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ANVIL INTERNATIONAL

www.anvilintl.com

PIPE FITTERS HANDBOOK

Building Connections That Last

NOT FOR RESALE
10.06

ANVIL PIPE FITTERS HANDBOOK

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TRUSTED FOR 150 YEARS

We built our reputation from the ground up.

Anvil's history stretches back to the mid1800s, when a company named Grinnell® began providing its customers with the finest quality pipe products. Since 2000, those quality products and services—and the people who provide them—have been known as Anvil® International. Anvil customers receive the quality and integrity that have been building strong connections in both products and business relationships for over 150 years.

Focused Product Line:

- *Anvil® Malleable and Cast Iron Fittings*
- *Anvil® Hangers, Supports and Struts*
- *Anvil® Seamless Pipe Nipples*
- *Anvil® Steel Pipe Couplings and Small Steel Fittings*
- *Beck Welded Pipe Nipples*
- *Merit® Tee-Lets and Drop Nipples*
- *Gruvlok® Couplings, Fittings and Valves*
- *SPF™ Cast Iron and Ductile Iron Fittings*
- *SPF™ Malleable Iron Fittings*
- *SPF™ Grooved Fittings and O'Lets*
- *J.B. Smith Swage Nipples and Bull Plugs*
- *Catawissa® Wing Unions and Check Valves*

1850 Providence Steam & Gas Pipe Co. is formed. Frederick Grinnell purchases a controlling interest.

1909 Frederick Grinnell opens a piping products foundry in Cranston, RI, and eventually develops the Grinnell Supply Sales Division.

1919 General Fire Extinguisher Co. becomes Grinnell Co.

1960 Gruvlok® line of grooved fittings is introduced.

1969 Grinnell Co. acquired by International Telephone and Telegraph.

1994 J.B. Smith™ and Catawissa™ join the Grinnell Supply Sales and Manufacturing division.

1999 Tyco sells the distribution and manufacturing operations known as "Grinnell Supply Sales", but keeps the Grinnell® trademark.

2000 The industry's trusted manufacturer of pipe products is renamed Anvil International, Inc.

2001 Anvil® International acquires Merit® Manufacturing and Beck Manufacturing.

2004 Anvil® International acquires Star Pipe Products, Building and Construction Divisions (SPF) and forms AnvilStar™ Fire Products Division.

TODAY Anvil® International is the largest and most complete fitting and hanger manufacturer in the world.

Grinnell® is a registered trademark of Grinnell Corporation, a Tyco International Ltd. company.

BUILDING CONNECTIONS THAT LAST

ANVIL® INTERNATIONAL

ANVIL BRANDS: GRUVLOK® SPF/ANVIL Catawissa AnvilStar ANVIL MERIT® BECK ANVIL-STRUT™

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ANVIL—BUILDING CONNECTIONS THAT LAST

Anvil's focused product line consists of:

- Anvil® Malleable & Cast Iron Fittings
- SPF™ Malleable, Cast & Ductile Iron Fittings
- Anvil® Hangers, Supports
- Anvil-Strut™ Strut and Strut Fittings
- Beck Welded Pipe Nipples
- Anvil® Seamless Pipe Nipples
- SPF™ Steel Pipe Nipples
- Anvil® Steel Pipe Couplings & Small Steel Fittings
- Merit® Tee-Lets & Drop Nipples
- Gruvlok® Couplings, Fittings & Valves
- SPF™ Grooved Fittings & O'Lets
- J.B. Smith™ Swage Nipples & Bull Plugs
- Catawissa™ Wing Unions & Check Valves

CONNECTING WITH CORE MARKETS:

From plumbing, mechanical, and fire protection, to mining, oil & gas, and OEMs, Anvil's focus has always been on providing real solutions for your applications. Our representatives are experts in the markets they serve, and understand the needs of your business. Anvil will work with you to find innovative products that meet your demands and exceed your expectations.

CONNECTING WITH QUALITY:

Many things have changed during the 150 years in the industry - including the name above our door - but our quality and commitment remains the best in the business. Our ISO 9001:2000 manufacturing facilities produce a range of products unmatched by any other single manufacturer. Our responsive service sets an industry standard for dependability and effectiveness recognized around the world. Whatever the word "quality" means to your business, Anvil guarantees it in everything we do.

CONNECTING WITH WHOLESALERS:

Wholesale distribution has always been a vital aspect of Anvil's business. Our dedication to the wholesale channel - and our customers - is a driving force for our services. These relationships remain a primary focus of Anvil's innovation.

CONNECTING WITH CUSTOMERS:

The most import connection that Anvil makes are the ones we make with our customers. In the field, over the phone, or on the web, we strive to provide our customers with the products, assistance, and service they need - when they need it. Responsive and accessible customer support is what makes the difference between simply delivering products, and delivering solutions.

ANVIL–
BUILDING CONNECTIONS THAT LAST.

VISIT US ON THE WEB AT: www.anvilintl.com

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Note: Every effort has been made to assure the accuracy of dimension data. We cannot accept responsibility for inaccuracies resulting from undetected errors or omissions. Contact your Anvil Rep. to verify information.

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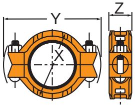
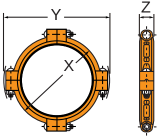
FIG. 7001

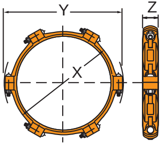
STANDARD COUPLING



SIZES 1" - 14"



SIZES 16" - 24"



SIZES 28" - 30"

FIGURE 7001 STANDARD COUPLING DIMENSIONS (CONTINUED ON NEXT PAGE)

Nom. Size	O.D.	Max. Work. Pressure	Max. End Load	Range of Pipe End Separation	Deflection from		Coupling Dimensions			Bolt Dimensions*		Specified Torque §		Approx. Wt. Ea.
					Per Coupling	of Pipe	X	Y	Z	Qty.	Size	Min.	Max.	
In./ DN(mm)	*In./mm*	*PSI/bar*	*Lbs./kN*	*In./mm*	*Degrees*	*In./ft.- mm/m*	*In./mm*	*In./mm*	*In./mm*		*In./mm*	*Ft.-Lbs./N-M*		*Lbs./kN*
1 *25*	1.315 *33.4*	1000 *68.9*	1,358 *6.04*	0-⅛ *0-3.2*	5° 26'	1.14 *94.7*	2½ *64*	4½ *114*	1⅞ *48*	2	⅜ x 2¼ *M10 x 57*	30 *40*	45 *60*	1.3 *0.6*
1¼ *32*	1.660 *42.2*	1000 *68.9*	2,164 *9.63*	0-⅛ *0-3.2*	4° 19'	0.90 *75.3*	2¾ *70*	4½ *114*	1⅞ *48*	2	⅜ x 2¼ *M10 x 57*	30 *40*	45 *60*	1.4 *0.6*
1½ *40*	1.900 *48.3*	1000 *68.9*	2,835 *12.61*	0-⅛ *0-3.2*	3° 46'	0.79 *65.7*	3 *76*	4⅝ *117*	1⅞ *48*	2	⅜ x 2¼ *M10 x 57*	30 *40*	45 *60*	1.5 *0.7*
2 *50*	2.375 *60.3*	1000 *68.9*	4,430 *19.71*	0-⅛ *0-3.2*	3° 1'	0.63 *52.6*	3⅝ *92*	6⅛ *156*	1⅞ *48*	2	½ x 3 *M12 x 76*	80 *110*	100 *150*	3.1 *1.4*
2½ *65*	2.875 *73.0*	1000 *68.9*	6,492 *28.88*	0-⅛ *0-3.2*	2° 29'	0.52 *43.3*	4¼ *108*	6½ *165*	1⅞ *48*	2	½ x 3 *M12 x 76*	80 *110*	100 *150*	3.7 *1.7*
3 O.D. 76.1	*2.996* 76.1	*1000* 68.9	*7,050* 31.36	*0-⅛* 0-3.2	*2° 23'*	*0.50* 41.6	*4¼* 108	*6¾* 171	*1⅞* 48	*2*	*½ x 3* M12 x 76	*80* 110	*100* 150	*4.3* 2.0
3 *80*	3.500 *88.9*	1000 *68.9*	9,621 *42.80*	0-⅛ *0-3.2*	2° 3'	0.43 *35.8*	4⅞ *124*	7⅛ *181*	1⅞ *48*	2	½ x 3 *M12 x 76*	80 *110*	100 *150*	4.3 *2.0*
3½ *65*	4.000 *101.6*	1000 *68.9*	12,566 *55.90*	0-⅛ *0-3.2*	1° 48'	0.38 *31.4*	5¼ *133*	8¼ *210*	1⅞ *48*	2	⅝ x 3½ *M16 x 89*	100 *135*	130 *175*	5.1 *2.3*
4 *100*	4.500 *114.3*	1000 *68.9*	15,904 *70.75*	0-¼ *0-6.4*	3° 11'	0.67 *55.5*	6¼ *159*	8¾ *222*	2 *51*	2	⅝ x 3½ *M16 x 89*	100 *135*	130 *175*	6.8 *3.1*

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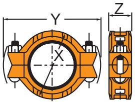
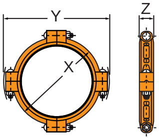
FIG. 7001, CONT'D.

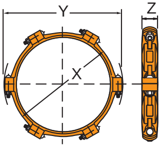
STANDARD COUPLING



SIZES 1" - 14"



SIZES 16" - 24"



SIZES 28" - 30"

FIGURE 7001 STANDARD COUPLING DIMENSIONS (CONTINUED ON NEXT PAGE)

Nom. Size	O.D.	Max. Work. Pressure	Max. End Load	Range of Pipe End Separation	Deflection from		Coupling Dimensions			Bolt Dimensions*		Specified Torque §		Approx. Wt. Ea.
					Per Coupling	of Pipe	X	Y	Z	Qty.	Size	Min.	Max.	
In./ DN(mm)	In./mm	PSI/bar	Lbs./kN	In./mm	Degrees	In./ft.- mm/m	In./mm	In./mm	In./mm		In./mm	Ft.-Lbs./N-M		Lbs./kN
5 125	5.563 141.3	1000 68.9	24,306 108.12	0-¼ 0-6.4	2° 35'	0.54 45.1	7¼ 184	11¼ 286	2 51	2	¾ x 4½ M20 x 110	130 175	180 245	9.6 4.4
6½ O.D. 165.1	6.500 165.1	1000 68.9	33,183 147.61	0-¼ 0-6.4	2° 12'	0.46 38.4	81⁄4 210	11¾ 298	2 51	2	¾ x 4½ M20 x 110	130 175	180 245	11.8 5.4
6 150	6.625 168.3	1000 68.9	34,472 153.34	0-¼ 0-6.4	2° 10'	0.45 37.8	8⅝ 219	11¾ 298	2 51	2	¾ x 4½ M20 x 110	130 175	180 245	11.8 5.4
8 200	8.625 219.1	800 55.2	46,741 207.91	0-¼ 0-6.4	1° 40'	0.35 29.1	11 279	14⅜ 365	2⅜ 60	2	⅞ x 5½ M22 x 140	180 245	220 300	21.7 9.8
10 250	10.750 273.0	800 55.2	72,610 322.99	0-¼ 0-6.4	1° 20'	0.28 23.3	13⅛ 333	16⅝ 422	2⅝ 67	2	⅞ x 5½ M22 x 140	180 245	220 300	27.0 12.2
12 300	12.750 323.9	800 55.2	102,141 454.35	0-¼ 0-6.4	1° 7'	0.23 19.5	15½ 394	18⅝ 473	2⅝ 67	2	⅞ x 6 M22 x 150	180 245	220 300	35.0 15.9
14 350	14.000 355.6	300 20.7	46,181 205.43	0-¼ 0-6.4	1° 2'	0.22 18.0	16⅛ 410	20½ 521	3 76	2	⅞ x 5½ M22 x 140	180 245	220 300	37.0 16.8
16 400	16.000 406.4	300 20.7	60,319 268.31	0-¼ 0-6.4	0° 54'	0.19 15.7	18⅛ 460	22⅞ 581	3 76	4	1 x 4 *	200 -	250 -	50.0 22.7
18 450	18.000 457.2	300 20.7	76,341 339.58	0-¼ 0-6.4	0° 48'	0.17 14.0	21⅛ 537	25⅜ 645	3⅛ 79	4	1 x 4 *	200 -	250 -	72.0 32.7

For Gruvlok Technical Detail Refer to the Gruvlok Catalog or contact your Anvil local sales representative.

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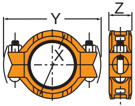
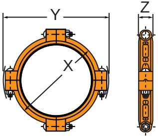
Fig. 7001, cont'd.

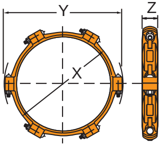
Standard Coupling



SIZES 1" - 14"



SIZES 16" - 24"



SIZES 28" - 30"

Figure 7001 Standard Coupling Dimensions (continued from previous page)

Nom. Size	O.D.	Max. Work. Pressure	Max. End Load	Range of Pipe End Separation	Deflection from ℄		Coupling Dimensions			Bolt Dimensions*		Specified Torque §		Approx. Wt. Ea.
					Per Coupling	Per. In/Ft.	X	Y	Z	Qty.	Size	Min.	Max.	
In./ DN(mm)	In./mm	PSI/bar	Lbs./kN	In./mm	Degrees	In./ft.- mm/m	In./mm	In./mm	In./mm		In./mm	Ft.-Lbs./N-M		Lbs./kN
20 500	20.000 508.0	300 20.7	94,248 419.23	0-¼ 0-6.4	0° 43'	0.15 12.5	23 584	28¼ 718	3⅛ 79	4	1⅛ x 4½ *	225 -	275 -	82.0 37.2
24 600	24.000 609.6	300 20.7	135,717 603.70	0-¼ 0-6.4	0° 36'	0.13 10.5	27 686	32⅜ 822	3⅛ 79	4	1⅛ x 4½ *	225 -	275 -	90.0 40.8
28" O.D. 733.4	28.875 733.4	150 10.3	98,226 436.93	0-¼ 0-6.4	0° 33'	0.12 9.6	33½ 851	35½ 902	3⅛ 79	6	1 x 5½ *	200 -	250 -	105.0 47.6
30" O.D. 787.4	31.00 787.4	150 10.3	113,215 503.61	0-¼ 0-6.4	0° 28'	0.10 8.1	33¾ 857	38¼ 972	3⅝ 92	6	1 x 5½ *	200 -	250 -	137.0 62.1

* Available in ANSI or metric bolt sizes only as indicated.

For additional details see “Coupling Data Chart Notes” on page 264.

§ – For additional Bolt Torque information on page 202.

See Installation & Assembly directions on pages 150-151.

Not for use in copper systems.

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FIG. 7011

STANDARD COUPLING

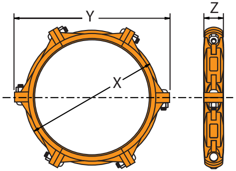

FIGURE 7011 STANDARD COUPLING

Nominal Size	O.D.	Max. Working Pressure	Max. End Load	Range of Pipe End Separation	Deflection from ℄		Coupling Dimensions			Coupling Bolts*		Specified		Approx. Wt. Ea.
					Per Coupling	Per in./ft.	X	Y	Z	Qty.	Size	Min.	Max.	
In./DN(mm)	*In./mm*	*PSI/bar*	*Lbs./kN*	*In./mm*	*Degrees*	*mm/m*	*In./mm*	*In./mm*	*In./mm*		*In./mm*	*Ft.-Lbs./M-M*		*Lbs./Kg*
30 O.D.	30.000	300	212,058	0 -3⁄16	0° 40'	0.14	34	39½	5	6	1¼ x 4⅜	600	800	200
750	*762.0*	*20.7*	*943.2*	*0 - 4.8*		*11.5*	*864*	*1003*	*127*		–	-	-	*90.9*

Working pressure and end load values are for standard wall pipe.

Roll and Cut Grooving Specifications can be found in the technical data section.

See technical data section for design factors.

For additional details see "Coupling Data Chart Notes" on page 264.

§ – For additional Bolt Torque information on page 202.

* Available in ANSI bolt sizes only as indicated.

See Installation & Assembly directions on pages 152-153.

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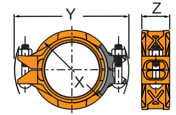
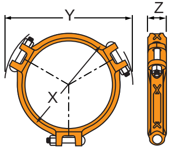
FIG. 7401

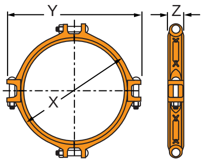
RIGIDLOK® COUPLING



1½" - 14"



16"



18" - 24"

FIGURE 7401 RIGIDLOK COUPLING (CONTINUED ON NEXT PAGE)

Nominal Size	O.D.	Max. Working Pressure	Max. End Load	Range of Pipe End Separation	Coupling Dimensions			Coupling Bolts*		Specified Torque §		Approx. Wt. Ea.
					X	Y	Z	Qty.	Size	Min.	Max.	
In./DN(mm)	In./mm	PSI/bar	Lbs./kN	In./mm	In./mm	In./mm	In./mm		In./mm	Ft.-Lbs./N-M		Lbs./Kg
1½ 40	1.900 48.3	750 51.7	2,126 9.46	0 -⅛ 0 - 3.2	3 76	5⅛ 130	1⅞ 48	2	⅜ x 2¼ M10 x 57	30 40	45 60	1.8 0.8
2 50	2.375 60.3	750 51.7	3,323 14.78	0 -⅛ 0 - 3.2	3½ 89	5⅝ 143	1⅞ 48	2	⅜ x 2½ M10 x 63	30 40	45 60	2.4 1.1
2½ 65	2.875 73.0	750 51.7	4,869 21.66	0 -⅛ 0 - 3.2	4 102	6⅛ 156	1⅞ 48	2	⅜ x 2½ M10 x 63	30 40	45 60	2.9 1.3
3 O.D. 76.1	2.996 76.1	750 51.7	5,207 23.52	0 -⅛ 0 - 3.2	4⅛ 105	6⅛ 156	1⅞ 48	2	½ x 3 M12 x 76	80 110	100 150	3.4 1.5
3 80	3.500 88.9	750 51.7	7,216 32.10	0 -⅛ 0 - 3.2	4¾ 121	7¼ 184	1⅞ 48	2	½ x 3 M12 x 76	80 110	100 150	3.6 1.6
4 100	4.500 114.3	750 51.7	11,928 53.06	0 -¼ 0 - 6.4	5⅞ 149	8⅜ 213	2⅛ 54	2	½ x 3 M12 x 76	80 110	100 150	5.0 2.3
5½ O.D. 139.7	5.500 139.7	750 51.7	17,819 79.26	0 -¼ 0 - 6.4	7 178	9¾ 248	2⅛ 54	2	⅝ x 3½ M16 x 85	100 135	130 175	6.9 3.1
5 125	5.563 141.3	750 51.7	18,229 81.09	0 -¼ 0 - 6.4	7 178	10 254	2⅛ 54	2	⅝ x 3½ M16 x 85	100 135	130 175	6.9 3.1
6½ O.D. 165.1	6.500 165.1	750 51.7	24,887 110.70	0 -¼ 0 - 6.4	8 203	11 279	2⅛ 54	2	⅝ x 3½ M16 x 85	100 135	130 175	7.6 3.4
6 150	6.625 168.3	750 51.7	25,854 115.00	0 -¼ 0 - 6.4	8⅛ 206	11⅛ 283	2⅛ 54	2	⅝ x 3½ M16 x 85	100 135	130 175	7.9 3.6

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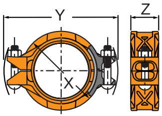
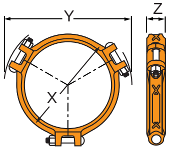
Fig. 7401, cont'd.

