

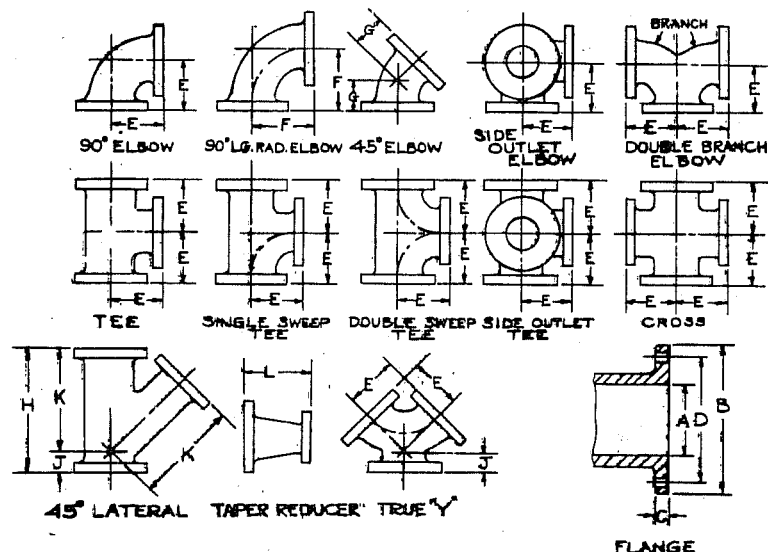
# MACHINE DRAFTING DATA

DECIMAL EQUIVALENTS <b>A</b>		DRILLS TO 1/2" M.D. <b>B</b>				NATIONAL THREAD SERIES <b>D</b>				WOODRUFF KEYS <b>F</b>			METAL GAGES <b>H</b>																												
		SIZE	DEC.	SIZE	DEC.	SIZE	THDS PER IN.	DIAM.	TAP DRILL	KEY NO.	A or B	C	NUMBER OF GAGE	AMERICAN OR BROWN & SHARPE AWG	WASHBURN & MOEN WING	BIRMINGHAM OF STUBS IRON WIRE B.W.G.	U. S. STANDARD FOR PLATE U.S.G.																								
1/64	0.015625	80	0.1375	91	0.159	1	64	0.073	53	204	1/16 X 1/2	13/64	7-0		4900																										
1/32	0.03125	79	0.140625	90	0.161	2	56	0.086	50	304	3/32 X 1/2	13/64	6-0	5000	4615																										
3/64	0.046875	78	0.14375	89	0.166	3	48	0.099	47	305	3/32 X 5/8	1/4	5-0	5165	4305	500																									
1/16	0.0625	77	0.146875	88	0.1695	4	40	0.112	43	404	1/8 X 1/2	13/64	4-0	4600	3930	454																									
3/32	0.09375	76	0.15	87	0.173	5	40	0.125	38	405	1/8 X 5/8	1/4	3-0	4096	3625	425																									
7/64	0.109375	75	0.153125	86	0.177	6	32	0.138	36	406	1/8 X 3/4	5/16	2-0	3648	3310	380																									
1/8	0.125	74	0.15625	85	0.18	8	32	0.164	29	505	5/32 X 5/8	1/4	0	3249	3065	340																									
3/16	0.1875	73	0.159375	84	0.183	10	24	0.19	25	506	5/32 X 3/4	5/16	1	2893	2830	300																									
1/4	0.25	72	0.1625	83	0.185	12	24	0.216	16	606	3/16 X 3/4	5/16	2	2576	2625	284																									
5/16	0.3125	71	0.165625	82	0.1875	1/4	20	0.25	7	607	3/16 X 7/8	3/8	3	2294	2437	259	2391																								
3/8	0.375	70	0.16875	81	0.189	5/16	18	0.325	F	608	3/16 X 1	7/16	4	2043	2253	238	2242																								
1/2	0.5	69	0.171875	80	0.191	3/8	16	0.375	5/16	609	3/16 X 1 1/8	3/16	5	1819	2070	220	2092																								
5/8	0.625	68	0.175	79	0.1935	7/16	14	0.4375	U	808	1/4 X 1	7/16	6	1620	1920	203	1943																								
3/4	0.75	67	0.178125	78	0.195	1/2	13	0.500	27/64	810	1/4 X 1 1/4	35/64	7	1443	1770	180	1793																								
7/8	0.875	66	0.18125	77	0.197	5/8	11	0.625	11/32	812	1/4 X 1 1/2	41/64	8	1285	1620	165	1644																								
1	1.0	65	0.184375	76	0.199	3/4	10	0.750	21/32	1008	5/16 X 1	7/16	9	1144	1483	148	1495																								
		64	0.1875	75	0.201	7/8	9	0.875	49/64	1010	5/16 X 1 1/4	35/64	10	1019	1350	134	1345																								
		63	0.190625	74	0.203	1-1/8	8	1.000	7/8	1012	5/16 X 1 1/2	41/64	11	8927	1205	120	1195																								
		62	0.19375	73	0.205	<b>FINE</b>			0	80	060	3/64	12	8008	1055	109	1046																								
		61	0.196875	72	0.207	1	72	0.073	53	SHAFT DIAMETER			13	0720	0915	095	0897																								
		60	0.199999	71	0.209	2	64	0.086	50	SQUARE A or A			14	0641	0800	083	0747																								
		59	0.203125	70	0.211	3	56	0.099	45	FLAT W or M			15	0571	0720	072	0673																								
		58	0.20625	69	0.213	4	48	0.112	42	1/2 AND 3/4	1/8 X 1/8	1/8 X 3/32	16	0508	0625	065	0598																								
		57	0.209375	68	0.215	5	40	0.125	37	5/8 TO 1/8	3/8 X 3/8	3/16 X 1/8	17	0453	0540	058	0538																								
		56	0.2125	67	0.217	6	40	0.138	33	15/16 TO 1/4	1/4 X 1/4	1/4 X 3/16	18	0403	0475	049	0478																								
		55	0.215625	66	0.219	8	36	0.164	29	1-1/8 TO 3/8	5/8 X 5/8	5/16 X 1/4	19	0359	0410	042	0418																								
		54	0.21875	65	0.221	10	32	0.19	21	1-1/4 TO 1/2	3/4 X 3/4	3/8 X 1/4	20	0320	0348	035	0359																								
		53	0.221875	64	0.223	12	28	0.216	14	1-1/2 TO 3/4	3/8 X 1/2	3/8 X 1/4	21	0285	0317	032	0328																								
		52	0.225	63	0.225	1/4	28	0.25	3	2-1/4 TO 2-3/4	5/8 X 5/8	5/8 X 1/6	22	0253	0286	028	0288																								
		51	0.228125	62	0.227	5/8	18	0.625	37/64	2-7/8 TO 3-1/4	3/4 X 3/4	3/4 X 1/2	23	0226	0258	025	0289																								
		50	0.23125	61	0.229	3/4	16	0.750	11/16	3-3/8 TO 3-7/8	1/2 X 1/2	1/2 X 3/8	24	0201	0230	022	0219																								
		49	0.234375	60	0.231	7/8	14	0.875	13/16	4-3/8 TO 5-1/4	1/2 X 3/8	1/2 X 1/4	25	0179	0204	020	0209																								
		48	0.2375	59	0.233	1	14	1.000	15/16	5-1/8 TO 6	1 X 1	1 X 3/4	26	0159	0181	018	0179																								
		47	0.240625	58	0.235	1-1/8	12	1.125	1-1/8	B. 1.414A			27	0142	0173	016	0164																								
		46	0.24375	57	0.237	1-1/4	12	1.250	1-1/4	B. 1.155A MATCH HANDBOOK			28	0126	0162	014	0149																								
		45	0.246875	56	0.239	1-1/2	12	1.500	1-1/2	<b>USES OF VARIOUS GAGES <b>J</b></b>			29	0113	0150	013	0135																								
		44	0.25	55	0.241	1/4	36	0.250	21/32	ROD			30	0100	0140	012	0120																								
		43	0.253125	54	0.243	5/16	32	0.3125	9/32	SHEET			31	0089	0132	010	0105																								
		42	0.25625	53	0.245	3/8	32	0.375	11/32	STRIP			32	0080	0128	009	0097																								
		41	0.259375	52	0.247	7/16	28	0.4375	Y	TUBE			33	0071	0119	008	0090																								
		40	0.2625	51	0.249	1/2	28	0.500	15/32	WIRE			34	0063	0104	007	0068																								
		39	0.265625	50	0.251	5/8	24	0.625	37/64	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>AWG</th> <th>W.M.G.</th> <th>B.W.G.</th> <th>U.S.G.</th> </tr> <tr> <td>ALUMINUM BRASS COPPER</td> <td></td> <td></td> <td></td> </tr> <tr> <td>ALUMINUM BRASS COPPER PHOS. BZ</td> <td></td> <td></td> <td>HOT &amp; CRS GALV. &amp; BLACK IRON BLUE ANNEALED STEEL HR IRON</td> </tr> <tr> <td></td> <td></td> <td>HOT &amp; CR STRIP HOT &amp; CR BANDS SPRING STEEL</td> <td></td> </tr> <tr> <td></td> <td></td> <td>AL, BR, COP SEAMLESS &amp; STAINLESS BOILER</td> <td></td> </tr> <tr> <td>ALUMINUM BRASS COPPER RESISTANCE</td> <td>GALVANIZED &amp; ANNEALED STEEL IRON SPRING STEEL</td> <td>FLAT TELEPHONE &amp; TELEGRAPH</td> <td></td> </tr> </table>			AWG	W.M.G.	B.W.G.	U.S.G.	ALUMINUM BRASS COPPER				ALUMINUM BRASS COPPER PHOS. BZ			HOT & CRS GALV. & BLACK IRON BLUE ANNEALED STEEL HR IRON			HOT & CR STRIP HOT & CR BANDS SPRING STEEL				AL, BR, COP SEAMLESS & STAINLESS BOILER		ALUMINUM BRASS COPPER RESISTANCE	GALVANIZED & ANNEALED STEEL IRON SPRING STEEL	FLAT TELEPHONE & TELEGRAPH		35	0056	0095	008	0075
AWG	W.M.G.	B.W.G.	U.S.G.																																						
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ALUMINUM BRASS COPPER RESISTANCE	GALVANIZED & ANNEALED STEEL IRON SPRING STEEL	FLAT TELEPHONE & TELEGRAPH																																							
				36	0050	0090	004	0067																																	
				37	0045	0085		0064																																	
				38	0040	0080		0060																																	
				39	0035	0075		0056																																	
				40	0031	0070		0052																																	

Table 1  
Specifications for Pipe with ASA Designations  
and Titles of Standard Specifications

ASA Designation	ASTM or API Designation	Title
B36.1	ASTM A53	Welded and Seamless Steel Pipe
B36.2	ASTM A72	Welded Wrought-Iron Pipe
B36.3	ASTM A106	Seamless Carbon-Steel Pipe for High-Temperature Service
B36.4	ASTM A134	Electric-Fusion-Welded Steel Pipe, Sizes 30" and Over
B36.5	ASTM A135	Electric-Resistance-Welded Steel Pipe
B36.9	ASTM A139	Electric-Fusion-Welded Steel Pipe, Sizes 4" to but not including 30"
B36.11	ASTM A155	Electric-Fusion-Welded Steel Pipe for High-Temperature and High-Pressure Service
G8.7	ASTM A120	Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses
—	API 5L	Line Pipe
—	API 5LX	High-Test Line Pipe
—	ASTM A158	Seamless Alloy-Steel Pipe for High-Temperature Service
—	ASTM A206	Seamless Carbon-Molybdenum Alloy-Steel Pipe for High-Temperature Service
B36.16	ASTM A211	Spiral-Welded Steel or Iron Pipe
—	ASTM A253	Welded Alloyed Open-Hearth Iron Pipe
—	ASTM A280	Seamless Chromium-Molybdenum Alloy-Steel Pipe for Service at High Temperatures
—	ASTM A312	Seamless Steel and Welded Austenitic Stainless Steel Pipe
—	ASTM A315	Seamless 1 Per Cent Chromium, 0.5 Per Cent Molybdenum Alloy-Steel Pipe for Service at High Temperatures





NOTE:- DIMENSIONS OF REDUCING ELBOWS, TEES & CROSSES & 45° LATERALS - ARE THE SAME AS STRAIGHT SIZE CORRESPONDING TO SIZE OF LARGEST OPENING EXCEPT 18" & LARGER. SEE PAGE 275

NOTE:- BRASS FITTINGS TO 8" ONLY. CHECK FOR LARGER SIZES. DIMENSIONS F-H-J-K & L DO NOT APPLY TO BRASS FITTINGS. CAST STEEL DIMENSIONS ONLY APPLY TO SIZES 2" TO 20" O.D. ALL DIMENSIONS IN INCHES AND REFER TO CRANE CATALOGUE #4

SIZE PIPE	A	B	C	D	E	NO. BOLTS	DIA. BOLTS
1	4 1/4	3/8	3/4	2	3 3/8	4	1/2
1 1/4	4 3/8	5/8	13/16	2 1/2	3 1/2	4	1/2
1 1/2	5	7/8	7/8	2 3/8	3 3/8	4	1/2
2	6	3/4	1	3 3/8	4 1/4	4	5/8
2 1/2	7	7/8	1 1/8	4 1/8	5 1/2	4	5/8
3	7 1/2	1 5/16	1 1/16	5	6	4	5/8
3 1/2	8 1/2	1 5/16	1 1/4	5 1/2	7	8	5/8
4	9	1 5/16	1 3/8	6 1/2	7 1/2	8	5/8
5	10	1 5/16	1 1/2	7 1/8	8 1/2	8	3/4
6	11	1 1/16	1 3/8	8 1/2	9 1/2	8	3/4
8	13 1/2	1 1/8	1 5/8	11 3/4	8	3/4	3 1/2
10	16	1 3/16	1 7/8	14 1/2	12	7/8	3 3/4
12	19	1 1/4	1 1/2	17	12	7/8	3 3/4
14	21	1 3/8	1 5/8	18 1/2	12	1	4 1/4
16	23 1/2	1 7/16	1 7/8	21 1/4	16	1	4 1/2
18	25	1 1/16	2	22 3/4	16	1	4 3/4
20	27 1/2	1 1/8	2 1/8	25	20	1 1/8	5
24	32	1 3/8	2 1/2	29 1/2	20	1 1/4	5 1/2
30	38 3/8	1 7/8	2 3/4	36	28	1 1/4	6 1/4
36	46	2 3/8	3 1/8	42 1/2	32	1 1/2	7
42	53	2 7/8	3 3/8	49 1/2	36	1 1/2	7 1/2
48	59 1/2	2 3/4	3 7/8	56	44	1 1/2	7 3/4
3/4	3/4	3/8	1/32	2 1/4	4	1/2	1 1/2

SIZE	A	B	C C.I.	BR.	D	NO. BOLTS	DIA. BOLTS	LGTH. BOLTS C.I.	BR.	O.D. GASKET C.I. FLA.	E	F	G	H	J	K	L
1	1	4 1/4	3/8	3/8	3 3/8	4	1/2	1 1/4	1 1/2	2 5/8	3 1/2	5	1 3/4	7 1/2	1 3/4	5 3/4	
1 1/4	1 1/4	4 3/8	1/2	13/32	3 1/2	4	1/2	2	1 1/2	3	3 3/4	5 1/2	2	8	1 3/4	6 1/4	
1 1/2	1 1/2	5	9/16	7/16	3 3/8	4	1/2	2	1 1/2	3 3/8	4	6	2 1/4	9	2	7	
2	2	6	5/8	1/2	4 1/4	4	5/8	2 1/4	1 3/4	4 1/8	4 1/2	6 1/2	2 1/2	10 1/2	2 1/2	8	5
2 1/2	2 1/2	7	11/16	9/16	5 1/2	4	5/8	2 1/2	2	4 7/8	5	7	3	12	2 1/2	9 1/2	5 1/2
3	3	7 1/2	3/4	5/8	6	4	5/8	2 1/2	2	5 5/8	5 1/2	7 1/4	3	13	3	10	6
3 1/2	3 1/2	8 1/2	13/16	11/16	7	8	5/8	2 3/4	2 1/4	6 3/8	6	8 1/2	3 1/2	14 1/2	3	11 1/2	6 1/2
4	4	9	15/16	1 1/16	7 1/2	8	5/8	3	2 1/4	6 3/8	6 1/2	9	4	15	3	12	7
5	5	10	1 1/16	3/4	8 1/2	8	3/4	3	2 1/2	7 3/4	7 1/2	10 1/4	4 1/2	17	3 1/2	13 1/2	8
6	6	11	1 1/8	7/8	9 1/2	8	3/4	3 1/4	2 1/2	8 3/4	8	11 1/2	5	18	3 1/2	14 1/2	9
8	8	13 1/2	1 1/8	1 1/8	11 3/4	8	3/4	3 1/2	2 1/2	11	9	14	5 1/2	22	4 1/2	17 1/2	11
10	10	16	1 1/8	1	14 1/2	12	7/8	3 3/4	3 3/4	13 3/8	11	16 1/2	6 1/2	25 1/2	5	20 1/2	12
12	12	19	1 1/4	1 1/8	17	12	7/8	3 3/4	3 3/4	16 1/8	12	19	7 1/2	30	5 1/2	24 1/2	14
14	14	21	1 3/8		18 1/2	12	1	4 1/4		17 3/4	14	21 1/2	7 1/2	33	6	27	16
16	16	23 1/2	1 7/16		21 1/4	16	1	4 1/2		20 1/4	15	24	8	36 1/2	6 1/2	30	18
18	18	25	1 1/16		22 3/4	16	1	4 3/4		21 3/8	16 1/2	26 1/8	8 1/2	39	7	32	19
20	20	27 1/2	1 1/8		25	20	1 1/8	5		23 3/8	18	29	9 1/2	43	8	35	20
24	24	32	1 3/8		29 1/2	20	1 1/4	5 1/2		28 1/4	22	34	11	49 1/2	9	40 1/2	24
30	30	38 3/8	1 7/8		36	28	1 1/4	6 1/4		34 1/4	25	41 1/2	15	59	10	49	30
36	36	46	2 3/8		42 1/2	32	1 1/2	7		41 1/4	28	49	18				36
42	42	53	2 7/8		49 1/2	36	1 1/2	7 1/2		48	31	56 1/2	21				
48	48	59 1/2	2 3/4		56	44	1 1/2	7 3/4		54 1/2	34	64	24				
3/4	3/4	3/8	1/32	2 1/4	4	1/2		1 1/2		3/4		1 3/4					

SIZE PIPE	A	B	C	D	NO. BOLTS	DIA. BOLTS
1	4 1/4	3/8	3/8	3 3/8	4	1/2
1 1/4	4 3/8	5/8	13/16	3 1/2	4	1/2
1 1/2	5	7/8	7/8	3 3/8	4	1/2
2	6	3/4	1	4 1/4	4	5/8
2 1/2	7	7/8	1 1/8	5 1/2	4	5/8
3	7 1/2	3/4	1 1/16	6	4	5/8
3 1/2	8 1/2	3/4	1 1/4	7	8	5/8
4	9	3/4	1 1/8	7 1/2	8	5/8
5	10	3/4	1 1/4	8 1/2	8	3/4
6	11	3/4	1 1/2	9 1/2	8	3/4
8	13 1/2	1 1/8	1 1/2	11 3/4	8	3/4
10	16	1 1/4	1 1/2	14 1/2	12	7/8
12	19	1 1/2	1 3/4	17 1/2	12	7/8
14	21	1 3/8	1 3/4	18 1/2	12	1
16	23 1/2	1 7/16	1 3/4	21 1/4	16	1
18	25	1 1/16	1 3/4	22 3/4	16	1
20	27 1/2	1 1/8	1 3/4	25	20	1 1/8
24	32	1 3/8	1 3/4	29 1/2	20	1 1/4
30	38 3/8	1 7/8	1 3/4	36	28	1 1/4
36	46	2 3/8	1 3/4	42 1/2	32	1 1/2

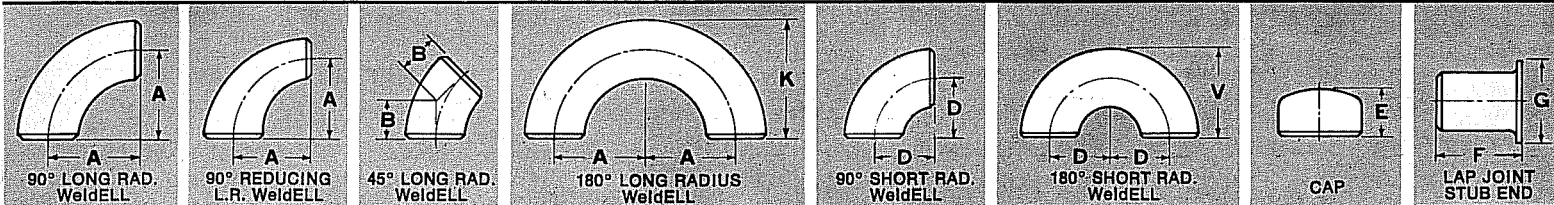


# Energy Products Group Seamless Welding Fittings

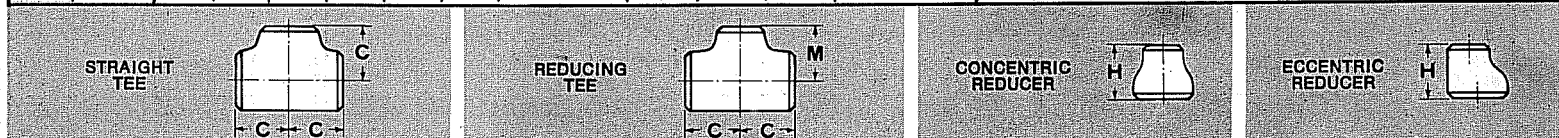
Gulf + Western Manufacturing Company • P. O. Box 485, Chicago, Ill., 60690



**B' FOR ODD ANGLE ELBOWS = RADIUS x (tan 1/2 ANGLE)**



Nom. Pipe Size	Pipe O.D.	WALL THICKNESS													A	B	K	D	V	E	F		G	Nom. Pipe Size
		Light Wall	Sch 20	Sch 30	Std	Sch 40	Sch 60	X-Stg	Sch 80	Sch 100	Sch 120	Sch 140	Sch 160	XX-Stg							ASA	MSS		
1/2	.840	.083	...	...	.109	.109	...	.147	.147	...	...	...	.188	.294	1 1/2	5/8	1 1/8	...	...	1	3	2	1 1/8	3/4
3/4	1.050	.083	...	...	.113	.113	...	.154	.154	...	...	...	.219	.308	1 1/2	7/8	1 1/4	...	...	1 1/2	3	2	1 1/4	3/4
1	1.315	.109	...	...	.133	.133	...	.179	.179	...	...	...	.250	.358	1 1/2	7/8	1 1/2	1	1 1/8	1 1/2	4	2	2	1
1 1/4	1.660	.109	...	...	.140	.140	...	.191	.191	...	...	...	.250	.382	1 1/2	1	1 3/4	1 1/4	1 1/8	1 1/2	4	2	2 1/2	1 1/4
1 1/2	1.900	.109	...	...	.145	.145	...	.200	.200	...	...	...	.281	.400	2	1 1/8	1 3/4	1 1/2	1 1/4	1 1/2	4	2	2 1/2	1 1/2
2	2.375	.109	...	...	.154	.154	...	.218	.218	...	...	...	.344	.436	3	1 1/8	1 3/4	2	1 1/2	1 1/2	6	2 1/2	3 1/2	2
2 1/2	2.875	.120	...	...	.203	.203	...	.276	.276	...	...	...	.375	.552	3 1/2	1 1/4	1 3/4	2 1/2	1 1/2	1 1/2	6	2 1/2	4 1/2	2 1/2
3	3.500	.120	...	...	.216	.216	...	.300	.300	...	...	...	.438	.600	4 1/2	2	1 3/4	3	1 1/2	1 1/2	6	2 1/2	5	3
3 1/2	4.000	.120	...	...	.226	.226	...	.318	.318	...	...	...	...	.636	5 1/4	2 1/4	1 3/4	3 1/2	1 1/2	1 1/2	6	3	5 1/2	3 1/2
4	4.500	.120	...	...	.237	.237	...	.337	.337	...	.438	...	.531	.674	6	2 1/2	1 3/4	4	1 1/2	1 1/2	6	3	6 1/2	4
5	5.563	.134	...	...	.258	.258	...	.375	.375	...	.500	...	.625	.750	7 1/2	3 1/8	1 3/4	5	1 1/2	1 1/2	8	3	7 1/2	5
6	6.625	.134	...	...	.280	.280	...	.432	.432	...	.562	...	.719	.864	9	3 1/4	1 3/4	6	1 1/2	1 1/2	8	3 1/2	8 1/2	6
8	8.625	.148	.250	.277	.322	.322	.406	.500	.500	.594	.719	.812	.906	.875	12	5	1 3/4	8	1 1/2	1 1/2	8	4	10 1/2	8
10	10.750	.165	.250	.307	.365	.365	.500	.500	.594	.719	.844	1.000	1.125	1.000	15	6 1/4	2 1/4	10	1 1/2	1 1/2	10	5	12 1/2	10
12	12.750	.180	.250	.330	.375	.406	.562	.500	.688	.844	1.000	1.125	1.312	1.000	18	7 1/2	2 1/4	12	1 1/2	1 1/2	10	6	15	12
14	14.000	.250	.312	.375	.375	.438	.594	.500	.750	.938	1.094	1.250	1.406	...	21	8 1/2	2 1/4	14	1 1/2	1 1/2	12	...	16 1/2	14
16	16.000	.250	.312	.375	.375	.500	.656	.500	.844	1.031	1.219	1.438	1.594	...	24	10	3 1/4	16	1 1/2	1 1/2	12	...	18 1/2	16
18	18.000	.250	.312	.438	.375	.562	.750	.500	.938	1.156	1.375	1.562	1.781	...	27	11 1/4	3 1/4	18	1 1/2	1 1/2	12	...	21	18
20	20.000	.250	.375	.500	.375	.594	.812	.500	1.031	1.281	1.500	1.750	1.969	...	30	12 1/2	4 1/4	20	1 1/2	1 1/2	12	...	23	20
24	24.000	.250	.375	.562	.375	.688	.969	.500	1.219	1.531	1.812	2.062	2.344	...	36	15	4 1/4	24	1 1/2	1 1/2	12	...	27 1/2	24
30	30.000	.312	.500	.625	.375	...	...	.500	...	...	...	...	...	...	45	18 1/2	6 1/4	30	1 1/2	1 1/2	...	...	...	30
36	36.000	.312	.500	.625	.375	.750	...	.500	...	...	...	...	...	...	54	22 1/4	...	36	1 1/2	1 1/2	...	...	...	36
42	42.000	...	...	.375	.375	...	...	.500	...	...	...	...	...	...	63	26	...	42	1 1/2	1 1/2	...	...	...	42



Nom. Pipe Size	Outlet	C			Nom. Pipe Size	Outlet	C			Nom. Pipe Size	Outlet	C			Nom. Pipe Size	Outlet	C		
		M	H	M			H	M	H			M	H						
3/4	3/4	1 1/8	...	1 1/2	3 1/2	3 1/2	3 3/4	...	...	10	10	8 1/2	...	...	20	20	15	...	...
1	1	1 1/2	...	2		3	3 3/4	3 3/4	4		4	8	8	8 1/2		8	7	18	15
1 1/4	1 1/4	1 3/4	...	2	4	4	4 1/8	...	...	12	12	10	...	...	24	24	17	...	...
1 1/2	1 1/2	2 1/4	...	2 1/2		3 1/2	4 1/8	4 1/8	4		4	10	10	10		9 1/2	8	20	17
2	2	2 1/2	...	3	5	5	4 7/8	...	...	14	14	11	...	...	30	30	22	...	...
2 1/2	2 1/2	3	...	3 1/2		4	4 7/8	4 7/8	5		5	12	12	11		10 3/4	13	24	22
3	3	3 3/8	...	3 1/2	6	6	5 1/8	...	...	16	16	12	...	...	36	36	26 1/2	...	...
3 1/2	3 1/2	3 3/4	...	3 3/4		5	5 1/8	5 1/8	5 1/2		5 1/2	14	14	12		11 1/4	14	30	26 1/2
4	4	4 1/4	...	4	8	8	5 1/4	...	...	18	18	13 1/2	...	...	42	42	30	...	...
4 1/2	4 1/2	4 1/2	...	4 1/2		6	6 1/4	6 1/4	6		6	16	16	13 1/2		13	15	36	30

**NOTES:** ① Light Wall thicknesses are identical to stainless steel Schedule 10S in sizes thru 12", and to Schedule 10 in sizes 14" and larger. ② Standard Wall thicknesses are identical to stainless steel Schedule 40S in sizes thru 12". ③ Extra Strong Wall thicknesses are identical to stainless steel Schedule 80S in sizes thru 12". ④ May be of welded pipe, x-rayed and stress-relieved. ⑤ Other types, sizes and thicknesses of fittings on application. ⑥ Stocked in carbon steel and a variety of other metals and alloys.



# COUPLINGS

STANDARD MERCHANT COUPLINGS

HALF COUPLINGS - STANDARD MERCHANT, EXTRA HEAVY

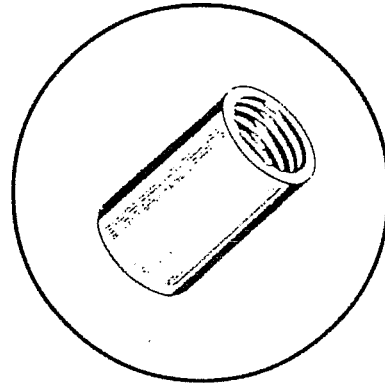
EXTRA HEAVY (AAR) COUPLINGS - NON-RECESSED

API LINE PIPE COUPLINGS

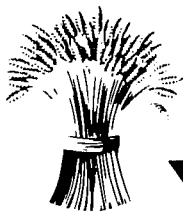
NET PRICE SHEET

EFFECTIVE MAY 6, 2002

BLACK & GALVANIZED



PRICE SHEET # C - 502



**SEMINOLE** Tubular Products Co.

ISO 9002 CERTIFIED LOCATIONS:  
Cambridge and Houston

9208 Jeffrey Drive  
Cambridge, Ohio 43725  
1-740-432-2146  
1-800-523-2708  
Fax No. 1-740-439-4160

6247 Navigation Boulevard  
Houston, Texas 77011  
1-713-928-6437  
1-800-231-6345  
Fax No. 1-713-928-8939

# STANDARD MERCHANT COUPLINGS

Trade Size (In.)	Wt./Lbs. 100 Pcs.	Std. Ctn.	Outside Diameter (Inches)	Length (Inches)	Net Price Per 100 pcs.			
					Straight Tapped Black	Galv.	Taper Tapped Black	Taper Tapped Black
1/8"	3	100	.563	13/16"	\$36.29	\$44.32	\$125.35	\$135.19
1/4"	7	100	.719	1-13/16"	50.01	57.59	128.15	138.50
3/8"	9	100	.875	1-3/16"	60.14	73.71	139.50	152.98
1/2"	17	100	1.063	1-9/16"	63.91	78.35	255.64	305.40
3/4"	26	50	1.313	1-5/8"	81.63	98.22	272.82	326.68
1"	40	30	1.576	2"	114.15	137.30	352.31	420.64
1-1/4"	48	25	1.900	2-1/16"	145.72	175.79	507.15	586.63
1-1/2"	67	25	2.220	2-1/16"	184.56	217.92	507.15	586.63
2"	105	20	2.750	2-1/8"	264.31	326.26	782.58	995.03
2-1/2"	209	Bulk	3.250	3-1/8"			752.77	924.63
3"	335	Bulk	4.000	3-1/4"			1056.50	1227.10
3-1/2"	482	Bulk	4.625	3-3/8"			1872.90	2162.78
4"	461	Bulk	5.000	3-1/2"			1872.90	2162.78
5"	852	Bulk	6.296	3-3/4"			3430.17	4022.78
6"	1127	Bulk	7.390	4"			4106.54	4950.39

**NOTE:**

1. AISI Specifies Straight Tapped in sizes up to and including 2"; Taper Tapped in sizes 2-1/2" and larger.
2. Taper Tapped 2-1/2" and larger - Black - OD Painted Black, Threads Electro Zinc Plated. Galvanized- Electro Zinc Plated.

# STANDARD MERCHANT HALF COUPLINGS BLACK

Trade Size (In.)	Wt./Lbs. 100 Pcs.	Std. Ctn.	Outside Diameter (Inches)	Length (Inches)	Net Price Per 100 pcs. Straight Tapped
1/8"	2	200	.563	11/32"	\$34.46
1/4"	4	200	.719	17/32"	47.50
3/8"	5	200	.875	17/32"	57.13
1/2"	8	200	1.063	23/32"	57.36
3/4"	12	200	1.313	3/4"	65.34
1"	18	100	1.576	15/16"	91.28
1-1/4"	23	50	1.900	31/32"	116.57
1-1/2"	32	50	2.220	31/32"	147.66
2"	47	50	2.750	1"	211.43
					Taper Tapped
2-1/2"	96	Bulk	3.250	1-1/2"	504.34
3"	160	Bulk	4.000	1-9/16"	707.98
3-1/2"	222	Bulk	4.625	1-5/8"	1255.13
4"	211	Bulk	5.000	1-11/16"	1255.13
5"	380	Bulk	6.296	1-3/4"	2298.05
6"	528	Bulk	7.390	1-7/8"	2750.56

**NOTE:**

1. Unless specified otherwise, half couplings will be supplied. Tapped the same as full couplings.
2. All Black Half Couplings furnished with phosphate coating - ideal for welding.
3. Galvanized prices on request.

## EXTRA HEAVY HALF COUPLINGS (NON-RECESSED)

Trade Size (In.)	Wt./Lbs. 100 Pcs.	Std. Ctn.	Outside Diameter (Inches)	Length (Inches)	Net Price Per 100 pcs. Taper Tapped
1/8"	2	200	.563	15/32"	\$99.56
1/4"	4	200	.719	3/4"	130.45
3/8"	6	200	.875	3/4"	142.00
1/2"	11	200	1.063	1"	192.24
3/4"	17	100	1.313	1"	205.13
1"	26	50	1.576	1-1/4"	261.15
1-1/4"	51	50	1.900	1-5/16"	419.47
1-1/2"	45	50	2.220	1-5/16"	419.47
2"	92	30	2.750	1-3/8"	638.46
2-1/2"	172	-	3.250	2"	948.43
3"	212	-	4.000	2-1/16"	1126.36
3-1/2"	297	-	4.625	2-1/8"	1513.68
4"	384	-	5.000	2-3/16"	1780.51
5"	485	-	6.296	2-3/16"	2541.23
6"	685	-	7.390	2-5/16"	3115.94

**NOTE:**

1. Unless specified otherwise, Extra Heavy Half couplings will be furnished with Standard chamfer.
2. All Black Half Couplings furnished with phosphate coating.
3. Galvanized pricing on request.

## EXTRA HEAVY (AAR) COUPLINGS (NON-RECESSED)

Trade Size (In.)	Wt./Lbs. 100 Pcs.	Std. Ctn.	Outside Diameter (Inches)	Length (Inches)	Net Price Per 100 pcs. Taper Tapped	
1/8"	4	100	.563	1-1/16"	\$142.24	
1/4"	9	100	.719	1-5/8"	186.34	
3/8"	14	100	.875	1-5/8"	202.86	
1/2"	25	100	1.063	2-1/8"	274.60	
3/4"	36	50	1.313	2-1/8"	293.05	
1"	56	25	1.576	2-5/8"	373.06	
1-1/4"	108	25	1.900	2-3/4"	599.25	
1-1/2"	95	20	2.220	2-3/4"	599.25	
2"	201	15	2.750	2-7/8"	911.83	
2-1/2"	353	Bulk	3.250	4-1/8"	1354.90	
3"	461	Bulk	4.000	4-1/4"	1609.08	
3-1/2"	625	Bulk	4.625	4-3/8"	2162.41	
4"	788	Bulk	5.000	4-1/2"	2543.57	
5"	1050	Bulk	6.296	4-5/8"	3630.34	
6"	1451	Bulk	7.390	4-7/8"	4451.32	

**NOTE:**

- Sizes 1/8" thru 1 1/2" treated with phosphate coating to inhibit rust.
- Galvanized prices upon request.

## API LINE PIPE COUPLINGS (RECESSED)

Trade Size (In.)	Wt./Lbs. 100 Pcs.	Std. Ctn.	Outside Diameter (Inches)	Length (Inches)	Net Price Per 100 pcs. Taper Tapped	
					Black	Black
1/8"	4	100	.563	1-1/16"	\$142.24	\$153.61
1/4"	9	100	.719	1-5/8"	186.34	201.38
3/8"	13	100	.875	1-5/8"	202.86	222.43
1/2"	24	100	1.063	2-1/8"	274.60	327.43
3/4"	34	50	1.313	2-1/8"	293.05	350.83
1"	55	25	1.576	2-5/8"	373.06	451.85
1-1/4"	103	25	1.900	2-3/4"	599.25	693.19
1-1/2"	90	20	2.220	2-3/4"	599.25	693.19
2"	186	15	2.750	2-7/8"	911.83	1153.77
2-1/2"	327	Bulk	3.250	4-1/8"	1354.90	1518.60
3"	409	Bulk	4.000	4-1/4"	1609.08	1813.39
3-1/2"	592	Bulk	4.625	4-3/8"	2162.41	2584.29
4"	759	Bulk	5.000	4-1/2"	2543.57	2969.91
5"	998	Bulk	6.296	4-5/8"	3630.34	4336.68
6"	129	Bulk	7.390	4-7/8"	4451.32	5319.76

**NOTE:**

- Taper Tapped 3/4" per foot. Sizes 1/8" thru 1 1/2" treated with phosphate coating to inhibit rust.
- Couplings 2" and larger - Black OD Painted Black. Threads Electro Zinc Plated.



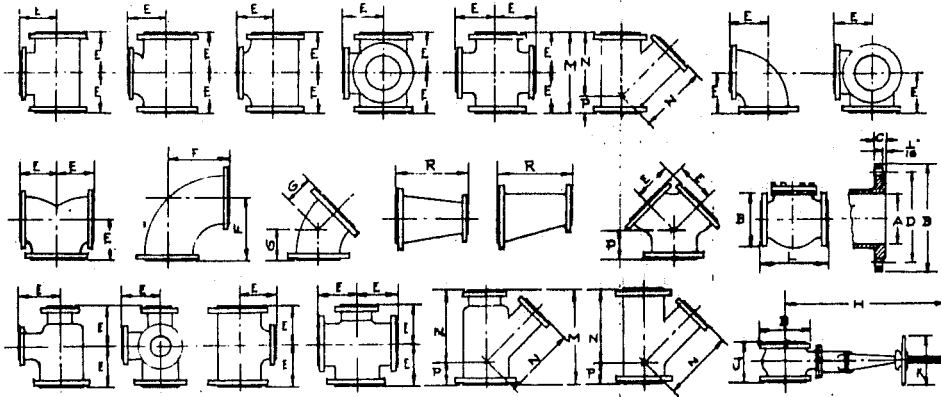
# ENGINEERING DATA - DIMENSIONS

## DIMENSIONS 250# CAST IRON FLANGED FITTINGS

### Working Pressures

- 1" to 24" - 250 Pounds Steam
- 1" to 12" - 400 Pounds Cold Water
- 14" to 24" - 350 Pounds Cold Water

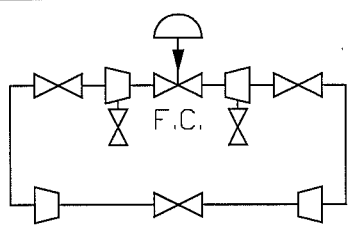
### Dimensions in Inches



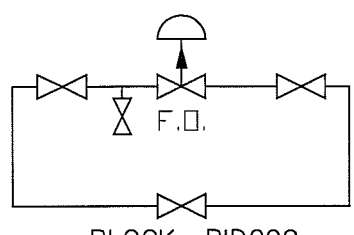
Size	A	B	C	D	No. of Bolts	Diag. of Bolts	E	EB	F	G	H	J	K	L	M	N	P	R
1"	1"	4 7/8"	11/16"	3 1/2"	4	5/8"	4"	8"	5"	2"					8 1/2"	6 1/2"	2"	
1 1/4"	1 1/4"	5 1/4"	3/4"	3 7/8"	4	5/8"	4 1/4"	8 1/2"	5 1/2"	2 1/2"	11 1/2"	6 1/2"	7"		9 1/2"	7 1/4"	2 1/4"	
1 1/2"	1 1/2"	6 1/8"	13/16"	4 1/2"	4	3/4"	4 1/2"	9"	6"	2 3/4"	13 1/4"	7 1/2"	8"		11"	8 1/2"	2 1/2"	
2"	2"	6 1/2"	7/8"	5"	8	5/8"	5"	10"	6 1/2"	3"	14 1/2"	8 1/2"	8"	10 1/2"	11 1/2"	9"	2 1/2"	5"
2 1/2"	2 1/2"	7 1/2"	1"	5 7/8"	8	3/4"	5 1/2"	11"	7"	3 1/2"	17 1/2"	9 1/2"	9"	11 1/2"	13"	10 1/2"	2 1/2"	5 1/2"
3"	3"	8 1/4"	1 1/8"	6 5/8"	8	3/4"	6"	12"	7 3/4"	3 1/2"	20 1/2"	11 1/8"	10"	12 1/2"	14"	11"	3"	6"
3 1/2"	3 1/2"	9"	1 3/16"	7 1/4"	8	3/4"	6 1/2"	13"	8 1/2"	4"	22"	11 7/8"	10"	13 1/4"	15 1/8"	12 1/2"	3"	6 1/2"
4"	4"	10"	1 1/4"	7 7/8"	8	3/4"	7"	14"	9"	4 1/2"	24 3/4"	12"	12"	14"	16 1/8"	13 1/2"	3"	7"
5"	5"	11"	1 3/8"	9 1/4"	8	3/4"	8"	16"	10 1/4"	5"	29 3/4"	15"	14"	15 3/4"	18 1/2"	15"	3 1/2"	8"
6"	6"	12 1/2"	1 7/16"	10 5/8"	12	3/4"	8 1/2"	17"	11 1/2"	5 1/2"	34 1/2"	15 7/8"	16"	17 1/2"	21 1/2"	17 1/2"	4"	9"
8"	8"	15"	1 5/8"	13"	16	7/8"	10"	20"	14"	6"	42 3/4"	16 1/2"	20"	21"	25 1/2"	20 1/2"	5"	11"
10"	10"	17 1/2"	1 7/8"	15 1/4"	16	1"	11 1/2"	23"	16 1/2"	7"	52 3/4"	18"	22"	24 1/2"	29 1/2"	24"	5 1/2"	12"
12"	12"	20 1/8"	2"	17 3/4"	16	1 1/8"	13"	26"	19"	8"	60"	19 3/4"	24"	26"	33 1/2"	27 1/2"	6"	14"
14"	13 1/4"	23"	2 1/8"	20 1/4"	20	1 1/8"	15"	30"	21 1/2"	8 1/2"	69 1/4"	22 1/2"	24"	33"	37 1/2"	31"	6 1/2"	16"
16"	15 1/4"	25 1/2"	2 1/4"	22 1/2"	20	1 1/4"	16 1/2"	33"	24"	9 1/2"	76"	24"	27"	X	42"	34 1/2"	7 1/2"	18"
18"	17"	28"	2 3/8"	24 3/4"	24	1 1/4"	18"	36"	26 1/2"	10"	83 3/4"	25"	30"	X	45 1/2"	37 1/2"	8"	19"
20"	19"	30 1/2"	2 1/2"	27"	24	1 1/2"	19 1/2"	39"	29"	10 1/2"	93"	27"	30"	X	49"	40 1/2"	8 1/2"	20"
22"	21"	33"	2 5/8"	29 1/4"	24	1 1/2"	20 1/2"	41"	31 1/2"	11"	101"	29 1/2"	36"	X	53"	43 1/2"	9 1/2"	22"
24"	23"	36"	2 3/4"	32"	24	1 1/2"	22 1/2"	45"	34"	12"	112 1/4"	31"	36"	X	57 1/2"	47 1/2"	10"	24"
26"	25"	38 1/4"	2 13/16"	34 1/2"	28	1 5/8"	24"	48"	36 1/2"	13"	X	X	X	X	X	X	X	26"
28"	27"	40 3/4"	2 15/16"	37"	28	1 5/8"	26"	52"	39"	14"	X	X	X	X	X	X	X	28"
30"	29"	43"	3"	39 1/4"	28	1 3/4"	27 1/2"	55"	41 1/2"	15"	X	X	X	X	X	X	X	30"
32"	30"	45 1/4"	3 1/8"	41 1/2"	28	1 7/8"	29"	58"	44"	16"	X	X	X	X	X	X	X	32"
34"	34"	47 1/2"	3 1/4"	43 1/2"	28	1 7/8"	30 1/2"	61"	46 1/2"	17"	X	X	X	X	X	X	X	34"
36"	36"	50"	3 3/8"	46"	32	1 7/8"	32 1/2"	65"	49"	18"	X	X	X	X	X	X	X	36"
38"	38"	52 1/4"	3 7/16"	48"	32	2"	34"	68"	51 1/2"	19"	X	X	X	X	X	X	X	38"
40"	40"	54 1/2"	3 9/16"	50 1/4"	36	2"	35 1/2"	71"	54"	20"	X	X	X	X	X	X	X	40"
42"	42"	57"	3 11/16"	52 3/4"	36	2"	37"	74"	56 1/2"	21"	X	X	X	X	X	X	X	42"
44"	44"	59 1/4"	3 3/4"	55"	36	2"	39"	78"	59"	22"	X	X	X	X	X	X	X	44"
46"	46"	61 1/2"	3 7/8"	57 1/4"	40	2"	40 1/2"	81"	61 1/2"	23"	X	X	X	X	X	X	X	46"
48"	48"	65"	4"	60 3/4"	40	2"	42"	84"	64"	24"	X	X	X	X	X	X	X	48"

The reducing fittings from 1" to 16" inclusive, have the same dimensions, center to face, as the straight size fittings, and this also applies to 18" and larger, when the reduced outlet is not more than two sizes smaller than the straight size. Three sizes or more are special. Dimensions marked (X) are special.

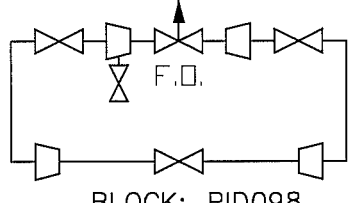




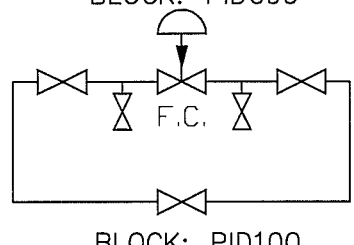
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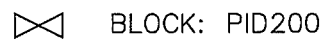


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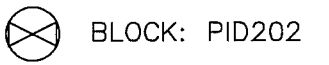
- BC-200 BLOCK: PID175
- SC-100 BLOCK: PID176
- BLOCK: PID183
- BLOCK: PID184
- ~ BLOCK: PID185
- ~ BLOCK: PID186
- × BLOCK: PID187
- ┌ BLOCK: PID188
- └ BLOCK: PID189



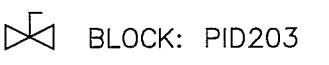
BLOCK: PID200



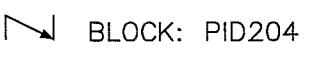
BLOCK: PID201



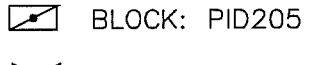
BLOCK: PID202



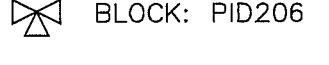
BLOCK: PID203



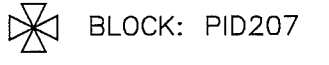
BLOCK: PID204



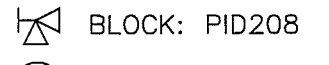
BLOCK: PID205



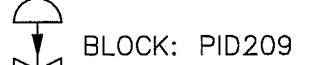
BLOCK: PID206



BLOCK: PID207



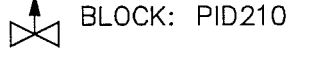
BLOCK: PID208



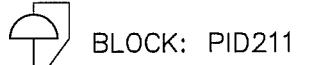
BLOCK: PID209



BLOCK: PID210



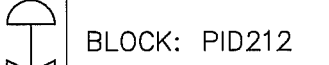
BLOCK: PID211



BLOCK: PID212



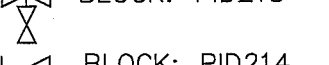
BLOCK: PID213



BLOCK: PID214



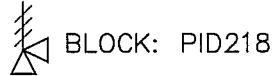
BLOCK: PID215



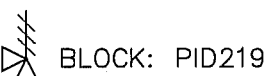
BLOCK: PID216



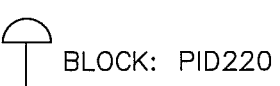
BLOCK: PID217



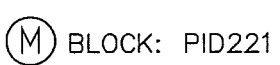
BLOCK: PID218



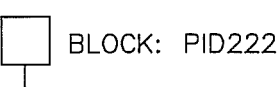
BLOCK: PID219



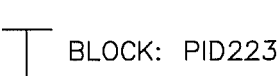
BLOCK: PID220



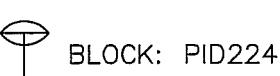
BLOCK: PID221



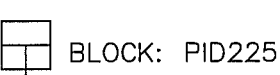
BLOCK: PID222



BLOCK: PID223



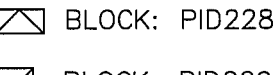
BLOCK: PID224



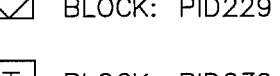
BLOCK: PID225



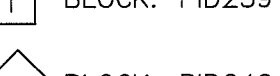
BLOCK: PID227



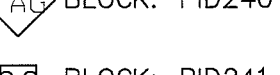
BLOCK: PID228



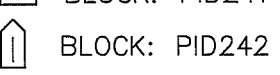
BLOCK: PID229



BLOCK: PID239



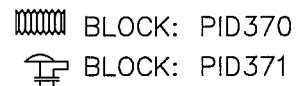
BLOCK: PID240



BLOCK: PID241



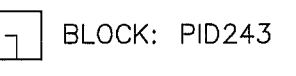
BLOCK: PID242



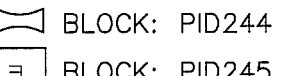
BLOCK: PID370



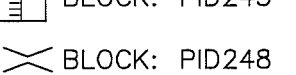
BLOCK: PID371



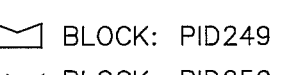
BLOCK: PID243



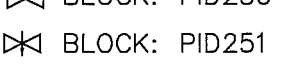
BLOCK: PID244



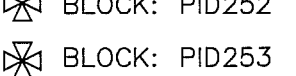
BLOCK: PID245



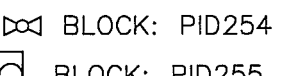
BLOCK: PID248



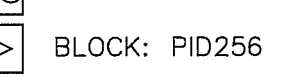
BLOCK: PID249



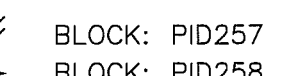
BLOCK: PID250



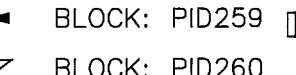
BLOCK: PID251



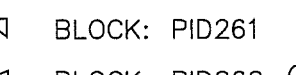
BLOCK: PID252



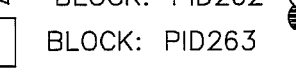
BLOCK: PID253



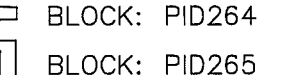
BLOCK: PID254



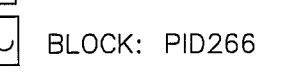
BLOCK: PID255



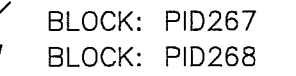
BLOCK: PID256



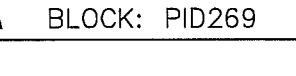
BLOCK: PID257



BLOCK: PID258



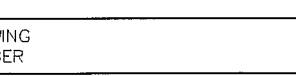
BLOCK: PID259



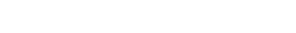
BLOCK: PID260



BLOCK: PID261



BLOCK: PID262



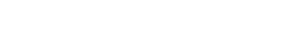
BLOCK: PID263



BLOCK: PID264



BLOCK: PID265



BLOCK: PID266



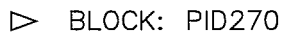
BLOCK: PID267



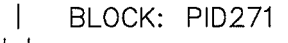
BLOCK: PID268



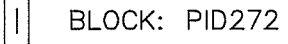
BLOCK: PID269



BLOCK: PID270



BLOCK: PID271



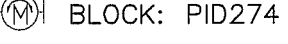
BLOCK: PID272



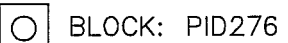
BLOCK: PID273



BLOCK: PID274



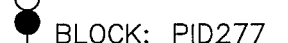
BLOCK: PID276



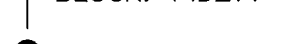
BLOCK: PID277



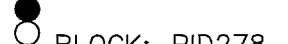
BLOCK: PID278



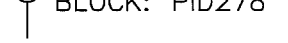
BLOCK: PID279



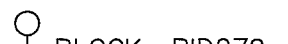
BLOCK: PID280



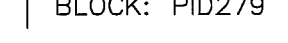
BLOCK: PID281



BLOCK: PID282



BLOCK: PID283



BLOCK: PID284



BLOCK: PID285



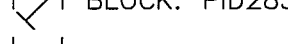
BLOCK: PID286



BLOCK: PID287



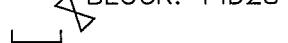
BLOCK: PID288



BLOCK: PID289



BLOCK: PID290



BLOCK: PID291



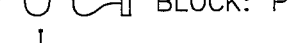
BLOCK: PID292



BLOCK: PID293

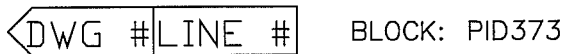
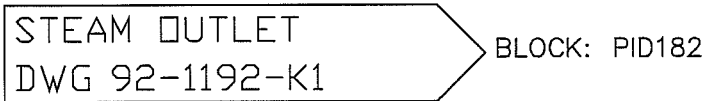
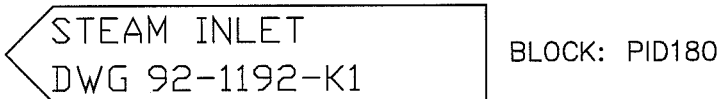
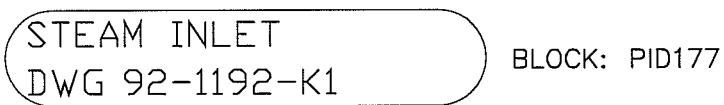
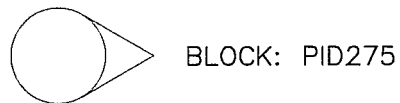
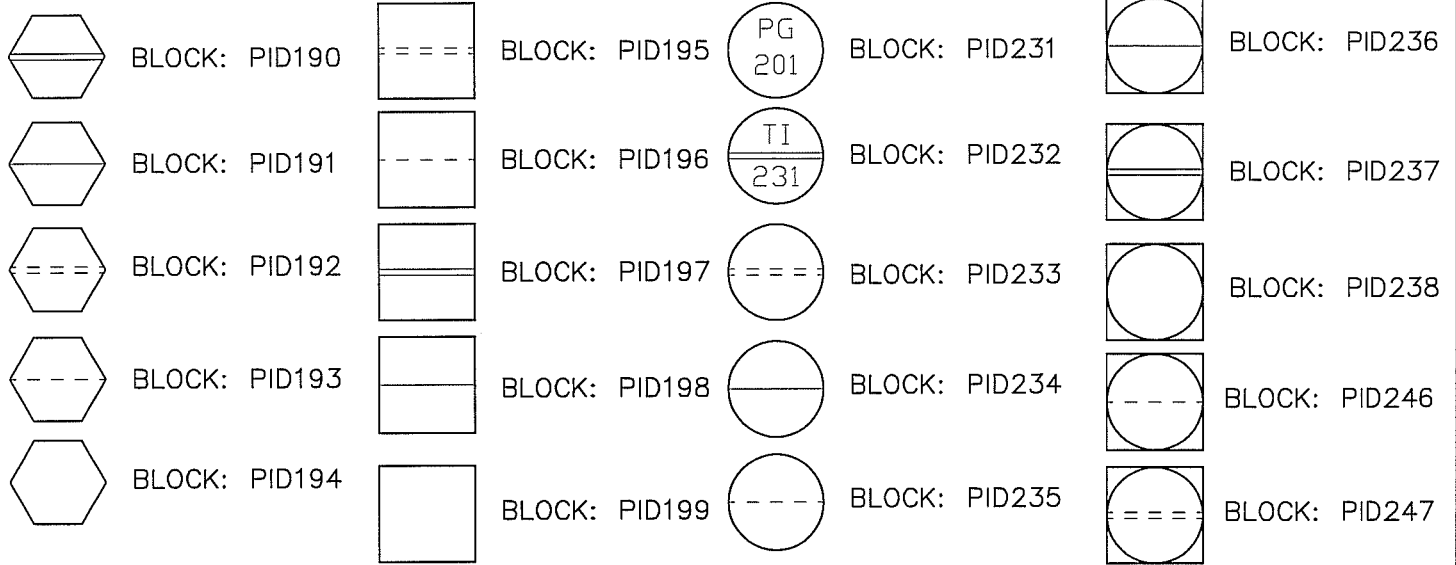


BLOCK: PID298

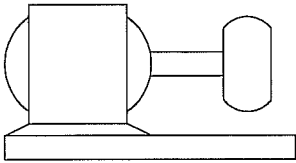


BLOCK: PID299

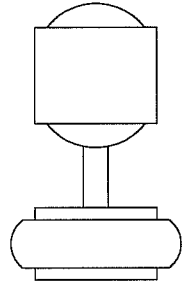
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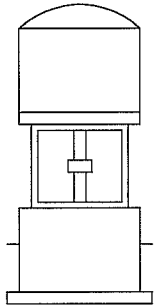
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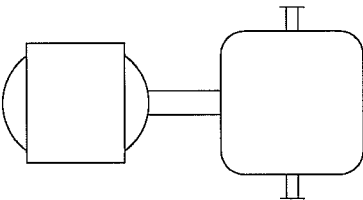
BLOCK: PID300



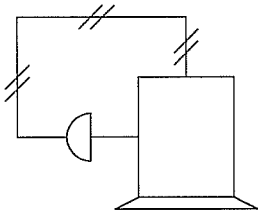
BLOCK: PID302



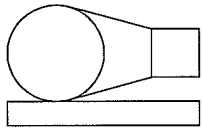
BLOCK: PID303



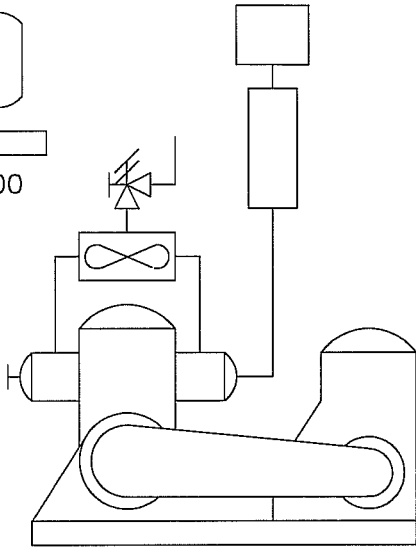
BLOCK: PID304



BLOCK: PID305



BLOCK: PID307



BLOCK: PID310



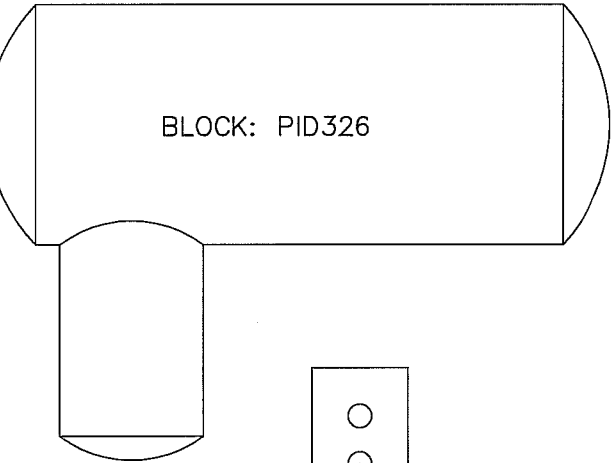
BLOCK: PID312



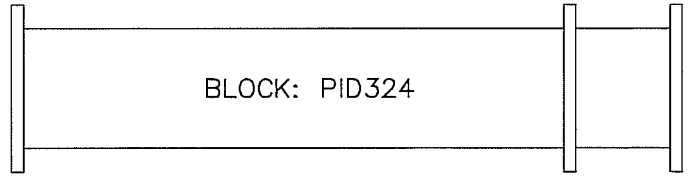
BLOCK: PID313



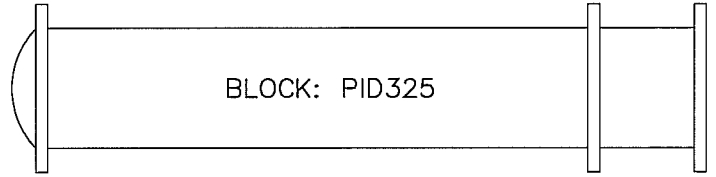
BLOCK: PID314



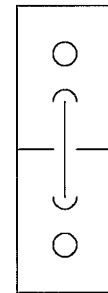
BLOCK: PID326



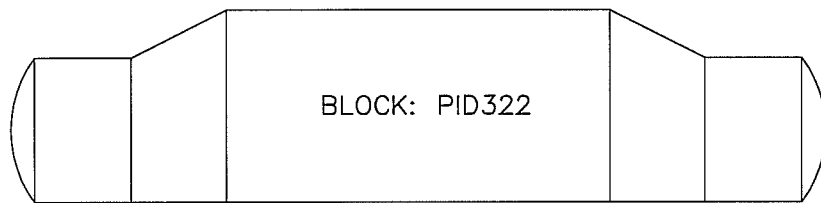
BLOCK: PID324



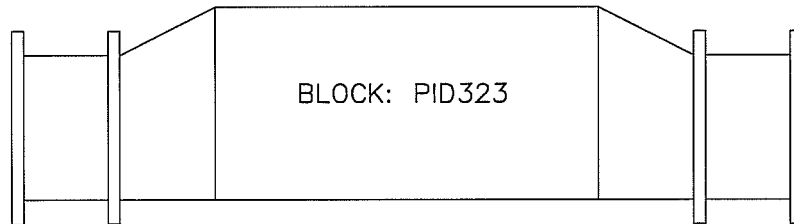
BLOCK: PID325



BLOCK: PID327



BLOCK: PID322



BLOCK: PID323

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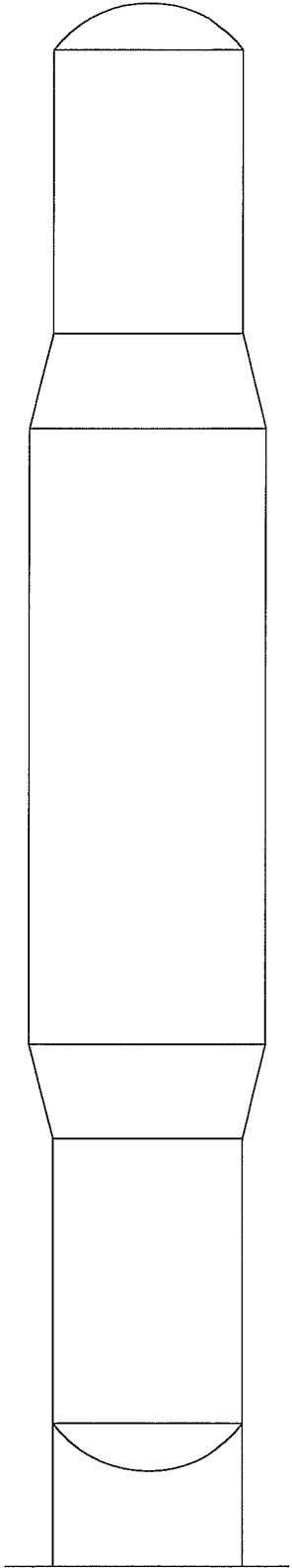
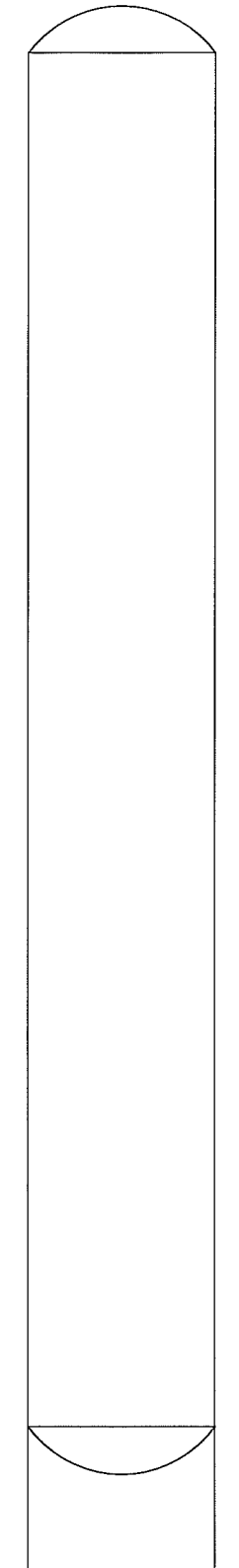
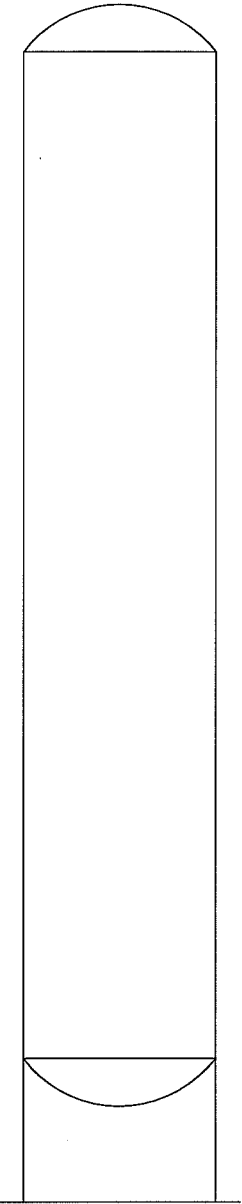
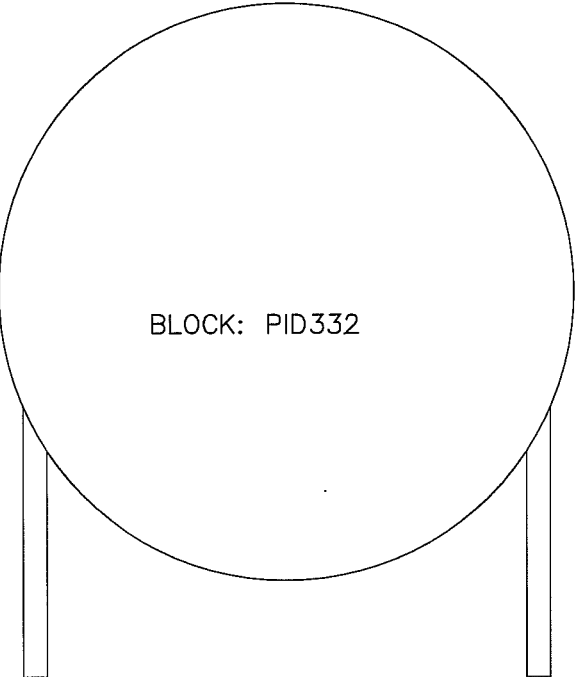
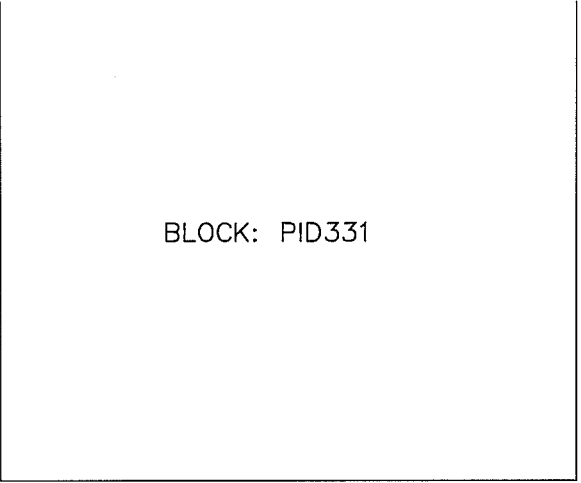
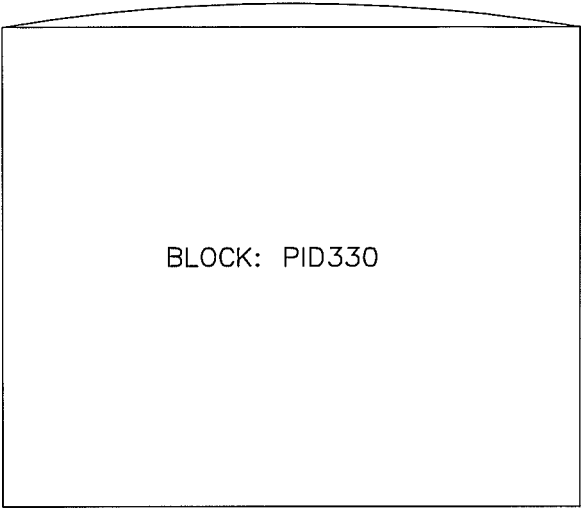
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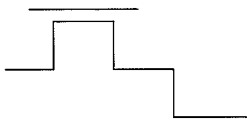

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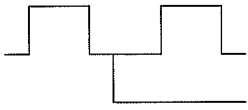
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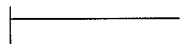
BLOCK: PID353



BLOCK: PID354



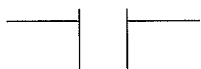
BLOCK: PID355



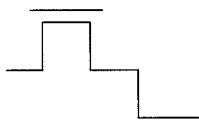
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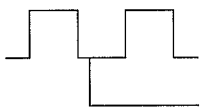
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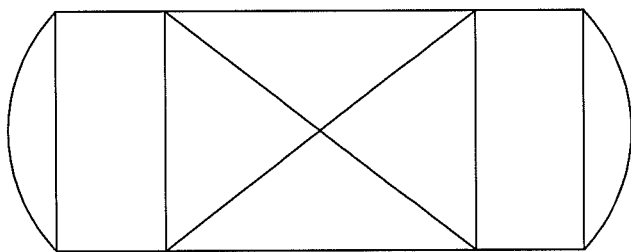
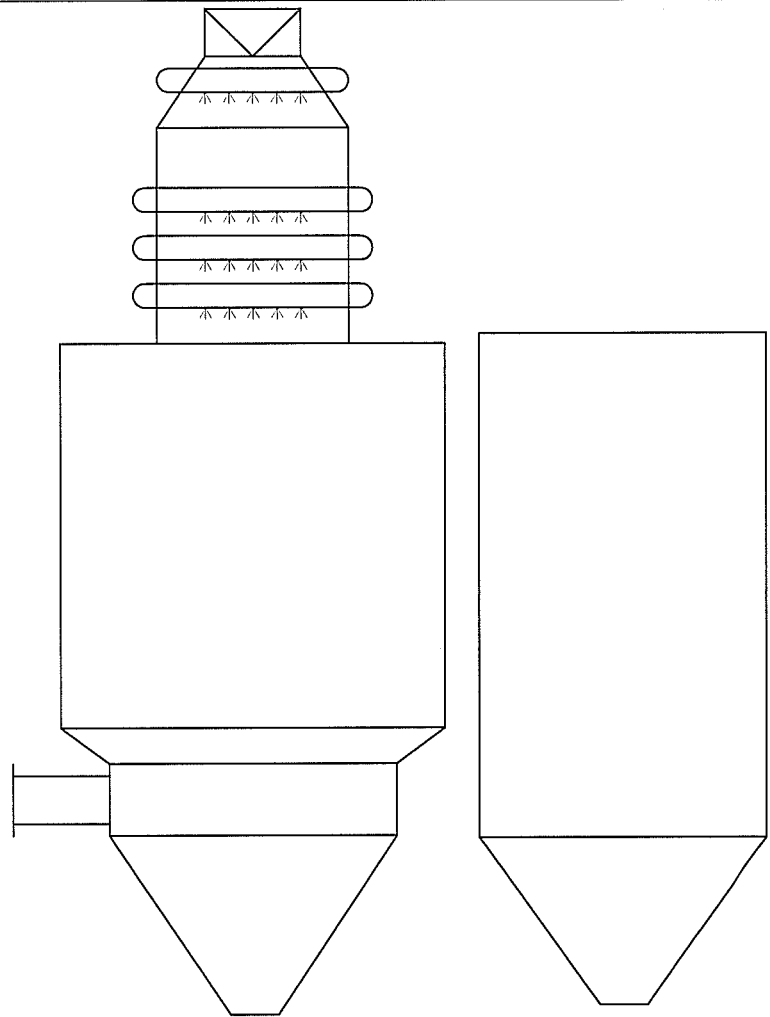
BLOCK: PID359



BLOCK: PID360

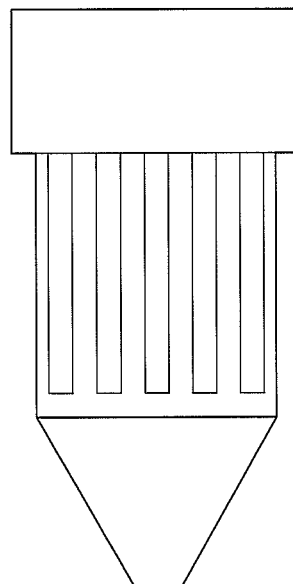


BLOCK: PID361



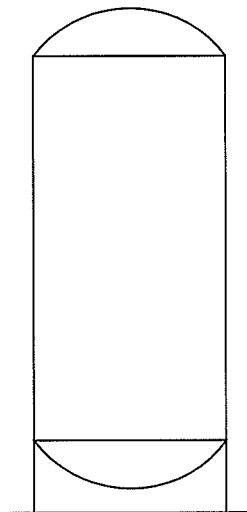
BLOCK: PID364

BLOCK: PID374



BLOCK: PID379

BLOCK: PID375



BLOCK: PID376

	DRAWN:	
	DATE:	
	SCALE:	
	CHECKED:	
	DRAWING NUMBER	REV.





