7.33	7.10	577.8	37.93	3602	257.3	9.75	9.5
	XS	20	API	28.000	27.062	.469	138	249.2	7.33	7.08	575.2	40.56	3844	274.6	9.74	11
			API	28.000	27.000	.500	147	248.0	7.33	7.07	572.6	43.20	4085	291.8	9.72	12
		30		28.000	26.750	.625	183	243.4	7.33	7.00	562.0	53.75	5038	359.8	9.68	17
				28.000	26.500	.750	218	238.9	7.33	6.94	551.6	64.21	5964	426.0	9.64	23
				28.000	26.250	.875	253	234.4	7.33	6.87	541.2	74.56	6865	490.3	9.60	27
				28.000	26.000	1.000	288	230.0	7.33	6.81	530.9	84.82	7740	552.8	9.55	34
				28.000	25.750	1.125	323	225.6	7.33	6.74	520.8	94.98	8590	613.6	9.51	41
				28.000	25.500	1.250	357	221.2	7.33	6.68	510.7	105.05	9417	672.6	9.47	49
				28.000	25.250	1.375	391	216.9	7.33	6.61	500.7	115.01	10219	729.9	9.43	57
				28.000	25.000	1.500	425	212.6	7.33	6.54	490.9	124.88	10997	785.5	9.38	66
30		5S	API	30.000	29.500	.250	79	296.3	7.85	7.72	683.4	23.37	2585	172.3	10.52	4.1
		10, 10S	API	30.000	29.438	.281	89	295.1	7.85	7.70	680.5	26.24	2897	193.1	10.51	4.9
			API	30.000	29.376	.312	99	293.7	7.85	7.69	677.8	29.19	3201	213.4	10.50	5.8
	STD		API	30.000	29.312	.344	109	292.6	7.85	7.67	674.8	32.04	3524	235.0	10.49	6.9
			API	30.000	29.250	.375	119	291.2	7.85	7.66	672.0	34.90	3823	254.8	10.48	8.0
			API	30.000	29.188	.406	130	290.7	7.85	7.64	669.0	37.75	4132	275.5	10.46	9.0
			API	30.000	29.124	.438	138	288.8	7.85	7.62	666.1	40.68	4442	296.2	10.45	10
	XS	20	API	30.000	29.062	.469	148	287.3	7.85	7.61	663.4	43.51	4744	316.3	10.44	11
			API	30.000	29.000	.500	158	286.2	7.85	7.59	660.5	46.34	5033	335.5	10.43	13
		30		30.000	28.750	.625	196	281.3	7.85	7.53	649.2	57.68	6213	414.2	10.39	18
				30.000	28.500	.750	234	276.6	7.85	7.46	637.9	68.92	7371	491.4	10.34	25
				30.000	28.250	.875	272	271.8	7.85	7.39	620.7	80.06	8494	566.2	10.30	29
				30.000	28.000	1.000	310	267.0	7.85	7.33	615.7	91.11	9591	639.4	10.26	36
				30.000	27.750	1.125	347	262.2	7.85	7.26	604.7	102.05	10653	710.2	10.22	44
				30.000	27.500	1.250	384	257.5	7.85	7.20	593.9	112.90	11682	778.8	10.17	53
				30.000	27.250	1.375	421	252.9	7.85	7.13	583.1	123.65	12694	846.2	10.13	62
				30.000	27.000	1.500	457	248.2	7.85	7.07	572.5	134.30	13673	911.5	10.09	71

(CONTINUED ON FOLLOWING PAGE)

(CONTINUED FROM PRECEDING PAGE)

Nom. Pipe Size	WALL THICKNESS			DIMENSIONS			WEIGHTS		AREAS				PROPERTIES			Approx. Weight of Welding Rods
	Iron Pipe Size	Sch. No.	Other	Outside Diam.	Inside Diam.	Wall Thkn.	Plain End Pipe	Water in Pipe	Surface		Cross-Sectional		Moment of Inertia	Section Modulus	Radius of Gyration	
									Outside	Inside	Flow	Metal				
in.				in.	in.	in.	lb. per ft.	lb. per ft.	ft.² per ft.	ft.² per ft.	in.²	in.²	in.⁴	in.³	in.	lb.
32			API	32.000	31.500	.250	85	337.8	8.38	8.25	779.2	24.93	3141	196.3	11.22	4.3
			API	32.000	31.438	.281	95	336.5	8.38	8.23	776.2	28.04	3525	220.3	11.21	5.2
		10	API	32.000	31.376	.312	106	335.2	8.38	8.21	773.2	31.02	3891	243.2	11.20	6.2
			API	32.000	31.312	.344	116	333.8	8.38	8.20	770.0	34.24	4287	268.0	11.19	7.4
	STD		API	32.000	31.250	.375	127	332.5	8.38	8.18	766.9	37.25	4656	291.0	11.18	8.5
			API	32.000	31.188	.406	137	331.2	8.38	8.16	764.0	40.29	5025	314.1	11.17	10
			API	32.000	31.124	.438	148	329.8	8.38	8.15	760.8	43.43	5407	337.9	11.16	11
	XS	20	API	32.000	31.062	.469	158	328.2	8.38	8.13	757.8	46.46	5775	360.9	11.15	12
			API	32.000	31.000	.500	168	327.2	8.38	8.11	754.7	49.48	6140	383.8	11.14	14
		30		32.000	30.750	.625	209	321.9	8.38	8.05	742.5	61.59	7578	473.6	11.09	20
		40		32.000	30.624	.688	230	319.0	8.38	8.02	736.6	67.68	8298	518.6	11.07	23
				32.000	30.500	.750	250	316.7	8.38	7.98	730.5	73.63	8990	561.9	11.05	27
				32.000	30.000	1.000	331	306.4	8.38	7.85	706.8	97.38	11680	730.0	10.95	39
				32.000	29.500	1.250	410	296.3	8.38	7.72	683.5	120.76	14398	899.9	10.88	56
				32.000	29.000	1.500	489	286.3	8.38	7.59	660.5	143.73	16752	104.70	10.80	76
34			API	34.000	33.500	.250	90	382.0	8.90	8.77	881.2	26.50	3773	221.9	11.93	4.6
			API	34.000	33.438	.281	101	380.7	8.90	8.75	878.2	29.77	4230	248.8	11.92	6.1
		10	API	34.000	33.376	.312	112	379.3	8.90	8.74	874.9	32.99	4680	275.3	11.91	6.6
			API	34.000	33.312	.344	124	377.8	8.90	8.72	871.6	36.36	5147	302.8	11.90	7.8
	STD		API	34.000	33.250	.375	135	376.2	8.90	8.70	867.8	39.61	5597	329.2	11.89	9.0
			API	34.000	33.188	.406	146	375.0	8.90	8.69	865.0	42.88	6047	355.7	11.87	10
			API	34.000	33.124	.438	157	373.6	8.90	8.67	861.7	46.18	6501	382.4	11.86	12
	XS	20	API	34.000	33.062	.469	168	371.9	8.90	8.66	858.5	49.40	6945	408.5	11.86	13
			API	34.000	33.000	.500	179	370.8	8.90	8.64	855.3	52.62	7385	434.4	11.85	14
		30		34.000	32.750	.625	223	365.0	8.90	8.57	841.9	65.53	9124	536.7	11.80	21
		40		34.000	32.624	.688	245	362.1	8.90	8.54	835.9	72.00	9992	587.8	11.78	25
				34.000	32.500	.750	266	359.5	8.90	8.51	829.3	78.34	10829	637.0	11.76	28
				34.000	32.000	1.000	353	348.6	8.90	8.38	804.2	103.67	14114	830.2	11.67	42
				34.000	31.500	1.250	437	337.8	8.90	8.25	779.2	128.61	17246	1014.5	11.58	60
				34.000	31.000	1.500	521	327.2	8.90	8.11	754.7	153.15	20247	1191.0	11.50	81
36			API	36.000	35.500	.250	96	429.1	9.42	9.29	989.7	28.11	4491	249.5	12.64	4.8
			API	36.000	35.438	.281	107	427.6	9.42	9.28	986.4	31.49	5023	279.1	12.63	5.9
		10	API	36.000	35.376	.312	119	426.1	9.42	9.26	982.9	34.95	5565	309.1	12.62	7.0
			API	36.000	35.312	.344	131	424.6	9.42	9.24	979.3	38.56	6127	340.4	12.60	8.2
	STD		API	36.000	35.250	.375	143	423.1	9.42	9.23	975.8	42.01	6664	370.2	12.59	9.5
			API	36.000	35.188	.406	154	421.6	9.42	9.21	972.5	45.40	7191	399.5	12.58	11
			API	36.000	35.124	.438	166	420.1	9.42	9.19	968.9	48.93	7737	429.9	12.57	12
	XS	20	API	36.000	35.062	.469	178	418.2	9.42	9.18	965.5	52.35	8263	459.0	12.56	14
			API	36.000	35.000	.500	190	417.1	9.42	9.16	962.1	55.76	8785	488.1	12.55	15
		30		36.000	34.876	.562	213	413.8	9.42	9.13	955.3	62.57	9825	545.8	12.53	19
		40		36.000	34.750	.625	236	411.1	9.42	9.10	948.3	69.50	10872	604.0	12.51	22
				36.000	34.500	.750	282	405.3	9.42	9.03	934.7	83.01	12898	716.5	12.46	30
				36.000	34.000	1.000	374	393.6	9.42	8.90	907.9	109.96	16851	936.2	12.38	44
				36.000	33.500	1.250	464	382.1	9.42	8.77	881.3	136.46	20624	1145.8	12.29	64
				36.000	33.000	1.500	553	370.8	9.42	8.64	855.3	162.58	24237	1346.5	12.21	86
42*				42.000	41.500	.250	112	586.4	10.99	10.86	1352.6	32.82	7126	339.3	14.73	5.7
	STD			42.000	41.250	.375	167	579.3	10.99	10.80	1336.3	49.08	10627	506.1	14.71	11
	XS	20		42.000	41.000	.500	222	572.3	10.99	10.73	1320.2	65.18	14037	668.4	14.67	18
		30		42.000	40.750	.625	276	565.4	10.99	10.67	1304.1	81.28	17373	827.3	14.62	26
		40		42.000	40.500	.750	330	558.4	10.99	10.60	1288.2	97.23	20689	985.2	14.59	35
				42.000	40.000	1.000	438	544.8	10.99	10.47	1256.6	128.81	27080	1289.5	14.50	52
				42.000	39.500	1.250	544	531.2	10.99	10.34	1225.3	160.03	33233	1582.5	14.41	74
				42.000	39.000	1.500	649	517.9	10.99	10.21	1194.5	190.85	39181	1865.7	14.33	92

*Although 42" pipe is not covered by B36.10-1959, it is included herein as a matter of convenience.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 75 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/75

VALVE DIMENSIONS

Shown below are overall lengths of solid wedge gate valves and globe valves, as prescribed by ASA Standard B16.10 for ferrous flanged and welding end valves. The dimensions are face-to-face for flanged valves, and beveled-end-to-beveled-end for welding valves. All measurements for flanged valves are taken to the gasket surface of flanges faced as follows:

125 lb. cast iron, flat-faced;
250 lb. cast iron, 1/16" raised face;
150 and 300 lb. steel, 1/16" raised face;
400 lb. and heavier steel, 1/4" raised face.

When other than standard facings are involved, the lengths shown below must be modified accordingly. See detailed facing dimensions on page 130.

Lengths of other types of valves may be calculated as follows:

Double-disc gate valves: Same as solid wedge gate valves, except 1 1/2" and smaller valves in 900 lb. and heavier ratings are not defined in ASA B16.10.

Globe lift check valves: Same as globe valves.

Swing check valves: Same as globe valves, except:

5" 150 lb.....13" length
6" 150 lb.....14" length
1" 300 lb..... 8 1/2" length
1 1/4" 300 lb..... 9" length
1 1/2" 300 lb..... 9 1/2" length
8" 300 lb..... 21" length

Tilting disc check valves: Same as swing check valves (except 2500 lb., dimensions of which should be procured from the manufacturer).

Angle or angle lift check valves: Center-to-face or -end dimensions are one-half globe valve lengths, except:

1" 150 lb.....2 3/4" length
1 1/4" 150 lb.....3" length

Corrosion-resistant valves made from stainless or other alloy steels are not always furnished to standard lengths. Dimensions may be obtained from individual manufacturers.

Nom. Pipe Size	Cast Iron		Steel							Nom. Pipe Size
					Welding or Flanged Ends					
	125 lb. Flanged	250 lb. Flanged	150 lb. Flanged	150 lb. Wldg. End	300 lb.	400 lb.	600 lb.	900 lb.	1500 lb.	2500 lb.	
SOLID WEDGE GATE VALVES											
1	—	—	5	5	—	8 1/2	8 1/2	10	10	12 1/8	1
1 1/4	—	—	5 1/2	5 1/2	—	9	9	11	11	13 3/4	1 1/4
1 1/2	—	—	6 1/2	6 1/2	7 1/2	9 1/2	9 1/2	12	12	15 1/8	1 1/2
2	7	8 1/2	7	8 1/2	8 1/2	11 1/2	11 1/2	14 1/2	14 1/2	17 3/4	2
2 1/2	7 1/2	9 1/2	7 1/2	9 1/2	9 1/2	13	13	16 1/2	16 1/2	20	2 1/2
3	8	11 1/8	8	11 1/8	11 1/8	14	14	15	18 1/2	22 3/4	3
3 1/2	8 1/2	11 7/8*	8 1/2*	—	11 7/8*	15*	15*	17*	19 1/2*	—	3 1/2
4	9	12	9	12	12	16	17	18	21 1/2	26 1/2	4
5	10	15	10	15	15	18	20	22	26 1/2	31 1/4	5
6	10 1/2	15 7/8	10 1/2	15 7/8	15 7/8	19 1/2	22	24	27 3/4	36	6
8	11 1/2	16 1/2	11 1/2	16 1/2	16 1/2	23 1/2	26	29	32 3/4	40 1/4	8
10	13	18	13	18	18	26 1/2	31	33	39	50	10
12	14	19 3/4	14	19 3/4	19 3/4	30	33	38	44 1/2	56	12
14	15	22 1/2	15	22 1/2	30	32 1/2	35	40 1/2	49 1/2	—	14
16	16	24	16	24	33	35 1/2	39	44 1/2	54 1/2	—	16
18	17	26	17	26	36	38 1/2	43	48	60 1/2	—	18
20	18	28	18	28	39	41 1/2	47	52	65 1/2	—	20
24	20	31	20	32	45	48 1/2	55	61	76 1/2	—	24
GLOBE VALVES											
1	—	—	5	5	8	8 1/2	8 1/2	10	10	12 1/8	1
1 1/4	—	—	5 1/2	5 1/2	8 1/2	9	9	11	11	13 3/4	1 1/4
1 1/2	—	—	6 1/2	6 1/2	9	9 1/2	9 1/2	12	12	15 1/8	1 1/2
2	8	10 1/2	8	8	10 1/2	11 1/2	11 1/2	14 1/2	14 1/2	17 3/4	2
2 1/2	8 1/2	11 1/2	8 1/2	8 1/2	11 1/2	13	13	16 1/2	16 1/2	20	2 1/2
3	9 1/2	12 1/2	9 1/2	9 1/2	12 1/2	14	14	15	18 1/2	22 3/4	3
3 1/2*	10 1/2	13 1/4	10 1/2	10 1/2	13 1/4	15	15	17	19 1/2	—	3 1/2*
4	11 1/2	14	11 1/2	11 1/2	14	16	17	18	21 1/2	26 1/2	4
5	13	15 3/4	14	14	15 3/4	18	20	22	26 1/2	31 1/4	5
6	14	17 1/2	16	16	17 1/2	19 1/2	22	24	27 3/4	36	6
8	19 1/2	21	19 1/2	19 1/2	22	23 1/2	26	29	32 3/4	40 1/4	8
10	24 1/2	24 1/2	24 1/2	24 1/2	24 1/2	26 1/2	31	33	39	50	10
12	27 1/2	28	27 1/2	27 1/2	28	30	33	38	44 1/2	56	12

DIMENSIONS are shown in inches. *Not defined in ASA B16.10.

METHODS OF CALCULATION

PRESSURE RATINGS

PIPE AND WELDING FITTINGS

Allowable working pressures for pipe and welding fittings are determined by formulas prescribed in the American Standard Association's Code for Pressure Piping (ASA B31), under the procedures detailed below. Pressure ratings for the commonly-used grades of pipe, in various temperature ranges, have been calculated, and are shown on pages 149 thru 157. In addition, tables of stress values are given on pages 158 thru 160, so that simple calculations can be made to provide working pressures for other metals and other temperatures.

Note that the working pressures shown apply equally to pipe and to welding fittings. ASA Standard B16.9, governing the manufacture of welding fittings, requires that they be at least equal to seamless pipe in strength, and Crane fittings comply with this requirement in all respects.

The Code for Pressure Piping

ASA B31 is divided into a number of sections, each devoted to piping for a particular industry. Each section contains a formula for determining allowable working pressures for pipe of various sizes, thicknesses and materials, at various temperatures. **These formulas are not all the same.** Safety factors vary with the potential danger from failure in a piping system, and therefore depend on the location of the piping and the fluid it carries.

Currently, the Code for Pressure Piping is undergoing major changes. Until recently, all types of piping services were covered in a single bound book (ASA B31.1-1955). It is now the intent to cover each type of piping service in an individually-bound book. The present status of the various sections, and the formulas used in computing the working pressures shown in this catalog, are as follows:

Section 1—Power Piping

This section covers power piping systems in steam-generating, central-heating, and industrial plants. Power piping systems include all steam, water, and oil piping within, or forming part of these plants, except certain portions under the jurisdiction of the ASME Boiler Code. Currently, Section 1 is contained in B31.1-1955. The new, separate section will probably be published within a year.

Allowable working pressures for pipe and welding fittings under this section are given on pages 149 thru 151. The formula:

$$P = \frac{S}{\frac{1}{2}\left(\frac{D}{t_m - C}\right) - y}$$

in which:

P = maximum allowable pressure, psig;

S = allowable stress in material due to internal pressure at the designated operating temperature, in psi. (Allowable stresses are shown on page 158.)

D = outside diameter of pipe, inches;

t_m = minimum pipe wall thickness, inches,
= 87 1/2% of nominal wall thickness;

C = allowance for minimum structural stability in inches, valued as follows:

0.065" for pipe sizes 3 1/2" and smaller,
0.000" for pipe sizes 4" and larger;

y = a coefficient having values as follows:

Temperature (° F)	900 and below	950	1000	1050	1100	1150 and above
Ferritic Steels	.4	.5	.7	.7	.7	.7
Austenitic Steels	.4	.4	.4	.4	.5	.7

Note: Interpolate for intermediate temperatures

No allowance for corrosion or erosion is provided in the working pressures listed herein. If either is expected, the amount, in inches, should be added to "C" in the formula, and reduced working pressures calculated.

Section 2—Industrial Gas and Air Piping

This section is used for gas and air piping in industrial installations only. Now contained in ASA B31.1-1955, the separate section will probably not be available for several years.

Allowable working pressures for Industrial Gas and Air Piping are tabulated on pages 149 through 151. The formula for their computation is the same as the one for Power Piping, except that:

1) the value of "C" is 0.050" for all sizes of pipe, and is intended as an allowance for structural stability, corrosion and other factors; and
2) the values of "S" are shown in the table on page 158.

Section 3—Petroleum Refinery Piping

A separate standard on Petroleum Refinery Piping, ASA B31.3-1962, covers piping within refinery limits, and replaces the Division "A" portion of the old Section 3, shown in ASA B31.1-1955.

Working pressures for refinery piping are tabulated on pages 152 through 157. These were calculated by the formula shown in ASA B31.3-1962, except that:

Power Piping, except that:

1) The value of "C" is zero for all sizes of pipe;
2) The values of "S" for Petroleum Refinery Piping are those shown on pages 159 and 160.

Here again, it should be noted that if corrosion or erosion is expected, the amount in inches should be added to "C" in the formula, and reduced working pressures calculated.