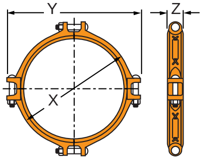
RigidLok® Coupling



1½" - 14"



16"



18" - 24"

Figure 7401 RigidLok Coupling (continued from next page)

Nominal Size	O.D.	Max. Working Pressure	Max. End Load	Range of Pipe End Separation	Coupling Dimensions			Coupling Bolts*		Specified Torque §		Approx. Wt. Ea.
					X	Y	Z	Qty.	Size	Min.	Max.	
In./DN(mm)	*In./mm*	*PSI/bar*	*Lbs./kN*	*In./mm*	*In./mm*	*In./mm*	*In./mm*		*In./mm*	*Ft.-Lbs./N-M*		*Lbs./Kg*
8 *200*	8.625 *219.1*	600 *51.7*	35,056 *155.94*	0 -¼ *0 - 6.4*	10½ *267*	14⅛ *359*	2⅝ *67*	2	¾ x 4½ *M20 x 110*	130 *175*	180 *245*	15.9 *7.2*
10 *250*	10.750 *273.1*	500 *51.7*	45,381 *201.87*	0 -¼ *0 - 6.4*	12⅞ *327*	17½ *445*	2⅝ *67*	2	1 x 6 *M24 x 150*	200 *270*	250 *340*	25.6 *11.6*
12 *300*	12.750 *323.9*	400 *51.7*	51,070 *227.17*	0 -¼ *0 - 6.4*	15 *381*	19½ *495*	2⅝ *67*	2	⅞ x 6 *M22 x 150*	180 *245*	220 *300*	30.5 *13.8*
14 *350*	14.000 *355.6*	300 *20.7*	46,181 *205.43*	0 -¼ *0 - 6.4*	16¼ *413*	19¾ *502*	3 *76*	2	⅞ x 5½	180 *245*	220 *300*	36.1 *16.4*
16 *400*	16.000 *406.4*	300 *20.7*	60,319 *268.31*	0 -¼ *0 - 6.4*	18⅛ *460*	22¼ *565*	3 *76*	3	⅞ x 5½	180 *245*	220 *300*	42.0 *19.1*
18 *450*	18.000 *457.2*	300 *20.7*	76,341 *339.58*	0 -¼ *0 - 6.4*	20½ *521*	24⅜ *619*	3⅛ *79*	4	1 x 4	200 *270*	250 *340*	51.6 *23.4*
20 *500*	20.000 *508.0*	300 *20.7*	94,248 *419.23*	0 -¼ *0 - 6.4*	23 *581*	26⅞ *683*	3⅛ *79*	4	1 x 4	200 *270*	250 *340*	68.3 *31.0*
24 *600*	24.000 *609.6*	250 *17.2*	113,097 *503.08*	0 -¼ *0 - 6.4*	27⅛ *689*	30⅞ *784*	3⅛ *79*	4	1 x 4	200 *270*	250 *340*	89.3 *40.5*

* Available in ANSI or metric bolt sizes only as indicated.

Not for use in copper systems.

For additional details see "Coupling Data Chart Notes" on page 264.

§ – For additional Bolt Torque information on page 202.

See Installation & Assembly directions on pages 154-155.

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Fig. 7000

Lightweight Flexible Coupling

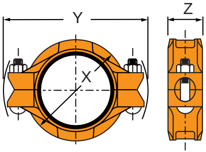

Figure 7000 Coupling (continued on next page)

Nom. Size	O.D.	Max. Working Pressure	Max. End Load	Range of Pipe End Separation	Deflection from ℄		Coupling Dimensions			Coupling Bolts		Specified Torque §		Approx. Wt. Ea.
					Per Coupling	Per in./ft.	X	Y	Z	Qty.	Size	Min.	Max.	
In./ DN(mm)	In./mm	PSI/bar	Lbs./kN	In./mm	Degrees	mm/m	In./mm	In./mm	In./mm		In./mm	Ft.-Lbs./N-M		Lbs./Kg
1 25	1.315 33.4	600 41.4	815 3.62	0 - ⅛ 0 - 3.2	5° 26'	1.14 94.7	2⅜ 60	4¼ 108	1¾ 44	2	⅜ x 2¼ M10 x 57	30 40	45 60	1.3 0.6
1¼ 32	1.660 42.2	600 41.4	1,299 5.78	0 - ⅛ 0 - 3.2	4° 19'	0.90 75.3	2¾ 70	4⅜ 111	1¾ 44	2	⅜ x 2¼ M10 x 57	30 40	45 60	1.4 0.6
1½ 40	1.900 48.3	600 41.4	1,701 7.57	0 - ⅛ 0 - 3.2	3° 46'	0.79 65.7	3 76	4⅝ 117	1¾ 44	2	⅜ x 2¼ M10 x 57	30 40	45 60	1.5 0.7
2 50	2.375 60.3	600 41.4	2,658 11.82	0 - ⅛ 0 - 3.2	3° 1'	0.63 52.6	3½ 89	5½ 140	1¾ 44	2	⅜ x 2¼ M10 x 57	30 40	45 60	1.7 0.8
2½ 65	2.875 73.0	600 41.4	3,895 17.33	0 - ⅛ 0 - 3.2	2° 29'	0.52 43.3	4 102	5¾ 146	1¾ 44	2	⅜ x 2¼ M10 x 57	30 40	45 60	1.9 0.9
3 O.D. 76.1	2.996 76.1	600 41.4	4,230 18.82	0 - ⅛ 0 - 3.2	2° 23'	0.50 41.6	4 102	6⅛ 156	1¾ 44	2	⅜ x 2¼ M10 x 57	80 110	100 150	2.3 1.0
3 80	3.500 88.9	600 41.4	5,773 25.68	0 - ⅛ 0 - 3.2	2° 3'	0.43 35.8	4⅝ 117	6¾ 171	1¾ 44	2	½ x 2¾ M12 x 70	80 110	100 150	2.9 1.3
3½ 90	4.000 101.6	600 41.4	7,540 33.54	0 - ⅛ 0 - 3.2	1° 48'	0.38 31.4	5⅛ 130	7⅝ 194	1¾ 44	2	½ x 3 M12 x 76	80 110	100 150	3.1 1.4
4¼ O.D. 108.0	4.250 108.0	600 41.4	8,512 37.86	0 - ¼ 0 - 6.4	3° 22'	0.70 58.7	5½ 140	7¾ 197	2 51	2	½ x 3 M12 x 76	80 110	100 150	4.0 1.8
4 100	4.500 114.3	600 41.4	9,543 42.45	0 - ¼ 0 - 6.4	3° 11'	0.67 55.5	5⅞ 149	8⅛ 206	2 51	2	½ x 3 M12 x 76	80 110	100 150	4.6 2.1

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FIG. 7000, CONT'D.

LIGHTWEIGHT FLEXIBLE COUPLING

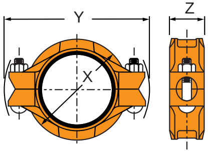

FIGURE 7000 COUPLING (CONTINUED FROM PREVIOUS PAGE)

Nom. Size	O.D.	Max. Working Pressure	Max. End Load	Range of Pipe End Separation	Deflection from ℄		Coupling Dimensions			Coupling Bolts		Specified Torque §		Approx. Wt. Ea.
					Per Coupling	Per in./ft.	X	Y	Z	Qty.	Size	Min.	Max.	
In./ DN(mm)	In./mm	PSI/bar	Lbs./kN	In./mm	Degrees	mm/m	In./mm	In./mm	In./mm		In./mm	Ft.-Lbs./N-M		Lbs./Kg
5¼ O.D. 133.0	5.236 133.0	500 34.5	10,766 47.89	0 -¼ 0 - 6.4	2° 44'	0.57 47.7	6½ 165	9⅛ 232	2 51	2	⅝ x 3½ M16 x 85	100 135	130 175	5.7 2.6
5½ O.D. 139.7	5.500 139.7	500 34.5	11,879 52.84	0 -¼ 0 - 6.4	2° 36'	0.54 45.4	6¾ 171	9⅜ 238	2 51	2	⅝ x 3½ M16 x 85	100 135	130 175	6 2.7
5 125	5.563 141.3	500 34.5	12,153 54.06	0 -¼ 0 - 6.4	2° 35'	0.54 45.1	7 178	9⅝ 244	2 51	2	⅝ x 3½ M16 x 85	100 135	130 175	6.1 2.8
6¼ O.D. 159.0	6.259 159.0	500 34.5	15,384 68.43	0 -¼ 0 - 6.4	2° 17'	0.48 39.8	7½ 191	10⅜ 264	2 51	2	⅝ x 3½ M16 x 85	100 135	130 175	6.7 3.0
6½ O.D. 165.1	6.500 165.1	500 34.5	16,592 73.80	0 -¼ 0 - 6.4	2° 12'	0.46 34.8	7¾ 197	10¾ 273	2 51	2	⅝ x 3½ M16 x 85	100 135	130 175	7.0 3.2
6 150	6.625 168.3	500 34.5	17,236 76.67	0 -¼ 0 - 6.4	2° 10'	0.45 37.8	8 203	11 279	2 51	2	⅝ x 3½ M16 x 85	100 135	130 175	8.1 3.7
8 200	8.625 219.1	500 34.5	29,213 129.95	0 -¼ 0 - 6.4	1° 40'	0.35 29.1	10 264	13¼ 337	2⅜ 60	2	¾ x 4½ M20 x 110	130 175	180 245	14.2 6.4

For additional details see "Coupling Data Chart Notes" on page 264.

§ – For additional Bolt Torque information on page 202.

Not for use in copper systems.

See Installation & Assembly directions on page 156-157.

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FIG. 7400

RIGIDLITE® COUPLING

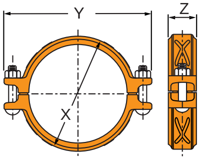


FIGURE 7400 RIGIDLITE® COUPLING (CONTINUED ON NEXT PAGE)

Nominal Size	O.D.	Max. Wk. Pressure	Max. End Load	Range of Pipe End Separation	Coupling Dimensions			Coupling Bolts		Specified Torque §		Approx. Wt. Ea.
					X	Y	Z	Qty.	Size	Min.	Max.	
In./ DN(mm)	*In./mm*	*PSI/bar*	*Lbs./kN*	*In./mm*	*In./mm*	*In./mm*	*In./mm*		*In./mm*	*Ft.-Lbs./N-M*		*Lbs./Kg*
1 *25*	1.315 *33.4*	300 *20.7*	407 *1.81*	0 -⅛ *0 - 3.2*	2¼ *57*	4½ *114*	1¾ *44*	2	⅜ x 2¼ *M10 x 57*	30 *40*	45 *60*	1.2 *0.5*
1¼ *32*	1.660 *42.2*	300 *20.7*	649 *2.89*	0 -⅛ *0 - 3.2*	2⅝ *67*	4¾ *121*	1¾ *44*	2	⅜ x 2¼ *M10 x 57*	30 *40*	45 *60*	1.3 *0.6*
1½ *40*	1.900 *48.3*	300 *20.7*	851 *3.78*	0 -⅛ *0 - 3.2*	2⅞ *73*	4⅞ *124*	1¾ *44*	2	⅜ x 2¼ *M10 x 57*	30 *40*	45 *60*	1.4 *0.6*
2 *50*	2.375 *60.3*	300 *20.7*	1,329 *5.91*	0 -⅛ *0 - 3.2*	3¼ *83*	5½ *140*	1¾ *44*	2	⅜ x 2¼ *M10 x 57*	30 *40*	45 *60*	1.6 *0.7*
2½ *65*	2.875 *73.0*	300 *20.7*	1,948 *8.66*	0 -⅛ *0 - 3.2*	3⅞ *98*	6 *152*	1¾ *44*	2	⅜ x 2¼ *M10 x 57*	30 *40*	45 *60*	1.9 *0.9*
3 O.D. 76.1	*2.996* 76.1	*300* 20.7	*2,115* 9.41	*0 -⅛* 0 - 3.2	*4* 102	*5⅞* 149	*1¾* 44	*2*	*⅜ x 2¼* M10 x 57	*30* 40	*45* 60	*1.9* 0.9
3 *80*	3.500 *88.9*	300 *20.7*	2,886 *12.84*	0 -⅛ *0 - 3.2*	4½ *114*	6¾ *171*	1¾ *44*	2	⅜ x 2¾ *M10 x 70*	30 *40*	45 *60*	2.1 *1.0*
4 *100*	4.500 *114.3*	300 *20.7*	4,771 *21.22*	0 -¼ *0 - 6.4*	5⅝ *143*	7¾ *197*	1⅞ *48*	2	⅜ x 2¾ *M10 x 70*	30 *40*	45 *60*	3.1 *1.4*

FIG. 7400, CONT'D.

RIGIDLITE® COUPLING

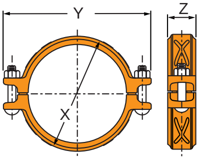


FIGURE 7400 RIGIDLITE® COUPLING (CONTINUED FROM PREVIOUS PAGE).

Nominal Size	O.D.	Max. Wk. Pressure	Max. End Load	Range of Pipe End Separation	Coupling Dimensions			Coupling Bolts		Specified Torque §		Approx. Wt. Ea.
					X	Y	Z	Qty.	Size	Min.	Max.	
In./ DN(mm)	In./mm	PSI/bar	Lbs./kN	In./mm	In./mm	In./mm	In./mm		In./mm	Ft.-Lbs./N-M		Lbs./Kg
5½ O.D. 139.7	5.500 139.7	300 20.7	7,127 31.70	0 -¼ 0 - 6.4	6¾ 171	9¼ 235	2 51	2	½ x 3 M12 x 76	80 110	100 150	4.5 2.0
5 125	5.563 141.3	300 20.7	7,292 32.44	0 -¼ 0 - 6.4	6⅞ 175	9¼ 235	2 51	2	½ x 3 M12 x 76	80 110	100 150	4.6 2.1
6½ O.D. 165.1	6.500 165.1	300 20.7	9,955 44.28	0 -¼ 0 - 6.4	7¾ 200	10⅜ 264	2 51	2	½ x 3 M12 x 76	80 110	100 150	5.5 2.5
6 150	6.625 168.3	300 20.7	10,341 46.00	0 -¼ 0 - 6.4	7⅞ 200	10⅜ 264	2 51	2	½ x 3 M12 x 76	80 110	100 150	5.5 2.5
8 200	8.625 219.1	300 20.7	17,528 77.97	0 -⅛ 0 - 3.2	10¼ 260	12¾ 324	2⅜ 60	2	½ x 3 M12 x 76	80 110	100 150	8.4 3.8

For additional details see "Coupling Data Chart Notes" on page 264.

§ – For additional Bolt Torque information on page 202.

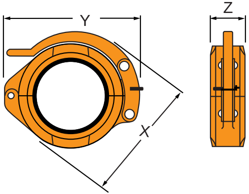
Not for use in copper systems.

See Installation & Assembly directions on pages 158-159.

Other sizes available, contact a Anvil Representative for more information.

FIG. 7003

HINGELOK® COUPLING



SPECIAL NOTE:
Fig. 7003 Hingelok Couplings are not designed for eccentric loading and therefore are not recommended for use at the end of concrete pumping booms or vertical risers above 30 feet (9.1 meters). Shockload must be considered and is to be included in the maximum working pressure listed above. Coupling keys, gasket cavity, and pipe grooves must be kept free of all foreign matter. Proper anchoring practice must always be exercised.

FIGURE 7003 HINGELOK COUPLING

Nominal Size	O.D.	Max. Wk. Pressure	Max. End Load	Range of Pipe End Separation	Deflection from ℄		Coupling Dimensions			Approx. Wt. Ea.
					Per Coupling	Per in./ft.	X	Y	Z	
In./DN(mm)	*In./mm*	*PSI/bar*	*Lbs./kN*	*In./mm*	*Degrees*	*mm/m*	*In./mm*	*In./mm*	*In./mm*	*Lbs./Kg*
1½ *40*	1.900 *48.3*	300 *20.7*	851 *3.78*	0 -⅛ *0 - 3.2*	3° 46'	0.79 *65.7*	3⅝ *92*	4¼ *108*	1⅞ *48*	1.7 *0.8*
2 *50*	2.375 *60.3*	300 *20.7*	1,329 *5.91*	0 -⅛ *0 - 3.2*	3° 1'	0.63 *52.6*	4¼ *108*	4⅞ *124*	1⅞ *48*	2.2 *1.0*
2½ *65*	2.875 *73.0*	300 *20.7*	1,948 *8.66*	0 -⅛ *0 - 3.2*	2° 29'	0.52 *43.3*	5¼ *133*	5⅞ *149*	1⅞ *48*	3.2 *1.5*
3 *80*	3.500 *88.9*	300 *20.7*	2,886 *12.84*	0 -⅛ *0 - 3.2*	2° 3'	0.43 *35.8*	5⅝ *143*	6½ *165*	1⅞ *48*	3.6 *1.6*
4 *100*	4.500 *114.3*	300 *20.7*	4,771 *21.22*	0 -¼ *0 - 6.4*	3° 11'	0.67 *55.5*	7 *178*	7¾ *197*	2 *51*	5.1 *2.3*
5 *125*	5.563 *141.3*	300 *20.7*	7,292 *32.44*	0 -¼ *0 - 6.4*	2° 35'	0.54 *45.1*	8⅝ *219*	9½ *241*	2⅛ *54*	9.5 *4.3*
6 *150*	6.625 *168.3*	300 *20.7*	10,341 *46.00*	0 -¼ *0 - 6.4*	2° 10'	0.45 *37.8*	9⅞ *251*	10⅞ *276*	2⅛ *54*	11.2 *5.1*
8 *200*	8.625 *219.1*	300 *20.7*	17,528 *77.97*	0 -¼ *0 - 6.4*	1° 40'	0.35 *29.1*	12 *305*	13⅛ *333*	2½ *64*	18.1 *8.2*

For additional details see "Coupling Data Chart Notes" on page 264.

Not for use in copper systems.

See Installation & Assembly directions on pages 160-161

CAUTION: Hammering or banging on the handle or coupling housing could cause serious damage to the locking device and coupling assembly. The result may be an unsuitable pipe joint and unusable coupling assembly. When re-using, always check for gasket damage, housing hinge and handle for looseness, distortion bent or any other damage.

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Fig. 7010

Reducing Coupling

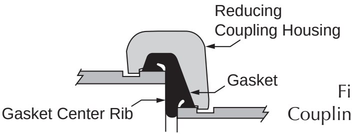

Fig. 7010
Coupling with Gasket

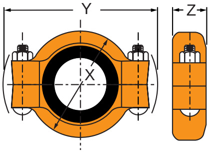

Figure 7010 Reducing Coupling (continued on next page)															
Nominal Size	Larger O.D.	Smaller O.D.	Max. Working Pressure	Max. End Load	Range of Pipe End Separation	Deflection from ℄		Coupling Dimensions			Coupling Bolts		Specified		Approx. Wt. Ea.
						Per Coupling	Per in./ft.	X	Y	Z	Qty.	Size	Min.	Max.	
In./DN(mm)	*In./mm*	*In./mm*	*PSI/bar*	*Lbs./kN*	*In./mm*	*Degrees*	*mm/m*	*In./mm*	*In./mm*	*In./mm*		*In./mm*	*Ft.-Lbs./N-M*		*Lbs./Kg*
2 x 1½ *50 x 40*	2.375 *60.3*	1.900 *48.3*	500 *34.5*	2,215 *9.85*	0 -⅛ *0 - 3.2*	1° 53'	0.39 *32.9*	3⅝ *92*	5⅞ *149*	1⅞ *48*	2	½ x 2¾ *M12 x 70*	80 *110*	100 *150*	2.0 *0.9*
2½ x 2 *65 x 50*	2.875 *73.0*	2.375 *60.3*	500 *34.5*	3,246 *14.44*	0 -⅛ *0 - 3.2*	1° 33'	0.32 *27.0*	4¼ *108*	6⅜ *162*	1⅞ *48*	2	½ x 2¾ *M12 x 70*	80 *110*	100 *150*	3.5 *1.6*
3 x 2 *80 x 50*	3.500 *88.9*	2.375 *60.3*	500 *34.5*	4,811 *21.40*	0 -⅛ *0 - 3.2*	1° 17'	0.27 *22.4*	4⅞ *124*	7⅛ *181*	1⅞ *48*	2	½ x 2¾ *M12 x 70*	80 *110*	100 *150*	4.4 *2.0*
3 x 2½ *80 x 65*	3.500 *88.9*	2.875 *73.0*	500 *34.5*	4,811 *21.40*	0 -⅛ *0 - 3.2*	1° 17'	0.27 *22.4*	4⅞ *124*	7⅛ *181*	1⅞ *48*	2	½ x 2¾ *M12 x 70*	80 *110*	100 *150*	4.1 *1.9*
4 x 2 *100 x 50*	4.500 *114.3*	2.375 *60.3*	500 *34.5*	7,952 *35.37*	0 -³⁄₁₆ *0 - 4.8*	2° 38'	0.55 *45.9*	6¼ *159*	8⅞ *225*	2 *51*	2	⅝ x 3½ *M16 x 85*	100 *135*	130 *175*	8.9 *4.0*
4 x 2½ *100 x 65*	4.500 *114.3*	2.875 *73.0*	500 *34.5*	7,952 *35.37*	0 -³⁄₁₆ *0 - 4.8*	2° 38'	0.55 *45.9*	6¼ *159*	8⅞ *225*	2 *51*	2	⅝ x 3½ *M16 x 85*	100 *135*	130 *175*	7.9 *3.6*
4 x 3 *100 x 80*	4.500 *114.3*	3.500 *88.9*	500 *34.5*	7,952 *35.37*	0 -³⁄₁₆ *0 - 4.8*	2° 38'	0.55 *45.9*	6¼ *159*	8⅞ *225*	2 *51*	2	⅝ x 3½ *M16 x 85*	100 *135*	130 *175*	6.7 *3.0*

For Gruvlok Technical Detail Refer to the Gruvlok Catalog or contact your Anvil local sales representative.

