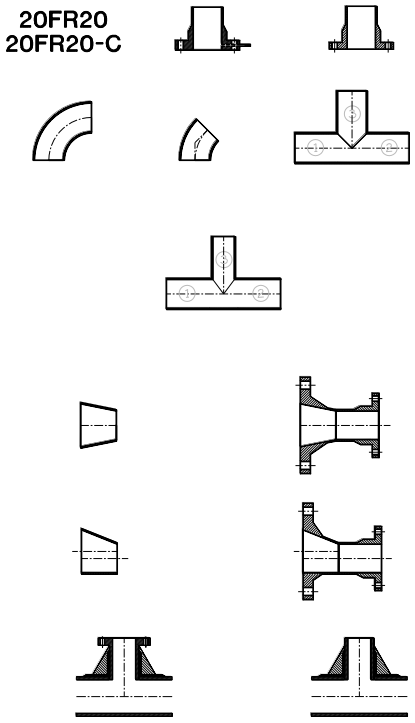
FIBERBOND®

ENGINEERED COMPOSITE PIPING SYSTEMS

SERIES 20FR20 FITTINGS GUIDE



FIBERBOND® SERIES

- **20FR20**
- **20FR20-C**

TIGER WRAP™

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April 2018 Edition

FIBERBOND® Fittings Guide - Series 20FR20 and 20FR20-C

PIPE SERIES:

The fittings contained in this book are available in the following series (unless otherwise noted):

20FR20	20.0bar (up to 12", 18.0bar up to 18") rated product for firewater, seawater, cooling water, and other high pressure lines, with fire endurance properties.
20FR20-C	Identical to 20FR20, except it has an electrically conductive exterior for use where grounding is required.

GASKETS:

1. In systems hydrotesting above 225psig (15.5bar), gaskets with better sealing properties, such as Garlock's "Stress Saver" gasket (www.garlock.com), CTG's "ET Energizer" gasket (www.ctgasket.com) or Asahi's "Low Torque" gasket (www.asahi-america.com), are recommended for sizes 2" (50NB) and larger.
2. O-ring gaskets may also be used, but they do require a special o-ring groove to be machined in one face (and only one face) of the mating pair of flanges. O-ring gaskets have no takeout. Shore "A" hardness values are typically between 55 and 75. A typical material is Buna-N (NBR). For higher temperatures and resistance to certain acids and solvents, Viton® is also available. Viton® is a fluoroelastomer manufactured by DuPont Dow.
3. In systems hydrotesting between 150psig (10.3bar) and 225psig (15.5bar), either full-face 1/8" thick flat rubber gaskets (neoprene, red rubber, etc.) or gaskets with better sealing properties may be used in sizes 2" (50NB) and larger.
4. In systems hydrotesting only up to 150psig (10.3bar), full-face 1/8" thick rubber gaskets are recommended. Shore "A" hardness values can range from 60 to 80, although values down to 50 may be suitable as well as higher values.
5. These gasket recommendations do not take into account the required corrosion resistance of the systems. Make sure that gasket materials are suitable for the intended services. CR (neoprene) is normally good for water and seawater and has excellent weathering resistance. SBR (red rubber) is normally good for water, seawater, alcohol, glycol, and weak acids. NBR (Buna-N) is normally good for water, seawater, dilute acids, and aliphatic hydrocarbons (propane, butane, petroleum oil, mineral oil, grease, diesel fuel). EPDM (ethylene-propylene-diene rubber) is a good choice for hot water service, many solvents and many acid services.

RULES FOR O-RING GASKETS:

1. Takeout of the gasket is essentially zero inches. The gasket is 3/16" (0.1875", 4.8mm) nominal diameter and the groove is 0.15" (3.8mm). With compression of the gasket, the takeout is zero.

2. A groove is only provided in one face of each mating pair of flanges. The #1 situation to avoid with the o-ring gasket is a grooved flange mated directly to another grooved flange. The only solution to this situation is 1) remove one of the grooved

flanges and replace with a flat-face flange, 2) fill one of the grooved flanges with a putty material to obtain a flat-face, or 3) insert a rubber gasket or harder material between the two grooved flanges along with an o-ring gasket in each groove to provide a suitable seal.

3. Other general rules that are usually followed with o-ring gaskets:

A. For FRP to FRP flange connection, the groove is placed in one of the FIBERBOND® flanges at the discretion of the fabricator. For convenience during installation, if the flange is in the vertical, the groove is normally placed in the lower flange.

B. For connections to alloy flanges, the groove is applied to the FIBERBOND® flange. There is only one exception to this rule and that is when the alloy flange is a drilled-and-tapped blind flange supplied by the fabricator. In this case, the groove is applied to the alloy blind flange.

C. For connections to full-face flanged valves, lug type valves, or wafer valves that do not have an integral seal, a groove is applied to the FIBERBOND® flange.

D. For connections to valves with integral seals (not seats), as is typical with many butterfly valves, no groove is applied to the FIBERBOND® flange as no gasket is used.

E. For connections to raised face flanges, an o-ring groove is not needed. A full-face 1/8" (3mm) thick rubber gasket, such as red rubber “SBR” can be used. The takeout for the gasket is 1/8" (3mm).

F. O-ring grooves are not applied to FIBERBOND® flanges smaller than 2" (50mm) diameter. If the connection is not to an alloy blind flange that can be “grooved” by the fabricator, then a full-face 1/8" (3mm) thick rubber gasket can be used.

G. For flange to blind flange connections, normally the groove is placed in the blind flange. Blind flanges are usually slightly less expensive to “groove” than flanges.

FLANGES:

1. All flanges are flat face and should be bolted to flat face flanges. FIBERBOND® flanges can be bolted to raised-face flanges, however, care should be taken when torqueing these flanges. Over-torqueing can cause cracking in the flange.
2. The flange thickness will differ from ANSI B16.5 150#.
3. The outside diameter and bolt pattern will match 150#. Other bolt patterns, such as 300# and BS4504 PN10 & PN16, can be provided. The flange will still be limited to its standard pressure and temperature rating.
4. Reducing flanges are also available.

NUTS, BOLTS, & WASHERS:

1. There are no special requirements for bolting materials except that ANSI B18.22.1 Type A Narrow "SAE" series washers must be used. ANSI B18.22.1 Type A Wide "USS" washers will not fit on FRP flanges.

LATERAL WELDS AND FITTINGS:

1. Lateral welds are currently only rated for design pressures up to 100psig (6.9bar) up to 16in. (400mm) diameter and 50psig (3.4bar) for larger sizes. If higher pressures are required, please consult with Specialty Plastics.

CERTIFICATIONS AND APPROVALS:

Series 20FR20	ABS 00 NO 32171-X, USCG 164.141/14/0 Sizes 2" - 18"
Series 20FR20-C	ABS 00 NO 32171-X, USCG 164.141/15/0 Sizes 2" - 18"

ANSI DIMENSION FITTINGS:

ANSI dimension flanged fittings are available upon request, but are rated only to 150psig (10.3bar). Please consult Specialty Plastics for information on these fittings.

VICTAULIC CONNECTIONS:

For most pipes up to 12in. nominal diameter, ends can be machined to fit a victaulic coupling. Please consult Specialty Plastics for information on these fittings.

VPDMS, PDS, and AutoCAD CATALOGS:

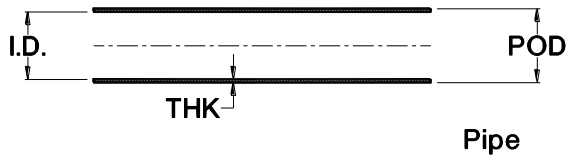
A catalog for Aveva Inc.'s 3D modeling software VPDMS is available by contacting Specialty Plastics (www.fiberbond.com). A 2-D catalog is also available for Autodesk's AutoCAD. A general catalog is also available for Intergraph's PDS, but there are some minor deviations in pipe O.D.s and flange neck lengths.

SPECIAL NOTES ON DRAIN SYSTEMS:

Slopes can be fabricated in FIBERBOND® systems at any angle. When shop prefabrication work is performed by Specialty Plastics, laterals can be fabricated at special angles, such as 45.9 degrees (for a 3/16" sloped header). This eliminates the need for any special dimensioning. The same is true for tees and reducing tees. In sloped systems, elbows are normally kept at their full sweep for 45 or 90 degrees and the pipe is mitered to maintain the slope in the header.

WALL THICKNESSES & OUTSIDE DIAMETERS:

All FIBERBOND® Fiberglass Piping Series are manufactured with a fixed inside diameter. As the pressure rating of the pipe series increases, the wall thickness and outer diameter also increase.



Pipe

Ratings, Wall Thicknesses, and Outside Diameters

Size	20FR20 and 20FR20-C									
	Rating		I.D.		THK		POD		Weight	
	(psig)	(bar)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(lb/ft)	(kg/m)
1"	290	20.0	1.00"	25.4	0.25"	6.4	1.50"	38.1	1.0	1.5
1.5"	290	20.0	1.50"	38.1	0.25"	6.4	2.00"	50.8	1.3	2.0
2"	290	20.0	2.00"	50.8	0.31"	7.9	2.62"	66.5	1.5	2.3
2.5"	290	20.0	2.50"	63.5	0.25"	6.4	3.00"	76.2	1.9	2.8
3"	290	20.0	3.00"	76.2	0.25"	6.4	3.50"	88.9	2.2	3.3
4"	290	20.0	4.00"	101.6	0.25"	6.4	4.50"	114.3	2.9	4.4
5"	290	20.0	5.00"	127.0	0.25"	6.4	5.50"	139.7	3.6	5.4
6"	290	20.0	6.00"	152.4	0.30"	7.6	6.60"	167.6	5.1	7.6
8"	290	20.0	8.00"	203.2	0.39"	9.9	8.78"	223.0	8.9	13.2
10"	290	20.0	10.00"	254.0	0.48"	12.2	10.96"	278.4	13.7	20.4
12"	290	20.0	12.00"	304.8	0.58"	14.7	13.16"	334.3	19.6	29.2
14"	261	18.0	14.25"	362.0	0.61"	15.5	15.47"	392.9	22.7	33.9
16"	261	18.0	16.25"	412.8	0.69"	17.5	17.63"	447.8	30.1	44.9
18"	261	18.0	18.25"	463.6	0.78"	19.8	19.81"	503.2	38.5	57.4
20"										
24"										
30"										
36"										
42"										
48"										
54"										
60"										

1. Sizes 2.5", 5", and 54" are non-standard and are not as readily available as the standard sizes.

CHANGES FROM THE PREVIOUS EDITION

April 2018: Clarified note on when it is acceptable to use 1” as the minimum pup length.