(CONTINUED ON FOLLOWING PAGE)

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 76 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/76

PRESSURE RATINGS • Methods of Calculation

(CONTINUED FROM PRECEDING PAGE)

Section 4—Oil Transportation Piping

An individual standard for Oil Transportation Piping, ASA B31.4-1959, has also been published. It applies to pipe-line transportation systems outside of refineries, including piping carrying crude oil, petroleum products, and liquified petroleum gas.

Allowable working pressures for piping under this section are given on pages 152 through 157. The formula:

$$P = \frac{2St}{D}$$

where P = maximum internal allowable pressure, psig;

S = maximum allowable hoop stress, determined by multiplying the minimum specified yield strength of the material by 0.72 XE. Minimum yield-strengths of various materials are shown on pages 120-122.

t = nominal wall thickness of the pipe, inches;

D = outside diameter of the pipe, inches.

E = Longitudinal Joint Factor, see table.

Section 4—District Heating Systems

This section covers district heating steam or hot water distribution systems for pressures and temperatures not exceeding 600 psi or 750°F. Now a part of the old ASA Standard B31.1-1955, it will later be eliminated by combining it with the new Section on Power Piping.

Note: The fact that there are currently two different sections, each numbered "4", may cause confusion unless the full name of the Section is specified in inquiries and orders.

Working pressures for District Heating Systems are calculated by the same formulas as those for Power Piping, except for the pressure-temperature limitations noted above. Pressure ratings are tabulated on pages 149 through 151; stress values are shown on page 158.

Section 5—Refrigeration Piping

A separate standard on Refrigeration Piping, ASA B31.5-1962, replaces Section 5 in ASA B31.1-1955.

Allowable working pressures for Refrigeration Piping are given on pages 152 through 157 and were calculated by the formula in ASA B31.5-1962.

The values of "S" for Refrigeration Piping are those shown on page 160.

Here again, it should be noted that if corrosion or erosion is expected, the amount in inches should be added to "C" in the formula, and reduced working pressures calculated.

Section 8—Gas Transmission and Distribution Piping

The Section covering Gas Transmission and Distribution Piping, ASA B31.8-1963, covers cross-country gas transmission and distribution systems.

The allowable working pressures for pipe and welding fittings used in gas transmission and distribution are not tabulated in this book, because of the many variables in the formula. However, the formula and all information required to compute working pressures are as follows:

$$P = \frac{2St}{D} \times E \times F \times T$$

where P = maximum allowable working pressure, psig;
S = specified minimum yield strength, psi;
t = nominal wall thickness, inches;
D = nominal outside diameter of pipe, inches;
E = longitudinal joint factor (see table below);
F = design factor (see table below);
T = temperature derating factor (see table below).

The design factor, F, is a safety factor based on location of the line. The table below describes the location of the line in general terms; for more detailed information, reference should be made to the Code.

LONGITUDINAL JOINT FACTOR: "E"

Spec.	Class of Pipe	E
ASTM A53	Seamless	1.00
	Electric Resistance Welded	1.00
	Furnace Butt Welded	0.60
ASTM A106	Seamless	1.00
ASTM A134	Electric Fusion Welded	0.80
ASTM A135	Electric Resistance Welded	1.00
ASTM A139	Electric Fusion Welded	0.80
ASTM A155	Electric Fusion Welded	1.00
ASTM A381	Double Submerged-Arc-Welded	1.00
API 5L	Seamless	1.00
	Electric Resistance Welded	1.00
	Electric Flash Welded	1.00
	Furnace Butt Welded	0.60
API 5LX	Seamless	1.00
	Electric Resistance Welded	1.00
	Electric Flash Welded	1.00
	Submerged Arc Welded	1.00
ASTM A211	Spiral Welded	.80

DESIGN FACTOR: "F"

Type of Construction	General Location	F
A	Sparsely populated areas.	0.72
B	Fringe areas around urban centers.	0.60
C	Average commercial and residental areas; compressor stations.	0.50
D	Densely populated areas.	0.40

TEMPERATURE DERATING FACTOR: "T"

Temperature (°F)	T
250 or less	1.000
300	0.967
350	0.933
400	0.900
450	0.867

NOTE: Interpolate for intermediate temperatures.

POWER PIPING
DISTRICT HEATING • GAS and AIR

PRESSURE RATINGS
PIPE AND WELDING FITTINGS

ASA B31 SECTION: →				POWER PIPING DISTRICT HEATING PIPING			POWER PIPING						INDUSTRIAL GAS AND AIR	
Seamless Pipe Specification: →				A-106-B Carbon Steel			A-335-P11 and P22 Alloy Steel					A-335-P22	A-106-B	
Welding Fittings Specification: →				A-234-WPB Carbon Steel			A-234-WP11 and WP22 Alloy Steel					A-234-WP22	A-234-WPB	
Nominal Pipe Size	Wall Thickness			Temperature (°F)			Temperature (°F)					Temp.(°F)	Temperature (°F)	
	I.P.S.	Sched. No.	Inches	-20 to 650	700	750	800	850	900	950	1000	1050	100	450
½"	STD	40	0.109	1103	1055	952	1103	1059	963	815	586	436	2371	2055
	XS	80	0.147	2434	2328	2101	2434	2337	2126	1814	1330	989	4250	3684
		160	0.188	3904	3735	3371	3904	3748	3410	2940	2202	1637	6371	5522
	XXS		0.294	8389	8026	7243	8389	8054	7327	6517	5242	3898	12911	11189
¾"	STD	40	0.113	997	954	861	997	957	871	736	529	393	2031	1760
	XS	80	0.154	2113	2021	1824	2113	2028	1845	1571	1147	853	3625	3141
		160	0.219	3982	3809	3438	3982	3823	3478	3000	2250	1673	6306	5465
	XXS		0.308	6941	6640	5993	6941	6664	6062	5337	4191	3117	10544	9138
1"	STD	40	0.133	1200	1148	1036	1200	1152	1048	887	639	475	2209	1915
	XS	80	0.179	2222	2125	1918	2222	2133	1940	1654	1209	899	3641	3156
		160	0.250	3873	3705	3344	3873	3718	3382	2915	2183	1623	6006	5205
	XXS		0.358	6658	6369	5748	6658	6391	5814	5109	3994	2970	10011	8676
1¼"	STD	40	0.140	1059	1013	914	1059	1017	925	782	563	418	1901	1647
	XS	80	0.191	1939	1855	1674	1939	1861	1693	1440	1049	780	3142	2723
		160	0.250	3006	2876	2595	3006	2886	2625	2249	1663	1237	4647	4028
	XXS		0.382	5585	5343	4821	5585	5361	4877	4254	3269	2431	8333	7222
1½"	STD	40	0.145	1005	962	868	1005	965	878	742	533	397	1756	1522
	XS	80	0.200	1821	1742	1572	1821	1748	1591	1352	983	731	2917	2528
		160	0.281	3093	2959	2671	3093	2970	2702	2316	1715	1275	4719	4090
	XXS		0.400	5114	4893	4415	5114	4910	4466	3883	2962	2203	7589	6577
2"	STD	40	0.154	905	866	781	905	869	791	668	479	356	1544	1338
	XS	80	0.218	1661	1589	1434	1661	1595	1451	1232	894	664	2612	2264
		160	0.344	3222	3083	2782	3222	3093	2814	2415	1791	1332	4830	4186
	XXS		0.436	4480	4286	3868	4480	4301	3913	3387	2559	1903	6598	5718
2½"	STD	40	0.203	1217	1164	1051	1217	1168	1063	900	649	482	1934	1676
	XS	80	0.276	1942	1858	1677	1942	1864	1696	1443	1051	781	2955	2561
		160	0.375	2960	2831	2555	2960	2841	2585	2214	1636	1216	4404	3817
	XXS		0.552	4934	4720	4260	4934	4737	4309	3741	2847	2117	7193	6234
3"	STD	40	0.216	1094	1046	944	1094	1050	955	808	582	432	1722	1492
	XS	80	0.300	1768	1692	1527	1768	1698	1544	1312	953	709	2680	2322
		160	0.438	2939	2812	2538	2939	2822	2567	2199	1624	1208	4328	3751
	XXS		0.600	4407	4216	3804	4407	4230	3848	3329	2513	1869	6395	5542
3½"	STD	40	0.226	1025	980	885	1025	984	895	757	544	405	1598	1385
	XS	80	0.318	1669	1596	1440	1669	1602	1457	1237	898	667	2512	2177
	XXS		0.636	4093	3915	3533	4093	3929	3574	3086	2318	1724	5918	5129
4"	STD	40	0.237	1433	1371	1237	1433	1375	1251	1061	767	570	1512	1310
	XS	80	0.337	2076	1986	1792	2076	1993	1813	1543	1126	837	2390	2071
		120	0.438	2740	2621	2365	2740	2630	2393	2047	1507	1121	3305	2865
		160	0.531	3379	3233	2917	3379	3244	2951	2535	1885	1401	4177	3620
	XXS		0.674	4394	4203	3793	4394	4218	3837	3319	2505	1863	5573	4830
5"	STD	40	0.258	1259	1205	1087	1259	1209	1100	931	672	500	1361	1179
	XS	80	0.375	1856	1776	1602	1856	1782	1621	1378	1002	745	2188	1896
		120	0.500	2520	2411	2176	2520	2419	2201	1880	1380	1026	3098	2685
		160	0.625	3201	3062	2764	3201	3073	2796	2399	1778	1322	4040	3502
	XXS		0.750	3905	3736	3372	3905	3749	3411	2940	2203	1638	5015	4346

(TABLE CONTINUED ON FOLLOWING PAGE)

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 77 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/77

PRESSURE RATINGS • Power Piping, District Heating, Gas and Air

(TABLE CONTINUED FROM PRECEDING PAGE)

ASA B31 SECTION: →				POWER PIPING DISTRICT HEATING PIPING			POWER PIPING						INDUSTRIAL GAS AND AIR	
Seamless Pipe Specification: →				A-106-B Carbon Steel			A-335-P11 and P22 Alloy Steel					A-335-P22	A-106-B	
Welding Fittings Specification: →				A-234-WPB Carbon Steel			A-234-WP11 and WP22 Alloy Steel					A-234-WP22	A-234-WPB	
Nominal Pipe Size	Wall Thickness			Temperature (°F)			Temperature (°F)					Temp. (°F)	Temperature (°F)	
	I.P.S.	Sched. No.	Inches	–20 to 650	700	750	800	850	900	950	1000	1050	100	450
6″	STD	40	0.280	1143	1094	987	1143	1097	998	845	608	452	1266	1097
	XS	80	0.432	1793	1715	1548	1793	1721	1566	1331	967	719	2165	1876
		120	0.562	2368	2266	2045	2368	2273	2068	1765	1293	961	2959	2564
		160	0.719	3082	2948	2661	3082	2959	2692	2308	1708	1270	3941	3416
	XXS		0.864	3767	3604	3252	3767	3616	3290	2834	2118	1575	4893	4241
8″		20	0.250	777	744	671	777	746	679	573	411	305	836	724
		30	0 277	861	824	743	861	827	752	635	456	339	953	826
	STD	40	0.322	1007	963	869	1007	967	880	744	534	397	1153	999
		60	0.406	1277	1221	1102	1277	1226	1115	944	681	507	1529	1325
	XS	80	0.500	1588	1519	1371	1588	1524	1387	1177	853	634	1957	1696
		100	0.594	1896	1814	1637	1896	1820	1656	1408	1025	762	2388	2069
		120	0.719	2323	2222	2006	2323	2230	2029	1730	1267	942	2976	2579
		140	0.812	2643	2529	2282	2643	2537	2308	1973	1451	1079	3427	2970
	XXS		0.875	2868	2743	2476	2868	2753	2504	2144	1582	1176	3732	3234
		160	0.906	2977	2848	2570	2977	2858	2600	2227	1646	1224	3885	3367
10″		20	0.250	621	594	536	621	596	543	458	327	243	668	579
		30	0.307	766	733	661	766	735	669	565	405	301	867	752
	STD	40	0.365	912	872	787	912	875	796	673	483	359	1073	930
	XS	60	0.500	1263	1209	1091	1263	1213	1103	934	674	501	1558	1350
		80	0.594	1507	1441	1301	1507	1446	1316	1116	808	601	1898	1645
		100	0.719	1842	1762	1590	1842	1768	1608	1367	994	739	2360	2046
		120	0.844	2179	2085	1881	2179	2092	1903	1622	1185	881	2831	2453
	XXS	140	1.000	2612	2499	2255	2612	2507	2281	1949	1433	1066	3434	2976
		160	1.125	2963	2835	2558	2963	2845	2588	2217	1638	1218	3923	3400
12″		20	0.250	522	500	451	522	502	456	384	275	204	563	488
		30	0.330	693	663	598	693	665	605	510	365	272	798	692
	STD		0.375	788	754	680	788	756	688	581	416	310	932	808
		40	0.406	854	817	738	854	820	746	630	452	336	1025	888
	XS		0.500	1060	1014	915	1060	1017	925	783	563	419	1308	1134
		60	0.562	1195	1143	1031	1195	1147	1043	883	636	473	1497	1298
		80	0.688	1470	1406	1269	1470	1411	1283	1088	787	585	1880	1629
		100	0.844	1821	1742	1572	1821	1748	1590	1352	983	731	2367	2051
	XXS	120	1.000	2178	2084	1881	2178	2091	1902	1621	1184	881	2867	2484
		140	1.125	2467	2361	2130	2467	2369	2155	1840	1350	1004	3270	2834
		160	1.312	2911	2785	2513	2911	2794	2542	2177	1607	1195	3885	3367
14″		10	0.250	475	455	410	475	456	415	350	249	186	510	442
		20	0.312	594	569	513	594	571	519	438	313	233	678	588
	STD	30	0.375	716	685	618	716	688	626	528	378	281	848	735
		40	0.438	839	803	724	839	806	733	619	444	330	1019	883
	XS		0.500	963	921	831	963	924	841	711	510	380	1189	1030
		60	0.594	1146	1097	990	1146	1100	1001	847	610	454	1445	1252
		80	0.750	1460	1397	1261	1460	1402	1275	1082	782	582	1884	1633
		100	0.938	1843	1764	1591	1843	1770	1610	1369	995	740	2415	2093
		120	1.094	2167	2073	1871	2167	2080	1893	1612	1178	876	2869	2486
		140	1.250	2500	2392	2159	2500	2400	2184	1865	1369	1018	3331	2887
		160	1.406	2835	2712	2448	2835	2722	2476	2119	1563	1162	3797	3291

Values are expressed in psi.
Working pressures shown are based on formulas and corrosion allowances given on pages 147-148.

Working pressures for A-106-B and A-234-WPB may also be used for:

(1) A-53-B pipe as shown,
(2) A-106-A or A-53-A pipe or A-234-WPA fittings after multiplying the above values by .800 at 650° F. & lower
.812 at 700° F.
.826 at 750° F.

(TABLE CONTINUED ON FOLLOWING PAGE)

PRESSURE RATINGS • Power Piping, District Heating, Gas and Air

(TABLE CONTINUED FROM PRECEDING PAGE)

ASA B31 SECTION: →				POWER PIPING DISTRICT HEATING PIPING			POWER PIPING						INDUSTRIAL GAS AND AIR	
Seamless Pipe Specification: →				A-106-B Carbon Steel			A-335-P11 and P22 Alloy Steel					A-335-P22	A-106-B	
Welding Fittings Specification: →				A-234-WPB Carbon Steel			A-234-WP11 and WP22 Alloy Steel					A-234-WP22	A-234-WPB	
Nominal Pipe Size	Wall Thickness			Temperature (°F)			Temperature (°F)					Temp. (°F)	Temperature (°F)	
	I.P.S.	Sched. No.	Inches	–20 to 650	700	750	800	850	900	950	1000	1050	100	450
16″		10	0.250	415	397	358	415	399	363	305	218	162	447	388
		20	0.312	519	496	448	519	498	453	382	273	203	592	513
	STD	30	0.375	625	598	540	625	600	546	460	329	245	741	642
	XS	40	0.500	840	803	725	840	806	733	619	444	330	1037	899
		60	0.656	1108	1060	957	1108	1064	968	819	589	438	1413	1225
		80	0.844	1437	1375	1240	1437	1379	1255	1064	769	572	1869	1620
		100	1.031	1771	1694	1529	1771	1700	1547	1314	955	710	2337	2026
		120	1.219	2111	2020	1823	2111	2027	1844	1570	1146	852	2810	2435
		140	1.438	2517	2408	2173	2517	2417	2198	1877	1378	1025	3375	2925
		160	1.594	2810	2688	2426	2810	2697	2454	2100	1548	1151	3782	3278
18″		10	0.250	369	353	318	369	354	322	271	193	144	397	344
		20	0.312	461	441	398	461	442	402	339	242	180	525	455
	STD		0.375	555	531	479	555	533	484	408	292	217	657	570
		30	0.438	649	621	561	649	623	567	478	342	254	790	684
	XS		0.500	744	712	643	744	715	650	549	393	292	920	797
		40	0.562	838	802	724	838	805	732	618	443	330	1052	912
		60	0.750	1126	1077	972	1126	1081	983	832	599	445	1453	1259
		80	0.938	1418	1357	1224	1418	1362	1239	1050	759	564	1861	1613
		100	1.156	1766	1690	1525	1766	1696	1542	1311	952	708	2344	2031
		120	1.375	2118	2027	1829	2118	2034	1850	1576	1150	855	2835	2457
		140	1.562	2426	2321	2094	2426	2329	2118	1808	1326	986	3263	2828
		160	1.781	2790	2669	2408	2790	2678	2436	2085	1536	1142	3772	3269
20″	STD	10	0.250	331	317	286	331	318	298	244	173	129	357	309
		20	0.375	499	477	430	499	479	435	367	262	195	590	511
	XS	30	0.500	669	640	577	669	642	584	493	352	262	827	717
		40	0.594	795	761	686	795	763	694	586	420	312	1004	870
		60	0.812	1096	1049	946	1096	1052	957	810	583	433	1424	1234
		80	1.031	1404	1343	1212	1404	1348	1226	1039	751	558	1852	1605
		100	1.281	1760	1684	1520	1760	1690	1537	1306	949	706	2350	2037
		120	1.500	2077	1987	1793	2077	1994	1814	1545	1127	838	2793	2421
		140	1.750	2446	2340	2112	2446	2348	2136	1824	1337	995	3308	2867
		160	1.969	2774	2654	2395	2774	2663	2423	2073	1527	1136	3763	3261
24″	STD	10	0.250	276	264	238	276	265	241	203	144	107	296	257
	XS	20	0.375	415	397	358	415	398	362	305	217	162	491	426
			0.500	556	532	480	556	533	485	409	292	217	687	595
		30	0.562	625	598	540	625	600	546	460	329	245	785	681
		40	0.688	767	733	662	767	736	669	565	405	301	983	852
		60	0.969	1089	1042	941	1089	1046	951	805	579	431	1432	1241
		80	1.219	1382	1322	1193	1382	1326	1207	1023	739	549	1840	1594
		100	1.531	1753	1677	1514	1753	1683	1531	1301	945	703	2358	2044
		120	1.812	2093	2003	1807	2093	2009	1828	1557	1136	845	2833	2455
		140	2.062	2399	2295	2071	2399	2303	2095	1788	1310	974	3261	2826
		160	2.344	2750	2631	2374	2750	2640	2402	2055	1513	1125	3751	3251

(3) A-106-C pipe or A-234-WPC fittings after multiplying the above values by
1.17 at 650° F. & lower
1.16 at 700° F.
1.14 at 750° F.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 78 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/78