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FIG. 7010, CONT'D.

REDUCING COUPLING

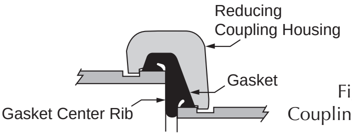

Fig. 7010
Coupling with Gasket

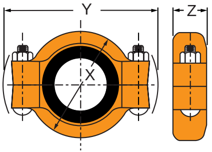

FIGURE 7010 REDUCING COUPLING (CONTINUED FROM PREVIOUS PAGE)

Nominal Size	Larger O.D.	Smaller O.D.	Max. Working Pressure	Max. End Load	Range of Pipe End Separation	Deflection from ℄		Coupling Dimensions			Coupling Bolts		Specified Torque §		Approx. Wt. Ea.
						Per Coupling	Per in./ft.	X	Y	Z	Qty.	Size	Min.	Max.	
In./DN(mm)	*In./mm*	*In./mm*	*PSI/bar*	*Lbs./kN*	*In./mm*	*Degrees*	*mm/m*	*In./mm*	*In./mm*	*In./mm*		*In./mm*	*Ft.-Lbs./N-M*		*Lbs./Kg*
5 x 4 *125 x 100*	5.563 *141.3*	4.500 *114.3*	500 *34.5*	12,153 *54.06*	0 -¼ *0 - 6.4*	2° 5'	0.44 *36.4*	7¼ *184*	10⅝ *270*	2⅛ *54*	2	¾ x 4½ *M20 x 110*	130 *175*	180 *245*	11.4 *5.2*
6 x 4 *150 x 100*	6.625 *168.3*	4.500 *114.3*	500 *34.5*	17,236 *76.67*	0 -¼ *0 - 6.4*	1° 44'	0.36 *30.2*	8¼ *210*	11⅝ *295*	2⅛ *54*	2	¾ x 4½ *M20 x 110*	130 *175*	180 *245*	13.4 *6.1*
6 x 5 *150 x 125*	6.625 *168.3*	5.562 *141.3*	500 *34.5*	17,236 *76.67*	0 -¼ *0 - 6.4*	1° 44'	0.36 *30.2*	8½ *216*	11⅝ *295*	2⅛ *54*	2	¾ x 4½ *M20 x 110*	130 *175*	180 *245*	13.5 *6.1*
8 x 6 *200 x 150*	8.625 *219.1*	6.625 *168.3*	500 *34.5*	29,213 *129.95*	0 -¼ *0 - 6.4*	1° 15'	0.26 *21.8*	10½ *267*	14 *356*	2¼ *57*	2	¾ x 4½ *M20 x 110*	130 *175*	180 *245*	17.7 *8.0*

For additional details see "Coupling Data Chart Notes" on page 264.

§ – For additional Bolt Torque information on page 202.

Not for use in copper systems.

See Installation & Assembly directions on pages 162-163.

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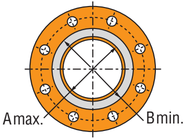
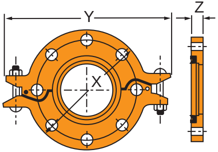
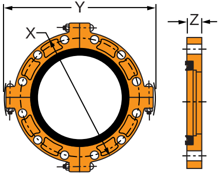
FIG. 7012

GRUVLOK FLANGES





2"-12" sizes



14"-24" sizes

GRUVLOK FIGURE 7012 FLANGE: (CONTINUED ON NEXT PAGE)

Nominal Size	O.D.	Max. Working Pressure▼	Max. End Load▼	Latch Bolt			Dimensions			Sealing Surface		Mating Flange Bolts				Approx. Wt. Ea.
				Latch* Bolt Size	Specified Torque §							Mating Flange Bolts		Specified Torque §		
					Min.	Max.	X	Y	Z	A Max.	B Min.	Qty. ANSI	Size (ANSI)	Min.	Max.	
In./DN(mm)	In./mm	PSI/bar	Lbs./kN	In./mm	Ft.-Lbs/N-M		In./mm	In./mm	In./mm	In./mm	In./mm	PN10 (16)	in. (ISO) mm	Ft.-Lbs/N-M		Lbs./Kg
2 *50*	2.375 *60.3*	300 *20.7*	1,329 *5.91*	⅜ x 2¾ *M10 x 70*	30 *40*	45 *60*	6¼ *159*	8⅜ *213*	¾ *19*	2⅜ *60*	3 7/16 *87*	4 *4*	⅝ x 2¾ *M16 x 70*	110 *149*	140 *190*	4.2 *1.9*
2½ *65*	2.875 *73.0*	300 *20.7*	1,948 *8.66*	⅜ x 2¾ *M10 x 70*	30 *40*	45 *60*	7 *178*	9½ *241*	¾ *19*	2⅞ *73*	4 *102*	4 *-*	⅝ x 2¾ *M16 x 70*	110 *149*	140 *190*	4.6 *2.1*
3 O.D. 76.1	*2.996* 76.1	*300* 20.7	*2,115* 9.41	*-* M10 x 70	*30* 40	*45* 60	*7¼* 184	*9¾* 248	*¾* 19	*3* 76	*4⅛* 105	*-* 4	*-* M16 x 70	*110* 149	*140* 190	*4.8* 2.2
3 *88.9*	3.500 *88.9*	300 *20.7*	2,886 *12.84*	⅜ x 2¾ *M10 x 70*	30 *40*	45 *60*	7⅞ *200*	10½ *267*	¾ *19*	3½ *89*	4 9/16 *116*	4 *8*	⅝ x 2¾ *M16 x 70*	110 *149*	140 *190*	6.0 *2.7*
4 *100*	4.500 *114.3*	300 *20.7*	4,771 *21.22*	⅜ x 2¾ *M10 x 70*	30 *40*	45 *60*	9 *229*	11½ *292*	¾ *19*	4½ *114*	5 9/16 *141*	8 *8*	⅝ x 2¾ *M16 x 70*	110 *149*	140 *190*	6.3 *2.9*
5½ O.D. 139.7	*5.500* 139.7	*300* 20.7	*7,127* 31.70	*-* M10 x 70	*30* 40	*45* 60	*9⅞* 251	*12⅞* 327	*⅞* 22	*5 9/16* 141	*6¾* 171	*-* 8	*-* M16 x 75	*220* 298	*250* 339	*15.6* 7.1

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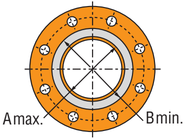
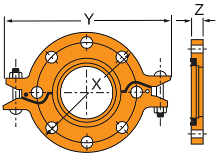
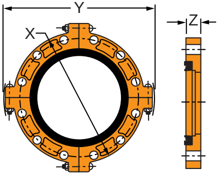
FIG. 7012, CONT'D

GRUVLOK FLANGES





2"-12" sizes



14"-24" sizes

GRUVLOK FIGURE 7012 FLANGE: (CONTINUED FROM PREVIOUS PAGE)

Nominal Size	O.D.	Max. Working Pressure▼	Max. End Load▼	Latch Bolt			Dimensions			Sealing Surface		Mating Flange Bolts				Approx. Wt. Ea.
				Latch* Bolt Size	Specified Torque §							Mating Flange Bolts		Specified Torque §		
					Min.	Max.	X	Y	Z	A Max.	B Min.	Qty. ANSI	Size (ANSI)	Min.	Max.	
In./DN(mm)	In./mm	PSI/bar	Lbs./kN	In./mm	Ft.-Lbs/N-M		In./mm	In./mm	In./mm	In./mm	In./mm	PN10 (16)	in. (ISO) mm	Ft.-Lbs/N-M		Lbs./Kg
5 125	5.563 141.3	300 20.7	7,292 32.44	3/8 x 2 3/4 M10 x 70	30 40	45 60	10 254	12 1/2 318	7/8 22	5 9/16 141	6 3/4 171	8 -	3/4 x 2 7/8 -	220 298	250 339	8.8 4.0
6 1/2 O.D. 165.1	6.500 165.1	300 20.7	9,955 44.28	- M10 x 70	30 40	45 60	11 1/4 286	14 356	7/8 22	6 5/8 168	7 13/16 198	- 8	- M20 x 80	220 298	250 339	9.7 4.4
6 150	6.625 168.3	300 20.7	10,341 46.00	3/8 x 2 3/4 M10 x 70	30 40	45 60	11 279	14 356	7/8 22	6 5/8 168	7 13/16 198	8 8	3/4 x 3 1/8 M20 x 80	220 298	250 339	9.6 4.4
8 200	8.625 219.1	300 20.7	17,528 77.97	3/8 x 2 3/4 M10 x 70	30 40	45 60	13 1/2 343	16 1/2 419	1 25	8 5/8 219	10 254	8 8 (12)	3/4 x 3 1/4 M20 x 80	220 298	250 339	15.6 7.1
10 250	10.750 273.1	300 20.7	27,229 121.12	3/8 x 2 3/4 M10 x 70	30 40	45 60	16 406	19 483	1 25	10 3/4 273	12 1/8 308	12 12	7/8 x 3 1/2 M20 x 90	320 439	400 542	18.2 8.3
12 300	12.750 323.9	300 20.7	38,303 170.38	3/8 x 2 3/4 M10 x 70	30 40	45 60	19 483	21 3/4 552	1 1/4 32	12 3/4 324	14 1/8 359	12 12	7/8 x 3 3/4 -	320 439	400 542	29.9 13.6

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FIG. 7012, CONT'D.

GRUVLOK FLANGES

GRUVLOK FIGURE 7012 FLANGE: (CONTINUED FROM PREVIOUS PAGE).

Nominal Size	O.D.	Max. Working Pressure▼	Max. End Load▼	Latch Bolt			Dimensions			Sealing Surface		Mating Flange Bolts				Approx. Wt. Ea.
				Latch* Bolt Size	Specified Torque §							Mating Flange Bolts		Specified Torque §		
					Min.	Max.	X	Y	Z	A Max.	B Min.	Qty. ANSI	Size (ANSI)	Min.	Max.	
In./DN(mm)	In./mm	PSI/bar	Lbs./kN	In./mm	Ft.-Lbs/N-M		In./mm	In./mm	In./mm	In./mm	In./mm	PN10 (16)	in. (ISO) mm	Ft.-Lbs/N-M		Lbs./Kg
12 (PN) 300	12.750 323.9	300 20.7	38,303 170.38	- M10 x 70	40 30	60 45	18⅛ 460	21¼ 540	1 25	12¾ 324	14⅛ 359	12 12	- M20 x 90 ✛	320 439	400 542	20.9 9.5
14 350	14.000 355.6	300 20.7	46,181 205.43	⅝ x 4¼ -	100 136	130 176	21 533	24 610	1½ 38	14 356	16 406	12 -	1 x 4¼ -	360 488	520 705	52.5 23.8
16 400	16.000 406.4	300 20.7	60,319 268.31	⅝ x 4¼ -	100 136	130 176	23½ 597	26½ 673	1½ 38	16 406	18 457	16 -	1 x 4¼ -	360 488	520 705	67.0 30.4
18 450	18.000 457.2	300 20.7	76,341 339.58	¾ x 5 -	130 176	180 244	25 635	29 737	1⅝ 41	18 457	20 508	16 -	1⅛ x 4¾ –	450 610	725 983	82.5 37.4
20 500	20.000 508.0	300 20.7	94,248 419.23	¾ x 5 -	130 176	180 244	27½ 699	31½ 800	1¾ 44	20 508	22 559	20 -	1⅛ x 4¾ –	450 610	725 983	106.5 48.3
24 600	24.000 609.6	250 17.2	113,097 503.08	⅞ x 5½ -	180 244	220 298	32 813	36½ 927	1⅞ 48	24 610	26 660	20 -	1¼ x 5½ -	620 841	1,000 1,356	138.5 62.8

✛ PN 16 uses M24 x 90 (PN) Dimensions for bolt circle PN 10 & 16 Flange.

* Available in ANSI or metric bolt sizes only as indicated.

▼ Based on use with standard wall pipe.

§ – For additional Bolt Torque information, see page 202

The Gruvlok Flange bolt hole pattern conforms to ANSI Class 150 & Class 125 flanges.

To avoid interference issues, flanges cannot be assembled directly to Series 7700 butterfly valve. Flange can be assembled to one side of series 7500 and 7600 valve only.

Mating flange bolts must be at least Intermediate Strength Bolting per ASME B16.5. Bolts with material properties equal or greater than SAE J429 Grade 5 are acceptable.

Refer to Gruvlok Products Catalog or Anvil's web site for more information on installing this flange.

See Installation & Assembly directions on pages 164-169.

For additional details see "Coupling Data Chart notes" on page 264.

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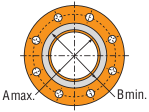
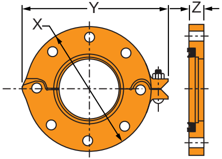
FIG. 7013

GRUVLOK FLANGES
(#300 FLANGE)





GRUVLOK FIGURE 7013 FLANGE

Nominal Size	O.D.	Max. Wk. Pressure	Max. End Load	Latch* Bolt Size	Specified Torque §		Dimensions			Sealing Surface		Mating Flange Bolts		Approx. Wt. Ea.
					Min.	Max.	X	Y	Z	A Max.	B Min.	Qty. ANSI	Size (ANSI) in.	
In./DN(mm)	In./mm	PSI/bar	Lbs./kN	In.	Ft.-Lbs/N-M		In./mm	In./mm	In./mm	In./mm	In./mm		(ISO) mm	Lbs./Kg
2 50	2.375 60.3	750 51.7	3,323 14.78	⅜ x 2½ -	30	45	6½ 165	8 203	1 25	2⅜ 60	3⁷⁄₁₆ 87	8 -	⅝ x 3 -	5.0 2.3
2½ 65	2.875 73.0	750 51.7	4,869 21.66	⅜ x 2½ -	30	45	7½ 191	9⅛ 232	1 25	2⅞ 73	4 102	8 -	¾ x 3¼ -	6.9 3.1
3 80	3.500 88.9	750 51.7	7,216 32.10	⅜ x 2½ -	30	45	8¼ 210	9⅞ 251	1⅛ 29	3½ 89	4⁹⁄₁₆ 116	8 -	¾ x 3½ -	9.4 4.3
4 100	4.500 114.3	750 51.7	11,928 53.06	⅜ x 2½ -	30	45	10 254	11⅜ 289	1¼ 32	4½ 114	5⅝ 143	8 -	¾ x 3¾ -	14.4 6.5
5 125	5.563 141.3	750 51.7	18,229 81.09	⅜ x 2½ -	30	45	11 279	12⅝ 321	1⅜ 35	5⁹⁄₁₆ 141	6¾ 171	8 -	¾ x 4½ -	18.3 8.3
6 150	6.625 168.3	750 51.7	25,854 115.00	⅜ x 2½ -	30	45	12½ 318	14⅛ 359	1½ 38	6⅝ 168	7¹³⁄₁₆ 198	12 -	¾ x 4½ -	24.9 11.3
8 200	8.625 219.1	750 51.7	43,820 194.92	½ x 3½ -	80	100	15 381	16⅞ 429	1⅝ 41	8⅝ 219	10 254	12 -	⅞ x 4¾ -	35.4 16.1
10 250	10.750 273.1	750 51.7	68,072 302.80	½ x 3½ -	80	100	17½ 445	19⅜ 492	1⅞ 48	10¾ 273	12⅛ 308	16 -	1 x 5 -	54.0 24.5
12 300	12.750 323.9	750 51.7	95,757 425.95	½ x 3½ -	80	100	20½ 521	22½ 572	2 51	12¾ 324	14³⁄₁₆ 360	16 -	1⅛ x 5¾ -	74.8 33.9

* Available in ANSI or metric bolt sizes only as indicated.

Effective sealing area of mating flange must be free from gouges, undulations or deformities of any type to ensure proper sealing of the gasket.

Not for use with copper systems.

▼ Based on use with standard wall pipe.

Flange cannot be assembled directly to Series 7700 butterfly valve. Flange can be assembled to one side of series 7500 & 7600 valve.

For Bolt Torque information, see page 202

For additional details see "Coupling Data Chart notes" on page 264.

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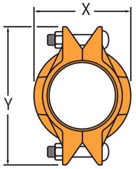
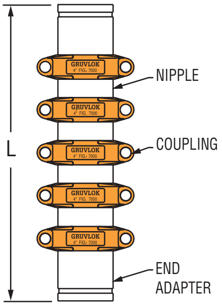
Fig. 7240

Expansion Joints





7240 Performance Data

Nominal Size	O.D.	Coupling Figure	X	Y	Compressed Length L	Expanded Length L	Coupling Movement Capability	Number of Couplings	Total Movement Capability
In./DN(mm)	*In./mm*		*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*		*In./mm*
2 *50*	2.375 *60.3*	7000	3½ *89*	5½ *125*	30 *450*	31¼ *794*	⅛ *3.2*	10	1¼ *31.8*
2½ *65*	2.875 *73.0*	7000	4 *100*	5¾ *146*	30 *450*	31¼ *794*	⅛ *3.2*	10	1¼ *31.8*
3 *80*	3.500 *88.9*	7000	4⅝ *117*	6¾ *171*	30 *450*	31¼ *794*	⅛ *3.2*	10	1¼ *31.8*
4 *100*	4.500 *114.3*	7000	5⅞ *149*	8⅛ *206*	17½ *445*	18¾ *476*	¼ *6.4*	5	1¼ *31.8*
5 *125*	5.562 *141.3*	7000	7 *178*	9⅝ *244*	19 *483*	20¼ *514*	¼ *6.4*	5	1¼ *31.8*
6 *150*	6.625 *168.3*	7000	8 *200*	11 *279*	19 *483*	20¼ *514*	¼ *6.4*	5	1¼ *31.8*
8 *200*	8.625 *219.0*	7000	10⅜ *264*	13¼ *337*	22½ *572*	23¾ *603*	¼ *6.4*	5	1¼ *31.8*
10 *250*	10.750 *273.1*	7001	12⅞ *327*	17½ *445*	23½ *597*	24¾ *629*	¼ *6.4*	5	1¼ *31.8*
12 *300*	12.750 *323.9*	7001	15 *381*	19½ *495*	23½ *597*	24¾ *629*	¼ *6.4*	5	1¼ *31.8*

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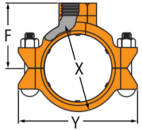
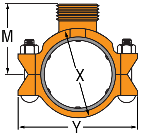
FIG. 7042

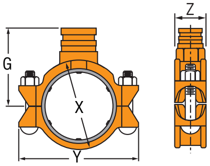
OUTLET COUPLING



Female IPS Outlet- 7042F



Male IPS Outlet - 7042M



Grooved Outlet - 7042G

FIGURE 7042 - OUTLET COUPLING (CONTINUED ON NEXT PAGE)

Nominal Pipe Size			Working Pressure	Max. Run End Load	Range of Pipe End Separation	Coupling Dimensions						Bolt Size	Approx. Wt. Each
Run	Outlet												
	FPT F	MPT/Grv. M/G				X	Y	Z	FPT F	MPT M	Grv. G		
In./DN(mm)	In./mm	In./mm	psi/bar	Lbs./kN	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	Lbs./Kg
1½ 40	½ 15	— —	500 34.5	1418 6.31	¾-1 1/16 19-27	2 15/16 75	4¾ 121	2¾ 70	2 1/16 52	2½ 64	— —	⅜ x 2⅛	2.6 1.2
	¾ 20	— —	500 34.5	1418 6.31	¾-1 1/16 19-27	2 15/16 75	4¾ 121	2¾ 70	2 1/16 52	2½ 64	— —	⅜ x 2⅛	2.6 1.2
	1 25	— —	5 00 34.5	1418 6.31	¾-1 1/16 19-27	2 15/16 75	4¾ 121	2¾ 70	1 15/16 49	2½ 64	— —	⅜ x 2⅛	2.6 1.2
2 50	½ 15	— —	500 34.5	2215 9.85	11/16-1 17-25	3 7/16 87	5¼ 133	2¾ 70	2 5/16 59	2⅞ 73	— —	⅜ x 2⅛	3.3 1.5
	¾ 20	— —	500 34.5	2215 9.85	11/16-1 17-25	3 7/16 87	5¼ 133	2¾ 70	2 5/16 59	2⅞ 73	— —	⅜ x 2⅛	3.3 1.5
	1 25	1 25	500 34.5	2215 9.85	11/16-1 17-25	3 7/16 87	5¼ 133	2¾ 70	2 3/16 56	2⅞ 73	3½ 89	⅜ x 2⅛	3.3 1.5
2½ 65	½ 15	— —	500 34.5	3246 14.44	1 3/16-1½ 30-38	4 3/16 106	6½ 165	3¼ 83	2 9/16 65	3⅛ 79	— —	½ x 2⅜	4.8 2.2
	¾ 20	— —	500 34.5	3246 14.44	1 3/16-1½ 30-38	4 3/16 106	6½ 165	3¼ 83	2 9/16 65	3⅛ 79	— —	½ x 2⅜	4.8 2.2
	1 25	— —	500 34.5	3246 14.44	1 3/16-1½ 30-38	4 3/16 106	6½ 165	3¼ 83	2 7/16 62	3⅛ 79	— —	½ x 2⅜	4.8 2.2
	— —	1¼ 32	500 34.5	3246 14.44	1 3/16-1½ 30-38	4 3/16 106	6½ 165	3¼ 83	— —	— —	3⅝ 92	½ x 2⅜	5.5 2.5

See Installation & Assembly directions on pages 170-171.