April 2016: Revised statement about <=2” gaskets at 435psig (30 bar) hydrotests in the Gaskets section to match the Gasket Selection document. Wall thickness and OD for the 2” size corrected to match our other documents.

January 2015: Combined flanges and blinds into one section. Moved bleed rings, vanstone flanges and Fig.19MH/MC blinds to the Special Fittings Guide. Removed Fig.80F3.

January 2013: Added note on flange neck lengths. Added note on the pigmented exterior of fittings and flanges (in the Elbows section). Updated FOD for the 2" size.

July 2012: Corrected the Fig.1 "Y" pup piece dimensions in sizes 5" and larger.

January 2012: Updated the drawing for Fig.94 and changed the layout of information; added note on gaskets.

March 2010: Clarified that the Fig.46 and Fig.48 olets consist of the branch fitting only. In April, the Fig.43 Reducing Tee chart was reformattted, but no changes were made.

February 2010: Corrected the LTHK2 and L2 lengths for the Fig.10-O orifice flanges.

April 2009: Changed wording on gasket recommendations.

August 2008: Changed wording on material choices for the Fig.47JF MNPT olet and Fig.94 threaded blind flange. Changed “metallic” to “alloy” throughout the document.

May 2008: Corrected POD, PROD, PBOD, FOD, and FROD dimensions for all items in sizes 16” thru 18”. Corrected POD and PBOD dimensions for Fig.48 and 80 in all sizes.

June 2005: Added weights and SI units to all the tables. Corrected the E+L dimensions for several reducers in sizes 6" and larger (6"x4", 8"x6", 8"x5", 8"x4", etc.). Updated letter designations in the figures so that all are unique (e.g. changed "A" to "G" for Fig.40, Fig.43 tees and changed "A" to "H" for Fig.48 olets). Changed hemicap to cap. Added more reducing tee sizes.

February 2005: Added reducing tee sizes. Split guide into two: one for 20FR16 and one for 20FR20. Added 2" and 3" Fig.96 hemicaps. Added information on bleed rings and other blind flanges. Added table on elbow thicknesses. Added Fig.1 "Pipe Pup Lengths". Added laterals and reducing laterals.

February 2004: Updated gasket recommendations and information on o-ring gaskets. Added information on VPDMS catalogs.

August 2003: Added section on Blind Flanges.

April 2003: Information regarding threaded connections was clarified to reflect the Figure 94 flanged saddle with drilled-and-tapped alloy blind flange as the only option. Figure 47JF and 97 NPT saddles are currently not available in Series 20FR16 nor 20FR20. The LS dimension for the Figure 46 Flanged Saddle was increased for sizes 4" and larger. Changed dummy leg size for Figure 90 for elbow sizes 6", 14", 16", and 18". Revised neck lengths for the Figure 10, 11, and 15 flanges for sizes 12" and larger in Series 20FR16 and sizes 4" and larger for Series 20FR20. Revised neck lengths for the Figure 10-O flange for sizes 10" and larger.

March 2002: In the March 2002 edition, the "C" and "C+L" dimensions for the 3" and 6" Figure 30 elbows were corrected. The "C" dimension was changed from 1 5/8" to 1 7/8" for 3" diameter and from 3 3/8" to 3 3/4" for 6" diameter.

January 2002: Only minor text changes were made in the January 2002 edition.

June 2001: The June 2001 Edition is the first release of our Fittings Guide for our 16barg and 20barg products.

FLANGES & BLINDS

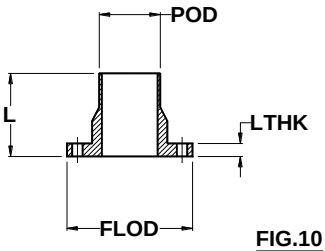


FIG.10

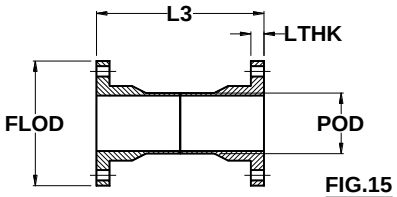


FIG.15

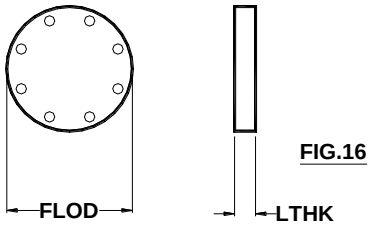


FIG.16

Size	Fig.10 and Fig.11				Fig.15					
	L		Max.L		L3		Min. L3			
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)		
1"	6"	152.4	6"	152.4	12"	304.8	6"	152.4		
1.5"	6"	152.4	6"	152.4	12"	304.8	6"	152.4		
2"	6"	152.4	12"	304.8	12"	304.8	6"	152.4		
2.5"	6"	152.4	12"	304.8	12"	304.8	6"	152.4		
3"	6"	152.4	12"	304.8	12"	304.8	8"	203.2		
4"	7"	177.8	12"	304.8	14"	355.6	10"	254.0		
5"	9"	228.6	12"	304.8	18"	457.2	10"	254.0		
6"	9"	228.6	12"	304.8	18"	457.2	12"	304.8		
8"	10"	254.0	12"	304.8	20"	508.0	14"	355.6		
10"	14"	355.6	18"	457.2	28"	711.2	16"	406.4		
12"	16"	406.4	18"	457.2	32"	812.8	18"	457.2		
14"	16"	406.4	18"	457.2	32"	812.8	18"	457.2		
16"	19"	482.6	19"	482.6	38"	965.2	20"	508.0		
18"	20"	508.0	20"	508.0	40"	1016.0	20"	508.0		
20"										
24"										
30"										
36"										
42"										
48"										
54"										
60"										

FLANGES & BLINDS (cont'd)

1. Flanges that are shipped loose for site installation are normally manufactured with a neck length up to 3" longer than the "L" and "L2" values specified in this table.

2. For Fig.15, the minimum L length for the Fig.15 flange requires special fabrication techniques and normally requires additional time for delivery.

Flange Thicknesses and Flange O.D.s

Size	LTHK		FLOD					
	Fig.10, 15, 16							
	(in.)	(mm)	(in.)	(mm)				
1"	0.50"	12.7	4.25"	108.0				
1.5"	0.58"	14.7	5.00"	127.0				
2"	0.71"	18.0	6.00"	152.4				
2.5"	0.80"	20.3	7.00"	177.8				
3"	0.86"	21.8	7.50"	190.5				
4"	1.13"	28.7	9.00"	228.6				
5"	1.23"	31.2	10.00"	254.0				
6"	1.32"	33.5	11.00"	279.4				
8"	1.50"	38.1	13.50"	342.9				
10"	1.87"	47.5	16.00"	406.4				
12"	2.16"	54.9	19.00"	482.6				
14"	2.13"	54.1	21.00"	533.4				
16"	2.46"	62.5	23.50"	596.9				
18"	2.44"	62.0	25.00"	635.0				
20"								
24"								
30"								
36"								
42"								
48"								
54"								
60"								

FLANGES & BLINDS (cont'd)

Flange Weights

Size	Fig.10		Fig.15		Fig.16			
	(lb)	(kg)	(lb)	(kg)	(lb)	(kg)		
1"	1.4	0.6	2.5	1.1	0.9	0.4		
1.5"	1.8	0.8	3.2	1.5	1.2	0.5		
2"	2.4	1.1	3.3	1.5	1.6	0.7		
2.5"	3.1	1.4	4.1	1.9	2.2	1.0		
3"	3.6	1.6	4.4	2.0	2.5	1.1		
4"	5.6	2.5	5.8	2.6	4.2	1.9		
5"	6.8	3.1	6.8	3.1	5.0	2.3		
6"	10.4	4.7	10.4	4.7	6.9	3.2		
8"	16.5	7.5	16.5	7.5	10.5	4.8		
10"	28.5	12.9	28.5	12.9	17.1	7.8		
12"	41.6	18.9	41.6	18.9	25.3	11.5		
14"	52.9	24.0	52.9	24.0	30.1	13.7		
16"	72.1	32.7	72.1	32.7	42.0	19.1		
18"	87.8	39.9	87.8	39.9	49.2	22.4		
20"								
24"								
30"								
36"								
42"								
48"								
54"								
60"								

FLANGES & BLINDS (cont'd)

Recommended Stud Bolt Length (LSSB)

Size	No./Size	Fig.10, 15							
		F/F		F/S					
1"	(4) 1/2"	2.75"	70	2.75"	70				
1.5"	(4) 1/2"	3.00"	76	3.00"	76				
2"	(4) 5/8"	3.50"	89	3.50"	89				
2.5"	(4) 5/8"	3.50"	89	3.75"	95				
3"	(4) 5/8"	3.75"	95	3.75"	95				
4"	(8) 5/8"	4.25"	108	4.00"	102				
5"	(8) 3/4"	4.75"	121	4.50"	114				
6"	(8) 3/4"	5.00"	127	4.50"	114				
8"	(8) 3/4"	5.25"	133	4.75"	121				
10"	(12) 7/8"	6.25"	159	5.50"	140				
12"	(12) 7/8"	6.75"	171	6.00"	152				
14"	(12) 1"	7.00"	178	6.25"	159				
16"	(16) 1"	7.75"	197	6.75"	171				
18"	(16) 1 1/8"	7.75"	197	7.00"	178				
20"	(20) 1 1/8"								
24"	(20) 1 1/4"								
30"	(28) 1 1/4"								
36"	(32) 1 1/2"								
42"	(36) 1 1/2"								
48"	(44) 1 1/2"								
54"	(44) 1 3/4"								
60"	(52) 1 3/4"								

1. The F/F column is for FRP to FRP flange connections. The F/S column is for FRP to 150# alloy flange connections.

2. For FRP to FRP flange connections, LSSB = 2 * (Flange Thickness + PTOL + Nut Thickness) + 1/8" + (2 * 1/8").

3. For FRP to 150# alloy flange connections, LSSB = Flange Thickness + PTOL + 150# Flange Thickness + PTOL + (2 * Nut Thickness) + 1/8" + (2 * 1/8").