**STUD BOLTS**

HUMBLE OIL & REFINING COMPANY

11/17 26.1/17

NOM PIPE SIZE	900-POUND		800-POUND ORIFICE (1)		1800-POUND			1800-POUND ORIFICE (1)		NOM PIPE SIZE	
	RAISED-FACE	RING-JOINT	T&G, M&F	RAISED-FACE	RING-JOINT (3)	RAISED-FACE	RING-JOINT	T&G, M&F	RAISED-FACE		RING-JOINT (3)
1/2											
3/4											
1											
1 1/4											
1 1/2											
2											
2 1/2											
3											
4											
5											
6											
8											
10											
12											
14											
16											
18											
20											
24											

**STUD BOLTS**

HUMBLE OIL & REFINING COMPANY

11/17 26.1/17

NOM PIPE SIZE	2500-POUND		2500-POUND ORIFICE (4)		3000-POUND TO 600-POUND			NOM PIPE SIZE
	RAISED-FACE	RING-JOINT	T&G, M&F	RAISED-FACE	RING-JOINT (3)	RAISED-FACE	RING-JOINT	
1/2								
3/4								
1								
1 1/4								
1 1/2								
2								
2 1/2								
3								
4								
5								
6								
8								
10								
12								
14								
16								
18								
20								
24								

1 STUD BOLT AND MACHINE BOLT LENGTHS CONFORM TO ASA B16.5-1961  
 2 BOLT LENGTHS FOR RTU ORIFICE FLANGES ARE BASED ON THESE ORIFICE PLATE THICKNESSES  
 3 BOLT LENGTHS FOR RTU ORIFICE FLANGES ARE SUITABLE FOR DANIEL AND ROBINSON STANDARD PLATE HOLDERS.  
 4 ADD 1/4 INCH TO BOLT LENGTH WHEN ORIFICE FLANGES ARE USED WITH FLEXITALIC TYPE GASKETS.

SIZE - INCHES	PLATE THICKNESS - INCHES
1 THROUGH 12	1/8
14 THROUGH 24	1/4



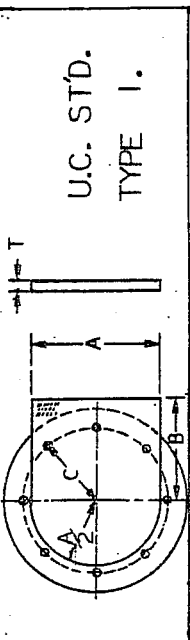
# SERIES 15 BOLTS - WRENCH & FLAT GASKET

PIPE SIZE	BOLT DIA.	NO. BOLT	STUD LENGTH	WRENCH SIZE	GASKET ID. ~ OD.	FLANGE O.D.
1	1/2	4	2 1/2	7/8	1 1/2 x 1 7/8	1 1/2 = 3 1/2
3	1/2	4	2 3/4	7/8	3/4 x 2 1/4	3/4 = 3 7/8
1	1/2	4	2 3/4	7/8	1 x 2 5/8	1 = 4 1/4
1 1/2	1/2	4	3	7/8	1 1/2 x 3 3/8	1 1/2 = 5
2	5/8	4	3 1/2	1 1/8	2 x 4 1/8	2 = 6
3	5/8	4	3 3/4	1 1/8	3 x 5 3/8	3 = 7 1/2
4	5/8	8	3 3/4	1 1/8	4 x 6 7/8	4 = 9
6	3/4	8	4 1/4	1 1/4	6 x 8 3/4	6 = 11
8	3/4	8	4 1/2	1 1/4	8 x 11	8 = 13 1/2
10	7/8	12	5	1 7/8	10 x 13 3/8	10 = 16
12	7/8	12	5	1 7/8	12 x 16 8	12 = 19
14	1	12	5 3/4	1 5/8	13 1/4 x 17 3/4	14 = 21

\*ADD 1/2" TO STUD LENGTH FOR LAP-JOINT FLGS.

\*SUB-BOLT DIA. FROM STUD LENGTH FOR MACH. BOLTS

PIPE SIZE	THREAD PER. IN.	STANDARD MAKE UP	MATERIAL	STORES CODE
1/8	27	1/4	TEFLON TAPE 59 393 007	
1/4 & 3/8	18	3/8	ON STEAM, TETRALIN, AND OIL	
1/2 & 3/4	14	1/2 & 3/4	USE	
1 to 2	11 1/2	1/6 & 3/4	CRANE 425-A	
2 1/2 & 3	8	15 & 1	28 792 177	



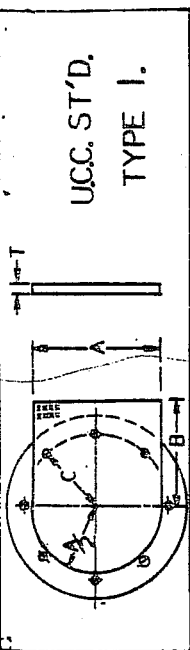
U.C. STD.  
TYPE I.

PIPE SIZE	A	B	C	T	STORES CODE
1	3 1/4	2 3/4	3 1/6	1	599 45
2	4 1/4	3 1/4	4 1/6	8	002
3	5 1/4	4 1/4	5 1/6	3	003
4	6 3/4	5 1/2	6 1/6	3	004
6	8 5/8	6 1/2	7 1/6	4	005
8	10 7/8	7 3/4	8 5/8	3	006
10	13 1/4	9	10 1/6	3	008
12	16	10 1/2	12 1/6	4	010
14	17 5/8	11 1/2	14 1/6	3	012
					013
					015
					017
					018

FOR 150 LB. MAX.

☆ FOR ADDITIONAL PRESSURES USE CARBIDE STD. - P-87

D = PIPE O.D.  
T = PRESSURE  
S = 24,750



U.C.C. STD.  
TYPE I.

PIPE SIZE	A	B	C	T	STORES CODE
1	2	2 7/8	3 1/6	1	599 45
2	3	3 1/2	4 1/6	8	041
3	4	4 1/2	5 1/6	1	042
4	5	5 1/2	6 1/6	1	043
6	7	7 1/2	8 1/6	1	045
8	9	9 1/2	10 1/6	1	046
10	11	11 1/2	12 1/6	1	048
12	13	13 1/2	15 1/6	1	050
14	15	15 1/2	17 1/6	1	052
					053
					054
					055
					056

FOR 300 LB. MAX.

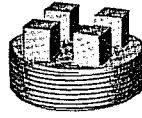
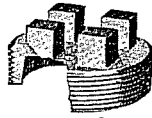
☆ FOR ADDITIONAL PRESSURES USE CARBIDE STD. - P-87

D = PIPE O.D.  
T = PRESSURE  
S = 24,750

# Iron Plugs



Cored Solid  
Square Head Plugs



Cored Solid  
Bar Plugs



Countersunk Plug  
1/4 and 3/8-inch sizes  
have a hexagon hole.

## List Prices, Each

Size  Inches	Square Head Plugs Right Hand				Bar Plugs Right Hand				Countersunk Plugs Right Hand	
	Cored		Solid		Cored		Solid		Black	Galv.
	Black	Galv.	Black	Galv.	Black	Galv.	Black	Galv.		
1/8			.07	.12						
1/4			.07	.12					.13	.22
3/8			.07	.12					.13	.22
1/2			.07	.12					.13	.22
3/4	.09	.15	.18	.30					.18	.30
1	.10	.17	.20	.34					.20	.34
1 1/4	.14	.24	.22	.37					.22	.37
1 1/2	.19	.32	.29	.49					.29	.49
2	.27	.46	.40	.68					.40	.68
2 1/2	.46	.78	.58	.98					.58	.98
3	.65	1.10	.94	1.60					.94	1.60
3 1/2	1.00	1.70	1.45	2.45					1.65	2.80
4					1.15	1.95	1.75	3.00	2.80	4.75
5					1.95	3.30	2.90	4.90		
6					2.30	3.90	3.50	6.00		
8					4.40	7.50	6.00	10.00		

**Service suggestions:** Cored and Countersunk Plugs are generally used with:

- 125-Pound Cast Iron Fittings
- 150-Pound Malleable Iron Fittings

Solid Plugs are generally used with:

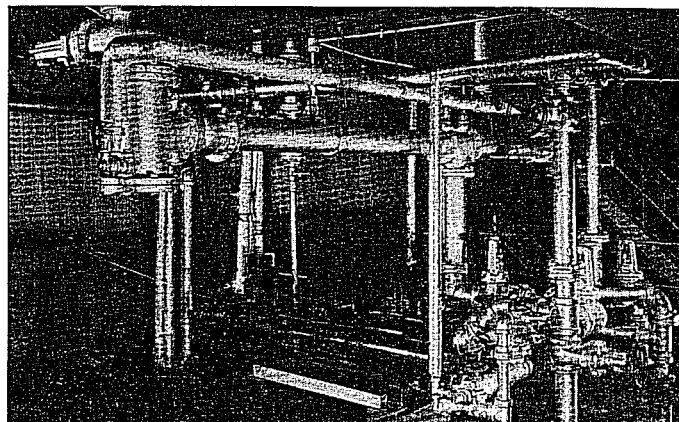
- 250-Pound Cast Iron Fittings
- 300-Pound Malleable Iron Fittings

Solid Plugs sizes 3/8-inch and smaller are recommended for the same pressures and temperatures as the No. 309 Steel Plugs shown on page 260.

**American Standard:** These plugs conform to the American Standard for Ferrous Plugs with Pipe Threads (B16.14-1949).

### Materials

Style		Steel	Malleable Iron	Cast Iron
Square Head	Cored			All sizes
	Solid	1/8 to 1/2"		3/4" and larger
Bar	Cored			All sizes
	Solid			All sizes
Countersunk		1/4 to 1/2"	3/4 to 1 1/4"	1 1/2" and larger



Diversified and complete, the Crane line fulfills the requirements of specialized or general piping installations.

# Iron Bushings



Outside Hexagon



Inside Hexagon

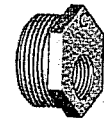


Face

List Prices, Each

Size Inches	Hexagon Bushings		Face Bushings		Eccentric Bushings	
	Black	Galv.	Black	Galv.	Black	Galv.
1/4	.12	.18	.18	.27		
3/8	.12	.18	.18	.27		
1/2	.13	.20	.20	.30		
3/4	.15	.22	.24	.36		
1	.17	.26	.28	.42		
1 1/4	.21	.32	.36	.54	.60	.90
1 1/2	.25	.38	.45	.69	.66	1.00
2	.30	.45	.61	.92	.90	1.35
2 1/2	.42	.63	.80	1.20	1.50	2.25
3	.57	.85	1.05	1.60	2.10	3.15
3 1/2	.90	1.35	1.75	2.65	2.80	4.25
4	1.15	1.75	2.10	3.15	3.70	5.50
5	2.00	3.00	3.20	4.80	5.00	7.50
6	2.40	3.60	4.80	7.20	6.60	10.00
8	4.50	6.70	13.00	19.50		

Face Bushings in sizes 3/4-inch and smaller do not have lugs (not illustrated).



Eccentric

List prices shown at the left apply only to stock items. A tabulation of the sizes carried in stock and the materials from which they are made—cast iron, malleable iron, or steel—is shown in the table below. Other sizes or materials are special; prices are furnished on application.

Bushings Carried in Stock

Hexagon			Face			Eccentric	
1/4 x 1/8 s	2 x 1 1/2 m	4 x 3 1/2	1/4 x 1/8 s	2 1/2 x 2 m	1 1/4 x 3/4	3 1/2 x 2 1/2	
3/8 x 1/4 s	x 1 1/4	x 3	3/8 x 1/4 s	x 1 1/2 m	x 1/2	x 2	
x 1/8 s	x 1	x 2 1/2	x 1/8 s	x 1 1/4 m	1 1/2 x 3/4	x 1 1/2	
1/2 x 3/8 m	x 3/4	x 2	1/2 x 3/8 s	3 x 2 1/2 m	x 1/2	x 1 1/4	
x 1/4 m	x 1/2	x 1 1/2	x 1/4 s	x 2 m	2 x 1 1/4	4 x 3	
x 1/8 m	x 3/8	x 1 1/4	x 1/8 s	x 1 1/2 m	x 1	x 2 1/2	
3/4 x 1/2 m	x 1/4	x 1	3/4 x 1/2 s	x 1 1/4 m	x 3/4	x 2	
x 3/8 m	2 1/2 x 2 m	5 x 4	x 3/8 s	3 1/2 x 3 m	x 1/2	x 1 1/2	
x 1/4	x 1 1/2	x 3 1/2	x 1/4 s	x 2 1/2 m	2 1/2 x 1 1/2	x 1 1/4	
x 1/8	x 1 1/4	x 3	1 x 3/4 m	x 2 m	x 1 1/4	x 1	
1 x 3/4 m	x 1	x 2 1/2	x 1/2 m	4 x 3 1/2 m	x 1	5 x 4	
x 1/2	x 3/4	x 2	x 3/8 m	x 3 m	x 3/4	x 3 1/2	
x 3/8	x 1/2	6 x 5	x 1/4 m	x 2 1/2 m	x 1/2	x 3	
x 1/4	3 x 2 1/2	x 4	1 1/4 x 1 m	x 2	3 x 2	x 2 1/2	
x 1/8	x 2	x 3 1/2	x 3/4 m	5 x 4 m	x 1 1/2	x 2	
1 1/4 x 1 m	x 1 1/2	x 3	x 1/2 m	x 3	x 1 1/4	6 x 4	
x 3/4	x 1 1/4	x 2 1/2	1 1/2 x 1 1/4 m	6 x 5 m	x 1	x 3	
x 1/2	x 1	x 2	x 1 m	x 4	x 3/4	x 2 1/2	
x 3/8	x 3/4	8 x 6	x 3/4 m	x 3		x 2	
x 1/4	x 1/2	x 5	x 1/2 m	8 x 6 m			
1 1/2 x 1 1/4 m	3 1/2 x 3	x 4	2 x 1 1/2 m				
x 1	x 2 1/2	x 3 1/2	x 1 1/4 m				
x 3/4	x 2	x 3	x 1 m				
x 1/2	x 1 1/2		x 3/4 m				
x 3/8	x 1 1/4		x 1/2 m				
x 1/4	x 1						

Notes

m—Letter "m" indicates sizes made of malleable iron.

s—Letter "s" indicates sizes made of steel.

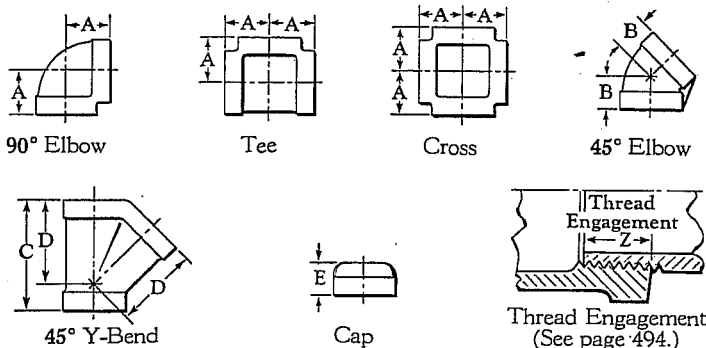
Sizes not indicated with either "m" or "s" are made of cast iron.

Hexagon bushing sizes set in light face type have an inside hexagon. Other sizes (set in bold face type) are made with an outside hexagon.



# 125-Pound Cast Iron Fittings

## Dimensions of Straight Sizes, in Inches



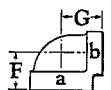
Size	A	B	C	D	E	Z
1/4	13/16	3/4				3/8
3/8	15/16	13/16				3/8
1/2	1 1/8	7/8				1/2
3/4	1 5/16	1	3	2 1/4		9/16
1	1 1/2	1 1/8	3 1/2	2 3/4		1 1/16
1 1/4	1 3/4	1 5/16	4 1/4	3 1/4		1 1/16
1 1/2	1 15/16	1 7/16	4 7/8	3 13/16		1 1/16
2	2 1/4	1 11/16	5 3/4	4 1/2		3/4
2 1/2	2 11/16	1 15/16	6 3/4	5 3/16		15/16
3	3 3/8	2 3/16	7 7/8	6 1/8		1
3 1/2	3 7/16	2 3/8				1 1/16
4	3 3/4	2 5/8	9 3/4	7 5/8	2 1/16	1 1/8
5	4 1/2	3 1/16			2 3/8	1 1/4
6	5 1/8	3 7/16			2 5/8	1 5/16
8	6 9/16	4 1/4			3 1/8	1 7/16

The engagement normally required to make a tight joint between male and female pipe threads is shown as dimension "Z" in the table; it applies to all 125-Pound Cast Iron Fittings.

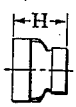
## List of Sizes of Reducing Elbows and Reducers and

### Dimensions, in Inches

90° Elbows		
Size a b	F	G
1/2 x 3/8	1 1/16	1 1/16
3/4 x 1/2	1 3/16	1 1/4
1 x 3/4	1 5/16	1 3/8
1 x 1/2	1 1/4	1 5/16
1 1/4 x 1	1 9/16	1 5/8
1 1/4 x 3/4	1 7/16	1 9/16
1 1/4 x 1/2	1 7/16	1 9/16
1 1/2 x 1 1/4	1 3/4	1 13/16
1 1/2 x 1	1 5/8	1 3/4
1 1/2 x 3/4	1 5/8	1 3/4
1 1/2 x 1/2	1 5/8	1 3/4
2 x 1 1/2	2	2 1/8
2 x 1 1/4	1 15/16	2 1/16
2 x 1	1 3/4	2
2 x 3/4	1 3/4	2
2 x 1/2	1 3/4	2
2 1/2 x 2	2 1/2	2 9/16
2 1/2 x 1 1/2	2 1/4	2 7/16
2 1/2 x 1 1/4	2 1/4	2 7/16
2 1/2 x 1	2 1/4	2 7/16
3 x 2 1/2	2 3/4	3
3 x 2	2 9/16	2 15/16
3 x 1 1/2	2 9/16	2 15/16
3 x 1 1/4	2 9/16	2 15/16
3 1/2 x 3	3 7/16	3 7/16
4 x 3 1/2	3 3/4	3 3/4
4 x 3	3 1/4	3 11/16
4 x 2 1/2	3 1/4	3 11/16
4 x 2	2 3/4	3 1/2
5 x 4	3 15/16	4 5/16
5 x 3	3 7/16	4 1/4
5 x 2 1/2	3 7/16	4 1/4
6 x 5	4 5/8	5 1/16
6 x 4	4 1/8	4 15/16
6 x 3	4 1/8	4 15/16
8 x 6	5 1/2	6 5/16



90° Elbow



Reducer (Concentric)



Eccentric Reducer

The prices of Reducing 90° Elbows and of Reducers shown on pages 150 and 151 apply only to the sizes listed here; the size of the larger opening determines the price.

90° Elbows, Pitched		
Size a b	F	G
3/4 x 1/2	1 3/16	1 1/4
1 x 3/4	1 5/16	1 3/8
1 1/4 x 1	1 9/16	1 5/8
1 1/2 x 1 1/4	1 3/4	1 13/16
2 x 1 1/2	2	2 1/8

Reducers (Concentric)	
Size	H
3/4 x 1/2	1 1/2
1 x 3/4	1 7/8
1 x 1/2	1 11/16
1 1/4 x 1	2 1/8
1 1/2 x 1 1/4	2 1/4
2 x 1 1/2	2 7/16
2 x 1 1/4	2 7/16
2 x 1	2 7/16
2 1/2 x 2	2 5/8
3 x 2 1/2	2 7/8
3 x 2	2 7/8
4 x 3 1/2	3 3/8
4 x 3	3 3/8
4 x 2 1/2	3 3/8
4 x 2	3 3/8
5 x 4	3 7/8
6 x 5	4 3/8
6 x 4	4 3/8
8 x 6	5 1/4

Eccentric Reducers			
Size	J	Size	J
1 1/4 x 1	2 1/8	3 1/2 x 1 1/4	3 1/8
1 1/4 x 3/4	2 1/8	x 1	3 1/8
1 1/2 x 1 1/4	2 1/4	4 x 3 1/2	3 1/4
1 1/2 x 1	2 1/4	x 3	3 3/8
1 1/2 x 3/4	2 1/4	x 2 1/2	3 3/8
2 x 1 1/2	2 7/16	x 2	3 3/8
2 x 1 1/4	2 7/16	x 1 1/2	3 3/8
2 x 1	2 7/16	x 1 1/4	3 3/8
2 x 3/4	2 7/16	x 1	3 3/8
2 1/2 x 2	2 11/16	5 x 4	3 7/8
2 1/2 x 1 1/2	2 11/16	x 3 1/2	3 7/8
2 1/2 x 1 1/4	2 11/16	x 3	3 7/8
2 1/2 x 1	2 11/16	x 2 1/2	3 7/8
3 x 2 1/2	2 15/16	x 2	3 7/8
3 x 2	2 15/16	6 x 5	4 3/8
3 x 1 1/2	2 15/16	x 4	4 3/8
3 x 1 1/4	2 15/16	x 3 1/2	4 3/8
3 x 3/4	2 15/16	x 3	4 3/8
3 1/2 x 3	3 1/8	x 2 1/2	4 3/8
3 1/2 x 1 1/2	3 1/8	x 2	4 3/8
3 1/2 x 1	3 1/8	8 x 6	5 1/4
3 1/2 x 3/4	3 1/8	x 5	5 1/4

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a b 1/2 x 1/2

3/4 x 3/4

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1 x 3/4

1 x 1/2

1 x 1/4 3/4 x 3/4

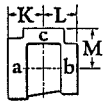
1 1/4 x 1 1/2

1 1/4 x 1

14

# 125-Pound Cast Iron Fittings

List of Sizes of Reducing Tees and Dimensions, in Inches



Reducing Tee

The prices of Reducing Tees on page 150 apply only to the sizes listed here and on the following page; the size of the largest opening determines the price.

When ordering, always name the size of openings in the sequence of the lower case letters shown on the illustration above.

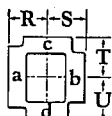
Size			K	L	M
a	b	c			
1/2	x 1/2	x 3/8	1 1/16	1 1/16	1 1/16
		x 1/4	1 1/16	1 1/16	1 1/16
3/4	x 3/4	x 1/2	1 3/16	1 3/16	1 1/4
		x 3/8	1 1/8	1 1/8	1 3/16
		x 1/4	1 1/8	1 1/8	1 3/16
3/4	x 1/2	x 3/4	1 5/16	1 1/4	1 5/16
		x 1/2	1 3/16	1 1/8	1 1/4
1	x 1	x 3/4	1 5/16	1 5/16	1 3/8
		x 1/2	1 1/4	1 1/4	1 5/16
		x 1/4	1 1/4	1 1/4	1 3/8
1	x 3/4	x 1	1 7/16	1 3/8	1 7/16
		x 3/4	1 5/16	1 5/16	1 3/8
1	x 1/2	x 1	1 7/16	1 5/16	1 7/16
		x 3/4	1 5/16	1 1/4	1 3/8
1	x 1/4	x 1	1 1/2	1 3/8	1 1/2
		x 3/4	1 3/8	1 3/8	1 5/16
1 1/4	x 1 1/4	x 1	1 9/16	1 9/16	1 5/8
		x 3/4	1 7/16	1 7/16	1 9/16
1 1/4	x 1	x 1 1/4	1 3/4	1 5/8	1 3/4
		x 3/4	1 7/16	1 7/16	1 5/8
1 1/4	x 1/2	x 1	1 5/16	1 1/4	1 1/2
		x 3/4	1 7/16	1 5/16	1 9/16

Size			K	L	M	Size			K	L	M
a	b	c				a	b	c			
1 1/4	x 3/4	x 1 1/4	1 3/4	1 9/16	1 3/4	2 1/2	x 3/4	1 13/16	1 5/8	2 1/4	
		x 1	1 9/16	1 3/8	1 5/8			1 3/4	1 1/2	2 3/16	
		x 3/4	1 7/16	1 5/16	1 9/16			1 3/4	2 7/16	2 11/16	
1 1/4	x 1/2	x 1 1/4	1 3/4	1 1/2	1 3/4	2 1/2	x 1 1/2	2 11/16	2 7/16	2 9/16	
		x 1	1 9/16	1 3/8	1 5/8			2 1/2	2 7/16	2 7/16	
		x 3/4	1 7/16	1 5/16	1 9/16			2 1/2	2 7/16	2 7/16	
1	x 1	x 1 1/4	1 5/8	1 5/8	1 9/16	2 1/2	x 1 1/2	2 7/16	2 7/8	2 9/16	
		x 3/4	1 5/8	1 3/8	1 5/8			2 1/2	2 7/16	2 9/16	
		x 1/2	1 5/8	1 3/8	1 5/8			2 1/2	2 7/16	2 9/16	
1 1/2	x 1 1/2	x 1 1/2	1 13/16	1 13/16	1 13/16	2 1/2	x 2	2 7/16	2 7/8	2 9/16	
		x 3/4	1 11/16	1 11/16	1 11/16			2 1/2	2 7/16	2 9/16	
		x 1/2	1 11/16	1 11/16	1 11/16			2 1/2	2 7/16	2 9/16	
1 1/2	x 3/4	x 1 1/2	1 13/16	1 13/16	1 13/16	2 1/2	x 2	2 7/16	2 7/8	2 9/16	
		x 1	1 11/16	1 11/16	1 11/16			2 1/2	2 7/16	2 9/16	
		x 3/4	1 11/16	1 11/16	1 11/16			2 1/2	2 7/16	2 9/16	
1 1/2	x 1	x 1 1/2	1 13/16	1 13/16	1 13/16	2 1/2	x 2	2 7/16	2 7/8	2 9/16	
		x 3/4	1 11/16	1 11/16	1 11/16			2 1/2	2 7/16	2 9/16	
		x 1/2	1 11/16	1 11/16	1 11/16			2 1/2	2 7/16	2 9/16	
1 1/2	x 3/4	x 1 1/2	1 13/16	1 13/16	1 13/16	2 1/2	x 2	2 7/16	2 7/8	2 9/16	
		x 1	1 11/16	1 11/16	1 11/16			2 1/2	2 7/16	2 9/16	
		x 3/4	1 11/16	1 11/16	1 11/16			2 1/2	2 7/16	2 9/16	
1	x 1	x 1 1/2	1 13/16	1 13/16	1 13/16	2 1/2	x 2	2 7/16	2 7/8	2 9/16	
		x 3/4	1 11/16	1 11/16	1 11/16			2 1/2	2 7/16	2 9/16	
		x 1/2	1 11/16	1 11/16	1 11/16			2 1/2	2 7/16	2 9/16	
1	x 3/4	x 1 1/2	1 13/16	1 13/16	1 13/16	2 1/2	x 2	2 7/16	2 7/8	2 9/16	
		x 1	1 11/16	1 11/16	1 11/16			2 1/2	2 7/16	2 9/16	
		x 3/4	1 11/16	1 11/16	1 11/16			2 1/2	2 7/16	2 9/16	
1	x 1/2	x 1 1/2	1 13/16	1 13/16	1 13/16	2 1/2	x 2	2 7/16	2 7/8	2 9/16	
		x 3/4	1 11/16	1 11/16	1 11/16			2 1/2	2 7/16	2 9/16	
		x 1/2	1 11/16	1 11/16	1 11/16			2 1/2	2 7/16	2 9/16	
1	x 1/4	x 1	1 1/2	1 3/8	1 1/2	2 1/2	x 2	2 7/16	2 7/8	2 9/16	
		x 3/4	1 3/8	1 3/8	1 5/16			2 1/2	2 7/16	2 9/16	
		x 1/2	1 3/8	1 3/8	1 5/16			2 1/2	2 7/16	2 9/16	
3/4	x 3/4	x 1	1 3/8	1 3/8	1 5/16	2 1/2	x 2	2 7/16	2 7/8	2 9/16	
		x 3/4	1 3/8	1 3/8	1 5/16			2 1/2	2 7/16	2 9/16	
		x 1/2	1 3/8	1 3/8	1 5/16			2 1/2	2 7/16	2 9/16	
1 1/4	x 1 1/4	x 1	1 9/16	1 9/16	1 5/8	2 1/2	x 2	2 7/16	2 7/8	2 9/16	
		x 3/4	1 7/16	1 7/16	1 9/16			2 1/2	2 7/16	2 9/16	
		x 1/2	1 5/16	1 5/16	1 1/2			2 1/2	2 7/16	2 9/16	
1 1/4	x 1	x 1 1/4	1 3/4	1 5/8	1 3/4	2 1/2	x 2	2 7/16	2 7/8	2 9/16	
		x 3/4	1 7/16	1 7/16	1 9/16			2 1/2	2 7/16	2 9/16	
		x 1/2	1 5/16	1 5/16	1 1/2			2 1/2	2 7/16	2 9/16	
1 1/4	x 1	x 1 1/4	1 3/4	1 5/8	1 3/4	2 1/2	x 2	2 7/16	2 7/8	2 9/16	
		x 3/4	1 7/16	1 7/16	1 9/16			2 1/2	2 7/16	2 9/16	
		x 1/2	1 5/16	1 5/16	1 1/2			2 1/2	2 7/16	2 9/16	
1 1/4	x 3/4	x 1	1 9/16	1 9/16	1 5/8	2 1/2	x 2	2 7/16	2 7/8	2 9/16	
		x 3/4	1 7/16	1 7/16	1 9/16			2 1/2	2 7/16	2 9/16	
		x 1/2	1 5/16	1 5/16	1 1/2			2 1/2	2 7/16	2 9/16	
1 1/4	x 1/2	x 1	1 5/16	1 1/4	1 1/2	2 1/2	x 2	2 7/16	2 7/8	2 9/16	
		x 3/4	1 7/16	1 5/16	1 9/16			2 1/2	2 7/16	2 9/16	
		x 1/2	1 5/16	1 1/4	1 1/2			2 1/2	2 7/16	2 9/16	

Continued on next page.

# 125-Pound Cast Iron Fittings

List of Sizes of Reducing Crosses  
and  
Dimensions, in Inches



Reducing Cross

The prices of Reducing Crosses on page 151 apply only to the sizes listed here; the size of the largest opening determines the price.

When ordering, always name the size of openings in the sequence of the lower case letters shown on the illustration above. For example, if "a" size is 2 1/2", "b" is 2", and "c" and "d" are 1", the size is written: 2 1/2 x 2 x 1 x 1".

Size					R	S	T	U	Size					R	S	T	U
a	b	c	d						a	b	c	d					
1 1/2	x 1 1/2	x 1	x 1		1 5/8	1 5/8	1 13/16	1 13/16	3 1/2	x 3	x 1 1/4	x 1 1/4		2 1/4	2 1/4	3	3
		x 1 1/4	x 1		1 5/8	1 5/8	1 13/16	1 13/16		x 1	x 1			2 1/4	2 1/4	3	3
2	x 2	x 1	x 1		1 3/4	1 3/4	2	2	4	x 4	x 3 1/2	x 3 1/2		3 3/4	3 3/4	3 3/4	3 3/4
		x 1 1/2	x 1 1/4		1 7/8	1 7/8	2 1/16	2 1/16		x 3	x 3			3 3/4	3 3/4	3 5/8	3 5/8
		x 1 1/2	x 1		1 3/4	1 3/4	2	2			x 2 1/2	x 2 1/2		2 15/16	2 15/16	3 9/16	3 9/16
2 1/2	x 2 1/2	x 2	x 2		2 7/16	2 7/16	2 9/16	2 9/16			x 2 1/2	x 2		2 15/16	2 15/16	3 9/16	3 9/16
		x 1 1/2	x 1 1/2		2 3/16	2 3/16	2 7/16	2 7/16		x 2	x 2			2 11/16	2 11/16	3 1/2	3 1/2
		x 1 1/2	x 1 1/4		2 3/16	2 3/16	2 7/16	2 7/16		x 2	x 1 1/2			2 11/16	2 11/16	3 1/2	3 1/2
		x 1 1/4	x 1 1/4		2 1/8	2 1/8	2 3/8	2 3/8			x 1 1/2	x 1 1/2		2 7/16	2 7/16	3 5/16	3 5/16
		x 1 1/4	x 1		2 1/16	2 1/16	2 3/8	2 3/8			x 1 1/4	x 1 1/4		2 5/16	2 5/16	3 5/16	3 5/16
		x 1	x 1		1 15/16	1 15/16	2 5/16	2 5/16			x 1	x 1		2 5/16	2 5/16	3 5/16	3 5/16
2 1/2	x 2	x 2	x 2		2 7/16	2 7/16	2 9/16	2 9/16	4	x 3 1/2	x 2 1/2	x 2 1/2		2 15/16	2 15/16	3 9/16	3 9/16
		x 1 1/2	x 1 1/2		2 3/16	2 3/16	2 7/16	2 7/16			x 2 1/2	x 1		2 15/16	2 15/16	3 9/16	3 9/16
		x 1 1/4	x 1 1/4		2 1/16	2 1/16	2 3/8	2 3/8		x 2	x 2			2 11/16	2 11/16	3 1/2	3 1/2
		x 1 1/4	x 1		2 1/16	2 1/16	2 3/8	2 3/8			x 2	x 1 1/2		2 11/16	2 11/16	3 1/2	3 1/2
		x 1	x 1		1 15/16	1 15/16	2 5/16	2 5/16			x 1 1/2	x 1 1/2		2 7/16	2 7/16	3 5/16	3 5/16
2 1/2	x 1 1/2	x 1 1/2	x 1		2 3/16	2 3/16	2 7/16	2 7/16			x 1 1/2	x 1		2 7/16	2 7/16	3 5/16	3 5/16
		x 1 1/4	x 1 1/4		2 1/16	2 1/16	2 3/8	2 3/8			x 1 1/4	x 1 1/4		2 5/16	2 5/16	3 5/16	3 5/16
		x 1 1/4	x 1		2 1/16	2 1/16	2 3/8	2 3/8			x 1 1/4	x 1		2 5/16	2 5/16	3 5/16	3 5/16
3	x 3	x 2 1/2	x 2 1/2		2 13/16	2 13/16	3 1/16	3 1/16	4	x 3	x 2 1/2	x 2 1/2		2 15/16	2 15/16	3 9/16	3 9/16
		x 2	x 2		2 9/16	2 9/16	2 15/16	2 15/16			x 2	x 2		2 15/16	2 15/16	3 9/16	3 9/16
		x 2	x 1 1/2		2 9/16	2 9/16	2 15/16	2 15/16	5	x 5	x 4	x 4		4	4	4 3/8	4 3/8
		x 1 1/2	x 1 1/2		2 5/16	2 5/16	2 13/16	2 13/16			x 3 1/2	x 3 1/2		4	4	4 3/8	4 3/8
		x 1 1/2	x 1 1/4		2 5/16	2 5/16	2 13/16	2 13/16			x 3	x 3		3 1/2	3 1/2	4 5/16	4 5/16
		x 1 1/4	x 1 1/4		2 3/16	2 3/16	2 3/4	2 3/4			x 2 1/2	x 2 1/2		3 3/16	3 3/16	4 1/4	4 1/4
		x 1 1/4	x 1		2 3/16	2 3/16	2 3/4	2 3/4			x 2 1/2	x 2		3 3/16	3 3/16	4 1/4	4 1/4
		x 1	x 1		2 1/16	2 1/16	2 11/16	2 11/16			x 2	x 2		2 15/16	2 15/16	4 1/8	4 1/8
3	x 2 1/2	x 2 1/2	x 2		2 13/16	2 13/16	3 1/16	3 1/16			x 2	x 1 1/2		2 15/16	2 15/16	4 1/8	4 1/8
		x 2	x 2		2 9/16	2 9/16	2 15/16	2 15/16			x 1 1/2	x 1 1/2		2 11/16	2 11/16	4	4
		x 2	x 1 1/2		2 9/16	2 9/16	2 15/16	2 15/16			x 1 1/2	x 1 1/4		2 11/16	2 11/16	4	4
		x 2	x 1 1/4		2 9/16	2 9/16	2 15/16	2 15/16			x 1 1/4	x 1 1/4		2 9/16	2 9/16	3 15/16	3 15/16
		x 1 1/2	x 1 1/2		2 5/16	2 5/16	2 13/16	2 13/16	5	x 4	x 3	x 3		3 1/2	3 1/2	4 5/16	4 5/16
		x 1 1/4	x 1 1/4		2 3/16	2 3/16	2 3/4	2 3/4			x 2 1/2	x 2 1/2		3 3/16	3 3/16	4 1/4	4 1/4
		x 1 1/4	x 1		2 3/16	2 3/16	2 3/4	2 3/4			x 2 1/2	x 2		3 3/16	3 3/16	4 1/4	4 1/4
		x 1	x 1		2 1/16	2 1/16	2 11/16	2 11/16			x 2	x 2		2 15/16	2 15/16	4 1/8	4 1/8
3 1/2	x 3 1/2	x 3	x 3		3 3/16	3 3/16	3 3/8	3 3/8	6	x 6	x 5	x 5		4 5/8	4 5/8	5	5
		x 2 1/2	x 2 1/2		2 7/8	2 7/8	3 5/16	3 5/16			x 4	x 4		4 1/16	4 1/16	4 15/16	4 15/16
		x 2	x 2		2 5/8	2 5/8	3 3/16	3 3/16			x 3 1/2	x 3 1/2		4 1/16	4 1/16	4 15/16	4 15/16
		x 2	x 1 1/2		2 5/8	2 5/8	3 3/16	3 3/16			x 3	x 3		3 9/16	3 9/16	4 13/16	4 13/16
		x 2	x 1 1/4		2 5/8	2 5/8	3 3/16	3 3/16			x 2 1/2	x 2 1/2		3 9/16	3 9/16	4 13/16	4 13/16
		x 1 1/2	x 1 1/2		2 3/8	2 3/8	3 1/16	3 1/16			x 2 1/2	x 2		3 1/4	3 1/4	4 3/4	4 3/4
		x 1 1/2	x 1 1/4		2 3/8	2 3/8	3 1/16	3 1/16			x 2 1/2	x 1		3 1/4	3 1/4	4 3/4	4 3/4
		x 1 1/2	x 1		2 3/8	2 3/8	3 1/16	3 1/16			x 2	x 2		3	3	4 5/8	4 5/8
		x 1 1/4	x 1 1/4		2 1/4	2 1/4	3	3			x 1 1/2	x 1 1/2		2 3/4	2 3/4	4 1/2	4 1/2
		x 1	x 1		2 1/4	2 1/4	3	3			x 1 1/4	x 1 1/4		2 5/8	2 5/8	4 7/16	4 7/16
3 1/2	x 3	x 2 1/2	x 2 1/2		2 7/8	2 7/8	3 5/16	3 5/16	6	x 5	x 3	x 3		3 9/16	3 9/16	4 13/16	4 13/16
		x 2 1/2	x 2		2 7/8	2 7/8	3 5/16	3 5/16			x 2	x 2		3	3	4 5/8	4 5/8
		x 2	x 2		2 5/8	2 5/8	3 3/16	3 3/16			x 1 1/2	x 1 1/2		2 3/4	2 3/4	4 1/2	4 1/2
		x 2	x 1 1/2		2 5/8	2 5/8	3 3/16	3 3/16	8	x 8	x 6	x 6		5 9/16	5 9/16	6 3/8	6 3/8
		x 2	x 1 1/4		2 5/8	2 5/8	3 3/16	3 3/16			x 5	x 5		5 9/16	5 9/16	6 3/8	6 3/8
		x 1 1/2	x 1 1/2		2 3/8	2 3/8	3 1/16	3 1/16			x 4	x 4		4 1/2	4 1/2	6 1/8	6 1/8
		x 1 1/2	x 1 1/4		2 3/8	2 3/8	3 1/16	3 1/16	8	x 6	x 4	x 4		4 1/2	4 1/2	6 1/8	6 1/8
		x 1 1/2	x 1		2 3/8	2 3/8	3 1/16	3 1/16									

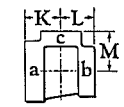
List prices . . . . . pages 150 and 151  
Description . . . . . pages 150 and 151  
Thread engagement . . . . . page 152  
Iron Plugs . . . . . page 166  
Iron Bushings . . . . . page 167

# 125-Pound Cast Iron Fittings

Size				K	L	M	Size				K	L	M
a	b	c					a	b	c				
<i>Continued from preceding page.</i>													
3 1/2 x 3	x 1 1/4			2 1/4	2 3/16	3	5	x 5	x 3	3 7/16	3 7/16	4 1/4	
	x 1			2 1/8	2 1/16	2 15/16		x 2 1/2		3 1/8	3 1/8	4 3/16	
3 1/2 x 2 1/2 x 3 1/2				3 7/16	3 5/16	3 7/16		x 2		2 7/8	2 7/8	4 1/16	
	x 3			3 3/16	3 1/8	3 3/8		x 1 1/2		2 5/8	2 5/8	3 15/16	
	x 2 1/2			2 7/8	2 13/16	3 5/16	5	x 1 1/4		2 1/2	2 1/2	3 7/8	
	x 2			2 5/8	2 9/16	3 3/16		x 1		2 1/2	2 1/2	3 7/8	
3 1/2 x 2	x 3 1/2			3 7/16	3 5/16	3 7/16	5	x 4	x 5	4 1/2	4 5/16	4 1/2	
	x 3			3 3/16	3 1/8	3 3/8		x 4		3 15/16	3 3/4	4 5/16	
3 1/2 x 1 1/2 x 3 1/2				3 7/16	3 5/16	3 7/16		x 3 1/2		3 7/16	3 1/4	4 1/4	
	x 3			3 3/16	3 1/8	3 3/8		x 2 1/2		3 1/8	2 15/16	4 3/16	
3 1/2 x 1 1/4 x 3 1/2				3 7/16	3 5/16	3 7/16		x 2		2 7/8	2 3/4	4 1/16	
	x 3			3 3/16	3 1/8	3 3/8		x 1 1/2		2 1 1/16	2 7/16	4	
3 1/2 x 1 x 3 1/2				3 7/16	3 5/16	3 7/16		x 1 1/4		2 1 1/16	2 7/16	4	
3 x 3	x 3 1/2			3 3/8	3 3/8	3 3/8	5	x 3 1/2 x 5		4 1/2	4 3/8	4 1/2	
	x 2 1/2 x 3 1/2			3 3/8	3 3/8	3 3/16		x 4		4	3 3/4	4 3/8	
	x 2 x 3 1/2			3 3/8	3 3/8	3 3/16		x 3 1/2		3 3/4	3 1/2	4 5/16	
	x 1 1/2 x 3 1/2			3 3/8	3 3/8	3 3/16	5	x 3	x 5	4 1/2	4 5/16	4 1/2	
2 1/2 x 2 1/2 x 3 1/2				3 5/16	3 5/16	2 7/8		x 4		4	3 3/4	4 3/8	
								x 3 1/2		3 3/4	3 1/2	4 5/16	
4	x 4	x 3 1/2		3 1/2	3 1/2	3 11/16	5	x 2 1/2 x 5		4 1/2	4 1/4	4 1/2	
		x 3		3 1/4	3 1/4	3 11/16		x 4		4	3 3/4	4 3/8	
		x 2 1/2		2 15/16	2 15/16	3 5/8	5	x 2	x 5	4 1/2	4 1/16	4 1/2	
		x 2		2 3/4	2 3/4	3 1/2		x 1 1/2 x 5		4 1/2	4 1/4	4 1/2	
		x 1 1/2		2 1/2	2 1/2	3 3/8		x 1 1/4 x 5		4 1/2	4 1/4	4 1/2	
		x 1 1/4		2 3/8	2 3/8	3 1/4	4	x 4	x 5	4 5/16	4 5/16	3 15/16	
		x 1		2 3/16	2 3/16	3 3/16		x 3 1/2 x 5		4 3/8	4 5/16	4	
		x 3/4		2 3/16	2 3/16	3 3/16		x 3 x 5		4 3/8	4 5/16	4	
4	x 3 1/2 x 4			3 3/4	3 3/4	3 3/4		x 2 1/2 x 5		4 3/8	4 5/16	4	
		x 3 1/2		3 1/2	3 1/2	3 11/16	3 1/2 x 3 1/2 x 5			4 5/16	4 5/16	3 3/4	
		x 3		3 1/4	3 1/4	3 5/8		x 3 x 5		4 5/16	4 5/16	3 3/4	
		x 2 1/2		2 15/16	2 7/8	3 9/16	3	x 3 x 5		4 5/16	4 5/16	3 3/4	
		x 2		2 1 1/16	2 5/8	3 1/2	6	x 6	x 5	4 5/8	4 5/8	5 1/16	
		x 1 1/2		2 7/16	2 3/8	3 5/16			x 4	4 1/8	4 1/8	4 15/16	
		x 1 1/4		2 5/16	2 1/4	3 5/16			x 3 1/2	4 1/8	4 1/8	4 15/16	
		x 1		2 5/16	2 1/4	3 5/16			x 3	3 5/8	3 5/8	4 7/8	
4	x 3	x 4		3 3/4	3 1 1/16	3 3/4			x 2 1/2	3 5/16	3 5/16	4 13/16	
		x 3 1/2		3 1/2	3 7/16	3 1 1/16			x 2	3 1/16	3 1/16	4 1 1/16	
		x 3		3 1/4	3 1/16	3 1 1/16			x 1 1/2	2 7/8	2 7/8	4 9/16	
		x 2 1/2		2 15/16	2 7/8	3 5/8			x 1 1/4	2 7/8	2 7/8	4 9/16	
		x 2		2 3/4	2 9/16	3 1/2			x 1	2 9/16	2 9/16	4 3/8	
4	x 2 1/2 x 4			3 3/4	3 5/8	3 3/4	6	x 5	x 6	5 1/8	5 1/8	5 1/8	
		x 3 1/2		3 1/2	3 7/16	3 1 1/16			x 5	4 5/8	4 7/16	5 1/16	
		x 3		3 1/4	3 1/8	3 5/8			x 4	4 1/8	3 15/16	4 15/16	
		x 2 1/2		2 15/16	2 13/16	3 9/16			x 3 1/2	4 1/16	4	4 15/16	
		x 2		2 3/4	2 9/16	3 1/2			x 3	3 5/8	3 5/8	4 7/8	
4	x 2	x 4		3 3/4	3 1/2	3 3/4			x 2 1/2	3 5/16	3 1/8	4 5/8	
		x 3 1/2		3 3/4	3 1/2	3 3/4			x 2	3 1/16	2 7/8	4 1 1/16	
		x 3		3 1/4	2 15/16	3 1 1/16			x 1 1/2	2 3/4	2 3/4	4 1/2	
		x 2		2 3/4	2 9/16	3 1/2			x 1 1/4	2 5/8	2 5/8	4 7/16	
4	x 1 1/2 x 4			3 3/4	3 3/8	3 3/4	6	x 4	x 6	5 1/8	4 15/16	5 1/8	
		x 1 1/4 x 4		3 3/4	3 1/4	3 3/4			x 5	4 5/8	4 7/16	5 1/16	
		x 1 x 4		3 3/4	3 1/4	3 3/4			x 4	4 1/8	3 15/16	4 15/16	
3 1/2 x 3 1/2 x 4				3 1 1/16	3 1 1/16	3 1/2			x 3 1/2	4 1/16	4	4 15/16	
		x 3 x 4		3 1 1/16	3 1 1/16	3 1/2			x 3	3 5/8	3 5/8	4 7/8	
		x 2 1/2 x 4		3 1 1/16	3 1 1/16	3 1/2			x 2	3 1/16	2 7/8	4 1 1/16	
		x 2 x 4		3 1 1/16	3 1 1/16	3 1/2			x 1 1/2	2 3/4	2 3/4	4 1/2	
3	x 3	x 4		3 1 1/16	3 1 1/16	3 1/4			x 1 1/4	2 5/8	2 5/8	4 7/16	
		x 2 1/2 x 4		3 5/8	3 5/8	3 1/4			x 6	5 1/8	4 15/16	5 1/8	
2 1/2 x 2 1/2 x 4				3 5/8	3 5/8	2 15/16			x 5	4 5/8	4 7/16	5 1/16	
2	x 2	x 4		3 5/8	3 5/8	2 15/16			x 4	4 1/8	3 3/4	4 15/16	
									x 3	3 9/16	3 9/16	4 13/16	
5	x 5	x 4		3 15/16	3 15/16	4 5/16	6	x 2 1/2 x 6		5 1/8	4 7/8	5 1/8	
		x 3 1/2		4	4	4 3/8							

## List of Sizes of Reducing Tees and Dimensions, in Inches

*Continued from preceding page*



Reducing Tee

The prices of Reducing Tees on page 150 apply only to the sizes listed here and on the preceding page; the size of the largest opening determines the price.

When ordering, always name the size of openings in the sequence of the lower case letters shown on the illustration above.

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Size				K	L	M
a	b	c				
6	x 2	x 6		5 1/8	4 1 1/16	5 1/8
		x 1 1/2 x 6		5 1/8	4 13/16	5 1/8
		x 1 1/4 x 6		5 1/8	4 13/16	5 1/8
5	x 5	x 6		5 1/16	5 1/16	4 5/8
		x 4 x 6		5	5	4 5/8
		x 3 1/2 x 6		5	4 7/8	4 5/8
		x 3 x 6		5	4 7/8	4 5/8
4	x 4	x 6		4 15/16	4 15/16	4 1/8
		x 3 1/2 x 6		4 15/16	4 15/16	4 1/16
8	x 8	x 6		5 1/2	5 1/2	6 5/16
		x 5		4 15/16	4 15/16	6 3/16
		x 4		4 7/16	4 7/16	6 1/8
		x 3 1/2		4 1/2	4 1/2	6 1/8
		x 3		3 15/16	3 15/16	6
		x 2 1/2		3 5/8	3 5/8	5 15/16
		x 2		3 3/8	3 3/8	5 13/16
8	x 6	x 8		6 9/16	6 9/16	6 9/16
		x 6		5 9/16	5 9/16	6 3/8
		x 5		5 9/16	5 9/16	6 3/8
		x 4		4 1/2	4 1/2	6 1/8
8	x 5	x 5		5 9/16	5 9/16	6 3/8
		x 4 x 8		6 9/16	6 9/16	6 9/16
		x 2 x 8		6 9/16	6 9/16	6 9/16
6	x 6	x 8		6 5/16	6 5/16	5 1/2
		x 5 x 8		6 3/8	6 3/8	5 9/16
5	x 5	x 8		6 3/8	6 3/8	5 9/16

List p Descri Threa Iron 1 Iron 1

# PIPING AND EQUIPMENT, INC.

## WEIGHTS AND DIMENSIONS OF SEAMLESS AND WELDED PIPE A.S.A. PIPE SCHEDULES

Red figure indicates wall thickness in inches. Black figure indicates weight per foot in pounds.

Pipe Size	Outside Diameter (Inches)	5S	5	10S	10	20	30	40S & Standard	40	60	80S & Extra Heavy	80	100	120	140	160	Double Extra Heavy
1/8	.405		.035 .1383	.049 .1863	.049 .1863			.068 .2447	.068 .2447		.095 .3145	.095 .3145					
1/4	.540		.049 .2750	.065 .3297	.065 .3297			.068 .4248	.088 .4248		.119 .5351	.119 .5351					
3/8	.675		.049 .3276	.065 .4235	.065 .4235			.091 .5676	.091 .5676		.126 .7388	.126 .7388					
1/2	.840	.065 .5383	.065 .5383	.083 .6710	.083 .6710			.109 .8510	.109 .8510		.147 1.088	.147 1.088				.187 1.304	.294 1.714
3/4	1.050	.065 .6383	.065 .6383	.083 .8572	.083 .8572			.113 1.131	.113 1.131		.154 1.474	.154 1.474				.218 1.937	.308 2.441
1	1.315	.065 .8678	.065 .8678	.109 1.404	.109 1.404			.133 1.679	.133 1.679		.179 2.172	.179 2.172				.250 2.844	.358 3.659
1-1/4	1.660	.065 1.107	.065 1.107	.109 1.806	.109 1.806			.140 2.273	.140 2.273		.191 2.997	.191 2.997				.250 3.785	.382 5.214
1-1/2	1.900	.065 1.274	.065 1.274	.109 2.085	.109 2.085			.145 2.718	.145 2.718		.200 3.631	.200 3.631				.281 4.859	.400 6.408
2	2.375	.065 1.604	.065 1.604	.109 2.638	.109 2.638			.154 3.653	.154 3.653		.218 5.022	.218 5.022				.343 7.444	.436 8.029
2-1/2	2.875	.083 2.475	.083 2.475	.120 3.531	.120 3.531			.203 5.793	.203 5.793		.276 7.661	.276 7.661				.375 10.01	.552 13.70
3	3.500	.083 3.029	.083 3.029	.120 4.332	.120 4.332			.216 7.576	.216 7.576		.300 10.25	.300 10.25				.437 14.32	.600 18.58
3-1/2	4.000	.083 3.472	.083 3.472	.120 4.973	.120 4.973			.226 9.109	.226 9.109		.318 12.51	.318 12.51					.636 22.85
4	4.500	.083 3.915	.083 3.915	.120 5.613	.120 5.613			.237 10.79	.237 10.79	.281 12.66	.337 14.98	.337 14.98		.437 19.01		.531 22.51	.674 27.54
4-1/2	5.000							2.47 12.53			.355 17.61						.710 32.53
5	5.563	.109 6.349	.109 6.349	.134 7.770	.134 7.770			.258 14.62	.258 14.62		.375 20.78	.375 20.78		.500 27.04		.625 32.96	.750 38.55
6	6.625	.109 7.585	.109 7.858	.134 9.290	.134 9.290			.280 18.97	.280 18.97		.432 28.57	.432 28.57		.562 36.39		.718 45.30	.864 53.16
7	7.625							.301 23.57			.500 38.05						.875 63.08
8	8.625	.109 9.914	.109 9.914	.148 13.40	.148 13.40	.250 22.36	.277 24.70	.322 28.55	.322 28.55	.406 35.64	.500 43.39	.500 43.39	.593 50.87	.718 60.93	.812 67.76	.908 74.69	.875 72.42
9	9.625							.342 33.90			.500 48.72						
10	10.750	.134 15.19	.134 15.19	.165 18.70	.165 18.70	.250 28.04	.307 34.24	.365 40.48	.365 40.48	.500 54.74	.500 54.74	.593 64.33	.718 76.93	.843 89.20	1.000 104.1	1.125 115.7	
11	11.750							.375 45.55			.500 60.07						
12	12.750	.156 21.07	.165 22.18	1.80 24.20	.180 24.20	.250 33.38	.330 43.77	.375 49.58	.408 53.53	.562 73.16	.500 65.42	.687 88.51	.843 107.2	1.000 125.5	1.125 139.7	1.312 160.3	
14	14.000	.156 23.07		.188 27.73	.250 36.71	.312 45.68	.375 54.57	.375 54.57	.437 63.67	.593 84.91	.500 72.09	.750 106.1	.937 130.7	1.093 150.7	1.250 170.2	1.406 189.1	
16	16.000	.165 27.90		.188 31.75	.250 42.05	.312 52.38	.375 62.58	.375 62.58	.500 82.77	.658 107.5	.500 82.77	.843 136.5	1.031 164.8	1.218 192.3	1.437 223.5	1.593 145.1	
18	18.000	.165 31.43		.188 35.76	.250 47.39	.312 59.03	.437 82.06	.375 70.59	.562 104.8	.750 138.2	.500 93.45	.937 170.8	1.156 208.0	1.375 244.1	1.562 274.2	1.781 308.5	
20	20.000	.188 39.78		.218 46.05	.250 52.73	.375 78.60	.500 104.1	.375 78.60	.593 122.9	.812 166.4	.500 104.1	1.031 208.9	1.280 256.1	1.500 296.4	1.750 341.1	1.988 379.0	
24	24.000	.218 55.37		.250 63.41	.250 63.41	.375 94.62	.562 140.8	.375 94.62	.687 171.2	.988 238.1	.500 125.5	1.218 296.4	1.531 367.4	1.182 429.4	2.062 483.1	2.343 541.9	





# DIMENSIONS OF WELDED AND SEAMLESS PIPE

## CARBON AND ALLOY STEELS

ASA B36.10-1950

NOMINAL SIZE	OUTSIDE DIA.	WALL THICKNESS	NOMINAL WALL THICKNESS AND INSIDE DIA.												
			SCHEDULE 10	SCHEDULE 20	SCHEDULE 30	STANDARD WEIGHT	SCHEDULE 40	SCHEDULE 60	EXTRA STRONG	SCHEDULE 80	SCHEDULE 100	SCHEDULE 120	SCHEDULE 140	SCHEDULE 160	
1/8	.405	Wall	...	...	...	.068	.068	...	.095	.095	...	...	...	...	...
		I.D.	...	...	...	.269	.269	...	.215	.215	...	...	...	...	...
1/4	.540	Wall	...	...	...	.088	.088	...	.119	.119	...	...	...	...	...
		I.D.	...	...	...	.364	.364	...	.302	.302	...	...	...	...	...
3/8	.675	Wall	...	...	...	.091	.091	...	.126	.126	...	...	...	...	...
		I.D.	...	...	...	.493	.493	...	.423	.423	...	...	...	...	...
1/2	.840	Wall	...	...	...	.109	.109	...	.147	.147	...	...	...	.187	.294
		I.D.	...	...	...	.622	.622	...	.546	.546	...	...	...	.466	.952
3/4	1.050	Wall	...	...	...	.113	.113	...	.154	.154	...	...	...	.218	.303
		I.D.	...	...	...	.824	.824	...	.742	.742	...	...	...	.614	.434
1	1.315	Wall	...	...	...	.133	.133	...	.179	.179	...	...	...	.250	.353
		I.D.	...	...	...	1.049	1.049	...	.957	.957	...	...	...	.815	.599
1 1/4	1.660	Wall	...	...	...	.140	.140	...	.191	.191	...	...	...	.250	.382
		I.D.	...	...	...	1.380	1.380	...	1.278	1.278	...	...	...	1.160	.396
1 1/2	1.900	Wall	...	...	...	.145	.145	...	.200	.200	...	...	...	.281	.400
		I.D.	...	...	...	1.610	1.610	...	1.500	1.500	...	...	...	1.338	1.100
2	2.375	Wall	...	...	...	.154	.154	...	.218	.218	...	...	...	.343	.436
		I.D.	...	...	...	2.067	2.067	...	1.939	1.939	...	...	...	1.689	1.503
2 1/2	2.875	Wall	...	...	...	.203	.203	...	.276	.276	...	...	...	.375	.552
		I.D.	...	...	...	2.469	2.469	...	2.323	2.323	...	...	...	2.125	1.771
3	3.500	Wall	...	...	...	.216	.216	...	.300	.300	...	...	...	.438	.600
		I.D.	...	...	...	3.068	3.068	...	2.900	2.900	...	...	...	2.624	2.300
3 1/2	4.000	Wall	...	...	...	.226	.226	...	.318	.318	...	...	...	...	.636†
		I.D.	...	...	...	3.548	3.548	...	3.364	3.364	...	...	...	...	2.728†
4	4.500	Wall	...	...	...	.237	.237	...	.337	.337	...	.438	...	.531	.674
		I.D.	...	...	...	4.026	4.026	...	3.826	3.826	...	3.624	...	3.438	2.152
5	5.563	Wall	...	...	...	.258	.258	...	.375	.375	...	.500	...	.625	.750
		I.D.	...	...	...	5.047	5.047	...	4.813	4.813	...	4.563	...	4.313	4.063
6	6.625	Wall	...	...	...	.280	.280	...	.432	.432	...	.562	...	.718	.864
		I.D.	...	...	...	6.065	6.065	...	5.761	5.761	...	5.501	...	5.189	4.397
8	8.625	Wall	...	.250	.277	.322	.322	.406	.500	.500	.593	.718	.812	.906	.875
		I.D.	...	8.125	8.071	7.981	7.981	7.813	7.625	7.625	7.439	7.189	7.001	6.813	6.875
10	10.750	Wall	...	.250	.307	.365	.365	.500	.500	.593	.718	.843	1.000	1.125	...
		I.D.	...	10.250	10.136	10.020	10.020	9.750	9.750	9.564	9.314	9.064	8.750	8.500	...
12	12.750	Wall	...	.250	.330	.375	.406	.562	.500	.687	.843	1.000	1.125	1.312	...
		I.D.	...	12.250	12.090	12.000	11.938	11.626	11.750	11.376	11.064	10.750	10.500	10.126	...
14	14.000	Wall	...	.250	.342	.375	.375	.438	.593	.500	.750	.937	1.093	1.250	1.406
		I.D.	...	13.500	13.375	13.250	13.250	13.124	12.814	13.000	12.500	12.126	11.814	11.500	11.188
16	16.000	Wall	...	.250	.312	.375	.375	.500	.656	.500	.843	1.031	1.218	1.438	1.593
		I.D.	...	15.500	15.375	15.250	15.250	15.000	14.688	15.000	14.314	13.938	13.564	13.124	12.814
18	18.000	Wall	...	.250	.342	.438	.375	.562	.750	.500	.937	1.156	1.375	1.562	1.781
		I.D.	...	17.500	17.375	17.124	17.250	16.876	16.500	17.000	16.126	15.688	15.250	14.876	14.438
20	20.000	Wall	...	.250	.375	.500	.375	.593	.812	.500	1.031	1.281	1.500	1.750	1.968
		I.D.	...	19.500	19.250	19.000	19.250	18.814	18.376	19.000	17.938	17.438	17.000	16.500	16.064
24	24.000	Wall	...	.250	.375	.562	.375	.687	.968	.500	1.218	1.531	1.812	2.062	2.343
		I.D.	...	23.500	23.250	22.875	23.250	22.626	22.064	23.000	21.564	20.938	20.376	19.876	19.314
30	30.000	Wall	...	.312	.500	.625	.375†	...	...	.500†	...	...	...	...	...
		I.D.	...	29.376	29.000	28.750	29.250†	...	...	29.000†	...	...	...	...	...