For additional details see "Coupling Data Chart notes" on page 264.

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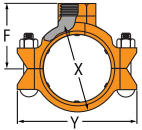
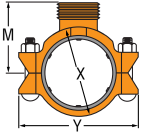
Fig. 7042, cont'd.

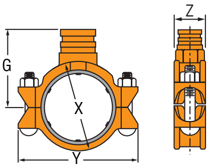
Outlet Coupling



Female IPS Outlet- 7042F



Male IPS Outlet - 7042M



Grooved Outlet - 7042G

Figure 7042 - Outlet Coupling (continued from previous page).

Nominal Pipe Size			Working Pressure	Max. Run End Load	Range of Pipe End Separation	Coupling Dimensions						Bolt Size	Approx. Wt. Each
Run	Outlet												
	FPT F	MPT/Grv. M/G				X	Y	Z	FPT F	MPT M	Grv. G		
In./DN(mm)	In./mm	In./mm	psi/bar	Lbs./kN	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	Lbs./Kg
3 80	¾ 20	— —	500 34.5	4811 21.40	1³⁄16-1½ 30-38	4¾ 121	7¼ 184	3¼ 83	2¹³⁄16 72	3⅜ 86	— —	½ x 3	7.9 3.6
	1 25	1 25	500 34.5	4811 21.40	1³⁄16-1½ 30-38	4¾ 121	7¼ 184	3¼ 83	2¾ 70	3⅜ 86	4 102	½ x 3	7.9 3.6
	— —	1½ 40	500 34.5	4811 21.40	1³⁄16-1½ 30-38	4¾ 121	7¼ 184	3¼ 83	— —	— —	4 102	½ x 3	8.6 3.9
4 100	¾ 20	— —	500 34.5	7952 35.37	1⁹⁄16-1⅞ 40-48	6³⁄16 157	8⅞ 225	3⅝ 92	3¹¹⁄16 94	4¼ 108	— —	⅝ x 3½	9.9 4.5
	1 25	— —	500 34.5	7952 35.37	1⁹⁄16-1⅞ 40-48	6³⁄16 157	8⅞ 225	3⅝ 92	3⁹⁄16 91	4¼ 108	— —	⅝ x 3½	9.9 4.5
	— —	1½ 40	500 34.5	7952 35.37	1⁹⁄16-1⅞ 40-48	6³⁄16 157	8⅞ 225	3⅝ 92	— —	— —	4⅞ 124	⅝ x 3½	11.0 5.0
	— —	2 50	500 34.5	7952 35.37	1⁹⁄16-1⅞ 40-48	6³⁄16 157	8⅞ 225	3⅝ 92	— —	— —	4⅞ 124	⅝ x 3½	11.0 5.0
6 150	1 25	— —	500 34.5	17236 76.66	1⅝-1¹⁵⁄16 41-51	8⅛ 206	11¼ 286	3¾ 95	4¾ 121	5⅜ 137	— —	⅝ x 3½	18.0 8.2
	1½ 40	1½ 40	500 34.5	17236 76.66	1⅝-1¹⁵⁄16 41-51	8⅛ 206	11¼ 286	3¾ 95	4¾ 121	5⅜ 137	6 152	⅝ x 3½	18.0 8.2
	— —	2 50	500 34.5	17236 76.66	1⅝-1¹⁵⁄16 41-51	8⅛ 206	11¼ 286	3¾ 95	— —	— —	6 152	⅝ x 3½	18.7 8.5

Pipe ends must be prepared in accordance with Gruvlok "Roll or Cut Groove Specifications for Steel & Other IPS or ISO size Pipe". Pressure & end load ratings are for use with standard wall steel pipe.

For a one-time field test only, the maximum working pressure may be increased 1½ times the figure shown. Not for use in copper systems.

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FIG. 7045

CLAMP-T, FPT BRANCH

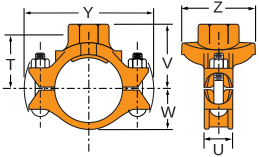

Fig. 7045

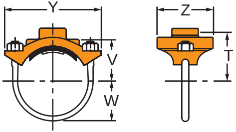

Fig. 7045 (U-Bolt)

FIGURE 7045-FPT BRANCH (CONTINUED ON NEXT PAGE)

Nominal Size	O.D.	Hole Dimensions		Max. Working Pressure▼	Clamp-T Dimensions						Bolt Size	Specified Torque §		Approx. Wt. Each
		Min. Dia.	Max. Dia.		T	U	V Threaded	W	Y	Z		Min.	Max.	
In./DN(mm)	*In./mm*	*In./mm*	*In./mm*	*psi/bar*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*Ft.-Lbs./N-M*		*Lbs./Kg*
2 x ½ *50 x 15*	2.375 x 0.840 *60.3 x 21.3*	1½ *38*	1⅝ *41*	500 *34.5*	2³⁄₁₆ *56*	⁹⁄₁₆ *14*	2⅝ *67*	½ *12*	5½ *140*	3 *76*	½ U-Bolt -	30	40	2.3 *1.0*
2 x ¾ *50 x 20*	2.375 x 1.050 *60.3 x 26.7*	1½ *38*	1⅝ *41*	500 *34.5*	2¹⁄₁₆ *52*	⁹⁄₁₆ *14*	2⅝ *67*	1½ *38*	5½ *140*	3 *76*	½ U-Bolt -	30	40	2.3 *1.0*
2 x 1 *50 x 25*	2.375 x 1.315 *60.3 x 33.7*	1½ *38*	1⅝ *41*	500 *34.5*	1¹⁵⁄₁₆ *51*	⁹⁄₁₆ *14*	2⅝ *67*	1½ *38*	5½ *140*	3 *76*	½ U-Bolt -	30	40	2.6 *1.2*
2 x 1¼ *50 x 32*	2.375 x 1.660 *60.3 x 42.4*	2 *51*	2⅛ *54*	500 *34.5*	2³⁄₁₆ *55*	⁹⁄₁₆ *14*	2⅞ *73*	1½ *38*	5½ *140*	3½ *89*	½ U-Bolt -	30	40	2.7 *1.2*
2 x 1½ *50 x 40*	2.375 x 1.900 *60.3 x 48.3*	2 *51*	2⅛ *54*	500 *34.5*	2³⁄₁₆ *55*	⁹⁄₁₆ *14*	2⅞ *73*	1½ *38*	7 *178*	3½ *89*	½ U-Bolt -	30	40	2.5 *1.1*
2½ x ½ *65 x 15*	2.875 x 0.840 *73.0 x 21.3*	1½ *38*	1⅝ *41*	500 *34.5*	2⁷⁄₁₆ *62*	⁹⁄₁₆ *14*	2⅞ *73*	1¾ *44*	5½ *140*	3 *76*	½ U-Bolt -	30	40	3.0 *1.4*
2½ x ¾ *65 x 20*	2.875 x 1.050 *73.0 x 26.7*	1½ *38*	1⅝ *41*	500 *34.5*	2⁵⁄₁₆ *59*	⁹⁄₁₆ *14*	2⅞ *73*	1¾ *44*	5½ *140*	3 *76*	½ U-Bolt -	30	40	2.9 *1.3*
2½ x 1 *65 x 25*	2.875 x 1.315 *73.0 x 33.7*	1½ *38*	1⅝ *41*	500 *34.5*	2³⁄₁₆ *55*	⁹⁄₁₆ *14*	2⅞ *73*	1¾ *44*	6⅛ *156*	3 *76*	½ U-Bolt -	30	40	2.9 *1.3*
2½ x 1¼ *65 x 32*	2.875 x 1.660 *73.0 x 42.4*	2 *51*	2⅛ *54*	500 *34.5*	2⁷⁄₁₆ *62*	⁹⁄₁₆ *14*	3⅛ *79*	1¾ *44*	6⅛ *156*	3⅜ *86*	½ U-Bolt -	30	40	3.4 *1.5*

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FIG. 7045, CONT'D.

CLAMP-T, FPT BRANCH

FIGURE 7045-FPT BRANCH (CONTINUED FROM PREVIOUS PAGE)

Nominal Size	O.D.	Hole Dimensions		Max. Working Pressure▼	Clamp-T Dimensions						Bolt Size	Specified Torque §		Approx. Wt. Each
		Min. Dia.	Max. Dia.		T	U	V Threaded	W	Y	Z		Min.	Max.	
In./DN(mm)	In./mm	In./mm	In./mm	psi/bar	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	Ft.-Lbs./N-M		Lbs./Kg
2½ x 1½ 65 x 40	2.875 x 1.900 73.0 x 48.3	2 51	2⅛ 54	500 34.5	2⁷⁄16 62	⁹⁄16 14	3⅛ 79	1¾ 44	6⅛ 156	3⅜ 86	½ U-Bolt -	30	40	3.4 1.5
3 x ½ 80 x 15	3.500 x 0.840 88.9 x 21.3	1½ 38	1⅝ 41	500 34.5	2⁹⁄16 65	⁹⁄16 14	3 76	2⅛ 54	7 178	3¾ 95	½ U-Bolt -	30	40	2.8 1.2
3 x ¾ 80 x 20	3.500 x 1.050 88.9 x 26.7	1½ 38	1⅝ 41	500 34.5	2⁷⁄16 62	⁹⁄16 14	3 76	2⅛ 54	7 178	3¾ 95	½ U-Bolt -	30	40	2.7 1.2
3 x 1 80 x 25	3.500 x 1.315 88.9 x 33.7	1½ 38	1⅝ 41	500 34.5	2⁵⁄16 59	⁹⁄16 14	3 76	2⅛ 54	7 178	3¾ 95	½ U-Bolt -	30	40	2.7 1.2
3 x 1¼ 80 x 32	3.500 x 1.660 88.9 x 42.4	2 51	2⅛ 54	500 34.5	2¹¹⁄16 68	1½ 38	3⅜ 86	2⅛ 54	6⅞ 175	3¾ 95	½ x 2¾ -	80	100	3.4 1.5
3 x 1½ 80 x 40	3.500 x 1.900 88.9 x 48.3	2 51	2⅛ 54	500 34.5	2¹¹⁄16 68	1½ 38	3⅜ 86	2⅛ 54	6⅞ 175	3¾ 95	½ x 2¾ -	80	100	4.4 2.0
3 x 2 80 x 50	3.500 x 2.375 88.9 x 60.3	2½ 64	2⅝ 67	500 34.5	2¹¹⁄16 68	1½ 38	3⅜ 86	2⅛ 54	6⅞ 175	4⅛ 105	½ x 2¾ -	80	100	4.6 2.1
4 x ½ 100 x 15	4.500 x 0.840 114.3 x 21.3	1½ 38	1⅝ 41	500 34.5	3¹⁄16 76	⁹⁄16 14	3½ 89	2⅝ 67	7¾ 197	3¾ 95	½ U-Bolt -	30	40	2.9 1.3
4 x ¾ 100 x 20	4.500 x 1.050 114.3 x 26.7	1½ 38	1⅝ 41	500 34.5	3¹⁄16 78	⁹⁄16 14	3½ 89	2⅝ 67	7¾ 197	3¾ 95	½ U-Bolt -	30	40	2.8 1.3
4 x 1 100 x 25	4.500 x 1.315 114.3 x 33.7	1½ 38	1⅝ 41	500 34.5	2¹³⁄16 73	⁹⁄16 14	3½ 89	2⅝ 67	7¾ 197	3¾ 95	½ U-Bolt -	30	40	2.7 1.2

NOTE: 2½", 5" and 6" Nom. size run pipe may be used on 3" O.D., 5½" O.D. and 6½" O.D. pipe

▼ Based on use with standard wall pipe.

Not for use in copper systems.

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Fig. 7045, cont'd.

Clamp-T, FPT Branch

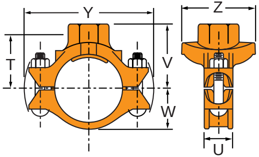

Fig. 7045

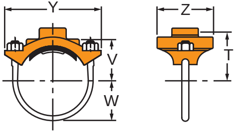

Fig. 7045 (U-Bolt)

Figure 7045-FPT Branch (continued on next page)

Nominal Size	O.D.	Hole Dimensions		Max. Working Pressure▼	Clamp-T Dimensions						Bolt Size	Specified Torque §		Approx. Wt. Each
		Min. Dia.	Max. Dia.		T	U	V Threaded	W	Y	Z		Min.	Max.	
In./DN(mm)	In./mm	In./mm	In./mm	psi/bar	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	Ft.-Lbs./N-M		Lbs./Kg
4 x 1¼	4.500 x 1.660	2	2⅛	500	3³⁄16	1⅞	3⅞	2⅝	7½	3¾	½ x 2¾	80	100	4.5
100 x 32	114.3 x 42.4	51	54	34.5	81	48	98	67	191	95	-			2.0
4 x 1½	4.500 x 1.900	2	2⅛	500	3³⁄16	1⅞	3⅞	2⅝	7½	3¾	½ x 2¾	80	100	4.6
100 x 40	114.3 x 48.3	51	54	34.5	81	48	98	67	191	95	-			2.1
4 x 2	4.500 x 2.375	2½	2⅝	500	3⁵⁄16	1⅞	4	2⅝	7½	4⅛	½ x 2¾	80	100	7.7
100 x 50	114.3 x 60.3	64	67	34.5	84	48	102	67	191	105	-			3.5
4 x 2½	4.500 x 2.875	2¾	2⅞	500	3¹⁄16	1⅞	4	2⅝	7½	4⅜	½ x 2¾	80	100	5.2
100 x 65	114.3 x 73.0	70	73	34.5	78	48	102	67	191	111	-			2.4
4 x 3 O.D.	4.500 x 2.996	2¾	2⅞	500	3	1⅞	4	2⅝	7½	4⅜	½ x 2¾	80	100	5.2
114.3 x 76.1	114.3 x 76.1	70	73	34.5	76	48	102	67	191	111	-			2.4
4 x 3	4.500 x 3.500	3½	3⅝	500	3¼	1⅞	4¼	2⅝	7½	5¼	½ x 3½	80	100	6.5
100 x 80	114.3 x 88.9	89	92	34.5	83	48	108	67	191	133	-			2.9
5 x 1¼	5.563 x 1.660	2	2⅛	500	3¹¹⁄16	1⅞	4⅜	3¼	9⅛	3¾	⅝ x 3¼	100	130	5.4
125 x 32	141.3 x 42.4	51	54	34.5	94	48	111	83	232	95	-			2.4
5 x 1½	5.563 x 1.900	2	2⅛	500	3¹¹⁄16	1⅞	4⅜	3¼	9⅛	3¾	⅝ x 3¼	100	130	5.5
125 x 40	141.3 x 48.3	51	54	34.5	94	48	111	83	232	95	-			2.5
5 x 2	5.563 x 2.375	2½	2⅝	500	3¹³⁄16	1⅞	4½	3¼	9⅛	4⅛	⅝ x 3¼	100	130	5.7
125 x 50	141.3 x 60.3	64	67	34.5	97	48	114	83	232	105	-			2.6

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Fig. 7045, cont'd.

Clamp-T, FPT Branch

Figure 7045-FPT Branch (continued from previous page)

Nominal Size	O.D.	Hole Dimensions		Max. Working Pressure▼	Clamp-T Dimensions						Bolt Size	Specified Torque §		Approx. Wt. Each
		Min. Dia.	Max. Dia.		T	U	V Threaded	W	Y	Z		Min.	Max.	
In./DN(mm)	In./mm	In./mm	In./mm	psi/bar	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	Ft.-Lbs./N-M		Lbs./Kg
5 x 2½ 125 x 65	5.563 x 2.875 141.3 x 73.0	2¾ 70	2⅞ 73	500 34.5	3¹³⁄16 97	1⅞ 48	4¾ 121	3¼ 83	9⅛ 232	4⅜ 111	⅝ x 3¼ -	100	130	7.0 3.2
5 x 3 O.D. 141.3 x 76.1	5.563 x 2.996 141.3 x 76.1	2¾ 70	2⅞ 73	500 34.5	3¾ 95	1⅞ 48	4¾ 121	3¼ 83	9⅛ 232	4⅜ 111	¾ x 4½ -	130	180	7.0 3.2
5 x 3 125 x 80	5.563 x 3.500 141.3 x 88.9	3½ 89	3⅝ 92	500 34.5	4 102	1⅞ 48	5 127	3¼ 83	9⅛ 232	5¼ 133	⅝ x 3¼ -	100	130	8.7 3.9
6 x1¼ 150 x 32	6.625 x 1.660 168.3 x 42.4	2 51	2⅛ 54	500 34.5	4³⁄16 106	2 51	4⅞ 124	3⅞ 98	10⅛ 257	3¾ 95	⅝ x 4¼ -	100	130	7.8 3.5
6 x 1½ 150 x 40	6.625 x 1.900 168.3 x 48.3	2 51	2⅛ 54	500 34.5	4³⁄16 106	2 51	4⅞ 124	3⅞ 98	10⅛ 257	3¾ 95	⅝ x 4¼ -	100	130	7.8 3.5
6 x 2 150 x 50	6.625 x 2.375 168.3 x 60.3	2½ 64	2⅝ 67	500 34.5	4³⁄16 106	2 51	4⅞ 124	3⅞ 98	10⅛ 257	4⅛ 105	⅝ x 4¼ -	100	130	7.8 3.5
6 x 2½ 150 x 65	6.625 x 2.875 168.3 x 73.0	2¾ 70	2⅞ 73	500 34.5	4³⁄16 106	2 51	5⅛ 130	3⅞ 98	10⅛ 257	4⅜ 111	⅝ x 4¼ -	100	130	8.4 3.8
6 x 3 O.D. 168.3 x 76.1	6.625 x 2.996 168.3 x 76.1	2¾ 70	2⅞ 73	500 34.5	4⅛ 105	2 51	5⅛ 130	3⅞ 98	10⅛ 257	4⅜ 111	⅝ x 4¼ -	100	130	8.4 3.8
6 x 3 150 x 80	6.625 x 3.500 168.3 x 88.9	3½ 89	3⅝ 92	500 34.5	4⅜ 111	2 51	5⅜ 137	3⅞ 98	10⅛ 257	5¼ 133	⅝ x 4¼ -	100	130	9.6 4.4
6 x 4 150 x 100	6.625 x 4.500 168.3 x 114.3	4½ 114	4⅝ 117	500 34.5	4⅜ 111	2 51	5½ 140	3⅞ 98	10⅛ 257	6½ 165	⅝ x 4¼ -	100	130	10.5 4.8

NOTE: 2½", 5" and 6" Nom. size run pipe may be used on 3" O.D., 5½" O.D. and 6½" O.D. pipe

▼ Based on use with standard wall pipe.