PRESSURE RATINGS
PIPE AND WELDING FITTINGS

OIL REFINERY
OIL TRANSPORTATION • REFRIGERATION

ASA B31 SECTION: →				PETROLEUM REFINERY PIPING										
Seamless Pipe Specification: →				A-106-B Carbon Steel					A-335-P11 Alloy Steel				A-335-P5	
Welding Fitting Specification: →				A-234-WPB Carbon Steel					A-234-WP11 Alloy Steel				A-234-WP5	
Nominal Pipe Size	Wall Thickness			Temperature (°F)					Temperature (°F)				Temperature (°F)	
	I.P.S.	Sched. No.	Inches	−20 to 100	300	500	650	750	800	900	1000	1100	800	900
½″	STD	40	0.109	4974	4514	4066	3730	3221	3730	3258	2096	1075	3183	2860
	XS	80	0.147	7003	6355	5725	5252	4534	5252	4587	3052	1565	4482	4027
		160	0.188	9255	8399	7566	6941	5993	6941	6062	4191	2149	5923	5322
	XXS		0.294	*	*	*	*	*	*	*	*	*	*	*
¾″	STD	40	0.113	4079	3702	3335	3059	2641	3059	2672	1695	869	2611	2346
	XS	80	0.154	5732	5202	4686	4299	3712	4299	3755	2446	1254	3669	3296
		160	0.219	8514	7727	6960	6386	5513	6386	5577	3807	1952	5449	4896
	XXS		0.308	*	*	*	*	*	*	*	*	*	*	*
1″	STD	40	0.133	3794	3443	3101	2845	2456	2845	2485	1569	805	2428	2181
	XS	80	0.179	5276	4788	4313	3957	3416	3957	3456	2234	1146	3376	3034
		160	0.250	7678	6967	6276	5758	4971	5758	5029	3384	1735	4914	4415
	XXS		0.358	11751	10664	9606	8813	7609	8813	7697	5563	2853	7521	6757
1¼″	STD	40	0.140	3124	2835	2553	2343	2022	2343	2046	1278	655	1999	1796
	XS	80	0.191	4376	3972	3578	3282	2834	3282	2867	1827	937	2801	2516
		160	0.250	5900	5354	4823	4425	3820	4425	3864	2524	1294	3776	3392
	XXS		0.382	9592	8705	7842	7194	6211	7194	6283	4370	2241	6139	5516
1½″	STD	40	0.145	2825	2564	2309	2119	1829	2119	1850	1150	590	1808	1624
	XS	80	0.200	3977	3609	3251	2983	2575	2983	2605	1649	846	2545	2287
		160	0.281	5777	5243	4723	4333	3741	4333	3784	2467	1265	3697	3322
	XXS		0.400	8643	7844	7066	6482	5596	6482	5661	3873	1986	5532	4970
2″	STD	40	0.154	2381	2161	1946	1786	1542	1786	1560	963	494	1524	1369
	XS	80	0.218	3436	3119	2809	2577	2225	2577	2251	1413	725	2199	1976
		160	0.344	5618	5098	4593	4213	3638	4213	3680	2393	1227	3596	3230
	XXS		0.436	7380	6697	6033	5535	4779	5535	4834	3237	1660	4723	4244
2½″	STD	40	0.203	2605	2364	2129	1953	1686	1953	1706	1057	542	1667	1498
	XS	80	0.276	3609	3275	2950	2707	2337	2707	2364	1488	763	2310	2075
		160	0.375	5020	4556	4104	3765	3251	3765	3288	2117	1086	3213	2887
	XXS		0.552	7761	7043	6345	5821	5025	5821	5083	3426	1757	4967	4463
3″	STD	40	0.216	2258	2049	1846	1693	1462	1693	1479	911	467	1445	1298
	XS	80	0.300	3185	2891	2604	2389	2062	2389	2086	1305	669	2039	1832
		160	0.438	4797	4354	3922	3598	3106	3598	3142	2016	1034	3070	2758
	XXS		0.600	6819	6188	5574	5114	4415	5114	4466	2962	1519	4364	3921
3½″	STD	40	0.226	2062	1871	1685	1546	1335	1546	1350	830	425	1319	1185
	XS	80	0.318	2944	2671	2407	2208	1906	2208	1928	1201	616	1884	1693
	XXS		0.636	6268	5688	5124	4701	4058	4701	4105	2698	1384	4011	3604
4″	STD	40	0.237	1910	1734	1562	1433	1237	1433	1251	767	393	1223	1098
	XS	80	0.337	2767	2511	2262	2076	1792	2076	1813	1126	577	1771	1591
		120	0.438	3653	3315	2986	2740	2365	2740	2393	1507	773	2338	2100
		160	0.531	4506	4089	3683	3379	2917	3379	2951	1885	966	2884	2591
	XXS		0.674	5858	5316	4789	4394	3793	4394	3837	2505	1285	3749	3368
5″	STD	40	0.258	1679	1524	1373	1259	1087	1259	1100	672	345	1075	966
	XS	80	0.375	2475	2246	2023	1856	1602	1856	1621	1002	514	1584	1423
		120	0.500	3360	3049	2747	2520	2176	2520	2201	1380	708	2151	1932
		160	0.625	4268	3873	3489	3201	2764	3201	2796	1778	912	2732	2454
	XXS		0.750	5207	4725	4257	3905	3372	3905	3411	2203	1130	3332	2994

*Because of the high ratio of wall thickness to outside diameter, special consideration must be given in determining the allowable working pressure. See the Petroleum Refinery Piping Code, Paragraph 303. Values are expressed in psi.

Working pressures shown are based on formulas and corrosion allowances given on pages 147-148.

(TABLE CONTINUED ON PAGE 154)

PRESSURE RATINGS • Oil Refinery, Oil Transportation, Refrigeration

PETROLEUM REFINERY PIPING							OIL TRANSPORTATION PIPING		REFRIG. PIPING	← ASA B31 SECTION:			
A-335-P5		A-312-TP304 Stainless Steel					5L-Grade B	5LX-52	A-106-B	← Seamless Pipe Specification:			
A-234-WP5		A-403-WP304 Stainless Steel					A-234-WPB	WPY52	A-234-WPB	← Welding Fitting Specification:			
Temperature (°F)		Temperature (°F)					Temp. (°F)	Temp. (°F)	Temp. (°F)	Wall Thickness			Nominal Pipe Size
1000	1100	900	1000	1100	1200	1400	−20 to 250	−20 to 250	0	Inches	Sched. No.	I.P.S.	
1962	887	2338	2189	1913	1209	376	6542	9719	3750	0.109	40	STD	½″
2856	1291	3291	3081	2722	1760	547	8820	13104	5160	0.147	80	XS	
3923	1773	4350	4072	3639	2418	752	11280	16758	6890	0.188	160		
*	*	*	*	*	*	*	17640	26208	*	0.294		XXS	
1586	717	1917	1795	1561	977	304	6386	9487	3050	0.113	40	STD	¾″
2289	1035	2694	2522	2213	1411	439	7394	10985	4300	0.154	80	XS	
3563	1611	4001	3746	3335	2196	683	10513	15620	6380	0.219	160		
*	*	*	*	*	*	*	14782	21962	*	0.308		XXS	
1468	664	1783	1670	1450	905	282	5095	7570	2855	0.133	40	STD	1″
2091	945	2480	2321	2032	1289	401	6859	10191	3945	0.179	80	XS	
3167	1432	3608	3378	2994	1952	608	9581	14235	5760	0.250	160		
5207	2354	5523	5171	4682	3210	998	13719	20382	8825	0.358		XXS	
1196	541	1468	1374	1190	737	229	4249	6312	2355	0.140	40	STD	1¼″
1710	773	2057	1925	1678	1054	328	5801	8619	3285	0.191	80	XS	
2362	1068	2773	2596	2280	1457	453	7590	11277	4420	0.250	160		
4090	1849	4508	4221	3778	2521	784	11597	17230	7200	0.382		XXS	
1077	487	1328	1243	1074	664	207	3846	5713	2115	0.145	40	STD	1½″
1544	698	1869	1750	1522	952	296	5307	7885	2985	0.200	80	XS	
2309	1044	2715	2542	2231	1424	443	7454	11075	4535	0.281	160		
3625	1639	4062	3803	3387	2234	695	10609	15762	6480	0.400		XXS	
901	407	1119	1048	904	556	173	3266	4852	1780	0.154	40	STD	2″
1322	598	1615	1512	1311	815	254	4627	6874	2575	0.218	80	XS	
2239	1012	2640	2472	2168	1380	429	7298	10843	4230	0.344	160		
3029	1369	3469	3247	2874	1868	581	9253	13748	5530	0.436		XXS	
989	447	1224	1146	989	610	189	3558	5287	1950	0.203	40	STD	2½″
1393	630	1696	1588	1378	858	267	4838	7188	2705	0.276	80	XS	
1982	896	2359	2209	1931	1222	380	6572	9764	3765	0.375	160		
3206	1449	3648	3415	3028	1976	615	9677	14377	5820	0.552		XXS	
853	386	1061	993	856	525	164	3110	4620	1695	0.216	40	STD	3″
1221	552	1497	1402	1214	752	234	4319	6417	2390	0.300	80	XS	
1887	853	2255	2111	1843	1163	362	6305	9367	3590	0.438	160		
2773	1253	3205	3000	2648	1709	532	8639	12834	5115	0.600		XXS	
777	351	969	907	781	478	149	2848	4231	1540	0.226	40	STD	3½″
1124	508	1384	1296	1121	693	216	4007	5953	2210	0.318	80	XS	
2525	1141	2946	2758	2427	1556	484	8014	11906	4700	0.636		XXS	
718	324	898	840	723	443	138	2656	3946	1435	0.237	40	STD	4″
1054	476	1301	1218	1052	650	202	3775	5609	2075	0.337	80	XS	
1411	638	1717	1607	1396	870	270	4904	7286	2750	0.438	120		
1764	797	2117	1983	1729	1087	338	5947	8836	3380	0.531	160		
2344	1060	2754	2578	2263	1445	450	7550	11217	4390	0.674		XXS	
629	284	789	739	635	388	120	2339	3474	1250	0.258	40	STD	5″
938	424	1163	1089	940	578	180	3397	5047	1855	0.375	80	XS	
1292	584	1579	1478	1282	796	248	4531	6732	2520	0.500	120		
1664	752	2006	1878	1636	1026	319	5660	8409	3200	0.625	160		
2062	932	2448	2291	2005	1271	396	6984	10094	3910	0.750		XXS	

Working pressures for A-106-B and A-234-WPB may also be used for:
(1) A-53-B pipe as shown,
(2) A-106-A or A-53-A pipe or A-234-WPA fittings after multiplying the above values by:
.800 at 650° F. and lower
.826 at 750° F.
(3) A-106-C pipe or A-234-WPC fittings after multiplying the above values by:
1.17 at 650° F. and lower
1.14 at 750° F.

(TABLE CONTINUED ON PAGE 155)

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 79 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/79

PRESSURE RATINGS • Oil Refinery, Oil Transportation, Refrigeration

(TABLE CONTINUED FROM PAGE 152)

ASA B31 SECTION: →				PETROLEUM REFINERY PIPING																				← ASA B31 SECTION:	
Seamless Pipe Specification: →				A-106-B Carbon Steel					A-335-P11 Alloy Steel				A-335-P5		A-335-P5		A-312-TP304 Stainless Steel				5L-Grade B	5LX-52	A-106-B	← Seamless Pipe Specification:	
Welding Fitting Specification: →				A-234-WPB Carbon Steel					A-234-WP11 Alloy Steel				A-234-WP5		A-234-WP5		A-403-WP304 Stainless Steel				A-234-WPB	WPY52	A-234-WPB	← Welding Fitting Specification:	
Nominal Pipe Size	Wall Thickness			Temperature (°F)					Temperature (°F)				Temperature (°F)		Temperature (°F)		Tempertaure (°F)				Temp. (°F)	Temp. (°F)	Temp. (°F)	Wall Thickness			Nominal Pipe Size
	I.P.S.	Sched. No.	Inches	-20 to 100	300	500	650	750	800	900	1000	1100	800	900	1000	1100	900	1000	1100	1200	1400	-20 to 250	-20 to 250	0	Inches	Sched. No.	I.P.S.	
6″	STD	40	0.280	1524	1383	1246	1143	987	1143	998	608	312	975	876	569	257	716	671	576	351	109	2132	3167	1145	0.280	40	STD	6″
	XS	80	0.432	2391	2170	1955	1793	1548	1793	1566	967	496	1530	1375	905	409	1124	1052	907	558	173	3286	4882	1795	0.432	80	XS	
		120	0.562	3158	2865	2581	2368	2045	2368	2068	1293	663	2021	1816	1210	547	1484	1389	1203	746	232	4274	6350	2375	0.562	120		
		160	0.719	4109	3729	3359	3082	2661	3082	2692	1708	876	2630	2363	1598	723	1931	1808	1574	985	307	5468	8124	3080	0.719	160		
	XXS		0.864	5023	4558	4106	3767	3252	3767	3290	2118	1086	3214	2888	1983	896	2360	2210	1932	1222	380	6572	9764	3770	0.864		XXS	
8″		20	0.250	1037	941	847	777	671	777	679	411	211	663	596	384	174	487	456	391	237	74	1462	2172	775	0.250	20		8″
		30	0.277	1148	1042	938	861	743	861	752	456	234	735	660	426	193	539	505	433	263	82	1618	2404	860	0.277	30		
	STD	40	0.322	1343	1219	1098	1007	869	1007	880	534	274	859	772	500	226	631	591	507	308	96	1880	2793	1000	0.322	40	STD	
		60	0.406	1702	1545	1392	1277	1102	1277	1115	681	349	1089	979	638	288	800	749	644	393	122	2374	3527	1280	0.406	60		
	XS	80	0.500	2117	1921	1731	1588	1371	1588	1387	853	437	1355	1217	798	361	995	932	803	492	153	2923	4343	1585	0.500	80	XS	
		100	0.594	2528	2295	2067	1896	1637	1896	1656	1025	526	1618	1454	959	434	1188	1113	961	592	184	3473	5159	1900	0.594	100		
		120	0.719	3097	2811	2532	2323	2006	2323	2029	1267	650	1982	1781	1186	536	1456	1363	1180	731	228	4203	6245	2325	0.719	120		
		140	0.812	3524	3198	2881	2643	2282	2643	2308	1451	744	2256	2026	1358	614	1656	1551	1345	837	260	4743	7046	2645	0.812	140		
	XXS		0.875	3823	3470	3126	2868	2476	2868	2504	1582	811	2447	2198	1480	669	1797	1682	1462	913	284	5111	7593	2865	0.875		XXS	
		160	0.906	3969	3602	3245	2977	2570	2977	2600	1646	844	2540	2282	1540	696	1865	1746	1519	950	295	5292	7862	2975	0.906	160		
10″		20	0.250	828	752	677	621	536	621	543	327	168	530	476	306	138	390	364	312	189	59	1174	1745	620	0.250	20		10″
		30	0.307	1021	927	835	766	661	766	669	405	207	654	587	379	171	480	449	385	234	73	1441	2142	765	0.307	30		
	STD	40	0.365	1216	1103	994	912	787	912	796	483	248	778	699	452	204	572	535	459	279	87	1714	2546	910	0.365	40	STD	
	XS	60	0.500	1685	1529	1377	1263	1091	1263	1103	674	346	1078	969	631	285	792	741	637	389	121	2344	3482	1260	0.500	60	XS	
		80	0.594	2009	1823	1642	1507	1301	1507	1316	808	414	1286	1155	756	342	944	884	761	466	145	2787	4141	1510	0.594	80		
		100	0.719	2455	2228	2007	1842	1590	1842	1608	994	510	1572	1412	931	421	1154	1080	932	574	179	3372	5009	1840	0.719	100		
		120	0.844	2906	2637	2375	2179	1881	2179	1903	1185	608	1860	1671	1109	501	1366	1278	1106	684	213	3956	5878	2180	0.844	120		
	XXS	140	1.000	3483	3160	2847	2612	2255	2612	2281	1433	735	2229	2002	1341	606	1637	1532	1329	826	257	4687	6964	2610	1.000	140	XXS	
		160	1.125	3951	3586	3230	2963	2558	2963	2588	1638	840	2529	2272	1533	693	1857	1739	1512	945	294	5277	7840	2965	1.125	160		
12″		20	0.250	697	632	569	522	451	522	456	275	141	446	401	257	116	327	307	262	158	49	988	1468	520	0.250	20		12″
	STD	30	0.330	923	838	755	693	598	693	605	365	187	591	531	342	155	434	406	348	210	66	1305	1939	690	0.330	30		
			0.375	1051	953	859	788	680	788	688	416	213	672	604	390	176	494	462	396	240	74	1482	2201	790	0.375		STD	
		40	0.406	1139	1034	931	854	738	854	746	452	232	729	655	423	191	535	501	430	261	81	1603	2381	855	0.406	40		
	XS		0.500	1413	1282	1155	1060	915	1060	925	563	289	904	812	527	238	664	622	534	325	101	1976	2935	1060	0.500		XS	
		60	0.562	1593	1445	1302	1195	1031	1195	1043	636	326	1019	916	596	269	748	701	602	367	114	2223	3302	1195	0.562	60		
		80	0.688	1959	1778	1602	1470	1269	1470	1283	787	404	1254	1127	737	333	921	862	742	454	141	2722	4044	1470	0.688	80		
		100	0.844	2428	2203	1985	1821	1572	1821	1590	983	504	1554	1396	920	416	1141	1068	922	567	176	3336	4957	1820	0.844	100		
	XXS	120	1.000	2904	2636	2374	2178	1881	2178	1902	1184	607	1859	1670	1108	501	1365	1278	1106	683	213	3951	5871	2180	1.000	120	XXS	
		140	1.125	3290	2986	2690	2468	2130	2468	2155	1350	692	2106	1892	1263	571	1546	1448	1254	779	242	4445	6604	2470	1.125	140		
		160	1.312	3881	3522	3273	2911	2513	2911	2542	1607	824	2484	2232	1504	680	1824	1708	1484	927	288	5186	7705	2910	1.312	160		
14″		10	0.250	634	575	518	475	410	475	415	249	128	406	364	234	106	298	279	239	144	45	897	1333	475	0.250	10		14″
		20	0.312	792	719	648	594	513	594	519	313	160	507	456	293	132	372	349	298	181	56	1124	1670	595	0.312	20		
	STD	30	0.375	955	867	781	716	618	716	626	378	194	611	549	354	160	449	420	360	218	68	1351	2007	715	0.375	30	STD	
		40	0.438	1119	1015	915	839	724	839	733	444	228	716	643	415	188	526	492	422	256	80	1578	2344	840	0.438	40		
	XS		0.500	1284	1165	1049	963	831	963	841	510	262	821	738	478	216	603	564	485	294	92	1799	2673	960	0.500		XS	
		60	0.594	1528	1387	1249	1146	989	1146	1001	610	313	978	879	571	258	718	673	578	352	110	2137	3175	1150	0.594	60		
		80	0.750	1947	1767	1592	1460	1261	1460	1275	782	401	1246	1120	732	331	915	857	738	451	140	2701	4014	1460	0.750	80		
		100	0.938	2458	2231	2009	1843	1591	1843	1610	995	510	1573	1413	931	421	1155	1082	933	574	179	3377	5017	1845	0.938	100		
		120	1.094	2889	2622	2362	2167	1871	2167	1893	1178	604	1849	1661	1102	498	1358	1272	1099	680	211	3936	5848	2165	1.094	120		
		140	1.250	3334	3026	2725	2500	2159	2500	2184	1369	702	2134	1917	1281	579	1567	1467	1271	790	245	4501	6687	2500	1.250	140		
		160	1.406	3780	3430	3090	2835	2448	2835	2476	1563	801	2419	2174	1463	661	1777	1663	1444	901	280	5060	7518	2835	1.406	160		

Values are expressed in psi.

Working pressures shown are based on formulas and corrosion allowances given on pages 147-148.

Working pressures for A-106-B and A-234-WPB may also be used for:
(1) A-53-B pipe as shown.
(2) A-106-A or A-53-A pipe or A-234-WPA fittings after multiplying the above values by:
.800 at 650° F. and lower
.826 at 750° F.
(3) A-106-C pipe or A-234-WPC fittings after multiplying the above values by:
1.17 at 650° F. and lower
1.14 at 750° F.