4. PTOL = 1/8" up to 18" nominal size and 3/16" above 18" nominal size. 1/8" accounts for the gasket. (2 * 1/8") accounts for two washers.

ELBOWS

FIG.20

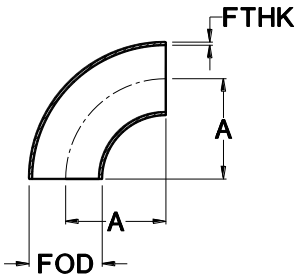
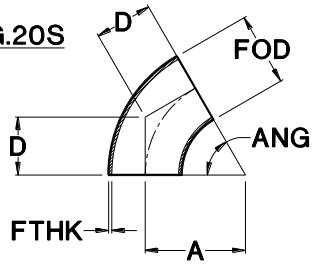


FIG.20S



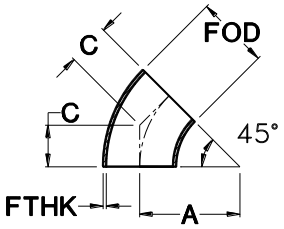


FIG.30

Size	Fig.20,20S,30		Fig.20S		Fig.30		Fig.20, 20S, 30			
	A		D	ANG	C		FTHK		FOD	
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)
1"	1.50"	38	ANG can be from 20 to 89degrees.				0.25"	6	1.50"	38
1.5"	2.25"	57					0.25"	6	2.00"	51
2"	3.00"	76			1.25"	32	0.31"	8	2.62"	67
2.5"	3.75"	95	D = 1.5 * Size * TAN (ANG/2).		2.56"	65	0.25"	6	3.00"	76
3"	4.50"	114			1.88"	48	0.25"	6	3.50"	89
4"	6.00"	152			2.50"	64	0.25"	6	4.50"	114
5"	7.50"	191	Smaller angles can be mitered.		3.13"	79	0.29"	7	5.58"	142
6"	9.00"	229			3.75"	95	0.33"	8	6.66"	169
8"	12.00"	305			5.00"	127	0.43"	11	8.86"	225
10"	15.00"	381			6.25"	159	0.53"	13	11.06"	281
12"	18.00"	457			7.50"	191	0.63"	16	13.26"	337
14"	21.00"	533			8.75"	222	0.67"	17	15.59"	396
16"	24.00"	610			10.00"	254	0.76"	19	17.77"	451
18"	27.00"	686			11.25"	286	0.85"	22	19.95"	507
20"										
24"										
30"										
36"										
42"										
48"										
54"										
60"										

ELBOWS (cont'd)

1. 42" and larger elbows are mitered, all other sizes are full sweep.

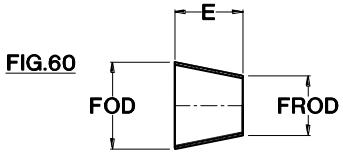
Elbow Ratings and Weights

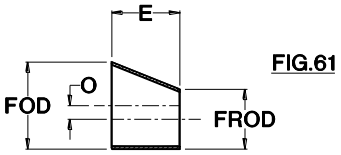
Size	Rating		Fig.20 Weight		Fig.30 Weight	
	(psig)	(bar)	(lb)	(kg)	(lb)	(kg)
1"	290	20.0	0.2	0.1		
1.5"	290	20.0	0.4	0.2		
2"	290	20.0	0.7	0.3	0.3	0.2
2.5"	290	20.0	0.9	0.4	0.4	0.2
3"	290	20.0	1.5	0.7	0.8	0.3
4"	290	20.0	2.6	1.2	1.3	0.6
5"	290	20.0	3.2	1.5	1.6	0.7
6"	290	20.0	7.4	3.4	3.7	1.7
8"	290	20.0	15.9	7.2	8.0	3.6
10"	290	20.0	31.3	14.2	15.7	7.1
12"	290	20.0	51.3	23.3	25.6	11.6
14"	261	18.0	73.6	33.4	36.8	16.7
16"	261	18.0	107.0	48.6	53.5	24.3
18"	261	18.0	149.3	67.8	74.6	33.9
20"						
24"						
30"						
36"						
42"						
48"						
54"						
60"						

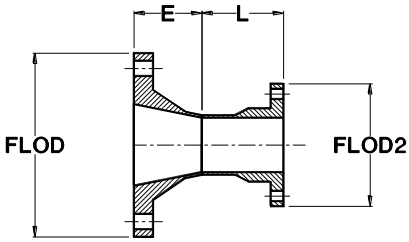
1. These ratings are also valid for flanges (Fig.10, Fig.10O, Fig.11, & Fig.15), blind flanges (Fig.16, Fig.19MC, Fig.19MH), bleed rings (Fig.17), tees (Fig.40, Fig.40PPF, & Fig.40F3), saddles (Fig.46 & Fig.48), reducers (Fig.60 & Fig.61), caps (Fig.96), MNPT saddles (Fig.47JF), and "dummy legs" (Fig.90 & Fig.91). Laterals (Fig.80 & Fig.80F3) and reducing laterals (Fig.88) are only rated to 100psig up to 16" and 50psig up to 60".

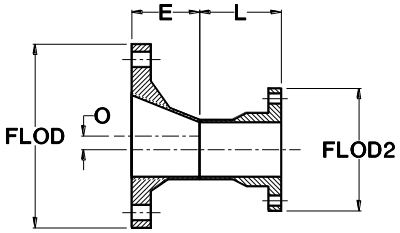
2. Fittings and flanges that are shipped loose for site installation are typically shipped without any pigmented gelcoat. This is due to the fact that the gelcoat would have to be removed during the bonding process.

REDUCERS









Size	E		E+L		FOD		FROD		O	
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)
1.5"x1"	1.25"	32	7.25"	184	2.00"	51	1.50"	38	0.25"	6
2"x1.5"	1.25"	32	7.25"	184	2.62"	67	2.00"	51	0.31"	8
2"x1"	2.50"	64	8.50"	216	2.62"	67	1.50"	38	0.56"	14
2.5"x2"	1.25"	32	7.25"	184	3.00"	76	2.62"	67	0.19"	5
3"x2.5"	1.25"	32	7.25"	184	3.50"	89	3.00"	76	0.25"	6
3"x2"	2.50"	64	8.50"	216	3.50"	89	2.62"	67	0.44"	11
3"x1.5"	3.75"	95	9.75"	248	3.50"	89	2.00"	51	0.75"	19
3"x1"	5"	127	11"	279	3.50"	89	1.50"	38	1.00"	25
4"x3"	2.50"	64	8.50"	216	4.50"	114	3.50"	89	0.50"	13
4"x2.5"	3.75"	95	9.75"	248	4.50"	114	3.00"	76	0.75"	19
4"x2"	5"	127	11"	279	4.50"	114	2.62"	67	0.94"	24
4"x1.5"	6.25"	159	12.25"	311	4.50"	114	2.00"	51	1.25"	32
4"x1"	7.50"	191	13.50"	343	4.50"	114	1.50"	38	1.50"	38
5"x4"	2.50"	64	9.50"	241	5.58"	142	4.50"	114	0.54"	14
6"x5"	2.50"	64	11.50"	292	6.66"	169	5.58"	142	0.54"	14
6"x4"	5"	127	12"	305	6.66"	169	4.50"	114	1.08"	27
6"x3"	7.50"	191	13.50"	343	6.66"	169	3.50"	89	1.58"	40
6"x2.5"	8.75"	222	14.75"	375	6.66"	169	3.00"	76	1.83"	46
6"x2"	10"	254	16"	406	6.66"	169	2.62"	67	2.02"	51
8"x6"	5"	127	14"	356	8.86"	225	6.66"	169	1.10"	28
8"x5"	7.50"	191	16.50"	419	8.86"	225	5.58"	142	1.64"	42
8"x4"	10"	254	17"	432	8.86"	225	4.50"	114	2.18"	55
8"x3"	12.50"	318	18.50"	470	8.86"	225	3.50"	89	2.68"	68

REDUCERS (cont'd)

1. Offset dimension for eccentric reducers is 0.5” x (FOD - FROD).
2. Reducers may be available in other sizes than those shown above. Min. E+L dimensions are also available.
3. The FLOD and FLOD2 dimensions match ASME B16.5 150# and B16.1 125# O.D.s.