Not for use in copper systems.

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Fig. 7045, cont'd.

Clamp-T, FPT Branch

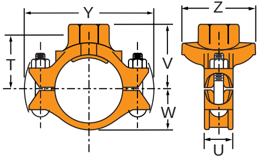

Fig. 7045

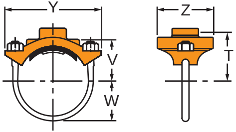

Fig. 7045 (U-Bolt)

Figure 7045-FPT Branch (continued from previous page))

Nominal Size	O.D.	Hole Dimensions		Max. Working Pressure▼	Clamp-T Dimensions						Bolt Size	Specified Torque §		Approx. Wt. Each
		Min. Dia.	Max. Dia.		T	U	V Threaded	W	Y	Z		Min.	Max.	
In./DN(mm)	In./mm	In./mm	In./mm	psi/bar	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	Ft.-Lbs./N-M		Lbs./Kg
8 x 2	8.625 x 2.750	2½	2⅝	500	5³⁄₁₆	2¼	5⅞	5	12¾	4⅛	⅝ x 4¼	100	130	11.2
200 x 50	*219.1 x 70.0*	*64*	*67*	*34.5*	*132*	*57*	*149*	*127*	*324*	*105*	-			*5.1*
8 x 2½	8.625 x 2.875	2¾	2⅞	500	5⁵⁄₁₆	2¼	6¼	5	12¾	4⅜	⅝ x 4¼	100	130	11.1
200 x 65	*219.1 x 73.0*	*70*	*73*	*34.5*	*134*	*57*	*159*	*127*	*324*	*111*	-			*5.0*
8 x 3 O.D.	*8.625 x 2.996*	*2¾*	*2⅞*	*500*	*5¼*	*2¼*	*6¼*	*5*	*12¾*	*4⅜*	*⅝ x 4¼*	*100*	*130*	*11.1*
219.1 x 76.1	219.1 x 76.1	70	73	34.5	133	57	159	127	324	111	-			5.0
8 x 3	8.625 x 3.500	3½	3⅝	500	5⅜	2¼	6⅜	5	12¾	5¼	⅝ x 4¼	100	130	13.0
200 x 80	*219.1 x 88.9*	*89*	*92*	*34.5*	*137*	*57*	*162*	*127*	*324*	*133*	-			*5.9*
8 x 4	8.625 x 4.500	4½	4⅝	500	5⅜	2¼	6½	5	12¾	6½	⅝ x 4¼	100	130	16.2
200 x 100	*219.1 x 114.3*	*114*	*117*	*34.5*	*137*	*57*	*165*	*127*	*324*	*165*	-			*7.3*

NOTE: 2½", 5" and 6" Nom. size run pipe may be used on 3" O.D., 5½" O.D. and 6½" O.D. pipe

▼ Based on use with standard wall pipe.

Not for use in copper systems.

§ – For additional Bolt Torque information, see page 202.

See Installation & Assembly directions on pages 172-173.

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Fig. 7046

Clamp-T, Grooved Branch

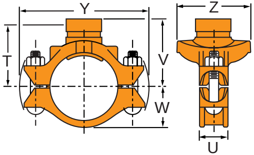

Fig. 7046

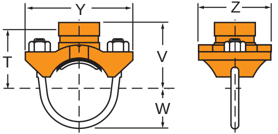

Fig. 7046 (U-BOLT)

Figure 7046-GR Branch (continued on next page)

Nominal Size	O.D.	Hole Dimensions		Max. Working Pressure▼	Clamp-T Dimensions					Bolt Size	Specified Torque §		Approx. Wt. Each
		Min. Dia.	Max. Dia.		U	V Grooved	W	Y	Z		Min.	Max.	
In./DN(mm)	*In./mm*	*In./mm*	*In./mm*	*psi/bar*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*Ft.-Lbs./N-M*		*Lbs./Kg*
2½ x 1¼• *65 x 32*	2.875 x 1.660 *73.0 x 42.4*	2 *51*	2⅛ *54*	500 *34.5*	9⁄16 *14*	3⅛ *79*	1¾ *44*	6⅛ *156*	3½ *89*	½ U-Bolt -	30	40	3.4 *1.5*
2½ x 1½ *65 x 40*	2.875 x 1.900 *73.0 x 48.3*	2 *51*	2⅛ *54*	500 *34.5*	9⁄16 *14*	3⅛ *79*	1¾ *44*	6⅛ *156*	3½ *89*	½ U-Bolt -	30	40	3.4 *1.5*
3 x 1¼ *80 x 32*	3.500 x 1.660 *88.9 x 42.4*	2 *51*	2⅛ *54*	500 *34.5*	1½ *38*	3½ *89*	2⅛ *54*	6⅞ *175*	3¾ *95*	½ x 2¾ -	80	100	3.4 *1.5*
3 x 1½ *80 x 40*	3.500 x 1.900 *88.9 x 48.3*	2 *51*	2⅛ *54*	500 *34.5*	1½ *38*	3½ *89*	2⅛ *54*	6⅞ *175*	3¾ *95*	½ x 2¾ -	80	100	4.4 *2.0*
3 x 2 *80 x 50*	3.500 x 2.375 *88.9 x 60.3*	2½ *64*	2⅝ *67*	500 *34.5*	1½ *38*	3½ *89*	2⅛ *54*	6⅞ *175*	4⅛ *105*	½ x 2¾ -	80	100	4.6 *2.1*
4 x 1¼ *100 x 32*	4.500 x 1.660 *114.3 x 42.4*	2 *51*	2⅛ *54*	500 *34.5*	1⅞ *48*	4 *102*	2⅝ *67*	7½ *191*	3¾ *95*	½ x 2¾ -	80	100	4.2 *1.9*
4 x 1½ *100 x 40*	4.500 x 1.900 *114.3 x 48.3*	2 *51*	2⅛ *54*	500 *34.5*	1⅞ *48*	4 *102*	2⅝ *67*	7½ *191*	3¾ *95*	½ x 2¾ -	80	100	4.3 *2.0*
4 x 2 *100 x 50*	4.500 x 2.375 *114.3 x 60.3*	2½ *64*	2⅝ *67*	500 *34.5*	1⅞ *48*	4 *102*	2⅝ *67*	7½ *191*	4⅛ *105*	½ x 2¾ -	80	100	4.6 *2.1*

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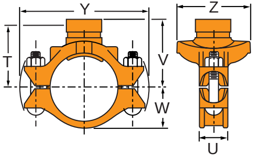
Fig. 7046, cont'd.

Clamp-T, Grooved Branch

Fig. 7046



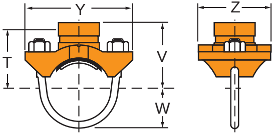


Fig. 7046 (U-BOLT)

Figure 7046-GR Branch (continued on next page)

Nominal Size	O.D.	Hole Dimensions		Max. Working Pressure▼	Clamp-T Dimensions					Bolt Size	Specified Torque §		Approx. Wt. Each
		Min. Dia.	Max. Dia.		U	V Grooved	W	Y	Z		Min.	Max.	
In./DN(mm)	In./mm	In./mm	In./mm	psi/bar	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	Ft.-Lbs./N-M		Lbs./Kg
4 x 2½ 100 x 65	4.500 x 2.875 114.3 x 73.0	2¾ 70	2⅞ 73	500 34.5	1⅞ 48	4 102	2⅝ 67	7½ 191	4⅜ 111	½ x 2¾ -	80	100	5.0 2.3
4 x 3 O.D. 114.3 x 76.1	4.500 x 2.996 114.3 x 76.1	2¾ 70	2⅞ 73	500 34.5	1⅞ 48	4 102	2⅝ 67	7½ 191	4⅜ 111	½ x 2¾ -	80	100	5.0 2.3
4 x 3 100 x 80	4.500 x 3.500 114.3 x 88.9	3½ 89	3⅝ 92	500 34.5	1⅞ 48	4 102	2⅝ 67	7½ 191	5¼ 133	½ x 3½ -	80	100	5.6 2.5
5 x 1¼ 125 x 32	5.563 x 1.660 141.3 x 42.4	2 51	2⅛ 54	500 34.5	1⅞ 48	4¼ 108	3¼ 83	9⅛ 232	3¾ 95	½ x 2¾ -	80	100	5.6 2.5
5 x 1½ 125 x 40	5.563 x 1.900 141.3 x 48.3	2 51	2⅛ 54	500 34.5	1⅞ 48	4¼ 108	3¼ 83	9⅛ 232	3¾ 95	⅝ x 3¼ -	100	130	5.6 2.5
5 x 2 125 x 50	5.563 x 2.375 141.3 x 60.3	2½ 64	2⅝ 67	500 34.5	1⅞ 48	4¼ 108	3¼ 83	9⅛ 232	4⅛ 105	⅝ x 3¼ -	100	130	5.5 2.5
5 x 2½ 125 x 65	5.563 x 2.875 141.3 x 73.0	2¾ 70	2⅞ 73	500 34.5	1⅞ 48	4¼ 108	3¼ 83	9⅛ 232	4⅜ 111	⅝ x 3¼ -	100	130	5.8 2.6
5 x 3 125 x 80	5.563 x 3.500 141.3 x 88.9	3½ 89	3⅝ 92	500 34.5	1⅞ 48	4⅝ 117	3¼ 83	9⅛ 232	5¼ 133	⅝ x 3¼ -	100	130	7.1 3.2

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Fig. 7046, cont'd.

Clamp-T, Grooved Branch

Figure 7046-GR Branch (continued on next page)

Nominal Size	O.D.	Hole Dimensions		Max. Working Pressure▼	Clamp-T Dimensions					Bolt Size	Specified Torque §		Approx. Wt. Each
		Min. Dia.	Max. Dia.		U	V Grooved	W	Y	Z		Min.	Max.	
In./DN(mm)	In./mm	In./mm	In./mm	psi/bar	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	Ft.-Lbs./N-M		Lbs./Kg
6 x 1½ 150 x 40	6.625 x 1.900 168.3 x 48.3	2 51	2⅛ 54	500 34.5	2 51	5 127	3⅞ 98	10⅛ 257	3¾ 95	⅝ x 4¼ *	100	130	7.2 3.3
6 x 2 150 x 50	6.625 x 2.375 168.3 x 60.3	2½ 64	2⅝ 67	500 34.5	2 51	5 127	3⅞ 98	10⅛ 257	4⅛ 105	⅝ x 4¼ *	100	130	7.8 3.5
6 x 2½ 150 x 65	6.625 x 2.875 168.3 x 73.0	2¾ 70	2⅞ 73	500 34.5	2 51	5⅛ 130	3⅞ 98	10⅛ 257	4⅜ 111	⅝ x 4¼ *	100	130	7.6 3.4
6 x 3 O.D. 168.3 x 76.1	6.625 x 2.996 168.3 x 76.1	2¾ 70	2⅞ 73	500 34.5	2 51	5⅛ 130	3⅞ 98	10⅛ 257	4⅜ 111	⅝ x 4¼ *	100	130	7.6 3.4
6 x 3 150 x 80	6.625 x 3.500 168.3 x 88.9	3½ 89	3⅝ 92	500 34.5	2 51	5⅛ 130	3⅞ 98	10⅛ 257	5¼ 133	⅝ x 4¼ *	100	130	8.0 3.6
6 x 4 150 x 100	6.625 x 4.500 168.3 x 114.3	4½ 114	4⅝ 117	500 34.5	2 51	5¼ 133	3⅞ 98	10⅛ 257	6½ 165	⅝ x 4¼ *	100	130	10.4 4.7
8 x 2 200 x 50	8.625 x 2.375 219.1 x 60.3	2½ 64	2⅝ 67	500 34.5	2¼ 57	6⅛ 156	5 127	12¾ 324	4¼ 108	¾ x 4½ -	130	180	10.4 4.7
8 x 2½ 200 x 65	8.625 x 2.875 219.1 x 73.0	2¾ 70	2⅞ 73	500 34.5	2¼ 57	6⅛ 156	5 127	12¾ 324	4⅜ 111	¾ x 4½ M20 x 110	130 175	180 245	10.6 4.8
8 x 3 200 x 80	8.625 x 3.500 219.1 x 88.9	3½ 89	3⅝ 92	500 34.5	2¼ 57	6⅛ 156	5 127	12¾ 324	5¼ 133	¾ x 4½ M20 x 110	130 175	180 245	11.5 5.2
8 x 4 200 x 100	8.625 x 4.500 219.1 x 114.3	4½ 114	4⅝ 117	500 34.5	2¼ 57	6¼ 159	5 127	12¾ 324	6½ 165	¾ x 4½ M20 x 110	130 175	180 245	16.2 7.3

NOTE: 2½", 5" & 6" Nom. size run pipe may be used on 3" O.D., 5½" O.D. & 6½" O.D. pipe.

▼ Based on use with standard wall pipe.

Not for use in copper systems.

- Cannot be used in cross configuration.

§ – For additional Bolt Torque information, see page 202.

See Installation & Assembly directions on pages 172-173.

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Fig. 7047, Fig. 7048 & Fig. 7049

Clamp-T, Cross

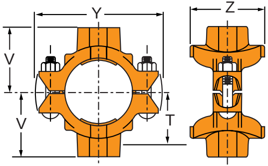

Fig. 7047 – Thread x Thread

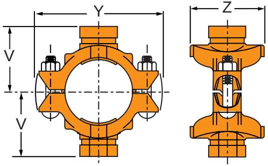

Fig. 7048 – Groove x Groove

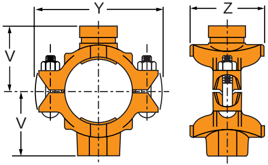

Fig. 7049 – Groove x Thread

The Gruvlok Clamp-T provides for a branch or cross connection in light wall or standard wall steel pipe.

The Fig. 7045 Clamp-T female pipe thread branch is available with NPT or ISO 7/1 connection and the Fig. 7046 Clamp-T has grooved-end branch connection.

Clamp-T cross connections are available allowing greater versatility in piping design.

NOTES:

2½" x 1¼" Figure 7046 cannot be used in cross configuration.

In addition, 2 x ½" through 2 x 1½" can now be made into crosses from the new design.

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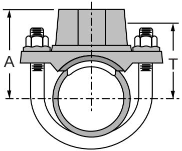
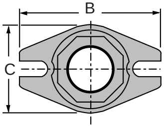
FIG. 7044

BRANCH OUTLET





Maximum Working Pressure for all sizes is 175 PSI (12.1 bar)

Not for use in copper systems.

§ – For additional Bolt Torque information on page 202

For additional details see "Coupling Data Chart notes" from page 264.

See Installation & Assembly directions on pages 174-175.

FIGURE 7044 BRANCH OUTLET

Nominal Size	O.D.	Hole Diameter		Dimensions				Specified Torque §		Approx. Wt. Each
		Min. Dia.	Max. Dia.	A	B	C	Take-out T	Min.	Max.	
In./DN(mm)	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	Ft.-Lbs./N-M		Lbs./Kg
1¼ x ½ 32 x 15	1.660 x 0.840 42.4 x 21.3	1 3/16 30	1¼ 32	2 1/16 53	3½ 89	2 7/32 56	1⅜ 35	27	33	0.8 0.4
1¼ x ¾ 32 x 20	1.660 x 1.050 42.4 x 26.7	1 3/16 30	1¼ 32	2 1/16 53	3½ 89	2 7/32 56	1⅜ 35	27	33	0.8 0.4
1¼ x 1 32 x 25	1.660 x 1.315 42.4 x 33.7	1 3/16 30	1¼ 32	2 3/16 56	3½ 89	2 7/32 56	1½ 38	27	33	0.9 0.4
1½ x ½ 40 x 15	1.900 x 0.840 48.3 x 21.3	1 3/16 30	1¼ 32	2 5/32 55	3½ 89	2 7/32 56	1⅜ 35	27	33	0.8 0.4
1½ x ¾ 40 x 20	1.900 x 1.050 48.3 x 26.7	1 3/16 30	1¼ 32	2 5/32 55	3½ 89	2 7/32 56	1⅜ 35	27	33	0.8 0.4
1½ x 1 40 x 25	1.900 x 1.315 48.3 x 33.7	1 3/16 30	1¼ 32	2 9/32 58	3½ 89	2 7/32 56	1½ 38	27	33	0.9 0.4
2 x ½ 50 x 15	2.375 x 0.840 60.3 x 21.3	1 3/16 30	1¼ 32	2½ 64	3⅞ 98	2 7/32 56	1⅝ 42	27	33	0.8 0.4
2 x ¾ 50 x 20	2.375 x 1.050 60.3 x 26.7	1 3/16 30	1¼ 32	2½ 64	3⅞ 98	2 7/32 56	1⅝ 42	27	33	0.8 0.4
2 x 1 50 x 25	2.375 x 1.315 60.3 x 33.7	1 3/16 30	1¼ 32	2⅝ 67	3⅞ 98	2 7/32 56	1¾ 45	27	33	0.9 0.4
2½ x ½ 65 x 15	2.875 x 0.840 73.0 x 21.3	1 3/16 30	1¼ 32	2 11/16 69	4⅜ 111	2 7/32 56	2 51	27	33	0.8 0.4
2½ x ¾ 65 x 20	2.875 x 1.050 73.0 x 26.7	1 3/16 30	1¼ 32	2 11/16 69	4⅜ 111	2 7/32 56	2 51	27	33	0.9 0.4
2½ x 1 65 x 25	2.875 x 1.315 73.0 x 33.7	1 3/16 30	1¼ 32	2 13/16 72	4⅜ 111	2 7/32 56	2⅛ 54	27	33	1.0 0.5

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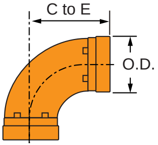
Fig. 7050

90° Elbow*



C - Cast malleable or ductile iron, all others are fabricated steel.

* 14"-24" Standard Radius 90° Elbows are 1½.

Center to end dimensions and weights may differ from those shown in chart, contact a Anvil Representative for more information.

Figure 7050 90° Elbow*

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./DN(mm)	In./mm	In./mm	Lbs./Kg
1 25	1.315 33.4	2¼ C 57	0.6 0.3
1¼ 32	1.660 42.2	2¾ C 70	1.0 0.5
1½ 40	1.900 48.3	2¾ C 70	1.2 0.5
2 50	2.375 60.3	3¼ C 83	1.7 0.8
2½ 65	2.875 73.0	3¾ C 95	2.6 1.2
3 O.D. 76.1	2.996 76.1	4 C 102	3.6 1.6
3 80	3.500 88.9	4¼ C 108	4.0 1.8
3½ 90	4.000 101.6	4½ C 114	5.5 2.5
4¼ O.D. 108.0	4.250 108.0	4¾ C 121	7.7 3.5
4 100	4.500 114.3	5 C 127	7.7 3.5
5¼ O.D. 133.0	5.236 133.0	5¼ C 133	10.4 4.7
5½ O.D. 139.7	5.500 139.7	5¼C 133	10.9 4.9
5 125	5.563 141.3	5½ C 140	11.1 5.0
6¼ O.D. 159.0	6.259 159.0	6 C 152	15.2 6.9
6½ O.D. 165.1	6.500 165.1	6½ C 165	17.4 7.9
6 150	6.625 168.3	6½ C 165	16.5 7.5
8 200	8.625 219.1	7¾ C 197	30.6 13.9
10 250	10.750 273.1	9 C 229	53.5 24.3
12 300	12.750 323.9	10 C 254	82 37.2
14 350	14.000 355.6	21 533	169.0 76.7
16 400	16.000 406.4	24 610	222.0 100.7
18 450	18.000 457.2	27 686	280.0 127.0
20 500	20.000 508.0	30 762	344.0 156.0
24 600	24.000 609.6	36 914	490.0 222.3

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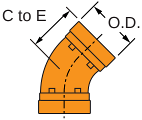
FIG. 7051

45° ELBOW*



C - Cast malleable or ductile iron, all others are fabricated steel.