(TABLE CONTINUED ON PAGE 156)

(TABLE CONTINUED ON PAGE 157)

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 80 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/80

PRESSURE RATINGS • Oil Refinery, Oil Transportation, Refrigeration

(TABLE CONTINUED FROM PAGE 154)

ASA B31 SECTION: →				PETROLEUM REFINERY PIPING										
Seamless Pipe Specification: →				A-106-B Carbon Steel					A-335-P11 Alloy Steel				A-335-P5	
Welding Fitting Specification: →				A-234-WPB Carbon Steel					A-234-WP11 Alloy Steel				A-234-WP5	
Nominal Pipe Size	Wall Thickness			Temperature (°F)					Temperature (°F)				Temperature (°F)	
	I.P.S.	Sched. No.	Inches	–20 to 100	300	500	650	750	800	900	1000	1100	800	900
16″		10	0.250	554	502	453	415	358	415	363	218	112	354	318
		20	0.312	692	628	566	519	448	519	453	273	140	443	398
	STD	30	0.375	834	757	682	625	540	625	546	329	169	534	479
	XS	40	0.500	1120	1016	915	840	725	840	733	444	228	716	644
		60	0.656	1477	1341	1208	1108	957	1108	968	589	302	946	850
		80	0.844	1916	1739	1566	1437	1240	1437	1255	769	394	1226	1102
		100	1.031	2362	2143	1931	1771	1529	1771	1547	955	490	1511	1358
		120	1.219	2815	2555	2301	2111	1823	2111	1844	1146	588	1802	1619
		140	1.438	3356	3046	2744	2517	2173	2517	2198	1378	707	2148	1930
		160	1.594	3746	3400	3062	2810	2426	2810	2454	1548	794	2397	2154
18″		10	0.250	491	446	402	369	318	369	322	193	99	315	283
		20	0.312	614	557	502	461	398	461	402	242	124	393	353
	STD		0.375	740	671	605	555	479	555	484	292	150	473	425
		30	0.438	866	786	708	649	561	649	567	342	175	554	498
	XS		0.500	993	901	811	744	643	744	650	393	202	635	571
		40	0.562	1118	1014	914	838	724	838	732	443	227	715	643
		60	0.750	1502	1363	1227	1126	972	1126	983	599	307	961	863
		80	0.938	1891	1716	1546	1418	1224	1418	1239	759	389	1210	1087
		100	1.156	2355	2137	1925	1766	1525	1766	1542	952	488	1507	1354
		120	1.375	2824	2563	2309	2118	1829	2118	1850	1150	590	1808	1624
		140	1.562	3234	2935	2644	2426	2094	2426	2118	1326	680	2070	1860
		160	1.781	3720	3375	3041	2790	2408	2790	2436	1536	788	2381	2139
20″	STD	10	0.250	442	401	361	331	286	331	289	173	89	283	254
	XS	20	0.375	665	603	543	499	431	499	435	262	134	425	382
		30	0.500	892	809	729	669	577	669	584	352	181	571	513
		40	0.594	1060	962	867	795	686	795	694	420	215	678	609
		60	0.812	1461	1326	1195	1096	946	1096	957	583	299	935	840
		80	1.031	1872	1698	1530	1404	1212	1404	1226	751	385	1198	1076
		100	1.281	2347	2130	1919	1760	1520	1760	1537	949	487	1502	1350
		120	1.500	2769	2513	2264	2077	1793	2077	1814	1127	578	1772	1592
		140	1.750	3262	2960	2666	2446	2112	2446	2136	1337	686	2087	1875
		160	1.969	3699	3357	3024	2774	2395	2774	2423	1527	783	2367	2127
24″	STD	10	0.250	368	334	301	276	238	276	241	144	74	235	211
	XS	20	0.375	553	502	452	415	358	415	362	217	111	354	318
			0.500	741	672	606	556	480	556	485	292	150	474	426
		30	0.562	834	757	682	625	540	625	546	329	169	534	479
		40	0.688	1022	928	836	767	662	767	669	405	208	654	588
		60	0.969	1453	1318	1188	1089	941	1089	951	579	297	930	835
		80	1.219	1842	1672	1506	1382	1193	1382	1207	739	379	1179	1059
		100	1.531	2338	2122	1911	1753	1514	1753	1531	945	485	1496	1344
		120	1.812	2791	2533	2282	2093	1807	2093	1828	1136	583	1786	1605
		140	2.062	3199	2903	2615	2399	2071	2399	2095	1310	672	2047	1839
		160	2.344	3667	3328	2998	2750	2374	2750	2402	1513	776	2347	2109

Values are expressed in psi.

Working pressures shown are based on formulas and corrosion allowances given on pages 147-148.

Working pressures for A-106-B and A-234-WPB may also be used for:
(1) A-53-B pipe as shown,

PRESSURE RATINGS • Oil Refinery, Oil Transportation, Refrigeration

(TABLE CONTINUED FROM PAGE 155)

PETROLEUM REFINERY PIPING							OIL TRANSPORTATION PIPING		REFRIG. PIPING	← ASA B31 SECTION:			
A-335-P5		A-312-TP304 Stainless Steel					5L-Grade B	5LX-52	A-106-B	← Seamless Pipe Specification:			
A-234-WP5		A-403-WP304 Stainless Steel					A-234-WPB	WPY52	A-234-WPB	← Welding Fitting Specification:			
Temperature (°F)		Temperature (°F)					Temp.(°F)	Temp. (°F)	Temp. (°F)	Wall Thickness			Nominal Pipe Size
1000	1100	900	1000	1100	1200	1400	–20 to 250	–20 to 250	0	Inches	Sched. No.	I.P.S.	
204	92	260	243	208	126	39	786	1168	415	0.250	10		
255	115	325	304	260	158	49	983	1460	520	0.312	20		
308	139	392	367	314	190	59	1179	1752	625	0.375	30	STD	
416	188	526	493	422	256	80	1572	2336	840	0.500	40	XS	
551	249	694	650	558	340	106	2066	3070	1105	0.656	60		
720	325	901	843	726	444	138	2661	3954	1435	0.844	80		16″
894	404	1110	1039	896	551	172	3246	4822	1770	1.031	100		
1073	485	1323	1238	1071	661	206	4067	6043	2115	1.219	120		
1290	583	1577	1476	1280	795	247	4531	6732	2520	1.438	140		
1449	655	1761	1648	1432	893	278	5020	7458	2810	1.594	160		
181	82	231	216	185	111	34	701	1041	370	0.250	10		
226	102	288	270	231	140	43	872	1295	460	0.312	20		
273	123	348	326	278	168	52	1048	1558	555	0.375		STD	
320	145	407	381	326	197	61	1225	1820	650	0.438	30		
368	166	466	437	374	227	70	1401	2082	745	0.500		XS	
415	188	525	492	421	256	80	1572	2336	840	0.562	40		18″
561	253	706	661	568	345	107	2102	3122	1125	0.750	60		
710	321	889	832	716	438	136	2626	3901	1420	0.938	80		
891	403	1107	1036	894	549	171	3236	4807	1785	1.156	100		
1077	487	1328	1243	1074	664	207	3851	5721	2120	1.375	120		
1241	561	1520	1423	1232	765	238	4375	6500	2425	1.562	140		
1438	650	1748	1637	1421	886	276	4985	7406	2795	1.781	160		
162	73	207	194	166	100	31	630	936	330	0.250	10		
245	111	312	292	250	151	47	948	1408	500	0.375	20	STD	
330	149	419	392	336	203	63	1260	1872	670	0.500	30	XS	
393	178	498	466	400	242	76	1497	2224	795	0.594	40		
545	247	687	643	552	336	105	2046	3040	1095	0.812	60		
703	318	879	823	708	433	135	2601	3864	1405	1.031	80		20″
888	401	1103	1033	891	547	170	3226	4792	1760	1.281	100		
1055	477	1301	1219	1053	650	202	3780	5616	2080	1.500	120		
1252	566	1533	1435	1243	772	240	4410	6552	2445	1.750	140		
1429	646	1738	1627	1414	882	274	4959	7368	2775	1.969	160		
135	61	173	162	138	83	26	524	779	275	0.250	10		
203	92	260	243	208	125	39	786	1168	415	0.375	20	STD	
273	124	348	326	279	169	52	1048	1558	555	0.500		XS	
308	139	392	367	314	190	59	1179	1752	625	0.562	30		
379	171	480	449	385	234	73	1446	2149	770	0.688	40		
542	245	683	639	549	334	104	2036	3025	1090	0.969	60		24″
691	313	866	810	697	426	132	2560	3804	1380	1.219	80		
884	400	1099	1028	887	545	170	3216	4777	1755	1.531	100		
1063	481	1312	1228	1062	655	204	3805	5653	2095	1.812	120		
1226	554	1503	1407	1220	756	235	4329	6432	2270	2.062	140		
1416	640	1724	1614	1400	873	272	4924	7316	2740	2.344	160		

(2) A-106-A or A-53-A pipe or A-234-WPA fittings after multiplying the above values by:
.800 at 650° F. and lower
.826 at 750° F.
(3) A-106-C pipe or A-234-WPC fittings after multiplying the above values by:
1.17 at 650° F. and lower
1.14 at 750° F.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 81 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/81

STRESS VALUES

POWER PIPING
DISTRICT HEATING · GAS and AIR

Material	Specification			Section 1: POWER PIPING / Section 4: DISTRICT HEATING PIPING* Temperature (°F)												Section 2: GAS AND AIR PIPING Temperature (°F)	
	ASTM	Grade	Kind†	-20 to 650	700	750	800	850	900	950	1000	1050	1100	1150	1200	100	450
CARBON STEEL	A-53	— —	BW	6750												9000 12000	7800 10400
		A B	ERW	10200 12750	9900 12200	9100 11000										18000 21000	15600 18200
		A B	S	12000 15000	11650 14350	10700 12950	9000 10800	7100 7800	5000 5000							18000 21000	15600 18200
	A-83	A	S	11750	11450	10550	9000	7100	5000								
	A-106	A B	S	12000 15000	11650 14350	10700 12950	9000 10800	7100 7800	5000 5000							18000 21000	15600 18200
	A-135	A B	ERW	10200 12750	9900 12200	9100 11000										18000 21000	15600 18190
	A-139	A B	EFW	9600 12000	9250 11350	8300 9950										14400 16800	12500 14550
	A-155‡	C50 C55	EFW	11250 12400	10900 11900	9900 10850	8450 9200	6550 7000								16200 18000	14050 15600
		KC60 KC65 KC70		13500 14600 15750	12900 13950 14950	11650 12450 13250	9700 10250 10800	7000 7000 7000									
WROUGHT IRON	A-72	— —	BW LW	6000 8000												8650 11500	7500 10000
CARB.-MOLY	A-335	P1	S	13750	13750	13750	13450	13150	12500								
½ Cr-½ Mo 1 Cr-½ Mo	A-155	½ CR 1 CR	EFW	14600 13500	14600 13500	14600 13500	14100 13250	12950 12750	11250 11800	9000 9900	5600 6750	4500	2500				
1¼ Cr-½ Mo 2¼ Cr-1 Mo		1¼ CR 2¼ CR		13500 13500	13500 13500	13500 13500	13500 13500	12950 12950	11800 11800	9900 9900	7000 7000	4950 5200	3600 3750	2700			
½ Cr-½ Mo 1 Cr-½ Mo 1¼ Cr-½ Mo	A-335	P2 P12 P11	S	13750 15000 15000	13750 15000 15000	13750 15000 15000	13450 14750 15000	13150 14200 14400	12500 13100 13100	10000 11000 11000	6250 7500 7800	5000 5500	2800 4000				
2¼ Cr-1 Mo 3 Cr-1 Mo		P22 P21		15000 15000	15000 14800	15000 14500	15000 13900	14400 13200	13100 12000	11000 9000	7800 7000	5800 5500	4200 4000	3000 2700			
5 Cr-½ Mo 5 Cr-½ Mo-Si		P5 P5b		See Stress Table Below	13400 13400	13100 13100	12800 12800	12400 12400	11500 10900	10000 9000	7300 5500	5200 3500	3300 2500	2200 1800	1500 1200		
18 Cr-8 Ni-Ti 18 Cr-8 Ni-Cb	A-312	TP321 TP347	S		14800 14800	14700 14700	14550 14550	14300 14300	14100 14100	13850 13850	13500 13500	13100 13100	10300 10300	7600 7600	5000 5000		

*District Heating Piping Systems stress values are covered here only for carbon steel and wrought iron up to 750° F, except for ASTM A-139 Grades "A" or "B", which is limited to 500° F under Section 4.

†Abbreviations used:

BW: Butt-Welded
LW: Lap-Welded
S: Seamless
ERW: Electric-Resistance-Welded
EFW: Electric-Fusion-Welded

‡Values given are for Class 2 pipe; for Class 1 pipe, these factors may be increased by 5.56%.

Values are expressed in psi, and may be interpolated for intermediate temperatures.

Pipe is not to be used at temperatures greater than those for which stress values are indicated.

Graphitization may occur after prolonged exposure of carbon steel to temperatures above 775° F; carbon molybdenum steel above 875° F; chromium-molybdenum steel (with chromium under 0.60) above 975° F.

SUPPLEMENTAL STRESS VALUES

Material	Specification			Section 1: POWER PIPING Temperature (°F)					
	ASTM	Grade	Kind†	-20 to 200	300	400	500	600	650
5 Cr-½ Mo 5 Cr-½ Mo-Si	A-335	P5 P5b	S	15000 15000	15000 15000	15000 15000	14500 14500	14000 14000	13700 13700
18 Cr-8 Ni-Ti 18 Cr-8 Ni-Cb	A-312	TP321 TP347	S	18750 18750	17000 17000	15800 15800	15200 15200	14900 14900	14850 14850

OIL REFINERY

STRESS VALUES

Material	Specification			Section 3: PETROLEUM REFINERY PIPING Temperature (°F)											
	ASTM or API	Grade	Kind*	-20 to 100	200	300	400	500	600	650	700	750	800	850	900 & above
CARBON STEEL	A-53 or 5L†	— —	BW	9000	8600	8200	7800								
		A B	ERW	13600 17000	13000 16200	12300 15400	11750 14650	11100 13900	10500 13150	10200 12750	9900 12200	9100 11000	7900 9200	6700 7350	
		A B	S	16000 20000	15300 19100	14500 18150	13800 17250	13100 16350	12350 15500	12000 15000	11650 14350	10700 12950	9300 10800	7900 8650	
	A-83	A	S	16000	15300	14500	13800	13100	12350	12000	11650	10700	9300	7900	
	A-106	A B	S	16000 20000	15300 19100	14500 18150	13800 17250	13100 16350	12350 15500	12000 15000	11650 14350	10700 12950	9300 10800	7900 8650	
	A-135	A B	ERW	13600 17000	13000 16200	12300 15400	11750 14650	11100 13900	10500 13150	10200 12750	9900 12200	9100 11000	7900 9200	6700 7350	
	A-155†●	C50 C55	EFW	16650 18350	15900 17500	15200 16700	14450 15850	13650 15000	12900 14200	12500 13750	12100 13250	11150 12050	9600 10200	8050 8350	
		KC60 KC65 KC70		20000 21650 23350	19100 20700 22250	18150 19700 21200	17250 18700 20150	16350 17750 19100	15500 16750 18050	15000 16250 17500	14350 15500 16600	12950 13850 14750	10800 11400 12000	8650 8950 9250	
	A-333	O	S	18350	17500	16700	15850	15000	14200	13750	13250	12050	10200	8350	
WROUGHT IRON	A-72	— —	BW LW	8000 10650	7650 10200	7250 9700	6900 9200	8750	8250	8000	7700	7300			
½ Cr-½ Mo 1 Cr-½ Mo	A-155†	½ CR 1 CR	EFW	21650 20000	20800 19250	19950 18500	19150 17750	18300 17000	17500 16250	17100 15900	16700 15500	16250 15150	15650 14750	14400 14200	
1¼ Cr-½ Mo 2¼ Cr-1 Mo 5 Cr-½ Mo		1¼ CR 2¼ CR 5 CR		20000 18750 18750	19300 18250 17900	18550 17650 17050	17850 17150 16200	17150 16600 15350	16450 16050 14500	16050 15800 14100	15700 15500 13650	15350 15300 13250	15000 15000 12800	14400 14400 12400	
½ Cr-½ Mo 1 Cr-½ Mo 1¼ Cr-½ Mo.	A-335	P2 P12 P11	S	18350 18750 18750	17650 18250 18250	16950 17600 17650	16300 17050 17150	15600 16450 16600	14900 15900 16050	14550 15650 15800	14200 15350 15550	13850 15050 15300	13500 14750 15000	13150 14200 14400	
2¼ Cr-1 Mo 3 Cr-1 Mo 5 Cr-½ Mo		P22 P21 P5		18750 18750 18750	18250 18100 17900	17650 17400 17050	17150 16750 16200	16600 16100 15350	16050 15450 14500	15800 15150 14100	15500 14800 13650	15300 14500 13250	15000 13900 12800	14400 13200 12400	
5 Cr-½ Mo-Si 7 Cr-½ Mo 9 Cr-1 Mo		P5b P7 P9		18750 18750 18750	17900 17850 17900	17050 17000 17100	16200 16150 16250	15350 15300 15450	14500 14450 14600	14100 14000 14200	13650 13550 13800	13250 13100 13350	12800 12500 12950	12400 11500 12500	
18 Cr-8 Ni 16 Cr-13 Ni-2½ Mo	A-312	TP304 TP316	S	18750 18750	16650 18750	15000 17900	13650 17500	12500 17200	11600 17100	11200 17050	10800 17000	10400 16900	10000 16750	9700 16500	
18 Cr-8 Ni-Ti 18 Cr-8 Ni-Cb		TP321 TP347		18750 18750	18750 18750	17000 17000	15800 15800	15200 15200	14900 14900	14850 14850	14800 14800	14700 14700	14550 14550	14300 14300	
COPPER	B-42▲	Annealed	S	6000	5900	5000	2500	750							
NICKEL	B-161	Annealed	S	10000	10000	10000	10000	10000	10000						
MONEL	B-165	Annealed	S	17500	16500	15500	14800	14700	14700	14700	14700	14650	14500	12500	
ALUMINUM	B-241■	M1A	S	3600	3000	2500	1900								

See next page.

*Abbreviations used:

BW: Butt-Welded
LW: Lap-Welded
S: Seamless
ERW: Electric-Resistance-Welded
EFW: Electric-Fusion-Welded

†Stress values given are for Class 1 pipe.

●Above 875° F, firebox quality plate is recommended.

▲Tensile properties must be verified by mill test.

■The stress values shown apply to pipe 1" N.P.S. and larger; for pipe under 1" N.P.S., use the stress values for temper H18 as shown in ASA B31.3.

Values are expressed in psi, and may be interpolated for intermediate temperatures.

Pipe is not to be used at temperatures greater than those for which stress values are indicated.

Graphitization may occur after prolonged exposure of carbon steel to temperatures above 775° F; or carbon molybdenum steel above 875° F.

Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/82

STRESS VALUES • Oil Refinery, Refrigeration

Material	Specification ASTM or API	Grade	Kind*	Section 3: PETROLEUM REFINERY PIPING — Temperature (°F) 850 & below	900	950	1000	1050	1100	1150	1200	1300	1400	1500	Sec. 5 REFRIG. PIPING °F 0
CARBON STEEL	A-53 or 5L†	—	BW												6750
		—	LW												
		A	ERW		5500	3800	2150	1350	850						
		B			5500	3800	2150	1350	850						
		A	S		6500	4500	2500	1600	1000						12000
		B			6500	4500	2500	1600	1000						15000
	A-83‡	A	S		6500	4500	2500	1600	1000						11750
	A-106	A	S		6500	4500	2500	1600	1000						12000
		B			6500	4500	2500	1600	1000						15000
	A-135	A	ERW		5500	3800	2150	1350	850						10000
		B			5500	3800	2150	1350	850						12750
	A-155†‡●	C50	EFW		6500	4500	2500	1600	1000						
		C55			6500	4500	2500	1600	1000						
		KC60			6500	4500	2500	1600	1000						
		KC65			6500	4500	2500	1600	1000						
		KC70			6500	4500	2500	1600	1000						
	A-333‡	O	S		6500	4500	2500	1600	1000						
WROUGHT IRON	A-72	—	BW												6000
		—	LW												8000
½ Cr-½ Mo	A-155†	½ CR	EFW		12500	10000	6250	4000	2400						
1 Cr-½ Mo		1 CR			13100	11000	7500	5000	2800	1550	1000				
1¼ Cr-½ Mo		1¼ CR			13100	11000	7800	5500	4000	2500	1200				
2¼ Cr-1 Mo		2¼ CR			13100	11000	7800	5800	4200	3000	2000				
5 Cr-½ Mo		5 CR			11500	10000	7300	5200	3300	2200	1500				
½ Cr-½ Mo	A-335	P2	S		12500	10000	6250	4000	2400						
1 Cr-½ Mo		P12			13100	11000	7500	5000	2800	1550	1000				
1¼ Cr-½ Mo		P11			13100	11000	7800	5500	4000	2500	1200				
2¼ Cr-1 Mo		P22			13100	11000	7800	5800	4200	3000	2000				
3 Cr-1 Mo		P21			12000	9000	7000	5500	4000	2700	1500				
5 Cr-½ Mo		P5			11500	10000	7300	5200	3300	2200	1500				
5 Cr-½ Mo-Si		P5b			10900	9000	5500	3500	2500	1800	1200				
7 Cr-½ Mo		P7			9500	7000	5000	3500	2500	1800	1200				
9 Cr-1 Mo		P9			12000	10800	8500	5500	3300	2200	1500				
18 Cr-8 Ni	A-312	TP304	S		9400	9100	8800	8500	7500	5750	4500	2450	1400	750	
16 Cr-13 Ni-2½ Mo		TP316			16000	15100	14000	12200	10400	8500	6800	4000	2350	1500	
18 Cr-8 Ni-Ti		TP321			14100	13850	13500	13100	12500	8000	5000	2700	1550	1000	18750
18 Cr-8 Ni-Cb		TP347			14100	13850	13500	13100	12500	8000	5000	2700	1550	1000	18750
COPPER	B-42	Annealed	S												6000
MONEL	B-165	Annealed	S		8000										

See preceding page.