Reducer Dimensions (cont'd)

Size	E		E+L		FOD		FROD		O	
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)
10"x8"	5"	127	15"	381	11.06"	281	8.86"	225	1.10"	28
10"x6"	10"	254	19"	483	11.06"	281	6.66"	169	2.20"	56
10"x5"	12.50"	318	21.50"	546	11.06"	281	5.58"	142	2.74"	70
10"x4"	15"	381	22"	559	11.06"	281	4.50"	114	3.28"	83
12"x10"	5"	127	19"	483	13.26"	337	11.06"	281	1.10"	28
12"x8"	10"	254	20"	508	13.26"	337	8.86"	225	2.20"	56
12"x6"	15"	381	24"	610	13.26"	337	6.66"	169	3.30"	84
14"x12"	5"	127	21"	533	15.59"	396	13.26"	337	1.17"	30
14"x10"	10"	254	24"	610	15.59"	396	11.06"	281	2.27"	58
14"x8"	15"	381	25"	635	15.59"	396	8.86"	225	3.37"	85
16"x14"	5"	127	21"	533	17.77"	451	15.59"	396	1.09"	28
16"x12"	10"	254	26"	660	17.77"	451	13.26"	337	2.26"	57
16"x10"	15"	381	29"	737	17.77"	451	11.06"	281	3.36"	85
18"x16"	5"	127	24"	610	19.95"	507	17.77"	451	1.09"	28
18"x14"	10"	254	6"	152	19.95"	507	15.59"	396	2.18"	55
18"x12"	15"	381	31"	787	19.95"	507	13.26"	337	3.35"	85
20"x18"										
20"x16"										
20"x14"										
24"x20"										
24"x18"										
30"x24"										
36"x30"										
42"x36"										
48"x42"										
54"x48"										
60"x54"										

REDUCERS (cont'd)

Reducer Weights

Size	Fig.60, 61		Fig.60FF, 61FF	
	(lb)	(kg)	(lb)	(kg)
1.5"x1"	0.1	0.0	2.7	1.2
2"x1.5"	0.3	0.1	3.7	1.7
2"x1"	0.3	0.1	3.3	1.5
2.5"x2"	0.2	0.1	4.7	2.1
3"x2.5"	0.4	0.2	6.0	2.7
3"x2"	0.4	0.2	5.3	2.4
3"x1.5"	0.8	0.4	5.1	2.3
3"x1"	0.8	0.4	4.7	2.1
4"x3"	0.5	0.2	8.3	3.8
4"x2.5"	1.0	0.5	8.3	3.8
4"x2"	1.0	0.5	7.6	3.4
4"x1.5"	1.6	0.7	7.5	3.4
4"x1"	1.6	0.7	7.1	3.2
5"x4"	0.6	0.3	11.2	5.1
6"x5"	1.0	0.4	14.7	6.7
6"x4"	2.0	0.9	14.5	6.6
6"x3"	3.0	1.3	13.5	6.1
6"x2.5"	3.9	1.8	14.0	6.4
6"x2"	3.9	1.8	13.3	6.0
8"x6"	3.2	1.4	24.0	10.9
8"x5"	4.8	2.2	22.0	10.0
8"x4"	6.3	2.9	22.4	10.2
8"x3"	7.9	3.6	22.0	10.0
10"x8"	5.0	2.3	38.6	17.5
10"x6"	10.0	4.5	37.5	17.0
10"x5"	12.5	5.7	36.3	16.5
10"x4"	14.9	6.8	37.7	17.1

Size	Fig.60, 61		Fig.60FF, 61FF	
	(lb)	(kg)	(lb)	(kg)
12"x10"	6.8	3.1	60.6	27.5
12"x8"	13.6	6.2	55.4	25.1
12"x6"	20.4	9.3	56.1	25.5
14"x12"	8.4	3.8	80.1	36.4
14"x10"	16.7	7.6	75.4	34.2
14"x8"	25.1	11.4	71.7	32.5
16"x14"	10.6	4.8	105.5	47.9
16"x12"	21.3	9.7	104.9	47.6
16"x10"	31.9	14.5	102.4	46.5
18"x16"	13.2	6.0	134.5	61.1
18"x14"	26.4	12.0	128.5	58.3
18"x12"	39.6	18.0	130.4	59.2
20"x18"				
20"x16"				
20"x14"				
24"x20"				
24"x18"				
30"x24"				
36"x30"				
42"x36"				
48"x42"				
54"x48"				
60"x54"				

EQUAL SIZE & REDUCING TEES

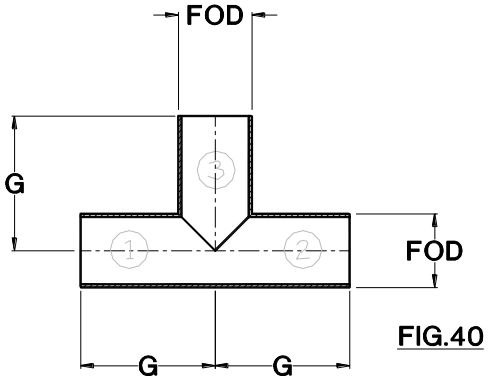


FIG.40

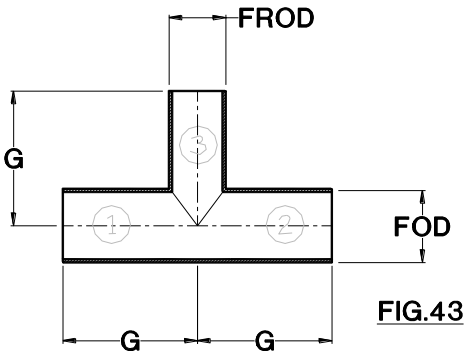


FIG.43

Size	Fig.40					
	G		FOD		Weight	
	(in.)	(mm)	(lb)	(kg)	(lb)	(kg)
1"	5"	127	1.50"	38	1.8	0.8
1.5"	5.5"	140	2.00"	51	2.7	1.2
2"	6"	152	2.62"	67	2.0	0.9
2.5"	6.5"	165	3.00"	76	2.4	1.1
3"	7"	178	3.50"	89	3.4	1.5
4"	8"	203	4.50"	114	5.0	2.3
5"	9"	229	5.58"	142	6.2	2.8
6"	10"	254	6.66"	169	11.8	5.4
8"	12"	305	8.86"	225	22.8	10.4
10"	14"	356	11.06"	281	41.9	19.0
12"	16"	406	13.26"	337	65.3	29.6
14"	18"	457	15.59"	396	90.3	41.0
16"	20"	508	17.77"	451	127.8	58.0
18"	21"	533	19.95"	507	348.7	158.3
20"						
24"						
30"						
36"						
42"						
48"						
54"						
60"						

EQUAL SIZE & REDUCING TEES (cont'd)

Size	Fig.43							
	G		FOD		FROD		Weight	
	(in.)	(mm)	(lb)	(kg)	(lb)	(kg)	(lb)	(kg)
8"x6"	12"	305	8.86"	225	6.66"	169	20.4	9.3
10"x8"	14"	356	11.06"	281	8.86"	225	37.4	17.0
10"x6"	14"	356	11.06"	281	6.66"	169	34.0	15.4
12"x10"	16"	406	13.26"	337	11.06"	281	60.4	27.4
12"x8"	16"	406	13.26"	337	8.86"	225	54.5	24.7
14"x12"	18"	457	15.59"	396	13.26"	337	85.9	39.0
14"x10"	18"	457	15.59"	396	11.06"	281	79.3	36.0
16"x14"	20"	508	17.77"	451	15.59"	396	120.1	54.5
16"x12"	20"	508	17.77"	451	13.26"	337	113.8	51.7
16"x10"	20"	508	17.77"	451	11.06"	281	106.5	48.3
18"x16"	21"	533	19.95"	507	17.77"	451	318.0	144.4
18"x14"	21"	533	19.95"	507	15.59"	396	290.1	131.7
18"x12"	21"	533	19.95"	507	13.26"	337	277.4	125.9

OLETS, PLAIN AND FLANGED

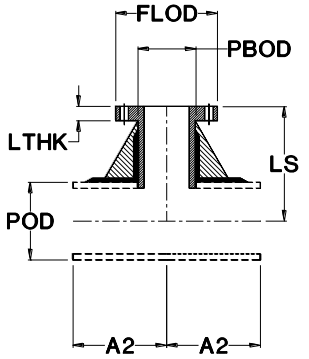


FIG.46

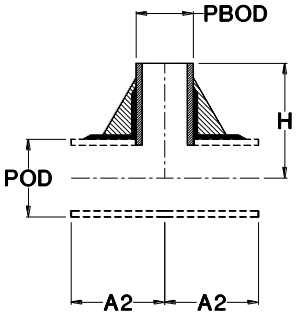


FIG.48

A2							
6"	7"	8"	10"	12"	14"	16"	18"

Branch Diameter							
1",1.5",2"	2.5", 3"	4"	5", 6"	8"	10"	12"	14"

H	Header Diameter	LS							
6"	1"								
6"	1.5"	7"							
6"	2"	7"							
6"	2.5"	7.5"							
7"	3"	7.5"	7.5"						
8"	4"	8"	8"						
10"	5"	9"	9"	10"					
10"	6"	9"	9"	10"	13"				
12"	8"	10"	10"	11"	14"				
14"	10"	11"	11"	12"	15"	18"			
16"	12"	12"	12"	13"	16"	19"			
18"	14"	13"	13"	14"	17"	20"			
20"	16"	14"	14"	15"	18"	21"			
21"	18"	15"	15"	16"	19"	22"			
22"	20"								
24"	24"								
30"	30"								
33"	36"								
36"	42"								
45"	48"								
54"	54"								
54"	60"								

1. The 'H' dimension is based on header size. The 'A2' dimension is based on branch size. The 'LS' dimension is based on both header and branch size; e.g. 3” on 6” Fig. 46 has LS = 9”, A2 = 7”
2. An olet fitting includes only the branch components. Unless purchased as part of a pre-fabricated (pre-assembled) system, it does require some assembly and bonding work.