* 14"-24" Standard Radius 45° Elbows are 1½.

Center to end dimensions and weights may differ from those shown in chart, contact a Anvil Representative for more information.

FIGURE 7051 45° ELBOW*

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./DN(mm)	In./mm	In./mm	Lbs./Kg
1 25	1.315 33.4	1¾ C 44	0.5 0.2
1¼ 32	1.660 42.2	1¾ C 44	0.7 0.3
1½ 40	1.900 48.3	1¾ C 44	0.9 0.4
2 50	2.375 60.3	2 C 51	1.5 0.7
2½ 65	2.875 73.0	2¼ C 57	1.9 0.9
3 O.D. 76.1	2.996 76.1	2½ C 64	2.2 1.0
3 80	3.500 88.9	2½ C 64	3.3 1.5
3½ 90	4.000 101.6	2¾ C 70	4.3 2.0
4¼ O.D. 108.0	4.250 108.0	2⅞ C 83	4.4 2.0
4 100	4.500 114.3	3 C 76	5.4 2.4
5¼ O.D. 133.0	5.236 133.0	3¼ C 83	7.3 3.3
5½ O.D. 139.7	5.500 139.7	3¼ C 83	7.8 3.5
5 125	5.563 141.3	3¼ C 83	9.0 4.1
6¼ O.D. 159.0	6.259 159.0	3½ C 89	10.1 4.6
6½ O.D. 165.1	6.500 165.1	3½ C 89	11.1 5.0
6 150	6.625 168.3	3½ C 89	11.2 5.1
8 200	8.625 219.1	4¼ C 108	19.8 9.0
10 250	10.750 273.1	4¾ C 121	34.3 15.6
12 300	12.750 323.9	5¼ C 133	50.0 22.7
14 350	14.000 355.6	8¾ 222	92.0 41.7
16 400	16.000 406.4	10 254	117.0 53.1
18 450	18.000 457.2	11¼ 286	146.0 66.2
20 500	20.000 508.0	12½ 317	179.0 81.2
24 600	24.000 609.6	15 381	255.0 115.7

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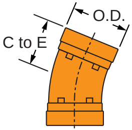
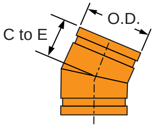
Fig. 7052

22½° Elbow

Cast





Fabricated

Figure 7052 22½° Elbow

Nom. Size In./DN(mm)	O.D. In./mm	Center to End In./mm	Approx. Wt. Ea. Lbs./Kg
1 25	1.315 33.4	3¼ 83	0.5 0.2
1¼ 32	1.660 42.2	1¾ 44	0.7 0.3
1½ 40	1.900 48.3	1¾ 44	0.8 0.4
2 50	2.375 60.3	1⅞ C 48	1.5 0.7
2½ 65	2.875 73.0	2 51	1.9 0.9
3 80	3.500 88.9	2¼ C 57	3.2 1.5
3½ 90	4.000 101.6	2½ 64	4.0 1.8
4 100	4.500 114.3	2⅝ C 67	5.3 2.4

Nom. Size In./DN(mm)	O.D. In./mm	Center to End In./mm	Approx. Wt. Ea. Lbs./Kg
5 125	5.563 141.3	2⅞ 73	7.2 3.3
6 150	6.625 168.3	3⅛ C 79	8.2 3.7
8 200	8.625 219.1	3⅞ C 98	17.8 8.1
10 250	10.750 273.1	4⅜ 111	30.0 13.6
12 300	12.750 323.9	4⅞ 124	40.4 18.3
14 350	14.000 355.6	5 127	46.0 20.9
16 400	16.000 406.4	5 127	52.2 23.7
18 450	18.000 457.2	5½ 140	65.0 29.5

Nom. Size In./DN(mm)	O.D. In./mm	Center to End In./mm	Approx. Wt. Ea. Lbs./Kg
20 500	20.000 508.0	6 152	80.0 36.3
24 600	24.000 609.6	7 178	112.0 50.8

C - Cast malleable or ductile iron, all others are fabricated steel.

Center to end dimensions and weights may differ from those shown in chart, contact a Anvil Representative for more information.

For Gruvlok Technical Detail Refer to the Gruvlok Catalog or contact your Anvil local sales representative.

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FIG. 7053

11¼° ELBOW

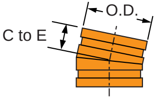

FIGURE 7053 11¼° ELBOW

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
1	1.315	1⅜	0.3
25	*33.4*	*35*	*0.1*
1¼	1.660	1⅜	0.5
32	*42.2*	*35*	*0.2*
1½	1.900	1⅜	0.7
40	*48.3*	*35*	*0.3*
2	2.375	1⅜	0.9
50	*60.3*	*35*	*0.4*
2½	2.875	1½	1.5
65	*73.0*	*38*	*0.7*
3	3.500	1½	2.0
80	*88.9*	*38*	*0.9*
3½	4.000	1¾	2.8
90	*101.6*	*44*	*1.3*
4	4.500	1¾	3.3
100	*114.3*	*44*	*1.5*
5	5.563	2	5.0
125	*141.3*	*51*	*2.3*
6	6.625	2	6.5
150	*168.3*	*51*	*2.9*
8	8.625	2	10.0
200	*219.1*	*51*	*4.5*
10	10.750	2⅛	14.5
250	*273.1*	*54*	*6.6*
12	12.750	2¼	18.7
300	*323.9*	*57*	*8.5*
14	14.000	3½	32.1
350	*355.6*	*89*	*14.6*
16	16.000	4	42.0
400	*406.4*	*102*	*19.1*
18	18.000	4½	53.2
450	*457.2*	*114*	*24.1*
20	20.000	5	65.7
500	*508.0*	*127*	*29.8*
24	24.000	6	96.0
600	*609.6*	*152*	*43.5*

C - Cast malleable or ductile iron, all others are fabricated steel.

Center to end dimensions and weights may differ from those shown in chart, contact a Anvil Representative for more information.

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FIG. 7050 LR

90° LONG RADIUS ELBOW*

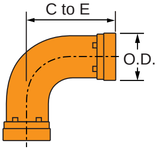

FIGURE 7050 LR 90° LONG RADIUS ELBOW*

Nominal Size	O.D.	Center to End	Approx. Wt. Ea.
In./DN(mm)	In./mm	In./mm	Lbs./Kg
1 25	1.315 33.4	3½ 89	0.9 0.4
1¼ 32	1.660 42.2	3⅞ 98	1.3 0.6
1½ 40	1.900 48.3	4¼ 108	1.7 0.8
2 50	2.375 60.3	4⅜ C 136	2.5 1.1
2½ 65	2.875 73.0	5¾ 146	4.9 2.2
3 80	3.500 88.9	5⅞ C 181	6.5 2.9
3½ 90	4.000 101.6	7¼ 184	9.7 4.4
4 100	4.500 114.3	7½ C 191	11.5 5.2
5 125	5.563 141.3	9½ 241	20.9 9.5
6 150	6.625 168.3	10¾ 273	29.1 13.2
8 200	8.625 219.1	15 381	59.2 26.9
10 250	10.750 273.1	18 457	104.0 47.2
12 300	12.750 323.9	21 533	147.0 66.7
14 350	14.000 355.6	21 533	169.0 76.7
16 400	16.000 406.4	24 610	222.0 100.7
18 450	18.000 457.2	27 686	280.0 127.0
20 500	20.000 508.0	30 762	344.0 156.0
24 600	24.000 609.6	36 914	490.0 222.3

C - Cast malleable or ductile iron, all others are fabricated steel.

* 14"-24" Standard Radius 90° Elbows are 1½.

Center to end dimensions and weights may differ from those shown in chart, Contact a Anvil Representative for more information.

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FIG. 7051LR

45° LONG RADIUS ELBOW*

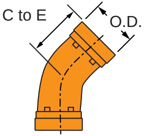

FIG. 7051LR 45° LONG RADIUS ELBOW*

Nominal Size	O.D.	Center to End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
1 *25*	1.315 *33.4*	2½ *64*	0.7 *0.3*
1¼ *32*	1.660 *42.2*	2½ *64*	1.0 *0.5*
1½ *40*	1.900 *48.3*	2½ *64*	1.2 *0.5*
2 *50*	2.375 *60.3*	2¾ *70*	1.7 *0.8*
2½ *65*	2.875 *73.0*	3 *76*	2.9 *1.3*
3 *80*	3.500 *88.9*	3⅜ *86*	4.3 *2.0*
3½ *90*	4.000 *101.6*	3½ *89*	5.3 *2.4*
4 *100*	4.500 *114.3*	4 *102*	7.2 *3.3*
5 *125*	5.563 *141.3*	5 *127*	12.2 *5.5*
6 *150*	6.625 *168.3*	5½ *140*	17.4 *7.9*
8 *200*	8.625 *219.1*	7¼ *184*	34.0 *15.4*
10 *250*	10.750 *273.1*	8½ *216*	57.4 *26.0*
12 *300*	12.750 *323.9*	10 *254*	82.6 *37.5*
14 *350*	14.000 *355.6*	21 *222*	169.0 *41.7*
16 *400*	16.000 *406.4*	10 *254*	117.0 *53.1*
18 *450*	18.000 *457.2*	11¼ *286*	146.0 *66.2*
20 *500*	20.000 *508.0*	12½ *317*	179.0 *81.2*
24 *600*	24.000 *609.6*	15 *381*	255.0 *115.7*

C - Cast malleable or ductile iron, all others are fabricated steel.

* 14"-24" Standard Radius 45° Elbows are 1½.

Center to end dimensions and weights may differ from those shown in chart, Contact a Anvil Representative for more information.

Return

Fig. 7063

Tee w/ Threaded Branch

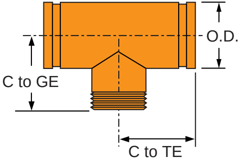

Figure 7063 Tee with Threaded Branch

Nominal Size	O.D.	C to GE	C to TE	Approx. Wt. Ea.
In./DN(mm)	In./mm	In./mm	In./mm	Lbs./Kg
1	1.315	2¼	2¼	0.9
25	33.4	57	57	0.4
1¼	1.660	2¾	2¾	1.4
32	42.2	70	70	0.6
1½	1.900	2¾	2¾	1.7
40	48.3	70	70	0.8
2	2.375	3¼	4¼	2.9
50	60.3	83	108	1.3
2½	2.875	3¾	3¾	4.7
65	73.0	95	95	2.1
3	3.500	4¼	6	8.1
80	88.9	108	152	3.7
3½	4.000	4½	4½	8.8
90	101.6	114	114	4.0
4	4.500	5	7¼	13.5
100	114.3	127	184	6.1
5	5.563	5½	5½	16.7
125	140	140	7.6	7.6
6	6.625	6½	6½	25.6
150	168.3	165	165	11.6
8	8.625	7¾	7¾	45.0
200	219.1	197	197	20.4
10	10.750	9	9	73.0
250	273.1	229	229	33.1
12	12.750	10	10	98.0
300	323.9	254	254	44.5

C - Cast malleable or ductile iron, all others are fabricated steel.

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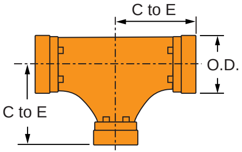
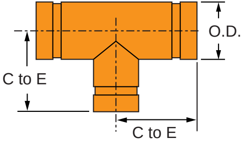
FIG. 7061

REDUCING TEE STANDARD



Cast



Fabricated

FIG. 7061 REDUCING TEE STANDARD (CONTINUED ON NEXT PAGE)

Nominal Size In./DN(mm)	Center to End In./mm	Approx. Wt. Ea. Lbs./Kg
1¼ x 1¼ x 1 32 x 32 x 25	2¾ 70	1.5 0.7
1½ x 1½ x 1 40 x 40 x 25	2¾ 70	1.8 0.8
1½ x 1½ x 1¼ 40 x 40 x 32	2¾ 70	1.8 0.8
2 x 2 x 1 50 x 50 x 25	3¼ C 83	2.6 1.2
2 x 2 x 1¼ 50 x 50 x 32	3¼ 83	1.7 0.8
2 x 2 x 1½ 50 x 50 x 40	3¼ C 83	2.7 1.2
2½ x 2½ x 1 65 x 65 x 25	3¾ 95	4.1 1.9
2½ x 2½ x 1¼ 65 x 65 x 32	3¾ 95	4.2 1.9
2½ x 2½ x 1½ 65 x 65 x 40	3¾ 95	4.3 2.0
2½ x 2½ x 2 65 x 65 x 50	3¾ 95	4.4 2.0
3 x 3 x 1 80 x 80 x 25	4¼ C 108	7.0 3.2
3 x 3 x 1¼ 80 x 80 x 32	4¼ 108	5.8 2.6
3 x 3 x 1½ 80 x 80 x 40	4¼ 108	5.9 2.7
3 x 3 x 2 80 x 80 x 50	4¼ C 108	5.5 2.5
3 x 3 x 2½ 80 x 80 x 65	4¼ 108	6.3 2.9
4 x 4 x 1 100 x 100 x 25	3¾ 95	7.0 3.2
4 x 4 x 1¼ 100 x 100 x 32	5 127	9.6 4.4
4 x 4 x 1½ 100 x 100 x 40	5 127	10.2 4.6
4 x 4 x 2 100 x 100 x 50	5 C 127	10.2 4.6
4 x 4 x 2½ 100 x 100 x 65	5 C 127	11.2 5.1
4 x 4 x 3 100 x 100 x 80	5 C 127	11.4 5.2
5 x 5 x 1 125 x 125 x 25	5½ 140	13.6 6.2
5 x 5 x 1½ 125 x 125 x 40	5½ 140	13.8 6.3
5 x 5 x 2 125 x 125 x 50	5½ 140	14 6.4
5 x 5 x 2½ 125 x 125 x 65	5½ 140	14.3 6.5
5 x 5 x 3 125 x 125 x 80	5½ 140	14.6 6.6
5 x 5 x 4 125 x 125 x 100	5½ C 140	17.9 8.1
6 x 6 x 1 150 x 150 x 25	6½ 165	20.5 9.3
6 x 6 x 1½ 150 x 150 x 40	6½ 165	21.0 9.5
6 x 6 x 2 150 x 150 x 50	6½ C 165	26.4 12.0
6 x 6 x 2½ 150 x 150 x 65	6½ C 165	26.5 12.0
6 x 6 x 3 150 x 150 x 80	6½ C 165	26.5 12.0

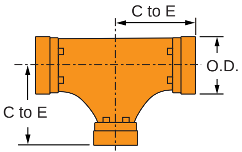
C - Cast malleable or ductile iron, all others are fabricated steel.

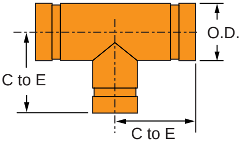
See Fitting Size Chart on page 148 for O.D. sizes

Fig. 7061, cont'd.

Reducing Tee Standard

Cast





Fabricated

Fig. 7061 Reducing Tee Standard (continued on next page)

Nominal Size	Center to End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*Lbs./Kg*
6 x 6 x 4 *150 x 150 x 100*	6½ C *165*	26.5 *12.0*
6 x 6 x 5 *150 x 150 x 125*	6½ C *165*	28.0 *12.7*
8 x 8 x 1½ *200 x 200 x 40*	7¾ *197*	33.0 *15.0*
8 x 8 x 2 *200 x 200 x 50*	7¾ *197*	32.7 *14.8*
8 x 8 x 2½ *200 x 200 x 65*	7¾ *197*	33.0 *15.0*
8 x 8 x 3 *200 x 200 x 80*	7¾ *197*	33.5 *15.2*
8 x 8 x 4 *200 x 200 x 100*	7¾ C *197*	50.0 *22.7*
8 x 8 x 5 *200 x 200 x 125*	7¾ *197*	34.7 *15.7*
8 x 8 x 6 *200 x 200 x 150*	7¾C *197*	54.0 *24.5*
10 x 10 x 1½ *250 x 250 x 40*	9 *229*	52.0 *23.6*
10 x 10 x 2 *250 x 250 x 50*	9 *229*	52.2 *23.7*
10 x 10 x 2½ *250 x 250 x 65*	9 *229*	52.6 *23.9*
10 x 10 x 3 *250 x 250 x 80*	9 *229*	53.0 *24.0*
10 x 10 x 4 *250 x 250 x 100*	9 *229*	53.6 *24.3*
10 x 10 x 5 *250 x 250 x 125*	9 *229*	54.2 *24.6*
10 x 10 x 6 *250 x 250 x 150*	9 C *229*	55.0 *24.9*
10 x 10 x 8 *250 x 250 x 200*	9 C *229*	64.7 *29.3*
12 x 12 x 1 *300 x 300 x 25*	10 *254*	77.0 *34.9*
12 x 12 x 2 *300 x 300 x 50*	10 *254*	80.0 *36.3*
12 x 12 x 2½ *300 x 300 x 65*	10 *254*	78.0 *35.4*
12 x 12 x 3 *300 x 300 x 80*	10 *254*	74.6 *33.8*
12 x 12 x 4 *300 x 300 x 100*	10 *254*	75.1 *34.1*
12 x 12 x 5 *300 x 300 x 125*	10 *254*	75.6 *34.3*
12 x 12 x 6 *300 x 300 x 150*	10 *254*	76.2 *34.6*
12 x 12 x 8 *300 x 300 x 200*	10 *254*	76.3 *34.6*
12 x 12 x 10 *300 x 300 x 250*	10 *254*	77.6 *35.2*
14 x 14 x 4 *350 x 350 x 100*	11 *279*	100.0 *45.4*
14 x 14 x 6 *350 x 350 x 150*	11 *279*	101 *45.8*
14 x 14 x 8 *350 x 350 x 200*	11 *279*	103 *46.7*
14 x 14 x 10 *350 x 350 x 250*	11 *279*	104 *47.2*
14 x 14 x 12 *350 x 350 x 300*	11 *279*	105 *47.6*
16 x 16 x 4 *400 x 400 x 100*	12 *305*	126 *57.2*
16 x 16 x 6 *400 x 400 x 150*	12 *305*	127 *57.6*
16 x 16 x 8 *400 x 400 x 200*	12 *305*	128 *58.1*
16 x 16 x 10 *400 x 400 x 250*	12 *305*	129 *58.5*
16 x 16 x 12 *400 x 400 x 300*	12 *305*	130 *59.0*

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FIG. 7061, CONT'D.

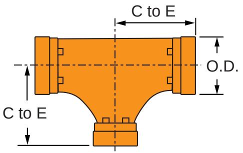
REDUCING TEE STANDARD

FIG. 7061 REDUCING TEE STANDARD (CONT'D. FROM PREVIOUS PAGE)

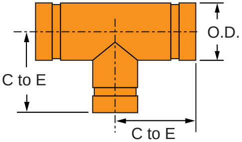
Nominal Size *In./DN(mm)*	Center to End *In./mm*	Approx. Wt. Ea. *Lbs./Kg*
16 x 16 x 14 *400 x 400 x 350*	12 *305*	132 *59.9*
18 x 18 x 4 *450 x 450 x 100*	15½ *394*	188 *85.3*
18 x 18 x 6 *450 x 450 x 150*	15½ *394*	190 *86.2*
18 x 18 x 8 *450 x 450 x 200*	15½ *394*	192 *87.1*
18 x 18 x 10 *450 x 450 x 250*	15½ *394*	194 *88.0*
18 x 18 x 12 *450 x 450 x 300*	15½ *394*	196 *88.9*
18 x 18 x 14 *450 x 450 x 350*	15½ *394*	201 *91.2*
18 x 18 x 16 *450 x 450 x 400*	15½ *394*	203 *92.1*
20 x 20 x 6 *500 x 500 x 150*	17¼ *438*	240 *108.9*
20 x 20 x 8 *500 x 500 x 200*	17¼ *438*	242 *109.8*
20 x 20 x 10 *500 x 500 x 250*	17¼ *438*	244 *110.7*
20 x 20 x 12 *500 x 500 x 300*	17¼ *438*	246 *111.6*
20 x 20 x 14 *500 x 500 x 350*	17¼ *438*	248 *112.5*
20 x 20 x 16 *500 x 500 x 400*	17¼ *438*	250 *113.4*
20 x 20 x 18 *500 x 500 x 450*	17¼ *438*	252 *114.3*
24 x 24 x 8 *600 x 600 x 200*	20 *508*	327 *148.3*
24 x 24 x 10 *600 x 600 x 250*	20 *508*	330 *149.7*
24 x 24 x 12 *600 x 600 x 300*	20 *508*	334 *151.5*
24 x 24 x 14 *600 x 600 x 350*	20 *508*	340 *154.2*
24 x 24 x 16 *600 x 600 x 400*	20 *508*	342 *155.1*
24 x 24 x 18 *600 x 600 x 450*	20 *508*	345 *156.5*
24 x 24 x 20 *600 x 600 x 500*	20 *508*	347 *157.4*

C - Cast malleable or ductile iron, all others are fabricated steel.