All dimensions given in inches.

†Not included in B36.10-1950.

The wall thicknesses shown represent nominal or average wall dimensions which are subject to a -12½% mill tolerance.

NOTE THAT SCHEDULE 40 IN SIZES 12" AND LARGER AND THAT SCHEDULE 80 IN SIZES 10" AND LARGER DO NOT AGREE WITH SCHEDULES 40S AND 80S OF ASA B36.19 NOR WITH STANDARD WEIGHT AND EXTRA STRONG RESPECTIVELY

# DIMENSIONS OF WELDED AND SEAMLESS PIPE

## STAINLESS STEELS

ASA B36.19-1957

2A 5-S

10-S

40-S

80-S

NOMINAL PIPE SIZE	OUTSIDE DIAMETER	WALL THICKNESS (MINIMUM)	SCHEDULES			
			SCHEDULE 5S	SCHEDULE 10S	SCHEDULE 40S	SCHEDULE 80S
1/8	.405	Wall	...	.049	.068	.095
		I.D.	...	.307	.269	.215
1/4	.540	Wall	...	.065	.088	.119
		I.D.	...	.410	.364	.302
3/8	.675	Wall	...	.065	.091	.126
		I.D.	...	.545	.493	.423
1/2	.840	Wall	.065	.083	.109	.147
		I.D.	.710	.674	.622	.546
3/4	1.050	Wall	.065	.083	.113	.154
		I.D.	.920	.884	.824	.742
1	1.315	Wall	.065	.109	.133	.179
		I.D.	1.185	1.097	1.049	.957
1 1/4	1.660	Wall	.065	.109	.140	.191
		I.D.	1.530	1.442	1.380	1.278
1 1/2	1.900	Wall	.065	.109	.145	.200
		I.D.	1.770	1.682	1.610	1.500
2	2.375	Wall	.065	.109	.154	.218
		I.D.	2.245	2.157	2.067	1.939
2 1/2	2.875	Wall	.083	.120	.203	.276
		I.D.	2.709	2.635	2.469	2.323
3	3.500	Wall	.083	.120	.216	.300
		I.D.	3.334	3.260	3.068	2.900
3 1/2	4.000	Wall	.083	.120	.226	.318
		I.D.	3.834	3.760	3.548	3.364
4	4.500	Wall	.083	.120	.237	.337
		I.D.	4.334	4.260	4.026	3.826
5	5.563	Wall	.109	.134	.258	.375
		I.D.	5.345	5.295	5.047	4.813
6	6.625	Wall	.109	.134	.280	.432
		I.D.	6.407	6.357	6.065	5.761
8	8.625	Wall	.109	.148	.322	.500
		I.D.	8.407	8.329	7.981	7.625
10	10.750	Wall	.134	.165	.365	.500**
		I.D.	10.482	10.420	10.020	9.750**
12	12.750	Wall	.156	.180	.375**	.500**
		I.D.	12.438	12.390	12.000**	11.750**
14†	14.000	Wall	.156	.188	...	...
		I.D.	13.688	13.624	...	...
16†	16.000	Wall	.165	.188	...	...
		I.D.	15.670	15.624	...	...
18†	18.000	Wall	.165	.188	...	...
		I.D.	17.670	17.624	...	...
20†	20.000	Wall	.188	.218	...	...
		I.D.	19.624	19.564	...	...
24†	24.000	Wall	.218	.250	...	...
		I.D.	23.564	23.500	...	...
30†	30.000	Wall	.250	.312	...	...
		I.D.	29.500	29.376	...	...

All dimensions given in inches.

The wall thicknesses shown represent nominal or average wall dimensions which are subject to a -12 1/2% mill tolerance.

Sizes 14" through 30" are not at publication date covered in B36.19, and dimensions listed are those commonly used in the industry.

\*Schedule 5S and 10S wall thicknesses do not permit threading in accordance with ASA B2.1.

\*\*NOTE THAT SCHEDULE 40S AND SCHEDULE 80S IN THESE SIZES DO NOT AGREE WITH SCHEDULE 40 AND SCHEDULE 80 OF ASA B36.10, AND THAT THEY ARE IDENTICAL TO STANDARD WEIGHT AND EXTRA STRONG RESPECTIVELY OF ASA B36.10.

CHECK LIST FOR ISOMETRICS

<u>ITEMS</u>	<u>DATA'S ORIGIN</u>	<u>REMARKS</u>
Title Block Completed	Line List P&ID's Iso Proc. Notes	
North Arrow Indicated	Iso. Proc. Notes	
All Line Sizes Shown on Iso	P&ID's	
Line Number Indicated	P&ID, Line List	
End Points of Iso's Properly Referenced	Iso Proc. Notes	
All Tagged Items Noted Properly	P&ID's, Iso Proc. Notes	
Insulation Requirements Noted	Line List, Iso Proc. Notes	
Pipe Supports Noted on Isometrics	Stress Dept., Model, Iso Proc. Notes	
All Sloped Lines are Noted Correctly	P&ID	
Elevations Noted	Iso Proc. Notes	
Flanged or Welded End Valves Dimensioned	Iso Proc. Notes, Dim. Charts	
SW or THR'D End Valves Not Dimensioned	Iso Proc. Notes	
All Valve Bonnets and Handles Checked for Clearance and Accessibility	Iso Proc. Notes Ref. Catalogs	
Valve Chain Wheels Noted where Required	Design Notes, Iso Proc. Notes	
Lines Passing Through Platforms Noted	Penetration Worksheets	
Piping Offsets Boxed-In and Angle Noted	Iso Proc. Notes	
Bolt Hole Orientations Noted At Offsets or Angles	Iso Proc. Notes	
Flanges Requiring Jack-Screws Noted	Design Notes, Iso Proc. Notes	
Special Bolting Noted	Iso Proc. Notes	
Flanges at Pumps Reviewed for	Equip. Work Sheets	

CHECK LIST FOR ISOMETRICS

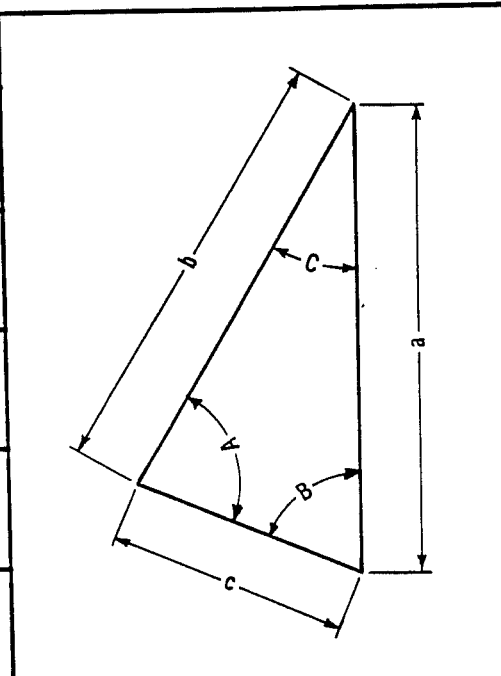
<u>ITEMS</u>	<u>DATA'S ORIGIN</u>	<u>REMARKS</u>
Proper Mating Flanges		
Orifice Requirements Shown Properly	Instr. Dept. Iso Proc. Notes	
Vents and Drains Noted on Isometrics	Design Notes	
Direction of Flow Indicated	P&ID's	
Shop Pieces Do Not Exceed 8' x 8' x 40'	Iso Proc. Notes	
Valves Identified by Code Number	Pipe Spec's	
All Valve Nomenclature Show (CSO, CSC, NC, Etc.)	P&ID's	
Valve Operators Noted	Design Notes, Models, Specs. Iso Proc. Notes	
Out-Of-Spec Material Shown	P&ID's Equip. Worksheets	
Relief Valve Information Shown	Instr. E/R's, Iso Proc. Notes	
Taper-Bores Noted	Iso Proc. Notes	
S.R. Ells Noted	Model	
Initials and Dates Shown Where Required	Iso Proc. Notes	

# Technical Bulletin

## TRIGONOMETRIC FORMULAS FOR OBLIQUE TRIANGLES

NO. 187

TO FIND	GIVEN	FORMULAS
A	B, C	$180^\circ - (B + C)$
Tan A	a, b, C	$\frac{a \times \sin C}{b - (a \times \cos C)}$
Cos A	a, b, c	$\frac{b^2 + c^2 - a^2}{2bc}$
Sin A	a, c, C	$\frac{a \times \sin C}{c}$



FORMULAS	GIVEN	TO FIND
$\frac{a \times \sin C}{\sin A}$	a, A, C	c
$\sqrt{a^2 + b^2 - (2ab \times \cos C)}$	a, b, C	c
$\frac{b \times \sin C}{\sin B}$	b, B, C	c
$180^\circ - (A + B)$	A, B	C

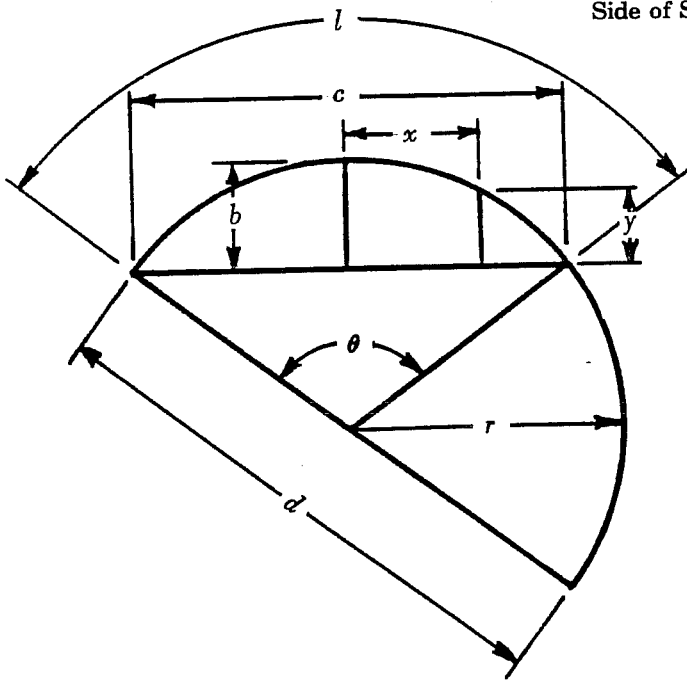
TO FIND	GIVEN	FORMULAS	TO FIND	GIVEN	FORMULAS	TO FIND	GIVEN	TO FIND
Sin A	a, b, B	$\frac{a \times \sin B}{b}$	a	c, A, C	$\frac{c \times \sin A}{\sin C}$	$\frac{c \times \sin A}{a}$	a, c, A	Sin C
Tan A	a, c, B	$\frac{a \times \sin B}{c - (a \times \cos B)}$	a	b, A, B	$\frac{b \times \sin A}{\sin B}$	$\frac{c \times \sin A}{b - (c \times \cos A)}$	b, c, A	Tan C
B	A, C	$180^\circ - (A + C)$	a	b, c, A	$\sqrt{b^2 + c^2 - (2bc \times \cos A)}$	$\frac{c \times \sin B}{b}$	b, c, B	Sin C
Sin B	a, b, A	$\frac{b \times \sin A}{a}$	a	a, A, B	$\frac{a \times \sin B}{\sin A}$	$\frac{c \times \sin B}{a - (c \times \cos B)}$	a, c, B	Tan C
Cos B	a, b, c	$\frac{c^2 + a^2 - b^2}{2ac}$	b	c, B, C	$\frac{c \times \sin B}{\sin C}$	$\frac{a^2 + b^2 - c^2}{2ab}$	a, b, c	Cos C
Tan B	b, c, A	$\frac{b \times \sin A}{c - (b \times \cos A)}$	b	a, b, c	$\frac{ab \times \sin C}{2}$	$\frac{ab \times \sin C}{2}$	a, b, C	Area
Sin B	b, c, C	$\frac{b \times \sin C}{c}$	b	a, b, c	$\sqrt{S(S-a)(S-b)(S-c)}$	$\sqrt{S(S-a)(S-b)(S-c)}$	a, b, c	Area $S = \frac{1}{2}(a+b+c)$

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HOUSTON, TEXAS  
ZIP 77015



Circumference of Circle of Diameter 1 =  $\pi = 3.14159265$   
 Circumference of Circle =  $2\pi r = \pi d$   
 Diameter of Circle = Circumference  $\times 0.31831$   
 Diameter of Circle of equal periphery as square = side  $\times 1.27324$   
 Side of Square of equal periphery as circle = diameter  $\times 0.78540$   
 Diameter of Circle circumscribed about square = side  $\times 1.41421$   
 Side of Square inscribed in Circle = diameter  $\times 0.70711$



$$\text{Arc, } l = \frac{\pi r \theta^\circ}{180} = 0.017453r\theta^\circ$$

$$\text{Angle, } \theta = \frac{180^\circ l}{\pi r} = 57.29578 \frac{l}{r}$$

$$\text{Radius, } r = \frac{4b^2 + c^2}{8b} \quad \text{Diameter, } d = \frac{4b^2 + c^2}{4b}$$

$$\text{Chord, } c = 2\sqrt{2br - b^2} = 2r \sin \frac{\theta}{2} = d \sin \frac{\theta}{2}$$

$$\text{Rise, } b = r - \frac{1}{2}\sqrt{4r^2 - c^2} = \frac{c}{2} \tan \frac{\theta}{4} = 2r \sin^2 \frac{\theta}{4}$$

$$b = r + y - \sqrt{r^2 - x^2}$$

$$x = \sqrt{r^2 - (r + y - b)^2}$$

$$y = b - r + \sqrt{r^2 - x^2}$$

$\pi = 3.14159265$	$\log = 0.4971499$	$\pi^2 = 9.869604$	$\log = 0.994300$
$\frac{1}{\pi} = 0.318310$	$\log = 9.502850 - 10$	$\pi^3 = 31.006277$	$\log = 1.491450$
$\frac{2}{\pi} = 0.636620$	$\log = 9.803880 - 10$	$\frac{1}{\pi^2} = 0.101321$	$\log = 9.005700 - 10$
$\frac{180}{\pi} = 57.295780$	$\log = 1.758123$	$\frac{1}{\pi^3} = 0.032252$	$\log = 8.508557 - 10$
$\frac{\pi}{180} = 0.017453$	$\log = 8.241870 - 10$	$\sqrt{\pi} = 1.772454$	$\log = 0.248575$
		$1/\sqrt{\pi} = 0.564190$	$\log = 9.751425 - 10$
		$\sqrt[3]{\pi} = 1.464592$	$\log = 0.165717$
		$1/\sqrt[3]{\pi} = 0.682784$	$\log = 9.834283 - 10$

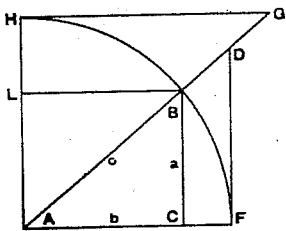
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 ZIP 77015



## TRIGONOMETRIC FORMULAS

### TRIGONOMETRIC FUNCTIONS



Radius AF = 1

$$\sin^2 A + \cos^2 A = \sin A \operatorname{cosec} A = \cos A \sec A = \tan A \cot A$$

Sine A =  $\frac{\cos A}{\cot A} = \frac{1}{\operatorname{cosec} A} = \cos A \tan A = \sqrt{1 - \cos^2 A} = BC$

Cosine A =  $\frac{\sin A}{\tan A} = \frac{1}{\sec A} = \sin A \cot A = \sqrt{1 - \sin^2 A} = AC$

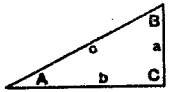
Tangent A =  $\frac{\sin A}{\cos A} = \frac{1}{\cot A} = \sin A \sec A = FD$

Cotangent A =  $\frac{\cos A}{\sin A} = \frac{1}{\tan A} = \cos A \operatorname{cosec} A = HG$

Secant A =  $\frac{\tan A}{\sin A} = \frac{1}{\cos A} = AD$

Cosecant A =  $\frac{\cot A}{\cos A} = \frac{1}{\sin A} = AG$

### RIGHT ANGLED TRIANGLES



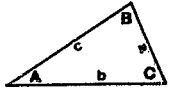
$$a^2 = c^2 - b^2$$

$$b^2 = c^2 - a^2$$

$$c^2 = a^2 + b^2$$

Known	Required					
	A	B	a	b	c	Area
a, b	$\tan A = \frac{a}{b}$	$\tan B = \frac{b}{a}$			$\sqrt{a^2 + b^2}$	$\frac{ab}{2}$
a, c	$\sin A = \frac{a}{c}$	$\cos B = \frac{a}{c}$		$\sqrt{c^2 - a^2}$		$\frac{a \sqrt{c^2 - a^2}}{2}$
A, a		$90^\circ - A$		$a \cot A$	$\frac{a}{\sin A}$	$\frac{a^2 \cot A}{2}$
A, b		$90^\circ - A$	$b \tan A$		$\frac{b}{\cos A}$	$\frac{b^2 \tan A}{2}$
A, c		$90^\circ - A$	$c \sin A$	$c \cos A$		$\frac{c^2 \sin 2A}{4}$

### OBLIQUE ANGLED TRIANGLES



$$s = \frac{a + b + c}{2}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$b^2 = a^2 + c^2 - 2ac \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$

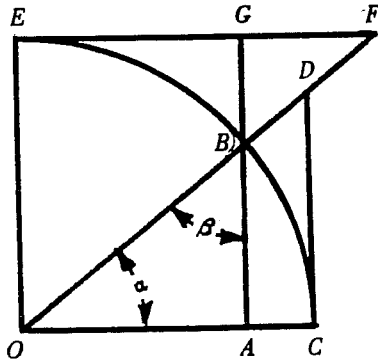
$$K = \sqrt{\frac{(s-a)(s-b)(s-c)}{s}}$$

Known	Required					
	A	B	C	b	c	Area
a, b, c	$\tan \frac{1}{2} A = \frac{K}{s-a}$	$\tan \frac{1}{2} B = \frac{K}{s-b}$	$\tan \frac{1}{2} C = \frac{K}{s-c}$			$\sqrt{s(s-a)(s-b)(s-c)}$
a, A, B			$180^\circ - (A+B)$	$\frac{a \sin B}{\sin A}$	$\frac{a \sin C}{\sin A}$	
a, b, A		$\sin B = \frac{b \sin A}{a}$			$\frac{b \sin C}{\sin B}$	
a, b, C	$\tan A = \frac{a \sin C}{b - a \cos C}$				$\sqrt{a^2 + b^2 - 2ab \cos C}$	$\frac{ab \sin C}{2}$

## DECIMALS OF For each 64th

With Millimeter E

Fraction	1/64ths	Decimal	Millimeters (Approx.)
...	1	.015625	0.397
1/32	2	.03125	0.794
...	3	.046875	1.191
1/16	4	.0625	1.588
...	5	.078125	1.984
3/32	6	.09375	2.381
...	7	.109375	2.778
1/8	8	.125	3.175
...	9	.140625	3.572
5/32	10	.15625	3.969
...	11	.171875	4.366
3/16	12	.1875	4.763
...	13	.203125	5.159
7/32	14	.21875	5.556
...	15	.234375	5.953
1/4	16	.250	6.350
...	17	.265625	6.747
9/32	18	.28125	7.144
...	19	.296875	7.541
5/16	20	.3125	7.938
...	21	.328125	8.334
11/32	22	.34375	8.731
...	23	.359375	9.128
3/8	24	.375	9.525
...	25	.390625	9.922
13/32	26	.40625	10.319
...	27	.421875	10.716
7/16	28	.4375	11.113
...	29	.453125	11.509
15/32	30	.46875	11.906
...	31	.484375	12.303
1/2	32	.500	12.700



$OC=OB=OE=1$   
 $AB=\text{Sin } \alpha$   
 $OA=\text{Cos } \alpha$   
 $CD=\text{Tan } \alpha$   
 $EF=\text{Cot } \alpha$   
 $OD=\text{Sec } \alpha$   
 $OF=\text{Cosec } \alpha$   
 $AC=\text{Vers } \alpha=1-\text{Cos } \alpha$   
 $BG=\text{Covers } \alpha=1-\text{Sin } \alpha$

$$\text{Radius } 1 = \sin^2 \alpha + \cos^2 \alpha = \sin \alpha \text{ cosec } \alpha = \cos \alpha \text{ sec } \alpha = \tan \alpha \cot \alpha$$

$$\sin \alpha = \frac{\cos \alpha}{\cot \alpha} = \frac{1}{\text{cosec } \alpha}$$

$$\cos \alpha = \frac{\sin \alpha}{\tan \alpha} = \frac{1}{\text{sec } \alpha}$$

$$\tan \alpha = \frac{\sin \alpha}{\cos \alpha} = \frac{1}{\cot \alpha} = \sin \alpha \text{ sec } \alpha$$

$$\cot \alpha = \frac{\cos \alpha}{\sin \alpha} = \frac{1}{\tan \alpha} = \cos \alpha \text{ cosec } \alpha$$

$$= \cos \alpha \tan \alpha = \sqrt{1 - \cos^2 \alpha}$$

$$= \sin \alpha \cot \alpha = \sqrt{1 - \sin^2 \alpha}$$

$$\sec \alpha = \frac{\tan \alpha}{\sin \alpha} = \frac{1}{\cos \alpha}$$

$$\text{cosec } \alpha = \frac{\cot \alpha}{\cos \alpha} = \frac{1}{\sin \alpha}$$

$$\sin(\alpha \pm \beta) = \sin \alpha \cos \beta \pm \cos \alpha \sin \beta$$

$$\cos(\alpha \pm \beta) = \cos \alpha \cos \beta \mp \sin \alpha \sin \beta$$

$$\sin \alpha + \sin \beta = 2 \sin \frac{1}{2}(\alpha + \beta) \cos \frac{1}{2}(\alpha - \beta)$$

$$\sin \alpha - \sin \beta = 2 \cos \frac{1}{2}(\alpha + \beta) \sin \frac{1}{2}(\alpha - \beta)$$

$$\cos \alpha + \cos \beta = 2 \cos \frac{1}{2}(\alpha + \beta) \cos \frac{1}{2}(\alpha - \beta)$$

$$\cos \beta - \cos \alpha = 2 \sin \frac{1}{2}(\alpha + \beta) \sin \frac{1}{2}(\alpha - \beta)$$

$$\tan(\alpha \pm \beta) = \frac{\tan \alpha \pm \tan \beta}{1 \mp \tan \alpha \tan \beta}$$

$$\cot(\alpha \pm \beta) = \frac{\cot \alpha \cot \beta \mp 1}{\cot \beta \pm \cot \alpha}$$

$$\tan \alpha + \tan \beta = \frac{\sin(\alpha + \beta)}{\cos \alpha \cos \beta}$$

$$\tan \alpha - \tan \beta = \frac{\sin(\alpha - \beta)}{\cos \alpha \cos \beta}$$

$$\cot \alpha + \cot \beta = \frac{\sin(\beta + \alpha)}{\sin \alpha \sin \beta}$$

$$\cot \alpha - \cot \beta = \frac{\sin(\beta - \alpha)}{\sin \alpha \sin \beta}$$

$$\sin^2 \alpha - \sin^2 \beta = \sin(\alpha + \beta) \sin(\alpha - \beta)$$

$$\frac{\sin \alpha \pm \sin \beta}{\cos \alpha + \cos \beta} = \tan \frac{1}{2}(\alpha \pm \beta)$$

$$\cos^2 \alpha - \sin^2 \beta = \cos(\alpha + \beta) \cos(\alpha - \beta)$$

$$\frac{\sin \alpha \pm \sin \beta}{\cos \beta - \cos \alpha} = \cot \frac{1}{2}(\alpha \mp \beta)$$

$$\sin 2\alpha = 2 \sin \alpha \cos \alpha$$

$$\cos 2\alpha = \cos^2 \alpha - \sin^2 \alpha$$

$$\tan 2\alpha = \frac{2 \tan \alpha}{1 - \tan^2 \alpha}$$

$$\cot 2\alpha = \frac{\cot^2 \alpha - 1}{2 \cot \alpha}$$

$$\sin \frac{1}{2}\alpha = \sqrt{\frac{1 - \cos \alpha}{2}}$$

$$\cos \frac{1}{2}\alpha = \sqrt{\frac{1 + \cos \alpha}{2}}$$

$$\tan \frac{1}{2}\alpha = \frac{\sin \alpha}{1 + \cos \alpha}$$

$$\cot \frac{1}{2}\alpha = \frac{\sin \alpha}{1 - \cos \alpha}$$

$$\sin^2 \alpha = \frac{1 - \cos 2\alpha}{2}$$

$$\cos^2 \alpha = \frac{1 + \cos 2\alpha}{2}$$

$$\tan^2 \alpha = \frac{1 - \cos 2\alpha}{1 + \cos 2\alpha}$$

$$\cot^2 \alpha = \frac{1 + \cos 2\alpha}{1 - \cos 2\alpha}$$

## J. H. JONES CO.

14656 EAST FREEWAY

HOUSTON, TEXAS

ZIP 77015







## 8600 Series Pipe

Very - High Molecular Weight  
High Density Polyethylene

### Dimensions and Pressure Ratings

Nominal Size	SDR	PSI	Dimensions - inches			Coil or joint length	Weight lbs. per 100 ft.	
			Nominal OD	Approx. ID	Min. Wall			
3/4"	9.33	190	1.050	0.824	0.113	300	14	
	11.0	160		0.860	0.095		500	12
1"	9.33	190	1.315	1.033	0.141	300	22	
	11.0	160		1.075	0.120		500	19
1-1/4"	9.33	190	1.660	1.304	0.178	500	35	
	11.0	160		1.348	0.151		500	31
1-1/2"	11.0	160	1.900	1.554	0.173	500	40	
	13.1s	110		1.610	0.145		500	34
2"	9.33	190	2.375	1.865	0.255	350	72	
	11.0	160		1.943	0.216		350	62
	15.5s	110		2.069	0.153		300	46
3"	9.33	190	3.500	2.750	0.375	40	157	
	11.0	160		2.864	0.318		135	
	16.0s	107		3.068	0.216		96	
	35.0	47		3.300	0.100		46	
4"	9.33	190	4.500	3.536	0.482	40	259	
	11.0	160		3.682	0.409		224	
	15.5	110		3.920	0.290		164	
	19.0s	89		4.026	0.237		135	
	30.0	55		4.200	0.150		88	
5"	11.0	160	5.563	4.551	0.506	40	342	
	21.5s	78		5.047	0.258		184	
	32.5	51		4.926	0.162		111	
6"	9.33	190	6.625	5.205	0.710	40	562	
	11.0	160		5.421	0.602		485	
	15.5	110		5.771	0.427		355	
	23.5s	71		6.065	0.280		240	
	32.5	51		6.217	0.204		176	
7"	18.0s	94	7.125	6.333	0.396	40	357	
8"	8.3	220	8.625	6.547	1.039	40	1054	
	11.0	160		7.057	0.784		823	
	15.5	110		7.513	0.556		601	
	27.0s	62		7.981	0.322		355	
	32.5	51		8.095	0.265		297	
10"	11.0	160	10.750	8.796	0.977	40	1278	
	15.5	110		9.362	0.694		935	
	25.3	65		9.900	0.425		588	
	29.5s	56		10.022	0.364		507	
	32.5	51		10.088	0.331		463	

(s) denotes Schedule 40

Nominal Size	SDR	PSI	Dimensions - inches			Coil or joint length	Weight lbs. per 100 ft.
			Nominal OD	Approx. ID	Min. wall		
12"	11.0	160	12.750	10.432	1.159	40	1798
	15.5	110		11.104	0.823		1315
	31.5s	52		11.940	0.405		671
14"	7.3	254	14.000	10.164	1.918	40	3096
	11.0	160		11.454	1.273		2169
	15.5	110		12.194	0.903		1584
	21.0	80		12.666	0.667		1192
	32.5s	51		13.138	0.431		784
16"	11.0	160	16.000	13.090	1.455	40	2833
	15.5	110		13.936	1.032		2069
	32.0s	52		15.000	0.500		1039
18"	7.3	254	18.000	13.068	2.466	40	5118
	11.0	160		14.728	1.636		3583
	15.5	110		15.678	1.161		2619
	32.5	51		16.892	0.554		1296
20"	25.3	65	20.000	18.418	0.791	40	2037
	32.5	51		18.770	0.615		1599
22"	11.0	160	21.500	17.590	1.955	40	5114
	15.5	110		18.726	1.387		3737
	32.5	51		20.176	0.662		1850
24"	11.0	160	24.000	19.636	2.182	40	6372
	15.5	110		20.904	1.548		4656
	25.3	65		22.102	0.949		2933
	32.5	51		22.524	0.738		2303
27"	11.0	160	27.000	22.090	2.455	40	8065
28" (710mm)	25.3	65	27.953	25.743	1.105	40	3978
	32.5	51		26.233	0.860		3125
32" (800mm)	32.5	51	31.496	29.558	0.969	40	3967
36"	21.0	65	36.000	32.572	1.714	40	7878
	32.5	51		33.784	1.108		5185
42"	32.5	51	42.000	39.416	1.292	40	7054
48" (1200mm)	26.0	65	47.244	43.610	1.817	40	11068
	32.5	51		44.336	1.454		8930

*s denotes Schedule 40*

Approximate ID = Nominal OD minus (2 times Minimum Wall) or  
 Approximate ID = Dp minus 2 t

$$\text{SDR (Standard Dimension Ratio)} = \frac{\text{OD}}{\text{min. wall}} \quad \text{or} \quad \text{SDR} = \frac{\text{Dp}}{t}$$

Pressure rating computed on the basis of:  $P = \frac{2S}{\text{SDR}-1} @ 73.4^\circ \text{F}$

Where:

Dp = Nominal OD of Pipe, inches

t = Minimum Wall Thickness

S = Hydrostatic Design Stress, (800 psi)

P = Pressure Rating, psi @ 73.4° F



**PHILLIPS DRISCOPE, INC.**  
 A SUBSIDIARY OF PHILLIPS 66 COMPANY

December 15, 1988



# Dimensions and Pressure Ratings

## 1 0 0 0 Series Pipe



Size	SDR	PSI @73.4	Weight lbs.	Dimensions - inches		
				Nominal O D	Approx. I D	Min. Wall
2"	11	160	.62	2.375	1.865	.255
	13.5	128	.52		2.023	.176
	15.5	110	.46		2.069	.153
	17	100	.42		2.095	.140

Size	SDR	PSI @73.4	Weight lbs.	Dimensions - inches		
				Nominal O D	Approx. I D	Min. Wall
3"	7	267	2.00	3.500	2.500	.500
	9	200	1.62		2.722	.389
	11	160	1.35		2.864	.318
	13.5	128	1.12		2.982	.259
3"	15.5	110	.99	3.048	3.048	.226
	17	100	.91		3.088	.206
	19	89	.82		3.132	.184
	21	80	.74		3.166	.167
32.5	26	64	.61	3.230	3.230	.135
	32.5	51	.49		3.284	.108

Size	SDR	PSI @73.4	Weight lbs.	Dimensions - inches		
				Nominal O D	Approx. I D	Min. Wall
4"	7	267	3.31	4.500	3.214	.643
	9	200	2.67		3.500	.500
	11	160	2.23		3.682	.409
	13.5	128	1.85		3.834	.333
4"	15.5	110	1.63	3.920	3.920	.290
	17	100	1.50		3.970	.265
	19	89	1.35		4.026	.237
	21	80	1.23		4.072	.214
32.5	26	64	1.00	4.154	4.154	.173
	32.5	51	.81		4.224	.138

Size	SDR	PSI @73.4	Weight lbs.	Dimensions - inches		
				Nominal O D	Approx. I D	Min. Wall
5-3/8"	21	80	1.75	5.375	4.863	.256
	26	64	1.43		4.961	.207
	32.5	51	1.15		5.045	.165

Size	SDR	PSI @73.4	Weight lbs.	Dimensions - inches		
				Nominal O D	Approx. I D	Min. Wall
5"	7	267	5.05	5.563	3.973	.795
	9	200	4.08		4.327	.618
	11	160	3.42		4.551	.506
	13.5	128	2.84		4.739	.412
5"	15.5	110	2.50	4.845	4.845	.359
	17	100	2.29		4.909	.327
	19	89	2.07		4.977	.293
	21	80	1.88		5.033	.265
32.5	26	64	1.53	5.135	5.135	.214
	32.5	51	1.23		5.221	.171

Size	SDR	PSI @73.4	Weight lbs.	Dimensions - inches		
				Nominal O D	Approx. I D	Min. Wall
6"	7	267	7.16	6.625	4.733	.946
	9	200	5.78		5.153	.736
	11	160	4.84		5.421	.602
	13.5	128	4.03		5.643	.491
6"	15.5	110	3.54	5.771	5.771	.427
	17	100	3.25		5.845	.390
	19	89	2.93		5.927	.349
	21	80	2.66		5.995	.315
32.5	26	64	2.17	6.115	6.115	.255
	32.5	51	1.75		6.217	.204

Size	SDR	PSI @73.4	Weight lbs.	Dimensions - inches		
				Nominal O D	Approx. I D	Min. Wall
7"	7	267	8.29	7.125	5.089	1.018
	9	200	6.69		5.541	.792
	11	160	5.61		5.829	.648
	13.5	128	4.66		6.069	.528
7"	15.5	110	4.10	6.205	6.205	.460
	17	100	3.76		6.287	.419
	19	89	3.39		6.375	.375
	21	80	3.08		6.445	.340
32.5	26	64	2.51	6.577	6.577	.274
	32.5	51	2.02		6.685	.220

Size	SDR	PSI @73.4	Weight lbs.	Dimensions - inches		
				Nominal O D	Approx. I D	Min. Wall
8"	7	267	12.14	8.625	6.161	1.232
	9	200	9.80		6.709	.958
	11	160	8.21		7.057	.784
	13.5	128	6.82		7.347	.639
8"	15.5	110	6.00	7.513	7.513	.556
	17	100	5.50		7.611	.507
	19	89	4.96		7.717	.454
	21	80	4.52		7.803	.411
32.5	26	64	3.68	7.961	7.961	.332
	32.5	51	2.97		8.095	.265

Size	SDR	PSI @73.4	Weight lbs.	Dimensions - inches		
				Nominal O D	Approx. I D	Min. Wall
10"	7	267	18.86	10.750	7.678	1.536
	9	200	15.23		8.362	1.194
	11	160	12.75		8.796	.977
	13.5	128	10.59		9.158	.796
10"	15.5	110	9.33	9.362	9.362	.694
	17	100	8.55		9.486	.632
	19	89	7.71		9.618	.566
	21	80	7.01		9.726	.512
32.5	26	64	5.71	9.924	9.924	.413
	32.5	51	4.62		10.088	.331

Size	SDR	PSI @73.4	Weight lbs.	Dimensions - inches		
				Nominal O D	Approx. I D	Min. Wall
12"	7	267	26.53	12.750	9.108	1.821
	9	200	21.44		9.916	1.417
	11	160	17.94		10.432	1.159
	13.5	128	14.89		10.862	.944
12"	15.5	110	13.12	11.104	11.104	.823
	17	100	12.03		11.250	.750
	19	89	10.84		11.408	.671
	21	80	9.86		11.536	.607
32.5	26	64	8.04	11.770	11.770	.490
	32.5	51	6.48		11.966	.392

Size	SDR	PSI @73.4	Weight lbs.	Dimensions - inches		
				Nominal O D	Approx. I D	Min. Wall
13"	7	267	29.24	13.386	9.562	1.912
	9	200	23.62		10.412	1.487
	11	160	19.78		10.952	1.217
	13.5	128	16.43		11.402	.992
13"	15.5	110	14.46	11.658	11.658	.864
	17	100	13.26		11.812	.787
	19	89	11.96		11.976	.705
	21	80	10.86		12.112	.637
32.5	26	64	8.87	12.356	12.356	.515
	32.5	51	7.15		12.562	.412

Size	SDR	PSI @73.4	Weight lbs.	Dimensions - inches		
				Nominal O D	Approx. I D	Min. Wall
14"	7	267	31.99	14.000	10.000	2.000
	9	200	25.84		10.888	1.556
	11	160	21.64		11.454	1.273
	13.5	128	17.97		11.926	1.037
14"	15.5	110	15.81	12.194	12.194	.903
	17	100	14.52		12.352	.824
	19	89	13.07		12.526	.737
	21	80	11.90		12.666	.667
32.5	26	64	9.69	12.924	12.924	.538
	32.5	51	7.83		13.138	.431

Size	SDR	PSI @73.4	Weight lbs.	Dimensions - inches		
				Nominal O D	Approx. I D	Min. Wall
16"	9	200	33.75	16.000	12.444	1.778
	11	160	28.27		13.090	1.455
	13.5	128	23.46		13.630	1.185
	15.5	110	20.65		13.936	1.032
16"	17	100	18.95	14.118	14.118	.941
	19	89	17.07		14.316	.842
	21	80	15.53		14.476	.762
	26	64	12.66		14.770	.615
32.5	51	10.21	15.016	15.016	.492	

# Dimensions and Pressure Ratings for 1 0 0 0 series Pipe

Size	SDR	PSI @73.4	Weight lbs.	Dimensions - inches		
				Nominal O D	Approx. I D	Min. Wall
18"	11	160	35.76	18.000	14.728	1.636
	13.5	128	29.69		15.334	1.333
	15.5	110	26.14		15.678	1.161
	17	100	23.99		15.882	1.059
	19	89	21.60		16.106	0.947
	21	80	19.65		16.286	0.857
	26	64	16.03		16.616	0.692
32.5	51	12.94	16.892	0.554		
20"	11	160	44.15	20.000	16.364	1.818
	13.5	128	36.66		17.038	1.481
	15.5	110	32.27		17.420	1.290
	17	100	29.60		17.648	1.176
	19	89	26.68		17.894	1.053
	21	80	24.26		18.096	0.952
	26	64	19.79		18.462	0.769
32.5	51	15.96	18.770	0.615		
21.5"	11	160	51.04	21.500	17.590	1.955
	13.5	128	42.38		18.314	1.593
	15.5	110	37.30		18.726	1.387
	17	100	34.23		18.970	1.265
	19	89	30.84		19.236	1.132
	21	80	28.05		19.452	1.024
	26	64	22.88		19.846	0.827
32.5	51	18.46	20.176	0.662		
22"	11	160	53.43	22.000	18.000	2.000
	13.5	128	44.38		18.740	1.630
	15.5	110	39.04		19.162	1.419
	17	100	35.83		19.412	1.294
	19	89	32.28		19.684	1.158
	21	80	29.37		19.904	1.048
	26	64	23.95		20.308	0.846
32.5	51	19.32	20.646	0.677		
24"	11	160	63.59	24.000	19.636	2.182
	13.5	128	52.81		20.444	1.778
	15.5	110	46.47		20.904	1.548
	17	100	42.65		21.176	1.412
	19	89	38.41		21.474	1.263
	21	80	34.95		21.714	1.143
	26	64	28.50		22.154	0.923
32.5	51	22.98	22.524	0.738		
26"	11	160	74.63	26.000	21.272	2.364
	13.5	128	61.97		22.148	1.926
	15.5	110	54.55		22.646	1.677
	17	100	50.03		22.942	1.529
	19	89	45.07		23.264	1.368
	21	80	41.01		23.524	1.238
	26	64	33.45		24.000	1.000
32.5	51	26.98	24.400	0.800		
28"	11	160	86.55	28.000	22.910	2.545
	13.5	128	71.86		23.852	2.074
	15.5	110	63.26		24.388	1.806
	17	100	58.04		24.706	1.647
	19	89	52.29		25.052	1.474
	21	80	47.55		25.334	1.333
	26	64	38.80		25.846	1.077
32.5	51	31.31	26.276	0.862		

Size	SDR	PSI @73.4	Weight lbs.	Dimensions - inches				
				Nominal O D	Approx. I D	Min. Wall		
30"	11	160	99.34	30.000	24.546	2.727		
	13.5	128	82.50		25.556	2.222		
	15.5	110	72.62		26.130	1.935		
	17	100	66.64		26.470	1.765		
	19	89	60.02		26.842	1.579		
	21	80	54.61		27.142	1.429		
	26	64	44.54		27.692	1.154		
32.5	51	35.92	28.154	0.923				
800 mm	13.5	128	90.93	31.496	26.830	2.333		
	15.5	110	80.04		27.432	2.032		
	17	100	73.45		27.790	1.853		
	19	89	66.17		28.180	1.658		
	21	80	60.19		28.496	1.500		
	26	64	49.07		29.074	1.211		
	32.5	51	39.59		29.558	0.969		
32"	13.5	128	93.87	32.000	27.260	2.370		
	15.5	110	82.64		27.870	2.065		
	17	100	75.79		28.236	1.882		
	19	89	68.28		28.632	1.684		
	21	80	62.13		28.952	1.524		
	26	64	50.68		29.538	1.231		
	32.5	51	40.89		30.030	0.985		
34"	13.5	128	105.98	34.000	28.962	2.519		
	15.5	110	93.29		29.612	2.194		
	17	100	85.58		30.000	2.000		
	19	89	77.07		30.422	1.789		
	21	80	70.13		30.762	1.619		
	26	64	57.22		31.384	1.308		
	32.5	51	46.14		31.908	1.046		
36"	13.5	128	118.81	36.000	30.666	2.667		
	15.5	110	104.57		31.354	2.323		
	17	100	95.96		31.764	2.118		
	19	89	86.44		32.210	1.895		
	21	80	78.61		32.572	1.714		
	26	64	64.15		33.230	1.385		
	32.5	51	51.74		33.784	1.108		
1000 mm	17	100	114.75	39.370	34.738	2.316		
	19	89	103.36		35.226	2.072		
	21	80	94.04		35.620	1.875		
	26	64	76.69		36.342	1.514		
	32.5	51	61.85		36.948	1.211		
	42"	17	100		130.61	42.000	37.058	2.471
		19	89		117.66		37.578	2.211
21		80	107.01	38.000	2.000			
26		64	87.27	38.770	1.615			
32.5		51	70.39	39.416	1.292			
1200 mm		17	100	165.23	47.244		41.686	2.779
		19	89	148.87			42.270	2.487
	21	80	135.42	42.744		2.250		
	26	64	110.45	43.610		1.817		
	32.5	51	89.11	44.336		1.454		

Approximate ID = Nominal OD -- (2 times Min.Wall)

SDR (Standard Dimension Ratio) =  $\frac{OD}{min. wall}$

Pressure rating =  $\frac{2s}{SDR-1}$  @ 73.4 deg. F

s = hydrostatic design stress (800 psi)



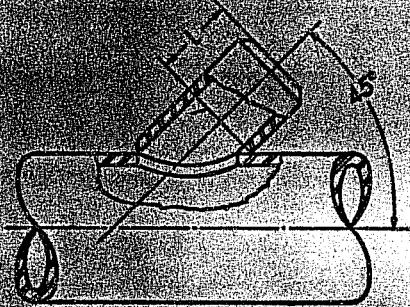
**PHILLIPS DRISCOPIPE, INC.**  
A SUBSIDIARY OF PHILLIPS 66 COMPANY





# TUBE-TURN

Welding Fittings



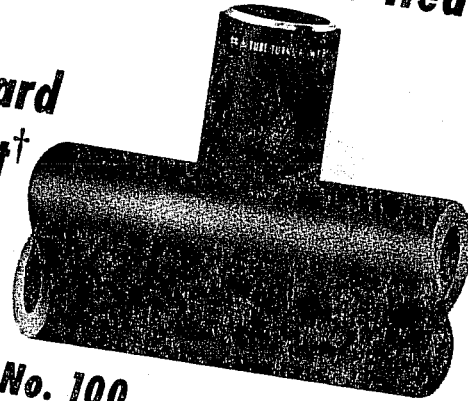
ASTM A234

# SHAPED NIPPLES

90° and 45° to Header

Standard Weight†

Extra Strong†



90° Part No. 100  
45° Part No. 102

90° Part No. 101  
45° Part No. 103

NOMINAL PIPE SIZE	SHAPED TO FIT HEADER SIZES	LENGTH L	APPROX. WT. LBS.		APPROX. WT. LBS.		LIST PRICE
			90° Standard Wt. PART No. 100	90° Extra Strong PART No. 101	45° Standard Wt. PART No. 102	45° Extra Strong PART No. 103	
2	2 to 24	3	1.1	1.5	1.4	2.0	
2½	2½ to 24	3	1.6	2.1	2.0	2.6	
3	3 to 24	3	2.1	3.0	3.1	4.0	
3½	3½ to 24	3	2.8	3.5	3.8	5.0	
4	4 to 24	4	4.3	5.5	5.3	7.5	
5	5 to 24	4	6.0	9.0	8.0	12	
6	6 to 24	4	8.0	12.0	12.0	17	
8	8 to 24	4	13	19.0	20.0	29	
10	10 to 24	5	23	31.0	35.0	47	
12	12 to 24	5	30	38.0	46.0	60	

All dimensions are in inches.

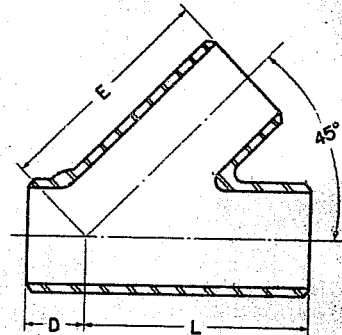
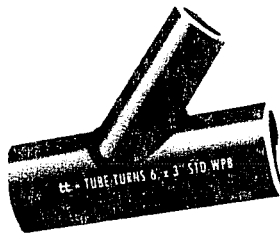
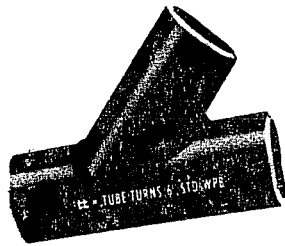
\* Grade B fittings are available from stock.

† All wall thicknesses are in accordance with ANSI B36.10.

Both ends are properly beveled, and shaped ends are accurately formed to follow the contour of the header pipe. Other sizes, thicknesses and lengths are available on request. For Dimensional Tolerances see page 92.

# WELDING LATERALS

STRAIGHT      REDUCING OUTLET



Standard Weight — Part Nos. 26 and 26-A  
 Extra Strong — Part Nos. 27 and 27-A

ASTM A234\*

NOMINAL PIPE SIZE	MADE FROM STANDARD WALL PIPE†				MADE FROM EXTRA STRONG WALL PIPE†					
	DIMENSIONS		APPROX. WT. IN POUNDS	LIST PRICE		DIMENSIONS		APPROX. WT. IN POUNDS	LIST PRICE	
	L and E	D		STRAIGHT PART 26	REDUCING PART 26-A	L and E	D		STRAIGHT PART 27	REDUCING PART 27-A
1	3½	1¼	1.08		3½	1¼	1.39			
1¼	4¼	2	1.73		4¼	2	2.30			
1½	5	2½	2.48		5	2½	3.33			
2	6	3¼	4.0		6	3¼	5.6			
2½	7	3½	7.3		7	3½	9.7			
3	7¾	3¾	10.2		7¾	3¾	13.9			
3½	8¾	4	13.2		8¾	4	18.1			
4	8½	4½	15.9		8½	4½	22.2			
5	11	4¾	26.8		11	4¾	38.3			
6	12½	5¼	38		12½	5¼	58			
8	15¼	6¼	69		15¼	6¼	107			
10	18	7	114		18	7	154			
12	21½	8	166		21½	8	219			
14	25	10	218		25	10	289			
16	28½	12	288		28½	12	381			
18	32	13	361		32	13	479			
20	35	14	435		35	14	580			
24	41¼	16¼	613		41¼	16¼	817			

All dimensions are in inches.

\* Grade B fittings are available from stock.

Dimensions of Reducing Outlet, and prices and dimensions of laterals made from Schedule 190 and Double Extra Strong Wall Pipe on request.

Parts No. 26 and 26-A fabricated from seamless Standard Wall Pipe. Parts No. 27 and 27-A fabricated from seamless Extra Strong Wall Pipe. The working pressure of any fabricated

lateral must be rated at only 40% of the allowable working pressure established for the pipe from which the lateral is made. Dimensions and prices of 100% strength laterals will be furnished on request.

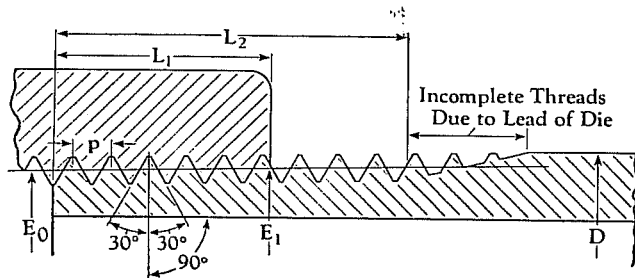
All wall thicknesses are in accordance with ANSI B39.10.

For Dimensional Tolerances see page 92.

For bevel detail see page 93.

# American Standard Taper Pipe Threads (NPT)

A

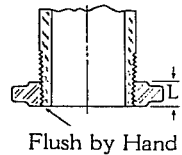


$$E_0 = D - (0.050D + 1.1)p$$

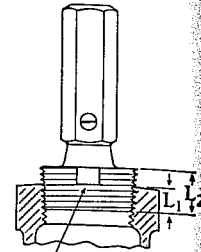
$$E_1 = E_0 + 0.0625 L_1$$

$$L_2 = (0.80D + 6.8)p$$

$p$  = Pitch  
 Depth of thread = 0.80 $p$   
 Total Taper  $\frac{3}{4}$ -inch per Foot



**Tolerance on Product**  
 One turn large or small from notch on plug gauge or face of ring gauge.



Notch flush with face of fitting. If chamfered, notch flush with bottom of chamfer.

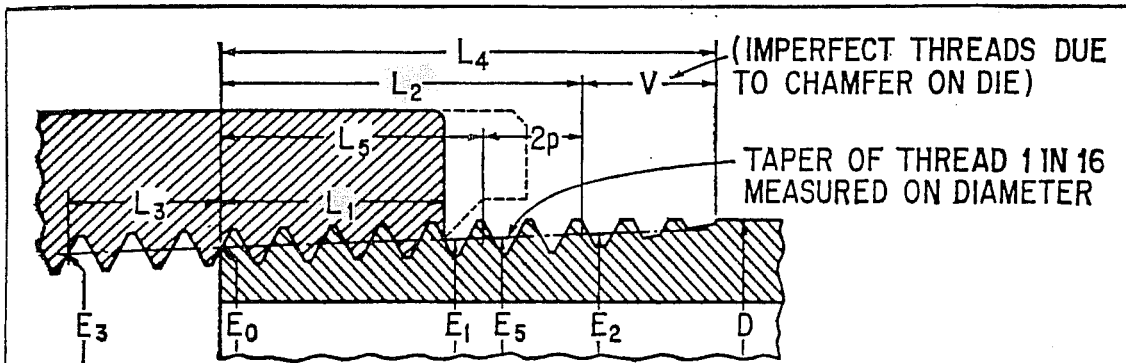
**Dimensions, in Inches**

Nominal pipe size	D Outside diameter of pipe	$E_0$ Pitch diameter at end of external thread	$E_1$ † Pitch diameter at end of internal thread	$L_1$ ‡ Normal engagement by hand between external and internal threads	$L_2$ § Length of effective thread	$p$ Pitch of thread	Depth of thread	Number of threads  Per Inch
$\frac{1}{8}$	0.405	0.36351	0.37476	0.180	0.2639	0.03704	0.02963	27
$\frac{1}{4}$	0.540	0.47739	0.48989	0.200	0.4018	0.05556	0.04444	18
$\frac{3}{8}$	0.675	0.61201	0.62701	0.240	0.4078	0.05556	0.04444	18
$\frac{1}{2}$	0.840	0.75843	0.77843	0.320	0.5337	0.07143	0.05714	14
$\frac{3}{4}$	1.050	0.96768	0.98887	0.339	0.5457	0.07143	0.05714	14
1	1.315	1.21363	1.23863	0.400	0.6828	0.08696	0.06957	11½
1¼	1.660	1.55713	1.58338	0.420	0.7068	0.08696	0.06957	11½
1½	1.900	1.79609	1.82234	0.420	0.7235	0.08696	0.06957	11½
2	2.375	2.26902	2.29627	0.436	0.7565	0.08696	0.06957	11½
2½	2.875	2.71953	2.76216	0.682	1.1375	0.12500	0.10000	8
3	3.500	3.34062	3.38850	0.766	1.2000	0.12500	0.10000	8
3½	4.000	3.83750	3.88881	0.821	1.2500	0.12500	0.10000	8
4	4.500	4.33438	4.38712	0.844	1.3000	0.12500	0.10000	8
5	5.563	5.39073	5.44929	0.937	1.4063	0.12500	0.10000	8
6	6.625	6.44609	6.50597	0.958	1.5125	0.12500	0.10000	8
8	8.625	8.43359	8.50003	1.063	1.7125	0.12500	0.10000	8
10	10.750	10.54531	10.62094	1.210	1.9250	0.12500	0.10000	8
12	12.750	12.53281	12.61781	1.360	2.1250	0.12500	0.10000	8
14 O.D.	14.000	13.77500	13.87262	1.562	2.2500	0.12500	0.10000	8
16 O.D.	16.000	15.76250	15.87575	1.812	2.4500	0.12500	0.10000	8
18 O.D.	18.000	17.75000	17.87500	2.000	2.6500	0.12500	0.10000	8
20 O.D.	20.000	19.73750	19.87031	2.125	2.8500	0.12500	0.10000	8
24 O.D.	24.000	23.71250	23.86094	2.375	3.2500	0.12500	0.10000	8

Nominal pipe size	Number of threads per inch
$\frac{1}{8}$	27
$\frac{1}{4}$	18
$\frac{3}{8}$	18
$\frac{1}{2}$	14
$\frac{3}{4}$	14
1	11½
1¼	11½
1½	11½
2	11½
2½	8
3	8
3½	8
4	8
5	8
6	8
8	8
10	8
12	8

†Also pitch diameter at gauging notch.  
 §Also length of plug gauge.  
 ¶Also length of ring gauge, and length from gauging notch to small end of plug gauge

Table 3. Basic Dimensions, American National Standard Taper Pipe Threads,<sup>1</sup> NPT (ANSI B2.1-1968)



For all dimensions see corresponding reference letters in table.

Angle between sides of thread is 60 degrees. Taper of thread, on diameter, is  $\frac{3}{4}$  inch per foot. Angle of taper with centerline is  $1^\circ 47'$ .

The basic maximum thread height,  $h$ , of the truncated thread is  $0.8 \times$  pitch of thread. The crest and root are truncated a minimum of  $0.033 \times$  pitch for all pitches. For maximum depth of truncation see Table 1.

Nominal Pipe Size	Outside Diam. of Pipe, $D$	Threads per Inch, $n$	Pitch of Thread, $p$	Pitch Diameter at Beginning of External Thread, $E_0$	Handtight Engagement		Effective Thread, External	
					Length, <sup>2</sup> $L_1$	Diam., <sup>3</sup> $E_1$	Length, <sup>4</sup> $L_2$	Diam., $E_2$
					In.	In.	In.	In.
$\frac{1}{16}$	0.3125	27	0.03704	0.27118	0.160	0.28118	0.2611	0.28750
$\frac{1}{8}$	0.405	27	0.03704	0.36351	0.1615	0.37360	0.2639	0.38000
$\frac{1}{4}$	0.540	18	0.05556	0.47739	0.2278	0.49163	0.4018	0.50250
$\frac{3}{8}$	0.675	18	0.05556	0.61201	0.240	0.62701	0.4078	0.63750
$\frac{1}{2}$	0.840	14	0.07143	0.75843	0.320	0.77843	0.5337	0.79179
$\frac{3}{4}$	1.050	14	0.07143	0.96768	0.339	0.98887	0.5457	1.00179
1	1.315	11½	0.08696	1.21363	0.400	1.23863	0.6828	1.25630
1¼	1.660	11½	0.08696	1.55713	0.420	1.58338	0.7068	1.60130
1½	1.900	11½	0.08696	1.79609	0.420	1.82234	0.7235	1.84130
2	2.375	11½	0.08696	2.26902	0.436	2.29627	0.7565	2.31630
2½	2.875	8	0.12500	2.71953	0.682	2.76216	1.1375	2.79062
3	3.500	8	0.12500	3.34062	0.766	3.38850	1.2000	3.41562
3½	4.000	8	0.12500	3.83750	0.821	3.88881	1.2500	3.91562
4	4.500	8	0.12500	4.33438	0.844	4.38712	1.3000	4.41562
5	5.563	8	0.12500	5.39073	0.937	5.44929	1.4063	5.47862
6	6.625	8	0.12500	6.44609	0.958	6.50597	1.5125	6.54062
8	8.625	8	0.12500	8.43359	1.063	8.50003	1.7125	8.54062
10	10.750	8	0.12500	10.54531	1.210	10.62094	1.9250	10.66562
12	12.750	8	0.12500	12.53281	1.360	12.61781	2.1250	12.66562
14 OD	14.000	8	0.12500	13.77500	1.562	13.87262	2.2500	13.91562
16 OD	16.000	8	0.12500	15.76250	1.812	15.87575	2.4500	15.91562
18 OD	18.000	8	0.12500	17.75000	2.000	17.87500	2.6500	17.91562
20 OD	20.000	8	0.12500	19.73750	2.125	19.87031	2.8500	19.91562
24 OD	24.000	8	0.12500	23.71250	2.375	23.86094	3.2500	23.91562

All dimensions given in inches.

<sup>1</sup> The basic dimensions of the ANSI Standard Taper Pipe Thread are given in inches to four or five decimal places. While this implies a greater degree of precision than is ordinarily attained, these dimensions are the basis of gage dimensions and are so expressed for the purpose of eliminating errors in computations.

<sup>2</sup> Also length of thin ring gage and length from gaging notch to small end of plug gage.

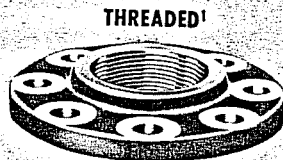
<sup>3</sup> Also pitch diameter at gaging notch (handtight plane).

<sup>4</sup> Also length of plug gage.

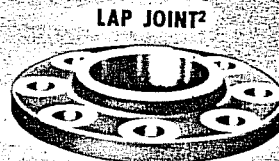




Part No. 50



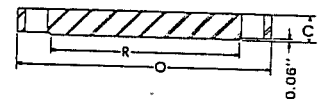
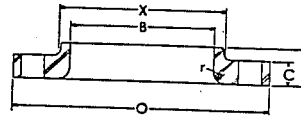
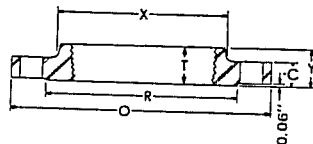
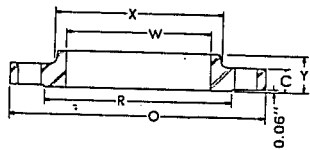
Part No. 60



Part No. 110



Part No. 70



ANSI B16.5    ASTM A105<sup>▲</sup>

NOMINAL PIPE SIZE	OUTSIDE DIAM. OF FLANGE O	THICK. OF FLANGE C	DIAM. OF RAISED FACE R	DIAM. OF HUB AT BASE X	LENGTH THRU HUB <sup>5</sup>			MINIMUM THREAD <sup>7</sup> LENGTH T	DIAM. OF BORE			DIAM. OF HUB AT BEVEL H <sup>10</sup>	RADIUS OF FILLET r	DEPTH OF SOCKET Z
					WELDING NECK Y	SLIP-ON, <sup>6</sup> THREADED, SOCKET Y	LAP JOINT Y		WELDING NECK, <sup>8</sup> SOCKET J	SLIP-ON, SOCKET W	LAP JOINT B			
1/2	3.50	0.44	1.38	1.19	1.88	0.62	0.62	0.62	0.62	0.88	0.90	0.84	0.12	0.38
3/4	3.88	0.50	1.69	1.50	2.06	0.62	0.62	0.62	0.82	1.09	1.11	1.05	0.12	0.44
1	4.25	0.56	2.00	1.94	2.19	0.69	0.69	0.69	1.05	1.36	1.38	1.32	0.12	0.50
1-1/4	4.62	0.62	2.50	2.31	2.25	0.81	0.81	0.81	1.38	1.70	1.72	1.66	0.19	0.56
1-1/2	5.00	0.69	2.88	2.56	2.44	0.88	0.88	0.88	1.61	1.95	1.97	1.90	0.25	0.62
2	6.00	0.75	3.62	3.06	2.50	1.00	1.00	1.00	2.07	2.44	2.46	2.38	0.31	0.69
2-1/2	7.00	0.88	4.12	3.56	2.75	1.12	1.12	1.12	2.47	2.94	2.97	2.88	0.31	0.75
3	7.50	0.94	5.00	4.25	2.75	1.19	1.19	1.19	3.07	3.57	3.60	3.50	0.38	0.81
3-1/2	8.50	0.94	5.50	4.81	2.81	1.25	1.25	1.25	3.55	4.07	4.10	4.00	0.38	0.88
4	9.00	0.94	6.19	5.31	3.00	1.31	1.31	1.31	4.03	4.57	4.60	4.50	0.44	0.94
5	10.00	0.94	7.31	6.44	3.50	1.44	1.44	1.44	5.05	5.66	5.69	5.56	0.44	0.94
6	11.00	1.00	8.50	7.56	3.50	1.56	1.56	1.56	6.07	6.72	6.75	6.63	0.50	1.06
8	13.50	1.12	10.62	9.69	4.00	1.75	1.75	1.75	7.98	8.72	8.75	8.63	0.50	1.25
10	16.00	1.19	12.75	12.00	4.00	1.94	1.94	1.94	10.02	10.88	10.92	10.75	0.50	1.31
12	19.00	1.25	15.00	14.38	4.50	2.19	2.19	2.19	12.00	12.88	12.92	12.75	0.50	1.56
14	21.00	1.38	16.25	15.75	5.00	2.25	2.25	2.25	13.25*	14.14	14.14	14.00	SEE NOTE 2	1.62
16	23.50	1.44	18.50	18.00	5.00	2.50	2.50	2.50	15.25*	16.16	16.16	16.00	SEE NOTE 2	1.75
18	25.00	1.56	21.00	19.88	5.50	2.69	2.69	2.69	17.25*	18.18	18.18	18.00	SEE NOTE 2	1.94
20	27.50	1.69	23.00	22.00	5.69	2.88	2.88	2.88	19.25*	20.20	20.20	20.00	SEE NOTE 2	2.12
24	32.00	1.88	27.25	26.12	6.00	3.25	3.25	3.25	23.25*	24.25	24.25	24.00	SEE NOTE 2	2.50

All dimensions are in inches. Prices on application.