*Abbreviations used:
BW: Butt-Welded
LW: Lap-Welded
S: Seamless
ERW: Electric-Resistance-Welded
EFW: Electric-Fusion-Welded

†Stress values given are for Class I pipe.

‡Above 900° F; silicon killed steel is recommended.

●Above 875° F, firebox quality plate is recommended.

Values are expressed in psi, and may be interpolated for intermediate temperatures.

*Stress values shown above 1000°F are for the "H" grades of TP321 & TP347.

Pipe is not to be used at temperatures greater than those for which stress values are indicated.

Graphitization may occur after prolonged exposure of carbon steel to temperatures above 775° F; carbon molybdenum steel above 875°F; chromium-molybdenum steel (with chromium under 0.60) above 975° F.

ASA STANDARD B16.5

PRESSURE RATINGS
FORGED FLANGES

Unlike pipe and welding fittings, forged flange pressure ratings do not vary from industry to industry, a single set of ratings having been established by the American Standards Association.

The maximum allowable non-shock pressures shown herein are those prescribed by ASA Standard B16.5, and apply to all CRANE ASA flanges.

On this page are given the pressure ratings for carbon and alloy steel flanges used at temperatures up to 650° F. When operating temperatures are 700° to 1500° F, pressure ratings for these materials may be taken from pages 162-166. Pressure ratings for non-ferrous flanges, used at temperatures of 100° to 1200° F, are given on page 167.

Users are reminded that:

(a) PRESSURES may be interpolated for intermediate temperatures.

(b) TEMPERATURES used in determining the ratings are the temperatures on the inside of the pressure-retaining structure.

(c) GASKETS shall conform to Paragraph 2.4 of B16.5.

(d) FLANGES used within the jurisdiction of any specific code will, of course, be subject to the temperature limitations imposed by the code on the particular material involved.

Service Temperature (°F)	PRIMARY SERVICE PRESSURE RATING (lb.) →	150	300	400	600	900	1500	2500
	HYDROSTATIC SHELL TEST PRESSURE (PSIG) →	425	1100	1450	2175	3250	5400	9000
	Material	Service Temperature (°F)	Maximum, Non-Shock Service Pressure Rating (PSIG)						
-20 to 650	Carbon Steel, Carbon Moly, Chrome Moly, and Stainless Steel conforming to the following ASTM Specifications: A-181, Grade I or II; A-105, Grade I or II; A-350, Grade LF1; A-182, Grades F1, F5a, F9, F11, F12, F22, F310, F316, F321 and F347; A-335, *Grades P2, P5b, and P21.	-20 to 100	275	720	960	1440	2160	3600	6000
		150	255	710	945	1420	2130	3550	5915
		200	240	700	930	1400	2100	3500	5830
		250	225	690	920	1380	2070	3450	5750
		300	210	680	910	1365	2050	3415	5690
		350	195	675	900	1350	2025	3375	5625
		400	180	665	890	1330	2000	3330	5550
		450	165	650	870	1305	1955	3255	5430
		500	150	625	835	1250	1875	3125	5210
		550	140	590	790	1180	1775	2955	4925
		600	130	555	740	1110	1660	2770	4620
		650	120	515	690	1030	1550	2580	4300
	PRIMARY SERVICE PRESSURE RATING (lb.) →	150	300	400	600	900	1500	2500
	HYDROSTATIC SHELL TEST PRESSURE (PSIG) →	425	925	1250	1875	2775	4650	7725
	Material	Service Temperature (°F)	Maximum, Non-Shock Service Pressure Rating (PSIG)						
	ASTM Specification A-182, Grade F304.	-20 to 100	275	615	825	1235	1850	3085	5145
		150	255	585	775	1165	1750	2915	4855
		200	240	550	730	1095	1645	2740	4565
		250	225	520	695	1040	1565	2605	4340
		300	210	495	660	985	1480	2470	4115
		350	195	470	630	945	1415	2360	3930
		400	180	450	600	900	1350	2245	3745
		450	165	430	575	860	1290	2150	3585
		500	150	410	550	825	1235	2055	3430
		550	140	395	530	795	1190	1985	3305
		600	130	380	510	765	1145	1910	3180
		650	120	370	490	735	1105	1845	3070

*No flange specification has been written for the grades shown. Flanges made to these grades shall conform in chemistry to the requirements of pipe specification ASTM A-335 and in all other respects to the nearest grade of ASTM A-182

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 83 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/83

PRESSURE RATINGS • Flanges

Service Temperature (°F)	Material	ASTM Specification No.	ASTM Specification Grade	150	300	400	600	900	1500	2500
				Maximum, Non-Shock Service Pressure Rating (PSIG)						
700	Carbon Steel	*	*	110	470	635	940	1410	2350	3920
	Carbon Moly	A-182	F1	110	480	640	960	1440	2400	4000
	½ Cr - ½ Mo	A-335	P2	110	480	640	960	1440	2400	4000
	1 Cr - ½ Mo	A-182	F12	110	485	645	965	1450	2415	4025
	1¼ Cr - ½ Mo	A-182	F11	110	485	645	965	1450	2415	4025
	2¼ Cr - 1 Mo	A-182	F22	110	485	645	965	1450	2415	4025
	3 Cr - 1 Mo	A-335	P21	110	480	640	960	1440	2400	4000
	5 Cr - ½ Mo	A-182	F5a	110	485	645	965	1450	2415	4025
	5 Cr - ½ Mo, Si	A-335	P5b	110	480	640	960	1440	2400	4000
	9 Cr - 1 Mo	A-182	F9	110	485	645	965	1450	2415	4025
	Type 304	A-182	F304	110	355	475	710	1065	1775	2960
	Type 310	A-182	F310	110	490	655	980	1470	2455	4090
	Types 316, 321, 347	A-182	F316, F321, F347	110	495	660	985	1480	2465	4110
750	Carbon Steel	*	*	100	425	575	850	1275	2125	3550
	Carbon Moly	A-182	F1	100	445	590	890	1330	2220	3700
	½ Cr - ½ Mo	A-335	P2	100	445	590	890	1330	2220	3700
	1 Cr - ½ Mo	A-182	F12	100	450	600	900	1350	2250	3745
	1¼ Cr - ½ Mo	A-182	F11	100	450	600	900	1350	2250	3745
	2¼ Cr - 1 Mo	A-182	F22	100	450	600	900	1350	2250	3745
	3 Cr - 1 Mo	A-335	P21	100	445	590	890	1330	2220	3700
	5 Cr - ½ Mo	A-182	F5a	100	450	600	900	1350	2250	3745
	5 Cr - ½ Mo, Si	A-335	P5b	100	445	590	890	1330	2220	3700
	9 Cr - 1 Mo	A-182	F9	100	450	600	900	1350	2250	3745
	Type 304	A-182	F304	100	340	455	685	1025	1710	2850
	Type 310	A-182	F310	100	465	620	930	1395	2325	3875
	Types 316, 321, 347	A-182	F316, F321, F347	100	470	625	940	1410	2355	3920
800	Carbon Steel	*	*	92	365	490	730	1100	1830	3050
	Carbon Moly	A-182	F1	92	410	545	815	1225	2040	3400
	½ Cr - ½ Mo	A-335	P2	92	410	545	815	1225	2040	3400
	1 Cr - ½ Mo	A-182	F12	92	415	555	835	1250	2080	3470
	1¼ Cr - ½ Mo	A-182	F11	92	415	555	835	1250	2080	3470
	2¼ Cr - 1 Mo	A-182	F22	92	415	555	835	1250	2080	3470
	3 Cr - 1 Mo	A-335	P21	92	410	545	815	1225	2040	3400
	5 Cr - ½ Mo	A-182	F5a	92	415	555	835	1250	2080	3470
	5 Cr - ½ Mo, Si	A-335	P5b	92	410	545	815	1225	2040	3400
	9 Cr - 1 Mo	A-182	F9	92	415	555	835	1250	2080	3470
	Type 304	A-182	F304	92	330	440	660	985	1645	2745
	Type 310	A-182	F310	92	440	585	880	1320	2200	3665
	Types 316, 321, 347	A-182	F316, F321, F347	92	450	595	895	1345	2240	3730
850	Carbon Steel	*	*	82	300	400	600	900	1500	2500
	Carbon Moly	A-182	F1	82	370	495	745	1115	1860	3100
	½ Cr - ½ Mo	A-335	P2	82	370	495	745	1115	1860	3100
	1 Cr - ½ Mo	A-182	F12	82	385	510	765	1150	1915	3190
	1¼ Cr - ½ Mo	A-182	F11	82	385	510	765	1150	1915	3190
	2¼ Cr - 1 Mo	A-182	F22	82	385	510	765	1150	1915	3190
	3 Cr - 1 Mo	A-335	P21	82	370	495	745	1115	1860	3100
	5 Cr - ½ Mo	A-182	F5a	82	385	510	765	1150	1915	3190
	5 Cr - ½ Mo, Si	A-335	P5b	82	370	495	745	1115	1860	3100
	9 Cr - 1 Mo	A-182	F9	82	385	510	765	1150	1915	3190
	Type 304	A-182	F304	82	320	425	640	960	1595	2660
	Type 310	A-182	F310	82	415	550	830	1245	2070	3455
	Types 316, 321, 347	A-182	F316, F321, F347	82	425	565	850	1275	2125	3540

*Pressure ratings apply to any of the three ASTM Specifications for carbon steel flanges: A-181, Grade I or II, for 150 and 300 lb. flange ratings; A-105, Grade I or II, for 400 lb. and higher ratings; A-350, Grade LF1, for low temperature flanges.

PRESSURE RATINGS • Flanges

Service Temperature (°F)	Material	ASTM Specification No.	ASTM Specification Grade	150	300	400	600	900	1500	2500
				Maximum, Non-Shock Service Pressure Rating (PSIG)						
875	Carbon Steel	*	*	75	260	350	525	785	1305	2180
	Carbon Moly	A-182	F1	75	355	470	710	1060	1770	2950
	½ Cr - ½ Mo	A-335	P2	75	355	470	710	1060	1770	2950
	1 Cr - ½ Mo	A-182	F12	75	365	490	735	1100	1830	3055
	1¼ Cr - ½ Mo	A-182	F11	75	365	490	735	1100	1830	3055
	2¼ Cr - 1 Mo	A-182	F22	75	365	490	735	1100	1830	3055
	3 Cr - 1 Mo	A-335	P21	75	355	470	710	1060	1770	2950
	5 Cr - ½ Mo	A-182	F5a	75	365	490	735	1100	1830	3055
	5 Cr - ½ Mo, Si	A-335	P5b	75	355	470	710	1060	1770	2950
	9 Cr - 1 Mo	A-182	F9	75	365	490	735	1100	1830	3055
	Type 304	A-182	F304	75	315	420	630	945	1570	2620
	Type 310	A-182	F310	75	400	535	805	1205	2010	3345
	Types 316, 321, 347	A-182	F316, F321, F347	75	415	550	825	1240	2070	3445
900	Carbon Steel	*	*	70	225	295	445	670	1115	1855
	Carbon Moly	A-182	F1	70	335	450	670	1010	1680	2800
	½ Cr - ½ Mo	A-335	P2	70	335	450	670	1010	1680	2800
	1 Cr - ½ Mo	A-182	F12	70	350	465	700	1050	1750	2915
	1¼ Cr - ½ Mo	A-182	F11	70	350	465	700	1050	1750	2915
	2¼ Cr - 1 Mo	A-182	F22	70	350	465	700	1050	1750	2915
	3 Cr - 1 Mo	A-335	P21	70	335	450	670	1010	1680	2800
	5 Cr - ½ Mo	A-182	F5a	70	350	465	700	1050	1750	2915
	5 Cr - ½ Mo, Si	A-335	P5b	70	335	450	670	1010	1680	2800
	9 Cr - 1 Mo	A-182	F9	70	350	465	700	1050	1750	2915
	Type 304	A-182	F304	70	310	415	620	930	1545	2580
	Type 310	A-182	F310	70	390	520	780	1165	1945	3240
	Types 316, 321, 347	A-182	F316, F321, F347	70	400	535	805	1205	2010	3350
925	Carbon Steel	*	*	60	190	250	375	565	945	1570
	Carbon Moly	A-182	F1	60	320	425	635	955	1590	2650
	½ Cr - ½ Mo	A-335	P2	60	320	425	635	955	1590	2650
	1 Cr - ½ Mo	A-182	F12	60	335	445	665	1000	1665	2775
	1¼ Cr - ½ Mo	A-182	F11	60	335	445	665	1000	1665	2775
	2¼ Cr - 1 Mo	A-182	F22	60	335	445	665	1000	1665	2775
	3 Cr - 1 Mo	A-335	P21	60	320	425	635	955	1590	2650
	5 Cr - ½ Mo	A-182	F5a	60	335	445	665	1000	1665	2775
	5 Cr - ½ Mo, Si	A-335	P5b	60	320	425	635	955	1590	2650
	9 Cr - 1 Mo	A-182	F9	60	335	445	665	1000	1665	2775
	Type 304	A-182	F304	60	305	410	615	920	1535	2560
	Type 310	A-182	F310	60	375	500	755	1130	1880	3135
	Types 316, 321, 347	A-182	F316, F321, F347	60	390	520	780	1175	1955	3260
950	Carbon Steel	*	*	55	155	205	310	465	770	1285
	Carbon Moly	A-182	F1	55	300	400	600	900	1500	2500
	½ Cr - ½ Mo	A-335	P2	55	300	400	600	900	1500	2500
	1 Cr - ½ Mo	A-182	F12	55	315	420	635	950	1585	2640
	1¼ Cr - ½ Mo	A-182	F11	55	315	420	635	950	1585	2640
	2¼ Cr - 1 Mo	A-182	F22	55	315	420	635	950	1585	2640
	3 Cr - 1 Mo	A-335	P21	55	300	400	600	900	1500	2500
	5 Cr - ½ Mo	A-182	F5a	55	315	420	635	950	1585	2640
	5 Cr - ½ Mo, Si	A-335	P5b	55	300	400	600	900	1500	2500
	9 Cr - 1 Mo	A-182	F9	55	315	420	635	950	1585	2640
	Type 304	A-182	F304	55	305	405	610	915	1525	2540
	Type 310	A-182	F310	55	365	485	725	1090	1820	3030
	Types 316, 321, 347	A-182	F316, F321, F347	55	380	505	760	1140	1900	3165

*Pressure ratings apply to any of the three ASTM Specifications for carbon steel flanges: A-181, Grade I or II, for 150 and 300 lb. flange ratings; A-105, Grade I or II, for 400 lb. and higher ratings; A-350, Grade LF1, for low temperature flanges.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 84 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/84

PRESSURE RATINGS • Flanges

PRIMARY SERVICE PRESSURE RATING (lb.) →				150	300	400	600	900	1500	2500
Service Temperature (°F)	Material	ASTM Specification		Maximum, Non-Shock Service Pressure Rating (PSIG)						
		No.	Grade							
975	Carbon Steel	*	*	50	120	160	240	360	600	1000
	Carbon Moly	A-182	F1	50	280	370	555	835	1395	2320
	½ Cr - ½ Mo	A-335	P2	50	280	370	555	835	1395	2320
	1 Cr - ½ Mo	A-182	F12	50	300	400	600	900	1500	2500
	1¼ Cr - ½ Mo	A-182	F11	50	300	400	600	900	1500	2500
	2¼ Cr - 1 Mo	A-182	F22	50	300	400	600	900	1500	2500
	3 Cr - 1 Mo	A-335	P21	50	275	365	550	825	1370	2285
	5 Cr - ½ Mo	A-182	F5a	50	300	400	600	900	1500	2500
	5 Cr - ½ Mo, Si	A-335	P5b	50	250	330	495	745	1245	2070
	9 Cr - 1 Mo	A-182	F9	50	300	400	600	900	1500	2500
	Type 304	A-182	F304	50	300	405	605	905	1510	2520
	Type 310	A-182	F310	50	350	470	700	1050	1755	2925
	Types 316, 321, 347	A-182	F316, F321, F347	50	370	490	735	1105	1840	3070
1000	Carbon Steel	*	*	40	85	115	170	255	430	715
	Carbon Moly	A-182	F1	40	215	285	430	645	1070	1785
	½ Cr - ½ Mo	A-335	P2	40	215	285	430	645	1070	1785
	1 Cr - ½ Mo	A-182	F12	40	255	345	515	770	1285	2145
	1¼ Cr - ½ Mo	A-182	F11	40	265	355	535	800	1335	2230
	2¼ Cr - 1 Mo	A-182	F22	40	265	355	535	800	1335	2230
	3 Cr - 1 Mo	A-335	P21	40	240	320	480	720	1200	2000
	5 Cr - ½ Mo	A-182	F5a	40	250	335	500	750	1250	2085
	5 Cr - ½ Mo, Si	A-335	P5b	40	190	250	375	565	945	1570
	9 Cr - 1 Mo	A-182	F9	40	290	390	585	875	1455	2430
	Type 304	A-182	F304	40	300	400	600	900	1500	2500
	Type 310	A-182	F310	40	340	450	675	1015	1690	2820
	Types 316, 321, 347	A-182	F316, F321, F347	40	355	475	715	1070	1785	2975
1025	1 Cr - ½ Mo	A-182	F12	—	215	285	430	645	1070	1785
	1¼ Cr - ½ Mo	A-182	F11	—	230	305	455	685	1140	1900
	2¼ Cr - 1 Mo	A-182	F22	—	235	310	465	700	1165	1945
	3 Cr - 1 Mo	A-335	P21	—	215	285	430	645	1070	1785
	5 Cr - ½ Mo	A-182	F5a	—	215	285	430	645	1070	1785
	5 Cr - ½ Mo, Si	A-335	P5b	—	155	205	310	465	770	1285
	9 Cr - 1 Mo	A-182	F9	—	240	320	480	720	1200	2000
	Type 304	A-182	F304	—	295	395	595	890	1485	2470
	Type 310	A-182	F310	—	325	435	650	975	1625	2710
	Types 316, 321, 347	A-182	F316, F321, F347	—	345	460	690	1035	1725	2880
1050	1 Cr - ½ Mo	A-182	F12	—	170	230	345	515	855	1430
	1¼ Cr - ½ Mo	A-182	F11	—	190	250	375	565	945	1570
	2¼ Cr - 1 Mo	A-182	F22	—	200	265	400	595	995	1655
	3 Cr - 1 Mo	A-335	P21	—	190	250	375	565	945	1570
	5 Cr - ½ Mo	A-182	F5a	—	180	240	355	535	890	1485
	5 Cr - ½ Mo, Si	A-335	P5b	—	120	160	240	360	600	1000
	9 Cr - 1 Mo	A-182	F9	—	190	250	375	565	945	1570
	Type 304	A-182	F304	—	290	390	585	875	1455	2430
	Type 310	A-182	F310	—	315	415	625	940	1565	2605
	Types 316, 321, 347	A-182	F316, F321, F347	—	335	445	670	1000	1670	2785

*Pressure ratings apply to any of the three ASTM Specifications for carbon steel flanges: A-181, Grade I or II, for 150 and 300 lb. flange ratings; A-105, Grade I or II, for 400 lb. and higher ratings; A-350, Grade LF1, for low temperature flanges.