Cast



Fabricated



See Fitting Size Chart on page 148 for O.D. sizes

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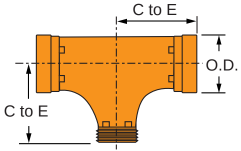
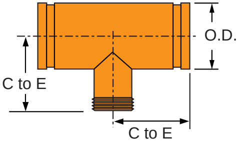
FIG. 7064

REDUCING TEE W/ THREADED BRANCH

Cast





Fabricated

FIGURE 7064 REDUCING TEE W/THREADED BRANCH (CONTINUED ON NEXT PAGE)

Nominal Size	Center to End	Approx. Wt. Ea.
In./DN(mm)	In./mm	Lbs/Kg
2 x 2 x ¾ 50 x 50 x 20	3¼ 83	1.6 0.7
2 x 2 x 1 50 x 50 x 25	3¼ C 83	2.6 1.2
2 x 2 x 1¼ 50 x 50 x 32	3¼ 83	1.7 0.8
2 x 2 x 1½ 50 x 50 x 40	3¼ C 83	2.7 1.2
2½ x 2½ x 1 65 x 65 x 25	3¾ 95	4.1 1.9
2½ x 2½ x 1½ 65 x 65 x 40	3¾ 95	4.3 2
2½ x 2½ x 2 65 x 65 x 50	3¾ 95	4.4 2
3 x 3 x ¾ 80 x 80 x 20	4¼ 108	5.7 2.6
3 x 3 x 1 80 x 80 x 25	4¼ C 108	7.0 3.2
3 x 3 x 1½ 80 x 80 x 40	4¼ 108	5.3 2.4
3 x 3 x 2 80 x 80 x 50	4¼ 108	5.5 2.5
3 x 3 x 2½ 80 x 80 x 65	4¼ 108	5.8 2.6
4 x 4 x ¾ 100 x 100 x 20	3¾ 95	7.2 3.3
4 x 4 x 1 100 x 100 x 25	3¾ 95	7.0 3.2
4 x 4 x 1½ 100 x 100 x 40	5 127	9.2 4.2
4 x 4 x 2 100 x 100 x 50	5 127	10.2 4.6
4 x 4 x 2½ 100 x 100 x 65	5 127	11.2 5.1
4 x 4 x 3 100 x 100 x 80	5 127	11.4 5.2
5 x 5 x 2 125 x 125 x 50	5½ 140	14.5 6.6
5 x 5 x 3 125 x 125 x 80	5½ 140	16.1 7.3
5 x 5 x 4 125 x 125 x 100	5½ C 140	17.9 8.1
6 x 6 x 2 150 x 150 x 50	6½ 165	26.4 12
6 x 6 x 2½ 150 x 150 x 65	6½ 165	26.5 12
6 x 6 x 3 150 x 150 x 80	6½ 165	26.5 12
6 x 6 x 4 150 x 150 x 100	6½ 165	26.5 12
6 x 6 x 5 150 x 150 x 125	6½ C 165	28.0 12.7
8 x 8 x 2 200 x 200 x 50	7¾ 197	37.5 17
8 x 8 x 3 200 x 200 x 80	7¾ 197	38.7 17.6
8 x 8 x 4 200 x 200 x 100	7¾ 197	50.0 22.7
8 x 8 x 5 200 x 200 x 125	7¾ 197	41.0 18.6
8 x 8 x 6 200 x 200 x 150	7¾ 197	54.0 24.5
10 x 10 x 2 250 x 250 x 50	9 229	61.8 28.0

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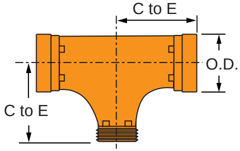
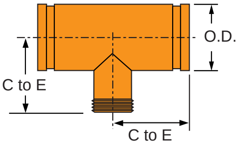
FIG. 7064, CONT'D.

REDUCING TEE W/ THREADED BRANCH



Cast



Fabricated

FIGURE 7064 REDUCING TEE W/THREADED BRANCH (CONTINUED FROM PREVIOUS PAGE)

Nominal Size	Center to End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*Lbs/Kg*
10 x 10 x 3 *250 x 250 x 80*	9 *229*	63.0 *28.6*
10 x 10 x 4 *250 x 250 x 100*	9 *229*	64.0 *29.0*
10 x 10 x 5 *250 x 250 x 125*	9 *229*	65.1 *29.5*
10 x 10 x 6 *250 x 250 x 150*	9 *229*	55.0 *24.9*
10 x 10 x 8 *250 x 250 x 200*	9 *229*	64.7 *29.3*
12 x 12 x 3 *300 x 300 x 80*	10 *254*	84.9 *38.5*
12 x 12 x 4 *300 x 300 x 100*	10 *254*	85.8 *38.9*
12 x 12 x 5 *300 x 300 x 125*	10 *254*	87.0 *39.5*
12 x 12 x 6 *300 x 300 x 150*	10 *254*	88.3 *40.1*
12 x 12 x 8 *300 x 300 x 200*	10 *254*	91.2 *41.4*
12 x 12 x 10 *300 x 300 x 250*	10 *254*	94.8 *43.0*
14 x 14 x 8 *350 x 350 x 200*	11 *279*	110.0 *49.7*
14 x 14 x 10 *350 x 350 x 250*	11 *279*	114.0 *51.5*
14 x 14 x 12 *350 x 350 x 300*	11 *279*	117.0 *52.8*
16 x 16 x 8 *400 x 400 x 200*	12 *305*	135.0 *61.2*
16 x 16 x 10 *400 x 400 x 250*	12 *305*	139.0 *63.0*
16 x 16 x 12 *400 x 400 x 300*	12 *305*	142.0 *64.4*
18 x 18 x 10 *450 x 450 x 250*	15½ *394*	204.0 *92.5*
18 x 18 x 12 *450 x 450 x 300*	15½ *394*	209.0 *94.8*
18 x 18 x 14 *450 x 450 x 350*	15½ *394*	211.0 *95.7*
18 x 18 x 16 *450 x 450 x 400*	15½ *394*	216.0 *98.0*
24 x 24 x 8 *600 x 600 x 200*	20 *508*	334.0 *152*
24 x 24 x 10 *600 x 600 x 250*	20 *508*	342.0 *155*
24 x 24 x 12 *600 x 600 x 300*	20 *508*	349.0 *158*

See Fitting Size Chart on page 148 for O.D. sizes

C - Cast malleable or ductile iron, all others are fabricated steel.

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FIG. 7060

TEE

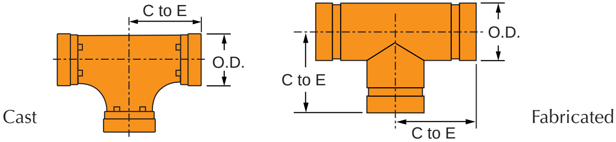

FIG. 7060 TEE

Nominal Size In./DN(mm)	O.D. In./mm	Center to End In./mm	Approx. Wt. Ea. Lbs./Kg
1 25	1.315 33.4	2¼ C 57	0.9 0.4
1¼ 32	1.660 42.2	2¾ C 70	1.5 0.7
1½ 40	1.900 48.3	2¾ C 70	1.8 0.8
2 50	2.375 60.3	3¼ C 83	2.4 1.1
2½ 65	2.875 73.0	3¾ C 95	4.0 1.8
3 O.D. 76.1	2.996 76.1	4 C 101	4.6 2.1
3 80	3.500 88.9	4¼ C 108	5.8 2.6
3½ 90	4.000 101.6	4½ C 114	9.8 4.4
4¼ O.D. 108.0	4.250 108.0	4¾ C 121	9.3 4.2
4 100	4.500 114.3	5 C 127	10.3 4.7
5¼ O.D. 133.0	5.236 133.0	5¼ C 133	14.1 6.4
5½ O.D. 139.7	5.500 139.7	5½ C 140	16.1 7.3
5 125	5.563 141.3	5½ C 140	16.2 7.3
6¼ O.D. 159.0	6.259 159.0	6 C 152	20.8 9.4
6½ O.D. 165.1	6.500 165.1	6½ C 165	24.4 11.1
6 150	6.625 168.3	6½ C 165	25.7 11.7
8 200	8.625 219.1	7¾ C 197	41.1 18.6
10 250	10.750 273.1	9 C 229	74.5 33.8
12 300	12.750 323.9	10 C 254	94.7 43.0
14 350	14.000 355.6	11 279	118.0 53.5
16 400	16.000 406.4	12 305	146.0 66.2
18 450	18.000 457.2	15½ 394	218.0 98.9
20 500	20.000 508.0	17¼ 438	275.0 125
24 600	24.000 609.6	20 508	379.0 172

C - Cast malleable or ductile iron, all others are fabricated steel.

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FIG. 7076

GR X THD CONCENTRIC REDUCERS

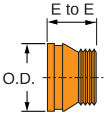

FIG. 7076 GR X THD CONCENTRIC REDUCERS

Nominal Size In./DN(mm)	End to End In./mm	Approx. Wt. Ea. Lbs./Kg
1½ x 1 *40 x 25*	2½ *64*	0.6 *0.3*
2 x ¾ *50 x 80*	2½ *64*	1.0 *0.5*
2 x 1 *50 x 25*	2½ *64*	0.8 *0.4*
2 x 1¼ *50 x 32*	2½ *64*	1.3 *0.6*
2 x 1½ *50 x 40*	2½ *64*	1.3 *0.6*
2½ x 1 *65 x 25*	2½ *64*	1.0 *0.5*
2½ x 1¼ *65 x 32*	2½ *64*	1.0 *0.5*
2½ x 1½ *65 x 40*	2½ *64*	1.3 *0.6*
2½ x 2 *65 x 50*	2½ *64*	1.2 *0.5*
3 x ¾ *80 x 80*	2½ *64*	1.2 *0.5*
3 x 1 *80 x 25*	2½ *64*	1.2 *0.5*
3 x 1½ *80 x 40*	2½ *64*	1.3 *0.6*
3 x 2 *80 x 50*	2½ *64*	1.3 *0.6*
3 x 2½ *80 x 65*	2½ *64*	1.5 *0.7*
3½ x 3 *90 x 80*	3 *76*	1.8 *0.8*
4 x 1 *100 x 25*	3 *76*	2.2 *1.0*
4 x 1½ *100 x 40*	3 *76*	2.3 *1.0*
4 x 2 *100 x 50*	3 *76*	2.3 *1.0*
4 x 2½ *100 x 65*	3 *76*	2.3 *1.0*
4 x 3 *100 x 80*	3 *76*	2.6 *1.2*
4 x 3½ *100 x 90*	3 *76*	2.5 *1.1*
5 x 4 *125 x 100*	3½ *89*	4.5 *2.0*
6 x 1 *150 x 25*	4 *102*	6.0 *2.7*
6 x 2 *150 x 50*	4 *102*	6.0 *2.7*
6 x 3 *150 x 80*	4 *102*	6.0 *2.7*
6 x 4 *150 x 100*	4 *102*	5.9 *2.7*
6 x 5 *150 x 125*	4 *102*	5.8 *2.6*

All are Fabricated Steel.

See Fitting Size Chart on page 148 for O.D. sizes

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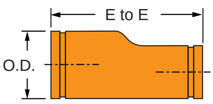
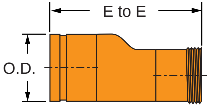
Fig. 7073 & Fig. 7097

Eccentric Reducers

Fig. 7073– Gr. x Gr.



Fabricated



Fabricated

Fig. 7097 – Gr. x Thd.

Figure 7073 & 7097 Eccentric Reducers (continued on next page)

Nominal Size	End to End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*Lbs./Kg*
1¼ x 1 *32 x 25*	8½ *216*	1.5 *0.7*
1½ x ¾ *40 x 20*	8½ *216*	1.6 *0.7*
1½ x 1 *40 x 25*	8½ *216*	1.7 *0.8*
1½ x 1¼ *40 x 32*	8½ *216*	4.5 *2.0*
2 x ¾ *50 x 80*	9 *229*	2.1 *1.0*
2 x 1 *50 x 25*	9 *229*	2.2 *1.0*
2 x 1¼ *50 x 32*	9 *229*	2.4 *1.1*
2 x 1½ *50 x 40*	9 *229*	2.5 *1.1*
2½ x 1 *65 x 25*	9½ *241*	3.2 *1.5*
2½ x 1¼ *65 x 32*	9½ *241*	3.4 *1.5*
2½ x 1½ *65 x 40*	9½ *241*	3.6 *1.6*
2½ x 2 *65 x 50*	9½ *241*	4.0 *1.8*
3 x 1 *80 x 25*	9½ *241*	4.0 *1.8*
3 x 1¼ *80 x 32*	9½ *241*	4.3 *2.0*
3 x 1½ *80 x 40*	9½ *241*	4.5 *2.0*
3 x 2 *80 x 50*	9½ *241*	4.8 *2.2*
3 x 2½ *80 x 65*	9½ *241*	5.6 *2.5*
3½ x 3 *90 x 80*	9½ *241*	6.6 *3.0*
4 x 1 *100 x 25*	10 *254*	5.9 *2.7*
4 x 1¼ *100 x 32*	10 *254*	6.3 *2.9*
4 x 1½ *100 x 40*	10 *254*	6.4 *2.9*
4 x 2 *100 x 50*	10 *254*	6.7 *3.0*
4 x 2½ *100 x 65*	10 *254*	7.3 *3.3*
4 x 3 *100 x 80*	10 *254*	7.9 *3.6*
4 x 3½ *100 x 90*	10 *254*	8.5 *3.9*
5 x 2 *125 x 50*	11 *279*	9.3 *4.2*
5 x 2½ *125 x 65*	11 *279*	9.9 *4.5*
5 x 3 *125 x 80*	11 *279*	10.7 *4.9*
5 x 4 *125 x 100*	11 *279*	11.9 *5.4*
6 x 1 *150 x 25*	11½ *292*	12.0 *5.4*
6 x 1½ *150 x 40*	11½ *292*	12.1 *5.5*
6 x 2 *150 x 50*	11½ *292*	12.2 *5.5*

See Fitting Size Chart on page 148 for O.D. sizes

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FIG. 7073 & FIG. 7097, CONT'D.

ECCENTRIC REDUCERS

FIGURE 7073 & 7097 ECCENTRIC REDUCERS (CONTINUED FROM PREVIOUS PAGE)

Nominal Size	End to End	Approx. Wt. Ea.
In./DN(mm)	In./mm	Lbs./Kg
6 x 2½ 150 x 65	11½ 292	12.8 5.8
6 x 3 150 x 80	11½ 292	13.6 6.2
6 x 4 150 x 100	11½ 292	14.9 6.8
6 x 5 150 x 125	11½ 292	16.2 7.3
8 x 3 200 x 80	12 305	17.9 8.1
8 x 4 200 x 100	12 305	19.7 8.9
8 x 5 200 x 125	12 305	21.4 9.7
8 x 6 200 x 150	12 305	23.2 10.5
10 x 4 250 x 100	13 330	29.7 13.5
10 x 5 250 x 125	13 330	31.7 14.4

Nominal Size	End to End	Approx. Wt. Ea.
In./DN(mm)	In./mm	Lbs./Kg
10 x 6 250 x 150	13 330	34.0 15.4
10 x 8 250 x 200	13 330	34.4 15.6
12 x 4 300 x 100	14 356	44.8 20.3
12 x 6 300 x 150	14 356	45.2 20.5
12 x 8 300 x 200	14 356	47.7 21.6
12 x 10 300 x 250	14 356	52.0 23.6
14 x 6 350 x 150	13 330	78 35.4
14 x 8 350 x 200	13 330	80 36.3
14 x 10 350 x 250	13 330	84 38.1
14 x 12 350 x 300	13 330	88 39.9

Nominal Size	End to End	Approx. Wt. Ea.
In./DN(mm)	In./mm	Lbs./Kg
16 x 8 400 x 200	14 356	91 41.3
16 x 10 400 x 250	14 356	96 43.5
16 x 12 400 x 300	14 356	99 44.9
16 x 14 400 x 350	14 356	104 47.2
18 x 10 450 x 250	15 381	110 49.9
18 x 12 450 x 300	15 381	113 51.3
18 x 14 450 x 350	15 381	117 53.1
18 x 16 450 x 400	15 381	121 54.9
20 x 10 500 x 250	20 508	145 65.8
20 x 12 500 x 300	20 508	149 67.6

Nominal Size	End to End	Approx. Wt. Ea.
In./DN(mm)	In./mm	Lbs./Kg
20 x 14 500 x 350	20 508	152 68.9
20 x 16 500 x 400	20 508	156 70.8
20 x 18 500 x 450	20 508	160 72.6
24 x 10 600 x 250	20 508	174 78.9
24 x 12 600 x 300	20 508	179 81.2
24 x 14 600 x 350	20 508	184 83.5
24 x 16 600 x 400	20 508	189 85.7
24 x 18 600 x 450	20 508	194 88
24 x 20 600 x 500	20 508	199 90.3

See Fitting Size Chart on page 148 for O.D. sizes

Fabricated Steel *Figure 7097 is available in sizes 1¼ x 1 through 12 x 10.

Center to end dimensions may differ from those shown above. Contact a Anvil Representative for more information.