OLETS, PLAIN AND FLANGED (cont'd)

Flanged End Olet Dimensions

Size	LS		A2		LTHK		FLOD		Weight	
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(lb)	(kg)
1.5"x1"	7.00"	178	6.00"	152	0.50"	13	4.25"	108	2.0	0.9
2"x1.5"	7.00"	178	6.00"	152	0.58"	15	5.00"	127	2.7	1.2
2"x1"	7.00"	178	6.00"	152	0.50"	13	4.25"	108	2.0	0.9
2.5"x2"	7.50"	191	6.00"	152	0.71"	18	6.00"	152	3.5	1.6
3"x2.5"	7.50"	191	7.00"	178	0.80"	20	7.00"	178	4.5	2.0
3"x2"	7.50"	191	6.00"	152	0.71"	18	6.00"	152	3.5	1.6
3"x1.5"	7.50"	191	6.00"	152	0.58"	15	5.00"	127	2.7	1.2
3"x1"	7.50"	191	6.00"	152	0.50"	13	4.25"	108	2.0	0.9
4"x3"	8.00"	203	7.00"	178	0.86"	22	7.50"	191	5.4	2.5
4"x2.5"	8.00"	203	7.00"	178	0.80"	20	7.00"	178	4.5	2.1
4"x2"	8.00"	203	6.00"	152	0.71"	18	6.00"	152	3.5	1.6
4"x1.5"	8.00"	203	6.00"	152	0.58"	15	5.00"	127	2.7	1.2
4"x1"	8.00"	203	6.00"	152	0.50"	13	4.25"	108	2.0	0.9
5"x4"	10.00"	254	8.00"	203	1.13"	29	9.00"	229	9.5	4.3
6"x5"	13.00"	330	10.00"	254	1.23"	31	10.00"	254	11.6	5.2
6"x4"	10.00"	254	8.00"	203	1.13"	29	9.00"	229	9.5	4.3
6"x3"	9.00"	229	7.00"	178	0.86"	22	7.50"	191	5.4	2.5
6"x2.5"	9.00"	229	7.00"	178	0.80"	20	7.00"	178	4.5	2.1
6"x2"	9.00"	229	6.00"	152	0.71"	18	6.00"	152	3.5	1.6
6"x1.5"	9.00"	229	6.00"	152	0.58"	15	5.00"	127	2.7	1.2
6"x1"	9.00"	229	6.00"	152	0.50"	13	4.25"	108	2.0	0.9
8"x6"	14.00"	356	10.00"	254	1.32"	34	11.00"	279	22.2	10.1
8"x5"	14.00"	356	10.00"	254	1.23"	31	10.00"	254	11.6	5.2
8"x4"	11.00"	279	8.00"	203	1.13"	29	9.00"	229	9.5	4.3
8"x3"	10.00"	254	7.00"	178	0.86"	22	7.50"	191	5.4	2.5
8"x2.5"	10.00"	254	7.00"	178	0.80"	20	7.00"	178	4.5	2.1
8"x2"	10.00"	254	6.00"	152	0.71"	18	6.00"	152	3.5	1.6
8"x1.5"	10.00"	254	6.00"	152	0.58"	15	5.00"	127	2.7	1.2
8"x1"	10.00"	254	6.00"	152	0.50"	13	4.25"	108	2.0	0.9
10"x8"	18.00"	457	12.00"	305	1.50"	38	13.50"	343	43.0	19.5
10"x6"	15.00"	381	10.00"	254	1.32"	34	11.00"	279	22.2	10.1
10"x5"	15.00"	381	10.00"	254	1.23"	31	10.00"	254	11.6	5.2
10"x4"	12.00"	305	8.00"	203	1.13"	29	9.00"	229	9.5	4.3
10"x3"	11.00"	279	7.00"	178	0.86"	22	7.50"	191	5.4	2.5
10"x2.5"	11.00"	279	7.00"	178	0.80"	20	7.00"	178	4.5	2.1
10"x2"	11.00"	279	6.00"	152	0.71"	18	6.00"	152	3.5	1.6
10"x1.5"	11.00"	279	6.00"	152	0.58"	15	5.00"	127	2.7	1.2
10"x1"	11.00"	279	6.00"	152	0.50"	13	4.25"	108	2.0	0.9

OLETS, PLAIN AND FLANGED (cont'd)

Flanged End Olet Dimensions (cont'd)

Size	LS		A2		LTHK		FLOD		Weight	
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(lb)	(kg)
12"x10"										
12"x8"	19.00"	483	12.00"	305	1.50"	38	13.50"	343	43.0	19.5
12"x6"	16.00"	406	10.00"	254	1.32"	34	11.00"	279	22.2	10.1
12"x5"	16.00"	406	10.00"	254	1.23"	31	10.00"	254	11.6	5.2
12"x4"	13.00"	330	8.00"	203	1.13"	29	9.00"	229	9.5	4.3
12"x3"	12.00"	305	7.00"	178	0.86"	22	7.50"	191	5.4	2.5
12"x2.5"	12.00"	305	7.00"	178	0.80"	20	7.00"	178	4.5	2.1
12"x2"	12.00"	305	6.00"	152	0.71"	18	6.00"	152	3.5	1.6
12"x1.5"	12.00"	305	6.00"	152	0.58"	15	5.00"	127	2.7	1.2
12"x1"	12.00"	305	6.00"	152	0.50"	13	4.25"	108	2.0	0.9
14"x12"										
14"x10"										
14"x8"	20.00"	508	12.00"	305	1.50"	38	13.50"	343	43.0	19.5
14"x6"	17.00"	432	10.00"	254	1.32"	34	11.00"	279	22.2	10.1
14"x5"	17.00"	432	10.00"	254	1.23"	31	10.00"	254	11.6	5.2
14"x4"	14.00"	356	8.00"	203	1.13"	29	9.00"	229	9.5	4.3
14"x3"	13.00"	330	7.00"	178	0.86"	22	7.50"	191	5.4	2.5
14"x2.5"	13.00"	330	7.00"	178	0.80"	20	7.00"	178	4.5	2.1
14"x2"	13.00"	330	6.00"	152	0.71"	18	6.00"	152	3.5	1.6
14"x1.5"	13.00"	330	6.00"	152	0.58"	15	5.00"	127	2.7	1.2
14"x1"	13.00"	330	6.00"	152	0.50"	13	4.25"	108	2.0	0.9
16"x14"										
16"x12"										
16"x10"										
16"x8"	21.00"	533	12.00"	305	1.50"	38	13.50"	343	43.0	19.5
16"x6"	18.00"	457	10.00"	254	1.32"	34	11.00"	279	22.2	10.1
16"x5"	18.00"	457	10.00"	254	1.23"	31	10.00"	254	11.6	5.2
16"x4"	15.00"	381	8.00"	203	1.13"	29	9.00"	229	9.5	4.3
16"x3"	14.00"	356	7.00"	178	0.86"	22	7.50"	191	5.4	2.5
16"x2.5"	14.00"	356	7.00"	178	0.80"	20	7.00"	178	4.5	2.1
16"x2"	14.00"	356	6.00"	152	0.71"	18	6.00"	152	3.5	1.6
16"x1.5"	14.00"	356	6.00"	152	0.58"	15	5.00"	127	2.7	1.2
16"x1"	14.00"	356	6.00"	152	0.50"	13	4.25"	108	2.0	0.9
18"x16"										
18"x14"										
18"x12"										

OLETS, PLAIN AND FLANGED (cont'd)

Flanged End Olet Dimensions (cont'd)

Size	LS		A2		LTHK		FLOD		Weight	
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(lb)	(kg)
18"x10"										
18"x8"	22.00"	559	12.00"	305	1.50"	38	13.50"	343	43.0	19.5
18"x6"	19.00"	483	10.00"	254	1.32"	34	11.00"	279	22.2	10.1
18"x5"	19.00"	483	10.00"	254	1.23"	31	10.00"	254	11.6	5.2
18"x4"	16.00"	406	8.00"	203	1.13"	29	9.00"	229	9.5	4.3
18"x3"	15.00"	381	7.00"	178	0.86"	22	7.50"	191	5.4	2.5
18"x2.5"	15.00"	381	7.00"	178	0.80"	20	7.00"	178	4.5	2.1
18"x2"	15.00"	381	6.00"	152	0.75"	19	6.00"	152	3.5	1.6
18"x1.5"	15.00"	381	6.00"	152	0.58"	15	5.00"	127	2.7	1.2
18"x1"	15.00"	381	6.00"	152	0.50"	13	4.25"	108	2.0	0.9
20"x18"										
20"x16"										
20"x14"										
20"x12"										
20"x10"										
20"x8"										
20"x6"										
20"x5"										
20"x4"										
20"x3"										
20"x2.5"										
20"x2"										
20"x1.5"										
20"x1"										
24"x20"										
24"x18"										
24"x16"										
24"x14"										
24"x12"										
24"x10"										
24"x8"										
24"x6"										
24"x5"										
24"x4"										
24"x3"										
24"x2.5"										
24"x2"										
24"x1.5"										
24"x1"										

OLETS, PLAIN AND FLANGED (cont'd)