▲ Flanges are carbon steel A105 unless specified otherwise (same as ASME Boiler Construction Code SA105). For stainless steels, aluminum and other alloys see page 180.

Flanges are furnished faced, drilled and spot faced or back faced. For standard facings see pages 112 & 113.

For Large Diameter ANSI Type Flanges and Pressure Vessel Flanges see pages 156 through 170.

(1) Flange dimensions and drilling are in accordance with ANSI B16.5.

(2) Lap joint flanges 10" and larger are stocked to slip-on dimensions. ANSI type also available.

(3) Socket type flanges conform to ANSI B16.5 for sizes 1/2 thru 3". Other sizes conform to dimensions of slip-on flanges except for alteration of the bore to provide the socket.

(4) Slip-on and threaded reducing flanges are designated by the size of the tapping or nominal pipe size of the bore and the outside diameter of the flange. Other dimensions are same as straight sizes. Reducing welding neck flanges available on application.

(5) The 0.06" raised face is included in thickness "C" and length thru hub "Y".

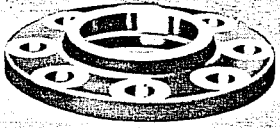
(6) Blind flanges 1/2" through 2 1/2" are furnished with hubs, having outside diameter and height the same as Class 150 slip-on flanges.

FOR APPROPRIATE CODE PRESSURE-TEMPERATURE RATINGS SEE PAGES 110 & 111.

**SOCKET TYPE<sup>3</sup>**

**REDUCING<sup>4</sup>**

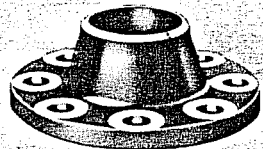
**WELDING NECK<sup>1</sup>**



Part No. 150

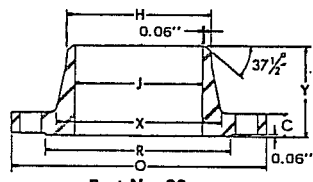
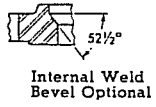
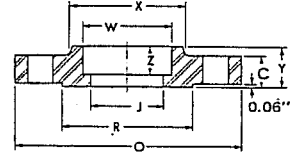


Slip-on—Part No. 120  
Threaded—Part No. 130



Part No. 30

# CLASS 150 FLANGES



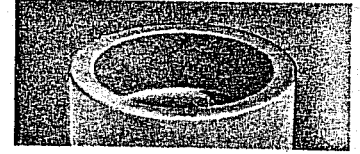
Part No. 30

DIAM. OF BOLT CIRCLE	NUMBER OF BOLTS	DIAM. OF BOLTS	DIAM. OF BOLT HOLES	LENGTH OF BOLTS			APPROXIMATE WEIGHT IN POUNDS					NOMINAL PIPE SIZE
				STUD BOLTS <sup>9</sup>		MACHINE BOLTS	WELDING NECK	SLIP-ON AND THREADED	LAP JOINT	BLIND	SOCKET TYPE AND THREADED	
				0.06" RAISED FACE	RING JOINT							
2.38	4	1/2	0.62	2.50		2.00	2	2	2	2	2	1/2
2.75	4	1/2	0.62	2.50		2.25	2	2	2	2	2	3/4
3.12	4	1/2	0.62	2.75	3.25	2.25	2	2.3	2.3	2.5	2.3	1
3.50	4	1/2	0.62	2.75	3.25	2.50	4	2.5	2.5	3	2.5	1-1/4
3.88	4	1/2	0.62	3.00	3.50	2.50	5	3	3.3	4	3	1-1/2
4.75	4	5/8	0.75	3.25	3.75	2.75	6.5	5	5.3	6	5	2
5.50	4	5/8	0.75	3.50	4.00	3.00	10	8	8.3	10.5	8.3	2-1/2
6.00	4	5/8	0.75	3.75	4.25	3.25	12.5	9	9.5	12.5	9.3	3
7.00	8	5/8	0.75	3.75	4.25	3.25	15	12	12	15	12.5	3-1/2
7.50	8	5/8	0.75	3.75	4.25	3.25	16	13	13	17	13.5	4
8.50	8	3/4	0.88	4.00	4.50	3.25	21	14	14	21	14.5	5
9.50	8	3/4	0.88	4.00	4.50	3.50	25	18	18	28	19	6
11.75	8	3/4	0.88	4.25	4.75	3.75	40	27	27	47	28	8
14.25	12	7/8	1.00	4.75	5.25	4.00	56	37	38	69	40	10
17.00	12	7/8	1.00	4.75	5.25	4.25	86	59	61	102	62	12
18.75	12	1	1.12	5.25	5.75	4.50	111	80	SEE NOTE 2	137	84	14
21.25	16	1	1.12	5.50	6.00	4.75	141	101		177	106	16
22.75	16	1-1/8	1.25	6.00	6.50	5.00	153	112		214	118	18
25.00	20	1-1/8	1.25	6.25	6.75	5.50	188	141	SEE NOTE 2	276	149	20
29.50	20	1-1/4	1.38	7.00	7.50	6.00	270	197		423	210	24

(7) Thread length for Class 150 flanges is American Standard for Pipe Threads ANSI B2.1.  
 (8) Flanges will be furnished bored to these dimensions (Standard Wall pipe I.D. ANSI B36.10) unless otherwise ordered. Extra Strong Wall bore also furnished from stock.  
 (9) In conformance with ANSI B16.5, stud lengths do not include point heights or laps. For lapped to lapped add thickness of two laps. For lapped to any other facing add the amount that such facing and one lap will cause the flange to be separated.  
 (10) When flanges are intended for service with higher yield strength pipe, the thickness of the hub at the bevel may be greater than that of the pipe to which the flange is joined.

(11) Flanges with a straight taper hub for use with thin wall, high strength pipe (similar to MSS SP-44 flanges) are available on special order.  
 • Bores for sizes 14" and larger correspond to Standard Wall pipe. These bores are not listed in ANSI B16.5.  
 For welding neck flange bevel details see page 177.  
 For gasket surface finishes see page 94.  
 For Ring type joint details see page 114.  
 For dimensional tolerances see page 176.  
 For ordering instructions see page 178.

# Socket Weld Fittings



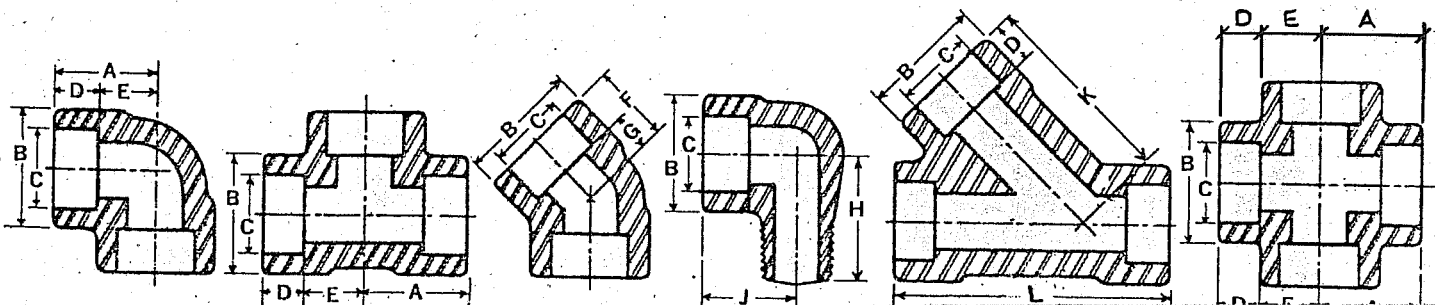
## DIMENSIONS (Inches)

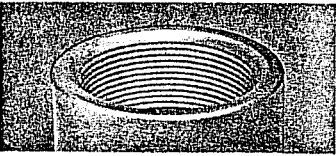
3000 Schedule 40 Bore	NOMINAL PIPE SIZE	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
	A	7/8	7/8	3 1/2	1 1/8	1 5/16	1 1/2	1 3/4	2	2 3/8	3	3 3/8	4 7/16
	B	2 9/32	2 9/32	1 1/16	1 5/16	1 1/16	1 27/32	2 7/32	2 1/2	3 1/32	3 5/8	4 7/16	5 3/4
	D	7/16	7/16	7/16	1/2	9/16	5/8	1 1/16	3/4	7/8	1 3/8	1 1/8	1 9/16
	E	7/16	7/16	1 7/32	5/8	3/4	7/8	1 1/16	1 1/4	1 1/2	1 5/8	2 1/4	2 5/8
	F	3/4	3/4	3/4	1	1 1/8	1 1/4	1 5/16	1 3/8	1 11/16	2 1/16	2 1/2	3 1/8
	G	5/16	5/16	5/16	7/16	1/2	9/16	1 1/16	1 1/16	1	1 1/8	1 1/4	1 5/8
	H	1 1/4	1 1/4	1 1/2	1 5/8	1 7/8	2 1/4	2 5/8	2 15/16	3 3/16			
	J	7/8	7/8	1	1 1/8	1 3/8	1 3/4	2	2 1/8	2 1/2			
	K			1 7/8	2 1/8	2 9/16	3	3 1/2	3 15/16	4 3/4			
	L			2 11/16	3	3 9/16	4 1/8	4 13/16	5 3/8	6 1/16			

6000 Schedule 160 Bore	NOMINAL PIPE SIZE	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
	A			1 1/8	1 5/16	1 1/2	1 3/4	2	2 3/8	2 1/2	3 1/4	3 3/4	4 1/2
	B			1 5/16	1 9/16	1 27/32	2 7/32	2 1/2	3 1/32	3 11/32	4	4 3/4	6
	D			1/2	9/16	5/8	1 1/16	3/4	7/8	7/8	1	1 1/4	1 7/8
	E			5/8	3/4	7/8	1 1/16	1 1/4	1 1/2	1 5/8	2 1/4	2 1/2	2 5/8
	F			1	1 1/8	1 1/4	1 5/16	1 3/8	1 11/16	1 3/4	2 1/16	2 1/2	3 1/8
	G			7/16	1/2	9/16	1 1/16	1 1/16	1	1 1/8	1 1/4	1 3/8	1 5/8
	H		1 1/2	1 5/8	1 7/8	2 1/4	2 5/8	2 15/16	3 3/16				
	J		1	1 1/8	1 3/8	1 3/4	2	2 1/8	2 1/2				
	K			2 1/8	2 9/16	3	3 1/2	3 15/16	4 3/4				
	L			3	3 9/16	4 1/8	4 13/16	5 3/8	6 1/16				

Dimension C (Common to all fittings)	.420	.555	.690	.855	1.065	1.330	1.675	1.915	2.406	2.906	3.535	4.545
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WEIGHTS (Pounds)	3000	90° ELBOW	.125	.125	.25	.50	.688	1.313	1.563	1.875	3.25	5.875	10.25	20.75	
		45° ELBOW	.125	.125	.188	.375	.50	.875	1.25	1.625	2.688	6.75	10.50	18.188	
		TEE	.25	.25	.313	.625	.875	1.375	2	2.50	3.75	8.75	12.50	27	
		STREET ELBOW	.25	.25	.375	.50	.875	1.438	2.25	3	5.188				
		LATERAL		.25	.625	1	1.75	2.375	3.75	4.125	6.875				
		CROSS	.25	.25	.375	.813	1.125	1.50	2.25	3.063	5.125	18	23	40	
		6000	90° ELBOW				.938	1.438	2.25	3.188	5.25	6.688	11.875	19.25	26.375
			45° ELBOW				.875	1.313	2.063	2.50	4.313	4.813	9.625	14.25	27.25
			TEE				1.375	2	3.313	3.75	6.50	7.875	16.625	23.50	33
			STREET ELBOW		.375	.438	1	1.625	2.50	3.688	6.438				
			LATERAL				2	3.063	5.125	6.25	11.938				
			CROSS				1.50	2.50	4.125	5.25	8.75	9.438	20.25	27	39





# Threaded Fittings



## DIMENSIONS (Inches)

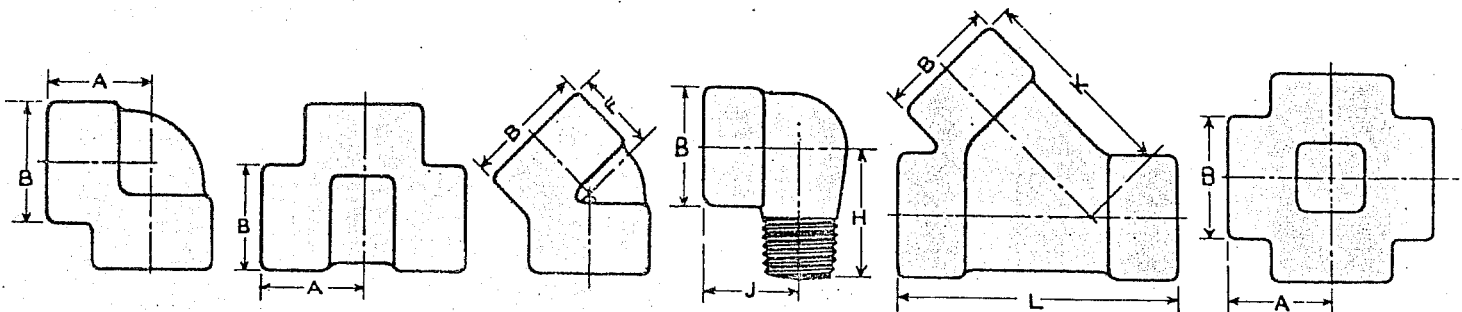
2000	NOMINAL PIPE SIZE	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
	A			7/8	3 1/32	1 1/8	1 5/16	1 1/2	1 3/4	2	2 3/8	3	3 3/8
B			29/32	1 1/16	1 5/16	1 5/16	1 29/32	2 7/32	2 1/2	3 3/32	3 5/8	4 5/16	5 3/4
F			3/4	3/4	1	1 1/8	1 1/4	1 5/16	1 3/8	1 11/16	2 1/16	2 1/2	3 1/8

3000	A	7/8	3 1/32	1 1/8	1 5/16	1 1/2	1 3/4	2	2 3/8	2 1/2	3 1/4	3 3/4	4 1/2
	B	29/32	1 1/16	1 5/16	1 5/16	1 27/32	2 7/32	2 1/2	3 3/32	3 11/32	4	4 3/4	6
	F	3/4	3/4	1	1 1/8	1 1/4	1 5/16	1 3/8	1 11/16	1 3/4	2 1/16	2 1/2	3 1/8
	H	1 1/4	1 1/4	1 1/2	1 5/8	1 7/8	2 1/4	2 5/8	2 15/16	3 3/16			
J		7/8	7/8	1	1 1/8	1 3/8	1 3/4	2	2 1/8	2 1/2			
	K		1 7/8	2 1/8	2 9/16	3	3 1/2	3 15/16	4 3/4				
	L		2 11/16	3	3 3/16	4 1/8	4 13/16	5 3/8	6 7/16				

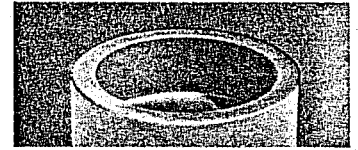
6000	A	3 1/32	1 1/8	1 5/16	1 1/2	1 3/4	2	2 3/8	2 1/2	3 1/4	3 3/4	4 3/16	4 1/2
	B	1 1/16	1 5/16	1 9/16	1 27/32	2 7/32	2 1/2	3 3/32	3 11/32	4	4 3/4	5 3/4	6
	F	3/4	1	1 1/8	1 1/4	1 5/16	1 3/8	1 11/16	1 3/4	2 1/16	2 1/2	3 1/8	3 1/8
	H		1 1/2	1 5/8	1 7/8	2 1/4	2 5/8	2 15/16	3 3/16				
J			1	1 1/8	1 3/8	1 3/4	2	2 1/8	2 1/2				
	K			2 9/16	3	3 1/2	3 15/16	4 3/4					
	L			3 3/16	4 1/8	4 13/16	5 3/8	6 7/16					

## WEIGHTS (Pounds)

2000	90° ELBOW	.25	.25	.313	.563	.688	1.125	1.688	2.25	3.50	6.50	10.50	22.75
	45° ELBOW	.125	.125	.25	.438	.625	.938	1.375	1.625	2.688	7.75	11.313	19.125
	TEE	.25	.25	.313	.563	.938	1.438	2	2.75	4.625	8.688	13.188	27.25
	CROSS	.50	.50	.50	.875	1.125	1.688	2.50	3.188	5.25	16.438	19.50	32.688
3000	90° ELBOW	.25	.375	.625	1.313	1.375	2.25	2.75	3.50	5.438	10.688	14.438	30.375
	45° ELBOW	.25	.25	.50	.75	1.188	1.875	2.125	3	4.25	7.375	13.50	19.063
	TEE	.25	.375	.813	1.188	1.875	2.50	3.125	5	6.75	13.125	20.375	39.50
	STREET ELBOW	.25	.25	.375	.50	.875	1.438	2.25	3	5.188			
	LATERAL		.625	1.313	1.75	2.75	4.625	5.50	10.813				
	CROSS	.438	.375	1	1.50	2.50	3.563	4.125	6.50	8.125	16.75	19.75	32
6000	90° ELBOW	.25	.625	1.063	1.625	2.625	3.50	6.75	7.50	13.438	20.875	34.563	38
	45° ELBOW	.25	.563	.50	1.438	2.188	2.688	4.688	5.75	9.50	15	30.563	29
	TEE	.50	1	1.375	2.125	3.625	4.625	7.625	9.625	18.875	28.063	47.500	50
	STREET ELBOW		.375	.438	1	1.625	2.50	3.688	6.438				
	LATERAL			2.375	3.25	5.438	7.188	12.313					
	CROSS	.563	1.188	1.50	2.75	4.313	5.625	10.75	11.50	22.188	27.50	54	43.50



# Socket Weld Couplings, Reducers and Caps



## DIMENSIONS (Inches)

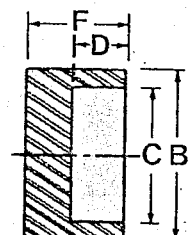
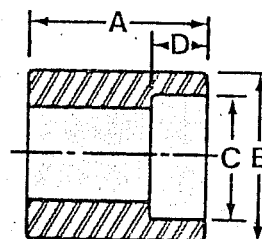
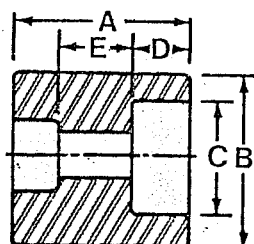
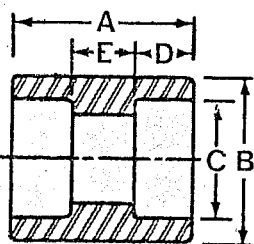
3000 #	NOMINAL PIPE SIZE	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
	A	1 1/8	1 1/8	1 1/8	1 3/8	1 1/2	1 3/4	1 7/8	2	2 1/2	2 1/2	2 3/4	3
	B	3/4	7/8	1 1/16	1 1/4	1 1/2	1 13/16	2 1/4	2 1/2	3	3 5/8	4 5/16	5 1/2
	C	.420	.555	.690	.855	1.065	1.330	1.675	1.915	2.406	2.906	3.535	4.545
	D	7/16	7/16	7/16	1/2	9/16	5/8	1 1/16	3/4	7/8	7/8	1	1 1/8
	E	1/4	1/4	1/4	3/8	3/8	1/2	1/2	1/2	3/4	3/4	3/4	3/4
F	1 1/16	3/4	3/4	7/8	1	1 1/16	1 3/16	1 1/4	1 1/2	1 1/2	1 3/4	1 7/8	

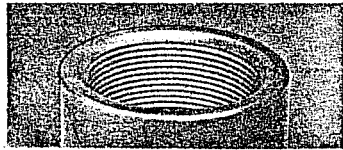
6000 #	A		1 1/8	1 1/8	1 3/8	1 1/2	1 3/4	1 7/8	2	2 1/2	2 1/2	2 3/4	3
	B		1 1/16	1 5/16	1 1/2	1 3/4	2 1/4	2 1/2	3	3 5/8	4 1/4	5	6 1/4
	C		.555	.690	.855	1.065	1.330	1.675	1.915	2.406	2.906	3.535	4.545
	D		7/16	7/16	1/2	9/16	5/8	1 1/16	3/4	7/8	7/8	1	1 1/8
	E		1/4	1/4	3/8	3/8	1/2	1/2	1/2	3/4	3/4	3/4	3/4
	F			1 5/16	1	1 1/16	1 1/4	1 3/16	1 3/8	1 5/8	1 5/8	1 7/8	2 1/8

## WEIGHTS (Pounds)

3000 #	COUPLING	.125	.125	.125	.188	.313	.563	.813	1	2	2.625	3.875	6.625
	REDUCER	.125	.125	.125	.188	.313	.563	.813	1	2	2.625	3.875	6.625
	HALF COUPLING	.125	.125	.125	.188	.313	.563	.813	1	2	2.625	3.875	6.625
	PIPE CAP	.063	.063	.125	.188	.313	.375	.813	1.125	1.688	3	3.625	6.688

6000 #	COUPLING				.375	.563	1	1.438	2	3.875	5.50	6.625	13.125
	REDUCER				.375	.563	1	1.438	2	3.875	5.50	6.625	13.125
	HALF COUPLING				.375	.563	1	1.438	2	3.875	5.50	6.625	13.125
	PIPE CAP				.375	.50	1.125	1.125	2.25	3.50	5.625	6	13.50





# Threaded Couplings, Reducers and Caps



## DIMENSIONS (Inches)

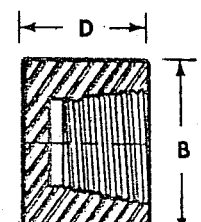
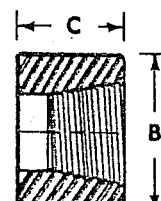
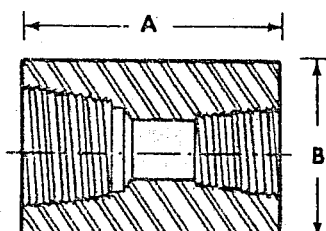
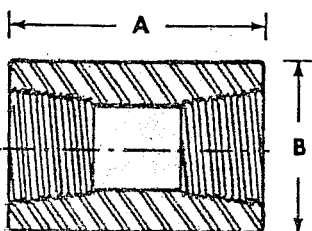
3000	NOMINAL PIPE SIZE	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
	A	1 1/4	1 3/8	1 1/2	1 7/8	2	2 3/8	2 5/8	3 1/8	3 3/8	3 5/8	4 1/4	4 3/4
	B	3/4	3/4	7/8	1 1/8	1 3/8	1 3/4	2 1/4	2 1/2	3	3 5/8	4 1/4	5 1/2
	C	5/8	1 1/16	3/4	15/16	1	1 3/16	1 5/16	1 9/16	1 11/16	1 13/16	2 1/8	2 3/8
	D	15/16	1	1	1 1/4	1 7/16	1 5/8	1 3/4	1 3/4	1 7/8	2 3/8	2 9/16	2 11/16

6000	A	1 1/4	1 3/8	1 1/2	1 7/8	2	2 3/8	2 5/8	3 1/8	3 3/8	3 5/8	4 1/4	4 3/4
	B	7/8	1	1 1/4	1 1/2	1 3/4	2 1/4	2 1/2	3	3 5/8	4 1/4	5	6 1/4
	C	5/8	1 1/16	3/4	15/16	1	1 3/16	1 5/16	1 9/16	1 11/16	1 13/16	2 1/8	2 3/8
	D	1	1 1/16	1 1/16	1 1/16	1 1/2	1 11/16	1 13/16	1 7/8	2	2 1/2	2 11/16	2 15/16

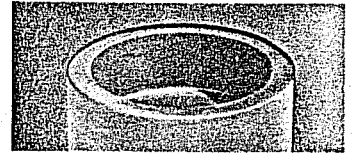
## WEIGHTS (Pounds)

3000	COUPLING	.125	.125	.25	.25	.438	.625	1.563	2.188	3.125	4	6.75	16.75
	REDUCER	.125	.125	.25	.25	.438	.625	1.563	2.188	3.125	4	6.75	16.75
	HALF COUPLING	.063	.063	.188	.188	.25	.313	.75	1.125	1.563	2	3.375	8.375
	PIPE CAP	.031	.063	.125	.25	.313	.50	1	1.625	3.125	5	8.50	14

6000	COUPLING	.188	.188	.25	.50	1	2.125	2.375	4.375	7.75	10.75	13.50	24.50
	REDUCER	.188	.188	.25	.50	1	2.125	2.375	4.375	7.75	10.75	13.50	24.50
	HALF COUPLING	.094	.094	.125	.25	.50	1.063	1.188	2.188	3.875	5.375	6.75	12.25
	PIPE CAP	.125	.125	.188	.313	.438	.75	1.313	1.688	3.25			

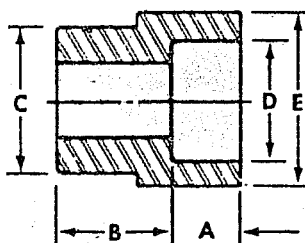


# Socket Weld Reducer Inserts

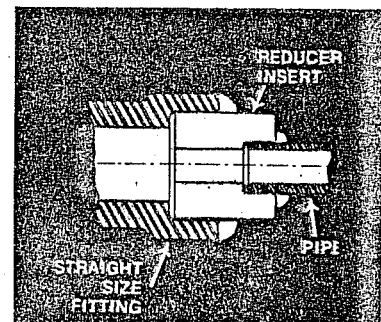
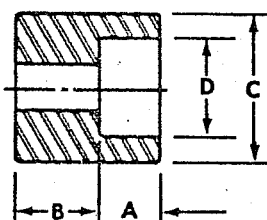


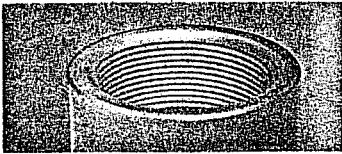
NOMINAL PIPE SIZE	DIAM. C	DIAM. D	3000 #				6000 #			
			INSERT TYPE	DIMENSIONS			INSERT TYPE	DIMENSIONS		
				A	B	E		A	B	E
1/2 x 3/8	.850	.690	1	7/16	1	1 1/16	1	7/16	1	1 5/16
1/2 x 1/4	.850	.555	2	3/8	1/2		1	3/8	1 1/16	1 1/8
1/2 x 1/8	.850	.420	2	3/8	1/2		1	3/8	1 1/16	1
3/4 x 1/2	1.060	.855	1	1/2	1 1/16	1 1/4	1	1/2	1 1/2	1 1/2
3/4 x 3/8	1.060	.690	2	7/16	1 1/16		1	7/16	1 9/16	1 5/16
3/4 x 1/4	1.060	.555	2	3/8	3/4		1	3/8	1 5/8	1 1/8
3/4 x 1/8	1.060	.420	2	3/8	3/4		2	3/8	3/4	
1 x 3/4	1.325	1.065	1	9/16	1 1/8	1 1/2	1	9/16	1 11/16	1 3/4
1 x 1/2	1.325	.855	2	1/2	1 1/16		1	1/2	1 3/4	1 1/2
1 x 3/8	1.325	.690	2	7/16	3/4		2	7/16	3/4	
1 x 1/4	1.325	.555	2	3/8	1 3/16		2	3/8	1 3/16	
1 1/4 x 1	1.670	1.330	1	5/8	1 5/16	1 13/16	1	5/8	7/8	2 1/4
1 1/4 x 3/4	1.670	1.065	2	9/16	1 1/16		2	9/16	1 1/16	
1 1/4 x 1/2	1.670	.855	2	1/2	3/4		2	1/2	3/4	
1 1/2 x 1 1/4	1.910	1.675	1	1 1/16	1 1/2	2 1/4	1	1 1/16	2 1/16	2 3/8
1 1/2 x 1	1.910	1.330	2	5/8	7/8		1	5/8	2	2 1/4
1 1/2 x 3/4	1.910	1.065	2	9/16	1 5/16		2	9/16	1 5/16	
1 1/2 x 1/2	1.910	.855	2	1/2	1		2	1/2	1	
2 x 1 1/2	2.385	1.915	1	3/4	1 11/16	2 1/2	1	3/4	2 1/8	2 13/16
2 x 1 1/4	2.385	1.675	2	1 1/16	1 5/16		2	1 1/16	1 5/16	
2 x 1	2.385	1.330	2	5/8	1		2	5/8	1	
2 x 3/4	2.385	1.065	2	9/16	1 1/16		2	9/16	1 1/16	
2 x 1/2	2.385	.855	2	1/2	1 1/8		2	1/2	1 1/8	

Type 1



Type 2





# Threaded Plugs and Bushings



## DIMENSIONS (Inches)

NOMINAL PIPE SIZE	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
A	1 3/8	1 5/8	1 5/8	1 3/4	1 3/4	2	2	2	2 1/2	2 3/4	2 3/4	3
B	1 3/32	1 1/32	1 1/16	2 1/32	1 1/16	1 5/16	1 11/16	1 29/32	2 3/8	2 7/8	3 1/2	4 1/2
C*	7/16	5/8	1 1/16	7/8	1 1/16	1 7/16	1 13/16	2	2 1/2	3	3 1/2	4 5/8
D	1/4	1/4	5/16	5/16	3/8	3/8	9/16	5/8	1 1/16	3/4	1 1/16	1 1/4
E	7/16	1/2	9/16	1 1/16	3/4	2 7/32	7/8	1 5/16	1	1 1/4	1 9/16	1 21/32
F	9/32	3/8	7/16	9/16	5/8	1 1/16	1 5/16	1 1/8	1 5/16	1 1/2	1 11/16	2 1/2
G	1/4	1/4	5/16	3/8	7/16	1/2	9/16	5/8	1 1/16	3/4	1 1/16	1 1/4
H	3/8	7/16	1/2	9/16	5/8	3/4	1 1/16	1 3/16	7/8	1 1/8	1 1/8	1 1/4
J*		5/8	1 1/16	7/8	1 1/16	1 7/16	1 13/16	2	2 1/2	3	3 1/2	4 5/8
K		3/16	3/16	3/16	1/4	1/4	3/8	3/8	3/8	1/2	1/2	5/8
L		1/2	9/16	1 1/16	3/4	2 7/32	7/8	1 5/16	1	1 1/4	1 9/16	1 21/32
M		7/16	1/2	9/16	5/8	3/4	1 1/16	1 3/16	7/8	1 1/16	1 1/8	1 1/4
N	3/8	7/16	1/2	9/16	5/8	3/4	1 1/16	1 3/16	7/8	1 1/16	1 1/8	1 1/4

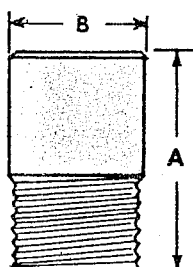
## WEIGHTS (Pounds)

ROUND HEAD PLUGS	.125	.125	.188	.250	.375	.750	1.125	1.563	3.00	4.75	7.62	12.87
HEXAGON PLUGS	.063	.063	.125	.188	.313	.500	1.125	1.375	2.25	3.87	5.87	13.00
SQUARE HEAD PLUGS	.016	.031	.063	.125	.188	.313	.563	.875	1.50	2.25	2.87	7.18
HEXAGON BUSHINGS		.063	.063	.063	.125	.188	.375	.688	1.62	2.37	3.50	8.31
FLUSH BUSHINGS		.063	.063	.063	.125	.125	.125	.188	.37	.62	1.00	2.00

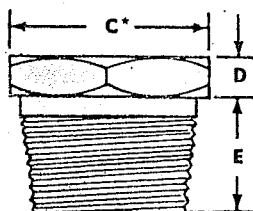
## MATERIAL AVAILABLE FROM STOCK

Bonney Forge fittings are available from stock in a wide range of ferrous and non-ferrous materials; these include (1) A105 carbon steel, (2) 304, 304L, 316, 316L stainless steels, (3) F5, F11 and F22 alloy steels, (4) aluminum, (5) copper-nickel and (6) Monel. Bonney quality control systems provide complete assurance of highest manufacturing standards and of compliance with ANSI B16.11. American Standard for Steel Socket Welding and Threaded Fittings. Every fitting is subjected

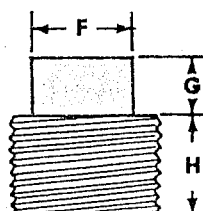
to three separate quality control systems: one for material control, one for manufacturing control and one for design control. All forgings are 100% inspected. Sample analyses are made of every forging heat to check against mill analyses, and records are kept of every fitting from initial forging bar through forging, heat treatment, machining, storage and shipment. Every single fitting has a heat identification number and is completely traceable.



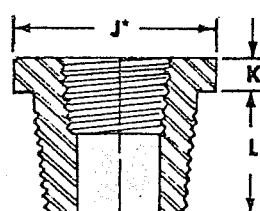
ROUND HEAD PLUG



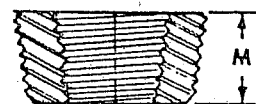
HEXAGON PLUG



SQUARE HEAD PLUG



HEXAGON BUSHING

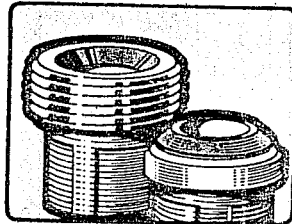


FLUSH BUSHING

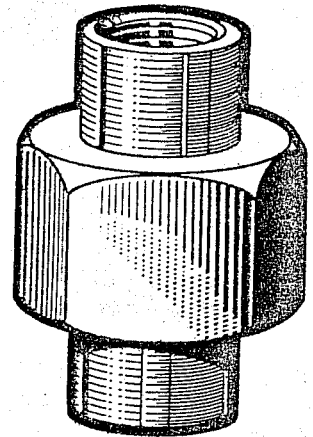
\*Dimension J for Hex Head Bushing and dimension C for Hex Head Plug are the same



# BONNEY FORGE ROCKWOOD UNION — one turn of a wrench makes it. Only a wrench can break it.

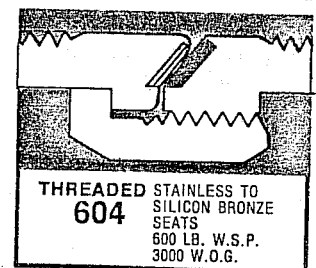
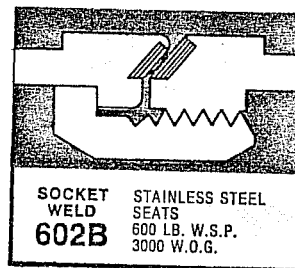
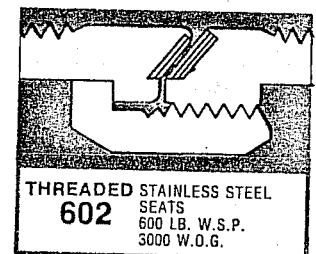
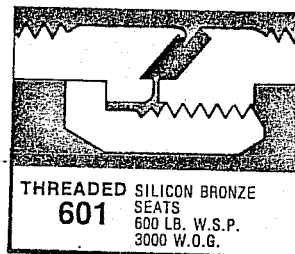


- Ball to cone seats for smooth alignment.
- Can be cracked and rejoined—repeatedly.
- Replaceable, interchangeable parts.
- Carbon Steel, coated to resist corrosion.
- Stays sealed despite shock, vibration expansion and rough wrenching.
- S/B seats double locked under 120,000 lb. psi.
- Conveniently packaged 25 per carton.



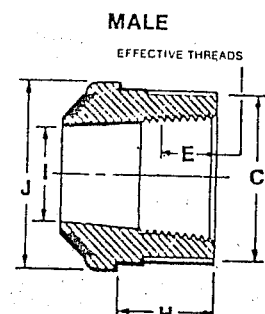
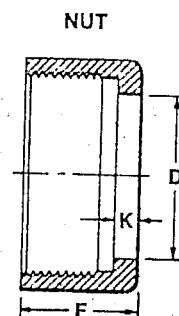
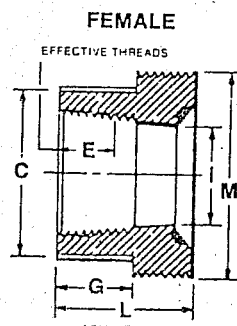
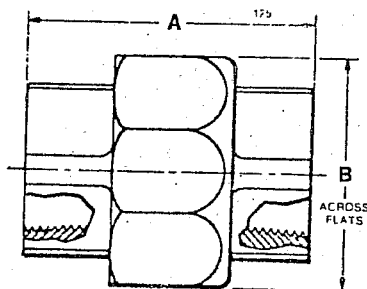
## TYPE 602B

Pipe Size	Style Nut	Depth Socket	Socket Dia.	Weight Per Union All Types
1/8 18-NPT	Hex	7/16	.420	.32 #
1/4 18-NPT	Hex	7/16	.555	.30 #
3/8 18-NPT	Hex	7/16	.690	.40 #
1/2 14-NPT	Hex	1/2	.855	.72 #
3/4 14-NPT	Octagon	1/2	1.065	1.10 #
1 11 1/2-NPT	Octagon	5/16	1.330	1.5 #
1 1/4 11 1/2-NPT	Octagon	5/16	1.675	2.2 #
1 1/2 11 1/2-NPT	Octagon	5/16	1.915	2.6 #
2 11 1/2-NPT	Octagon	1 1/16	2.406	4.6 #



## TYPES 601, 602 AND 604

Pipe Size	A	B	C	D	E	F	G	H	I	J	K	L	M	Style Nut
1/8 18-NPT	1 3/4	1 1/4	3/4	5/16	.264	3/4	1/2	19/32	2 1/64	29/32	1/8	7/8	1.035	Hex
1/4 18-NPT	1 3/4	1 1/4	3/4	5/16	.402	3/4	1/2	19/32	3/8	29/32	1/8	7/8	1.035	Hex
3/8 18-NPT	2	1 3/8	7/8	19/16	.408	13/16	9/16	3/4	1/2	1 1/16	1/8	15/16	1.164	Hex
1/2 14-NPT	2 1/4	1 21/32	1 3/32	1 11/64	.534	1	1 1/16	29/32	5/8	1 1/16	3/16	1 1/8	1.437	Hex
3/4 14-NPT	2 7/16	2	1 25/64	1 1/16	.548	1 1/16	3/4	29/32	2 7/32	1 3/64	7/32	1 1/16	1.693	Octagon
1 11 1/2-NPT	2 11/16	2 3/8	1 5/8	1 23/32	.683	1 3/32	2 7/32	1 1/16	1 1/16	1 13/16	7/32	1 1/16	1.975	Octagon
1 1/4 11 1/2-NPT	2 33/32	2 3/4	2	2 3/32	.707	1 19/64	7/8	1 5/32	1 13/32	2 1/4	9/32	1 1/16	2.416	Octagon
1 1/2 11 1/2-NPT	3 1/8	3	2 3/32	2 11/32	.724	1 21/64	1	1 7/32	1 21/32	2 1/2	9/32	1 1/2	2.649	Octagon
2 11 1/2-NPT	3 11/16	3 23/32	2 51/64	2 7/8	.757	1 15/32	1 1/32	1 1/16	2 1/16	3 1/16	1 9/64	1 25/32	3.221	Octagon



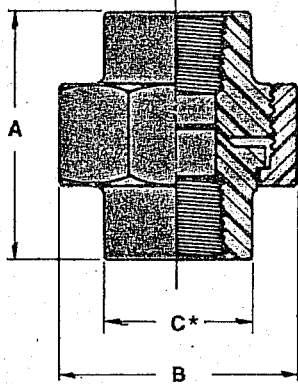


# AAR Unions Threaded and Socket Weld

3000 POUND AAR							
PIPE SIZE	A	B	C	D	E	F	WEIGHT PER UNION
1/8	1 <sup>11</sup> / <sub>16</sub>	1 <sup>31</sup> / <sub>64</sub>	<sup>55</sup> / <sub>64</sub>	<sup>25</sup> / <sub>32</sub>	<sup>7</sup> / <sub>16</sub>	.420 .430	.38 #
1/4	1 <sup>11</sup> / <sub>16</sub>	1 <sup>31</sup> / <sub>64</sub>	<sup>55</sup> / <sub>64</sub>	<sup>25</sup> / <sub>32</sub>	<sup>7</sup> / <sub>16</sub>	.555 .565	.36 #
3/8	1 <sup>27</sup> / <sub>32</sub>	1 <sup>11</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>64</sub>	<sup>31</sup> / <sub>32</sub>	<sup>7</sup> / <sub>16</sub>	.690 .700	.50 #
1/2	1 <sup>31</sup> / <sub>32</sub>	1 <sup>15</sup> / <sub>16</sub>	1 <sup>15</sup> / <sub>64</sub>	<sup>31</sup> / <sub>32</sub>	1/2	.855 .865	.695#
3/4	2 <sup>5</sup> / <sub>16</sub>	2 <sup>3</sup> / <sub>8</sub>	1 <sup>15</sup> / <sub>32</sub>	1 <sup>5</sup> / <sub>32</sub>	<sup>9</sup> / <sub>16</sub>	1.065 1.075	1.175#
1	2 1/2	2 <sup>25</sup> / <sub>32</sub>	1 <sup>25</sup> / <sub>32</sub>	1 1/4	<sup>5</sup> / <sub>8</sub>	1.330 1.340	1.64 #
1 1/4	2 <sup>55</sup> / <sub>64</sub>	3 <sup>23</sup> / <sub>64</sub>	2 <sup>11</sup> / <sub>64</sub>	1 1/2	<sup>11</sup> / <sub>16</sub>	1.675 1.685	2.59 #
1 1/2	3	3 <sup>23</sup> / <sub>32</sub>	2 <sup>15</sup> / <sub>32</sub>	1 <sup>17</sup> / <sub>32</sub>	<sup>3</sup> / <sub>4</sub>	1.915 1.925	3.41 #
2	3 <sup>15</sup> / <sub>32</sub>	4 <sup>27</sup> / <sub>64</sub>	3 <sup>1</sup> / <sub>32</sub>	1 <sup>23</sup> / <sub>32</sub>	<sup>7</sup> / <sub>8</sub>	2.406 2.416	5.12 #
2 1/2	4 <sup>1</sup> / <sub>32</sub>	5 <sup>15</sup> / <sub>64</sub>	3 <sup>21</sup> / <sub>32</sub>	2 <sup>5</sup> / <sub>16</sub>	<sup>7</sup> / <sub>8</sub>	2.906 2.921	8.75 #
3	4 1/4	6 <sup>5</sup> / <sub>32</sub>	4 <sup>13</sup> / <sub>32</sub>	2 <sup>5</sup> / <sub>16</sub>	1	3.535 3.550	12.625#

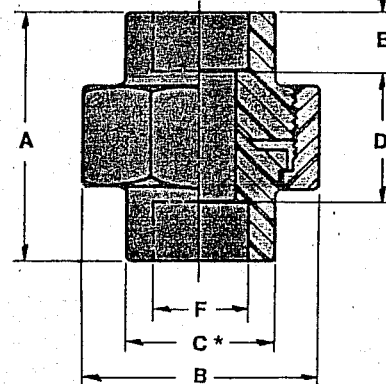
6000 POUND AAR							
PIPE SIZE	A	B	C	D	E	F	WEIGHT PER UNION
1/8	1 <sup>11</sup> / <sub>16</sub>	1 <sup>31</sup> / <sub>64</sub>	<sup>55</sup> / <sub>64</sub>	<sup>25</sup> / <sub>32</sub>	<sup>7</sup> / <sub>16</sub>	.420 .430	.5 #
1/4	1 <sup>27</sup> / <sub>32</sub>	1 <sup>11</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>64</sub>	<sup>31</sup> / <sub>32</sub>	<sup>7</sup> / <sub>16</sub>	.555 .565	.56#
3/8	1 <sup>31</sup> / <sub>32</sub>	1 <sup>15</sup> / <sub>16</sub>	1 <sup>15</sup> / <sub>64</sub>	<sup>31</sup> / <sub>32</sub>	1/2	.690 .700	.75#
1/2	2 <sup>5</sup> / <sub>16</sub>	2 <sup>3</sup> / <sub>8</sub>	1 <sup>15</sup> / <sub>32</sub>	1 <sup>5</sup> / <sub>32</sub>	<sup>9</sup> / <sub>16</sub>	.855 .865	1.25#
3/4	2 1/2	2 <sup>25</sup> / <sub>32</sub>	1 <sup>25</sup> / <sub>32</sub>	1 1/4	<sup>5</sup> / <sub>8</sub>	1.065 1.075	1.75#
1	2 <sup>55</sup> / <sub>64</sub>	3 <sup>23</sup> / <sub>64</sub>	2 <sup>11</sup> / <sub>64</sub>	1 1/2	<sup>11</sup> / <sub>16</sub>	1.330 1.340	3 #
1 1/4	3	3 <sup>23</sup> / <sub>32</sub>	2 <sup>15</sup> / <sub>32</sub>	1 <sup>17</sup> / <sub>32</sub>	<sup>3</sup> / <sub>4</sub>	1.675 1.685	3.75#
1 1/2	3 <sup>15</sup> / <sub>32</sub>	4 <sup>27</sup> / <sub>64</sub>	3 <sup>1</sup> / <sub>32</sub>	1 <sup>23</sup> / <sub>32</sub>	<sup>7</sup> / <sub>8</sub>	1.915 1.925	6.0 #
2	4 <sup>1</sup> / <sub>32</sub>	5 <sup>15</sup> / <sub>64</sub>	3 <sup>21</sup> / <sub>32</sub>	2 <sup>5</sup> / <sub>16</sub>	<sup>7</sup> / <sub>8</sub>	2.406 2.416	10.5 #

### THREADED



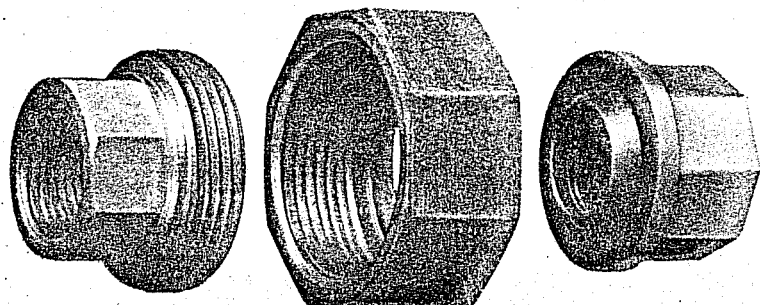
B DIMENSIONS ACROSS OCTAGON CORNERS

### SOCKET WELD



B DIMENSION ACROSS OCTAGON CORNERS

\*\*C\*\* dimension is across octagon corners or a diameter as applicable. The 2 1/2" and 3" 3000# and 2" 6000# sizes have octagonal male and female ends; the other sizes are round.



Bonney Forge  
US Route 522 South  
Mount Union, PA 17066

800 345 7546

814 542 2545

Fax 814 542 9977

Kathy Hann x 2488

→ Kristi Hoover x 2435

Joe Wilson x 2463 Product Eng. Tech.  
Jwilson@bonneyforge.com

### Union Part Numbers

	Complete Union	Male Half	Female Half	Nut
1/2"	113373	252580	252940	252130
3/4"	113374	252590	252950	252140
1"	113375	252600	252960	252150
1 1/4"	113376	252610	252970	252160
1 1/2"	113377	252620	252980	252170
2"	113378	252630	252990	252180

# Products

Swages, Locknuts, & WeldSpuds

NPT Elbs, Tees & Crosses	NPT Couplings, Half-Coups, Red'rs. & Caps	NPT Plugs & Bushings	Swages, Locknuts, & Weldspuds
S/W Elbs, Tees & Crosses	S/W Couplings, Half-Coups, Red'rs. & Caps	S/W Inserts	MSS Flanges
NPT & S/W Unions	ASP Unit Weights	Nominal Mat'l Comp	MSS Flg'd Fittings
<b>Related Piping Products</b>			

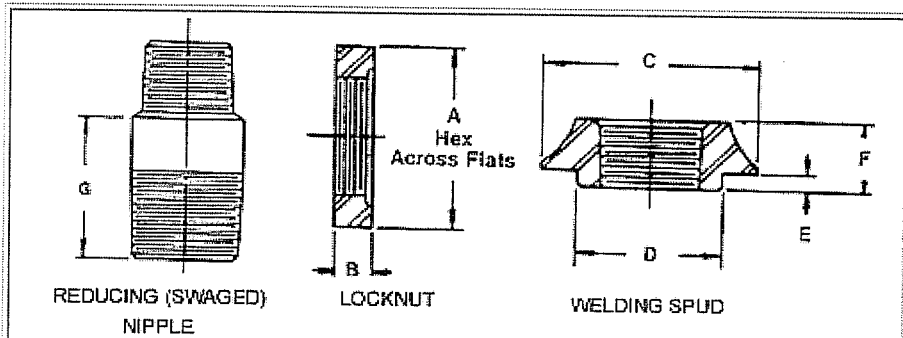
**ASP**

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Pricing Guides:  
Pricing Schedule 200  
Pricing Schedule I-300



## Bar Stock or Forged (except as noted)



Size	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2
150 p.s.i. Service									
A	3/4	7/8	1	1 3/16	1 1/2	1 3/4	2 1/8	2 3/8	2 7/8
B	3/16	1/4	9/32	5/16	11/32	3/8	7/16	15/32	17/32
C	1 3/8	1 1/2	1 5/8	1 3/4	2	2 1/4	2 11/16	3	3 1/2
D	27/32	31/32	31/32	1 5/32	1 11/32	1 23/32	1 15/16	2 5/16	2 11/16
E	3/32	1/8	1/8	5/32	5/32	3/16	3/16	3/16	3/16
F	15/32	1/2	1/2	19/32	21/32	25/32	3/4	3/4	13/16
G	-	1 1/8	1 1/8	1 1/4	1 1/2	1 5/8	1 3/4	1 3/4	2 1/8
Size	2 1/2	3	4						
A	3 1/2	4 9/32	5 3/8						
B	19/32	11/16	13/16						
C	4 1/16	4 5/8	5 13/16						
D	3 3/16	3 11/16	4 3/4						
E	3/16	3/16	3/16						
F	1	1	1 1/8						
G	2 1/4	2 1/4	2 3/8						

---

**Notes:**

1. Pipe Threads conform to ASME B1.20.1
  2. General dimensions and threading of locknuts are based on ASME B16.14
  3. Locknuts 1-1/2" and larger - Cast
  4. Welding Spuds 2-1/2" and larger - Cast
- 

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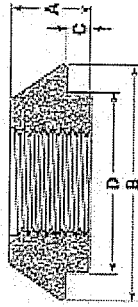
Alloy Stainless Products  
611 Union Blvd  
Totowa, NJ 07512

PH 800 631 8372      Fax 800 432-9277

PH 973-256 1616      Fax 973-256-5256

[www.ASPFITTING.com](http://www.ASPFITTING.com)

**CLASS 150 THREADED FITTINGS  
WELDING SPUD**



Not available in Monel, Nickel, or Alloy 20

Pipe Size	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
Dimension A	27/64	1/2	1/2	19/32	21/32	25/32	3/4	7/8	15/16	1	1	1 1/8
Dimension B	1 3/8	1 1/2	1 5/8	1 3/4	1 15/16	2 3/16	2 11/16	3	3 1/2	4 1/16	4 5/8	5 13/16
Dimension C	3/64	1/8	1/8	5/32	5/32	3/16	3/16	5/16	3/16	3/16	3/16	3/16
Dimension D	27/32	31/32	31/32	1 5/32	1 11/32	1 23/32	1 15/16	2 5/16	2 11/16	3 3/16	3 11/16	4 3/4
Approx. Wt. #	.08	.10	.10	.14	.25	.33	.49	.55	.63	1.18	1.30	1.95

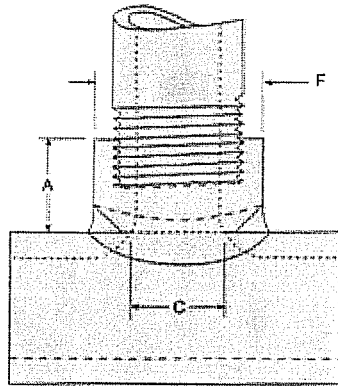
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Capitol Manufacturing  
742 Brooksedge Plaza Drive  
Westerville, OH 43086

Ph 614-823-6691

Fax 614-823-6692

# Coupolet



300# Female Threaded Coupolet			
Nominal Outlet Size	Dimensions		
	A	C	F
1/2	15/16	0.745	1.188
3/4	1	0.958	1.441
1	1 3/16	1.188	1.562
1 1/4	1 5/16	1.550	1.906
1 1/2	1 9/16	1.780	2.188
2	1 11/16	2.260	2.750
2 1/2	1 13/16	2.890	3.386
3	2 1/2	3.400	4.000
4	3	4.380	5.000

Interchangeability or Combination of Sizes										
Coupolet Outlet Size Inches	Run Sizes									
	1/2	1/2	3/4	1 1/4 -1	8-3	36-10				
3/4	3/4	1	2 - 1 1/4	36-8						
1	1	1 1/4	2 - 1 1/2	8-5	36-10					
1 1/4	1 1/4	1 1/2	2 1/2 - 2	8-5	36-10					
1 1/2	1 1/2	2	2 1/2	8-5	16-10	36-18				
2	2	2 1/2	3	4	5	6	8	10	16-12	36-18
2 1/2	2 1/2	3	3 1/2	5	6	8	12-10	16-14	36-18	
3	3	3 1/2	4	6	8	10	12	14	18-16	36-20
4	5	6	8	14-12	16	18	20	24	36	

## Printing Tips

**BACK**

Tank Fittings and Accessories

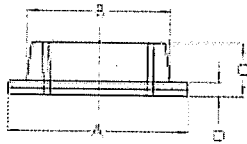
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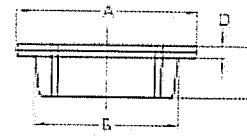


ASTM A105/ASME SA105  
ASTM A181-70/ASME SA181-70

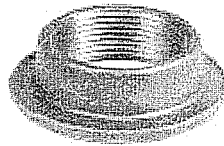
Tank & Cylinder Fittings



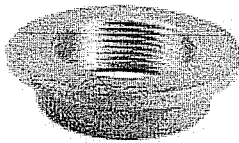
Standard -  
Tapped from hub side



Inverted -  
Tapped from flange side

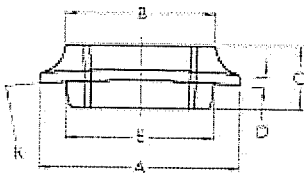


SERIES 100



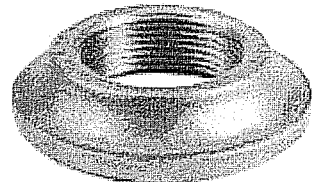
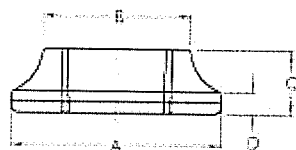
SERIES 125

FLAT TYPE						
SERIES STANDARD	SERIES INVERTED	PIPE SIZE	A	B	C	D
100	125	1/2"	1 1/4"	5/8"	7/32"	1/8"
101	126	3/4"	1 3/4"	3/4"	3/8"	5/32"
102	127	3/2"	1 3/8"	15/16"	3/8"	5/32"
103	128	1 1/2"	1 7/2"	1 1/8"	1/2"	5/32"
104	129	3/4"	1 3/4"	1 1/8"	5/8"	5/32"
105	130	1"	2 1/8"	1 1/16"	5/8"	5/32"
106	131	1 1/4"	2 1/2"	2"	1 1/16"	5/32"
107	132	1 1/2"	3"	2 3/8"	1 3/16"	5/32"
108	133	2"	3 1/2"	2 7/8"	1 3/16"	5/32"
109	134	2 1/2"	4 1/4"	3 1/2"	1"	3/16"
110	135	3"	5"	4 1/8"	1"	3/16"
111	136	3 1/2"	5 1/2"	4 5/8"	1"	7/32"
112	137	4"	6"	5 1/16"	1 1/8"	7/4"



SERIES 150

STANDARD HEAVY CURVED TYPE WITH PILOT							
SERIES	PIPE SIZE	A	B	C	D	E	R
150A	3/4"	2 1/16"	1 7/16"	5/8"	1/8"	1 11/32"	7"
150	1"	2 3/8"	1 5/16"	3/4"	1/8"	1 3/4"	15"
151	1 1/4"	2 3/4"	2 5/32"	3/4"	1/8"	1 7/8"	15"
151SR	1 1/4"	2 3/4"	2 5/32"	3/4"	1/8"	1 7/8"	10"
152	1 1/2"	3 1/8"	2 13/32"	3/4"	1/8"	2 11/32"	15"
153	2"	3 5/8"	2 15/16"	1 1/16"	1/8"	2 33/32"	15"
154	2 1/2"	4 1/4"	3 7/16"	1"	1/8"	3 1/16"	22"
155	3"	4 7/8"	4 3/32"	1"	1/8"	3 11/16"	22"
156	3 1/2"	5 5/8"	4 9/8"	1 1/16"	3/16"	4 1/16"	26"
157	4"	5 11/16"	5 1/8"	1 3/16"	3/16"	4 1/4"	26"
158	5"	7 1/8"	6 1/4"	1 3/8"	1/4"	5 3/16"	42"
159	6"	8 1/4"	7 3/8"	1 7/16"	1/4"	6 7/8"	28"
160	8"	10 7/2"	9 1/2"	1 7/16"	1/4"	9"	48"



SERIES 175

EXTRA HEAVY FLAT TYPE				
SERIES	PIPE SIZE	A	B	D
175A	3/4"	1 5/8"	1 7/16"	1 1/16"
175B	3/8"	1 3/8"	1 1/16"	1 1/16"
175	1/2"	2"	1 1/4"	3/4"
176	3/4"	2 1/4"	1 1/2"	1 1/8"
177	1"	2 1/2"	1 3/4"	3/4"
178	1 1/4"	2 3/8"	2 1/16"	3/4"
179	1 1/2"	3 1/4"	2 3/8"	3/4"
180	2"	3 3/4"	2 7/8"	1 1/4"
181	2 1/2"	4 1/4"	3 1/2"	1"
182	3"	5 1/2"	4 1/4"	1"
183	3 1/2"	6"	4 3/8"	1"
184	4"	6 1/2"	5 1/8"	1 1/8"
185	5"	8 1/16"	6 11/16"	1 13/32"
186	6"	8 1/2"	7 3/8"	1 13/32"

Flanges 1 1/2" through 4" can be curved to a radius. Inquire.

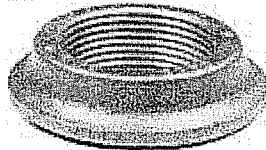
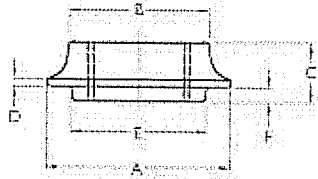
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Call Toll-Free 1-800-444-3674



# Tank & Cylinder Fittings

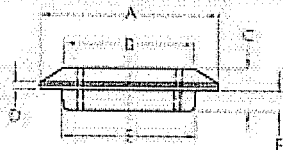
ASTM A105/ASME SA105  
ASTM A101-70/ASME SA101-70



**SERIES 250**

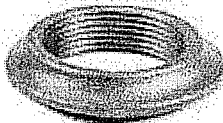
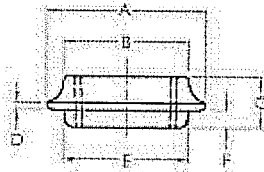
STANDARD FLAT TYPE WITH PILOT							
SERIES	PIPE SIZE	A	B	C	D	E	F
250	1/8"	1 3/8"	7/8"	1 5/32"	3/4"	2 1/32"	5/32"
251	1/4"	1 1/2"	1"	1 1/2"	3/32"	2 3/32"	1/8"
252	3/8"	1 3/8"	1 1/16"	1 1/2"	3/32"	1 5/16"	1/8"
253	1/2"	1 13/16"	1 3/16"	1 9/32"	3/32"	1 3/32"	5/32"
254	3/4"	2 1/16"	1 7/16"	2 1/32"	3/32"	1 11/32"	5/32"
255	1"	2 5/16"	1 3/4"	2 1/4"	3/32"	1 5/16"	3/16"
256	1 1/4"	2 11/16"	2 1/8"	2 1/4"	3/32"	1 5/16"	3/16"
257	1 1/2"	3 1/32"	2 3/8"	2 1/4"	3/32"	2 5/16"	3/16"
258	2"	3 1/2"	2 3/8"	2 3/16"	3/32"	2 11/16"	3/16"
259	2 1/2"	4 1/16"	3 5/16"	1"	3/32"	3 1/16"	3/16"
260	3"	4 3/8"	3 15/16"	1"	3/32"	3 1/16"	3/16"
261	3 1/2"	5 1/8"	4 1/16"	1"	3/32"	4 1/16"	3/16"
262	4"	5 11/16"	4 15/16"	1 1/8"	1/8"	4 1/4"	3/16"

Available 304L/316L      Manufactured to A-102 Spec



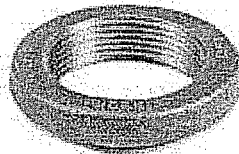
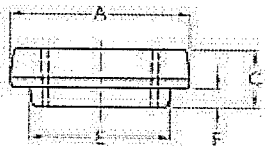
**SERIES 300**

BOILER FLANGE WITH PILOT							
SERIES	PIPE SIZE	A	B	C	D	E	F
300	1/8"	1 5/16"	1 3/16"	1 3/32"	3/32"	2 7/8"	1 1/8"
301	1/4"	1 5/16"	1 3/16"	1 3/32"	3/32"	2 7/8"	1 1/8"
302	3/8"	1 7/16"	1 1/16"	1 5/32"	3/32"	1 3/16"	3/16"
303	1/2"	1 5/8"	1 3/16"	1 5/32"	3/32"	1 1/8"	3/16"
304	3/4"	2"	1 3/8"	1 5/32"	3/32"	1 5/16"	3/16"
305	1"	2 1/4"	1 3/8"	1 7/32"	3/32"	1 11/16"	1/4"
306	1 1/4"	2 9/16"	1 5/16"	1 9/16"	3/32"	1 5/16"	1/4"
307	1 1/2"	2 15/16"	2 5/16"	1 7/16"	3/32"	2 1/4"	1/4"
308	2"	3 3/8"	2 3/4"	1 9/32"	3/32"	2 5/8"	1/4"



**SERIES 380**

LIGHTWEIGHT FLAT TYPE WITH PILOT							
SERIES	PIPE SIZE	A	B	C	D	E	F
380	1/8"	1 3/16"	3/4"	1 3/32"	3/32"	3/4"	1/8"
381	1/4"	1 3/16"	7/8"	1 1/16"	3/32"	7/4"	5/32"
382	3/8"	1 5/16"	1 5/16"	1 1/16"	3/32"	1 5/16"	5/32"
383	1/2"	1 7/16"	1 7/16"	1 5/32"	3/32"	1 7/16"	3/16"
384	3/4"	1 5/8"	1 9/16"	1 5/32"	3/32"	1 3/8"	3/16"
385	1"	2"	1 9/16"	1 11/16"	3/32"	1 9/16"	3/32"
386	1 1/4"	2 3/8"	1 5/16"	1 11/16"	3/32"	1 5/16"	1/4"
387	1 1/2"	2 11/16"	2 3/16"	1 5/8"	3/32"	2 3/16"	1/4"
388	2"	3 1/8"	2 5/8"	1 7/16"	3/32"	2 5/8"	5/32"



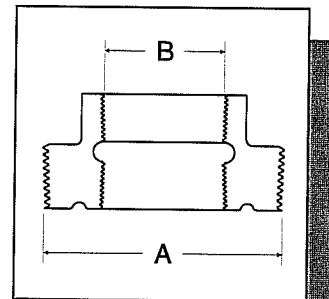
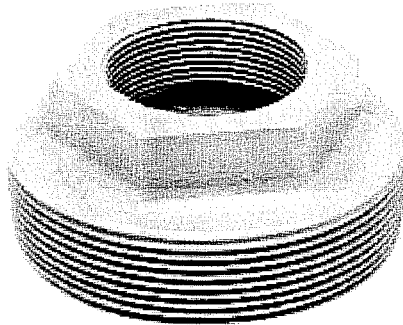
**SERIES 390**

MODIFIED LIGHTWEIGHT FLAT TYPE WITH PILOT							
SERIES	PIPE SIZE	A	C	E	F		
391	1/4"	1 7/16"	1 3/32"	1 5/16"	1/8"		
392	3/8"	1 7/16"	1 7/16"	1 5/16"	5/32"		
393	1/2"	1 7/16"	1 5/32"	1 1/16"	3/16"		
394	3/4"	1 3/8"	1 5/32"	1 3/8"	5/16"		
395	1"	2"	1 11/16"	1 9/16"	7/32"		
396	1 1/4"	2 3/8"	1 11/16"	1 11/16"	1/4"		
397	1 1/2"	2 11/16"	1 5/8"	2 3/16"	1/4"		
398	2"	3 1/8"	1 7/16"	2 5/8"	1/4"		

Call Toll-Free 1-800-444-3674

## Features

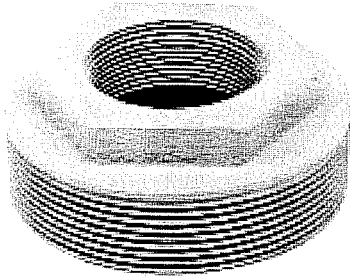
Heavy Duty Cast Iron Double Tapped Bushings for use on underground or aboveground storage tanks. Internal and external threads are true, for straight piping runs. NPT threads are standard.