PRESSURE RATINGS • Flanges

PRIMARY SERVICE PRESSURE RATING (lb.) →				150	300	400	600	900	1500	2500
Service Temperature (°F)	Material	ASTM Specification		Maximum, Non-Shock Service Pressure Rating (PSIG)						
		No.	Grade							
1075	1 Cr - ½ Mo	A-182	F12	—	135	180	265	400	670	1115
	1¼ Cr - ½ Mo	A-182	F11	—	165	215	325	490	815	1355
	2¼ Cr - 1 Mo	A-182	F22	—	170	230	345	515	855	1430
	3 Cr - 1 Mo	A-335	P21	—	165	215	325	490	815	1355
	5 Cr - ½ Mo	A-182	F5a	—	145	195	290	435	730	1215
	5 Cr - ½ Mo, Si	A-335	P5b	—	105	135	205	310	515	855
	9 Cr - 1 Mo	A-182	F9	—	150	200	300	455	755	1255
	Type 304	A-182	F304	—	275	365	550	825	1370	2285
	Type 310	A-182	F310	—	300	400	600	900	1500	2500
	Types 316, 321, 347	A-182	F316, F321, F347	—	325	430	645	970	1615	2690
1100	1 Cr - ½ Mo	A-182	F12	—	95	130	190	290	480	800
	1¼ Cr - ½ Mo	A-182	F11	—	135	185	275	410	685	1145
	2¼ Cr - 1 Mo	A-182	F22	—	145	190	290	430	720	1200
	3 Cr - 1 Mo	A-335	P21	—	135	185	275	410	685	1145
	5 Cr - ½ Mo	A-182	F5a	—	115	150	225	340	565	945
	5 Cr - ½ Mo, Si	A-335	P5b	—	85	115	170	255	430	715
	9 Cr - 1 Mo	A-182	F9	—	115	150	225	340	565	945
	Type 304	A-182	F304	—	255	345	515	770	1285	2145
	Type 310	A-182	F310	—	290	390	585	875	1455	2430
	Types 316, 321, 347	A-182	F316, F321, F347	—	310	415	625	935	1555	2595
1125	1 Cr - ½ Mo	A-182	F12	—	75	100	150	225	375	620
	1¼ Cr - ½ Mo	A-182	F11	—	110	150	225	335	555	930
	2¼ Cr - 1 Mo	A-182	F22	—	125	165	245	370	615	1030
	3 Cr - 1 Mo	A-335	P21	—	115	155	230	345	575	955
	5 Cr - ½ Mo	A-182	F5a	—	95	125	190	285	470	785
	5 Cr - ½ Mo, Si	A-335	P5b	—	75	100	145	220	370	615
	9 Cr - 1 Mo	A-182	F9	—	95	125	190	285	470	785
	Type 304	A-182	F304	—	225	305	455	680	1135	1895
	Type 310	A-182	F310	—	270	360	540	810	1350	2250
	Types 316, 321, 347	A-182	F316, F321, F347	—	300	400	600	900	1500	2500
1150	1 Cr - ½ Mo	A-182	F12	—	55	70	105	160	265	445
	1¼ Cr - ½ Mo	A-182	F11	—	85	115	170	255	430	715
	2¼ Cr - 1 Mo	A-182	F22	—	105	135	205	310	515	855
	3 Cr - 1 Mo	A-335	P21	—	95	125	185	280	465	770
	5 Cr - ½ Mo	A-182	F5a	—	75	100	150	225	375	630
	5 Cr - ½ Mo, Si	A-335	P5b	—	60	80	125	185	310	515
	9 Cr - 1 Mo	A-182	F9	—	75	100	150	225	375	630
	Type 304	A-182	F304	—	195	265	395	590	985	1645
	Type 310	A-182	F310	—	250	330	495	745	1245	2070
	Type 316	A-182	F316	—	290	390	585	875	1455	2430
	Types 321, 347	A-182	F321, F347	—	260	345	520	780	1305	2170
1175	1 Cr - ½ Mo	A-182	F12	—	45	60	85	130	220	365
	1¼ Cr - ½ Mo	A-182	F11	—	65	85	125	190	315	530
	2¼ Cr - 1 Mo	A-182	F22	—	85	115	170	255	430	715
	3 Cr - 1 Mo	A-335	P21	—	70	95	145	215	360	600
	5 Cr - ½ Mo	A-182	F5a	—	65	85	125	190	315	530
	5 Cr - ½ Mo, Si	A-335	P5b	—	50	70	105	155	255	430
	9 Cr - 1 Mo	A-182	F9	—	65	85	125	190	315	530
	Type 304	A-182	F304	—	175	235	350	525	880	1465
	Type 310	A-182	F310	—	225	305	455	680	1135	1895
	Type 316	A-182	F316	—	260	350	525	785	1310	2185
	Types 321, 347	A-182	F321, F347	—	215	290	430	650	1080	1800

Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/85

PRESSURE RATINGS • Flanges

PRIMARY SERVICE PRESSURE RATING (lb.) →		ASTM Specification		150	300	400	600	900	1500	2500
Service Temperature (°F)	Material	No.	Grade	Maximum, Non-Shock Service Pressure Rating (PSIG)						
1200	1 Cr - ½ Mo	A-182	F12	—	35	45	70	105	170	285
	1¼ Cr - ½ Mo	A-182	F11	—	40	55	80	125	205	345
	2¼ Cr - 1 Mo	A-182	F22	—	70	90	135	205	345	570
	3 Cr - 1 Mo	A-335	P21	—	50	70	105	155	255	430
	5 Cr - ½ Mo	A-182	F5a	—	50	70	105	155	255	430
	5 Cr - ½ Mo, Si	A-335	P5b	—	40	55	80	125	205	345
	9 Cr - 1 Mo	A-182	F9	—	50	70	105	155	255	430
	Type 304	A-182	F304	—	155	205	310	465	770	1285
	Type 310	A-182	F310	—	205	275	410	615	1030	1715
	Type 316	A-182	F316	—	235	310	465	700	1165	1945
	Types 321, 347	A-182	F321, F347	—	170	230	345	515	855	1430
1225	Type 304	A-182	F304	—	135	175	265	400	665	1105
	Type 310	A-182	F310	—	185	245	370	555	920	1535
	Type 316	A-182	F316	—	205	275	415	620	1035	1730
	Types 321, 347	A-182	F321, F347	—	140	190	285	425	710	1185
1250	Type 304	A-182	F304	—	110	150	225	335	555	930
	Type 310	A-182	F310	—	165	215	325	490	815	1355
	Type 316	A-182	F316	—	180	240	365	545	910	1515
	Types 321, 347	A-182	F321, F347	—	115	150	225	340	565	945
1275	Type 304	A-182	F304	—	100	130	195	295	490	815
	Type 310	A-182	F310	—	140	190	285	425	705	1180
	Type 316	A-182	F316	—	160	215	320	480	795	1330
	Types 321, 347	A-182	F321, F347	—	95	125	190	285	470	785
1300	Type 304	A-182	F304	—	85	110	170	250	420	700
	Type 310	A-182	F310	—	120	160	240	360	600	1000
	Type 316	A-182	F316	—	135	185	275	410	685	1145
	Types 321, 347	A-182	F321, F347	—	75	100	150	225	375	630
1325	Type 304	A-182	F304	—	75	95	145	220	365	605
	Type 310	A-182	F310	—	100	135	200	300	500	835
	Type 316	A-182	F316	—	115	155	230	345	575	955
	Types 321, 347	A-182	F321, F347	—	65	85	125	190	315	530
1350	Type 304	A-182	F304	—	60	80	125	185	310	515
	Type 310	A-182	F310	—	80	105	160	240	405	670
	Type 316	A-182	F316	—	95	125	185	280	465	770
	Types 321, 347	A-182	F321, F347	—	50	70	105	155	255	430
1375	Type 304	A-182	F304	—	55	75	110	165	275	455
	Type 310	A-182	F310	—	70	90	135	205	340	565
	Type 316	A-182	F316	—	80	105	160	240	405	670
	Types 321, 347	A-182	F321, F347	—	45	60	95	140	230	385
1400	Type 304	A-182	F304	—	50	65	95	145	240	400
	Type 310	A-182	F310	—	55	75	110	165	275	455
	Type 316	A-182	F316	—	70	90	135	205	345	570
	Types 321, 347	A-182	F321, F347	—	40	55	80	125	205	345
1425	Type 304	A-182	F304	—	40	55	80	125	205	345
	Type 310	A-182	F310	—	45	60	95	140	230	385
	Type 316	A-182	F316	—	60	80	120	180	300	500
	Types 321, 347	A-182	F321, F347	—	35	50	70	110	180	300
1450	Type 304	A-182	F304	—	35	45	70	105	170	285
	Type 310	A-182	F310	—	40	50	75	115	190	315
	Type 316	A-182	F316	—	50	70	105	155	255	430
	Types 321, 347	A-182	F321, F347	—	30	40	60	95	155	255
1475	Type 304	A-182	F304	—	30	40	60	90	150	250
	Type 310	A-182	F310	—	30	40	65	95	160	265
	Type 316	A-182	F316	—	45	55	85	130	215	355
	Types 321, 347	A-182	F321, F347	—	30	40	55	85	140	235
1500	Type 304	A-182	F304	—	25	35	50	75	130	215
	Type 310	A-182	F310	—	25	35	50	75	130	215
	Type 316	A-182	F316	—	35	45	70	105	170	285
	Types 321, 347	A-182	F321, F347	—	25	35	50	75	130	215

PRESSURE RATINGS • Flanges

PRIMARY SERVICE PRESSURE RATING (lb.) →			150	300	400	600	900	1500	2500
Service Temperature (°F)	Material	Specification	Maximum, Non-Shock Service Pressure Rating (PSIG)						
100	Nickel	ASTM B160	120	310	410	615	925	1545	2570
	Low-Carbon Nickel	ASTM B160	80	205	275	410	615	1030	1715
	Monel (Nickel-Copper)	ASTM B164	195	515	685	1030	1545	2570	4285
	Inconel (Ni-Cr-Fe)	ASTM B166	235	615	825	1235	1850	3085	5140
	Hastelloy B (Ni-Mo)	ASME Code Case No. 1173	350	910	1215	1825	2735	4560	7600
	Hastelloy C (Ni-Cr-Mo)	ASME Code Case No. 1194	345	900	1200	1805	2705	4510	7510
200	Nickel	ASTM B160	120	310	410	615	925	1545	2570
	Low-Carbon Nickel	ASTM B160	75	200	265	400	600	1000	1665
	Monel (Nickel-Copper)	ASTM B164	175	455	605	905	1360	2265	3770
	Inconel (Ni-Cr-Fe)	ASTM B166	220	580	775	1160	1740	2900	4830
	Hastelloy B (Ni-Mo)	ASME Code Case No. 1173	335	880	1175	1765	2645	4405	7345
	Hastelloy C (Ni-Cr-Mo)	ASME Code Case No. 1194	320	845	1125	1685	2530	4215	7025
300	Nickel	ASTM B160	120	310	410	615	925	1545	2570
	Low-Carbon Nickel	ASTM B160	75	195	255	385	580	965	1610
	Monel (Nickel-Copper)	ASTM B164	160	420	560	845	1265	2110	3515
	Inconel (Ni-Cr-Fe)	ASTM B166	215	560	745	1115	1675	2795	4655
	Hastelloy B (Ni-Mo)	ASME Code Case No. 1173	320	845	1125	1685	2530	4215	7025
	Hastelloy C (Ni-Cr-Mo)	ASME Code Case No. 1194	300	790	1050	1575	2365	3945	6570
400	Nickel	ASTM B160	120	310	410	615	925	1545	2570
	Low-Carbon Nickel	ASTM B160	75	190	255	380	575	955	1590
	Monel (Nickel-Copper)	ASTM B164	155	410	545	815	1225	2040	3400
	Inconel (Ni-Cr-Fe)	ASTM B166	210	555	740	1110	1665	2775	4625
	Hastelloy B (Ni-Mo)	ASME Code Case No. 1173	305	800	1070	1605	2405	4010	6685
	Hastelloy C (Ni-Cr-Mo)	ASME Code Case No. 1194	285	740	990	1480	2220	3705	6175
500	Nickel	ASTM B160	120	310	410	615	925	1545	2570
	Low-Carbon Nickel	ASTM B160	75	190	255	380	575	955	1590
	Monel (Nickel-Copper)	ASTM B164	155	405	540	805	1210	2015	3360
	Inconel (Ni-Cr-Fe)	ASTM B166	210	555	740	1110	1665	2775	4625
	Hastelloy B (Ni-Mo)	ASME Code Case No. 1173	285	745	990	1490	2230	3720	6200
	Hastelloy C (Ni-Cr-Mo)	ASME Code Case No. 1194	275	715	955	1435	2150	3585	5970
600	Nickel	ASTM B160	120	310	410	615	925	1545	2570
	Low-Carbon Nickel	ASTM B160	75	190	255	380	575	955	1590
	Monel (Nickel-Copper)	ASTM B164	155	405	540	805	1210	2015	3360
	Inconel (Ni-Cr-Fe)	ASTM B166	210	555	740	1110	1665	2775	4625
	Hastelloy B (Ni-Mo)	ASME Code Case No. 1173	275	715	955	1435	2150	3585	5970
	Hastelloy C (Ni-Cr-Mo)	ASME Code Case No. 1194	260	680	910	1365	2045	3410	5685
650	Hastelloy B (Ni-Mo)	ASME Code Case No. 1173	265	700	935	1400	2095	3495	5825
700	Low-Carbon Nickel	ASTM B160	70	190	250	380	570	945	1575
	Monel (Nickel-Copper)	ASTM B164	155	405	540	805	1210	2015	3360
	Inconel (Ni-Cr-Fe)	ASTM B166	210	550	730	1095	1645	2745	4570
	Hastelloy C (Ni-Cr-Mo)	ASME Code Case No. 1194	260	680	905	1360	2035	3395	5655
800	Low-Carbon Nickel	ASTM B160	70	180	240	360	545	905	1510
	Monel (Nickel-Copper)	ASTM B164	155	405	540	805	1210	2015	3360
	Inconel (Ni-Cr-Fe)	ASTM B166	205	530	710	1065	1595	2655	4430
	Hastelloy C (Ni-Cr-Mo)	ASME Code Case No. 1194	260	680	905	1360	2035	3395	5655
900	Low-Carbon Nickel	ASTM B160	60	155	205	310	465	770	1285
	Monel (Nickel-Copper)	ASTM B164	105	275	365	550	825	1370	2285
	Inconel (Ni-Cr-Fe)	ASTM B166	190	505	670	1010	1510	2520	4200
	Hastelloy C (Ni-Cr-Mo)	ASME Code Case No. 1194	260	680	905	1360	2035	3395	5655
1000	Low-Carbon Nickel	ASTM B160	40	105	135	205	310	515	855
	Inconel (Ni-Cr-Fe)	ASTM B166	90	240	320	480	720	1200	2000
	Hastelloy C (Ni-Cr-Mo)	ASME Code Case No. 1194	260	680	905	1360	2035	3395	5655
1100	Low-Carbon Nickel	ASTM B160	25	70	90	135	205	345	570
	Inconel (Ni-Cr-Fe)	ASTM B166	40	105	135	205	310	515	860
1200	Low-Carbon Nickel	ASTM B160	15	40	55	80	125	205	345
	Inconel (Ni-Cr-Fe)	ASTM B166	25	70	90	135	205	340	570

Approximate pressure ratings for intermediate temperatures may be obtained by interpolation. For exact values of intermediate temperatures, see the 1960 Addendum to ASA Standard B16.5-1957.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 86 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/86

FORMULAS

AREA

Metal cross section..... A_{metal} $=3.1416(D-t)t$
Flow cross section..... A_{flow} $=0.7854d^2$
Inside surface..... a_{inside} $=0.2618d$
Outside surface..... $a_{outside}$ $=0.2618D$

VOLUME

Flow..... V_{flow} $=0.005454d^2$

WEIGHT

Plain end pipe..... $W_{metal}=3.4(A_{metal})=10.68(D-t)t$
Water in full pipe..... $W_{water}=0.4332(A_{flow})=0.3402d^2$

INERTIA

Radius of gyration..... $r=0.25\sqrt{D^2+d^2}$
Moment of inertia..... $I=(A_{metal})r^2=0.04909(D^4-d^4)$
Polar moment of inertia.. $J=2I$
Section modulus..... $Z=J/D$

NOMENCLATURE

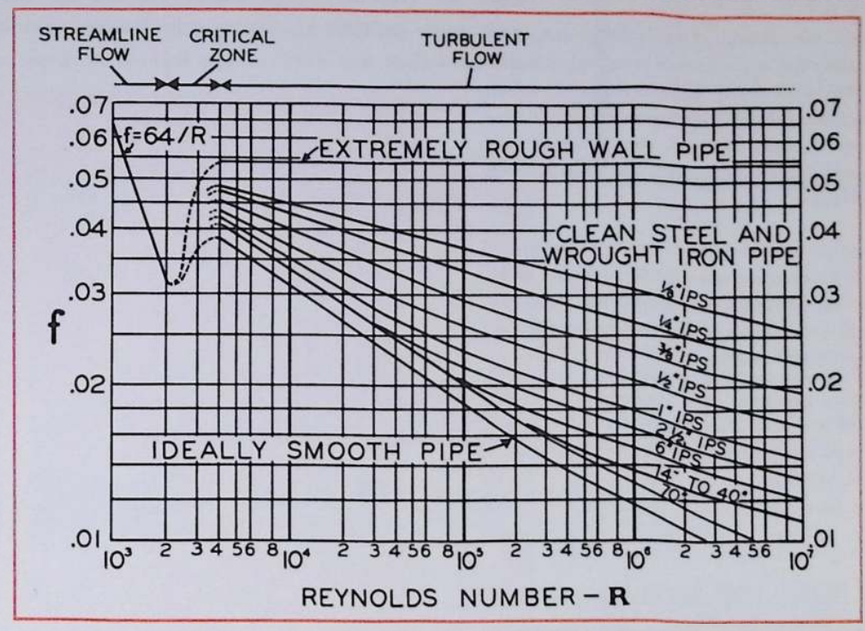
The following symbols are used on this and the following page.

A = Cross sectional area (square inches)
a = Surface area per unit length (square feet per lineal foot)
D = Outside diameter of pipe (inches)
d = Inside diameter of pipe (inches)
f = Friction factor (dimensionless)
I = Moment of inertia (inches^4)
J = Polar moment of inertia (inches^4)
L = Length of pipe (feet)
M = Molecular weight of gas (dimensionless)
$\triangle P$ = Pressure drop (pounds per square inch)
p = Absolute pressure (pounds per square inch)
R = Reynolds number (dimensionless)
r = Radius of gyration (inches)
T = Temperature (degrees Fahrenheit)
t = Pipe wall thickness (inches)
V = Volume per unit length (cubic feet per lineal foot)
v = Mean velocity of flow (feet per second)
W = Weight per unit length (pounds per lineal foot)
Z = Section modulus (cubic inches)
μ = Absolute viscosity (centipoises)
ρ = Density (pounds per cubic foot)

THERMAL EXPANSION

The chart below gives the linear expansion of pipe in inches per hundred feet. These figures are based on ambient temperatures of 70° F; if normal surrounding temperatures differ from this, corrections should be made accordingly.