Plain End Olet Dimensions

Size	H		A2		POD		PBOD		Weight	
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(lb)	(kg)
1.5"x1"	6.00"	152	6.00"	152	2.00"	51	1.50"	38	0.9	0.4
2"x1.5"	6.00"	152	6.00"	152	2.62"	67	2.00"	51	1.3	0.6
2"x1"	6.00"	152	6.00"	152	2.62"	67	1.50"	38	0.9	0.4
2.5"x2"	7.00"	178	6.00"	152	3.00"	76	2.50"	64	1.6	0.7
3"x2.5"	7.00"	178	7.00"	178	3.50"	89	3.00"	76	2.0	0.9
3"x2"	7.00"	178	6.00"	152	3.50"	89	2.62"	67	1.6	0.7
3"x1.5"	7.00"	178	6.00"	152	3.50"	89	2.00"	51	1.3	0.6
3"x1"	7.00"	178	6.00"	152	3.50"	89	1.50"	38	0.9	0.4
4"x3"	8.00"	203	7.00"	178	4.50"	114	3.50"	89	2.4	1.1
4"x2.5"	8.00"	203	7.00"	178	4.50"	114	3.00"	76	2.0	0.9
4"x2"	8.00"	203	6.00"	152	4.50"	114	2.62"	67	1.6	0.7
4"x1.5"	8.00"	203	6.00"	152	4.50"	114	2.00"	51	1.3	0.6
4"x1"	8.00"	203	6.00"	152	4.50"	114	1.50"	38	0.9	0.4
5"x4"	10.00"	254	8.00"	203	5.50"	140	4.50"	114	4.2	1.9
6"x5"	10.00"	254	10.00"	254	6.60"	168	5.50"	140	5.2	2.3
6"x4"	10.00"	254	8.00"	203	6.60"	168	4.50"	114	4.2	1.9
6"x3"	10.00"	254	7.00"	178	6.60"	168	3.50"	89	2.4	1.1
6"x2.5"	10.00"	254	7.00"	178	6.60"	168	3.00"	76	2.0	0.9
6"x2"	10.00"	254	6.00"	152	6.60"	168	2.62"	67	1.6	0.7
6"x1.5"	10.00"	254	6.00"	152	6.60"	168	2.00"	51	1.3	0.6
6"x1"	10.00"	254	6.00"	152	6.60"	168	1.50"	38	0.9	0.4
8"x6"	12.00"	305	10.00"	254	8.78"	223	6.60"	168	11.6	5.3
8"x5"	12.00"	305	10.00"	254	8.78"	223	5.50"	140	5.2	2.3
8"x4"	12.00"	305	8.00"	203	8.78"	223	4.50"	114	4.2	1.9
8"x3"	12.00"	305	7.00"	178	8.78"	223	3.50"	89	2.4	1.1
8"x2.5"	12.00"	305	7.00"	178	8.78"	223	3.00"	76	2.0	0.9
8"x2"	12.00"	305	6.00"	152	8.78"	223	2.62"	67	1.6	0.7
8"x1.5"	12.00"	305	6.00"	152	8.78"	223	2.00"	51	1.3	0.6
8"x1"	12.00"	305	6.00"	152	8.78"	223	1.50"	38	0.9	0.4
10"x8"	14.00"	356	12.00"	305	10.96"	278	8.78"	223	24.2	11.0
10"x6"	14.00"	356	10.00"	254	10.96"	278	6.60"	168	11.6	5.3
10"x5"	14.00"	356	10.00"	254	10.96"	278	5.50"	140	5.2	2.3
10"x4"	14.00"	356	8.00"	203	10.96"	278	4.50"	114	4.2	1.9
10"x3"	14.00"	356	7.00"	178	10.96"	278	3.50"	89	2.4	1.1
10"x2.5"	14.00"	356	7.00"	178	10.96"	278	3.00"	76	2.0	0.9
10"x2"	14.00"	356	6.00"	152	10.96"	278	2.62"	67	1.6	0.7
10"x1.5"	14.00"	356	6.00"	152	10.96"	278	2.00"	51	1.3	0.6
10"x1"	14.00"	356	6.00"	152	10.96"	278	1.50"	38	0.9	0.4

OLETS, PLAIN AND FLANGED (cont'd)

Plain End Olet Dimensions (cont'd)

Size	H		A2		POD		PBOD		Weight	
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(lb)	(kg)
12"x10"										
12"x8"	16.00"	406	12.00"	305	13.16"	334	8.78"	223	24.2	11.0
12"x6"	16.00"	406	10.00"	254	13.16"	334	6.60"	168	11.6	5.3
12"x5"	16.00"	406	10.00"	254	13.16"	334	5.50"	140	5.2	2.3
12"x4"	16.00"	406	8.00"	203	13.16"	334	4.50"	114	4.2	1.9
12"x3"	16.00"	406	7.00"	178	13.16"	334	3.50"	89	2.4	1.1
12"x2.5"	16.00"	406	7.00"	178	13.16"	334	3.00"	76	2.0	0.9
12"x2"	16.00"	406	6.00"	152	13.16"	334	2.62"	67	1.6	0.7
12"x1.5"	16.00"	406	6.00"	152	13.16"	334	2.00"	51	1.3	0.6
12"x1"	16.00"	406	6.00"	152	13.16"	334	1.50"	38	0.9	0.4
14"x12"										
14"x10"										
14"x8"	18.00"	457	12.00"	305	15.47"	393	8.78"	223	24.2	11.0
14"x6"	18.00"	457	10.00"	254	15.47"	393	6.60"	168	11.6	5.3
14"x5"	18.00"	457	10.00"	254	15.47"	393	5.50"	140	5.2	2.3
14"x4"	18.00"	457	8.00"	203	15.47"	393	4.50"	114	4.2	1.9
14"x3"	18.00"	457	7.00"	178	15.47"	393	3.50"	89	2.4	1.1
14"x2.5"	18.00"	457	7.00"	178	15.47"	393	3.00"	76	2.0	0.9
14"x2"	18.00"	457	6.00"	152	15.47"	393	2.62"	67	1.6	0.7
14"x1.5"	18.00"	457	6.00"	152	15.47"	393	2.00"	51	1.3	0.6
14"x1"	18.00"	457	6.00"	152	15.47"	393	1.50"	38	0.9	0.4
16"x14"										
16"x12"										
16"x10"										
16"x8"	20.00"	508	12.00"	305	17.63"	448	8.78"	223	24.2	11.0
16"x6"	20.00"	508	10.00"	254	17.63"	448	6.60"	168	11.6	5.3
16"x5"	20.00"	508	10.00"	254	17.63"	448	5.50"	140	5.2	2.3
16"x4"	20.00"	508	8.00"	203	17.63"	448	4.50"	114	4.2	1.9
16"x3"	20.00"	508	7.00"	178	17.63"	448	3.50"	89	2.4	1.1
16"x2.5"	20.00"	508	7.00"	178	17.63"	448	3.00"	76	2.0	0.9
16"x2"	20.00"	508	6.00"	152	17.63"	448	2.62"	67	1.6	0.7
16"x1.5"	20.00"	508	6.00"	152	17.63"	448	2.00"	51	1.3	0.6
16"x1"	20.00"	508	6.00"	152	17.63"	448	1.50"	38	0.9	0.4
18"x16"										
18"x14"										
18"x12"										

OLETS, PLAIN AND FLANGED (cont'd)

Plain End Olet Dimensions (cont'd)

Size	H		A2		POD		PBOD		Weight	
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(lb)	(kg)
18"x10"										
18"x8"	21.00"	533	12.00"	305	19.93"	506	8.78"	223	24.2	11.0
18"x6"	21.00"	533	10.00"	254	19.93"	506	6.60"	168	11.6	5.3
18"x5"	21.00"	533	10.00"	254	19.93"	506	5.50"	140	5.2	2.3
18"x4"	21.00"	533	8.00"	203	19.93"	506	4.50"	114	4.2	1.9
18"x3"	21.00"	533	7.00"	178	19.93"	506	3.50"	89	2.4	1.1
18"x2.5"	21.00"	533	7.00"	178	19.93"	506	3.00"	76	2.0	0.9
18"x2"	21.00"	533	6.00"	152	19.93"	506	2.62"	67	1.6	0.7
18"x1.5"	21.00"	533	6.00"	152	19.93"	506	2.00"	51	1.3	0.6
18"x1"	21.00"	533	6.00"	152	19.93"	506	1.50"	38	0.9	0.4
20"x18"										
20"x16"										
20"x14"										
20"x12"										
20"x10"										
20"x8"										
20"x6"										
20"x5"										
20"x4"										
20"x3"										
20"x2.5"										
20"x2"										
20"x1.5"										
20"x1"										
24"x20"										
24"x18"										
24"x16"										
24"x14"										
24"x12"										
24"x10"										
24"x8"										
24"x6"										
24"x5"										
24"x4"										
24"x3"										
24"x2.5"										
24"x2"										
24"x1.5"										
24"x1"										

LATERALS

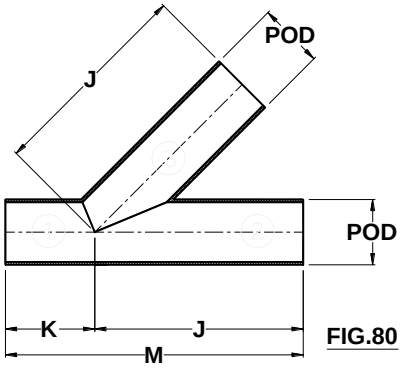


FIG.80

Size	Fig.80									
	J		K		M (J+K)		POD		Weight	
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(lb)	(kg)
1"										
1.5"										
2"	10"	254	6"	152	16"	406	2.62"	67	4.2	1.9
2.5"	12"	305	6"	152	18"	457	3.00"	76	5.1	2.3
3"	12"	305	6"	152	18"	457	3.50"	89	6.9	3.1
4"	14"	356	6"	152	20"	508	4.50"	114	11.0	5.0
5"	16"	406	8"	203	24"	610	5.58"	142	13.6	6.2
6"	16"	406	8"	203	24"	610	6.60"	168	25.2	11.4
8"	20"	508	10"	254	30"	762	8.78"	223	55.3	25.1
10"	24"	610	10"	254	34"	864	10.96"	278	100.1	45.4
12"	26"	660	12"	305	38"	965	13.16"	334	160.9	73.0
14"	30"	762	12"	305	42"	1067	15.47"	393	206.9	93.9
16"	32"	813	14"	356	46"	1168	17.63"	448	301.8	137.0
18"	36"	914	14"	356	50"	1270	19.81"	503	422.6	191.9
20"										
24"										
30"										
36"										
42"										
48"										
54"										
60"										