Part No.	Size	lbs	Thds	
			A	B
0120-01-2037	2"	1.75	2"	3/8"
0120-01-2005	2"	1.5	2"	1/2"
0120-01-2075	2"	1.5	2"	3/4"
0120-01-2001	2"	1.25	2"	1"
0120-01-2012	2"	1.0	2"	1 1/4"
0120-01-2015	2"	1.0	2"	1 1/2"
0120-01-2051	2 1/2"	2.25	2 1/2"	1"
0120-01-2050	2 1/2"	2.25	2 1/2"	1 1/4"
0120-01-2059	2 1/2"	2.0	2 1/2"	1 1/2"
0120-01-2052	2 1/2"	2.0	2 1/2"	2"
0120-01-3001	3"	3.0	3"	1"
0120-01-3012	3"	2.75	3"	1 1/4"
0120-01-3015	3"	2.75	3"	1 1/2"
0120-01-3020	3"	2.5	3"	2"
0120-01-3025	3"	2.25	3"	2 1/2"
0120-01-3051	3"	4.0	3"	1"
0120-01-3050	3"	3.25	3"	1 1/2"
0120-01-3052	3"	3.0	3"	2"
0120-01-3059	3"	3.0	3"	2 1/2"
0120-01-3053	3 1/2"	3.0	3 1/2"	3"
0120-01-4001	4"	5.0	4"	1"
0120-01-4012	4"	4.75	4"	1 1/4"
0120-01-4015	4"	4.5	4"	1 1/2"
0120-01-4002	4"	3.5	4"	2"
0120-01-4025	4"	3.5	4"	2 1/2"
0120-01-4003	4"	4.75	4"	3"
0120-01-4035	4"	4.0	4"	3 1/2"
0120-01-5003	5"	8	5"	3"
0120-01-5004	5"	6	5"	4"
0120-01-6003	6"	12	6"	3"
0120-01-6004	6"	11	6"	4"



# BUSHINGS

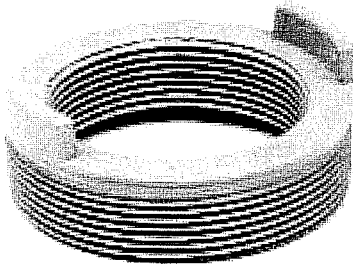
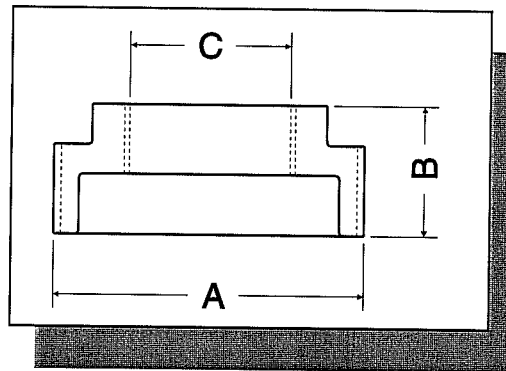


122

## Features

Heavy Duty Cast Iron Single Tap Bushing suitable for use on underground or aboveground storage tanks.

Part No.	Size	lbs	Thds		Thds
			A	B	C
0122-01-3002	3"x2"	1.5	3"	2"	2"
0122-01-4015	4"x1 1/2"	2.75	4"	2"	1 1/2"
0122-01-4002	4"x2"	2.75	4"	2"	2"
0122-01-4003	4"x3"	2.25	4"	2"	3"

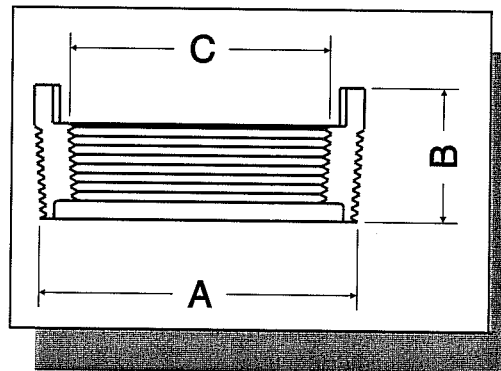


123

## Features

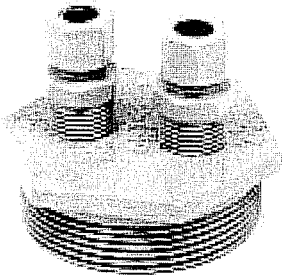
Cast Iron Flush Single Tapped bushing suitable for use on underground or aboveground storage tanks.

Part No.	Size	lbs	Thds		
			A	B	C
0123-01-4003	4"	2.25	4"	2"	3"



# BUSHINGS

PEI



## 1210S

Shown with optional compression fittings.

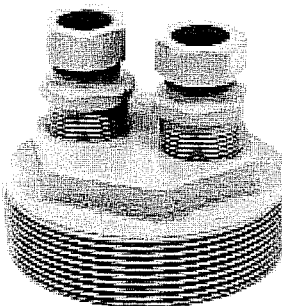
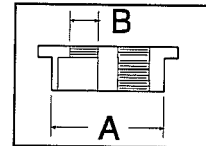
Part No.	Size	lbs	Thds	
			A	B
0121-01-2030	2" x 3/8" x 3/8"	.75	2"	3/8"
0121-01-2050	2" x 1/2" x 1/2"	.75	2"	1/2"

Optional Connectors:

0122-02-0370	3/8"
0122-02-0050	1/2"

### Features

Cast Iron Bushing for fuel oil tanks. 2" NPT with 3/8" or 1/2" NPT taps for supply and return lines. Copper connectors available separately.



## 122 Quad

Shown with optional compression fittings.

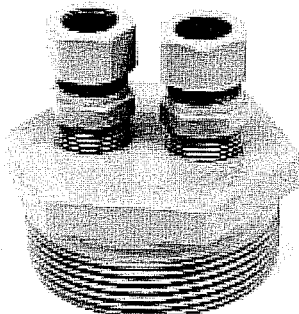
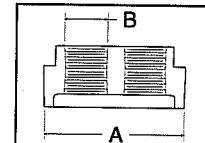
Part No.	Size	lbs	A	B
0122-01-3076	3" x 3/4" x 3/4"	3.25	3"	3/4"
0122-01-3001	3" x 1" x 1"	3.2	3"	1"
0122-01-4075	4" x 3/4" x 3/4"	5.8	4"	3/4"
0122-01-4001	4" x 1" x 1"	5.7	4"	1"

Optional Connectors:

0122-02-0750	3/4"
0122-02-1000	1"

### Features

Cast Iron bushing for fuel tanks. Allows 1 opening to act as the In/Out port.



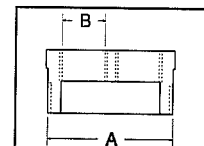
## 122 Terminator

Shown with optional compression fittings.

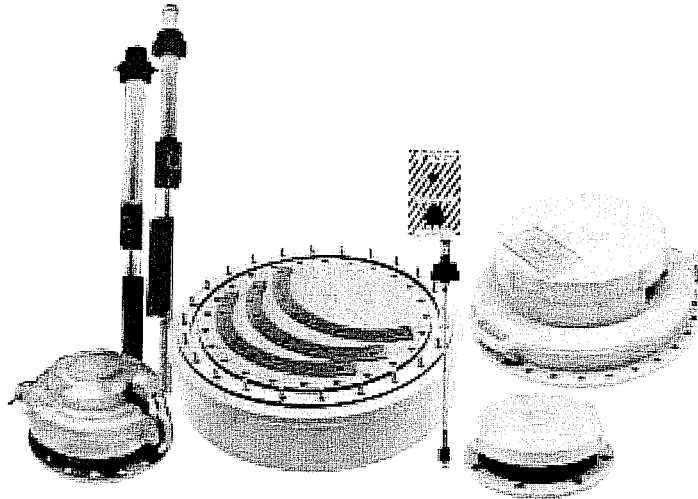
Part No.	Size	lbs	A	B
0122-01-3075	3"	3.0	3"	3/4"

### Features

Cast Iron bushing for fuel tanks. Allows 1 opening to work as the In/Out port.



# Clay & Bailey Mfg. Co.



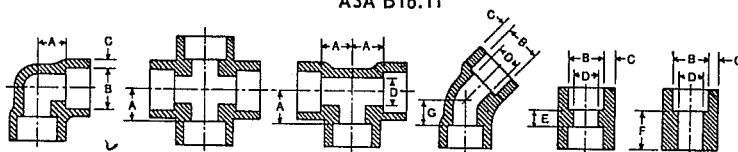
## Other Products Available:

- Above Ground Storage Equipment
- Underground Storage Tank Equipment
- Service Station Equipment
- D.O.T. Manholes & Vents
- Pavement Accessories
- Oil Field Equipment
- Corrosion Control Accessories
- Pneumatic Conveying Accessories
- Dry Bulk Storage Accessories



# Forged Steel Socket Welding Fittings

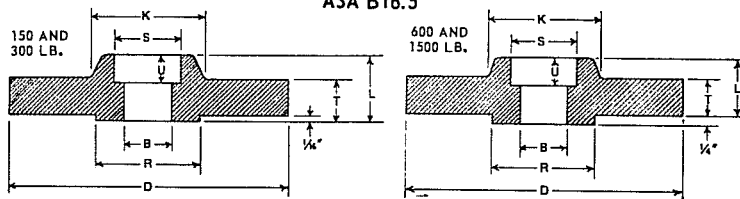
ASA B16.11



Pipe Size	Depth of Socket, Min	Center to Bottom of Socket		Center to Bottom of Socket for 45 Deg. Ells		Bore Diameter of Socket, Min	Socket Wall Thickness Min			Bore Diameter of Fitting			Couplings Distance Between Bottoms of Sockets	Half Couplings, Bottom of Socket to Opposite Face	Pipe Size
		Sched 40 and 80	Sched 160	Sched 40 and 80	Sched 160		Sched 40	Sched 80	Sched 160	Sched 40	Sched 80	Sched 160			
		A		G			C			D					
1/8	3/8	7/16	7/16	7/16	7/16	0.420	0.125	0.125	0.125	0.269	0.215	0.364	0.302	1/4	1/8
1/4	3/8	7/16	7/16	7/16	7/16	0.555	0.125	0.149	0.149	0.364	0.302	0.364	0.302	1/4	1/4
3/8	3/8	7/16	7/16	7/16	7/16	0.690	0.125	0.158	0.158	0.493	0.423	0.493	0.423	3/8	3/8
1/2	3/8	7/16	7/16	7/16	7/16	0.855	0.136	0.184	0.184	0.622	0.546	0.622	0.546	1/2	1/2
3/4	1/2	7/16	7/16	7/16	7/16	1.065	0.141	0.193	0.193	0.824	0.742	0.824	0.742	3/4	3/4
1	1/2	7/16	7/16	7/16	7/16	1.330	0.166	0.224	0.224	1.049	0.957	1.049	0.957	1	1
1-1/4	1/2	7/16	7/16	7/16	7/16	1.675	0.175	0.239	0.239	1.380	1.278	1.380	1.278	1-1/4	1-1/4
1-1/2	1/2	7/16	7/16	7/16	7/16	1.915	0.181	0.250	0.250	1.610	1.500	1.610	1.500	1-1/2	1-1/2
2	3/4	1 1/8	1 1/8	1 1/8	1 1/8	2.406	0.193	0.273	0.273	2.067	1.939	2.067	1.939	2	2
2-1/2	3/4	1 1/8	1 1/8	1 1/8	1 1/8	2.906	0.254	0.345	0.345	2.469	2.323	2.469	2.323	2-1/2	2-1/2
3	3/4	1 1/8	1 1/8	1 1/8	1 1/8	3.535	0.270	0.375	0.375	3.068	2.900	3.068	2.900	3	3

# Forged Steel Socket Welding Flanges

ASA B16.5



Pipe Size	150 LB. STANDARD				300 LB. STANDARD				600 LB. STANDARD				Pipe Size
	D	T	L	K	D	T	L	K	D	T	L	K	
1/4 <sup>1</sup>	3 1/2	3/8	5/8	1 1/8	3 3/4	3/8	5/8	1 1/2	3 3/4	3/8	5/8	1 1/2	1/4 <sup>1</sup>
3/8 <sup>1</sup>	3 3/8	3/8	5/8	1 1/8	3 3/4	3/8	5/8	1 1/2	3 3/4	3/8	5/8	1 1/2	3/8 <sup>1</sup>
1/2	3 3/4	3/8	5/8	1 1/8	3 3/4	3/8	5/8	1 1/2	3 3/4	3/8	5/8	1 1/2	1/2
3/4	3 7/8	1/2	5/8	1 1/2	4 1/8	3/8	1	1 1/2	4 1/8	3/8	1	1 1/2	3/4
1	4 1/4	1/2	5/8	1 1/2	4 1/8	3/8	1 1/8	2 1/2	4 1/8	3/8	1 1/8	2 1/2	1
1-1/4	4 3/4	1/2	5/8	2 3/8	5 1/8	3/8	1 1/8	2 3/4	5 1/8	3/8	1 1/8	2 3/4	1-1/4
1-1/2	5	1/2	5/8	2 3/8	6 1/8	3/8	1 1/8	2 3/4	6 1/8	3/8	1 1/8	2 3/4	1-1/2
2	6	3/4	1	3 3/8	6 3/8	3/8	1 1/8	3 3/8	6 3/8	3/8	1 1/8	3 3/8	2
2-1/2	7	3/4	1 1/4	3 3/8	7 1/2	3/8	1 1/8	3 3/8	7 1/2	3/8	1 1/8	3 3/8	2-1/2
3	7 1/2	3/4	1 3/8	4 1/4	8 1/4	3/8	1 1/8	4 1/4	8 1/4	3/8	1 1/8	4 1/4	3
Pipe Size	1500 LB. STANDARD				DIMENSIONS COMMON TO 150,300,600 AND 1500 LB.				Pipe Size				
	D	T	L	K	S	B <sup>2</sup>	R	U					
1/4 <sup>1</sup>	----	----	----	----	.58	.36	1 1/2	3/8	1/4 <sup>1</sup>				
3/8 <sup>1</sup>	----	----	----	----	.71	.49	1 3/8	3/8	3/8 <sup>1</sup>				
1/2	4 1/4	1	1 1/4	1 1/2	.88	.62	1 1/2	3/8	1/2				
3/4	5 1/4	1	1 3/8	1 3/4	1.09	.82	1 11/16	3/8	3/4				
1	5 3/4	1 1/8	1 3/8	2 1/4	1.36	1.05	2	3/8	1				
1-1/4	6 1/4	1 1/8	1 3/8	2 3/4	1.70	1.38	2 1/2	3/8	1-1/4				
1-1/2	7	1 1/8	1 3/8	2 3/4	1.95	1.61	2 3/4	3/8	1-1/2				
2	8 1/2	1 1/2	2 1/4	4 1/4	2.44	2.07	3 3/4	3/8	2				
2-1/2	9 1/4	1 1/2	2 1/4	4 1/4	2.94	2.47	4 1/4	3/8	2-1/2				
3	----	----	----	----	3.57	3.07	5	3/8	3				

All dimensions given in inches.

(1) 1/8 inch and 3/8 inch sizes are not included in ASA standard B16.5.

(2) Dimension "B" applies to 150 lb. and 300 lb. standards only. For 600 lb. and 1500 lb. standards the "B" dimension is to be specified.

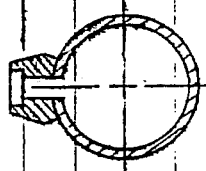
SI with water temperature

SOCKET & THREDDLET FITTING MAKEUP DIMENSIONS

3000LB SOCKET

REDUCING SIZES

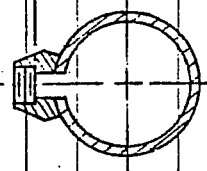
PIPE SIZE	2	3	4	6	8	10	12	14	16	18	20	24
0	1.3/4	2.5/16	2.13/16	3.7/8	4.7/8	5.15/16	6.15/16	7.9/16	8.9/16	9.9/16	10.9/16	12.9/16
U S	1.3/4	2.5/16	2.13/16	3.7/8	4.7/8	5.15/16	6.15/16	7.9/16	8.9/16	9.9/16	10.9/16	12.9/16
I I	2	2.9/16	3.1/16	4.1/8	5.1/8	6.3/16	7.3/16	7.13/16	8.13/16	9.13/16	10.13/16	12.13/16
E L	1.1/2	2.1/2	3	4.1/16	5.1/16	6.1/8	7.1/8	7.3/4	8.3/4	9.3/4	10.3/4	12.3/4
T	2	2.9/16	3.1/16	4.1/8	5.1/8	6.3/16	7.3/16	7.13/16	8.13/16	9.13/16	10.13/16	12.13/16



6000LB SOCKET

REDUCING SIZES

PIPE SIZE	2	3	4	6	8	10	12	14	16	18	20	24
U S	2.1/16	2.5/8	3.1/8	4.3/16	5.3/16	6.1/4	7.1/4	7.7/8	8.7/8	9.7/8	10.7/8	12.7/8
I I	2.1/16	2.5/8	3.1/8	4.3/16	5.3/16	6.1/4	7.1/4	7.7/8	8.7/8	9.7/8	10.7/8	12.7/8
E L	2.1/8	2.11/16	3.3/16	4.1/4	5.1/4	6.5/16	7.5/16	7.15/16	8.15/16	9.15/16	10.15/16	12.15/16
T	2.1/16	2.5/8	3.1/8	4.3/16	5.3/16	6.1/4	7.1/4	7.7/8	8.7/8	9.7/8	10.7/8	12.7/8
T	2	2.9/16	3.1/16	4.3/4	5.3/4	6.13/16	7.13/16	8.7/16	9.7/16	10.7/16	11.7/16	13.7/16



3000LB THREDDLET

REDUCING SIZES

PIPE SIZE	2	3	4	6	8	10	12	14	16	18	20	24
U S	1.11/16	2.1/4	2.3/4	3.13/16	4.13/16	5.7/8	6.7/8	7.1/2	8.1/2	9.1/2	10.1/2	12.1/2
I I	1.11/16	2.1/4	2.3/4	3.13/16	4.13/16	5.7/8	6.7/8	7.1/2	8.1/2	9.1/2	10.1/2	12.1/2
E L	1.13/16	2.3/8	2.7/8	3.15/16	4.15/16	6	7	7.5/8	8.5/8	9.5/8	10.5/8	12.5/8
T	1.1/2	2.7/16	2.15/16	4	5	6.1/16	7.1/16	7.11/16	8.11/16	9.11/16	10.11/16	12.11/16
T	2	2.1/2	3	4.1/16	5.1/16	6.1/8	7.1/8	7.3/4	8.3/4	9.3/4	10.3/4	12.3/4

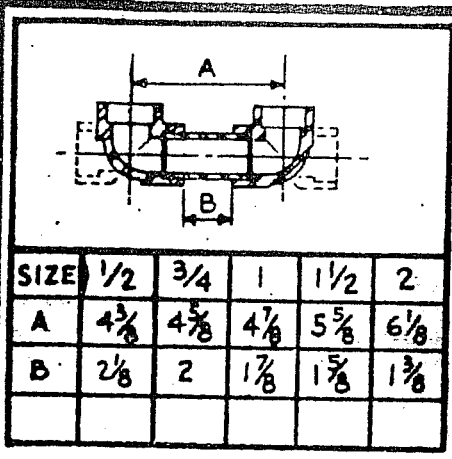
6000LB THREDDLET

REDUCING SIZES

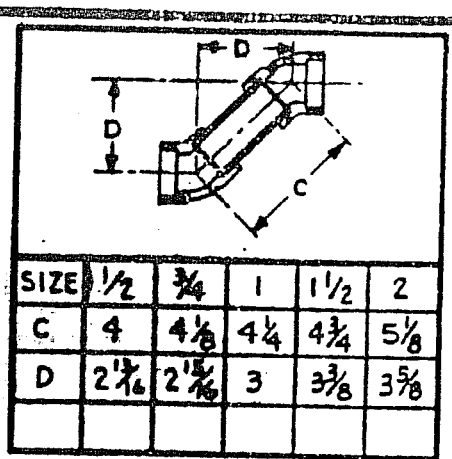
PIPE SIZE	2	3	4	6	8	10	12	14	16	18	20	24
U S	1.15/16	2.1/2	3	4.1/16	5.1/16	6.1/8	7.1/8	7.3/4	8.3/4	9.3/4	10.3/4	12.3/4
I I	1.15/16	2.1/2	3	4.1/16	5.1/16	6.1/8	7.1/8	7.3/4	8.3/4	9.3/4	10.3/4	12.3/4
E L	2.1/16	2.5/8	3.1/8	4.3/16	5.3/16	6.1/4	7.1/4	7.7/8	8.7/8	9.7/8	10.7/8	12.7/8
T	2.3/4	2.3/4	3.1/4	4.5/16	5.5/16	6.3/8	7.3/8	8	9	10	11	13
T	2	3.1/16	3.9/16	4.5/8	5.5/8	6.11/16	7.11/16	8.5/16	9.5/16	10.5/16	11.5/16	13.5/16

NOTE: ALL DIMENSIONS ARE LESS SOCKET OR THREAD ENGAGEMENT.

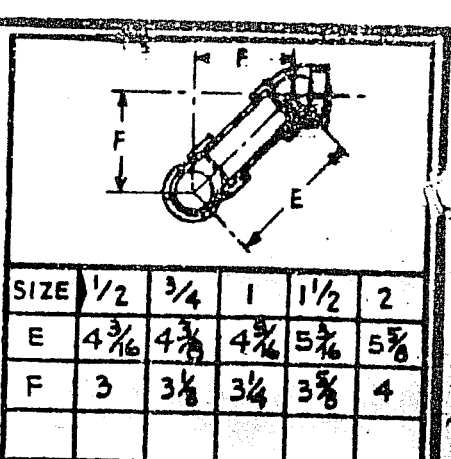
S.O.L. TOG 24



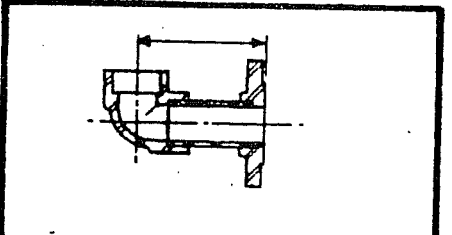
SIZE	1/2	3/4	1	1 1/2	2
A	4 3/8	4 5/8	4 7/8	5 5/8	6 1/8
B	2 1/8	2	1 7/8	1 5/8	1 3/8



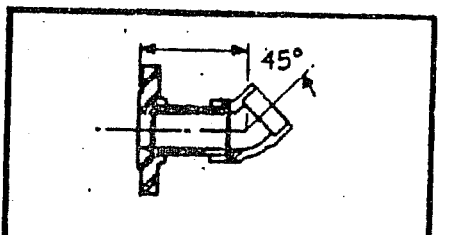
SIZE	1/2	3/4	1	1 1/2	2
C	4	4 1/8	4 1/4	4 3/4	5 1/8
D	2 1/4	2 15/16	3	3 3/8	3 5/8



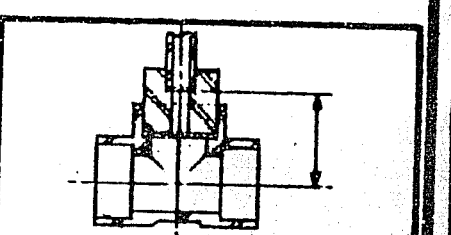
SIZE	1/2	3/4	1	1 1/2	2
E	4 3/16	4 3/8	4 9/16	5 3/16	5 5/8
F	3	3 1/8	3 1/4	3 5/8	4



FLANGE RATING	1/2	3/4	1	1 1/2	2
150	4	4 1/16	4 3/16	4 5/8	4 15/16
300	4 1/4	4 7/16	4 9/16	4 15/16	5 1/4
600	4 1/2	4 1 1/16	4 1 3/16	5 1/4	5 5/8
900	4 7/8	5 1/16	5 3/8	5 3/4	6 7/16
1500					



FLANGE RATING	1/2	3/4	1	1 1/2	2
150	3 13/16	3 1 1/16	3 7/8	4 3/16	4 7/16
300	4 1/16	4 3/16	4 1/4	4 1/2	4 3/4
600	4 5/16	4 7/16	4 1/2	4 13/16	5 1/8
900	4 1 1/16	4 1 3/16	5 1/16	5 5/16	5 15/16
1500					



SMALL END	1/2	3/4	1	1 1/2	2
1/2	-	1 15/16	1 3/4	2 1/4	2 5/8
3/4	-	-	1 7/8	2 3/16	2 3/8
1	-	-	-	2 1/8	2 1/2
1 1/2	-	-	-	-	2 3/8

- NOTE: 1. STANDARD 3" LONG NIPPLES ARE TO BE USED WHEREVER POSSIBLE TO MINIMIZE FIELD LABOR.  
 2. THE COMMON MAKEUP DIMENSIONS SHOWN ABOVE ARE BASED ON A STANDARD 3" LONG NIPPLE PLUS 1/16" CLEARANCE EACH END.  
 3. ONE FIELD CUT NIPPLE SHOULD BE INCLUDED IN EACH MANIFOLD FOR ADJUSTMENT & ROUNDING OFF OVERALL DIMENSION.

SIZE	ELBOW OR TEE			45° ELBOW		
	R	S	T	R	S	T
1/2	5/8	1/2	1/8	7/16	7/16	7/8
3/4	3/4	9/16	15/16	1/2	1/2	1
1	7/8	5/8	1/2	9/16	9/16	1 1/8
1 1/2	1 1/4	3/4	2	13/16	9/16	1 3/8
2	1 1/2	7/8	2 3/8	1	1 1/16	1 11/16

S	FLANGE			
	150	300	600	900/1500
1/2	3/8	1/4	1/2	3/4
3/4	7/16	3/16	3/16	13/16
1	1/2	3/16	9/16	13/16
1 1/2	5/8	1/4	9/16	7/8
2	1 1/16	5/16	5/8	1

COUPLING OR REDUCING CPLG.		REDUCING INSERT		SWAGE
S	T	R	L	
1/2	1/2	1 3/8	-	2 3/4
3/4	1/2	1 1/2	-	3
1	1 3/4	-	15/16	3 1/2
1 1/2	2	-	13/16	4 1/2
2	2 1/2	13/16	15/16	6 1/2

**BROWN & ROOT Inc.** HOUSTON, TEXAS



CONT. NO. CR-28

MINIMUM FITTING MAKE UP DIMENSIONS FOR 2000# AND 3000# SOCKET WELD FITTINGS

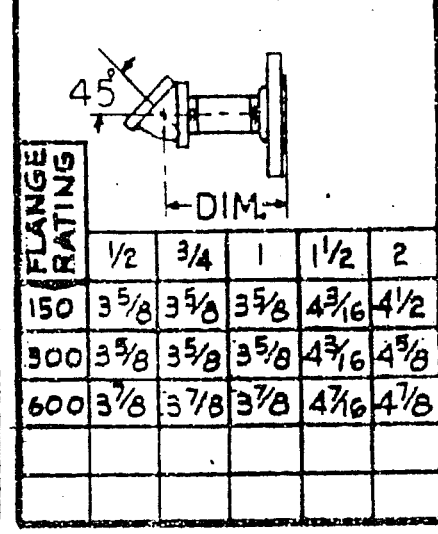
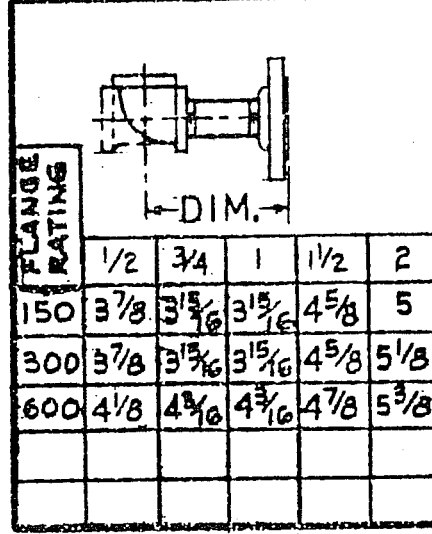
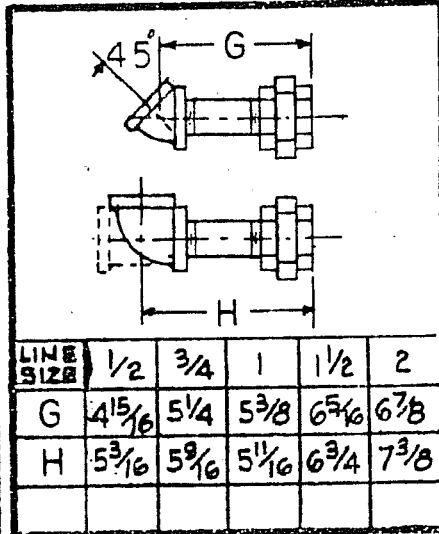
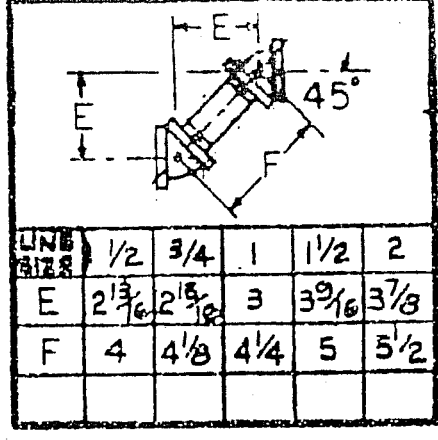
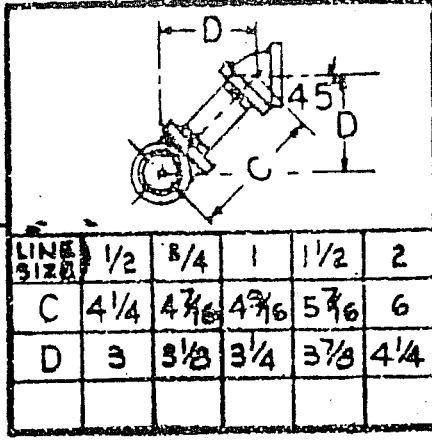
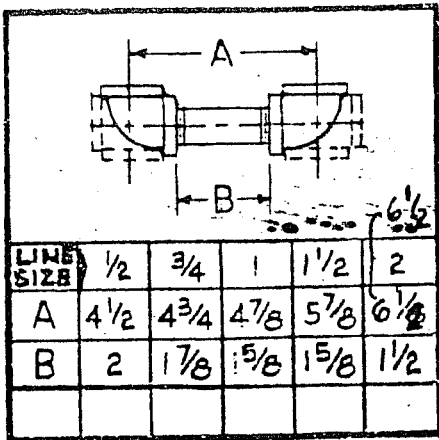
DWG. No. ST-P-187

DRAWN BY H.H.C. CHECKED \_\_\_\_\_ APPROVED \_\_\_\_\_

DATE

SPEC. \_\_\_\_\_





NOTE: 1. STANDARD "3" LONG NIPPLES TO BE USED WHEREVER POSSIBLE TO MINIMIZE MATERIAL INVENTORY & FIELD LABOR.  
 2. ADD 1/4" FOR EACH NIPPLE USED IN EACH MAKE-UP TO ONE FIELD CUT NIPPLE TO DETERMINE MINIMUM OVERALL LENGTH.

PIPE SIZE	90° TEE-ELL	THRD MAKE-UP	45° ELL.	UNION	REDUCER	COUPLING	REDUCING TEE			
							1/2	3/4	1	1 1/2
1/2	1 1/4	1/2	1	1 3/16	—	1 7/8	—	—	—	—
3/4	1 7/16	9/16	1 1/8	2 1/4	1 3/4	2 1/8	1 3/8	—	—	—
1	1 5/8	1 1/16	1 5/16	2 7/16	2	2 3/8	1 1/2	1 9/16	—	—
1 1/2	2 1/8	1 1/16	1 11/16	3	2 1/16	2 7/8	1 13/16	1 7/8	2	—
2	2 1/2	3/4	2	3 3/8	3 3/16	3 5/8	2 1/4	2 1/4	2 1/4	2 3/8

**BROWN & ROOT Inc.** HOUSTON, TEXAS

300# MALLEABLE IRON SCREWED FITTING DIMENSIONS USING 3" LONG NIPPLES

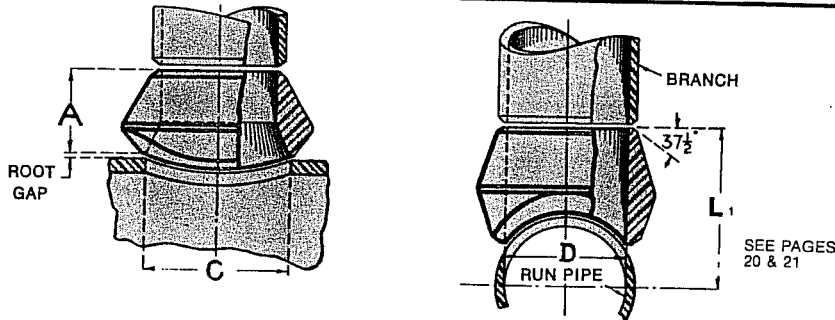
CONT. No. CR-28

DWG. No. ST-P-186

DRAWN BY \_\_\_\_\_ CHECKED \_\_\_\_\_ APPROVED \_\_\_\_\_ DATE \_\_\_\_\_ SPEC. \_\_\_\_\_

**FULL SIZES**

**WELDOLET®**



**STANDARD  
WEIGHT  
FORGED**

OUTLET SIZES	DIMENSIONS			WEIGHT POUNDS
	INCHES	A	C	
1/2	3/4	15/16	5/8	.15
3/4	7/8	13/16	13/16	.25
1	1 1/16	17/16	1 1/32	.40
1 1/4	1 1/4	1 3/4	1 3/8	.70
1 1/2	1 5/16	2	1 5/8	.80
2	1 1/2	2 9/16	2 1/16	1.50
2 1/2	1 5/8	3	2 7/16	2.25
3	1 3/4	3 11/16	3 1/16	3.75
3 1/2	2	4 5/16	3 9/16	5.00
4	2	4 3/4	4	6.70
5	2 1/4	5 13/16	5 1/16	8.50
6	2 3/8	6 11/16	6 1/16	14.00
8	2 3/4	8 11/16	7 15/16	28.00
10	3 1/16	10 13/16	10	39.00
12	3 3/8	12 13/16	12	65.00
14	3 1/2	14 1/16	13 1/4	70.00
16	3 11/16	16 1/16	15 1/4	92.00
18	4 1/16	18 5/8	17 1/4	125.00
20	4 5/8	20 1/16	19 1/4	175.00
24	5 3/8	25 1/8	23 1/4	280.00
30	5 3/8	30 7/16	29 1/4	440.00
36	5 3/8	36 1/2	35 1/4	-1180.00
48	5 13/16	49 1/8	47 1/4	2260.00

**FOOTNOTES APPLY TO PAGES 14 AND 15**

Each outlet size listed is available to fit any run curvature.

**RUN PIPE SIZES**

Outlet sizes 4" and less fit a number of run pipe sizes, and the fittings are marked accordingly. See page 13 for run pipe size consolidation table.

**SCHEDULES**

Standard weight fittings are the same as schedule 40 fittings through 10" Pipe schedule numbers and weight designations are in accordance with ANSI B36.10. A schedule 40 Weldolet for sizes 12" and larger is available.

**MATERIALS**

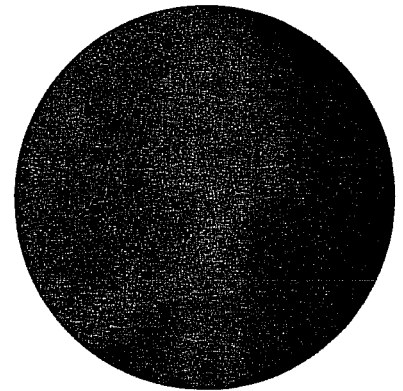
See page 10 for alloy, stainless and other materials available from stock.

**FLATS**

A flat Weldolet for use on welding caps, elliptical heads and flat surfaces is available.

**ORDERING**

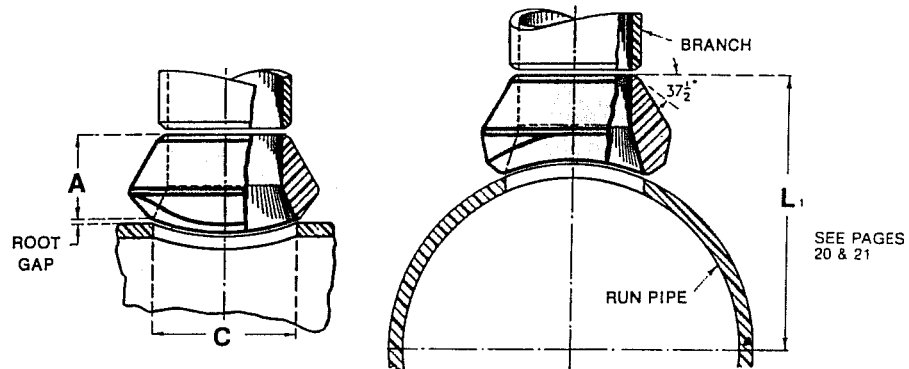
When ordering Weldolet, see page 9.



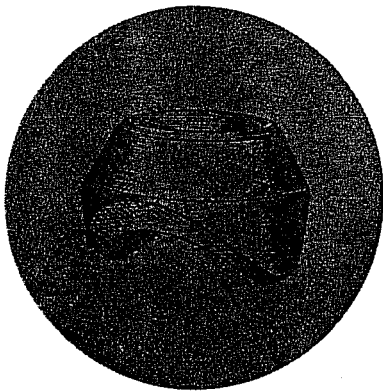
**WELDOLET®**

**REDUCING SIZES**

**STANDARD  
 WEIGHT  
 FORGED**



OUTLET SIZES	DIMENSIONS		WEIGHT
INCHES	A	C	POUNDS
1/8	5/8	5/8	.08
1/4	5/8	5/8	.08
3/8	3/4	3/4	.15
1/2	3/4	15/16	.18
3/4	7/8	13/16	.25
1	1 1/16	1 1/16	.50
1 1/4	1 1/4	1 3/4	.80
1 1/2	1 5/16	2	1.00
2	1 1/2	2 9/16	1.75
2 1/2	1 5/8	3	2.50
3	1 3/4	3 11/16	4.00
3 1/2	1 7/8	4	5.50
4	2	4 3/4	6.30
5	2 1/4	5 9/16	10.25
6	2 3/8	6 11/16	12.00
8	2 3/4	8 11/16	23.00
10	3 1/16	10 13/16	36.00
12	3 3/8	12 13/16	59.00
14	3 1/2	14 1/16	66.00
16	3 11/16	16 1/16	75.00
18	3 13/16	18 1/16	97.00
20	4	20	118.00
24	4 9/16	24 3/16	220.00
26	4 11/16	26 1/4	265.00
30	5 3/8	30 7/16	430.00
36	5 3/8	36 1/2	900.00
48	5 13/16	49 1/8	1780.00

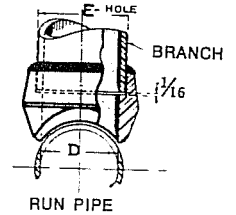
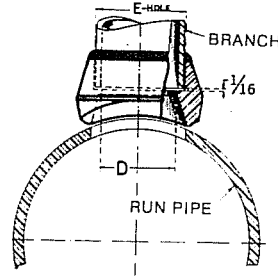
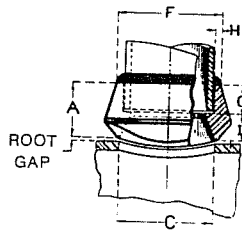


For schedules less than standard weight, 2", 3", 4", 6", 8" light weight Weldolet® are available in reducing sizes only.

**Larger outlet sizes available on application**

# REDUCING AND FULL SIZES

3000 #  
6000 #



## REDUCING SIZES

OUTLET SIZE	DIMENSIONS									APPROX. WEIGHT POUNDS
INCHES	A	C	D	E	F	G	H	I		
<b>3000 # A.S.T.M. A105—GRADE II</b>										
1/8	3/4	5/8	.269	.420	7/8	3/8	7/32	9/32		.10
1/4	3/4	5/8	.364	.555	7/8	3/8	7/32	9/32		.10
3/8	1 1/16	3/4	.493	.690	1	3/8	7/32	7/16		.19
1/2	1	1 1/16	.622	.855	1 1/4	7/16	13/64	9/16		.30
3/4	1 1/16	1 3/16	.824	1.065	1 7/16	1/2	3/16	9/16		.34
1	1 1/16	1 7/16	1.049	1.330	1 13/16	17/32	1/4	2 5/32		.60
1 1/4	1 5/16	1 3/4	1.380	1.675	2 3/16	19/32	1/4	3/4		.85
1 1/2	1 3/8	2	1.610	1.915	2 7/16	5/8	15/64	3/4		1.04
2	1 1/2	2 5/16	2.067	2.406	2 15/16	1 1/16	17/64	1 3/16		1.60
2 1/2	1 9/16	3	2.469	2.906	3 3/16	1 3/16	17/64	3/4		2.75
3	1 3/4	3 11/16	3.068	3.535	4 1/8	1 3/16	19/64	15/16		3.80
3 1/2	2 1/8	4	3.548	4.040	4 13/16	1 1/8	19/64	1		4.30
4	1 7/8	4 3/4	4.026	4.545	5 1/8	1 3/16	19/64	1 1/16		7.25
**5	2 5/8	5 9/16	5.047	5.619	6 5/16	1 9/16	1 11/32	1 13/32		12.00
**6	2 11/16	6 1/16	6.065	6.691	7 3/8	1 9/16	1 11/32	1 13/32		14.50
<b>6000 # A.S.T.M. A105—GRADE II</b>										
1/2	1 1/4	3/4	.466	.855	1 9/16	3/8	23/64	7/8		.50
3/4	1 1/16	1	.614	1.065	1 25/32	9/16	2 1/64	7/8		.80
1	1 1/16	1 1/16	.815	1.330	2 1/4	5/8	15/32	1 5/16		1.30
1 1/4	1 5/8	1 1/2	1.160	1.675	2 9/16	1 3/16	29/64	1 3/16		1.60
1 1/2	1 11/16	1 15/16	1.338	1.915	3	1 3/16	41/64	7/8		2.00
2	2 1/16	2 3/4	1.689	2.406	3 5/8	7/8	39/64	1 1/16		5.13

## FULL SIZES \*

OUTLET SIZE	DIMENSIONS									APPROX. WEIGHT POUNDS
INCHES	A	C	D	E	F	G	H	I		
<b>3000 # A.S.T.M. A105—GRADE II</b>										
1/2	1	1 1/16	.622	.855	1 1/4	15/32	13/64	17/32		.14
3/4	1 1/16	1 3/16	.824	1.065	1 7/16	19/32	3/16	15/32		.25
1	1 1/16	1 7/16	1.049	1.330	1 13/16	19/32	1/4	23/32		.44
1 1/4	1 5/16	1 3/4	1.380	1.675	2 3/16	3/4	1/4	9/16		.64
1 1/2	1 3/8	2	1.610	1.915	2 7/16	23/32	15/64	2 1/32		.85
2	1 1/2	2 5/16	2.067	2.406	2 15/16	9/16	17/64	1 5/16		1.37
2 1/2	1 9/16	3	2.469	2.906	3 3/16	1 3/16	17/64	3/4		2.25
3	1 3/4	3 11/16	3.068	3.535	4 1/8	1 3/16	19/64	15/16		3.75
3 1/2	1 11/16	4 7/16	3.548	4.040	4 3/4	1	19/64	1 1/16		4.30
4	1 7/8	4 3/4	4.026	4.545	5 1/8	1 3/16	19/64	1 1/16		6.60
**5	2 1/16	5 1/4	5.047	5.619	6 5/16	1 7/16	1 11/32	1		9.00
**6	2 1/16	6 1/16	6.065	6.691	7 1/2	1 17/32	1 11/32	1 13/32		15.50

### FOOTNOTES

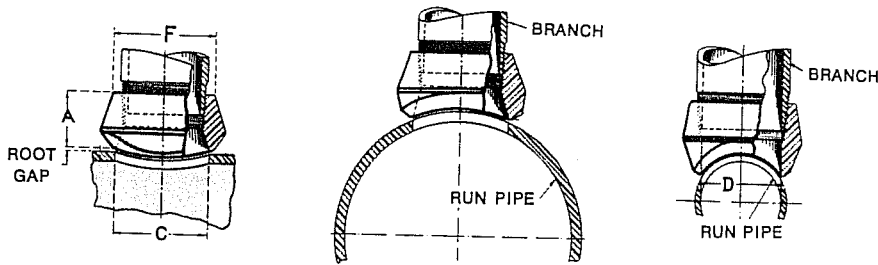
RUN PIPE SIZES

SCHEDULES

MATERIALS  
FLATS

Each outlet size listed is available to fit any run curvature.  
Outlet sizes noted above fit a number of run pipe sizes, and the fittings are marked accordingly. See page 16 for run pipe size consolidation table.  
\*Full size 6000 # Sockolets not manufactured.  
\*\*3000 # fittings are for use with standard and extra strong pipe through 4" outlet size. 6000 # fittings are for use with S160 and XXS pipe. 5" and 6" fittings are rated standard weight.  
See page 13 for alloy, stainless and other materials available from stock.  
Flat Sockolets for use on welding caps, elliptical heads and flat surfaces are available.  
3000 # 6000 # screwed and socket welding ends in accordance with USAS B16 11

# REDUCING AND FULL SIZES



**3000 #**  
**6000 #**

## REDUCING SIZES

OUTLET SIZE	DIMENSIONS			APPROX. WEIGHT POUNDS
INCHES	A	C	F	
<b>3000 # A.S.T.M. A105—GRADE II</b>				
1/8	3/4	5/8	7/8	.10
1/4	3/4	5/8	7/8	.10
3/8	13/16	3/4	1	.20
1/2	1	15/16	1 1/4	.24
3/4	1 1/16	1 3/16	1 1/16	.35
1	1 5/16	1 7/16	1 13/16	.62
1 1/4	1 5/16	1 3/4	2 3/16	.90
1 1/2	1 3/8	2	2 1/16	1.00
2	1 1/2	2 9/16	2 15/16	1.75
2 1/2	1 13/16	3	3 1/16	3.00
3	2	3 11/16	4 1/8	4.35
3 1/2	2 1/8	4	4 13/16	5.75
4	2 1/4	4 3/4	5 1/8	7.10
** 5	2 5/8	5 9/16	6 3/16	12.00
** 6	2 11/16	6 11/16	7 1/16	15.30
<b>6000 # A.S.T.M. A105—GRADE II</b>				
1/4	1 1/8	9/16	1 1/4	.30
3/8	1 1/8	9/16	1 1/4	.30
1/2	1 1/4	3/4	1 9/16	.45
3/4	1 7/16	1	1 13/16	.75
1	1 9/16	1 5/16	2 1/4	1.23
1 1/4	1 5/8	1 1/2	2 9/16	1.57
1 1/2	1 11/16	1 15/16	3	1.96
2	2 1/16	2 3/4	3 5/8	5.08

## FULL SIZES \*

OUTLET SIZE	DIMENSIONS				APPROX. WEIGHT POUNDS
INCHES	A	C	D	F	
<b>3000 # A.S.T.M. A105—GRADE II</b>					
1/2	1	15/16	5/8	1 1/4	.15
3/4	1 1/16	1 3/16	1 3/16	1 1/16	.25
1	1 5/16	1 7/16	1 1/16	1 13/16	.45
1 1/4	1 5/16	1 3/4	1 3/8	2 3/16	.70
1 1/2	1 3/8	2	1 5/8	2 1/16	.90
2	1 1/2	2 9/16	2 1/16	2 15/16	1.40
2 1/2	1 13/16	3	2 1/2	3 1/16	2.50
3	2	3 11/16	3 1/16	4 1/8	4.30
3 1/2	2 1/8	4 7/16	3 9/16	4 5/8	4.50
4	2 1/4	4 3/4	4 1/16	5 1/8	6.80
** 5	2 7/16	5 1/4	5 1/4	6 5/16	9.20
** 6	2 9/16	7 1/4	6 1/16	7 1/16	15.70

### FOOTNOTES

RUN PIPE SIZES

SCHEDULES

MATERIALS  
FLATS

Each outlet size listed is available to fit any run curvature. Outlet sizes noted above fit a number of run pipe sizes, and the fittings are marked accordingly. See page 16 for run pipe size consolidation table.

\*Full size 6000 # Thredolets not manufactured.

\*\*3000 # fittings are for use with standard and extra strong pipe through 4" outlet size. 6000 # fittings are for use with S160 and XXS pipe. 5" and 6" fittings are rated standard weight.

See page 13 for alloy, stainless and other materials available from stock.

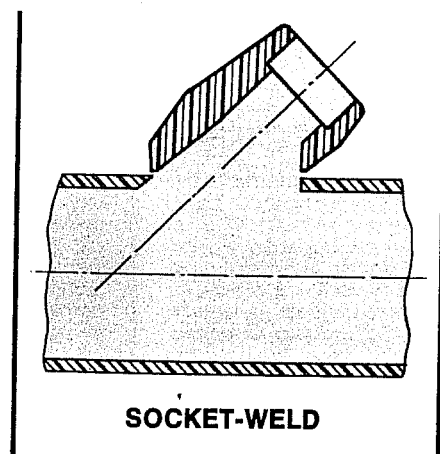
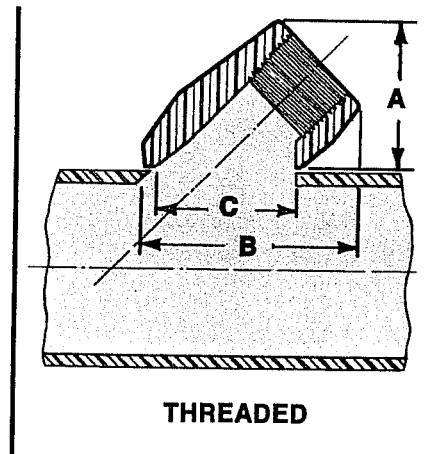
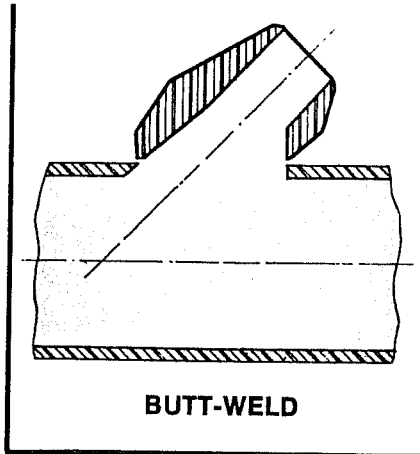
Flat Thredolets are for use on welding caps, elliptical heads and flat surfaces are available.

3000 # 6000 # screwed and socket welding ends in accordance with USAS B16 11

**BONNEY  
FORGE**

**LATROLET® FORGED**  
PATENTED

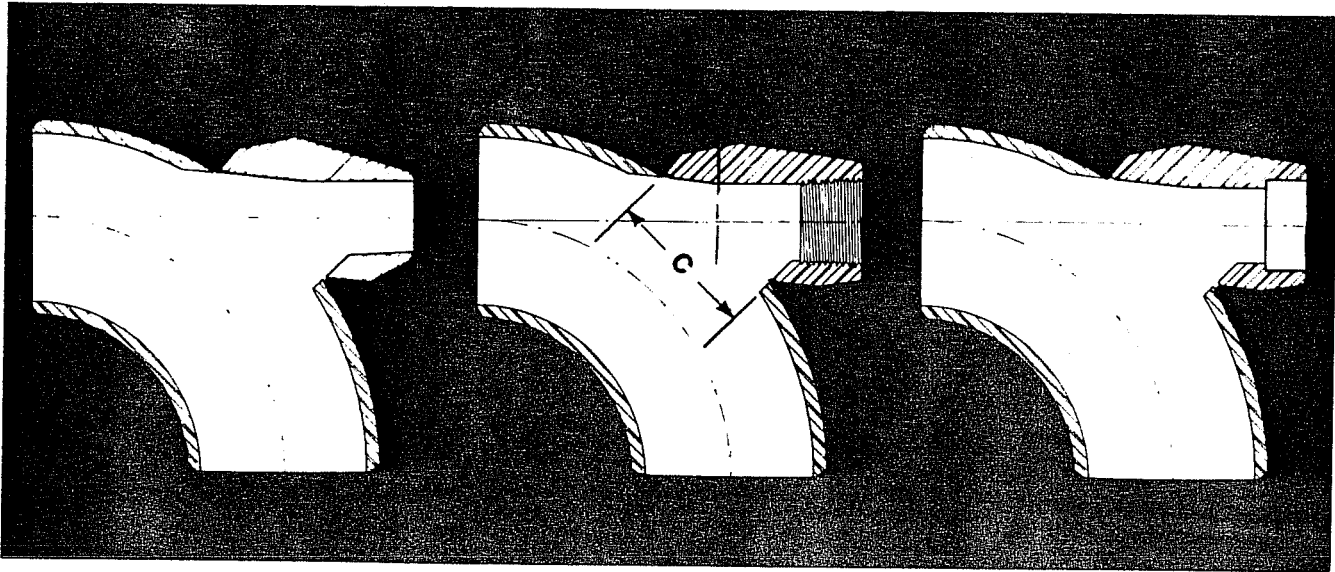
FOR 45° LATERAL CONNECTIONS



NOMINAL RUN PIPE SIZE INCHES	OUTLET SIZE INCHES	DIMENSIONS					
		3000# Threaded and Socketweld Std. and XS Butt-weld			6000# Threaded and Socketweld Sch. 160 and XXS Butt-weld		
		A	B	C	A	B	C
2½-1¼ 12 -3	¼	1⅞	2⅝	1⅞	1⅞	2⅝	1⅞
2½-1¼ 12 -3	⅜	1⅞	2⅝	1⅞	1⅞	2⅝	1⅞
2½-1¼ 12 -3	½	1⅞	2⅝	1⅞			
1½-1¼ 5 -2 12 -6	½				1⅜	2¾	1¾
1½-1¼ 5 -2 12 -6	¾	1⅜	2¾	1¾			
2½-2 5 -3 12 -6	¾				2⅞	3¼	2⅞
2½-2 5 -3 12 -6	1	2⅞	3¼	2⅞	2½	3⅜	2⅝
2½-2 5 -3 12 -6	1¼	2½	3⅜	2⅝	2¾	4¼	3
2½-2 5 -3 12 -6	1½	2¾	4¼	3			
5 -4 8 -6 12 -10	1½				3⅜	5⅜	4⅞
5 -4 8 -6 12 -10	2	3⅜	5⅜	4⅞			
ORDER TO SPECIFIC RUN PIPE SIZES	**2½ **3 **4 **6 **8 **10 **12	3⅞ 3⅜ 4¾ 6½ 8 10 11⅜	5¼ 6¼ 7⅞ 10⅜ 14¼ 17⅜ 20⅞	4⅜ 4⅜ 6⅜ 9 12⅜ 15⅜ 18⅜			

Also available for run sizes through 36". \*\* Available as butt-welding outlets only.

**ELBOLET® FORGED** FOR 90° LONG RADIUS ELBOWS  
PATENTED



*NOMINAL ELBOW SIZE INCHES	OUTLET SIZE INCHES	DIMENSIONS			
		3000# THREADED & SOCKET WELD Std. & XS Butt-Weld		6000# THREADED & SOCKET WELD Sch. 160 & XXS Butt-Weld	
		C	E	C	E
36-1 1/4	1/4	1 1/2	1 19/32	1 1/2	1 19/32
36-1 1/4	3/8	1 1/2	1 19/32	1 1/2	1 19/32
36-1 1/4	1/2	1 1/2	1 19/32	1 23/32	1 7/8
36-1 1/4	3/4	1 23/32	1 7/8	2 1/4	2 1/4
36-2	1	2 1/4	2 1/4	2 7/8	2 1/2
36-2	1 1/4	2 7/8	2 1/2	3 1/8	2 11/16
36-2	1 1/2	3 1/8	2 11/16	4 3/16	3 1/4
36-3	2	4 3/16	3 1/4		
ORDER TO SPECIFIC ELBOW SIZES	**2 1/2	4 3/16	3 1/4		
	**3	5 1/16	3 7/8		
	**4	6 5/8	4 13/16		
	**6	9 3/8	6 1/2		
	**8	13 5/16	8 1/16		
	**10	17 1/32	10 3/8		
	**12	19 5/8	11 1/8		

**Notes Applying to the Elbolet and Latrolet:**

- Socket Dimensions to ANSI B16.11
- Butt-welding End Dimensions to ANSI B16.9 & ANSI B16.25
- \* Each Elbolet 2" & smaller is uniquely designated to fit all the elbow sizes shown. The complete size range interchangeability is so marked on the fitting.
- \*\* Available as Butt-welding outlets only.
- Alloy, stainless & other materials available from stock.
- Schedule 160 Butt-weld available 6" and smaller. XXS Butt-weld available 2" and smaller.