Temp. (°F)	Carbon Steel; Carbon-Moly; ½-3% Cr Mo	5-9% Cr Mo	18-8 Stainless Steel	Wrought Iron	Copper	Aluminum	Brass
0	−0.53	−0.52	−0.78	−0.55	−0.79	−1.06	−0.81
50	−0.16	−0.16	−0.22	−0.16	−0.22	−0.31	−0.23
70	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100	0.22	0.23	0.34	0.24	0.34	0.46	0.34
150	0.61	0.60	0.88	0.64	0.91	1.25	0.93
200	1.02	0.98	1.45	1.08	1.51	2.06	1.53
250	1.43	1.36	2.02	1.49	2.08	2.88	2.14
300	1.84	1.77	2.59	1.93	2.67	3.72	2.75
350	2.27	2.16	3.18	2.38	3.27	4.58	3.38
400	2.70	2.58	3.78	2.82	3.88	5.46	4.01
450	3.16	2.99	4.41	3.30	4.49	6.36	4.66
500	3.62	3.43	5.02	3.77	5.12	7.27	5.31
550	4.09	3.86	5.67	4.26			
600	4.57	4.34	6.32	4.75			
650	5.05	4.78	6.98	5.26			
700	5.55	5.25	7.64	5.78			
750	6.06	5.70	8.30	6.30			
800	6.57	6.18	8.97				
850	7.10	6.66	9.62				
900	7.64	7.13	10.30				
950	8.19	7.60	10.98				
1000	8.75	8.10	11.65				
1050	9.31	8.59	12.30				
1100	9.89	9.11	13.01				
1150	10.47	9.63	13.72				
1200	11.07	10.13	14.41				
1250	11.67	10.62	15.09				
1300	12.29	11.11	15.72				



The most widely accepted general formula for determining the steady flow pressure drop of a homogeneous fluid (liquid or gas) in a circular pipe is

$$\triangle P=\frac{.00129f\rho v^2L}{d} \quad (1)$$

The pressure drop given by formula (1) is that due only to frictional resistance and does not take into account losses (or gains) due to differences in elevation, or dynamic losses that occur at entrances to, or exits from vessels, or in valves and fittings. However, certain dynamic losses may be accounted for approximately by adding to the true length of the pipe an appropriate "equivalent resistance" expressed in equivalent feet of straight pipe (see page 170).

For compressible fluids, such as vapors and gases, the density ρ and velocity v will vary along the length of the pipe as the pressure and temperature vary. Accordingly, to obtain accurate results if $\triangle P$ is larger than one-tenth of the upstream pressure, use values for ρ and v which are an average of the values at the two ends of the pipe. If $\triangle P$ exceeds approximately four-tenths of the down stream pressure, it is necessary to divide the pipe run into two or more subsections, to each of which formula (1) may be applied. In certain problems, this will require a trial-and-error solution.

The friction factor f which appears in formula (1) may be determined from the graph shown above. This factor depends not only upon the type and size of pipe and the condition of its interior surface, but also upon the value of the Reynolds number R appropriate to the flow. This dimensionless parameter may be determined by the formula

$$R=\frac{124\ dv\rho}{\mu} \quad (2)$$

Values of ρ for saturated and superheated steam and for saturated and subcooled water are given in the usual steam tables. Similar information for ammonia gas may be found in various engineering handbooks. For dry air

$$\rho=\frac{2.697p}{T+459.6} \quad (3)$$

while for most gases

$$\rho=\frac{.0932Mp}{T+459.6} \quad (4)$$

Values of viscosity, μ, are not as well established as those for ρ. Fortunately since large variations in R result in only small variations in f, a rough approximation of μ is all that is required. The following empirical formulas are sufficiently accurate for use in formula (2).

For water

$$\mu=470\ (T+30)^{-1.35} \quad (5)$$

For saturated and superheated steam

$$\mu=\left(.013+\frac{p}{95000}-\frac{.48}{p+120}\right)+\left(.0153-\frac{p}{162000}+\frac{.48}{p+120}\right)\frac{T}{1000} \quad (6)$$

For dry air

$$\mu=.019+.000018T-\frac{.3}{T+100} \quad (7)$$

For ammonia gas

$$\mu=.009+.0000174T \quad (8)$$

For natural gas at atmospheric temperature

$$\mu=.01 \quad (9)$$

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 87 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/87

PIPING DESIGN

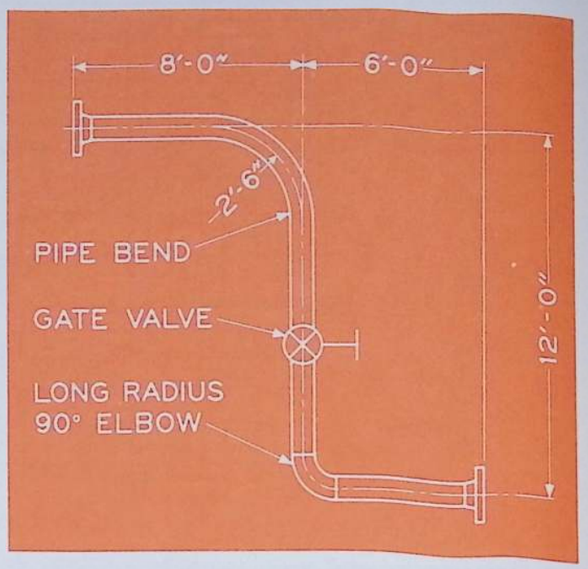
EQUIVALENT RESISTANCE

The table below shows the resistance of bends, fittings and valves to the flow of fluids, expressing that resistance in equivalent feet of straight pipe. The values given are for commercial pipe, free from icicles or other obstructions. Although these figures are based upon the broadest experience currently available, they should be considered as only approximate, due to the fact that research in this field is not entirely complete.

Note that allowance has been made for curvature of bends and elbows, so that the resistance values given should be added to the **total center-to-center dimensions** of the configuration under consideration. For example, the total equivalent resistance of the 6" assembly shown at right is calculated thus:

Resistance of the pipe (8 ft. + 12 ft. + 6 ft.)	26.0
Resistance of the bend	3.0
Resistance of the valve	3.5
Resistance of the elbow	6.1
Total	38.6

Thus, the resistance to fluid flow of the entire assembly is equivalent to the resistance of 38.6 lineal feet of 6" straight pipe. Formulas for translating the resistance of straight pipe into pressure drop are shown on page 169.



Nom. Pipe Size	BENDS Ratio of bend radius to nominal pipe size 4	5	6	WELDING ELLS Long Radius	Short Radius	Single Mitre-Weld Elbow	Welding Tee	Welded Nozzle	VALVES Gate	Globe	Angle	Swing Check	Nom. Pipe Size
1"	0.5	0.5	0.6	1.1	1.4	5.2	3.9	5.2	0.6	29	15	7.3	1"
1¼"	0.6	0.6	0.8	1.4	1.8	6.9	5.2	6.9	0.8	38	19	9.6	1¼"
1½"	0.7	0.8	0.9	1.6	2.1	8.0	6.0	8.0	0.9	45	22	11	1½"
2"	0.9	1.0	1.1	2.1	2.8	10	7.8	10	1.2	57	29	14	2"
2½"	1.1	1.2	1.3	2.5	3.3	12	9.3	12	1.4	69	34	17	2½"
3"	1.4	1.5	1.7	3.1	4.1	15	11	15	1.8	85	43	21	3"
4"	1.8	2.0	2.2	4.0	5.4	20	15	20	2.4	112	56	28	4"
5"	2.2	2.5	2.8	5.1	6.7	25	19	25	2.9	140	70	35	5"
6"	2.7	3.0	3.3	6.1	8.1	30	23	30	3.5	168	84	42	6"
8"	3.5	3.9	4.3	8.0	11	40	30	40	4.7	222	111	56	8"
10"	4.4	4.9	5.5	10	13	50	38	50	5.9	278	139	70	10"
12"	5.2	5.8	6.4	12	16	60	45	60	7.0	332	166	83	12"
14"	5.7	6.2	6.8	13	18	65	49	66	7.7	364	182	91	14"
16"	6.5	7.1	7.8	15	20	75	56	75	8.8	417	208	104	16"
18"	7.3	8.0	8.8	17	23	84	63	84	9.9	469	234	117	18"
20"	8.1	9.0	9.8	19	25	94	71	94	11	522	261	131	20"
24"	9.8	11	12	23	30	113	85	113	13	629	314	157	24"

SPECIAL WELDING BEVELS

Bevels most commonly used for pipe and stock welding fittings and flanges are those shown on page 116. In some cases, special bevels are required, particularly for high-pressure piping welded with machined backing rings. Several bevels for such special applications are shown on this page.

Figure 1 (PFI Standard ES1)
Angle Bevel & Taper-Bore
Wall Thickness (T) 5/16" thru 1"

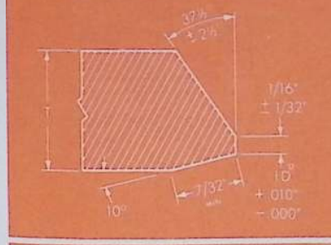


Figure 2 (PFI Standard ES1)
Angle Bevel & Counter-Bore
Wall Thickness (T) 5/16" thru 1"

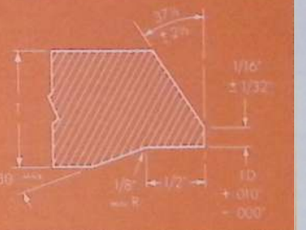


Figure 3
Double-Angle Bevel & Taper-Bore
Wall Thickness (T) Over 5/16" (ASA Std. B16.25) 1" (PFI Std. ES1)

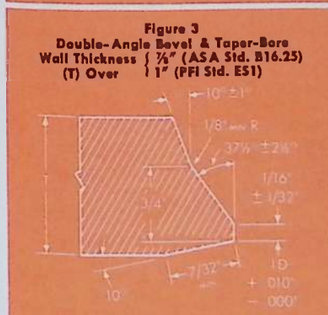
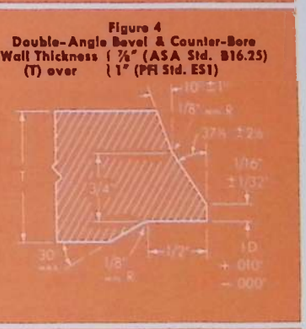


Figure 4
Double-Angle Bevel & Counter-Bore
Wall Thickness (T) over 5/16" (ASA Std. B16.25) 1" (PFI Std. ES1)



Figures 1 and 3 illustrate an end preparation with tapered inside surface and closely held inside diameter. These bevels are intended for use with machined tapered backing rings, and are recommended for this purpose by the Pipe Fabrication Institute (PFI Standard ES1).

Figures 2 and 4 show an inside counterbore and taper-bore, again with close tolerances for the inside diameter. These bevels are for use with a flat machined backing ring, and also comply with PFI Standard ES1.

Figure 5
"U" Bevel & Counter-Bore

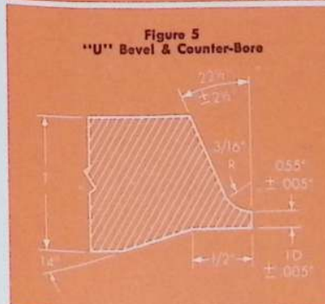
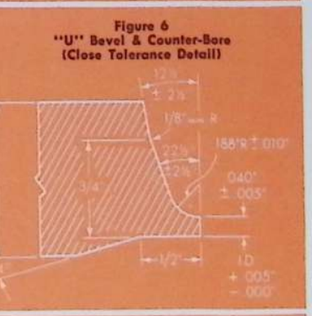


Figure 6
"U" Bevel & Counter-Bore
(Close Tolerance Detail)



Figures 5 and 6 show the application of a counter-and-taper-bore to a "U" type bevel. The "U" bevel, formerly applied to all heavy-wall pipe, has now been superseded by the double-angle bevel shown in Figures 2 and 4, for reasons of economy and weldability. However, in many cases, the "U" bevel is still specified for Tungsten-Inert-Gas welding.

Figure 7
"Lip" Bevel & Counter-Bore
(Close Tolerance Detail)

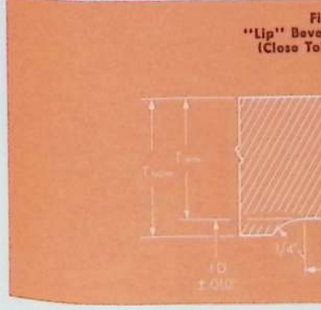


Figure 7 illustrates one of several "lip" bevels which may be applied to pipe and fittings to prepare them for special welding techniques, such as Tungsten-Inert-Gas welding.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 88 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/88

EXAMPLE
Catalog No. for an ASA 90° Long Radius Elbow (Carbon Steel), for Standard Pipe.

12 – B – S

Basic No. of Fitting | Suffix for Carbon Steel | Suffix for Standard Pipe

TYPE OF FITTING	CATALOG NUMBERS (consist of three parts as indicated below)		
	1 FITTING — Select Basic No. from this Column	2 MATERIAL — Select Letter Suffix for Material from this Column	3 PIPE WALL THICKNESS — Select Suffix for Pipe Wall Thickness from this Column
BANTAM FITTINGS			
90° Elbow	DISCONTINUED		
45° Elbow			
Tee			
Cap			
Reducer, Concentric			
Reducer, Eccentric			
CONVENTIONAL FITTINGS			
90° Elbow, Long Radius ASA	No. 12	B....for Carbon Steel—(Grade B)	S....for Standard
90° Elbow, Long Radius, Long Tang	No. 13	D....for Carbon-Moly Steel	X....for Extra Strong
90° Elbow, Short Radius	No. 14	E....for Chrome-Moly Steel—(1%)	XX....for Double Ex. Strong
90° Elbow, Short Radius, Long Tang	No. 15	G....for Chrome-Moly Steel—(1¼%)	GD...for Gas Distribution
90° Elbow, 3R Contur	No. 16	H....for Chrome-Moly Steel—(2¼%)	
45° Elbow, Long Radius ASA	No. 17	J....for Chrome-Moly Steel—(4–6%)	F....for Schedule 5
45° Elbow, Long Radius, Long Tang	No. 18		01....for Schedule 10
45° Elbow, 3R Contur	No. 19	K....for 3½% Nickel	02....for Schedule 20
180° Return Bend, Long Radius ASA	No. 22	L....for Low Temp. Carbon Steel (WFLC)	03....for Schedule 30
180° Return Bend, Short Radius	No. 23	M....for Chrome-Copper-Nickel	04....for Schedule 40
Tee ASA	No. 24	N....for Genuine Wrought Iron	06....for Schedule 60
Cross	No. 25	O....for Monel	08....for Schedule 80
Shaped Nipple, 90° (*)	No. 28	P....for Stainless Steel T-304	
Shaped Nipple, 45° (*)	No. 29	R....for Stainless Steel T-304-L	10....for Schedule 100
45° Lateral, Unreinforced	No. 32	T....for Stainless Steel T-316	12....for Schedule 120
45° Lateral, Reinforced	No. 33	V....for Stainless Steel T-316-L	14....for Schedule 140
45° Lateral Reinforcing Ring Only	No. 34	W....for Stainless Steel T-347	16....for Schedule 160
Cap ASME and ASA	No. 35	X....for Nickel	
Reducer, Concentric ASA	No. 36	Y....for Aluminum 3003-F	
Reducer, Eccentric ASA	No. 37	Z....for Aluminum 6061	
Stub End, Long Length ASA	No. 38		
Stub End MSS	No. 39		
Backing Ring, Plain	No. 44		
Backing Ring, Type "C"	No. 45		
Backing Ring, Type "CC"	No. 46		
Backing Ring, Type "CCC"	No. 47		
SADDLES AND SLEEVES			
Saddle, Regular (*)	No. 26	(same as above)	(not required)
Saddle, Wrap-Around (*)	No. 27		
Sleeve, Butt-Welding	No. 42		
Sleeve, Slip-Coupling	No. 43		
HI-YIELD FITTINGS			
90° Elbow, Long Radius, No Tangent	No. 52	(same as above)	Use suffixes indicated above or, if necessary, specify in inches.
90° Elbow, Long Radius, Long Tangent	No. 53		
45° Elbow, Long Radius, No Tangent	No. 54		
45° Elbow, Long Radius, Long Tangent	No. 55		
Tee	No. 56		
Cap	No. 57		
Reducer, Concentric	No. 58		
Reducer, Eccentric	No. 59		
Other than Above, please describe	.....		

*—Include nominal size of header. PRODUCT DESCRIPTION: See Catalog.

EXAMPLE
Catalog Number for an ASA Welding Neck Flange, Carbon Steel, 600-Pound.

62 – B – C6

Basic No. of Flange | Suffix for Carbon Steel | Suffix for 600# Pressure Class

TYPE OF FLANGE and PRESSURE CLASSIFICATIONS	CATALOG NUMBERS (consist of three parts as indicated below)		
	1 FLANGE — Select Basic No. from this Column	2 MATERIAL — Select Letter Suffix for Material from this Column	3 CLASS — Select Numeral Suffix for Pressure Class from this Column
REGULAR ASA FLANGES			
Welding Neck ASA 150 to 2500#	No. 62	B....for Carbon Steel—(Grade B)	01....for 150#
Slip-On ASA 150 to 2500#	No. 63	D....for Carbon-Moly Steel	03....for 300#
Screwed ASA 150 to 2500#	No. 64	E....for Chrome-Moly Steel—(1%)	04....for 400#
Lap Joint ASA 150 to 2500#	No. 65	G....for Chrome-Moly Steel—(1¼%)	06....for 600#
Blind ASA 150 to 2500#	No. 66	H....for Chrome-Moly Steel—(2¼%)	09....for 900#
Socket-Welding ASA 150 to 2500#	No. 67	J....for Chrome-Moly Steel—(4–6%)	15....for 1500#
ORIFICE FLANGES—(HALF UNION)		K....for 3½% Nickel	25....for 2500#
Welding Neck ASA 300 to 1500#	No. 68	L....for Low Temp. Carbon Steel (WFLC)	
Slip-On ASA 300 to 1500#	No. 69	M....for Chrome-Copper-Nickel	
Screwed ASA 300 to 1500#	No. 71	N....for Genuine Wrought Iron	
ORIFICE FLANGE UNIONS—(COMPLETE)		O....for Monel	
Welding Neck ASA 300 to 1500#	No. 72	P....for Stainless Steel T-304	
Slip-On ASA 300 to 1500#	No. 73	R....for Stainless Steel T-304-L	
Screwed ASA 300 to 1500#	No. 74	T....for Stainless Steel T-316	
		V....for Stainless Steel T-316-L	
LONG FLANGES		W....for Stainless Steel T-347	
Long Welding Neck ASA 150 to 2500#	No. 79	X....for Nickel	
		Y....for Aluminum 3003-F	
		Z....for Aluminum 6061	
LIGHTWEIGHT FLANGES			
Welding Neck (1 to 12") (*)	No. 77	(same as above)	(not required)
Slip-On (3 to 72") (*)	No. 78		
LARGE DIAMETER FLANGES —(Nominal Sizes 26" and Larger)			
Welding Neck ASA 125 & 250#	No. 82	(same as above)	01....for 125 or 150#
Welding Neck ASME 150 & 300#	No. 83		02....for 250#
Welding Neck....MSS SP-44....ASA 300 to 900#	No. 84		03....for 300#
Slip-On ASA 125 & 250#	No. 85		04....for 400#
Slip-On ASME 150 & 300#	No. 86		06....for 600#
Slip-On....MSS SP-44....ASA 300 to 900#	No. 87		09....for 900#
Slip-On....Lightweight; see No. 78 above	.....		
Blind ASA 125 & 250#	No. 88		
Blind ASME 150 & 300#	No. 89		
Blind....MSS SP-44....ASA 300 to 900#	No. 90		
API RING JOINT FLANGES			
Welding Neck API 2000 to 15000#	No. 92	(same as above)	06....for API 2000#
Screwed API 2000 to 15000#	No. 94		09....for API 3000#
Blind API 2000 to 15000#	No. 96		15....for API 5000#
			35....for API 10000#
			45....for API 15000#

*—Diameter and drilling of Lightweight Flanges comply with ASA B16.5 (150#) in sizes 24-inch and smaller, and with ASA B16.1 (125#) in larger sizes. Sizes 12-inch and smaller rated for 175 psi, and 14-inch and larger for 150 psi (at atmospheric temperature).

**—Dimensions and facing of API 2000, 3000, and 5000# Flanges comply with ASA B16.5 Ring Joint Standards for 600, 900, and 1500-Pound Classes, respectively.