1. Standard laterals are limited to a 100psig design pressure up to 16" and 50psig up to 60".

REDUCING LATERAL OLETS

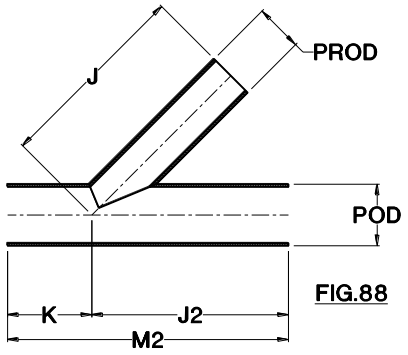


FIG.88

			K					
			6"	6"	6"	8"	10"	10"	12"	12"
			Branch Diameter							
			1",1.5",2"	2.5", 3"	4"	5", 6"	8"	10"	12"	14"
J		Header Diameter	J2							
		1"								
		1.5"								
	10"	2"								
	12"	2.5"								
	12"	3"	10"	12"						
	14"	4"	10"	12"						
	16"	5"	10"	12"	14"					
	16"	6"	10"	12"	14"	15"				
	20"	8"	10"	12"	14"	16"				
	24"	10"	12"	13"	14"	16"	20"			
	26"	12"	14"	15"	16"	18"	20"	24"		
	30"	14"	16"	17"	18"	20"	22"	24"	26"	
	32"	16"	18"	19"	20"	22"	24"	26"	28"	30"
	36"	18"	20"	21"	22"	24"	26"	28"	30"	32"
	38"	20"	22"	23"	24"	26"	28"	30"	32"	34"
	42"	24"	26"	27"	28"	30"	32"	34"	36"	38"
	52"	30"								
	62"	36"								
	72"	42"								
		48"								
		54"								
		60"								

REDUCING LATERAL OLETS (cont'd)

1. The 'J' dimension is based on header size. The 'K' dimension is based on branch size. The 'J2' dimension is based on header and branch size; e.g. 3” on 6” Fig. 88 has J=16", K=12", J2=12".
2. Standard reducing laterals are limited to a 100psig design pressure up to 16" and 50psig up to 60".

Reducing Lateral Olet Dimensions

Size	Fig.88									
	J		K		J2		POD		PROD	
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)
1.5"x1"										
2"x1.5"	10"	254	6"	152	10"	254	2.62"	67	2.00"	51
2"x1"	10"	254	6"	152	10"	254	2.62"	67	1.50"	38
2.5"x2"	12"	305	6"	152	10"	254	3.00"	76	2.62"	67
3"x2.5"	12"	305	6"	152	12"	305	3.50"	89	3.00"	76
3"x2"	12"	305	6"	152	10"	254	3.50"	89	2.62"	67
3"x1.5"	12"	305	6"	152	10"	254	3.50"	89	2.00"	51
3"x1"	12"	305	6"	152	10"	254	3.50"	89	1.50"	38
4"x3"	14"	356	6"	152	12"	305	4.50"	114	3.50"	89
4"x2.5"	14"	356	6"	152	12"	305	4.50"	114	3.00"	76
4"x2"	14"	356	6"	152	10"	254	4.50"	114	2.62"	67
4"x1.5"	14"	356	6"	152	10"	254	4.50"	114	2.00"	51
4"x1"	14"	356	6"	152	10"	254	4.50"	114	1.50"	38
5"x4"	16"	406	6"	152	14"	356	5.50"	140	4.50"	114
6"x5"	16"	406	8"	203	15"	381	6.60"	168	5.50"	140
6"x4"	16"	406	6"	152	14"	356	6.60"	168	4.50"	114
6"x3"	16"	406	6"	152	12"	305	6.60"	168	3.50"	89
6"x2.5"	16"	406	6"	152	12"	305	6.60"	168	3.00"	76
6"x2"	16"	406	6"	152	10"	254	6.60"	168	2.62"	67
6"x1.5"	16"	406	6"	152	10"	254	6.60"	168	2.00"	51
6"x1"	16"	406	6"	152	10"	254	6.60"	168	1.50"	38
8"x6"	20"	508	8"	203	16"	406	8.78"	223	6.60"	168
8"x5"	20"	508	8"	203	16"	406	8.78"	223	5.50"	140
8"x4"	20"	508	6"	152	14"	356	8.78"	223	4.50"	114
8"x3"	20"	508	6"	152	12"	305	8.78"	223	3.50"	89
8"x2.5"	20"	508	6"	152	12"	305	8.78"	223	3.00"	76
8"x2"	20"	508	6"	152	10"	254	8.78"	223	2.62"	67
8"x1.5"	20"	508	6"	152	10"	254	8.78"	223	2.00"	51
8"x1"	20"	508	6"	152	10"	254	8.78"	223	1.50"	38

REDUCING LATERAL OLETS (cont'd)

Reducing Lateral Olet Dimensions

Size	Fig.88									
	J		K		J2		POD		PROD	
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)
10"x8"	24"	610	10"	254	20"	508	10.96"	278	8.78"	223
10"x6"	24"	610	8"	203	16"	406	10.96"	278	6.60"	168
10"x5"	24"	610	8"	203	16"	406	10.96"	278	5.50"	140
10"x4"	24"	610	6"	152	14"	356	10.96"	278	4.50"	114
10"x3"	24"	610	6"	152	13"	330	10.96"	278	3.50"	89
10"x2.5"	24"	610	6"	152	13"	330	10.96"	278	3.00"	76
10"x2"	24"	610	6"	152	12"	305	10.96"	278	2.62"	67
10"x1.5"	24"	610	6"	152	12"	305	10.96"	278	2.00"	51
10"x1"	24"	610	6"	152	12"	305	10.96"	278	1.50"	38
12"x10"	26"	660	10"	254	24"	610	13.16"	334	10.96"	278
12"x8"	26"	660	10"	254	20"	508	13.16"	334	8.78"	223
12"x6"	26"	660	8"	203	18"	457	13.16"	334	6.60"	168
12"x5"	26"	660	8"	203	18"	457	13.16"	334	5.50"	140
12"x4"	26"	660	6"	152	16"	406	13.16"	334	4.50"	114
12"x3"	26"	660	6"	152	15"	381	13.16"	334	3.50"	89
12"x2.5"	26"	660	6"	152	15"	381	13.16"	334	3.00"	76
12"x2"	26"	660	6"	152	14"	356	13.16"	334	2.62"	67
12"x1.5"	26"	660	6"	152	14"	356	13.16"	334	2.00"	51
12"x1"	26"	660	6"	152	14"	356	13.16"	334	1.50"	38
14"x12"	30"	762	12"	305	26"	660	15.47"	393	13.16"	334
16"x14"	32"	813	12"	305	30"	762	17.63"	448	15.45"	392
18"x16"	36"	914	14"	356	34"	864	19.81"	503	17.61"	447
20"x18"										
24"x20"										
30"x24"										
36"x30"										
42"x36"										
48"x42"										
54"x48"										
60"x54"										

REDUCING LATERAL OLETS (cont'd)

Reducing Lateral Olet Weights

Size	Fig.88	
	(lb)	(kg)
1.5" x 1"		
2" x 1.5"	2.0	0.9
2" x 1"	1.5	0.7
2.5" x 2"	2.4	1.1
3" x 2.5"	3.3	1.5
3" x 2"	2.7	1.2
3" x 1.5"	2.2	1.0
3" x 1"	1.7	0.8
4" x 3"	4.3	1.9
4" x 2.5"	3.6	1.6
4" x 2"	3.0	1.3
4" x 1.5"	2.4	1.1
4" x 1"	1.8	0.8
5" x 4"	7.1	3.2
6" x 5"	8.7	4.0
6" x 4"	7.1	3.2
6" x 3"	4.7	2.1
6" x 2.5"	3.9	1.8
6" x 2"	3.2	1.5
6" x 1.5"	2.7	1.2
6" x 1"	2.0	0.9

Size	Fig.88	
	(lb)	(kg)
8" x 6"	16.1	7.3
8" x 5"	7.8	3.5
8" x 4"	6.3	2.9
8" x 3"	4.0	1.8
8" x 2.5"	3.3	1.5
8" x 2"	2.7	1.2
8" x 1.5"	2.2	1.0
8" x 1"	1.8	0.8
10" x 8"	36.9	16.8
10" x 6"	17.8	8.1
10" x 5"	9.0	4.1
10" x 4"	7.3	3.3
10" x 3"	4.8	2.2
10" x 2.5"	3.9	1.8
10" x 2"	3.2	1.5
10" x 1.5"	2.7	1.2
10" x 1"	2.0	0.9
12" x 10"	67.9	30.8
12" x 8"	38.4	17.4
12" x 6"	18.6	8.5
12" x 5"	9.6	4.4
12" x 4"	7.8	3.5
12" x 3"	4.8	2.2
12" x 2.5"	3.9	1.8
12" x 2"	3.2	1.5
12" x 1.5"	2.7	1.2
12" x 1"	2.0	0.9

Size	Fig.88	
	(lb)	(kg)
14" x 12"	78.1	35.4
16" x 14"	96.1	43.6
18" x 16"	141.3	64.2
20" x 18"		
24" x 20"		
30" x 24"		
36" x 30"		
42" x 36"		
48" x 42"		
54" x 48"		
60" x 54"		