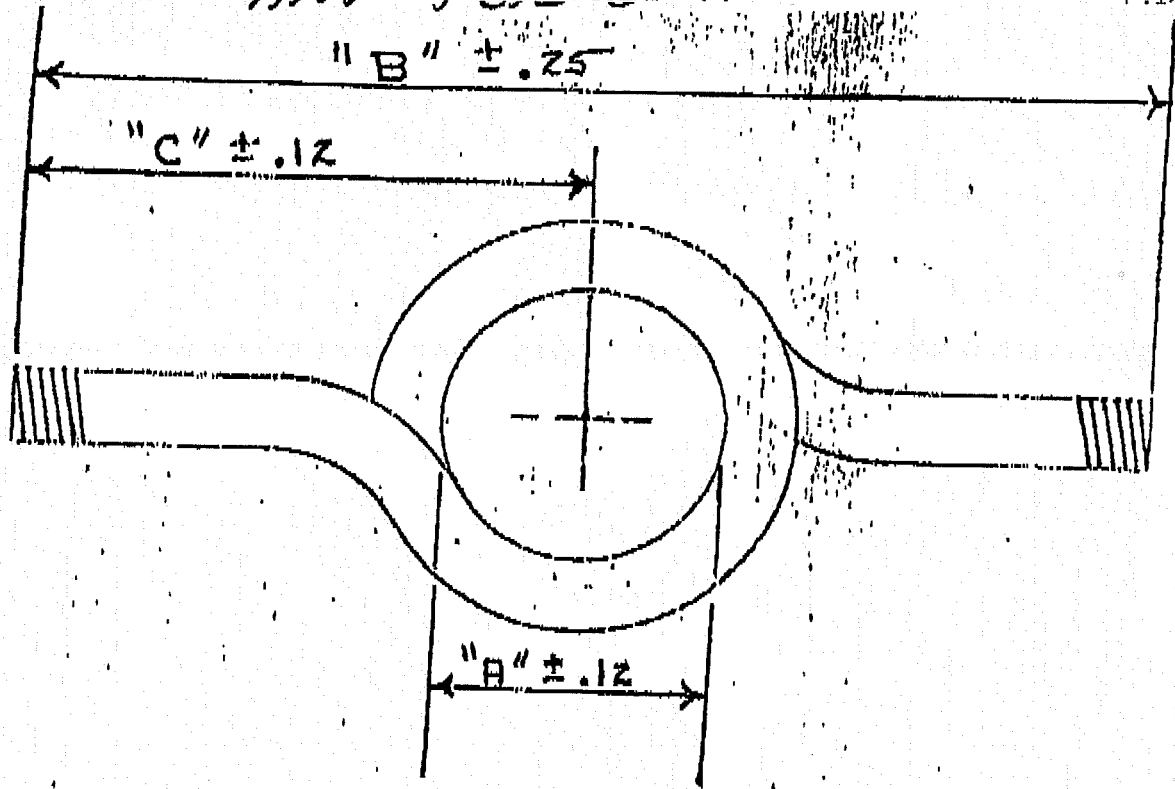


FIG. 370 PIGTAIL

SIZE	"A"	"B"	"C"
1/4"	2"	8"	4"
1/2"	3"	10 3/4"	5 3/8"



**Piping & Equipment, Inc.**

P.O. Box 41307  
 Rosemead, CA 91768-0137

FREE ESTIMATE SERVICE

6781 Paul Starr Drive  
 Elgin Industrial Park  
 Rosemead, CA 91768

PHONE 484-9094

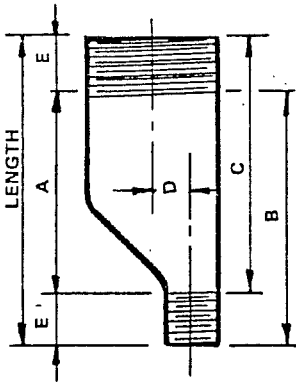


# DRAFTING STANDARDS

CONTINENTAL OIL COMPANY  
ENGINEERING CENTER  
PONCA CITY, OKLAHOMA

E-14

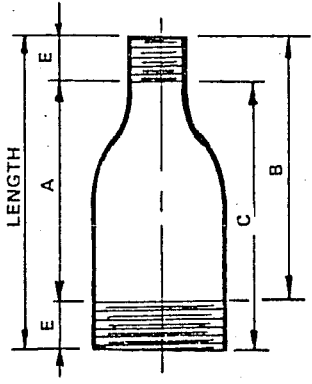
ISSUE No 1  
DATE 9-1-76



ECCENTRIC SWAGE

Nominal Pipe Size	Thread Engage. "E"	Nominal Pipe Size	Thread Engage. "E"	Nominal Pipe Size	Thread Engage. "E"
1/2"	1/2"	1-1/2"	11/16"	3-1/2"	1-1/16"
3/4"	9/16"	2"	3/4"	4"	1-1/8"
1"	11/16"	2-1/2"	15/16"	5"	1-1/4"
1-1/4"	11/16"	3"	1"	6"	1-5/16"

SWAGE NIPPLES ARE MADE IN EITHER PLAIN, BEVELED, GROOVED, OR THREADED ENDS, OR IN ANY COMBINATION. (FROM W.C. NORRIS BULLETIN NO. 31)



CONCENTRIC SWAGE

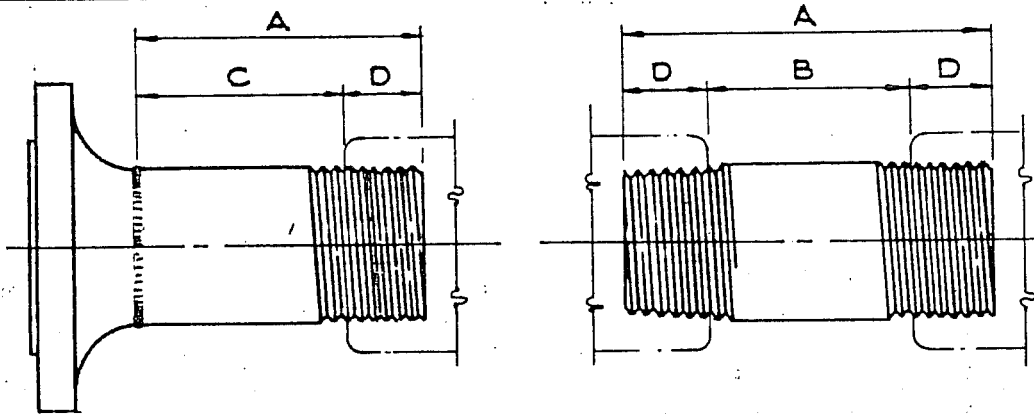
Nominal Pipe Reduction	Length	A	B	C	D	Nominal Pipe Reduction	Length	A	B	C	D	Nominal Pipe Reduction	Length	A	B	C	D	
3/4" x 1/2"	3"	1-15/16	2-7/16	2-1/2"	1/8"	6" x 3/4"	12"	10-1/8"	10-11/16	11-7/16	2-5/8"	4" x 1-1/2"	9"	7-3/16	7-7/8	8-5/16	1-1/4	
1" x 1/2"	3-1/2"	2-5/16	2-13/16	3"	1/4"	1-1/4" x 1"	4"	2-5/8"	3-5/16	3-5/16	1/8"	5" x 1-1/2"	11"	9-1/16	9-3/4	10-5/16	1-3/4	
1-1/4" x 1/2"	4"	2-13/16	3-5/16	3-1/2"	3/8"	1-1/2" x 1"	4-1/2"	3-1/8"	3-13/16	3-13/16	1/4"	6" x 1-1/2"	12"	10	10-11/16	11-5/16	2-3/8	
1-1/2" x 1/2"	4-1/2"	3-5/16	3-13/16	4"	1/2"	2" x 1"	6-1/2"	5-1/16	5-3/4	5-13/16	1/2	2-1/2" x 2"	7"	5-5/16	6-1/16	6-1/16	1/4	
2" x 1/2"	6-1/2"	5-1/4"	5-3/4"	6"	3/4"	2-1/2" x 1"	7"	5-3/8"	6-1/16	6-5/16	3/4"	3" x 2"	8"	6-1/4"	7	7-1/4	1/2	
2-1/2" x 1/2"	7"	5-9/16	6-1/16	6-1/2"	1"	3" x 1"	8"	6-5/16	7"	7-5/16	1"	4" x 2"	9"	7-1/8"	7-7/8	8-1/4	1	
3" x 1/2"	8"	6-1/2"	7"	7-1/2"	1-1/4"	4" x 1"	9"	7-3/16	7-7/8	8-5/16	1-1/2"	5" x 2"	11"	9"	9-3/4	10-1/4	1-1/2	
4" x 1/2"	9"	7-3/8"	7-7/8"	8-1/2"	1-3/4"	5" x 1"	11"	9-1/16	9-3/4"	10-5/16	2"	6" x 2"	12"	9-15/16	10-11/16	11-1/4	2	
5" x 1/2"	11"	9-1/4"	9-3/4"	10-1/2"	2-1/4"	6" x 1"	12"	10"	10-11/16	11-5/16	2-1/2"	3" x 2-1/2"	8"	6-1/16	7	7-1/16	1/4	
6" x 1/2"	12"	10-3/16	10-11/16	11-1/2"	2-3/4"	1-1/2" x 1-3/4"	4-1/2"	3-1/8"	3-13/16	3-13/16	1/8"	4" x 2-1/2"	9"	6-15/16	7-7/8	8-1/16	3/4	
1" x 3/4"	3-1/2"	2-1/4	2-13/16	2-15/16	1/8"	2" x 1-1/4"	6-1/2"	5-1/16	5-3/4"	5-13/16	3/8"	5" x 2-1/2"	11"	8-13/16	9-3/4	10-1/16	1-1/4	
1-1/4" x 3/4"	4"	2-3/4	3-5/16	3-7/16"	1/4"	2-1/2 x 1-1/4"	7"	5-3/8"	6-1/16	6-5/16	5/8"	6" x 2-1/2"	12"	9-3/4"	10-11/16	11-1/16	1-3/4	
1-1/2" x 3/4"	4-1/2"	3-1/4	3-13/16	3-15/16	3/8	3" x 1-1/4"	8"	6-5/16	7	7-5/16	7/8	4" x 3"	9"	6-7/8	7-7/8	8	1/2	
2" x 3/4"	6-1/2"	5-3/16	5-3/4	5-15/16	5/8	4" x 1-1/4"	9"	7-3/16	7-7/8	8-5/16	1-3/8	5" x 3"	11"	8-3/4	9-3/4	10	1	
2-1/2" x 3/4"	7"	5-1/2	6-1/16	6-7/16	7/8	5" x 1-1/4"	11"	9-1/16	9-3/4	10-5/16	1-7/8	6" x 3"	12"	9-11/16	10-11/16	11	1-1/2	
3" x 3/4"	8"	6-7/16	7	7-7/16	1-1/8	6" x 1-1/4"	12"	10	10-11/16	11-5/16	2-3/8	5" x 4"	11"	8-5/8	9-3/4	9-7/8	1/2	
4" x 3/4"	9"	7-5/16	7-7/8	8-7/16	1-5/8	2" x 1-1/2"	6-1/2"	5-1/16	5-3/4	5-13/16	1/4	6" x 4"	12"	9-9/16	10-11/16	10-7/8	1	
5" x 3/4"	11"	9-3/16	9-3/4	10-7/16	2-1/8	2 1/2" x 1 1/2"	7"	5-3/8	6-1/16	6-5/16	1/2	6" x 5"	12"	9-7/16	10-11/16	10-3/4	1/2	
						3" x 1-1/2"	8"	6-5/16	7	7-5/16	3/4							

# DRAFTING STANDARDS

CONTINENTAL OIL COMPANY  
ENGINEERING CENTER  
PONCA CITY, OKLAHOMA

E-13

ISSUE No	DATE
1	9-1-76



SIZE	D	LENGTH - INCHES											
		A	3/4	1/2"	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
1/8	1/4"	A	3/4	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
		B	1/4	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2
		C	1/2	1 1/4	1 3/4	2 1/4	2 3/4	3 1/4	3 3/4	4 1/4	4 3/4	5 1/4	5 3/4
1/4	3/8	A		1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
		B		3/4	1 1/4	1 3/4	2 1/4	2 3/4	3 1/4	3 3/4	4 1/4	4 3/4	5 1/4
		C		1 1/8	1 5/8	1 7/8	2 3/8	2 7/8	3 3/8	3 7/8	4 3/8	4 7/8	5 3/8
3/8	3/8	A		1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
		B		3/4	1 1/4	1 3/4	2 1/4	2 3/4	3 1/4	3 3/4	4 1/4	4 3/4	5 1/4
		C		1 1/8	1 5/8	1 7/8	2 3/8	2 7/8	3 3/8	3 7/8	4 3/8	4 7/8	5 3/8
1/2	1/2	A		1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
		B		1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5
		C		1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2
3/4	5/16	A			2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
		B			7/8	1 1/8	1 1/4	1 5/8	2 1/8	2 1/4	2 3/8	2 7/8	3 1/8
		C			1 1/16	1 5/16	1 9/16	2 1/16	2 1/4	2 5/16	2 9/16	3 1/16	3 5/16
1	1/16	A			2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
		B			5/8	1 1/8	1 1/4	1 5/8	2 1/8	2 1/4	2 3/8	2 7/8	3 1/8
		C			1 5/16	1 9/16	1 13/16	2 1/16	2 1/4	2 5/16	2 9/16	3 1/16	3 5/16
1 1/4	1/16	A			2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
		B			5/8	1 1/8	1 1/4	1 5/8	2 1/8	2 1/4	2 3/8	2 7/8	3 1/8
		C			1 5/16	1 9/16	1 13/16	2 1/16	2 1/4	2 5/16	2 9/16	3 1/16	3 5/16
1 1/2	1/16	A			2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
		B			5/8	1 1/8	1 1/4	1 5/8	2 1/8	2 1/4	2 3/8	2 7/8	3 1/8
		C			1 5/16	1 9/16	1 13/16	2 1/16	2 1/4	2 5/16	2 9/16	3 1/16	3 5/16
2	3/4	A				2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
		B				1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2
		C				1 3/4	2 1/4	2 3/4	3 1/4	3 3/4	4 1/4	4 3/4	5 1/4
2 1/2	15/16	A					3	3 1/2	4	4 1/2	5	5 1/2	6
		B					1 1/8	1 1/4	1 5/8	2 1/8	2 1/4	2 3/8	2 7/8
		C					2 1/16	2 1/4	2 5/16	2 9/16	3 1/16	3 5/16	
3	1	A					3	3 1/2	4	4 1/2	5	5 1/2	6
		B					1	1 1/2	2	2 1/2	3	3 1/2	4
		C					2	2 1/2	3	3 1/2	4	4 1/2	5
4	1 1/8	A						4	4 1/2	5	5 1/2	6	
		B						1 3/4	2 1/4	2 3/4	3 1/4	3 3/4	
		C						2 7/8	3 3/8	3 7/8	4 3/8	4 7/8	

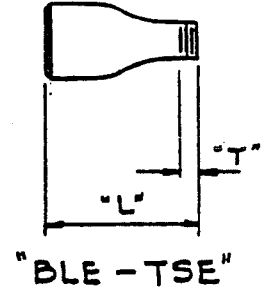
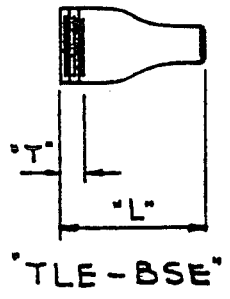
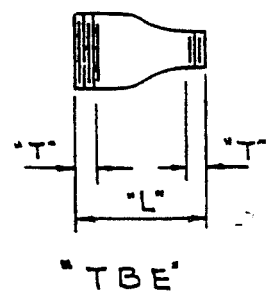
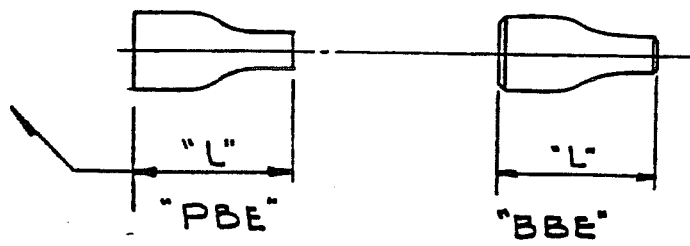


TABLE 6I  
DIMENSIONS OF STD. WT., XS AND XXS SWAGED NIPPLES

PIPE SIZE

	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½	⅜	¼
¼									9	8	6½	4½	3½	3	3	3	
⅜									9	8	6½	4½	3½	3	3		
½									9	8	6½	4½	3½	3			
¾									9	8	6½	4½	3½				
1								12	9	8	6½	4½					
1½								12	9	8	6½						
2	22	20	18	17	16	15	13	12	9	8							
3	22	20	18	17	16	15	13	12	9								
4	22	20	18	17	16	15	13	12									
6	22	20	18	17	16	15	13										
8	22	20	18	17	16	15											
10	22	20	18	17	16												
12	22	20	18	17													
14	22	20	18														
16	22	20															
18	22																
20																	

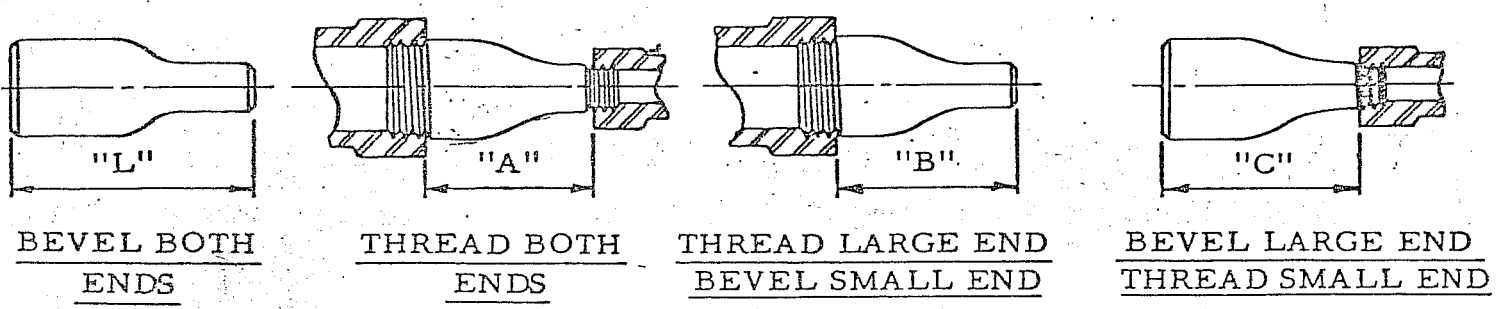
PIPE SIZE



EXAMPLE FOR LABELING ON PIPE SKETCHES:  
 6 X 2 SWAGED NIPPLE - BBE  
 3 X 1 SWAGED NIPPLE - BLE-PSE  
 4 X ½ SWAGED NIPPLE - BLE-TSE

"T" = NORMAL THREAD ENGAGEMENT TO MAKE TIGHT JOINTS.

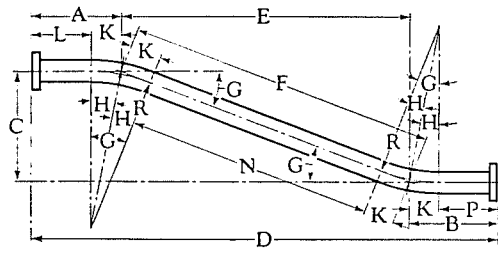
PIPE SIZE	¼	⅜	½	¾	1	1¼	1½	2	2½	3	4	6
"T"	⅜	⅜	½	9/16	11/16	11/16	11/16	¾	15/16	1	1 1/8	1 5/16



PIPE SIZE	"L"	"B"	"C"																PIPE SIZE
			1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4	6	8	10	12	
1/8				2 1/2	2 1/2	2 1/2													1/8
1/4	2 3/4	2 3/8	2 1/8		2 3/8	2 3/8	2 5/8	3 1/8	3 5/8	4 1/8	6 1/8	6 5/8	7 5/8	8 5/8					1/4
3/8	2 3/4	2 3/8	2 1/8	2		2 3/8	2 5/8	3 1/8	3 5/8	4 1/8	6 1/8	6 5/8	7 5/8	8 5/8					3/8
1/2	2 3/4	2 1/2	2	1 7/8	1 7/8		2 1/2	3	3 1/2	4	6	6 1/2	7 1/2	8 1/2	11 1/2				1/2
3/4	3	2 3/16		2 1/16	2 1/16	1 15/16		2 15/16	3 7/16	3 15/16	5 15/16	6 7/16	7 7/16	8 7/16	11 7/16				3/4
1	3 1/2	2 13/16		2 7/16	2 7/16	2 5/16	2 1/4		3 5/16	3 13/16	5 13/16	6 5/16	7 5/16	8 5/16	11 5/16				1
1 1/4	4	3 5/16		2 15/16	2 15/16	2 13/16	2 3/4	2 5/8		3 13/16	5 13/16	6 5/16	7 5/16	8 5/16	11 5/16				1 1/4
1 1/2	4 1/2	3 13/16		3 7/16	3 7/16	3 5/16	3 1/4	3 1/8	3 1/8		5 13/16	6 5/16	7 5/16	8 5/16	11 5/16				1 1/2
2	6 1/2	5 3/4		5 3/8	5 3/8	5 1/4	5 3/16	5 1/16	5 1/16	5 1/16		6 1/4	7 1/4	8 1/4	11 1/4	12 1/4	14 1/4	15 1/4	2
2 1/2	7	6 1/16		5 11/16	5 11/16	5 9/16	5 1/2	5 3/8	5 3/8	5 3/8	5 5/16		7 1/16	8 1/16	11 1/16	12 1/16	14 1/16	15 1/16	2 1/2
3	8	7		6 5/8	6 5/8	6 1/2	6 7/16	6 5/16	6 5/16	6 5/16	6 1/4	6 1/16		8	11	12	14	15	3
4	9	7 7/8		7 1/2	7 1/2	7 3/8	7 5/16	7 3/16	7 3/16	7 3/16	7 1/8	6 15/16	6 7/8		10 7/8	11 7/8	13 7/8	14 7/8	4
6	12	10 11/16				10 3/16	10 1/8	10	10	10	9 15/16	9 3/4	9 11/16	9 9/16		11 11/16	13 11/16	14 11/16	6
8	13	11 9/16									10 13/16	10 5/8	10 9/16	9 7/16	10 1/4		13 9/16	14 9/16	8
10	15	13 3/8									12 5/8	12 7/16	12 3/8	12 1/4	12 1/16	11 15/16		14 3/8	10
12	16	14 1/4									13 1/2	13 5/16	13 1/4	13 1/8	12 15/16	12 13/16	12 5/8		12
PIPE SIZE	"L"	"B"	1/8	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4	6	8	10	12	PIPE SIZE

When specifying in the Bill of Material give the size of both ends with required wall thickness, and describe how each end is prepared (beveled or threaded).

# Calculation of Pipe Bends



Example No. 8—Given A, B, C, D, R

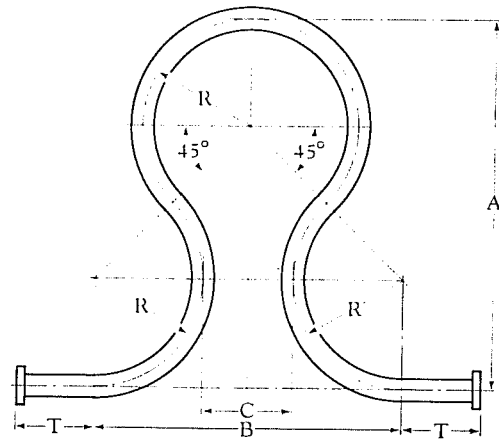
$$E = D - A - B \quad \angle H = \frac{1}{2} \angle G$$

$$F = \sqrt{E^2 + C^2} \quad K = \tan \angle H \times R$$

$$L = A - K$$

$$C = \bar{F} \sin \angle G \quad P = B - K$$

$$\bar{F} = \sin \angle G \quad N = F - 2K$$

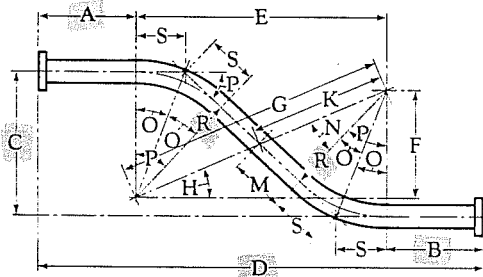


Example No. 11—Given R and 45° Angles

$$A = 3.414 \times R \quad T = \text{Tangent}$$

$$B = 2.828 \times R \quad \text{Length of pipe in bend} =$$

$$C = 0.828 \times R \quad 9.425 \times R + 2T$$



Example No. 9—Given A, B, C, D, R

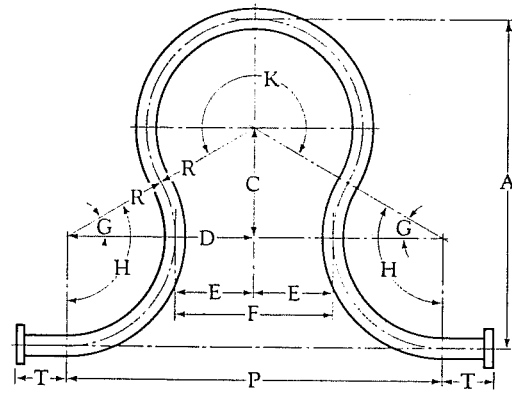
$$E = D - A - B \quad M = \sqrt{K^2 - R^2}$$

$$F = 2R - C \quad \frac{M}{K} = \sin \angle N$$

$$G = \sqrt{E^2 + F^2} \quad \angle P = 90^\circ - \angle H - \angle N$$

$$\frac{F}{E} = \tan \angle H \quad \angle O = \frac{1}{2} \angle P$$

$$K = \frac{1}{2} G \quad S = \tan \angle O \times R$$

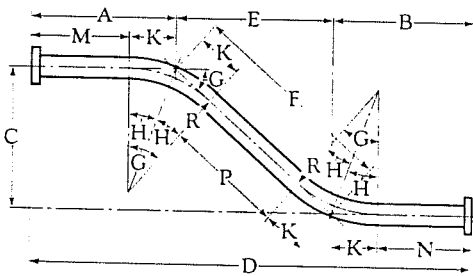


Example No. 12—Given A, R

$$C = A - 2R \quad P = 2D \quad C/2R = \sin \angle G$$

$$D = \sqrt{(2R)^2 - C^2} \quad E = D - R \quad \angle H = 90^\circ + \angle G$$

$$F = 2E \quad \angle K = 180^\circ + 2 \angle G$$



Example No. 10—Given A, B, C, D, R

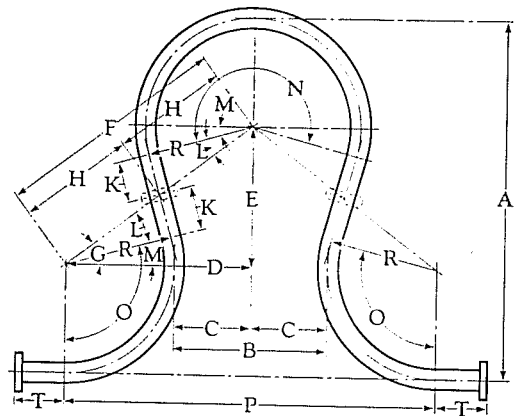
$$E = D - A - B \quad \angle H = \frac{1}{2} \angle G$$

$$F = \sqrt{C^2 + E^2} \quad K = \tan \angle H \times R$$

$$M = A - K$$

$$C = \bar{F} \sin \angle G \quad N = B - K$$

$$\bar{F} = \sin \angle G \quad P = F - 2K$$



Example No. 13—Given A, B, R

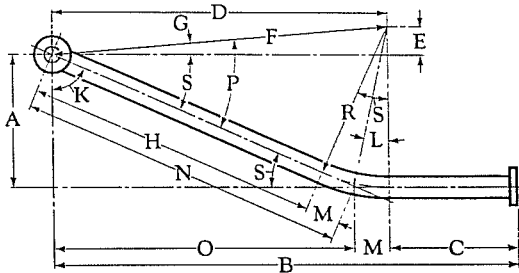
$$C = \frac{1}{2} B \quad E/F = \sin \angle G \quad \angle M = \angle G - \angle L$$

$$D = R + C \quad H = \frac{1}{2} F \quad \angle N = 180^\circ + 2 \angle M$$

$$E = A - 2R \quad K = \sqrt{H^2 - R^2} \quad \angle O = 90^\circ + \angle M$$

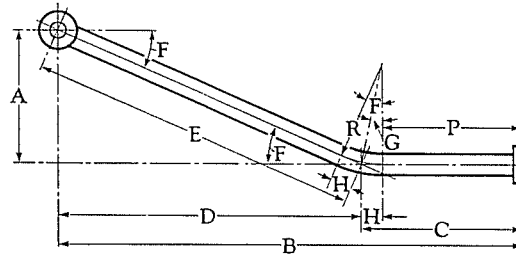
$$F = \sqrt{D^2 + E^2} \quad K/H = \sin \angle L \quad P = 2D$$

# Calculation of Pipe Bends



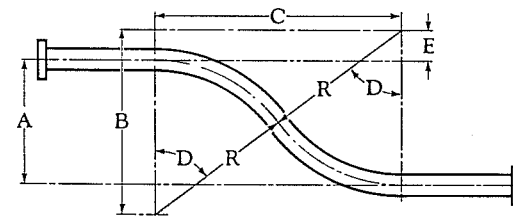
Example No. 1—Given A, B, C, R

$$\begin{aligned}
 D &= B - C & R &= \sin \angle P \\
 E &= R - A & \frac{R}{F} &= \sin \angle P \\
 F &= \sqrt{D^2 + E^2} & \angle S &= \angle P - \angle G \\
 \frac{E}{F} &= \sin \angle G & \angle K &= 90^\circ - \angle S \\
 H &= \sqrt{F^2 - R^2} & \angle L &= \frac{1}{2} \angle S \\
 & & M &= \tan \angle L \times R \\
 & & N &= H + M \\
 & & O &= B - C - M
 \end{aligned}$$



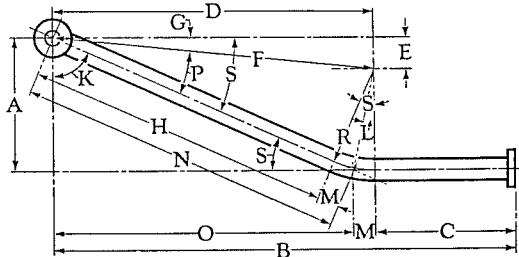
Example No. 4—Given A, B, C, R

$$\begin{aligned}
 D &= B - C & \frac{A}{E} &= \sin \angle F & H &= \tan \angle G \times R \\
 E &= \sqrt{A^2 + D^2} & \angle G &= \frac{1}{2} \angle F & P &= C - H
 \end{aligned}$$



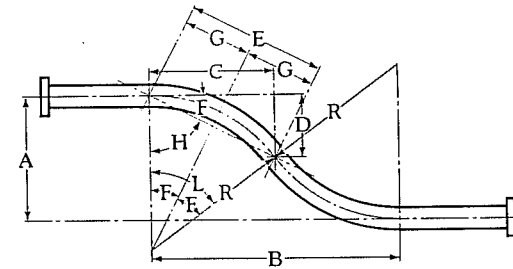
Example No. 5—Given A, R

$$\begin{aligned}
 B &= 2R - A & C &= \sqrt{(2R)^2 - B^2} & \frac{C}{2R} &= \sin \angle D
 \end{aligned}$$



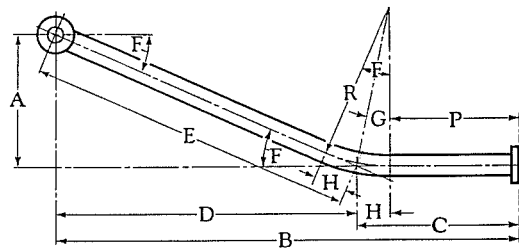
Example No. 2—Given A, B, C, R

$$\begin{aligned}
 D &= B - C & R &= \sin \angle P \\
 E &= A - R & \frac{R}{F} &= \sin \angle P \\
 F &= \sqrt{D^2 + E^2} & \angle S &= \angle P + \angle G \\
 \frac{E}{F} &= \sin \angle G & \angle K &= 90^\circ - \angle S \\
 H &= \sqrt{F^2 - R^2} & \angle L &= \frac{1}{2} \angle S \\
 & & M &= \tan \angle L \times R \\
 & & N &= H + M \\
 & & O &= B - C - M
 \end{aligned}$$



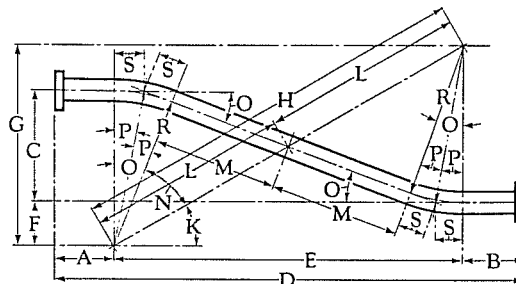
Example No. 6—Given A, B

$$\begin{aligned}
 C &= \frac{1}{2} B & \frac{D}{E} &= \sin \angle F & \angle H &= 90^\circ - \angle F \\
 D &= \frac{1}{2} A & G &= \frac{1}{2} E & R &= \frac{A^2 + B^2}{4A} \\
 E &= \sqrt{C^2 + D^2} & L &= 2F
 \end{aligned}$$



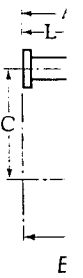
Example No. 3—Given A, B, C, R

$$\begin{aligned}
 D &= B - C & \angle G &= \frac{1}{2} \angle F \\
 E &= \sqrt{A^2 + D^2} & H &= \tan \angle G \times R \\
 \frac{A}{E} &= \sin \angle F & P &= C - H
 \end{aligned}$$



Example No. 7—Given A, B, C, D, R

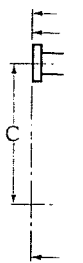
$$\begin{aligned}
 E &= D - A - B & G/H &= \sin \angle K & M/L &= \sin \angle N \\
 F &= R - C & L &= \frac{1}{2} H & \angle O &= 90^\circ - \angle K - \angle N \\
 G &= R + F & H &= \sqrt{E^2 + G^2} & \angle P &= \frac{1}{2} \angle O \\
 & & M &= \sqrt{L^2 - R^2} & S &= \tan \angle P \times R
 \end{aligned}$$



$$\begin{aligned}
 E &= L \\
 F &= \sqrt{C^2 + E^2} \\
 \frac{C}{F} &= \sin \angle
 \end{aligned}$$



$$\begin{aligned}
 E &= L \\
 F &= 2 \\
 G &= \sqrt{F^2 + L^2} \\
 \frac{F}{E} &= \tan \angle \\
 K &= \frac{1}{2}
 \end{aligned}$$



$$\begin{aligned}
 E &= L \\
 F &= \sqrt{C^2 + E^2} \\
 \frac{C}{F} &= \sin \angle
 \end{aligned}$$



# AMERICAN WELDING SOCIETY STANDARD WELDING SYMBOLS

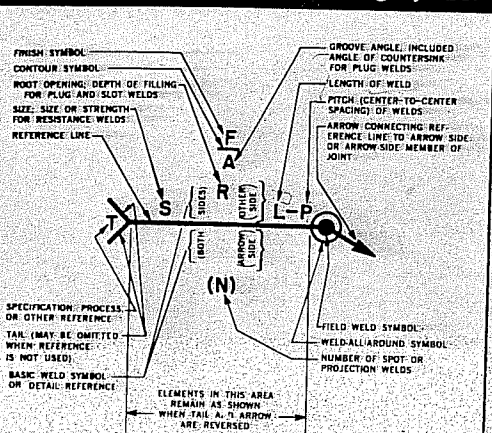
## Basic Weld Symbols and Their Location Significance

LOCATION SIGNIFICANCE	ARC AND GAS WELD SYMBOLS												RESISTANCE WELD SYMBOLS					
	FILLET	PLUG OR SLOT	ARC SEAM OR ARC SPOT	SQUARE	V	BEVEL	GROOVE	FLARE-V	FLARE-BEVEL	BACK OR BACKING	MELT-THRU	SURFACING	EDGE	CORNER	RESISTANCE-SPOT	PROJECTION	RESISTANCE-SEAM	FLASH OR UPSET
ARROW-SIDE															NOT USED		NOT USED	NOT USED
OTHER-SIDE															NOT USED		NOT USED	NOT USED
BOTH-SIDES		NOT USED	NOT USED												NOT USED		NOT USED	NOT USED
NO ARROW-SIDE OR OTHER-SIDE SIGNIFICANCE	NOT USED	NOT USED	NOT USED															

### Supplementary Symbols

WELD ALL AROUND	FIELD WELD	CONTOUR
		FLUSH 
		CONVEX 

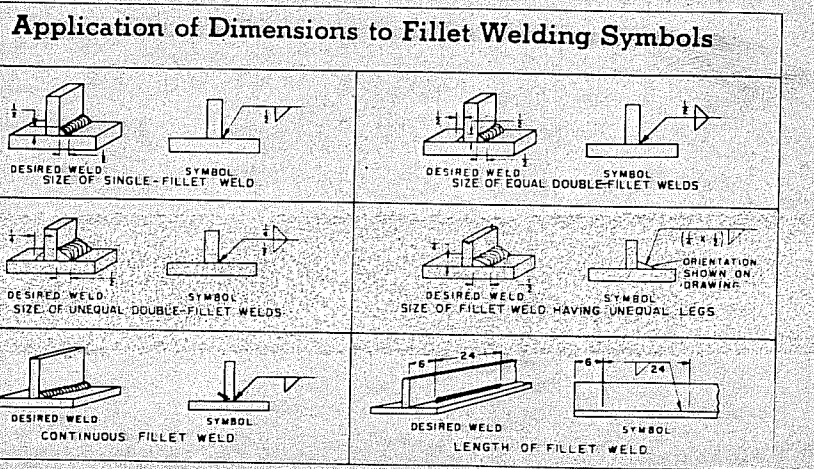
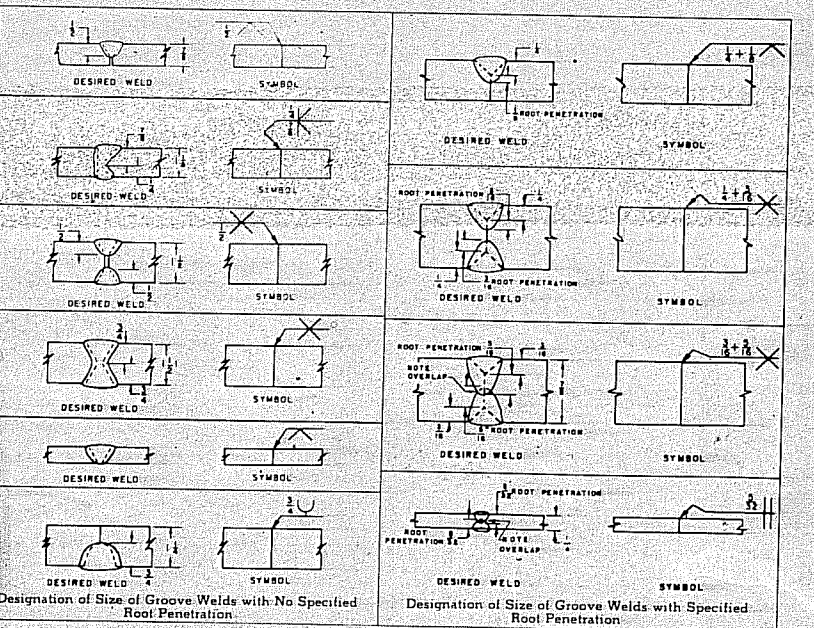
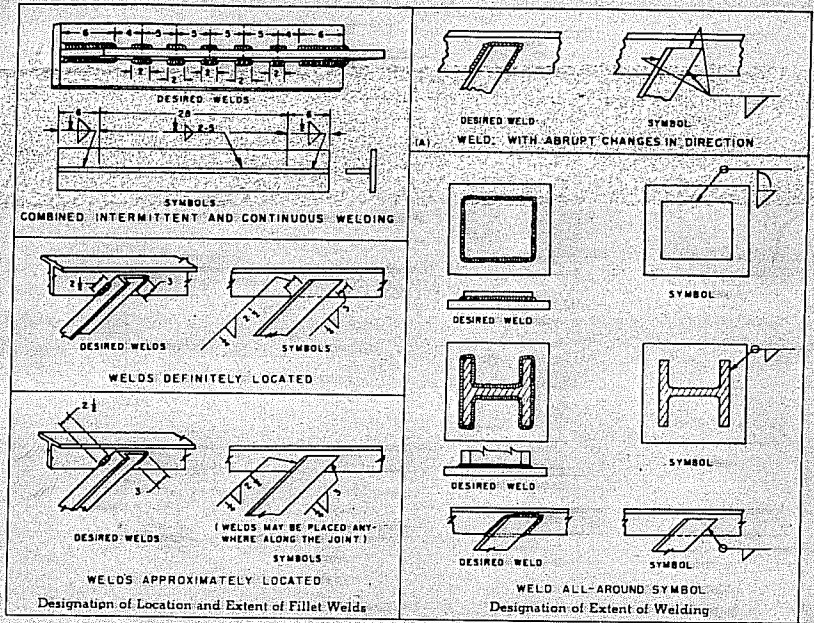
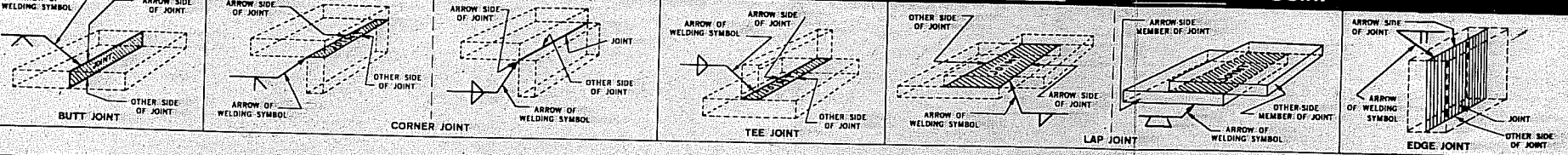
### Location of Elements of a Welding Symbol



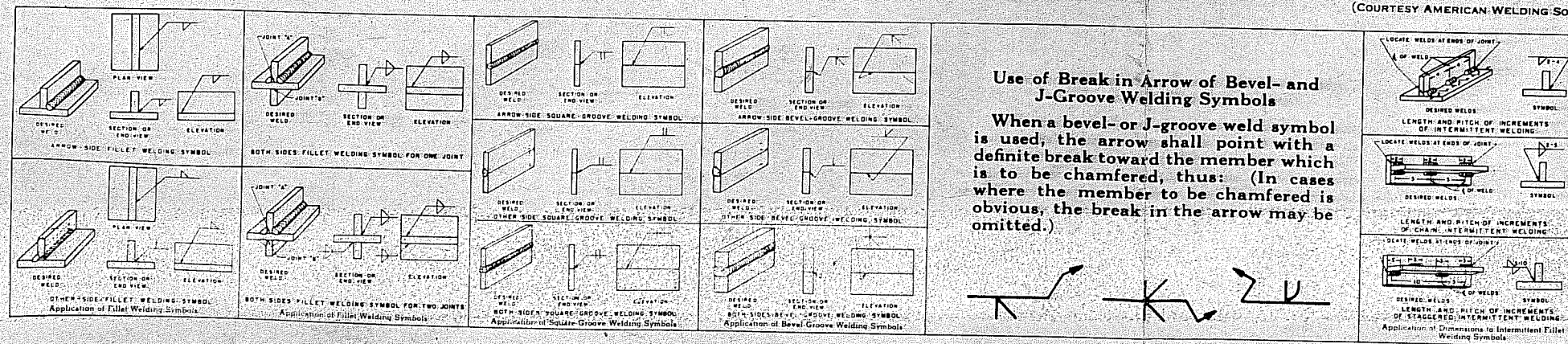
### Supplementary Symbols Used with Welding Symbols

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### Basic Joints—Identification of Arrow Side and Other Side of Joint and Arrow-Side and Other-Side Member of Joint

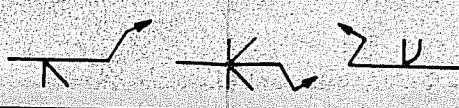


### Typical Welding Symbols

**Use of Break in Arrow of Bevel- and J-Groove Welding Symbols**

When a bevel- or J-groove weld symbol is used, the arrow shall point with a definite break toward the member which is to be chamfered, thus: (In cases where the member to be chamfered is obvious, the break in the arrow may be omitted.)





# WELDED JOINTS

## Standard symbols

# PREQUALIFIED

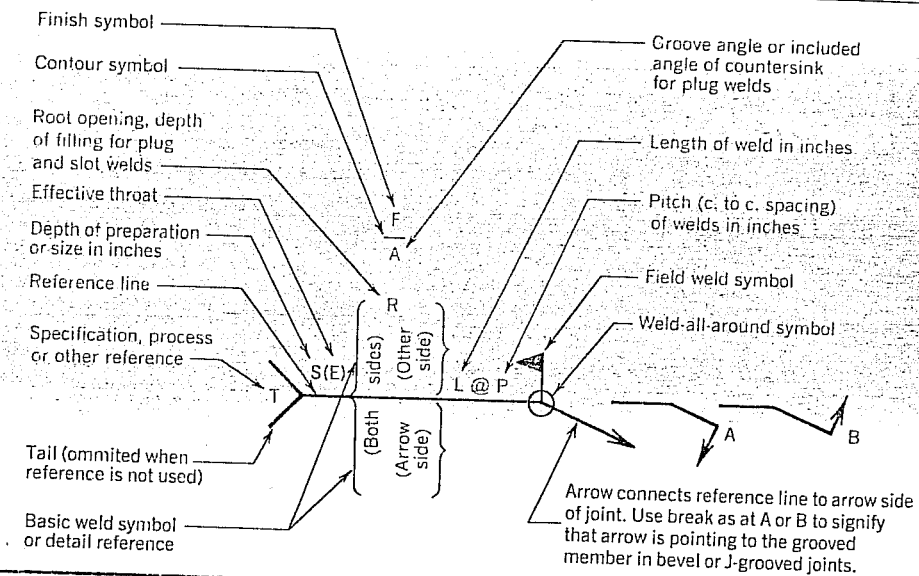
## Fillet

BASIC WELD SYMBOLS									
BACK	FILLET	PLUG OR SLOT	GROOVE OR BUTT						
			SQUARE	V	BEVEL	U	J	FLARE V	FLARE BEVEL

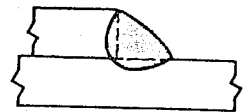
SUPPLEMENTARY WELD SYMBOLS						
BACKING	SPACER	WELD ALL AROUND	FIELD WELD	CONTOUR		For other basic and supplementary weld symbols, see AWS A2.4-79
				FLUSH	CONVEX	

### STANDARD LOCATION OF ELEMENTS OF A WELDING SYMBOL



**Note:**

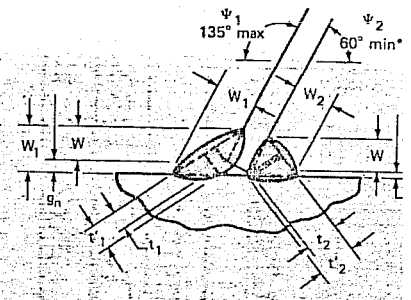
- Size, weld symbol, length of weld and spacing must read in that order from left to right along the reference line. Neither orientation of reference line nor location of the arrow alter this rule.
- The perpendicular leg of  $\Delta$ ,  $\nabla$ ,  $\nabla$ ,  $\nabla$  weld symbols must be at left.
- Arrow and Other Side welds are of the same size unless otherwise shown. Dimensions of fillet welds must be shown on both the Arrow Side and the Other Side Symbol.
- The point of the field weld symbol must point toward the tail.
- Symbols apply between abrupt changes in direction of welding unless governed by the "all around" symbol or otherwise dimensioned.
- These symbols do not explicitly provide for the case that frequently occurs in structural work, where duplicate material (such as stiffeners) occurs on the far side of a web or gusset plate. The fabricating industry has adopted this convention: that when the billing of the detail material discloses the existence of a member on the far side as well as on the near side, the welding shown for the near side shall be duplicated on the far side.



Base metal less than 1/4 thick

(A)

Maximum size.



(C)

Skew

Note:  $t_{(n)}$ ,  $t'_{(n)}$  = effective throats dependent on magnit

\*Angles smaller than 60 degrees are permitted; however, i penetration groove weld.





**STA-RITE INDUSTRIES, INC.**  
 INDUSTRIAL FLUID POWER DIVISION  
 1900 CLARK STREET RACINE, WIS. 53403

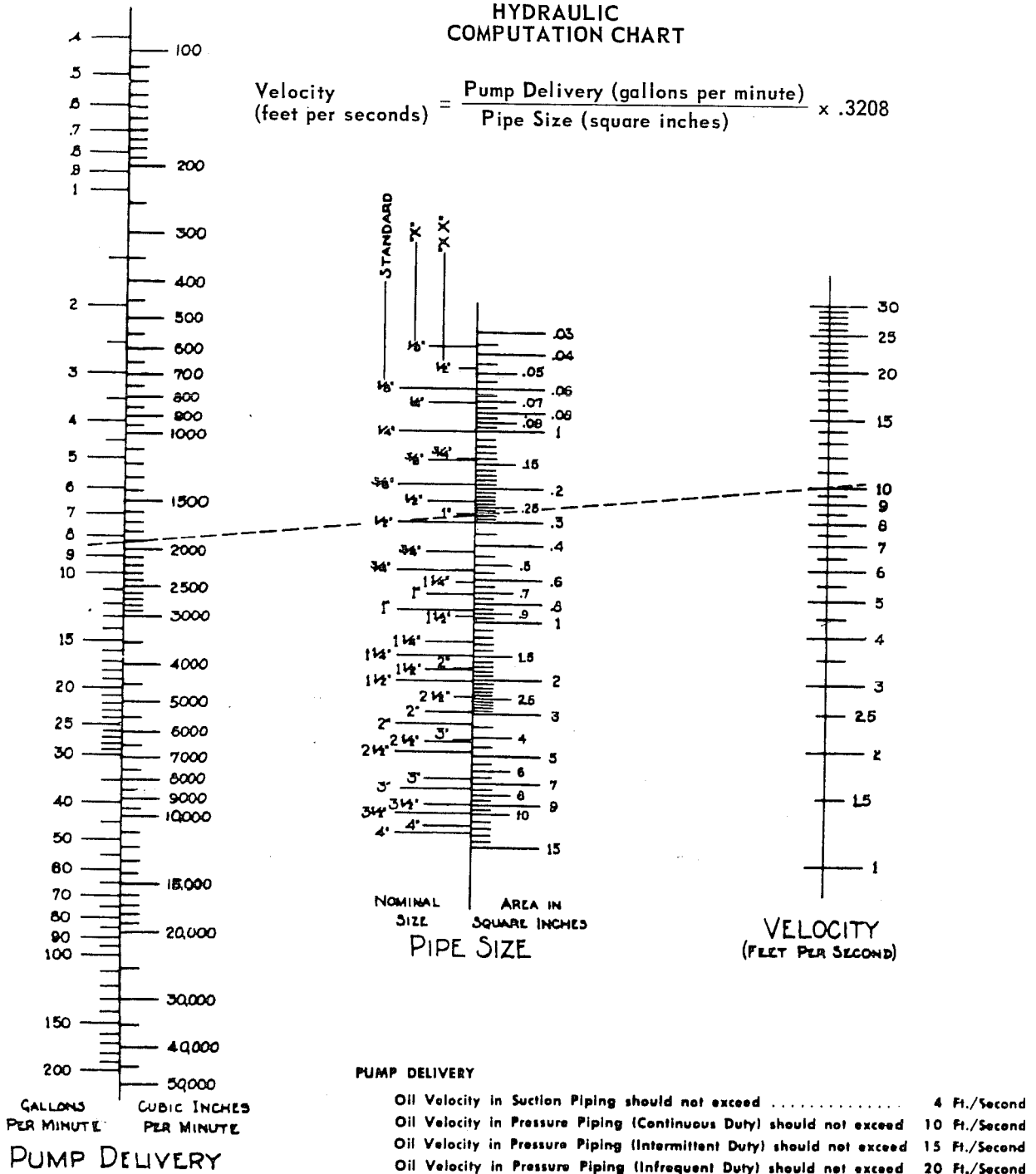
velocity & orifice pressure drop  
 nomographs

bulletin  
 FP144-8

JAN. 67

**HYDRAULIC  
 COMPUTATION CHART**

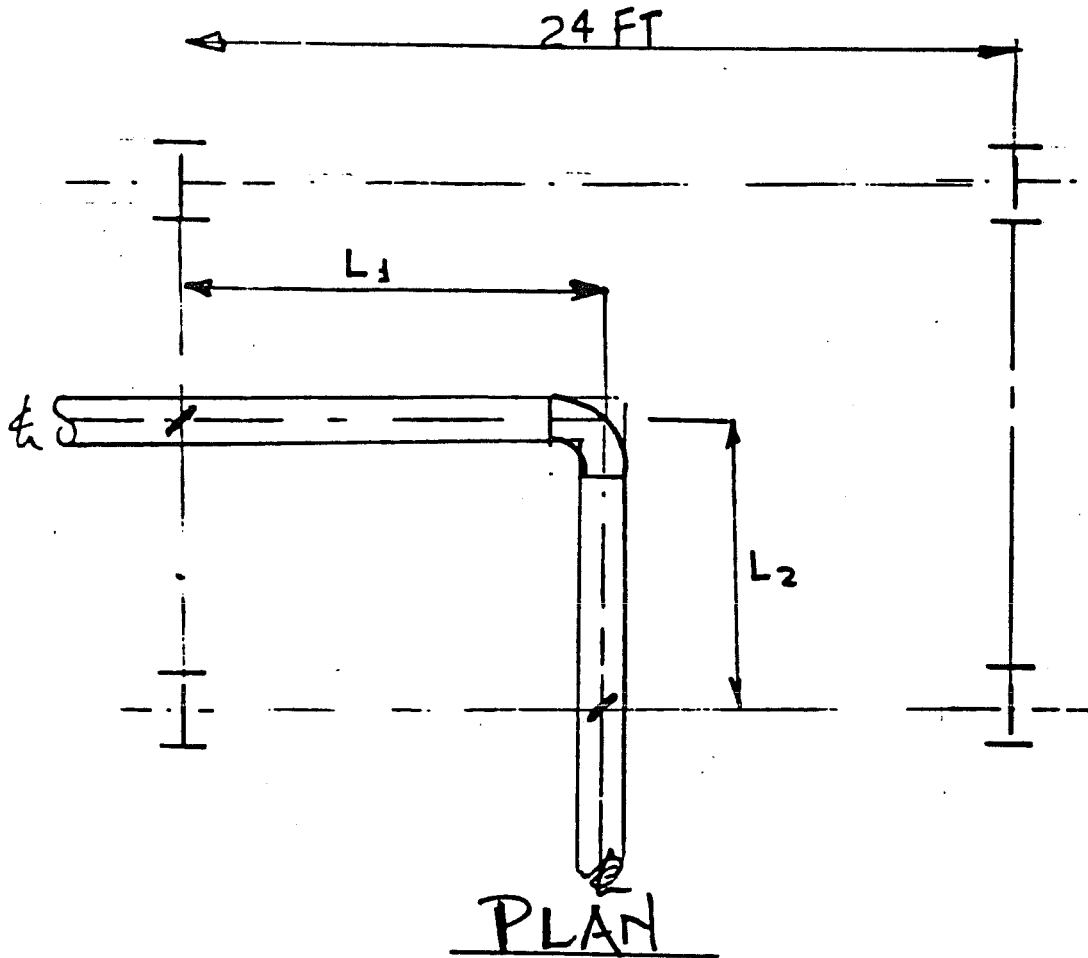
$$\text{Velocity (feet per seconds)} = \frac{\text{Pump Delivery (gallons per minute)}}{\text{Pipe Size (square inches)}} \times .3208$$



- PUMP DELIVERY**
- Oil Velocity in Suction Piping should not exceed . . . . . 4 Ft./Second
  - Oil Velocity in Pressure Piping (Continuous Duty) should not exceed 10 Ft./Second
  - Oil Velocity in Pressure Piping (Intermittent Duty) should not exceed 15 Ft./Second
  - Oil Velocity in Pressure Piping (Infrequent Duty) should not exceed 20 Ft./Second

# OVERHANG PIPING

Page 68



L = MAX SPAN SHOWN ON SP. 54  
FOR DIFFERENT MATERIALS

$$L_1 + L_2 \leq 0.75 L$$

PIPE SIZE	PIPE-VAPOR-INSULATION							PIPE-LIQUID-INSULATION						BARE PIPE EMPTY		WATER FILLED		IN.
	SC#	UP TO 350°		351° - 600°		601° - 750°		UP TO 350°		351° - 600°		601° - 750°		UP TO 350°		UP TO 350°		
		SPAN	WGT	SPAN	WGT	SPAN	WGT	SPAN	WGT	SPAN	WGT	SPAN	WGT	SPAN	WGT	SPAN	WGT	
IN.		FEET	LB/FT	FEET	LB/FT	FEET	LB/FT	FEET	FT/LB	FEET	FT/LB	FEET	FT/LB	FEET	LB/FT	FEET	LB/FT	
3/4	40	12	1.75	11	2.50	8*	4.33	12	1.98	10*	2.73	7*	4.56	14	1.13	13	1.36	3/4
1	40	14	2.37	13	3.23	10*	5.12	14	2.74	12	3.60	9*	5.49	16	1.68	14	2.06	1
1 1/4	40	18	3.59	16	4.51	14*	6.77	17	4.46	13	5.39	12*	7.65	19	2.72	17	3.89	1 1/4
2	40	18	4.90	16	6.76	11*	10.11	17	6.35	15	8.11	14*	11.58	21	3.65	18	5.10	2
2 1/2	40	23	7.22	19	9.25	16*	12.03	19	9.29	18	11.32	15*	14.10	25	5.79	21	7.86	2 1/2
3	40	24	9.23	21	11.45	18*	15.53	21	12.43	19	14.69	16*	18.73	26	7.57	22	10.77	3
4	40	27	13.03	25	15.40	22	20.53	24	18.53	23	20.91	19*	28.05	29	10.79	25	16.30	4
6	40	33	22.09	31	27.05	28	32.10	29	34.42	27	39.38	25*	44.62	34	18.97	29	31.30	6
8	40	39	32.95	36	38.36	33	44.70	33	54.55	32	58.96	29*	66.38	40	28.55	33	50.15	8
10	40	44	45.77	42	52.20	39	60.80	37	79.88	35	86.31	34*	94.88	46	40.48	38	74.59	10
12	3/8"W	47	57.13	45	63.10	42	72.56	39	106.16	38	112.13	36*	121.59	49	49.60	40	83.50	12
14	3/8"W	40	63.12	47	69.00	44	80.00	40	122.82	39	129.22	37*	139.75	52	55.00	41	114.90	14
16	3/8"W	53	72.2	50	78.70	47	91.50	42	161.2	41	157.82	39*	170.62	55	63.0	43+	149.1	16
18	3/8"W	56	81.2	54	89.0	50	102.70	44	182.4	43	190.2	40*	203.52	59	71.0	45+	172.2	18
20	3/8"W	59	90.2	57	98.20	53	114.00	46	216.2	45	223.87	41*	239.67	62	79.0	46+	205.0	20
24	3/8"W	65	108.2	62	117.80	58	135.30	48	292.0	47	302.1	43*	320.25	68+	95.0	29+	275.0	24
3/4	80	12	2.09	10	2.81	7*	4.67	11	2.26	10	3.03	6*	4.86	14	1.47	13	1.08	3/4
1	80	14	2.86	12	3.72	10*	5.61	13	3.17	12	4.14	9*	5.98	16	2.17	14	2.48	1
1 1/4	80	17	4.49	16	5.42	14*	7.66	16	5.26	15	6.19	13*	8.45	19	3.68	17	4.40	1 1/4
2	80	19	6.27	17	8.13	14*	11.43	18	7.55	16	9.41	13*	12.76	21	5.02	19	6.30	2
2 1/2	80	22	9.09	20	11.18	18	13.80	20	10.92	19	12.95	17*	15.73	23	7.66	21	9.40	2 1/2
3	80	24	11.91	22	14.19	20	18.26	22	14.77	21	17.03	19	21.12	25	10.25	23	13.11	3
4	80	27	17.21	26	19.59	23	24.38	26	22.19	24	24.57	22	29.36	29	14.96	26	19.95	4
6	80	34	31.72	32	36.67	30	41.20	31	43.01	29	47.96	28	52.99	35	28.60	31	39.69	6
8	1/2"W	39	47.80	37	53.22	35	59.50	35	67.59	33	73.01	32	79.28	40	43.40	36	63.19	8
10	1/2"W	44	60.09	42	66.50	39	75.10	38	92.44	37	98.85	35	107.45	45	54.80	39	87.15	10
12	1/2"W	47	72.85	45	78.83	43	88.72	41	119.96	40	125.88	38	135.43	49	65.48	42	112.43	12
14	1/2"W	50	80.22	48	86.50	45	97.50	42	137.76	41	144.04	40	155.04	51	72.10	44	129.64	14
16	1/2"W	53	91.96	51	98.90	49	111.70	44	168.54	43	175.48	42	188.28	55	82.80	46+	159.38	16
18	1/2"W	57	103.70	55	111.50	52	125.90	47	202.11	46	207.91	44	224.01	59	93.50	48+	194.91	18
20	1/2"W	60	116.30	57	124.60	55	140.4	49	239.17	47	247.47	46	263.27	62	105.00	49+	227.97	20
24	1/2"W	65	138.80	63	148.00	60	167.10	52	319.93	50	328.73	49	347.23	68+	125.50	52+	308.63	24
1	XXS	14	4.45	13	5.21	10*	7.10	13	4.57	12	5.33	10*	7.28	15	3.68	14	3.78	1
1 1/4	XXS	17	7.27	16	8.20	14	10.46	16	7.88	15	8.61	14	10.87	18	6.41	17	6.82	1 1/4
2	XXS	20	10.28	18	12.14	15	15.48	18	11.05	17	12.91	15	16.25	21	9.02	19	9.80	2
2 1/2	160	21	11.44	19	13.23	27	16.23	19	12.98	28	15.01	16	17.77	23	10.01	21	11.55	2 1/2
3	160	42	15.96	22	18.22	20	22.26	22	18.31	21	20.57	19	24.61	25	14.30	23	16.66	3
4	120	27	21.19	26	23.57	23	30.30	25	25.66	24	28.04	22	34.17	27	18.96	26	22.43	4
6	80	33	31.72	31	36.67	28	41.20	28	43.01	27	47.96	26	52.89	35	26.60	29	39.89	6
8	1/2"W	39	47.80	36	53.22	34	59.50	33	67.59	32	73.01	30	79.29	40	43.40	34	63.19	8
10	1/2"W	43	60.09	42	66.50	38	75.10	36	92.44	35	98.85	33	107.45	45	54.80	37	87.15	10
12	1/2"W	47	72.85	45	78.83	41	88.72	38	119.96	37	125.88	35	135.43	49	65.42	39	112.43	12
14	1/2"W	49	80.22	47	86.50	44	97.50	39	137.76	38	144.04	37	155.04	52	72.10	40	129.64	14
16	1/2"W	52	91.96	50	98.90	43	111.70	41	168.54	40	175.48	39	188.28	55	82.80	42+	159.38	16
18	1/2"W	56	103.70	53	111.50	50	125.90	43	202.11	42	209.91	40	224.01	59	93.50	44+	191.91	18
20	1/2"W	60	116.30	56	124.60	53	140.4	45	239.17	44	247.47	42	263.27	62	105.00	46+	227.97	20
24	1/2"W	64	138.80	60	148.60	58	167.10	47	318.83	46	328.73	45	347.53	68+	125.50	48+	306.63	24

DR		
CHK	W	1/80
APP	ES	JAN 80
SCALE		

**CARBON STEEL PIPE  
SUPPORT SPACING**

FOR \_\_\_\_\_

<b>CRAWFORD &amp; RUSSELL</b>		
INCORPORATED		
STAMFORD, CONNECTICUT 06904		
CONTRACT	DWG. No.	REV.
	54-80	0

		PIPE + VAPOR		PIPE + WATER		WEIGHT		
PIPE SIZE IN.	SCHEDULE	UP TO 400°F	401°-750°F	UP TO 400°F	401°-750°F	EMPTY PIPE LB/FT	WATER FILLED LB/FT	PIPE SIZE IN.
		SPAN FT	SPAN FT	SPAN FT	SPAN FT			
		3/4	5S	12	12	12	11	0.70
1	5S	14	14	13	12	0.90	1.35	1
1 1/2	5S	17	17	15	13	1.30	2.35	1 1/2
2	5S	19	19	16	14	1.60	3.35	2
2 1/2	5S	21	21	18	16	2.50	5.00	2 1/2
3	5S	24	23	19	17	3.00	6.80	3
4	5S	27	26	20	18	3.90	10.30	4
6	5S	33	32	23	20	7.60	21.50	6
8	5S	37	37	24	21	9.90	33.90	8
10	5S	42	41	26	24	15.20	52.60	10
12	5S	46	45	29	26	21.00	73.60	12
1/2	10S	11	11	10	10	0.70	0.85	1/2
3/4	10S	12	12	12	11	0.90	1.10	3/4
1	10S	14	14	13	12	1.40	1.80	1
1 1/2	10S	17	17	15	15	2.00	3.00	1 1/2
2	10S	19	19	17	16	2.60	4.25	2
2 1/2	10S	21	21	19	17	3.50	5.90	2 1/2
3	10S	24	23	20	18	4.30	7.95	3
4	10S	27	26	21	20	5.60	11.80	4
6	10S	33	32	24	22	9.30	23.00	6
8	10S	37	37	26	24	13.40	37.00	8
10	10S	42	41	28	26	18.70	55.60	10
12	10S	46	45	30	27	24.20	76.40	12
1/2	40S	11	10	10	10	0.85	1.00	1/2
3/4	40S	12	12	11	11	1.15	1.40	3/4
1	40S	14	13	13	13	1.70	2.00	1
1 1/2	40S	17	16	16	15	2.70	3.60	1 1/2
2	40S	19	18	17	17	3.70	5.10	2
2 1/2	40S	21	20	19	18	5.80	7.80	2 1/2
3	40S	23	23	21	20	7.60	10.80	3
4	40S	26	26	24	22	10.80	16.30	4
6	40S	32	32	28	26	19.00	31.50	6
8	40S	37	36	32	29	28.50	50.25	8
10	40S	41	40	36	32	40.50	74.60	10
12	40S	45	44	37	34	49.60	93.60	12

DR			STAINLESS STEEL PIPE SUPPORT SPACING	CRAWFORD & RUSSELL INCORPORATED STAMFORD, CONNECTICUT 06904	CONTRACT	DWG. NO. 54-81	REV. 0
CHK	N	1/80					
APP	ES	JAN 80	FOR				
SCALE							

LINED STEEL PIPE			COPPER PIPE		GLASS PIPE		
PIPE SIZE IN.	SCH.	SPECIFIC GRAVITY OF FLUID IN PIPE LESS THAN 1.35	REGULAR SCHEDULE	HEAVY SCHEDULE	SPECIFIC GRAVITY OF FLUID IN PIPE		PIPE SIZE IN.
					LESS THAN 1.3	GREATER THAN 1.3	
		SUPPORT SPACING, FT	SUPPORT SPACING, FT		SUPPORT SPACING, FT		
1/2	40	5	6.5	6.5	8	6	1/2
1		7	8	8	8	6	3/4
1 1/4		8	—	—	8	7	1
1 1/2		9	9.5	9.5	9	7	1 1/2
2		10	10.5	11	9	8	2
2 1/2		11	—	—	9	8	3
3		12	12.5	13	10	8	4
4		14	13.5	15	10	8	6
6		17	15.5	17.5	9	5	9
8		19	17	20	5	5	12
10		22	20	21.5	5	5	18
12	1	23					

**POLYPROPYLENE PIPE**

PIPE SIZE IN.	SCH.	OPERATING TEMPERATURE			SCH.	OPERATING TEMPERATURE			PIPE SIZE IN.
		70 °F	120 °F	150 °F		70 °F	120 °F	150 °F	
1/2	40	4	3	C	80	5	3.5	C	1/2
3/4	40	4	3	C	80	5	3.5	C	3/4
1	40	4.5	3	C	80	5.5	4	C	1
1 1/4	40	4.5	3.5	C	80	5.5	4	2.5	1 1/4
1 1/2	40	5	3.5	C	80	5.5	4	2.5	1 1/2
2	40	5	3.5	2	80	6	4.5	2.5	2
2 1/2	40	5.5	4	2.5	80	6.5	4.5	3	2 1/2
3	40	6	4	2.5	80	7	5	3	3
4	40	6	4.5	3	80	7.5	5	3.5	4
6	40	6.5	5	3	80	8.5	6	4	6
8	40	7	5	3.5	80	9	6	4	8
10	40	Continuous	Continuous	Continuous	80	Continuous	Continuous	Continuous	10
12	40	"	"	"	80	"	"	"	12

DR		
CHK	N	1/80
APP	ES	SAM 80
SCALE		

**LINED, COPPER, GLASS & POLYPROPYLENE PIPE SUPPORT SPACING**  
 FOR \_\_\_\_\_

**Crawford & Russell**  
 Incorporated  
 CONTRACT \_\_\_\_\_ Dwg. No. 54-83 Rev. 0

OPER. TEMP. OF	PIPE SCH.	PIPE MAT.	NOMINAL PIPE SIZE, IN.											
			1/4	3/8	1/2	3/4	1	2	3	4	6	8	110	12
20°	40	PVC	4.5	4.5	5.0	5.5	6.0	6.5	8.0	8.5	9.5	10.0	11.0	12.0
		CPVC	4.5	4.5	5.0	5.5	6.0	6.5	8.0	8.5	9.5	—	—	—
	80	PVC	4.5	5.0	5.5	6.0	6.5	7.5	9.0	10.0	11.0	12.5	13.5	14.5
		CPVC	4.5	5.0	5.5	6.0	6.5	7.5	9.0	10.0	11.0	—	—	—
60°	40	PVC	4.0	4.0	4.0	5.0	5.5	6.0	7.0	7.0	8.5	9.0	10.0	11.5
		CPVC	4.5	4.5	5.0	5.5	6.0	6.5	8.0	8.5	9.5	—	—	—
	80	PVC	4.0	4.5	5.0	5.5	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0
		CPVC	4.5	5.0	5.5	6.0	6.5	7.5	9.0	10.0	11.0	—	—	—
80°	40	PVC	3.5	4.0	4.5	4.5	5.0	5.5	7.0	7.0	8.0	8.5	9.0	10.5
		CPVC	4.0	4.0	4.5	5.0	5.5	6.0	7.0	7.5	8.5	—	—	—
	80	PVC	4.0	4.0	4.5	5.0	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.0
		CPVC	4.0	4.5	5.0	5.5	6.0	7.0	8.0	9.0	10.0	—	—	—
100°	40	PVC	3.5	3.5	4.0	4.0	4.5	5.0	6.0	6.5	7.5	8.0	8.5	9.5
		CPVC	4.0	4.0	4.5	5.0	5.5	6.0	7.0	7.5	8.5	—	—	—
	80	PVC	3.5	4.0	4.5	4.5	5.0	6.0	7.0	7.5	9.0	9.5	10.0	10.5
		CPVC	4.0	4.5	5.0	5.5	6.0	7.0	8.0	9.0	10.0	—	—	—
120°	40	PVC	2.0	2.5	2.5	2.5	3.0	3.5	4.0	4.5	5.0	5.0	5.5	6.5
		CPVC	3.5	4.0	4.5	4.5	5.0	5.5	7.0	7.0	8.0	—	—	—
	80	PVC	2.5	2.5	3.0	3.0	3.5	4.0	4.5	5.0	6.0	6.5	7.0	7.5
		CPVC	4.0	4.5	4.5	5.0	5.5	6.5	7.5	8.5	9.5	—	—	—
140°	40	PVC	2.0	2.0	2.5	2.5	2.5	3.0	3.5	4.0	4.5	4.5	5.0	5.5
		CPVC	3.5	3.5	4.0	4.0	4.5	5.0	6.0	6.5	7.5	—	—	—
	80	PVC	2.0	2.5	2.5	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5
		CPVC	3.5	4.0	4.5	4.5	5.0	6.0	7.0	7.5	9.0	—	—	—
150°	40	PVC	*C	*C	2.0	2.0	2.0	3.0	3.5	3.5	4.0	4.0	4.5	5.0
		CPVC	2.0	2.5	2.5	2.5	3.0	3.5	4.0	4.5	5.0	—	—	—
	80	PVC	2.0	2.0	2.5	2.5	2.5	3.0	4.0	4.0	4.5	5.0	5.5	6.0
		CPVC	2.5	2.5	3.0	3.0	3.5	4.0	4.5	5.5	6.0	—	—	—

NOTES: Spacing Dimensions Given In Feet.  
 This Table Is Based On Lines Carrying Liquids With A Specific Gravity of 1.35  
 For Insulated Lines, Reduce Spans To 70 Percent Of The Values Shown.  
 Concentrated Loads Should Be Supported Independently.

\*Continuous Support.