FACINGS: Except for Lap Joint and Lightweight Flanges which regularly have a flat face (and API Ring Point Flanges), flanges are regularly furnished with a raised facing. Other facings can be furnished when specified.

WELDING NECK AND SOCKET-WELDING FLANGES: In addition to size and Catalog No., specify the diameter of bore.

PRODUCT DESCTRIPTION: See Catalog.

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 89 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/89

ALPHABETICAL INDEX

Page

A

Accuracy 10
Acetylene Welding 173
Air Piping
(see Industrial Gas and Air Piping)
Allowable Working Pressures
(see Pressure Ratings)
Alloy Fittings:
general information 82
elbows 16
branch connections 42
other types 62
specifications 113
Alloy Flanges:
general information 111
specifications 115
Alloy Pipe Specifications 117
Alloy Piping Components 123
Aluminum and Aluminum Alloys
(see Alloy)
Annealing ..... (see Heat Treatment)
API Specifications ..... (see Specifications)
Arc Welding 172
Areas of Pipe 138, 168
ASA Standards ..... (see Specifications)
ASME:
caps 72
flanges 108
pressure ratings 147
ASTM Specifications ..... (see Specifications)
Austenitic Steel ..... (see Stainless Steel)
AWWA Flanges 107

B

Backing Rings:
general information 62
dimensions and weights 77
Bends, Flow Resistance 170
Bends, Return ..... (see Returns)
Bevels:
regular 116
special 171
specifications 113
Blind Flanges:
general information 86
dimensions and weights 88
special 111
Boiler Code ..... (see ASME)
Bolting Dimensions 135
Bore of Flanges:
regular 88
minimum 134
Branch Fittings:
general information 42
tees 44
extrusions 54
saddles 56
shaped nipples 58
crosses 60
laterals 61
pipeline 78
special 82, 84

Page

Branches, Flow Resistance 170
Brass and Bronze ..... (see Alloy)
Bursting Strength 9, 113

C

Caps:
general information 62
dimensions and weights 72
special 82, 84
Carbon Moly ..... (see Alloy)
Carbon Steel Fittings:
general information 82
elbows 16
branch connections 42
other types 62
specifications 113
Carbon Steel Flanges:
general information 111
specifications 115
Carbon Steel Pipe Specifications 117
Carbon Steel Piping Components 123
Chamfer ..... (see Bevels)
Charpy Testing 15, 114
Chemical Analyses:
comparison chart 120
fittings 113
flanges 115
pipe 117
Chill Rings ..... (see Backing Rings)
Chrome-Copper-Nickel Fittings 82
Chrome Moly Fittings:
general information 82
elbows 16
branch connections 42
other types 62
specifications 113
Chrome Moly Flanges:
general information 111
specifications 115
Chrome Moly Pipe Specifications 117
Chrome Moly Piping Components 123
Chrome-Nickel-Steel ..... (see Stainles Steel)
Clad Fittings 82
Codes ..... (see Specifications)
Combinations of Fittings 128
Comparison Charts:
fitting dimensions 126
fitting combinations 128
piping components 123
pipe physicals 120
pipe chemicals 120
Components, Piping 123
Concentric Reducers ..... (see Reducers)
"Contur" Elbows 84
Conversion Factors ..... Inside Back Cover
Copper and Copper Alloy ..... (see Alloy)
Crosses:
general information 42
dimensions and weights 60

Page

D

Decimal Equivalents ..... Inside Back Cover
Design Data 112
Design Formulas 168
Design of Fittings and Flanges 8
Dimensions of Fittings:
accuracy 10
combinations 128
comparison chart 126
elbows 16
specifications 113
tolerances 116
Dimensions of Flanges:
accuracy 10
bolting 135
combinations 129
comparison chart 127
facings 130
gaskets 130
minimum bore 134
specifications 115
tolerances 116
Dimensions of Pipe 136
Dimensions of Valves 146
District Heating Piping:
ASA Code 148
pressure ratings 149
stress values 158
Double Extra Strong:
elbows, 90° 21
elbows, 45° 35
reducers 71
tees 53
pipe dimensions 136
Drilling, Flanges 86, 88

E

Eccentric Reducers ..... (see Reducers)
Elbows:
general information 16
90° long radius, ASA type 18
90° long radius, long tangent 22
90° reducing 28
90° short radius 24
90° short radius, long tangent 26
45° long radius, ASA type 32
45° long radius, long tangent 36
180° long radius, ASA type 38
180° short radius 40
flow resistance 170
specials 82, 84
Electric Arc Welding 172
Elongation 120
Equivalent Resistance 170
Etch Testing 9
Expansion, Thermal 168
Extrusions:
general information 42
dimensions and design data 54
pipeline 78

Page

F

Facings, Flanges:
general information 86
dimensions 130
Female Faced Flanges 131
Ferritic Steel ..... (see Alloy)
Finish of Flanges 86
Flat Faced Flanges 130
Flow 138, 168
Formulas, Design 168

G

Gas Distribution Thickness:
elbows, 90° 20
elbows, 45° 34
reducers 70
tees 52
pipe dimensions 136
Gas, Industrial (see Industrial Gas Piping)
Gas Transmission and Distribution Piping:
ASA Code 148
fittings 78
flanges 109
Gasket Dimensions 130
Gasket Surface, Flanges 86
Genuine Wrought Iron (see Wrought Iron)
Grade Symbols 120
Grades of Steel:
comparison chart 123
fittings 82, 113
flanges 115
pipe 117, 120
Groove Faced Flanges 131

H

Hastelloy ..... (see Alloy)
Heads ..... (see Caps)
Heat Treatment:
fittings 113
flanges 115
pipe 117
High-Yield Strength Fittings 78, 82
High-Yield Strength Pipe 118, 120
High-Yield Strength Piping
Components 123
Hot Coining 6, 10
Hydrostatic Burst Testing 8

I

Inconel ..... (see Alloy)
Industrial Gas and Air Piping:
ASA Code 147
pressure ratings 149
stress values 158
Inert Gas Welding 172
Iron Pipe Sizes 136

J

Joints, Lapped
(see Lap Joint Flanges or Stub Ends)

L

Lap Joint Flanges:
general information 86
dimensions and weights 88
Lap Joint Stub Ends:
general information 62
dimensions and weights 74
special facings 130

Page

Large Diameter Flanges:
light weight 106
125 & 250 lb. American Standard 107
150 & 300 lb. (ASME) 108
pipeline (MSS) 109
Laterals:
general information 42
dimensions and weight 61
special 84
Length of Bolts and Studs 135
Length of Tangents,
Elbows 16, 22, 26, 36
Light Gauge or Light Wall:
elbows, 90° 20
elbows, 45° 34
reducers 70
tees 52
pipe dimensions 136
Light Weight Flanges:
general information 86
dimensions and weights 106
Lined Fittings 82
Lip Bevels 171
Liquid Penetrant Testing 15
Long Radius Elbows ..... (see Elbows)
Long Tangent Elbows ..... (see Elbows)
Long Welding Necks:
general information 86
dimensions and weights 110
Low-Temperature Material ..... (see Alloy)

M

Machining:
fittings 10
flanges 86
regular bevels 116
special bevels 171
Magnetic Particle Testing 15
Male Facing 86, 131
Manufacturing:
processes 6
standards ..... (see Specifications)
testing 12
Marking:
fittings 12, 113
flanges 115
Materials:
fittings 82, 113
flanges 111, 115
pipe 117
piping components 123
Metallurgy 12
Metal Inert Gas Welding 173
Metals ..... (see Materials)

"MIG" Welding 173
Minimum Bore, Flanges 134
Mitered Elbows, Flow Resistance 170
Moment of Inertia 138, 168
Monel ..... (see Alloy)
MSS Flanges 109
MSS Standards ..... (see Specifications)

N

Necks, Long Welding
(see Long Welding Necks)
Nickel and Nickel Alloys ..... (see Alloy)
Non-Ferrous ..... (see Alloy)
Nozzles ..... (see Branch Fittings)
Nuclear Fittings 80

Page

O

Oil Transportation Piping:
ASA Code 148
pressure ratings 152
stress values 120
Orifice Flange Unions:
general information 86
dimensions and weights 102
Oxy-Acetylene Welding 173

P

Petroleum Refinery Piping:
ASA Code 147
pressure ratings 152
stress values 159
Physical Properties:
comparison chart 120
fittings 113
flanges 115
pipe 117, 120
Pictorial Index 2
Pipe:
areas 138, 168
chemicals 120
component chart 123
design formulas 168
dimensions 136
physicals 120
pressure ratings 147
properties 138, 168
schedule numbers 136
specifications 117
stress values 158
weights 136
Piping Components 123
Piping Formulas 168
Pipeline ..... (see Gas Transmission & Distribution Piping)
Power Piping:
ASA Code 147
pressure ratings 149
stress values 158
Plate for Fittings 123
Plated Fittings 82
Pressure Drop 169
Pressure Ratings, Allowable:
fittings 147
flanges 161
pipe 149
Pressure Ratings, Required:
fittings 113
flanges 115
pipe 147
Procedures, Welding 172

R

Radiography:
code requirements 113
special fittings 14
stock fittings 12
Radius of Elbows 16
Radius of Gyration 138, 168
Raised Face Flanges 130
Red Brass ..... (see Alloy)
Reducers:
general information 62
dimensions and weights 64
special 82, 84
venturi 84

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 90 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/90

ALPHABETICAL INDEX

Page

Reducing Crosses ..... (see Crosses)
Reducing Elbows:
- general information 16
- dimensions and weights 28
- special 82, 84

Reducing Flanges:
- general information 86
- dimensions 88
- special 111

Reducing Tees ..... (see Tees)
Refinery Piping (see Petroleum Refinery Piping)
Refrigeration Piping:
- ASA Code 148
- pressure ratings 152
- stress values 160

Reinforcement of Branches 42, 61
Reinforcing Rings:
- general information 42
- sizes 61

Resistance to Flow 169
Returns, 180°:
- general information 16
- long radius 38
- short radius 40
- specials 82, 84

Ring Joint Facing 132

S

Saddles:
- general information 42
- pipeline 78
- regular 56
- wrap around 57
- special 84

Schedule Numbers:
- elbows, 90° 20
- elbows, 45° 34
- reducers 70
- tees 52
- pipe dimensions 136

Screwed Flanges:
- general information 86
- ASA 88
- orifice 102
- special 111

Seamless Fittings 6
Section Modulus 138, 168
Service Pressure Ratings (see Pressure Ratings)
Shaped Nipples:
- general information 42
- dimensions and weights 58
- specials 82, 84

Short Radius Elbows ..... (see Elbows)
Sizing of Fittings 6, 10
Sleeves:
- general information 62
- dimensions and weights 76
- special 84

Slip-On Flanges:
- general information 86
- ASA 88
- orifice 102
- large diameter 106
- special 111

Socket Welding Flanges:
- general information 86
- dimensions and weights 88

Page

Special Fittings 14, 82, 84
Special Flanges 111
Specifications:
- bevels 116, 171
- fittings 113
- flanges 115
- pipe 117
- pipe dimensions 136
- pipe components 123
- pressure piping 147

Stainless Steel Fittings:
- general information 82
- elbows 16
- branch connections 42
- other types 62
- specifications 113

Stainless Steel Flanges:
- general information 111
- specifications 115

Stainless Steel Pipe Specifications 117
Stainless Steel Piping Components 123
Standards ..... (see Specifications)
Steel ..... (see Carbon Steel or Alloy)
Strength ..... (see Tensile Strength)
Stress Values 147, 158
Stub Ends ..... (see Lap Joint Stub Ends)
Stud Dimensions 135
Submerged Arc Welding 172
Surface Areas 138, 168

T

Tangent Elbows ..... (see Elbows)
Tees:
- general information 42
- dimensions and weights 44
- extrusions 54
- flow resistance 170
- pipeline 78
- special 82

Tensile Strength:
- fittings 113
- flanges 115
- pipe 117

Testing:
- code requirements 113
- fittings 8
- flanges 8
- pipe 117

Thermal Expansion 168
Thickness ..... (see Wall Thicknesses)
Threaded Flanges ..... (see Screwed Flanges)
Three Diameter Elbows 84
"TIG" Welding 173
Titanium ..... (see Alloy)
Tolerances 116
Tongue Faced Flanges 130
Trigonometric Functions Inside Back Cover
"Tri-Ten" Fittings 82
Tubing 123
Tungsten Inert Gas Welding 173
Types of:
- elbows 16
- branch connections 42
- other fittings 62
- flanges 86

Page

U

U-Bevels 171
Ultrasonic Testing 15

V

Valves:
- dimensions 146
- flow resistance 170

Van Stone ..... (see Lap Joint)
Venturi Reducers 84
Volume:
- pipe 138, 168
- caps 72

W

Wall Thicknesses:
- elbows 16
- branch connections 42
- other fittings 62
- pipe 136

Weights:
- fittings 18
- flanges 88
- pipe 138, 168
- water in pipe 138, 168
- welding rod 138

Welded-Type Fittings 6
Welding Bevels ..... (see Bevels)
Welding Neck Flanges:
- general information 86
- ASA 88
- orifice 102
- large diameter 106
- special 111

Welding Processes:
- fittings 6, 113
- piping 172

Welding Rod:
- specifications 123
- weights 138

Working Pressures ..... (see Pressure Ratings)
Wrap-Around Saddles ..... (see Saddles)
Wrought Iron Fittings:
- general information 82
- elbows 16
- branch connections 42
- other types 62
- specifications 113

Wrought Iron Flanges:
- general information 111
- specifications 115

Wrought Iron Pipe Specification 117
Wrought Iron Piping Components 123
Wyes 84

X

X-Grades:
- fittings 82
- pipe 117

X-ray of Fittings ..... (see Radiography)

Y

"Y" Grades, Pipe 117
"Y" Fittings 84
Yield Strength:
- fittings 113
- flanges 115
- pipe 117

Yoloy Fittings 82

Crane Co.: Welding Fittings, Forged Flanges (1967)
ACL Doc 21277 · Page 91 of 92
Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/91

FINDER	PAGES	MATERIAL		SECTION
1	4 - 15	INTRODUCTION		
2	16 - 17	Types	Catalog Numbers	
3	18 - 27	90° Elbows	12, 13, 14, 15	
4	28 - 31	Reducing Elbows	12	
5	32 - 37	45° Elbows	17, 18	
6	38 - 41	180° Returns	22, 23	
7	42 - 43	Types		
8	44 - 53	Tees	24	
9	54 - 55	Extrusions		WELDING FITTINGS
10	56 - 57	Saddles	26, 27	
11	58 - 59	Shaped Nipples	28, 29	
12	60 - 61	Crosses, Laterals	25, 32, 33	
13	62 - 63	Types		
14	64 - 71	Reducers	36, 37	
15	72 - 73	Caps	35	
16	74 - 75	Lap Joint Stub Ends	38	
17	76 - 77	Sleeves, Backing Rings	42, 45, 46, 47	
18	78 - 79	Pipeline		
19	80 - 81	Nuclear		
20	82 - 83	Special Metals		
21	84 - 85	Special Design		
22	86 - 87	INTRODUCTION		
23	88 - 89	150 lb.	ASA	
24	90 - 91	300 lb.	ASA	
25	92 - 93	400 lb.	ASA	
26	94 - 95	600 lb.	ASA	FORGED FLANGES
27	96 - 97	900 lb.	ASA	
28	98 - 99	1500 lb.	ASA	
29	100 - 101	2500 lb.	ASA	
30	102 - 105	Orifice Unions	OTHER	
31	106 - 109	Large Diameter	OTHER	
32	110	Long Welding Necks	OTHER	
33	111	SPECIAL		
34	112	INTRODUCTION		
35	113 - 125	STANDARDS AND SPECIFICATIONS		DESIGN DATA
36	126 - 146	DIMENSIONS AND PROPERTIES		
37	147 - 167	PRESSURE RATINGS		
		OTHER TECHNICAL INFORMATION		

DECIMAL EQUIVALENTS

1/64	.015625	33/64	.515625
1/32	.031250	17/32	.531250
3/64	.046875	35/64	.546875
1/16	.062500	9/16	.562500
5/64	.078125	37/64	.578125
3/32	.093750	19/32	.593750
7/64	.109375	39/64	.609375
1/8	.125000	5/8	.625000
9/64	.140625	41/64	.640625
5/32	.156250	21/32	.656250
11/64	.171875	43/64	.671875
3/16	.187500	11/16	.687500
13/64	.203125	45/64	.703125
7/32	.218750	23/32	.718750
15/64	.234375	47/64	.734375
1/4	.250000	3/4	.750000
17/64	.265625	49/64	.765625
9/32	.281250	25/32	.781250
19/64	.296875	51/64	.796875
5/16	.312500	13/16	.812500
21/64	.328125	53/64	.828125
11/32	.343750	27/32	.843750
23/64	.359375	55/64	.859375
3/8	.375000	7/8	.875000
25/64	.390625	57/64	.890625
13/32	.406250	29/32	.906250
27/64	.421875	59/64	.921875
7/16	.437500	15/16	.937500
29/64	.453125	61/64	.953125
15/32	.468750	31/32	.968750
31/64	.484375	63/64	.984375
1/2	.500000	1	1.000000

CONVERSION FACTORS

AREA
1 Square Centimeter ..... 0.15500 Square Inches

DENSITY
1 Gram per Cubic Centimeter .... 0.036128 Pounds per Cubic Inch

ENERGY
1 British Thermal Unit (BTU) .. 0.2930 Watt-hour; 777.97 Foot-pounds; 1054.8 Joules (absolute); 251.98 Gram-calories

LENGTH
1 Centimeter = 10 Millimeters ..... 0.39370 Inches

MASS
1 Kilogram ..... 2.2046 Pounds (avoirdupois)

PRESSURE
1 Kilogram per Square Centimeter ..... 14.223 Pounds per Square Inch
1 Inch of Mercury ..... 0.49116 Pounds per Square Inch
1 Centimeter of Mercury ..... 0.19337 Pounds per Square Inch
1 Foot of Water ..... 0.43352 Pounds per Square Inch
1 Atmosphere ..... 14.696 Pounds per Square Inch

TEMPERATURE
° F ..... 1.8° C + 32°

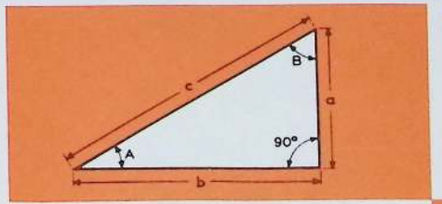
VELOCITY
1 Mile per Hour ..... 1.4667 Feet per Second
1 Knot ..... 1.1516 Miles per Hour
1 Gallon per Minute ..... 0.13368 Cubic Feet per Minute

VISCOSITY
1 Poise ..... 0.0672 Pounds (mass) per Foot-second
1 Slug ..... 32.174 Pounds (mass) per Foot-second

VOLUME
1 Cubic Centimeter ..... 0.061023 Cubic Inches
1 U. S. Gallon ..... 3.7853 Liters; 231 Cubic Inches

WORK
1 Horsepower ..... 550 Foot-pounds per Second; 745.70 Watts

TRIGONOMETRIC FUNCTIONS



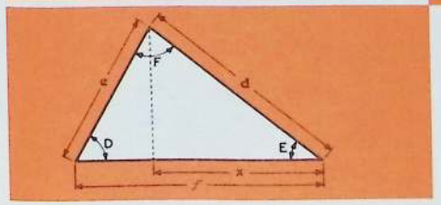
$a^2 + b^2 = c^2$

$A + B = 90°$

$\frac{a}{c} = \sin A = \cos B$

$\frac{a}{b} = \tan A = \cot B$

$\frac{c}{b} = \sec A = \csc B$



$d^2 = e^2 + f^2 - 2ef \cdot \cos D$

$D + E + F = 180°$

$\frac{\sin D}{d} = \frac{\sin E}{e} = \frac{\sin F}{f}$

$d = e \cdot \cos F + f \cdot \cos E$

$x = \frac{d^2 + f^2 - e^2}{2f}$

DESIGNED BY BATZ-HODGSON-NEUWOEHNER INC.

PRINTED AND BOUND BY VON HOFFMANN PRESS, INC.

Published by AsbestosClaims.Law
asbestosclaims.law/library/21277/92