DUMMY LEGS, CAPS, PUP PIECES

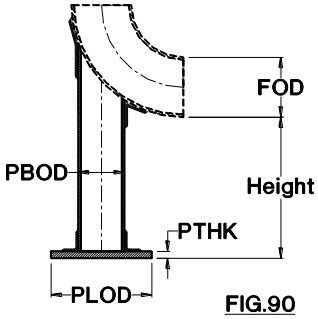


FIG.90

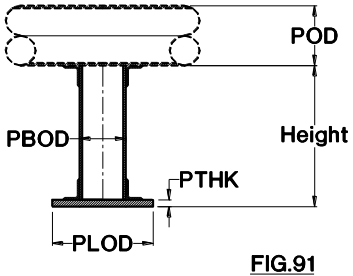


FIG.91

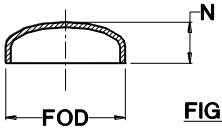


FIG.96

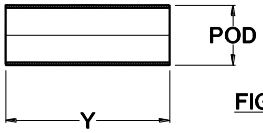


FIG.1

Size	Fig.90, 91									
	Dummy Leg Size		PLOD		PTHK		PBOD		Weight	
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(lb)	(kg)
1"										
1.5"										
2"	2"	51	5"	127	0.50"	13	2.62"	67	5.3	2.4
2.5"	2"	51	5"	127	0.50"	13	2.62"	67	5.3	2.4
3"	2"	51	5"	127	0.50"	13	2.62"	67	5.3	2.4
4"	3"	76	6"	152	0.50"	13	3.50"	89	7.8	3.5
5"	3"	76	6"	152	0.50"	13	3.50"	89	7.8	3.5
6"	4"	102	7"	178	0.50"	13	4.50"	114	10.3	4.7
8"	6"	152	9"	229	0.50"	13	6.60"	168	15.5	7.0
10"	6"	152	9"	229	0.50"	13	6.60"	168	15.5	7.0
12"	8"	203	12"	305	0.50"	13	8.78"	223	28.1	12.8
14"	10"	254	14"	356	0.50"	13	10.96"	278	39.4	17.9
16"	12"	305	16"	406	0.50"	13	13.16"	334	57.2	26.0
18"	14"	356	18"	457	0.50"	13	15.47"	393	72.9	33.1
20"	18"	457	22"	559	0.50"	13	19.81"	503	116.8	53.0
24"	18"	457	22"	559	0.50"	13	19.81"	503	116.8	53.0
30"										
36"										
42"										
48"										
54"										
60"										

DUMMY LEGS, CAPS, PUP PIECES (cont'd)

1. Fig. 90 and Fig. 91 include the dummy leg only, not the elbow nor pipe. Dummy legs can also be placed under tees and reducers.
2. Maximum dummy leg length is 3'-0". Specify the required leg length with the figure number.
3. Plate to be shipped loose and field installed. 6" of trim to be provided on dummy leg.
4. In prefabricated systems, the Fig.1 'Y' dimension can be as short as 1".

Caps and Pup Pieces

Size	Fig.96						Fig.1			
	N		FOD		Weight		Y		POD	
	(in.)	(mm)	(in.)	(mm)	(lb)	(kg)	(in.)	(mm)	(in.)	(mm)
1"							4"	1.8	1.50"	38
1.5"							4"	1.8	2.00"	51
2"	1.5"	38	2.62"	67	0.1	0.1	4"	102	2.62"	67
2.5"	1.5"	38	3.00"	76	0.1	0.1	4"	102	3.00"	76
3"	2.0"	51	3.50"	89	0.2	0.1	4"	102	3.50"	89
4"	2.5"	64	4.50"	114	0.4	0.2	6"	152	4.50"	114
5"	3.0"	76	5.58"	142	0.5	0.2	7"	178	5.50"	140
6"	3.5"	89	6.66"	169	1.2	0.5	9"	229	6.60"	168
8"	4.0"	102	8.86"	225	2.5	1.2	12"	305	8.78"	223
10"	5.0"	127	11.06"	281	5.0	2.3	15"	381	10.96"	278
12"	6.0"	152	13.26"	337	8.2	3.7	17"	432	13.16"	334
14"	6.5"	165	15.59"	396	11.7	5.3	19"	483	15.47"	393
16"	7.0"	178	17.77"	451	17.0	7.7	21"	533	17.63"	448
18"	8.0"	203	19.95"	507	23.8	10.8	24"	610	19.81"	503
20"										
24"										
30"										
36"										
42"										
48"										
54"										
60"										

THREADED CONNECTIONS

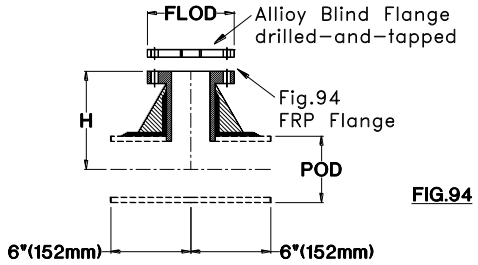


FIG.94

For Series 20FR20 and 20FR20-C, the threaded options are: 1) the Figure 94 Flanged Saddle with drilled-and-tapped alloy blind flange. The Fig.47JF threaded alloy MNPT is not available and the Figure 97 threaded FRP FNPT is no longer a standard product.

1. Fig.94: The most reliable and heavy-duty solution for threaded connections is to use an FRP flange and bolt an alloy (316SS, 90/10 Cu-Ni, Gr. 2 Ti, etc.) blind flange that is drilled-and-tapped for the NPT size. This type of connection has been used for many years and is the most durable and toughest solution.

Notes:
1. The Fig.94 threaded alloy blind includes the drilled-and-tapped alloy blind flange only. The branch size is 2" diameter, standard. Other branch sizes are available upon request. Material choices for the alloy blind flange include 316SS, 90/10 Cu-Ni and others.

Size	Fig.47JF,94,97	
	POD	
	(in.)	(mm)
0.5"		
0.75"		
1.0"	1.50"	38
1.5"	2.00"	51
2"	2.62"	67
2.5"	3.00"	76
3"	3.50"	89
4"	4.50"	114
5"	5.50"	140
6"	6.60"	168
8"	8.78"	223
10"	10.96"	278
12"	13.16"	334
14"	15.47"	393
16"	17.63"	448
18"	19.81"	503

Fig.47JF		Fig.94	
H2		H	
(in.)	(mm)	(in.)	(mm)
Not Available			
		7.00"	178
		7.25"	184
		7.50"	191
		8.00"	203
		8.50"	216
		9.00"	229
		10.00"	254
		11.00"	279
		12.00"	305
		13.00"	330
		14.00"	356
		15.00"	381

Fig.94	
Weight	
(lb)	(kg)
6.1	2.3
6.1	2.3
6.1	2.3
6.1	2.3
6.1	2.3
6.1	2.3
6.1	2.3
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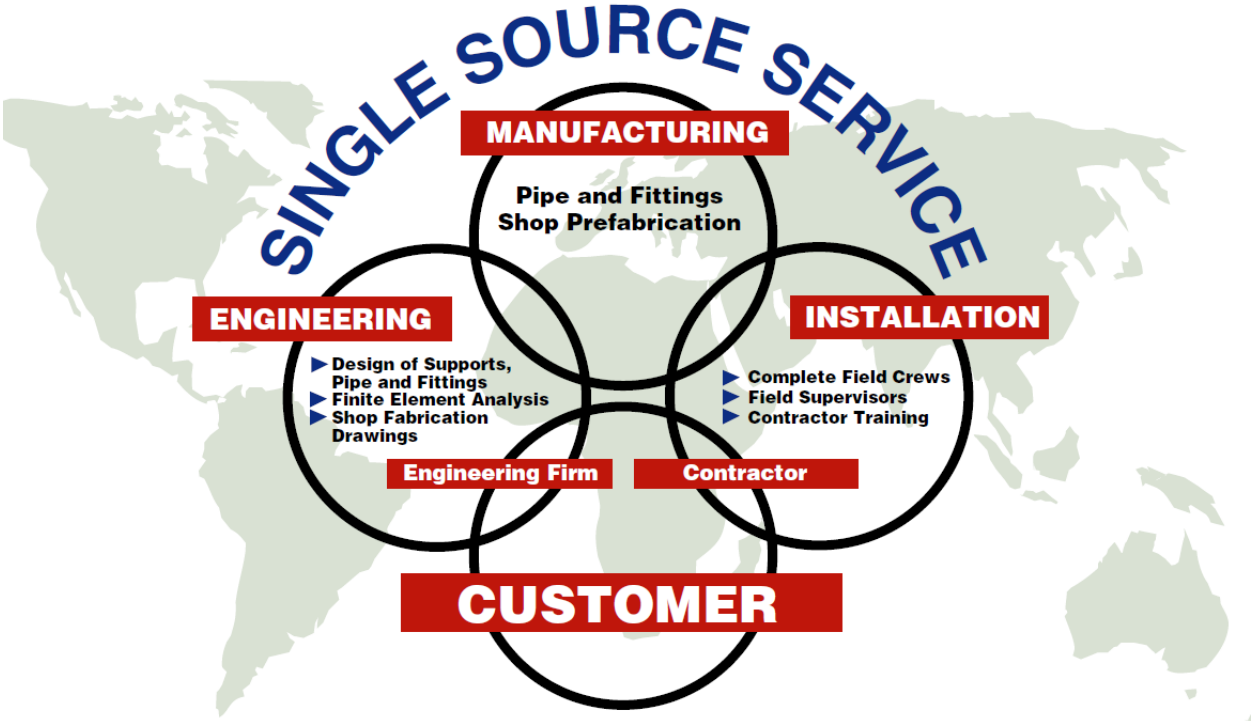
6.1	2.3
6.1	2.3
6.1	2.3



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