DR			PVC & CPVC PIPE SUPPORT SPACING	Crawford & Russell Incorporated			
CHK	RV	1/80		FOR	CONTRACT	Dwg. No.	REV.
APP	ES	JAN 80				54-84	0
SCALE							

K-K-I

## REINFORCED POLYESTER PIPE

PIPE SIZE INCHES	MAXIMUM PIPE SPAN (FEET) AT PRESSURE RATINGS												PIPE SIZE INCHES
	25 PSI		50 PSI		75 PSI		100 PSI		125 PSI		150 PSI		
	FILLED	EMPTY	FILLED	EMPTY	FILLED	EMPTY	FILLED	EMPTY	FILLED	EMPTY	FILLED	EMPTY	
2	6.0	7.0	6.0	7.0	6.0	7.0	6.0	7.0	6.0	7.0	6.0	7.0	2
3	6.5	8.5	6.5	8.5	6.5	8.5	6.5	8.5	8.0	10.5	8.0	10.5	3
4	7.0	10.0	7.0	10.0	7.0	10.0	8.5	12.0	8.5	12.0	8.5	12.0	4
6	8.0	12.0	8.0	12.0	9.0	13.5	9.0	13.5	10.0	15.0	10.5	16.0	6
8	8.5	13.5	10.0	16.0	10.0	16.0	10.5	17.0	11.0	17.5	11.5	18.5	8
10	9.5	15.0	10.5	17.0	11.5	18.5	12.0	19.0	12.5	20.0	13.0	21.0	10
12	10.0	16.0	11.5	18.5	12.5	20.0	13.0	21.0	13.5	21.5	14.0	22.5	12
14	11.5	18.5	12.5	20.0	13.0	21.0	14.0	22.0	15.0	24.0	15.5	25.0	14
16	12.0	19.0	13.0	21.0	14.0	22.0	15.5	25.0	16.5	26.0	17.0	27.0	16
18	12.5	20.0	14.5	23.0	15.0	24.0	16.0	25.5	16.5	26.0	17.5	28.0	18
20	12.5	20.0	15.0	24.0	15.5	25.0	17.0	27.0	18.0	29.0	18.5	29.5	20
24	8.5	14.0	13.0	24.0	17.0	27.0	18.5	29.5	19.0	30.0			24
30	9.5	15.5	17.5	28.0	19.5	31.0	21.0	33.0					30
36	10.5	17.0	19.5	31.0	21.0	33.0							36
42	8.0	13.0	21.0	33.0	22.5	36.0							42

**NOTES**

1. This table is based on uninsulated pipe containing liquids having a specific gravity of 1.3 and a maximum temperature of 180<sup>0</sup>F. For services at temperature above 180<sup>0</sup>F consult the Manufacturer relative to Hanger spacing.
3. Pipe spans for empty pipe have been extrapolated from the spans given for liquid filled pipe shown on Standard SP-53, table 6 and apply only to pipes carrying gases or vapours and not subject to hydraulic test.

DR			<b>REINFORCED POLYESTER PIPE</b>	<b>Crawford &amp; Russell</b>		
CHK	TV	1/80	<b>SUPPORT SPACING</b>	<small>Incorporated</small>		
APP	ES	JAN 80	FOR	CONTRACT	Dwg. No. 54-85	REV. 0
SCALE						

PIPE SIZE IN.	SCHEDULE	UP TO 200°F			201° TO 300°F			PIPE WGT LBS/FT		PIPE SIZE IN.
		SPAN, FT			SPAN, FT			PIPE EMPTY	WATER FILLED	
		PIPE EMPTY	PIPE + LIQUID	PIPE + LIQUID + INSULAT.	PIPE EMPTY	PIPE + LIQUID	PIPE + LIQUID + INSULAT.			
1	5S	15	11	11	14	11	11	0.30	0.80	1
	10S	15	12	12	14	12	12	0.50	0.90	
	40S	16	12	12	14	12	12	0.60	1.00	
1 1/2	5S	17	13	13	17	13	13	0.45	1.50	1 1/2
	10S	17	14	14	17	14	14	0.75	1.70	
	40S	17	14	14	17	14	14	0.95	1.85	
2	5S	19	14	14	19	13	13	0.56	2.30	2
	10S	19	14	14	19	14	14	0.90	2.50	
	40S	19	15	15	19	15	15	1.30	2.75	
2 1/2	5S	21	15	15	21	14	14	0.85	3.50	2 1/2
	10S	21	15	15	21	15	15	1.25	3.75	
	40S	21	16	16	21	16	16	2.00	4.00	
3	5S	24	16	16	24	15	15	1.00	4.85	3
	10S	24	16	16	24	15	15	1.50	5.10	
	40S	24	18	18	24	18	18	2.60	5.85	
4	5S	27	16	16	27	15	15	1.40	7.80	4
	10S	27	18	18	27	17	17	2.00	8.20	
	40S	27	21	21	27	21	21	3.80	9.30	
6	5S	33	18	18	33	17	17	2.70	16.50	6
	10S	33	20	20	33	18	18	5.25	17.00	
	40S	33	24	24	33	24	24	6.70	19.00	
8	5S	38	19	19	38	18	18	3.50	27.50	8
	10S	38	21	21	38	20	20	4.75	28.30	
	40S	38	27	27	38	25	25	10.00	37.75	
10	5S	42	20	20	42	19	19	5.30	42.75	10
	10S	42	22	22	42	21	21	6.55	43.50	
	40S	42	30	30	42	29	29	14.20	48.25	
12	5S	46	21	21	46	20	20	7.35	60.00	12
	10S	46	24	24	46	22	22	8.50	60.75	
	40S	46	32	32	46	30	30	17.35	66.50	

DR			ALUMINUM PIPE SUPPORT SPACING		Crawford & Russell Incorporated		
CHK	FU	1/80			CONTRACT	Dwg. No. 54-82	REV. 0
APP	ES	JAN 80	FOR				
SCALE							



Rev \_\_\_\_\_ Date \_\_\_\_\_

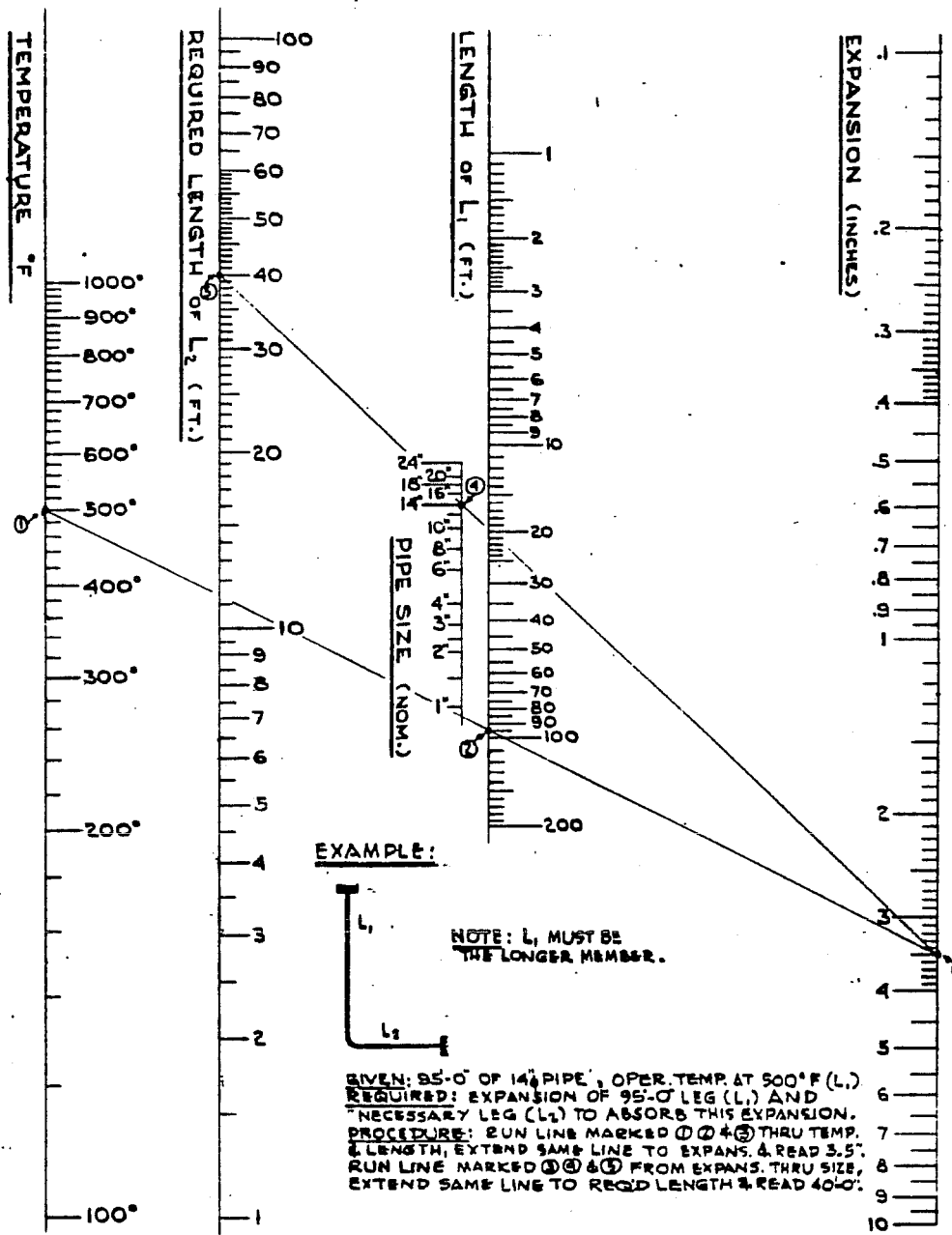
PLANT DESIGN

Table 319.3.1A - Thermal Expansion Data

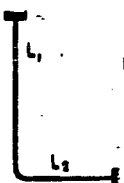
Linear Thermal Expansion between 70F and Indicated Temperature, inches/100 feet

Temp. deg F	MATERIAL									
	Carbon Steel Carbon-Moly Low-Chrome (thru 3 Cr Mo)	5 Cr Mo thru 9 Cr Mo	Austenitic Stainless Steels 18 Cr 8 Ni	12 Cr 17 Cr 27 Cr	25 Cr 20 Ni	Monel 67 Ni 30 Cu	3% Nickel	Aluminum	70 Cu 30 Ni	Ni-Fe-Cr
-325	-2.37	-2.22	-3.85	-2.04		-2.62	-2.25	-4.68	-3.15	
-300	-2.24	-2.10	-3.63	-1.92		-2.50	-2.17	-4.46	-2.87	
-275	-2.11	-1.98	-3.41	-1.80		-2.38	-2.07	-4.21	-2.70	
-250	-1.98	-1.86	-3.19	-1.68		-2.26	-1.96	-3.97	-2.53	
-225	-1.85	-1.74	-2.96	-1.57		-2.14	-1.86	-3.71	-2.36	
-200	-1.71	-1.62	-2.73	-1.46		-2.02	-1.76	-3.44	-2.19	
-175	-1.58	-1.50	-2.50	-1.35		-1.90	-1.62	-3.16	-2.12	
-150	-1.45	-1.37	-2.27	-1.24		-1.79	-1.48	-2.88	-1.95	
-125	-1.30	-1.23	-2.01	-1.11		-1.59	-1.33	-2.57	-1.74	
-100	-1.15	-1.08	-1.75	-0.98		-1.38	-1.17	-2.27	-1.63	
-75	-1.00	-0.94	-1.50	-0.85		-1.18	-1.01	-1.97	-1.33	
-50	-0.84	-0.79	-1.24	-0.72		-0.98	-0.84	-1.67	-1.13	
-25	-0.68	-0.63	-0.98	-0.57		-0.77	-0.67	-1.32	-0.89	
0	-0.49	-0.46	-0.72	-0.42		-0.57	-0.50	-0.97	-0.66	
25	-0.32	-0.30	-0.46	-0.27		-0.37	-0.32	-0.63	-0.42	
50	-0.14	-0.13	-0.21	-0.12		-0.20	-0.15	-0.28	-0.19	
70	0	0	0	0	0	0	0	0	0	0
100	0.23	0.22	0.34	0.20	0.32	0.28	0.23	0.46	0.31	0.28
125	0.42	0.40	0.62	0.36	0.58	0.52	0.42	0.85	0.66	0.52
150	0.61	0.58	0.90	0.53	0.84	0.75	0.61	1.23	0.82	0.76
175	0.80	0.76	1.18	0.69	1.10	0.99	0.81	1.62	1.07	0.99
200	0.99	0.94	1.46	0.86	1.37	1.22	1.01	2.00	1.33	1.23
225	1.21	1.13	1.75	1.03	1.64	1.46	1.21	2.41	1.59	1.49
250	1.40	1.33	2.03	1.21	1.91	1.71	1.42	2.83	1.86	1.76
275	1.61	1.52	2.32	1.38	2.18	1.96	1.63	3.24	2.13	2.03
300	1.82	1.71	2.61	1.56	2.45	2.21	1.84	3.67	2.40	2.30
325	2.04	1.90	2.90	1.74	2.72	2.44	2.05	4.09	2.68	2.59
350	2.26	2.10	3.20	1.93	2.99	2.68	2.26	4.52	2.96	2.88
375	2.48	2.30	3.50	2.11	3.26	2.91	2.47	4.95	3.24	3.18
400	2.70	2.50	3.80	2.30	3.53	3.25	2.69	5.39	3.52	3.48
425	2.93	2.72	4.10	2.50	3.80	3.52	2.91	5.83	3.80	3.76
450	3.16	2.93	4.41	2.69	4.07	3.79	3.13	6.28	4.08	4.04
475	3.39	3.14	4.71	2.89	4.34	4.06	3.35	6.72	4.36	4.31
500	3.62	3.35	5.01	3.08	4.61	4.33	3.58	7.17	4.64	4.59
525	3.86	3.58	5.31	3.28	4.88	4.61	3.81	7.63	4.92	4.87
550	4.11	3.80	5.62	3.49	5.15	4.90	4.04	8.10	5.20	5.16
575	4.35	4.02	5.93	3.69	5.42	5.18	4.27	8.56	5.48	5.44
600	4.60	4.24	6.24	3.90	5.69	5.46	4.50	9.03	5.76	5.72
625	4.86	4.47	6.55	4.10	5.96	5.75	4.74		6.04	6.01
650	5.11	4.69	6.87	4.31	6.23	6.05	4.98		6.32	6.30
675	5.37	4.92	7.18	4.52	6.50	6.34	5.22		6.60	6.58
700	5.63	5.14	7.50	4.73	6.77	6.64	5.46		6.88	6.88
725	5.90	5.38	7.82	4.94	7.04	6.94	5.70		7.17	7.17
750	6.16	5.62	8.15	5.16	7.31	7.25	5.94		7.47	7.47
775	6.43	5.86	8.47	5.38	7.58	7.55	6.18		7.76	7.76
800	6.70	6.10	8.80	5.60	7.85	7.85	6.43		8.06	8.06
825	6.97	6.34	9.13	5.82	8.15	8.16	6.68		8.35	8.35
850	7.25	6.59	9.46	6.05	8.45	8.48	6.93		8.66	8.66
875	7.53	6.83	9.79	6.27	8.75	8.80	7.18		8.95	8.95
900	7.81	7.07	10.12	6.49	9.05	9.12	7.43		9.26	9.26
925	8.08	7.31	10.46	6.71	9.35	9.44	7.68		9.56	9.56
950	8.35	7.56	10.80	6.94	9.65	9.77	7.93		9.87	9.87
975	8.62	7.81	11.14	7.17	9.95	10.09	8.17		10.18	10.18
1000	8.89	8.06	11.48	7.40	10.25	10.42	8.41		10.49	10.49
1025	9.17	8.30	11.82	7.62	10.55	10.75			10.80	10.80
1050	9.46	8.55	12.16	7.95	10.85	11.09			11.11	11.11
1075	9.75	8.80	12.50	8.18	11.15	11.43			11.42	11.42
1100	10.04	9.05	12.84	8.31	11.45	11.77			11.74	11.74
1125	10.31	9.28	13.18	8.53	11.78	12.11			12.05	12.05
1150	10.57	9.52	13.52	8.76	12.11	12.47			12.38	12.38
1175	10.83	9.76	13.86	8.98	12.44	12.81			12.69	12.69
1200	11.10	10.00	14.20	9.20	12.77	13.15			13.02	13.02
1225	11.38	10.26	14.54	9.42	13.10	13.50			13.36	13.36
1250	11.66	10.53	14.88	9.65	13.43	13.86			13.71	13.71
1275	11.94	10.79	15.22	9.88	13.76	14.22			14.04	14.04
1300	12.22	11.06	15.56	10.11	14.09	14.58			14.39	14.39
1325	12.50	11.30	15.90	10.33	14.39	14.94			14.74	14.74
1350	12.78	11.55	16.24	10.56	14.69	15.30			15.10	15.10
1375	13.06	11.80	16.58	10.78	14.99	15.66			15.44	15.44
1400	13.34	12.05	16.92	11.01	15.29	16.02			15.80	15.80
1425			17.30							16.16
1450			17.69							16.53
1475			18.08							16.88
1500			18.47							17.25

AMERICAN NATIONAL STANDARD  
PETROLEUM REFINERY PIPING  
ANSI B31.3-1973

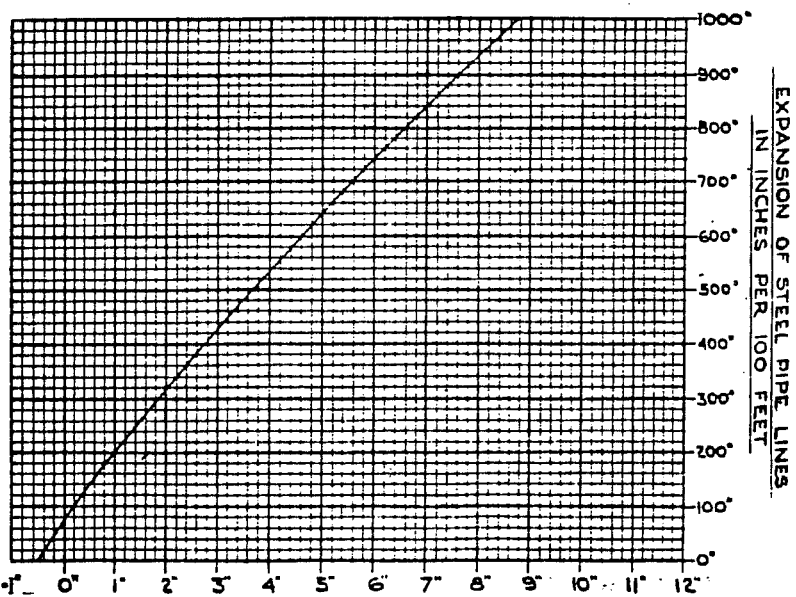


**EXAMPLE:**



NOTE: L<sub>1</sub> MUST BE THE LONGER MEMBER.

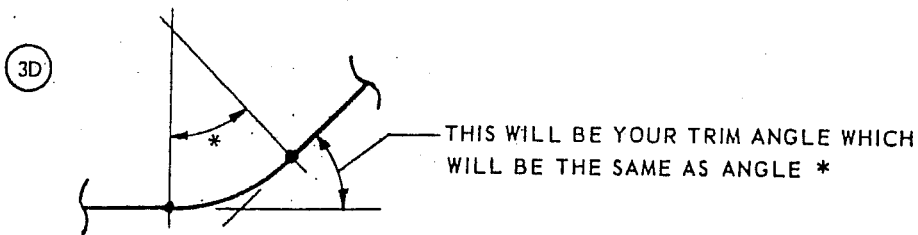
GIVEN: 95'-0" OF 14" PIPE, OPER. TEMP. AT 500° F (L<sub>1</sub>)  
 REQUIRED: EXPANSION OF 95'-0" LEG (L<sub>1</sub>) AND NECESSARY LEG (L<sub>2</sub>) TO ABSORB THIS EXPANSION.  
 PROCEDURE: RUN LINE MARKED ① THROUGH TEMP. & LENGTH, EXTEND SAME LINE TO EXPANS. & READ 3.5". RUN LINE MARKED ② THROUGH SIZE, EXTEND SAME LINE TO REQ'D LENGTH & READ 40'-0".



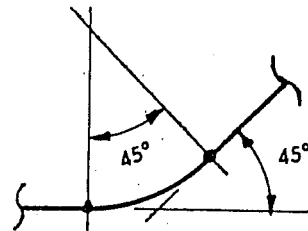
ISSUED AS ENGINEERING STD.	HM	FJG	
REV. DATE	ISSUE & REVISIONS	BY	CHK. APPR. DATE
<b>BECHTEL</b>			
SAN FRANCISCO		NEW YORK	
LOS ANGELES			
<b>BECHTEL ENGINEERING STANDARD</b>			
<b>STRESS NOMOGRAPH FOR EXPANSION</b>			
<b>LEG IN STEEL PIPE</b>			
DESIGNED	DATE 8-17-57	DRAFTS	REVIS.
DRAWN H.M.	JOB NO.	DRAWING NO.	REV.
CHECKED FJG		D-L-5017	0
SCALE			

# GUIDE FOR ROLLING OFFSETS

- ① WHENEVER THE STRAIGHT RUNS ON A ROLLING OFFSET ARE PARALLEL THE ELBOWS WILL BE  $45^\circ$
- ② WHENEVER THE STRAIGHT RUNS ON A ROLLING OFFSET ARE PERPENDICULAR, USE A  $45^\circ$  ELBOW FOR ONE FITTING & TRIM THE OTHER ELBOW TO THE DESIRED ANGLE.
- ③ TRIMMED ELBOW —  
TO ESTABLISH THE TRIM ANGLE:
  - ③A TRIANGULATE THE TRUE LENGTH WITH IT AS THE HYPOTENUSE.
  - ③B THE BASE WILL BE THE CONSTRUCTION BOX LINE IN PARALLEL TO THE BOTTOM STRAIGHT RUN.
  - ③C THE RISER WILL BE THE DIAGONAL LINE INTERSECTING THE TWO TURNING POINTS OF THE STRAIGHT RUNS.



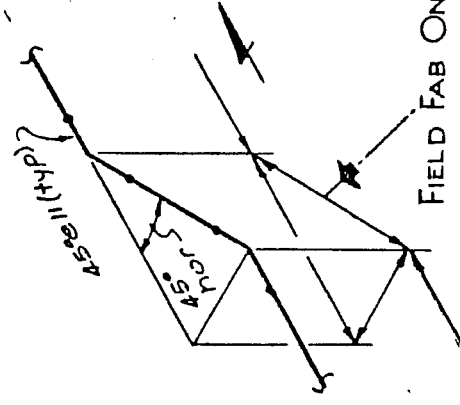
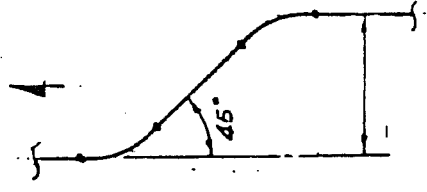
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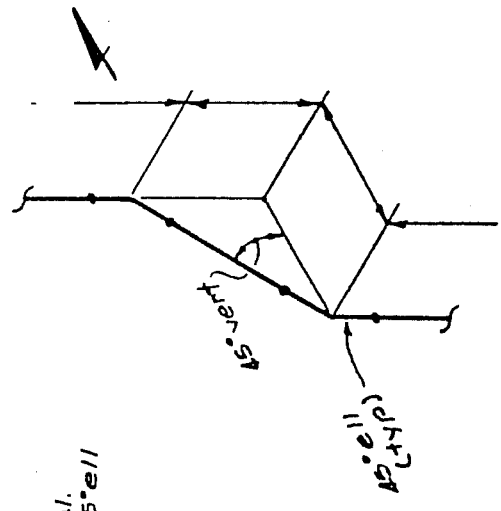
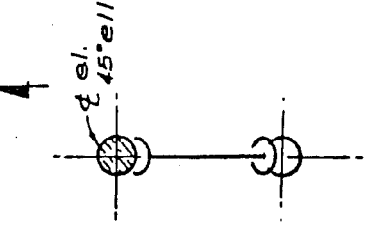
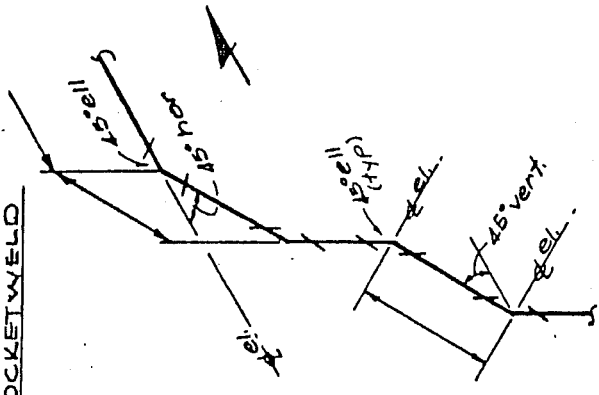
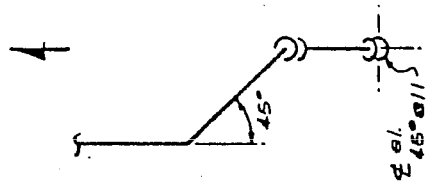


FLAT PLANE OFFSETS

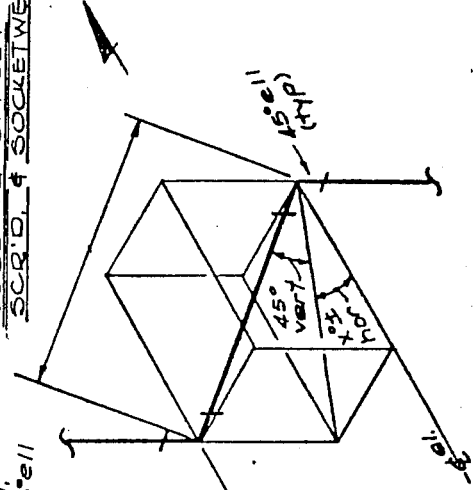
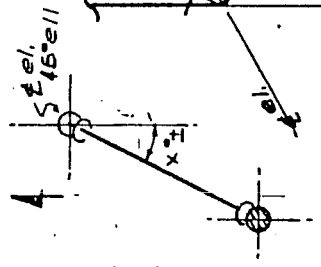
BUTT WELD



SCREWED & SOCKET WELD

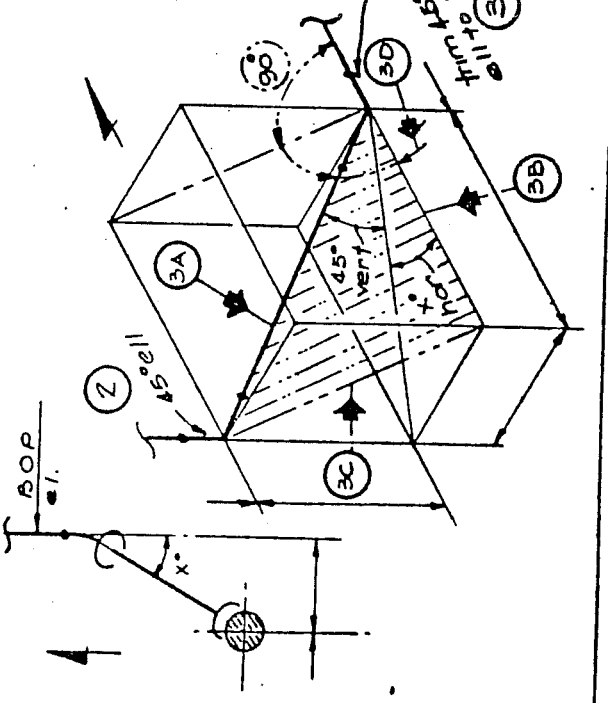
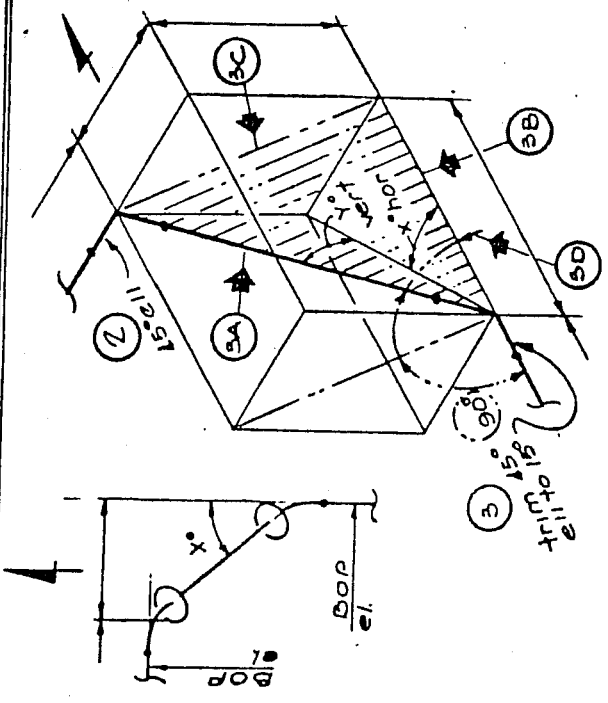
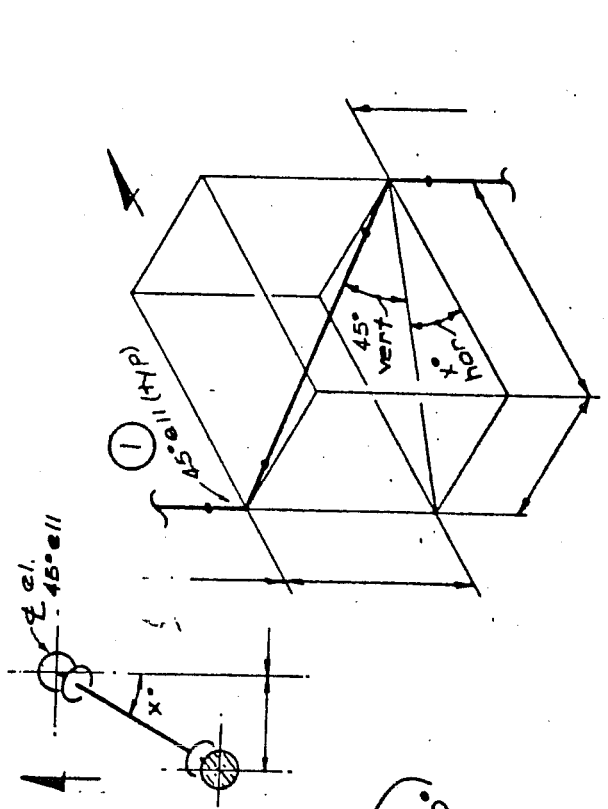
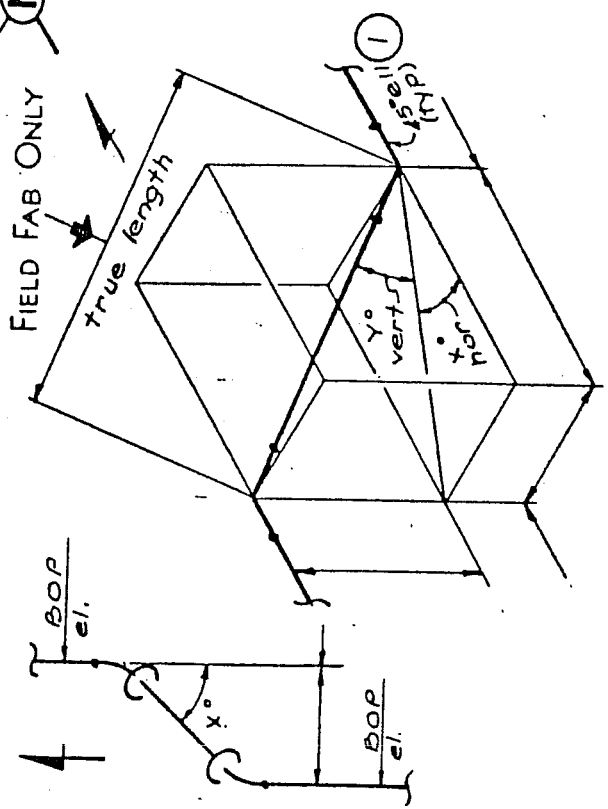


ROLLING OFFSET  
SCR'D & SOCKET WELD





ROLLING OFFSET - BUTT WELD



## PIPE-FITTING CALCULATION

### ROLLING OFFSETS

#### Finding Travel and Run for a Rolling Offset

Formula:

$$A = \sqrt{\text{roll}^2 + \text{set}^2}$$

Travel =  $A \times$  cosecant of angle of fitting (See Trigonometry Table.)

Run =  $A \times$  cotangent of angle of fitting (See Trigonometry Table.)

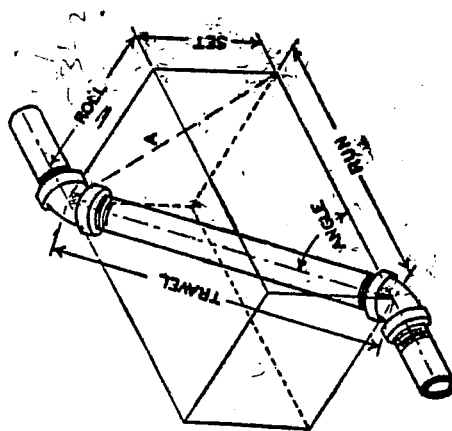


Fig. 45. Rolling offset.

### ROLLING OFFSETS

Example:

The roll of a  $45^\circ$  offset is 8 in. and the set is 15 in. Find the length of travel and run.

$$A = \sqrt{\text{roll}^2 + \text{set}^2}$$

$$A = \sqrt{8^2 + 15^2} = \sqrt{289} = 17 \text{ in.}$$

Travel =  $A \times$  cosecant of angle of fitting

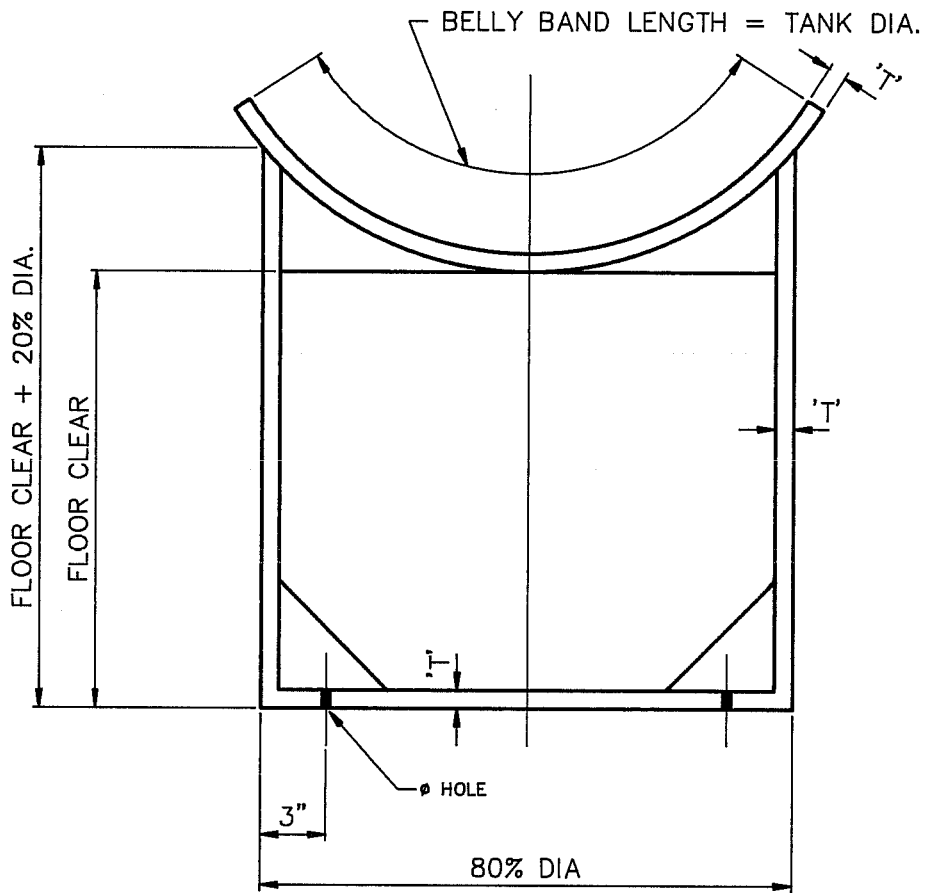
$$\text{Travel} = 17 \times 1.414 = 24 \frac{1}{2} \text{ in., center to center}$$


Run =  $A \times$  cotangent of angle of fitting

$$\text{Run} = 17 \times 1.000 = 17 \text{ in., center to center}$$

*A = Run when 45° is used  
A = Run FITTING*





			CERTIFIED FOR CONSTRUCTION DATE _____ PER _____		 PENSACOLA, FLORIDA	S.E. THERMAL SYSTEMS GROUP, INC.
			DRAWN BY _____ DATE _____			
NO.	DATE/BY	REVISION				



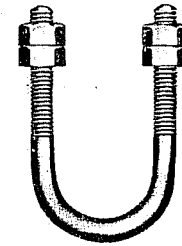
**U BOLTS — Fig. 283 STEEL**

Fig. 283 U-Bolts are of carbon steel with four hex nuts. Galvanized on request. Alloy steels and Stainless Steels available on request.

Approvals: Complies with Federal Specification WW-H-171 (Type 24) and Manufacturers Standardization Society SP 69 (Type 24)

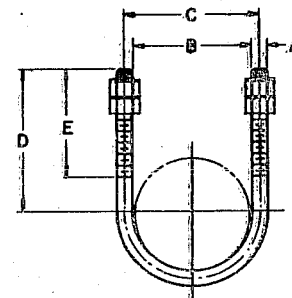
Note: When furnished hot-dip galvanized, oversize hex nuts must be used.

When ordering, specify pipe size and figure number.



DIMENSIONS IN INCHES

Pipe Size	Max. Load, lbs.	A	B	C	D	E	Weight per 100
1/2	480	1/4	3/8	1 1/8	2 1/2	2 1/2	12
3/4	480	1/4	1 1/8	1 3/8	2 5/8	2 1/2	13
1	480	1/4	1 3/8	1 5/8	2 3/4	2 1/2	14
1 1/4	1200	3/8	1 3/4	2 1/8	2 7/8	2 1/2	38
1 1/2	1200	3/8	2	2 3/8	3	2 1/2	39
2	1200	3/8	2 1/2	2 7/8	3 1/4	2 1/2	42
2 1/2	2200	1/2	3	3 1/2	3 3/4	3	90
3	2200	1/2	3 5/8	4 1/8	4	3	99
4	2200	1/2	4 5/8	5 1/8	4 1/2	3	115
5	2200	1/2	5 5/8	6 1/8	5	3	128
6	3600	3/4	6 3/4	7 3/8	6 1/8	3 3/4	239
8	3600	5/8	8 3/4	9 3/8	7 1/8	3 3/4	283
10	5400	3/4	10 5/8	11 3/8	8 3/8	4	479
12	7500	7/8	12 5/8	13 3/4	9 5/8	4 1/4	764
14	7500	7/8	14 1/8	15	10 1/4	4 1/4	820
16	7500	7/8	16 1/8	17	11 1/4	4 1/4	870
18	9800	1	18 1/8	19 1/8	12 5/8	4 3/4	1350
20	9800	1	20 1/8	21 1/8	13 5/8	4 3/4	1460
24	9800	1	24 1/8	25 1/8	15 5/8	4 3/4	1710



**SPRINKLER U HOOKS — Fig. 44 STEEL**

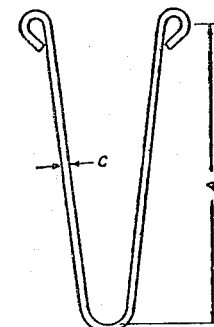
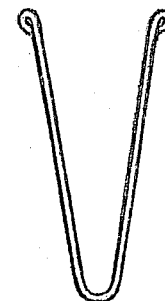
When ordering, specify pipe size, length which is from center of eyes to bottom of pipe and figure number.

DIMENSIONS IN INCHES

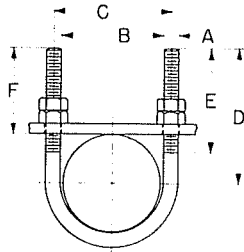
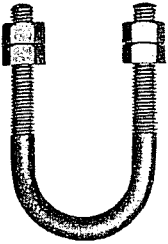
Pipe Sizes	3/4-2	2 1/2-3	3 1/2-4	5	6	8
Dim. C	5/16	3/8	1/2	5/8	3/4	7/8
Size Screw	No. 16	3/8	1/2	1/2	1/2	5/8
Max. Load, lb.	250	300	300	550	750	1100

WEIGHT PER HUNDRED

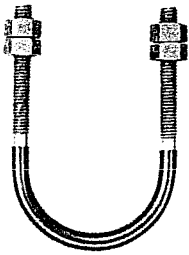
Length A Inches	Pipe Sizes, Inches					
	3/4-2	2 1/2-3	3 1/2-4	5	6	8
6	36					
8	45					
10	54	82	159	273	278	
12	62	97	181	307	312	
14	71	107	204	343	347	531
16	80	120	226	378	381	582
18	88	132	248	411	416	632
20	100	147	271	447	450	663
24	108	166	315	481	520	762
30	134	213	382	532	618	908
36	160	251	448	584	722	1062



standard U-bolt  
fig. 137  
special U-bolt (non-standard dimensions)  
fig. 137S\*



plastic coated: fig. 137C



**SIZE RANGE:** 1/2 to 36 inch pipe. **U-bolts**

**MATERIAL:** Carbon steel U-bolt and four finished hex nuts.

**FINISH:** Black or galvanized; furnished black unless otherwise specified.

**SERVICE:** Recommended for support, anchor or guide of heavy loads; often employed in power and process plant service.

**MAXIMUM TEMPERATURE:** 750°F.

**APPROVALS:** Complies with Federal Specification WW-H-171E (Type 24) and Manufacturers Standardization Society SP-69 (Type 24).

**ORDERING FIG. 137:** Specify rod size x pipe size (as 5/8 x 6), figure number, name. U-bolt will be furnished with longer tangents D or with longer threads E if so required and ordered. If hex nuts are not required, specify "without hex nuts."

**ORDERING FIG. 137S:** Specify figure number, name, material specification, dimensions A, B, C, D and E, and "with hex nuts" or "without hex nuts."

**SPECIAL NOTE:** When furnished hot-dip galvanized, oversize hex nuts must be used.

**fig. 137C coated U-bolt**

**SIZE RANGE:** 1/2 to 8 inch pipe.

**MATERIAL:** Carbon steel U-bolt and four finished hex nuts. Formed portion of the U-bolt is plastic coated.

**SERVICE:** Recommended for support, anchor or guide for glass, copper, brass and aluminum pipe.

**MAXIMUM TEMPERATURE:** 225°F.

**ORDERING:** Specify rod size x pipe size (as 3/8 x 2), figure number, name. If hex nuts are not required, specify "without hex nuts."

load • weights • packaging • dimensions (inches)

pipe size	rod size A	maximum recommended load, lb■		weight with nuts (approx) lbs each	no of pieces per carton		B	C	D	E	F
		650°F	750°F		fig. 137	fig. 137C					
1/2	1/4	485	435	.11	50	50	15/16	13/16	23/4	21/8	25/16
3/4	1/4	485	435	.12	50	50	11/8	13/8	23/4	21/8	27/32
1	1/4	485	435	.12	50	50	13/8	15/8	23/4	21/8	27/32
1 1/4	3/8	1220	1090	.28	50	50	111/16	21/16	27/8	21/8	21/32
1 1/2	3/8	1220	1090	.30	50	50	2	23/8	3	21/2	21/16
2	3/8	1220	1090	.33	50	50	27/16	213/16	3 1/4	2 1/2	21/16
2 1/2	1/2	2260	2020	.73	50	50	215/16	37/16	3 3/4	3	25/16
3	1/2	2260	2020	.78	50	50	39/16	41/16	4	3	2 1/4
3 1/2	1/2	2260	2020	.84	50	50	41/16	49/16	4 1/4	3	2 1/4
4	1/2	2260	2020	.90	50	50	49/16	51/16	4 1/2	3	2 1/4
5	1/2	2260	2020	1.0	...	15	55/8	6 1/8	5	3	27/32
6	5/8	3620	3230	2.0	...	15	6 3/4	7 3/8	6 1/8	3 3/4	213/16
8	5/8	3620	3230	2.3	...	...	8 3/4	9 3/8	7 1/8	3 3/4	213/16
10	3/4	5420	4830	4.9	...	...	10 7/8	11 5/8	8 3/8	4	3
12	7/8	7540	6730	7.7	...	...	12 7/8	13 3/4	9 5/8	4 1/4	3 1/4
14	7/8	7540	6730	8.3	...	...	14 1/8	15	10 1/4	4 1/4	3 1/4
16	7/8	7540	6730	9.2	...	...	16 1/8	17	11 1/4	4 1/4	3 1/4
18	1	9920	8850	13.5	...	...	18 1/8	19 1/8	12 5/8	4 3/4	3 5/8
20	1	9920	8850	14.6	...	...	20 1/8	21 1/8	13 5/8	4 3/4	3 5/8
24	1	9920	8850	16.9	...	...	24 1/8	25 1/8	15 5/8	4 3/4	3 5/8
30	1	9920	8850	19.1	...	...	30 1/8	31 1/8	18 5/8	4 3/4	3 5/8
36	1	9920	8850	23.2	...	...	36 1/8	37 1/8	21 5/8	4 3/4	3 5/8

■ With minimum safety factor of 5.

• Loads, weights and dimensions shown do not apply for Fig. 137S.

## bolts

### machine bolts



American Standard hexagon head bolts with American Standard hexagon nuts are stocked for immediate shipment in sizes  $\frac{3}{8}$ ,  $\frac{1}{2}$ ,  $\frac{5}{8}$ ,  $\frac{3}{4}$ ,  $\frac{7}{8}$ , 1 and  $1\frac{1}{8}$  inch.

Lengths of bolts are measured from under head to extreme point.

**ORDERING:** Specify bolt size, name, length.

### hexagon nuts

American Standard hexagon nuts — sizes  $\frac{1}{4}$  thru  $1\frac{1}{2}$  inch.

American Standard heavy hexagon flat nuts — sizes  $1\frac{3}{4}$  thru  $3\frac{3}{4}$  inch.

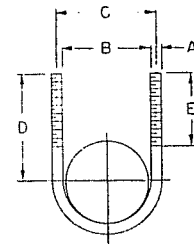
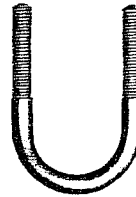
**ORDERING:** Specify bolt size, name.

### dimensions (inches)

bolt size	width	thickness
$\frac{1}{4}$	$\frac{7}{16}$	$\frac{15}{64}$
$\frac{3}{8}$	$\frac{9}{16}$	$\frac{11}{32}$
$\frac{1}{2}$	$\frac{3}{4}$	$\frac{29}{64}$
$\frac{5}{8}$	$\frac{15}{16}$	$\frac{9}{16}$
$\frac{3}{4}$	$1\frac{1}{8}$	$\frac{43}{64}$
$\frac{7}{8}$	$1\frac{5}{16}$	$\frac{25}{32}$
1	$1\frac{1}{2}$	$\frac{57}{64}$
$1\frac{1}{4}$	$1\frac{7}{8}$	$1\frac{3}{32}$
$1\frac{3}{8}$	$2\frac{1}{16}$	$1\frac{13}{64}$
$1\frac{1}{2}$	$2\frac{1}{4}$	$1\frac{5}{16}$
$1\frac{3}{4}$	$2\frac{3}{4}$	$1\frac{25}{32}$
2	$3\frac{1}{8}$	$2\frac{1}{32}$
$2\frac{1}{4}$	$3\frac{1}{2}$	$2\frac{9}{64}$
$2\frac{1}{2}$	$3\frac{7}{8}$	$2\frac{35}{64}$
$2\frac{3}{4}$	$4\frac{1}{4}$	$2\frac{13}{16}$
3	$4\frac{5}{8}$	$3\frac{1}{16}$
$3\frac{1}{4}$ ■	5	$3\frac{5}{16}$
$3\frac{1}{2}$ ■	$5\frac{3}{8}$	$3\frac{9}{16}$
$3\frac{3}{4}$ ■	$5\frac{3}{4}$	$3\frac{13}{16}$

■ Furnished with 8 UN series threads.

### light weight U-bolt fig. 120



**SIZE RANGE:**  $\frac{1}{2}$  to 10 inch pipe and conduit.

**MATERIAL:** Carbon steel.

**FINISH:** Black or electro-galvanized; furnished black unless otherwise specified.

**SERVICE:** Recommended for support, anchor or guide of relatively light loads. Normally used with two hex nuts.

**MAXIMUM TEMPERATURE:** 650°F.

**ORDERING:** Specify rod size x pipe size, figure number, name. Hex nuts must be ordered separately.

### loads • weights • dimensions (inches)

pipe size	max recom load, lb■	wgt app'x lbs each	rod size A	B	C	D	E
$\frac{1}{2}$	485	.06	$\frac{1}{4}$	$\frac{15}{16}$	$1\frac{3}{16}$	$1\frac{15}{16}$	$1\frac{3}{4}$
$\frac{3}{4}$	485	.07	$\frac{1}{4}$	$1\frac{1}{8}$	$1\frac{3}{8}$	$2\frac{1}{16}$	$1\frac{3}{4}$
1	485	.07	$\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{5}{8}$	$2\frac{3}{16}$	$1\frac{3}{4}$
$1\frac{1}{4}$	485	.08	$\frac{1}{4}$	$1\frac{11}{16}$	$1\frac{15}{16}$	$2\frac{3}{8}$	$1\frac{3}{4}$
$1\frac{1}{2}$	485	.09	$\frac{1}{4}$	2	$2\frac{1}{4}$	$2\frac{7}{16}$	$1\frac{3}{4}$
2	485	.10	$\frac{1}{4}$	$2\frac{7}{16}$	$2\frac{11}{16}$	$2\frac{11}{16}$	$1\frac{3}{4}$
$2\frac{1}{2}$	1220	.28	$\frac{3}{8}$	$2\frac{15}{16}$	$3\frac{5}{16}$	$3\frac{1}{16}$	2
3	1220	.31	$\frac{3}{8}$	$3\frac{9}{16}$	$3\frac{15}{16}$	$3\frac{3}{8}$	2
$3\frac{1}{2}$	1220	.35	$\frac{3}{8}$	$4\frac{1}{16}$	$4\frac{7}{16}$	$3\frac{5}{8}$	2
4	1220	.38	$\frac{3}{8}$	$4\frac{9}{16}$	$4\frac{15}{16}$	$3\frac{7}{8}$	2
5	1220	.45	$\frac{3}{8}$	$5\frac{5}{8}$	6	$4\frac{9}{16}$	$2\frac{1}{4}$
6	2260	.95	$\frac{1}{2}$	$6\frac{3}{4}$	$7\frac{1}{4}$	$5\frac{1}{16}$	$2\frac{1}{4}$
8	2260	1.2	$\frac{1}{2}$	$8\frac{3}{4}$	9 $\frac{1}{4}$	$6\frac{1}{16}$	$2\frac{1}{4}$
10	3620	2.3	$\frac{5}{8}$	$10\frac{7}{8}$	$11\frac{1}{2}$	$7\frac{1}{4}$	$2\frac{1}{2}$

■ With minimum safety factor of 5.

ENGINEERING DEPARTMENT STANDARDS  
GRAVER WATER CONDITIONING CO.

F-2900.05

DATE OF ORIGINAL ISSUE 11/14/63 DISTRIBUTION LIST A PAGE 1 OF 1

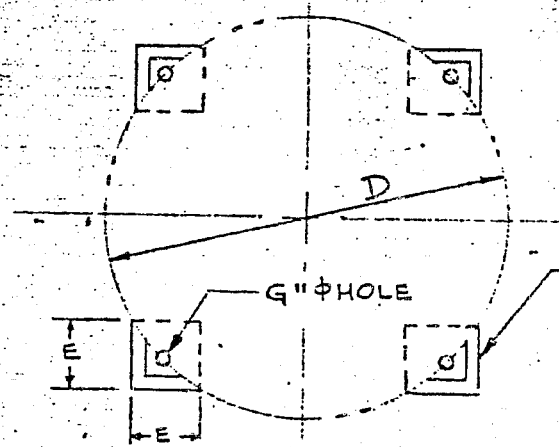
DESCRIPTION

NO. DATE BY

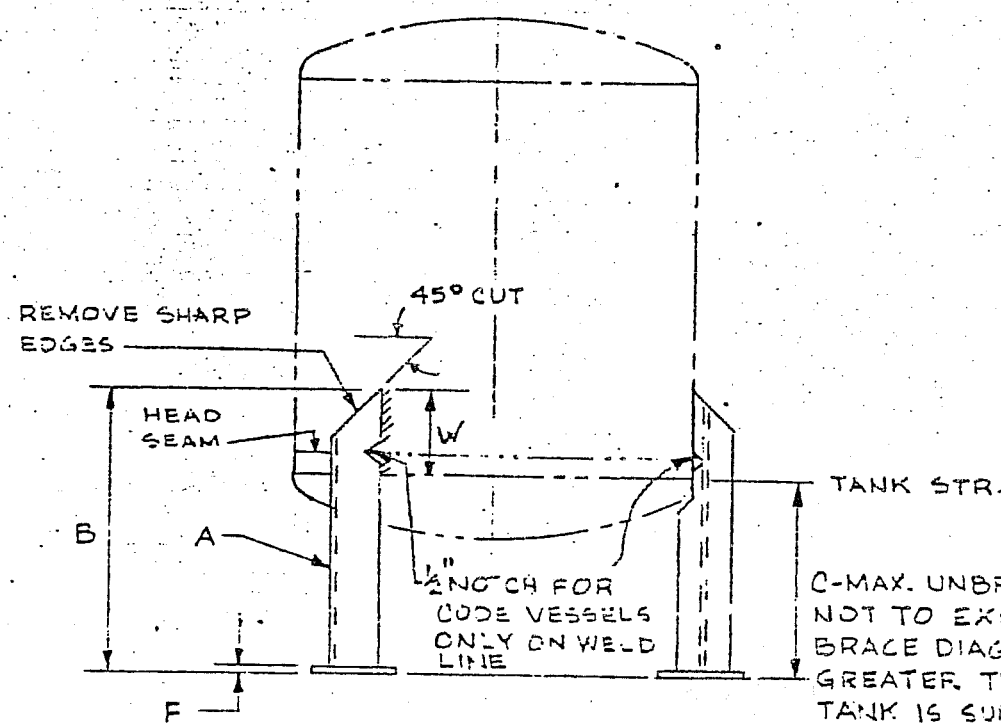
DESCRIPTION

NO. DATE BY

REVISIONS



NOTE: 3 LEGS MAY BE USED FOR TANKS 30" AND SMALLER



C-MAX. UNBRACED LENGTH NOT TO EXCEED 60" BRACE DIAGONALLY WHEN GREATER THAN 60" OR IF TANK IS SUBJECT TO WIND OR E.Q. LOADS.

A	B	C	D	E	F	G	MAX. VERT. LOAD PER LEG	W
	SEE TANK DETAILS		BOLT CIRCLE EQUAL TO TANK DIA.					4"
2 1/2" x 2 1/2" x 3/8"		60"		4"	1/2"	5/8"	2500	4"
3" x 3" x 3/8"		60"		5"	5/8"	7/8"	5,000	6"
4" x 4" x 3/8"		60"		6"	3/4"	7/8"	8,000	6"
4" x 4" x 3/8"		10'-0"		SPECIAL		13,500	6"	
6" x 6" x 20"		14'-0"		SPECIAL		23,000	10"	

DESIGN BASED ON AISC CODE

PREP. | CHKD. | APFD.

TANK O.D.

ANGLE SIZE

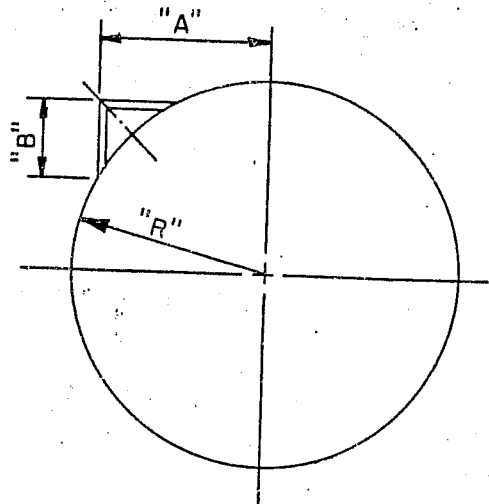
	2"	3"	4"	6"
36	13 11/16	14 1/8	14 9/16	15 3/8
42	15 13/16	16 1/4	16 11/16	17 9/16
48	17 15/16	18 3/8	18 7/8	19 11/16
54		20 1/2	21	21 7/8
60		22 11/16	23 1/8	24
66		24 13/16	25 1/4	26 1/8
72		26 15/16	27 3/8	28 1/4
78		29 1/16	29 1/2	30 7/16
84		31 1/8	31 5/8	32 9/16
90		33 1/4	33 3/4	34 11/16
96		35 3/8	35 7/8	36 13/16
102		37 1/2	38	38 15/16
108		39 5/8	40 1/8	41 1/16
114		41 3/4	42 1/4	43 3/16
120		43 7/8	44 3/8	45 5/16
144		52 3/8	52 7/8	53 13/16

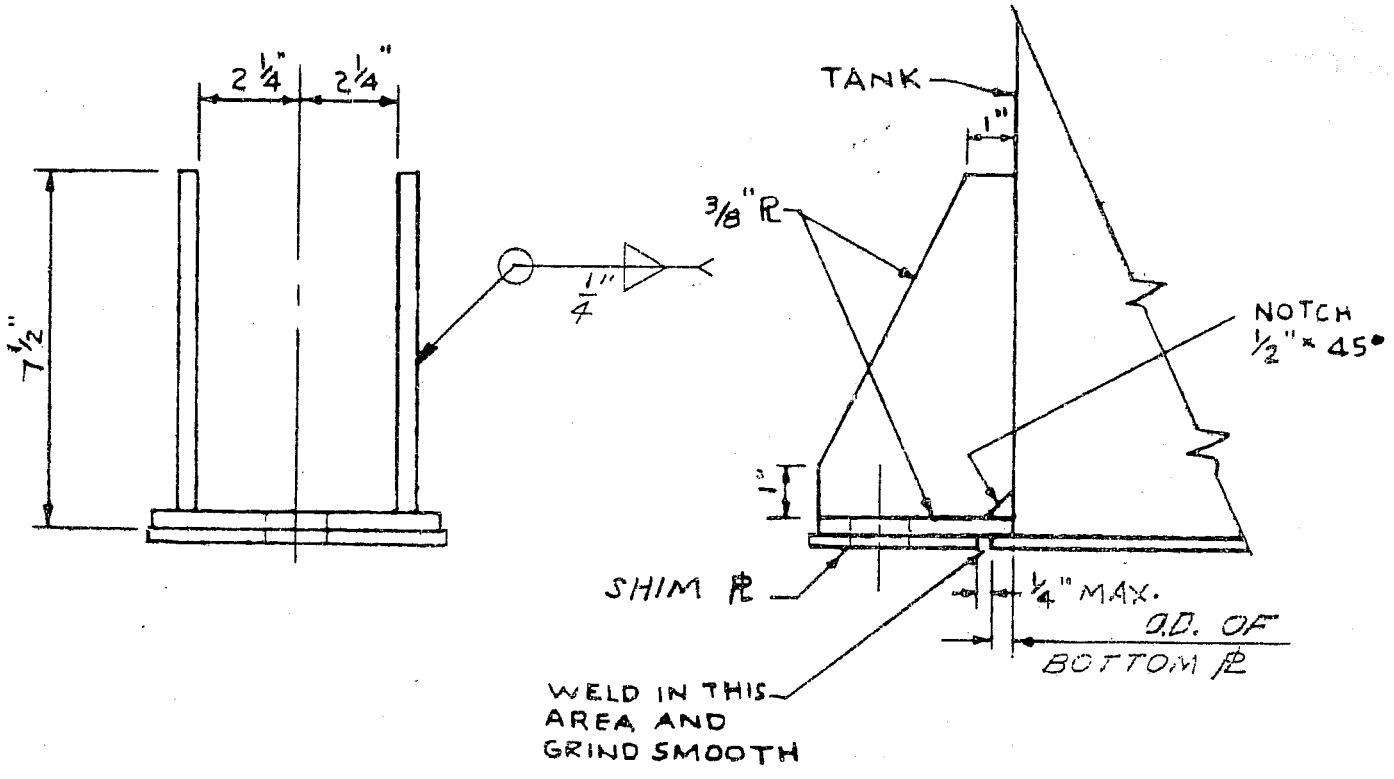
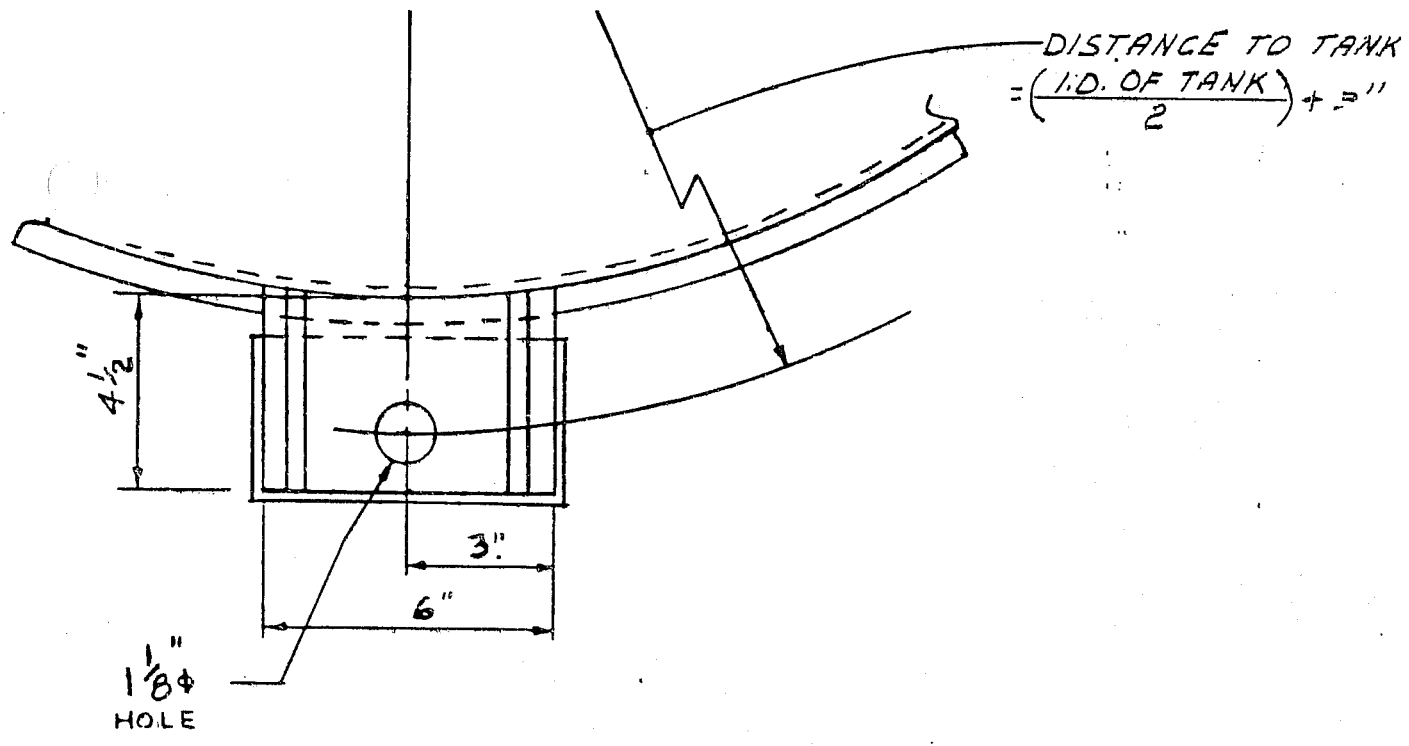
For Angles Other Than Those Shown Use The Following:

$$A = (\sqrt{R^2 - (B \times .707)^2} + (B \times .707)) \times .707$$

A = Center Line of Tank to Back of Angle

NOTE: All Dimensions Are In Inches





SHOP STANDARD

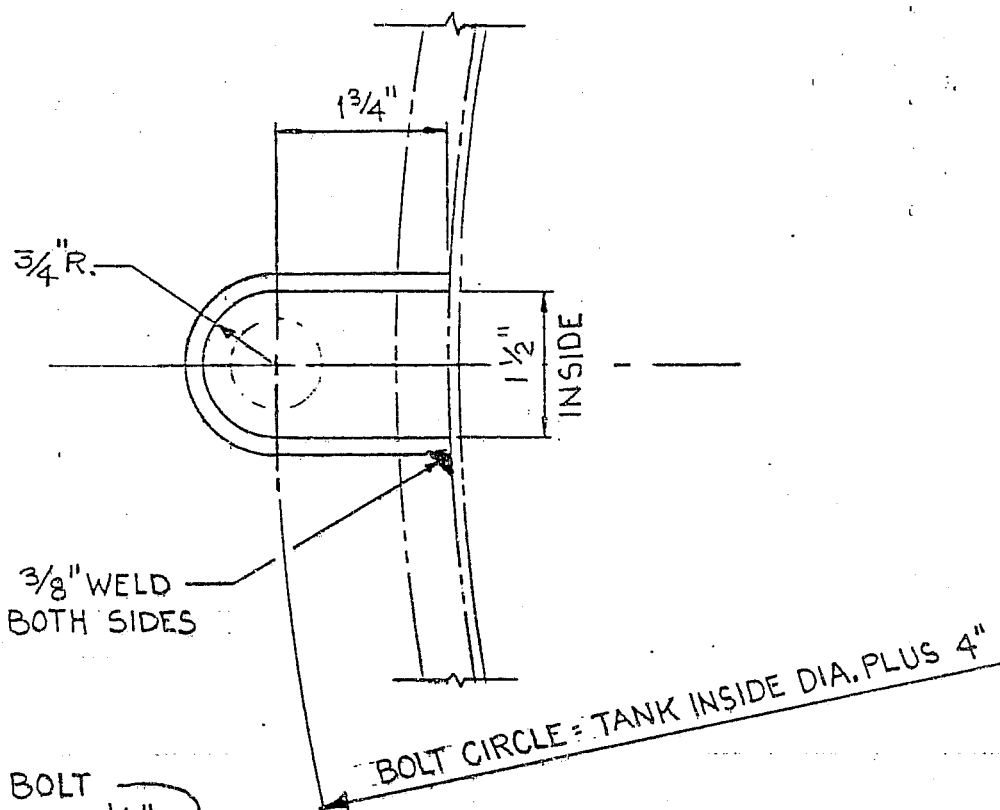
<b>DETAIL</b>	
<b>ANCHOR BOLT CLIP</b>	
GRAVER WATER CONDITIONING CO.	
SCALE <i>N</i>	DWN ADG
DATE 3-23-72	CH'D AT
<b>A-20474</b>	

REV. NO.	DATE	REMARKS

THIS DRAWING CERTIFIED CORRECT WHEN INITIALED

JJS

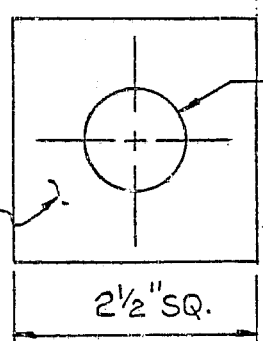
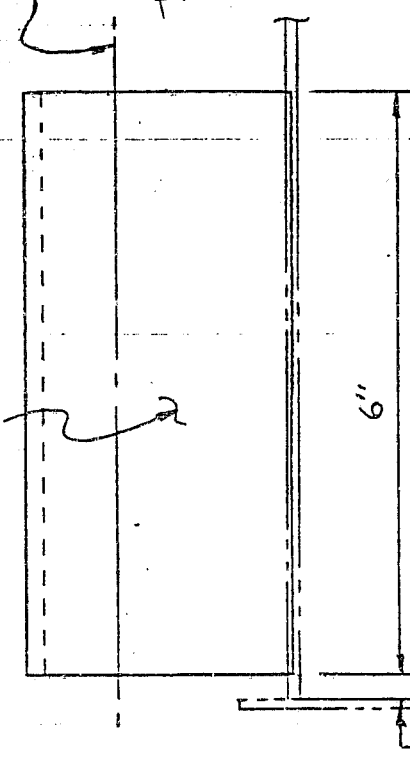
W



3/8" WELD BOTH SIDES

BOLT CIRCLE = TANK INSIDE DIA. PLUS 4"

ANCHOR BOLT PROJECTION = 8 1/4" ABOVE CONCRETE



WASHER ONE PER CLIP

12,000# DESIGN

DETAIL  
ANCHOR BOLT CLIP - 1"φ

**ECODYNE** Graver Water Division

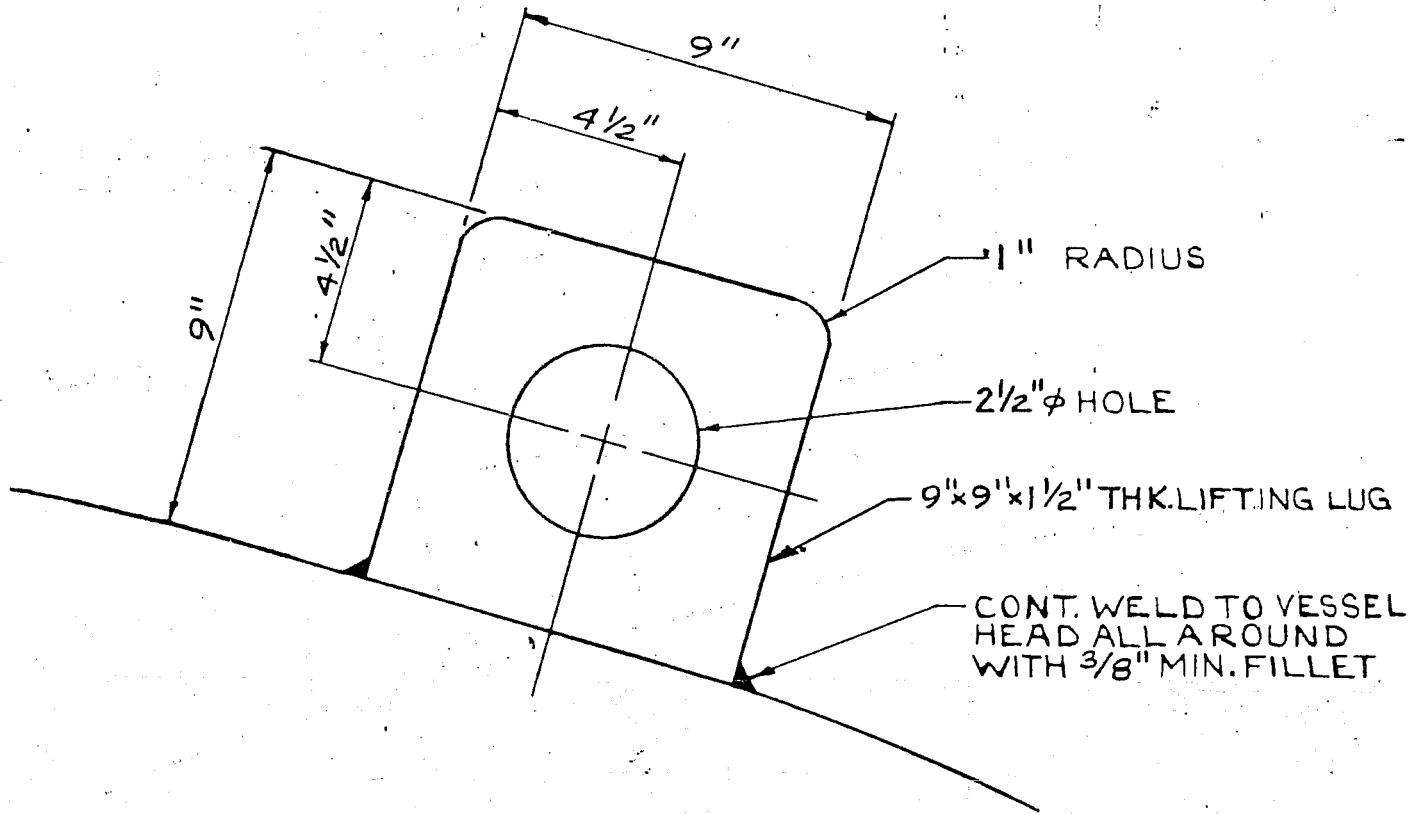
REV. NO.	DATE	REMARKS

SCALE 1/2" = 1" DWN D.S.P.  
DATE 6/30/75 CH'D AS

A-23129

THIS DRAWING CERTIFIED CORRECT WHEN INITIALED.

DR 1  
DE 2



NOTES:

1. MATERIAL OF LUG TO HAVE A MINIMUM ULTIMATE TENSILE STRENGTH OF 55,000 PSI. (SA-285 GR. C. P.L.)
2. DESIGN LOAD 60,000 LBS.(MAX)

A-23774

-DETAIL-  
LIFTING LUG

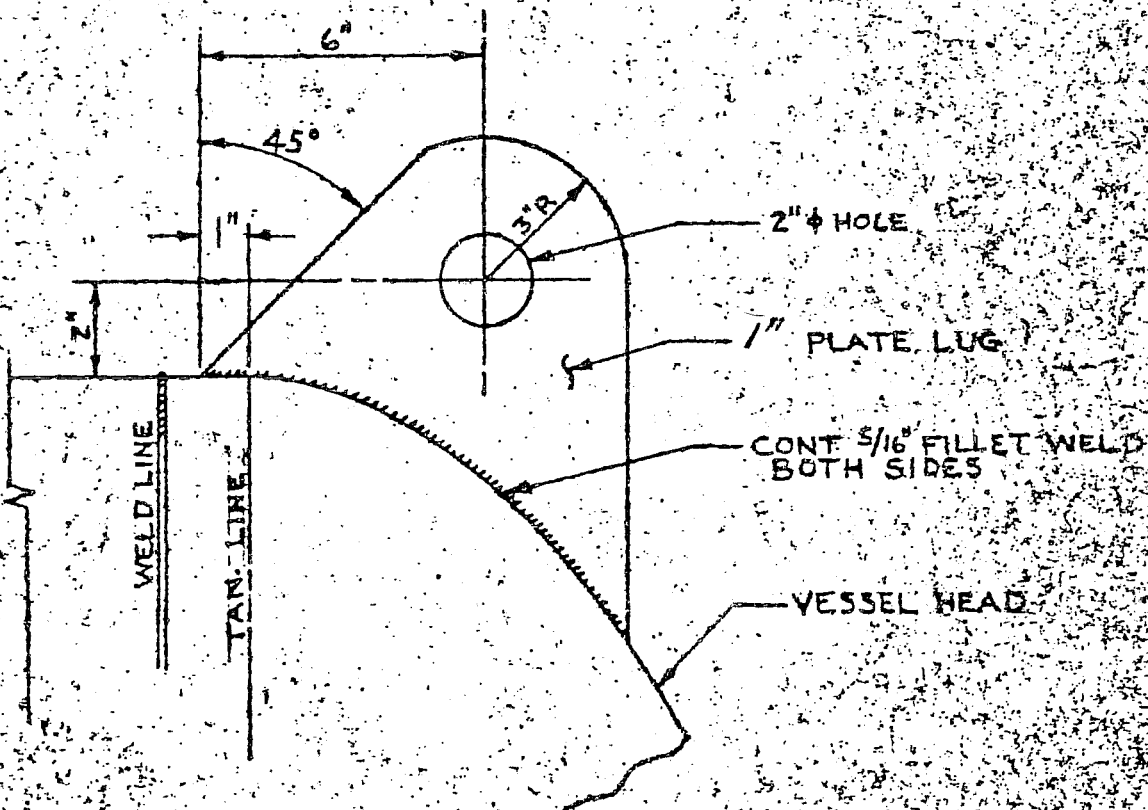
**ECODYNE** Graver Water Division

REV NO	DATE	REMARKS

SCALE <i>CHD</i>	DWN J.K.	<b>A-23774</b>
DATE 10-21-75	CHD <i>V.L.</i>	

THIS DRAWING CERTIFIED CORRECT WHEN INITIALED





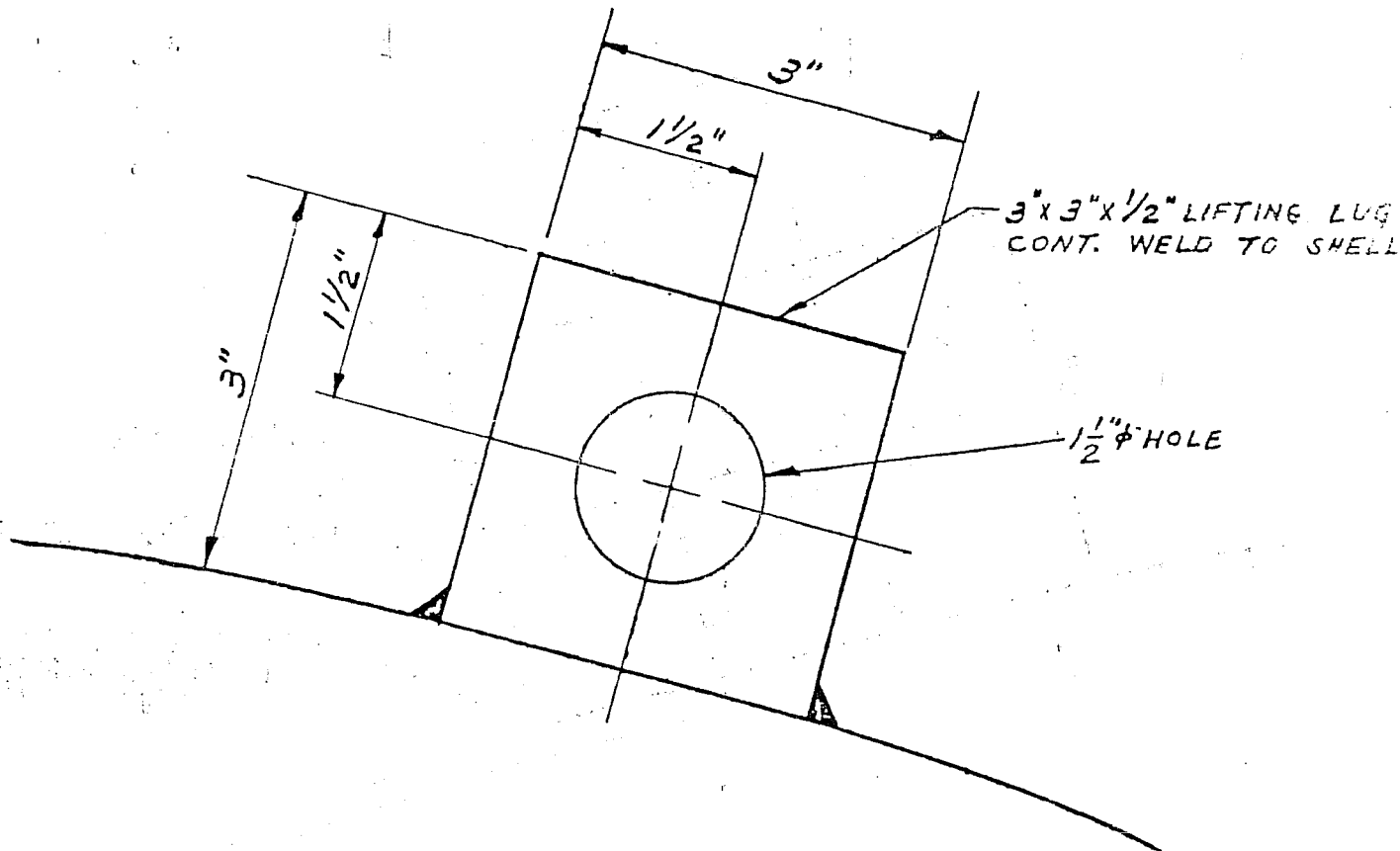
MAT'L TO BB SA-285-C  
 SE-18,780 A.S.I.



DETAIL  
 LIFTING LUG  
 FOR  
 HORIZONTAL VESSELS

GRAVER WATER CONDITIONING CO.

REV. NO.	DATE	REMARKS	SCALE	DATE	CH'D	NO.
			5'-1-0" DWN L.H.	9/4/80	44	A-27203
THIS DRAWING CERTIFIED CORRECT WHEN INITIALED						



**SHOP STANDARD**

DETAIL  
LIFTING LUG

DO NOT SCALE THIS DRAWING — USE DIMENSIONS ONLY


**Ecodyne Corporation · Graver Water Division**

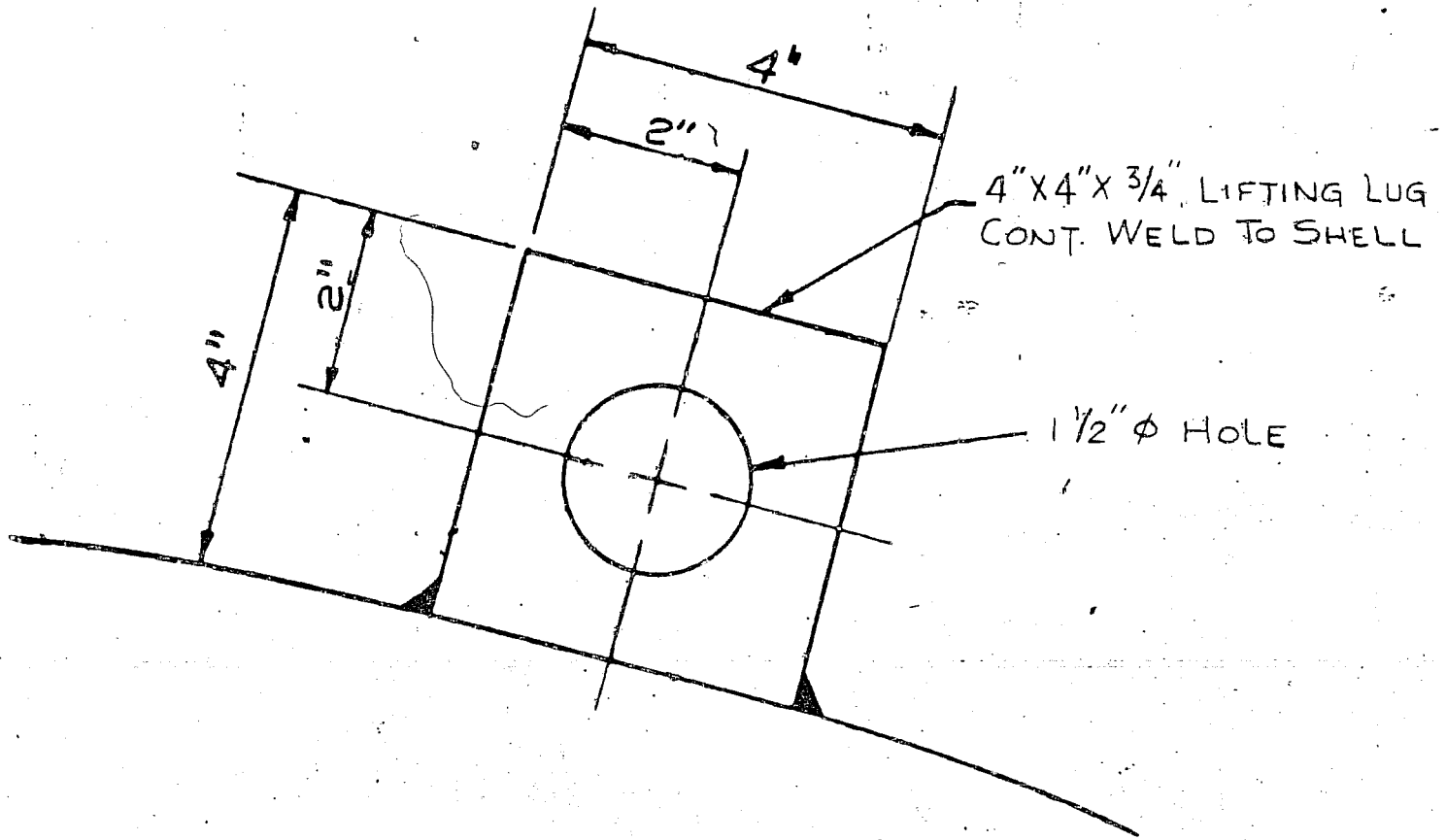
NO.	DATE	REVISION	SCALE 1/2" = 1"	DWN DTPJ
			DATE 6-6-63	CH'D RM

THIS DRAWING CERTIFIED CORRECT WHEN SIGNED *GHW*

*DJ*

**A-12167**

A-12167



SHOP STANDARD



DETAIL

LIFTING LUG

DO NOT SCALE THIS DRAWING -- USE DIMENSIONS ONLY

GRAVER WATER CONDITIONING CO.

NO.	DATE	REVISION	SCALE 1/2" = 1"	DWR P.C.
			DATE 9-18-62	CH'D RM

A-12215

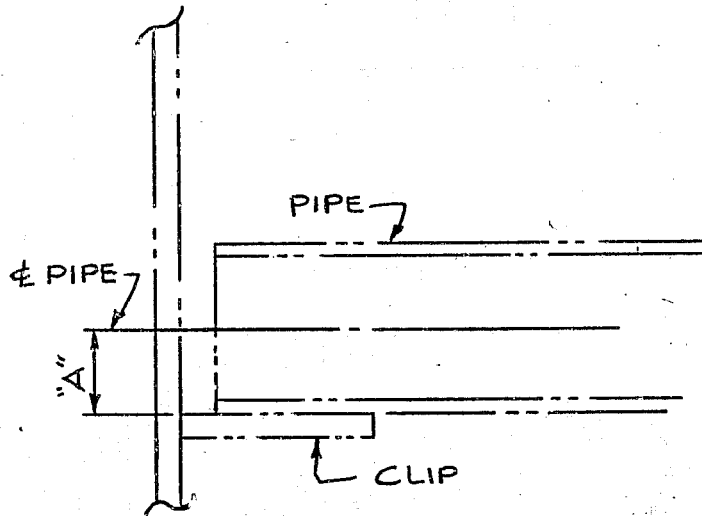
THIS DRAWING CERTIFIED CORRECT WHEN SIGNED

*SHW* *AS*

SUPERCEDED BY A-2372 H.P. ONLY  
USE AS ORIGINAL

A-12215

PIPE SIZE	"A"	DIMENSION
1/2"	.420	7/16"
3/4"	.525	9/16"
1"	.658	11/16"
1 - 1/4"	.830	7/8"
1 - 1/2"	.950	1"
2"	1.188	1 - 3/16"
2 - 1/2"	1.438	1 - 7/16"
3"	1.750	1 - 3/4"
4"	2.250	2 - 1/4"
5"	2.782	2 - 13/16"
6"	3.313	3 - 5/16"
8"	4.313	4 - 5/16"
10"	5.375	5 - 3/8"
12"	6.375	6 - 3/8"



W.P.O. Sheet Protector PS-5...

W.P.O. Sheet Protector PS-5...

ANTHRACITE FILTER

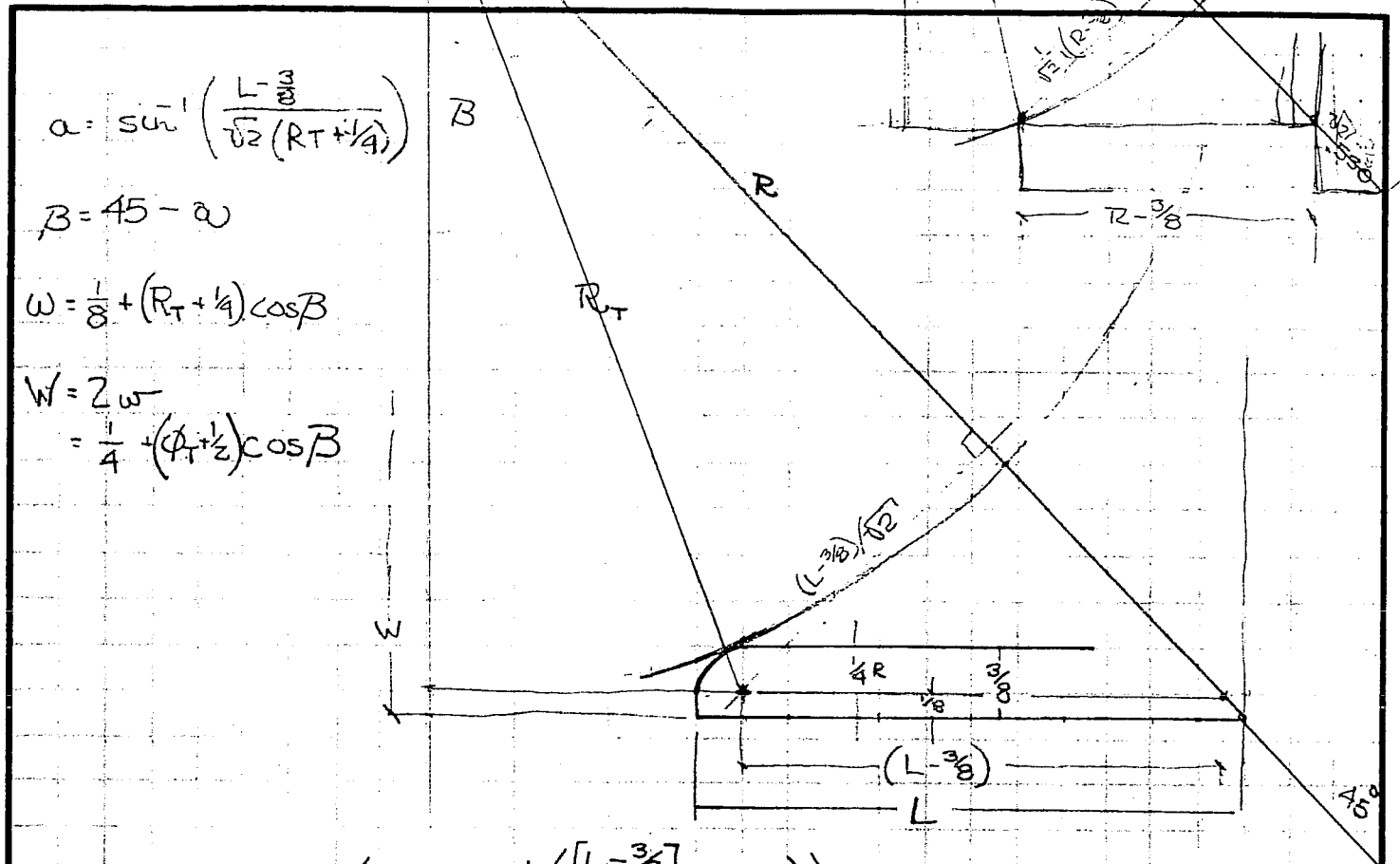
UNIT SIZE Ø	LAYOUT DWG'S.	SHELL DETAIL DWG'S.	MAIN PIPE SIZE	OPERATING WEIGHT / SHIPPING	LEG SIZE	MAX. E.Q. (ZONE)	BILL OF MATERIAL
36"	R-19297	R-18939	2"	3000 800	2½"X2½"X3/8" 4	II	960
42	R-19299	R-18941	2	4100 900	2½"X2½"X3/8" 4	II	961
48	R-19301	R-18943	3	5500 1200	2½"X2½"X3/8" 4	II	962
54	R-19303	R-18945	3	7000 1500	2½"X2½"X3/8" 4	II	963
60	R-19305	R-18947	3	8800 2000	2½"X2½"X3/8" 4	II	964
66	R-19307	R-18948	3	10850 2400	2½"X2½"X3/8" 4	I	965
72	R-19309	R-18950	4	13200 3000	3"X3"X3/8" 4	I	966
78	R-19311	R-18952	4	16000 3700	3"X3"X3/8" 4	I	967
84	R-19313	R-18954	4	19000 4500	3"X3"X3/8" 4	I	968
90	R-19315	R-18956	4	22400 5500	4"X4"X3/8" 4	I	969
96	R-19317	R-18958	4	26100 6500	4"X4"X3/8" 4	I	970
102	R-19319	R-18960	6	29900 7500	4"X4"X3/8" 4	I	971
108	R-19321	R-18975	6	35000 9400	6"X6"X1/2" 4	II	972
114	R-19323	R-18977	6	39400 10400	6"X6"X1/2" 4	II	973
120	R-19325	R-18979	6	44350 11700	6"X6"X1/2" 4	II	974
126	R-19327	R-18981	6	50400 13800	6"X6"X1/2" 4	II	975
132	R-19329	R-18983	8	56600 15700	6"X6"X1/2" 4	II	976
138	R-19331	R-18985	8	62400 17000	6"X6"X1/2" 4	I	977
144	R-19333	R-18987	8	69100 18300	6"X6"X1/2" 4	I	978

USING 3/8" THICK S

THERMAL SYSTEMS GROUP, INC.  
ENGINEERING DATA

Cust. \_\_\_\_\_  
Desc. \_\_\_\_\_

Sheet \_\_\_\_\_  
File \_\_\_\_\_  
Date \_\_\_\_\_  
By \_\_\_\_\_



$$\alpha = \sin^{-1} \left( \frac{L - \frac{3}{8}}{\sqrt{2} (R_T + \frac{1}{4})} \right)$$

$$\beta = 45 - \alpha$$

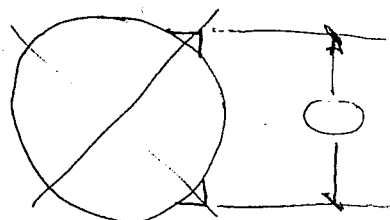
$$w = \frac{1}{8} + (R_T + \frac{1}{4}) \cos \beta$$

$$W = 2w = \frac{1}{4} + (\phi_T + \frac{1}{2}) \cos \beta$$

$$W = \frac{1}{4} + (\phi_T + \frac{1}{2}) \cos \left( 45 - \sin^{-1} \left( \frac{L - \frac{3}{8}}{\sqrt{2} (R_T + \frac{1}{4})} \right) \right) \quad \left( \frac{\phi}{2} + \frac{3}{8} = \frac{1}{2} (\phi + \frac{3}{4}) \right)$$

$$= \frac{1}{4} + (\phi_T + \frac{1}{2}) \cos \left( 45 - \sin^{-1} \left[ \frac{\sqrt{2} (L - \frac{3}{8})}{(\phi_T + \frac{1}{2})} \right] \right)$$

	$\phi_T = 18$	24	30	36	42	48
4.773 L=3	15.690 (15 <sup>11/16</sup> ) 15 <sup>3/4</sup>	20.000 (20) 20	24.281 (24 <sup>1/4</sup> ) 24 <sup>3/8</sup>	28.551 (28 <sup>9/16</sup> ) 28 <sup>5/8</sup>	32.812 (32 <sup>13/16</sup> ) 32 <sup>7/8</sup>	37.069 (37 <sup>1/8</sup> ) 37 <sup>1/8</sup>
5.187 L=4	16.444 (16 <sup>17/16</sup> ) 16 <sup>1/2</sup>	20.816 (20 <sup>13/16</sup> ) 20 <sup>7/8</sup>	25.135 (25 <sup>1/8</sup> ) 25 <sup>1/4</sup>	29.428 (29 <sup>7/16</sup> ) 29 <sup>1/2</sup>	33.707 (33 <sup>11/16</sup> ) 33 <sup>3/4</sup>	37.978 (38) 38 -

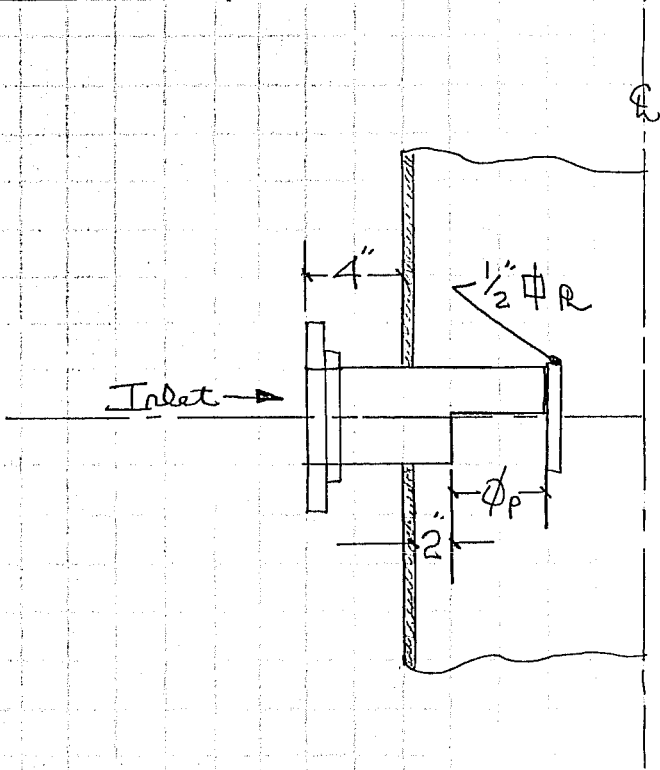


S.E. THERMAL SYSTEMS GROUPS, INC.  
ENGINEERING DATA

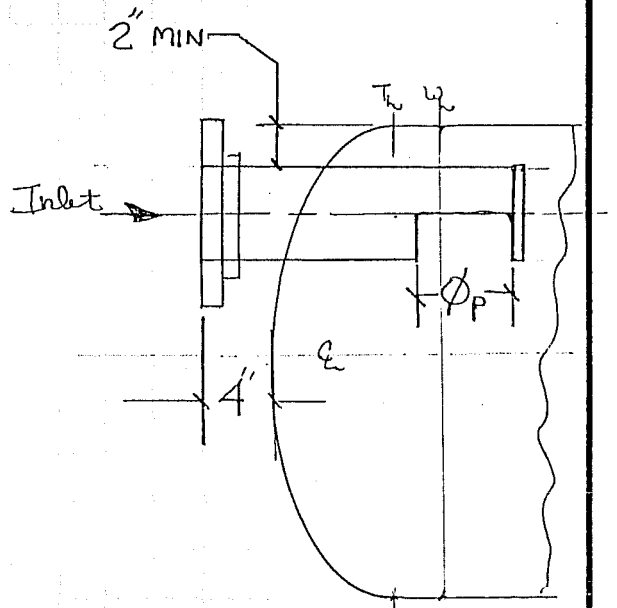
Sheet 1 of 1  
File Pipe Stds  
Date 4-18-90  
By M Driscoll

Cust. Pipe  
Desc. Condensate Receiver  
Inlets & Vapor Outlets

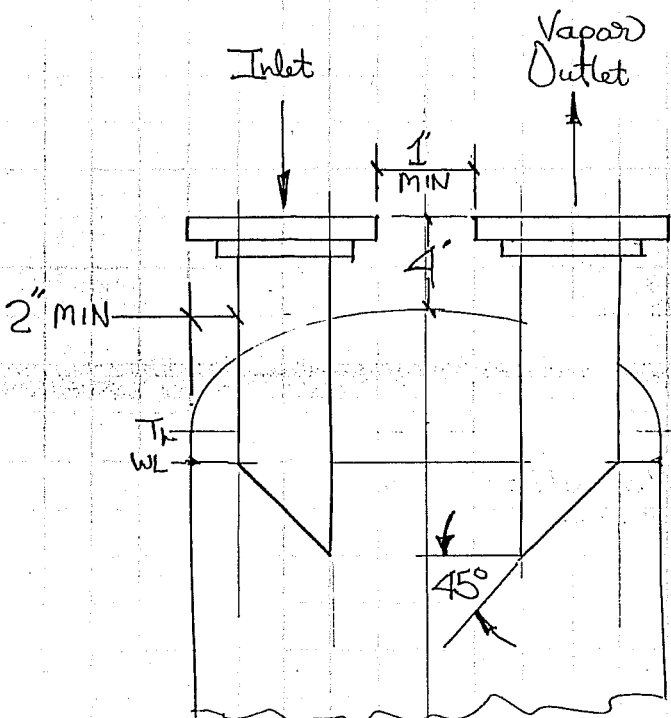
Horiz In - Vert Tank



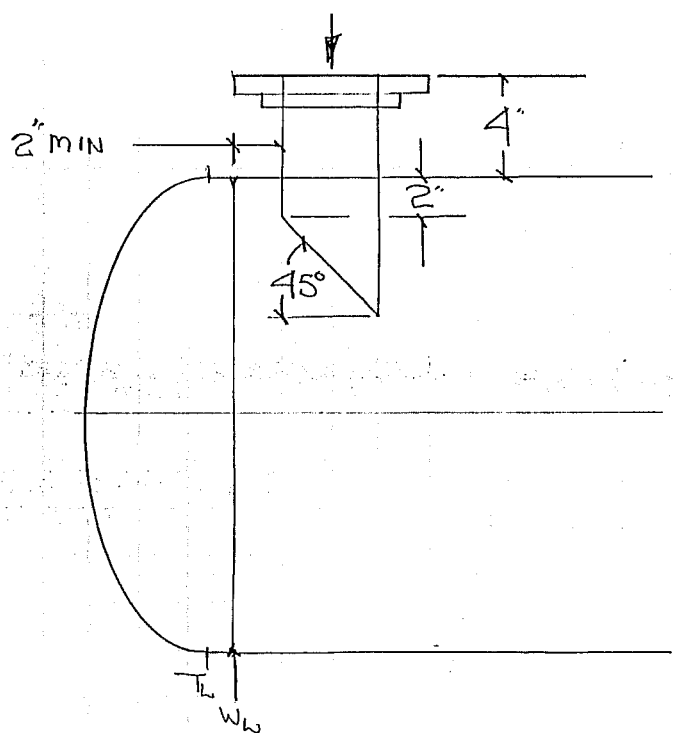
Horiz In - Horiz Tank



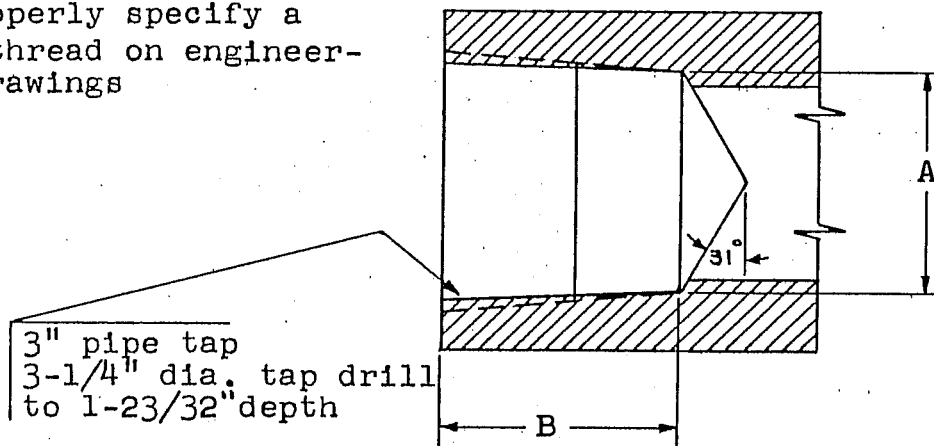
Vert In - Vert Tank



Vert In - Horiz Tank



See example below on how to properly specify a pipe thread on engineering drawings



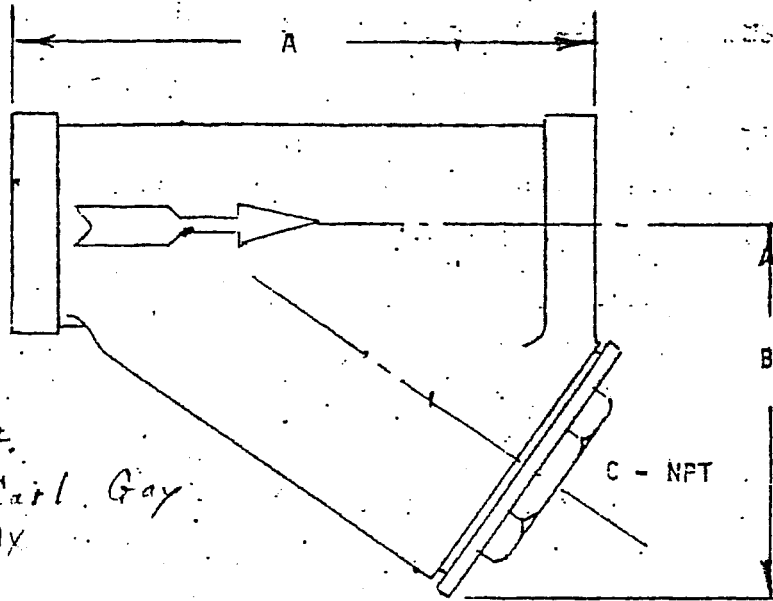
PIPE TAP SIZE	INDUSTRY STANDARD		EFFECTIVE THR'D. LENGTH	SPECIAL * THREAD		TOOL DATA TAP LG. FROM GAUGE POINT
	TAP DRILL DIA. A	TAP DRILL DEPTH B		TAP DRILL DIA. A	TAP DRILL DEPTH B	
1/8	R(.339)	9/16	19/64	R(.339)	3/8	23/64
1/4	7/16	23/32	3/8	7/16	15/32	29/64
3/8	37/64	3/4	13/32	37/64	1/2	31/64
1/2	23/32	31/32	17/32	23/32	9/16	35/64
3/4	59/64	31/32	9/16	59/64	5/8	39/64
1	1-5/32	1-11/64	21/32	1-5/32	13/16	51/64
1-1/4	1-1/2	1-13/64	11/16	1-1/2	7/8	55/64
1-1/2	1-47/64	1-7/32	11/16	1-47/64	31/32	61/64
2	2-7/32	1-13/64	45/64	2-7/32	1-1/8	1-7/64
2-1/2	2-5/8	1-23/32	15/16	2-5/8	1-1/4	1-15/64
3	3-1/4	1-23/32	1-1/64	3-1/4	1-3/8	1-23/64
3-1/2	3-3/4	1-9/16	1-5/64	3-3/4	1-1/2	1-31/64
4	4-1/4	2	1-3/32	4-1/4	1-5/8	1-39/64

NOTE: Effective thread length is the same for both the industry standard and the special thread, it will permit wrench type engagement.

\* Use special thread only when impossible to use industry standard and with approval of department head.



D-212272



Piping & Equip't.  
 785-7733 Carl. Gay  
 785 9741 FAX

MFG - 1) MUELLER STEAM SPECIALTY

PART NO	SIZE	A	B	C	NOTES
D-212272-1	1/4	2-11/16	1-7/8	1/4	SEE D-212122 FOR CAST IRON STRAINERS D-212123 FOR STEEL STRAINERS D-212124 FOR STAINLESS STEEL STRAINERS
" -2	3/8	2-11/16	1-7/8	1/4	
" -3	1/2	3-1/2	2-1/8	1/4	
" -4	3/4	3-13/16	2-9/16	1/4	STRAINERS ON THIS DRAWING SUPERSEDE L-R-P STRAINERS ON D-815469
DP " -5	1	4-5/8	3	1/2	
DP " -6	1-1/2	6	4-3/8	3/4	FOR 300# STRAINERS REFER TO D-212535
" -7	2	6-7/8	5-1/2	1	
" -8	3/8	2-11/16	1-7/8	1/4	THIS STRAINER MUST HAVE 60 MESH SCREEN BMA-162835

" -9 2-1/2" Ref. Mueller # 352

**MANUFACTURING**  
 MAY 24 1994

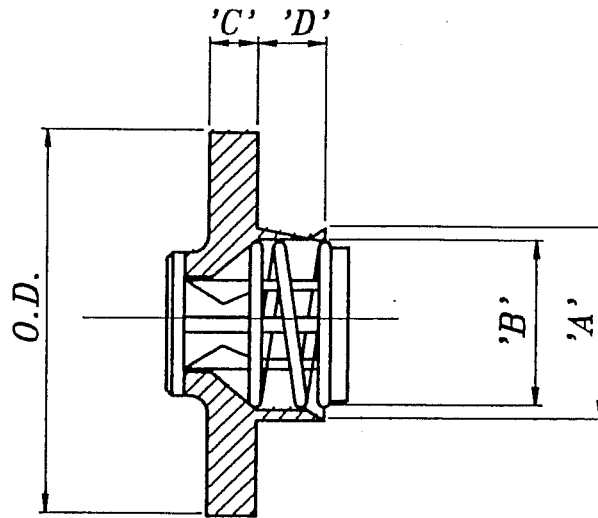
NOTE: VENDOR TO PROVIDE PLUG  
 OF PROPER MATERIAL IN  
 DRAIN PORT

BM-D-

L. O. E. M. OR P. L. NO.

C	ECN-20416	MAT'L	BODY - BRONZE ASTM D62	DATE	4-4-75	DR	P.C.
B	ECN-19365	SCREEN -	STAINLESS STEEL	SCALE		CK	
A	ECN-16343	FINISH:	20 MESH SCREEN 1/32" PERFORAT (HMS)	EXCEPT	-3	SUPERSEDES NO.: 1-013409	
UNLESS OTHERWISE SPECIFIED			NAME:	SUPERSEDED BY NO.:			
2-PLACE DECIMAL ± .02			STRAINER	NO: D-212272			
3-PLACE DECIMAL ± .005"			MODEL:	A UNIT OF ORIGINAL DESIGN			
SHARP EDGES TO BE BROKEN			PRESSURE RATING - 150 PSIG				

DO NOT SCALE DRAWING



SIZE	ASA RATING	'A'	'B'	'C'	'D'	O.D.	ORIFICE DIA.	Cv
1"	150# 300#	1.0"	0.860"	1/4"	0.358"	2"	0.610"	6.1
1 1/2"	150# 300#	1.570"	1.468"	1/4"	0.437"	2-7/8"	1.150"	18.8
2"	150# 300#	2.005"	1.780"	1/4"	0.488"	3-5/8"	1.385"	32.0
2 1/2"	150# 300#	2.407"	2.100"	1/4"	0.688"	4-1/8"	1.555"	42.5
3"	150# 300#	3.006"	2.700"	5/16"	0.726"	5"	2.050"	95
4"	150# 300#	3.964"	3.660"	3/8"	1.055"	6-3/16"	2.560"	128
6"	150# 300#	6.003"	5.650"	3/8"	1.512"	8-1/2"	3.875"	277
8"	150# 300#	7.919"	7.520"	1/2"	2.262"	10-5/8"	5.110"	470

DIMENSIONS ARE FOR CARBON AND STAINLESS STEEL VALVES



PENSACOLA, FLORIDA

S.E. THERMAL  
SYSTEMS  
GROUP, INC.

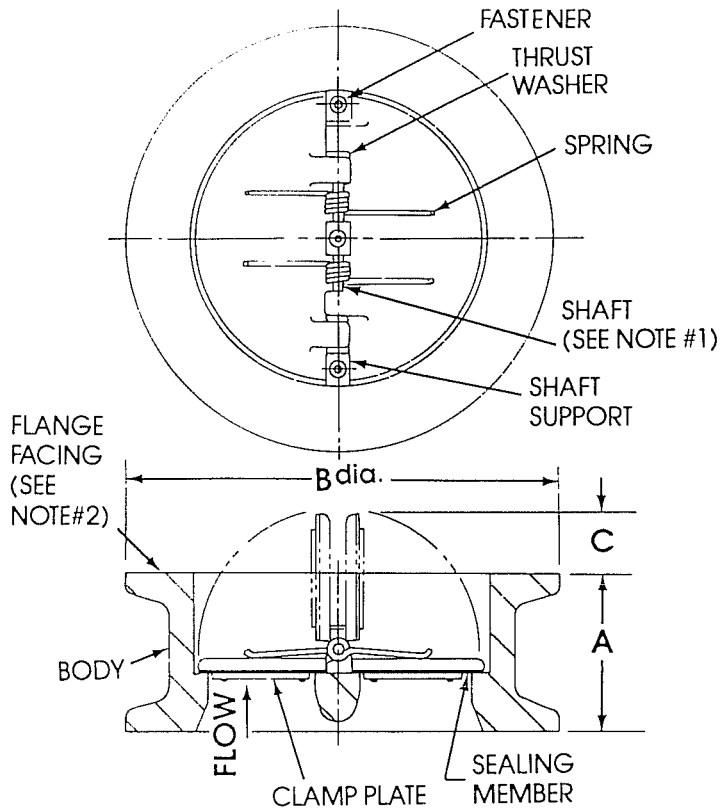
CHECK-ALL VALVE  
MODEL 'FIV'  
INSTALLATION DIMENSIONS

DRAWING  
NUMBER

A-5102-X

REV. 0

# TECHNOLOGICALLY ADVANCED DESIGN WITH FIELD REPLACEABLE SEALS, ELIMINATION OF LEAKAGE TO ATMOSPHERE, AND LOW PRESSURE LOSS



## GENERAL DIMENSIONS

ALL DIMENSIONS IN INCHES

VALVE SIZE	STYLE 5050 ANSI 125#			STYLES 5051 & 5051-316 ANSI 150#		
	A	B	C	A	B	C
2	2 <sup>1</sup> / <sub>8</sub>	4 <sup>1</sup> / <sub>8</sub>	—	2 <sup>3</sup> / <sub>8</sub>	4 <sup>1</sup> / <sub>8</sub>	—
2½	2 <sup>1</sup> / <sub>8</sub>	4 <sup>7</sup> / <sub>8</sub>	1/8	2 <sup>5</sup> / <sub>8</sub>	4 <sup>7</sup> / <sub>8</sub>	—
3	2¼	5 <sup>3</sup> / <sub>8</sub>	3/8	2 <sup>7</sup> / <sub>8</sub>	5 <sup>3</sup> / <sub>8</sub>	—
4	2½	6 <sup>7</sup> / <sub>8</sub>	7/8	2 <sup>7</sup> / <sub>8</sub>	6 <sup>7</sup> / <sub>8</sub>	½
5	2¾	7¾	1¼	3 <sup>3</sup> / <sub>8</sub>	7¾	5/8
6	3	8¾	1 <sup>7</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>8</sub>	8¾	1
8	3¾	11	2¾	5	11	1½
10	4¼	13 <sup>3</sup> / <sub>8</sub>	3 <sup>7</sup> / <sub>8</sub>	5¾	13 <sup>3</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>
12	5 <sup>5</sup> / <sub>8</sub>	16 <sup>1</sup> / <sub>8</sub>	4	7 <sup>1</sup> / <sub>8</sub>	16 <sup>1</sup> / <sub>8</sub>	2½

### NOTE:

1. Shaft must be in vertical position for horizontal flow application.
2. Plain face (non-serrated) for style 5050 raised faces (serrated) for styles 5051 and 5051-316.
3. Lifting lug feature is optional on 6"-12" style 5051 & 5051-316 valves – consult factory.

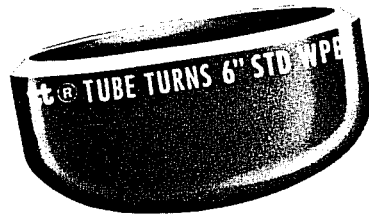
## STANDARD MODELS AND MATERIALS

Part Description	Quantity per Valve		Style 5050 ANSI 125#	Style 5051 ANSI 150#	Style 5051-316 ANSI 150#
	2" - 6"	8" - 12"			
Body	1	1	Cast Iron	Carbon Steel	316 Stainless Steel
Valve Plate	2	2	Aluminum Bronze	Carbon Steel	316 Stainless Steel
Sealing Member	2	2	EPDM	BUNA-N	BUNA-N
Clamp Plate	2	2	316 Stainless Steel		
Shaft Support	2	3	316 Stainless Steel		
Shaft	1	2	316 Stainless Steel		
Thrust Washer	4	4	Teflon		
Spring	1	2	316 Stainless Steel		
Fastener	2	3	316 Stainless Steel		

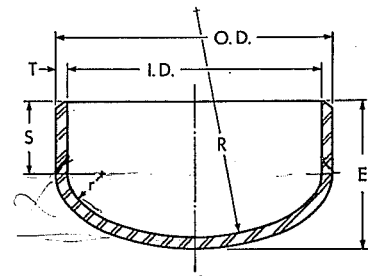
- Consult factory for materials, sizes and pressure ratings not shown.
- Stainless Steel thrust washers are standard with metal to metal sealing option.

# CAPS

## Standard Weight†



### Part No. 80



ANSI B16.9<sup>▲</sup>

ASTM A234\*

NOMINAL PIPE SIZE	OUTSIDE DIAMETER O.D.	INSIDE DIAMETER I.D.	WALL THICKNESS T	LENGTH E	TANGENT S	DISH RADIUS R‡	KNUCKLE RADIUS r‡	PIPE SCHEDULE NUMBERS	APPROXIMATE WEIGHT IN POUNDS	LIST PRICE
1/2	.840	.622	.109	1	.74	.54	.10	40	.07	
3/4	1.050	.824	.113	1	.68	.72	.14	40	.11	
1	1.315	1.049	.133	1 1/2	1.10	.92	.17	40	.25	
1 1/4	1.660	1.380	.140	1 1/2	1.02	1.35	.23	40	.3	
1 1/2	1.900	1.610	.145	1 1/2	.95	1.41	.27	40	.35	
2	2.375	2.067	.154	1 1/2	.83	1.81	.34	40	.5	
2 1/2	2.875	2.469	.203	1 1/2	.68	2.15	.41	40	.8	
3	3.500	3.068	.216	2	1.02	2.69	.51	40	1.5	
3 1/2	4.000	3.548	.226	2 1/2	1.39	3.11	.59	40	2.0	
4	4.500	4.026	.237	2 1/2	1.26	3.52	.67	40	2.5	
5	5.563	5.047	.258	3	1.48	4.42	.84	40	5	
6	6.625	6.065	.280	3 1/2	1.70	5.31	1.01	40	7	
8	8.625	7.981	.322	4	1.68	6.98	1.33	40	12	
10	10.750	10.020	.365	5	2.13	8.77	1.67	40	20	
12	12.750	12.000	.375	6	2.62	10.50	2.00	ST <sup>(1)</sup>	29	
14	14.000	13.250	.375	6 1/2	2.81	11.60	2.21	30	35	
16	16.000	15.250	.375	7	2.81	13.34	2.54	30	44	
18	18.000	17.250	.375	8	3.31	15.08	2.88	ST <sup>(1)</sup>	58	
20	20.000	19.250	.375	9	3.81	16.84	3.21	20	79	
22	22.000	21.250	.375	10	4.31	18.60	3.54	20	86	
24	24.000	23.250	.375	10 1/2	4.31	20.34	3.88	20	105	
26	26.000	25.250	.375	10 1/2	3.81	22.10	4.21	ST <sup>(1)</sup>	110	
28	28.000	27.250	.375	10 1/2	3.31	23.85	4.54	ST <sup>(1)</sup>	119	
30	30.000	29.250	.375	10 1/2	2.81	25.60	4.88	ST <sup>(1)</sup>	125	
32	32.000	31.250	.375	10 1/2	2.31	27.35	5.21	ST <sup>(1)</sup>	143	
34	34.000	33.250	.375	10 1/2	1.81	29.10	5.54	ST <sup>(1)</sup>	160	
36	36.000	35.250	.375	10 1/2	1.31	30.85	5.88	ST <sup>(1)</sup>	175	
42	42.000	41.250	.375	12	1.31	36.10	6.88	ST <sup>(1)</sup>	230	
48	48.000	47.250	.375	13 1/2	1.31	41.36	7.88	ST <sup>(1)</sup>	292	

All dimensions are in inches.

\* Grade B fittings are available from stock.

† All thicknesses agree with those for Standard Wall Pipe (see ANSI B36.10). Pipe Schedule Numbers are in accordance with ANSI B36.10.

Pipe Line Welding Fittings, conforming to MSS Standard Practice SP-75, High Test Wrought Welding Fittings, are available in sizes 16" and larger with physical properties to match pipe with 42,000, 48,000, 50,000, 52,000, 60,000, 65,000 and over psi minimum yield strengths.

(1) ST designates Standard Weight (standard wall).

Welding Caps are formed from steel plate and are stress relieved after forming. Caps are of an ellipsoidal shape in which the minor axis is equal to half the major axis.

‡ Radii "R" and "r" closely approximate the actual semi-ellipsoidal shape of the TUBE-TURN welding cap.

Caps conform to ASME Boiler and Pressure Vessel Code requirements.

Pressure-Temperature Ratings are identical with those of seamless pipe of the same size, thickness or schedule, and material grade. For Dimensional Tolerances see page 92.

For bevel detail see page 93.

▲ For information on this Standard see page 93.

Friction Losses in Pipe Fittings														
Resistance Coefficient K (use in formula $hf = Kv^2/2g$ )														
Fitting	LD	Nominal Pipe Size												
		½	¾	1	1¼	1½	2	2½-3	4	6	8-10	12-16	18-24	
		K Value												
Angle Valve	55	1.48	1.38	1.27	1.21	1.16	1.05	0.99	0.94	0.83	0.77	0.72	0.66	
Angle Valve	150	4.05	3.75	3.45	3.30	3.15	2.85	2.70	2.55	2.25	2.10	1.95	1.80	
Ball Valve	3	0.08	0.08	0.07	0.07	0.06	0.06	0.05	0.05	0.05	0.04	0.04	0.04	
Butterfly Valve							0.86	0.81	0.77	0.68	0.63	0.35	0.30	
Gate Valve	8	0.22	0.20	0.18	0.18	0.15	0.15	0.14	0.14	0.12	0.11	0.10	0.10	
Globe Valve	340	9.2	8.5	7.8	7.5	7.1	6.5	6.1	5.8	5.1	4.8	4.4	4.1	
Plug Valve Branch Flow	90	2.43	2.25	2.07	1.98	1.89	1.71	1.62	1.53	1.35	1.26	1.17	1.08	
Plug Valve Straightaway	18	0.48	0.45	0.41	0.40	0.38	0.34	0.32	0.31	0.27	0.25	0.23	0.22	
Plug Valve 3-Way Thru-Flow	30	0.81	0.75	0.69	0.66	0.63	0.57	0.54	0.51	0.45	0.42	0.39	0.36	
Standard Elbow	90°	30	0.81	0.75	0.69	0.66	0.63	0.57	0.54	0.51	0.45	0.42	0.39	0.36
	45°	16	0.43	0.40	0.37	0.35	0.34	0.30	0.29	0.27	0.24	0.22	0.21	0.19
	long radius 90°	16	0.43	0.40	0.37	0.35	0.34	0.30	0.29	0.27	0.24	0.22	0.21	0.19
Close Return Bend	50	1.35	1.25	1.15	1.10	1.05	0.95	0.90	0.85	0.75	0.70	0.65	0.60	
Standard Tee	Thru-Flow	20	0.54	0.50	0.46	0.44	0.42	0.38	0.36	0.34	0.30	0.28	0.26	0.24
	Thru-Branch	60	1.62	1.50	1.38	1.32	1.26	1.14	1.08	1.02	0.90	0.84	0.78	0.72
90 Bends, Pipe Bends, Flanged Elbows, Butt-Welded Elbows	r/d=1	20	0.54	0.50	0.46	0.44	0.42	0.38	0.36	0.34	0.30	0.28	0.26	0.24
	r/d=2	12	0.32	0.30	0.28	0.26	0.25	0.23	0.22	0.20	0.18	0.17	0.16	0.14
	r/d=3	12	0.32	0.30	0.28	0.26	0.25	0.23	0.22	0.20	0.18	0.17	0.16	0.14
	r/d=4	14	0.38	0.35	0.32	0.31	0.29	0.27	0.25	0.24	0.21	0.20	0.18	0.17
	r/d=6	17	0.46	0.43	0.39	0.37	0.36	0.32	0.31	0.29	0.26	0.24	0.22	0.20
	r/d=8	24	0.65	0.60	0.55	0.53	0.50	0.46	0.43	0.41	0.36	0.34	0.31	0.29
	r/d=10	30	0.81	0.75	0.69	0.66	0.63	0.57	0.54	0.51	0.45	0.42	0.39	0.36
	r/d=12	34	0.92	0.85	0.78	0.75	0.71	0.65	0.61	0.58	0.51	0.48	0.44	0.41
	r/d=14	38	1.03	0.95	0.87	0.84	0.80	0.72	0.68	0.65	0.57	0.53	0.49	0.46
	r/d=16	42	1.13	1.05	0.97	0.92	0.88	0.80	0.76	0.71	0.63	0.59	0.55	0.50
	r/d=18	45	1.24	1.15	1.06	1.01	0.97	0.87	0.83	0.78	0.69	0.64	0.60	0.55
Mitre Bends	a=0°	2	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.02
	a=15°	4	0.11	0.10	0.09	0.09	0.08	0.08	0.07	0.07	0.06	0.06	0.05	0.05
	a=30°	8	0.22	0.20	0.18	0.18	0.17	0.15	0.14	0.14	0.12	0.11	0.10	0.10
	a=45°	15	0.41	0.38	0.35	0.33	0.32	0.29	0.27	0.26	0.23	0.21	0.20	0.18
	a=60°	25	0.68	0.63	0.58	0.55	0.53	0.48	0.45	0.43	0.38	0.35	0.33	0.30
	a=75°	40	1.09	1.00	0.92	0.88	0.84	0.76	0.72	0.68	0.60	0.56	0.52	0.48
	a=90°	60	1.62	1.50	1.38	1.32	1.26	1.14	1.08	1.02	0.90	0.84	0.78	0.72

Note: Fittings are standard with full openings.

Fitting	L/D	Minimum Velocity for Full Disc Lift		Nominal Pipe Size											
		General ft/sec	Water ft/sec	½	¾	1	1¼	1½	2	2½-3	4	6	8-10	12-16	18-24
				K Value											
Swing Check Valve	100	35√V	4.40	2.70	2.50	2.30	2.20	2.10	1.90	1.80	1.70	1.50	1.40	1.30	1.20
	50	48√V	6.06	1.40	1.30	1.20	1.10	1.10	1.00	0.90	0.90	0.75	0.70	0.65	0.60
Lift Check Valve	600	40√V	5.06	16.2	15.0	13.08	13.2	12.6	11.4	10.8	10.2	9.0	8.4	7.8	7.2
	55	140√V	17.7	1.50	1.40	1.30	1.20	1.20	1.10	1.00	0.94	0.83	0.77	0.72	0.66
Tilting Disc Check Valve	5	80√V	10.13						0.76	0.72	0.68	0.60	0.56	0.39	0.24
	15	30√V	3.80						2.30	2.20	2.00	1.80	1.70	1.20	0.72
Foot Valve with Strainer Poppet Disc	420	15√V	1.90	11.3	10.5	9.70	9.30	8.80	8.00	7.60	7.10	6.30	5.90	5.50	5.0
Foot Valve with Strainer Hinged Disc	75	35√V	4.43	2.00	1.90	1.70	1.70	1.70	1.40	1.40	1.30	1.10	1.10	1.00	0.90

Fitting	Description	All Pipe Sizes
		K Value
Pipe Exit	Projecting Sharp-Edged Rounded	1.00
Pipe Entrance	Inward Projecting	0.78
Pipe Entrance Flush	Sharp-Edged	0.50
	r/d=0.02	0.28
	r/d=0.04	0.24
	r/d=0.06	0.15
	r/d=0.10	0.09
	r/d<0.14	0.04

The K values given below are for making estimates of friction loss in cases not covered in the previous tables.

Type of Fitting	K Value
Disk or Wobble Meter	3.4 - 10
Rotary Meter (Star or Cog-Wheel Piston)	10
Reciprocating Piston Meter	15
Turbine Wheel (Double-Flow) Meter	5 - 7.5
Bends w/Corrugated Inner Radius	1.3 - 1.6 times value for smooth bend
<b>Example:</b> Determine L (friction loss in pipe fittings in terms of equivalent length in feet of straight pipe). Assume a 6" angle valve for Schedule 40 pipe size. Select the appropriate K value for such and select D and f for Schedule 40 pipe from the table below where K is the pipe diameter in feet.	
Pipe Size	Pipe Size

Inches Sch. 40	D feet	f	Inches Sch. 40	D feet	f	Inches Sch. 40	D feet	f	Inches Sch. 40	D feet	f
½	0.0518	0.027	2½	0.2058	0.018	10	0.8350	0.014	24	1.8857	0.012
¾	0.0687	0.025	3	0.2557	0.018	12	0.9948	0.013	30	2.3333	0.011
1	0.0874	0.023	4	0.3355	0.017	14	1.0937	0.013	36	2.8333	0.011
1¼	0.1150	0.022	5	0.4206	0.016	16	1.250	0.013	42	3.3333	0.010
1½	0.1342	0.021	6	0.5054	0.015	18	1.4063	0.012	48	3.8333	0.010
2	0.1723	0.019	8	0.6651	0.014	20	1.5678	0.012			

Friction Loss of Water in Pipe Fittings in Terms of Equivalent Length - Feet of Straight Pipe																
Nominal pipe size	Actual inside diameter inches d	Friction factor f	Gate valve - full open	90° elbow	Long radius 90° or 45° std elbow	Std tee - thru flow	Std tee - branch flow	Close return bend	Swing check valve - full open	Angle valve - full open	Globe valve - full valve	Butter-fly valve	90° Welding elbow		Mitre bend	
													r/d = 1	r/d = 2	45°	90°
½	.622	.027	.41	1.55	.83	1.04	3.11	2.59	5.18	7.78	17.6					
¾	.824	.025	.55	2.06	1.10	1.37	4.12	3.43	6.86	10.3	23.3					
1	1.049	.023	.70	2.62	1.40	1.75	5.25	4.37	8.74	13.1	29.7					
1¼	1.380	.022	.92	3.45	1.84	2.30	6.90	5.75	11.5	17.3	39.1					
1½	1.610	.021	1.07	4.03	2.15	2.68	8.05	6.71	13.4	20.1	45.6					
2	2.067	.019	1.38	5.17	2.76	3.45	10.3	8.61	17.2	25.8	58.6	7.75	3.45	2.07	2.58	10.3
2½	2.469	.018	1.65	6.17	3.29	4.12	12.3	10.3	20.6	30.9	70.0	9.26	4.12	2.47	3.08	12.3
3	3.068	.018	2.04	7.67	4.09	5.11	15.3	12.8	25.5	38.4	86.9	11.5	5.11	3.07	3.84	15.3
4	4.026	.017	2.68	10.1	5.37	6.71	20.1	16.8	33.6	50.3	114	15.1	6.71	4.03	5.03	20.1
5	5.047	.016	3.36	12.6	6.73	8.41	25.2	21.0	42.1	63.1	143	18.9	8.41	5.05	6.31	25.2
6	6.065	.015	4.04	15.2	8.09	10.1	30.3	25.3	50.5	75.8	172	22.7	10.1	6.07	7.58	30.3
8	7.981	.014	5.32	20.0	10.6	13.3	39.9	33.3	33.3	99.8	226	29.9	13.3	7.98	9.98	39.9
10	10.02	.014	6.68	25.1	13.4	16.7	50.1	41.8	41.8	125	284	29.2	16.7	10.0	12.5	50.1
12	11.938	.013	7.96	29.8	15.9	19.9	59.7	49.7	49.7	149	338	34.8	19.9	11.9	14.9	59.7
14	13.124	.013	8.75	32.8	17.5	21.8	65.6	54.7	54.7	164	372	38.3	21.8	13.1	16.4	65.6
16	15.00	.013	10.0	37.5	20.0	25.0	75.0	62.5	62.5	188	425	31.3	25.0	15.0	18.8	75.0
18	16.876	.012	16.9	42.2	22.5	28.1	84.4	70.3	70.3	210	478	35.2	28.1	16.9	21.1	84.4
20	18.814	.012	12.5	47.0	25.1	31.4	94.1	78.4	78.4	235	533	39.2	31.4	18.8	23.5	94.1
24	22.628	0.12	15.1	56.6	30.2	37.7	113	94.3	94.3	283	641	47.1	37.7	22.6	28.3	113
30	28	.011	18.7	70	37.3	46.7	140	117					46.7	28	35	140
36	34	.011	22.7	85	45.3	56.7	170	142					56.7	34	43	170
42	40	.010	26.7	100	53.3	66.7	200	167					66.7	40	50	200
48	46	.010	30.7	115	61.3	76.7	230	192					76.7	46	58	230
L/D			8	30	16	20	60	50	½ to 6 = 100 24 to 48 =50	150	340		20	12	15	60