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Fig. 7077, Fig. 7078 & Fig. 7079

Swaged Nipples

Fig. 7077
Gr x Gr

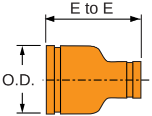

Fig. 7078
Gr x Thd

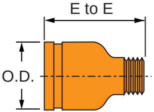

Fig. 7079
Gr x Bev

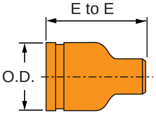

Figure 7077, 7078 & 7079 Swaged Nipples

Nominal Size	End to End	Approx. Wt. Ea.
In./DN(mm)	In./mm	Lbs./Kg
2 x 1 50 x 25	6½ 165	2.0 0.9
2 x 1¼ 50 x 32	6½ 165	2.0 0.9
2 x 1½ 50 x 40	6½ 165	2.0 0.9
2½ x 1 65 x 25	7 178	3.5 1.6
2½ x 1¼ 65 x 32	7 178	3.5 1.6
2½ x 1½ 65 x 40	7 178	3.5 1.6
2½ x 2 65 x 50	7 178	3.5 1.6
3 x 1 80 x 25	8 203	5.0 2.3
3 x 1¼ 80 x 32	8 203	5.0 2.3
3 x 1½ 80 x 40	8 203	5.0 2.3
3 x 2 80 x 50	8 203	5.0 2.3
3 x 2½ 80 x 65	8 203	5.0 2.3
3½ x 3 90 x 80	8 203	7.0 3.2
4 x 1 100 x 25	9 229	8.0 3.6
4 x 1¼ 100 x 32	9 229	8.0 3.6
4 x 1½ 100 x 40	9 229	8.0 3.6
4 x 2 100 x 50	9 229	8.0 3.6
4 x 2½ 100 x 65	9 229	8.0 3.6
4 x 3 100 x 80	9 229	8.0 3.6
4 x 3½ 100 x 90	9 229	8.0 3.6
5 x 2 125 x 50	11 279	12.0 5.4
5 x 2½ 125 x 65	11 279	12.0 5.4
5 x 3 125 x 80	11 279	12.0 5.4
5 x 4 125 x 100	11 279	12.0 5.4
6 x 1 150 x 25	12 305	19.0 8.6
6 x 1¼ 150 x 32	12 305	19.0 8.6
6 x 1½ 150 x 40	12 305	19.0 8.6
6 x 2 150 x 50	12 305	19.0 8.6
6 x 2½ 150 x 65	12 305	19.0 8.6
6 x 3 150 x 80	12 305	19.0 8.6
6 x 3½ 150 x 90	12 305	17.0 7.7
6 x 4 150 x 100	12 305	19.0 8.6
6 x 5 150 x 125	12 305	19.0 8.6

See Fitting Size Chart on page 148 for O.D. sizes

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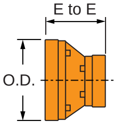
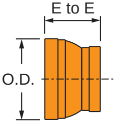
FIG. 7072

GR x GR CONCENTRIC REDUCERS



Cast



Fabricated

FIGURE 7072 CONCENTRIC REDUCER (CONTINUED ON NEXT PAGE)

Nominal Size	End to End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*Lbs./Kg*
1¼ x 1 *32 x 25*	2½ *64*	0.6 *0.3*
1½ x 1 *40 x 25*	2½ *64*	0.6 *0.3*
1½ x 1¼ *40 x 32*	2½ *64*	0.6 *0.3*
2 x 1 *50 x 25*	2½ *64*	0.8 *0.4*
2 x 1¼ *50 x 32*	2½ C *64*	1.3 *0.6*
2 x 1½ *50 x 40*	2½ C *64*	1.3 *0.6*
2½ x 1 *65 x 25*	2½ *64*	1.0 *0.5*
2½ x 1¼ *65 x 32*	2½ *64*	1.0 *0.5*
2½ x 1½ *65 x 40*	2½ *64*	1.3 *0.6*
2½ x 2 *65 x 50*	2½ C *64*	1.6 *0.7*
3 x 1 *80 x 25*	2½ *64*	1.2 *0.5*
3 x 1¼ *80 x 32*	2½ *64*	1.3 *0.6*
3 x 1½ *80 x 40*	2½ *64*	1.3 *0.6*
3 x 2 *80 x 50*	2½ C *64*	1.4 *0.6*
3 x 2½ *80 x 65*	2½ C *64*	1.5 *0.7*
3½ x 3 *90 x 80*	3 *76*	1.8 *0.8*
4 x 1 *100 x 25*	3 C *76*	2.2 *1.0*
4 x 1¼ *100 x 32*	3 *76*	2.2 *1.0*
4 x 1½ *100 x 40*	3 *76*	2.3 *1.0*
4 x 2 *100 x 50*	3 C *76*	2.4 *1.1*
4 x 2½ *100 x 65*	3 C *76*	2.6 *1.2*
4 x 3 *100 x 80*	3 C *76*	3.2 *1.5*
4 x 3½ *100 x 90*	3 C *76*	3.6 *1.6*
5 x 2 *125 x 50*	3½ *89*	4.6 *2.1*
5 x 2½ *125 x 65*	3½ *89*	4.5 *2.0*
5 x 3 *125 x 80*	3½ *89*	4.4 *2.0*
5 x 4 *125 x 100*	3½ C *89*	4.5 *2.0*
6 x 1 *150 x 25*	4 *102*	6.8 *3.1*
6 x 1½ *150 x 40*	4 *102*	6.9 *3.1*
6 x 2 *150 x 50*	4 C *102*	6.0 *2.7*
6 x 2½ *150 x 65*	4 *102*	6.0 *2.7*
6 x 3 *150 x 80*	4 C *102*	5.4 *2.4*
6 x 4 *150 x 100*	4 C *102*	5.6 *2.5*
6 x 5 *150 x 125*	4 C *102*	6.0 *2.7*
8 x 3 *200 x 80*	5 *127*	12.0 *5.5*
8 x 4 *200 x 100*	5 C *127*	9.0 *4.1*

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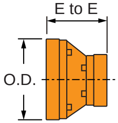
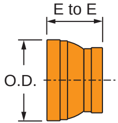
FIG. 7072, CONT'D.

GR x GR CONCENTRIC REDUCERS



Cast



Fabricated

FIGURE 7072 CONCENTRIC REDUCER (CONTINUED FROM PREVIOUS PAGE)

Nominal Size	End to End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*Lbs./Kg*
8 x 5 *200 x 125*	5 *127*	11.5 *5.2*
8 x 6 *200 x 150*	5 C *127*	10.6 *4.8*
10 x 4 *250 x 100*	6 *152*	20 *9.1*
10 x 5 *250 x 125*	6 *152*	20 *9.1*
10 x 6 *250 x 150*	6 C *152*	20 *9.1*
10 x 8 *250 x 200*	6 *152*	23.9 *10.8*
12 x 4 *300 x 100*	7 *178*	25 *11.3*
12 x 6 *300 x 150*	7 *178*	29 *13.2*
12 x 8 *300 x 200*	7 *178*	29 *13.2*
12 x 10 *300 x 250*	7 *178*	32.4 *14.7*
14 x 6 *350 x 150*	13 *330*	54.3 *24.6*
14 x 8 *350 x 200*	13 *330*	54.5 *24.7*
14 x 10 *350 x 250*	13 *330*	55.7 *25.3*
14 x 12 *350 x 300*	13 *330*	57.3 *26.0*
16 x 8 *400 x 200*	14 *356*	65.4 *29.7*
16 x 10 *400 x 250*	14 *356*	66.7 *30.3*
16 x 12 *400 x 300*	14 *356*	68.1 *30.9*
16 x 14 *400 x 350*	14 *356*	71.0 *32.2*
18 x 10 *450 x 250*	15 *381*	82.3 *37.3*
18 x 12 *450 x 300*	15 *381*	83.6 *37.9*
18 x 14 *450 x 350*	15 *381*	86.2 *39.1*
18 x 16 *450 x 400*	15 *381*	87.2 *39.6*
20 x 10 *500 x 250*	20 *508*	123.0 *55.8*
20 x 12 *500 x 300*	20 *508*	125.0 *56.7*
20 x 14 *500 x 350*	20 *508*	129.0 *58.5*
20 x 16 *500 x 400*	20 *508*	131.0 *59.4*
20 x 18 *500 x 450*	20 *508*	133.0 *60.3*
24 x 10 *600 x 250*	20 *508*	147.0 *66.7*
24 x 12 *600 x 300*	20 *508*	149.0 *67.6*
24 x 14 *600 x 350*	20 *508*	152.0 *68.9*
24 x 16 *600 x 400*	20 *508*	153.0 *69.4*
24 x 18 *600 x 450*	20 *508*	154.0 *69.9*
24 x 20 *600 x 500*	20 *508*	155.0 *70.3*

See Fitting Size Chart on page 148 for O.D. sizes

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FIG. 7069

45° LATERAL

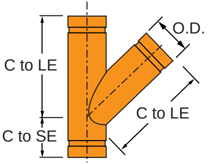

FIGURE 7069 45° LATERALS

Nominal Size	O.D.	Center to Long End	Center to Short End	Approx. Wt. Ea.
In./ DN(mm)	*In./mm*	*In./mm*	*In./mm*	*Lbs./Kg*
1 *25*	1.315 *33.4*	5 *127*	2¼ *57*	1.5 *0.7*
1¼ *32*	1.660 *42.2*	5¾ *146*	2½ *64*	2.5 *1.1*
1½ *40*	1.900 *48.3*	6¼ *159*	2¾ *70*	3.5 *1.6*
2 *50*	2.375 *60.3*	7 *178*	2¾ *70*	4.5 *2.0*
2½ *65*	2.875 *73.0*	7¾ *197*	3 *76*	10.0 *4.5*
3 *80*	3.500 *88.9*	8½ *216*	3¼ *83*	11.0 *5.0*
3½ *90*	4.000 *101.6*	10 *254*	3½ *89*	14.0 *6.4*
4 *100*	4.500 *114.3*	10½ *267*	3¾ *95*	18.3 *8.3*
5 *125*	5.563 *141.3*	12½ *318*	4 *102*	30.0 *13.6*
6 *150*	6.625 *168.3*	14 *356*	4½ *114*	46.6 *21.1*
8 *200*	8.625 *219.1*	18 *457*	6 *152*	82.8 *37.6*
10 *250*	10.750 *273.1*	20½ *521*	6½ *165*	127 *57.4*
12 *300*	12.750 *323.9*	23 *584*	7 *178*	165 *74.8*
14 *350*	14.000 *355.6*	26½ *673*	7½ *191*	215 *97.5*
16 *400*	16.000 *406.4*	29 *737*	8 *203*	345 *157*
18 *450*	18.000 *457.2*	32 *813*	8½ *216*	425 *193*
20 *500*	20.000 *508.0*	35 *889*	9 *229*	517 *235*
24 *600*	24.000 *609.6*	40 *1016*	10 *254*	940 *426*

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FIG. 7070

45° REDUCING LATERAL

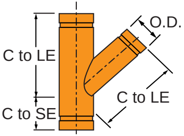

FIGURE 7070 45° REDUCING LATERAL

Nominal Size	Center to Long End	Center to Short End	Approx. Wt. Ea.
In./DN(mm)	In./mm	In./mm	Lbs./Kg
3 x 3 x 2 80 x 80 x 50	8½ 216	3¼ 83	9.8 4.4
3 x 3 x 2½ 80 x 80 x 65	8½ 216	3¼ 83	11.5 5.2
4 x 4 x 2 100 x 100 x 50	10½ 267	3¾ 95	15.5 7.0
4 x 4 x 2½ 100 x 100 x 65	10½ 267	3¾ 95	17.0 7.7
4 x 4 x 3 100 x 100 x 80	10½ 267	3¾ 95	18.5 8.4
5 x 5 x 2 125 x 125 x 50	12½ 318	4 102	22.5 10.2
5 x 5 x 3 125 x 125 x 80	12½ 318	4 102	26.5 12.0
5 x 5 x 4 125 x 125 x 100	12½ 318	4 102	30.5 13.8
6 x 6 x 2 150 x 150 x 50	14 356	4½ 114	33.0 15.0
6 x 6 x 3 150 x 150 x 80	14 356	4½ 114	37.0 16.8
6 x 6 x 4 150 x 150 x 100	14 356	4½ 114	40.0 18.1
6 x 6 x 5 150 x 150 x 125	14 356	4½ 114	45.0 20.4
8 x 8 x 4 200 x 200 x 100	18 457	6 152	59.6 27.0
8 x 8 x 5 200 x 200 x 125	18 457	6 152	68.0 30.8
8 x 8 x 6 200 x 200 x 150	18 457	6 152	75.0 34.0
10 x 10 x 4 250 x 250 x 100	20½ 521	6½ 165	83.0 37.6
10 x 10 x 5 250 x 250 x 125	20½ 521	6½ 165	100.0 45.4
10 x 10 x 6 250 x 250 x 150	20½ 521	6½ 165	105.0 47.6
10 x 10 x 8 250 x 250 x 200	20½ 521	6½ 165	116.0 52.6
12 x 12 x 4 300 x 300 x 100	23 584	7 178	137.0 62.1
12 x 12 x 6 300 x 300 x 150	23 584	7 178	140.0 63.5
12 x 12 x 8 300 x 300 x 200	23 584	7 178	147.0 66.7
12 x 12 x 10 300 x 300 x 250	23 584	7 178	168 76.2
14 x 14 x 4 350 x 350 x 100	26½ 673	7½ 191	173 78.5

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Fig. 7070, cont'd.

45° Reducing Lateral

Figure 7070 45° Reducing Lateral

Nominal Size In./DN(mm)	Center to Long End In./mm	Center to Short End In./mm	Approx. Wt. Ea. Lbs./Kg
14 x 14 x 6 *350 x 350 x 150*	26½ *673*	7½ *191*	185 *83.9*
14 x 14 x 8 *350 x 350 x 200*	26½ *673*	7½ *191*	195 *88.5*
14 x 14 x 10 *350 x 350 x 250*	26½ *673*	7½ *191*	223 *101*
14 x 14 x 12 *350 x 350 x 300*	26½ *673*	7½ *191*	240 *109*
16 x 16 x 6 *400 x 400 x 150*	29 *737*	8 *203*	235 *107*
16 x 16 x 8 *400 x 400 x 200*	29 *737*	8 *203*	250 *113*
16 x 16 x 10 *400 x 400 x 250*	29 *737*	8 *203*	263 *119*
16 x 16 x 12 *400 x 400 x 300*	29 *737*	8 *203*	283 *128*
16 x 16 x 14 *400 x 400 x 350*	29 *737*	8 *203*	307 *139*
18 x 18 x 6 *450 x 450 x 150*	32 *813*	8½ *216*	275 *125*
18 x 18 x 8 *450 x 450 x 200*	32 *813*	8½ *216*	306 *139*
18 x 18 x 10 *450 x 450 x 250*	32 *813*	8½ *216*	321 *146*
18 x 18 x 12 *450 x 450 x 300*	32 *813*	8½ *216*	333 *151*
18 x 18 x 14 *450 x 450 x 350*	32 *813*	8½ *216*	358 *162*
18 x 18 x 16 *450 x 450 x 400*	32 *813*	8½ *216*	382 *173*
20 x 20 x 12 *500 x 500 x 300*	35 *889*	9 *229*	390 *177*
20 x 20 x 14 *500 x 500 x 350*	35 *889*	9 *229*	410 *186*
20 x 20 x 16 *500 x 500 x 400*	235 *889*	9 *229*	440 *200*
24 x 24 x 16 *600 x 600 x 400*	40 *1016*	10 *254*	725 *329*
24 x 24 x 20 *600 x 600 x 500*	40 *1016*	10 *254*	785 *356*

See Fitting Size Chart on page 148 for O.D. sizes

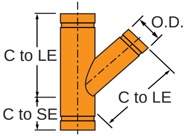

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Fig. 7066

Tee Wye

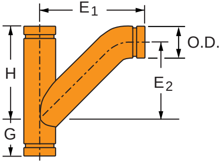

Figure 7066 Tee Wye (continued on next page)

Nominal Size	G	H	E1	E2	Approx. Wt. Ea.
In./DN(mm)	In./mm	In./mm	In./mm	In./mm	Lbs./Kg
2 x 2 x 2 50 x 50 x 50	2¾ 70	7 178	9 229	4⅝ 117	6.4 2.9
2½ x 2½ x 2½ 65 x 65 x 65	3 76	7¾ 197	10½ 267	5¾ 146	11.5 5.2
3 x 3 x 3 80 x 80 x 80	3¼ 83	8½ 216	11½ 292	6½ 165	16.5 7.5
3½ x 3½ x 3½ 90 x 90 x 90	3½ 89	10 254	13 330	7¾ 197	22 10.0
4 x 4 x 3 100 x 100 x 80	3¾ 95	10½ 267	12⅞ 327	7⅞ 200	23 10.4
4 x 4 x 4 100 x 100 x 100	3¾ 95	10½ 267	13⅝ 346	8⅛ 206	26 11.8
5 x 5 x 3 125 x 125 x 80	4 102	12½ 318	14¼ 362	9¼ 235	32 14.5
5 x 5 x 4 125 x 125 x 100	4 102	12½ 318	15⅛ 384	9⅝ 244	35 15.9
5 x 5 x 5 125 x 125 x 125	4 102	12½ 318	16⅛ 410	10 254	40 18.1
6 x 6 x 3 150 x 150 x 80	4½ 114	14 356	15⁵⁄₁₆ 389	10⁵⁄₁₆ 262	50 22.7
6 x 6 x 4 150 x 150 x 100	4½ 114	14 356	16¼ 413	10¾ 273	55 24.9
6 x 6 x 5 150 x 150 x 125	4½ 114	14 356	17¼ 438	11⅛ 283	58 26.3
6 x 6 x 6 150 x 150 x 150	4½ 114	14 356	18¼ 464	11½ 292	60.5 27.4
8 x 8 x 3 200 x 200 x 80	6 152	18 457	18³⁄₁₆ 462	13³⁄₁₆ 338	100 45.4
8 x 8 x 4 200 x 200 x 100	6 152	18 457	19 483	13½ 343	110 49.9
8 x 8 x 5 200 x 200 x 125	6 152	18 457	20 508	13⅞ 352	111 50.3

FIG. 7066, CONT'D.

TEE WYE

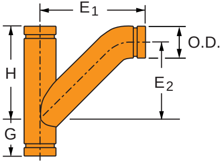

FIGURE 7066 TEE WYE (CONTINUED FROM PREVIOUS PAGE)

Nominal Size In./DN(mm)	G In./mm	H In./mm	E1 In./mm	E2 In./mm	Approx. Wt. Ea. Lbs./Kg
8 x 8 x 6 200 x 200 x 150	6 152	18 457	21⅛ 537	14⅜ 365	112 50.8
8 x 8 x 8 200 x 200 x 200	6 152	18 457	23¼ 591	15¼ 387	120 54.4
10 x 10 x 3 250 x 250 x 80	6½ 165	20½ 521	19⅞ 505	14⅞ 378	130 59.0
10 x 10 x 4 250 x 250 x 100	6½ 165	20½ 521	20¾ 527	15¼ 387	135 61.2
10 x 10 x 5 250 x 250 x 125	6½ 165	20½ 521	21⅞ 556	15¾ 400	140 63.5
10 x 10 x 6 250 x 250 x 150	6½ 165	20½ 521	22⅞ 581	16⅛ 410	145 65.8
10 x 10 x 8 250 x 250 x 200	6½ 165	20½ 521	27¼ 692	19¼ 489	150 68.0
10 x 10 x 10 250 x 250 x 250	6½ 165	20½ 521	27¼ 692	18 457	190 86.2
12 x 12 x 3 300 x 300 x 80	7 178	23 584	20¾ 527	15¾ 400	140 63.5
12 x 12 x 4 300 x 300 x 100	7 178	23 584	21½ 546	16 406	145 65.8
12 x 12 x 6 300 x 300 x 150	7 178	23 584	23¾ 603	17 432	165 74.8
12 x 12 x 8 300 x 300 x 200	7 178	23 584	26 660	18 457	175 79.4
12 x 12 x 10 300 x 300 x 250	7 178	23 584	28 711	18¾ 476	200 90.7
12 x 12 x 12 300 x 300 x 300	7 178	23 584	31 787	20½ 521	240 109

See Fitting Size Chart on page 148 for O.D. sizes

FIG. 7067

REDUCING TEE WYE

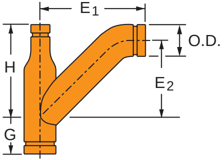

FIGURE 7067 REDUCING TEE WYE

Nominal Size	G	H	E1	E2	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*Lbs./Kg*
4 x 3 x 3 *100 x 80 x 80*	1⅝ *41*	7⅜ *187*	10¾ *273*	5⅝ *143*	16.0 *7.3*
4 x 3 x 4 *100 x 80 x 100*	3¾ *95*	10½ *267*	13⅝ *346*	8⅛ *206*	27.0 *12.2*
5 x 3 x 3 *125 x 80 x 80*	1¼ *32*	9¾ *248*	11½ *292*	6½ *165*	25.0 *11.3*
5 x 3 x 5 *125 x 80 x 125*	4 *102*	12½ *318*	16⅛ *410*	10 *254*	44.0 *20.0*
5 x 4 x 3 *125 x 100 x 80*	1⅞ *48*	9⅛ *232*	11⅞ *302*	6⅞ *175*	21.0 *9.5*
5 x 4 x 4 *125 x 100 x 100*	1⅞ *48*	9⅛ *232*	12¾ *324*	7¼ *184*	25.0 *11.3*

Nominal Size	G	H	E1	E2	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*Lbs./Kg*
6 x 4 x 6 *150 x 100 x 150*	4½ *114*	14 *356*	18¼ *464*	11½ *292*	61.0 *27.7*
6 x 5 x 3 *150 x 125 x 80*	1¼ *32*	10¾ *273*	13 *330*	8 *203*	27.0 *12.2*
6 x 5 x 4 *150 x 125 x 100*	1¼ *32*	10¾ *273*	13⅞ *352*	8⅜ *213*	31.0 *14.1*
8 x 6 x 4 *200 x 150 x 100*	1 *25*	12 *305*	14¾ *375*	9¼ *235*	45.0 *20.4*
8 x 6 x 8 *200 x 150 x 200*	6 *152*	18 *457*	23¼ *591*	15¼ *387*	95.0 *43.1*

See Fitting Size Chart on page 148 for O.D. sizes

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FIG. 7071

TRUE WYE

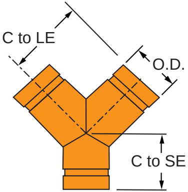

FIGURE 7071 TRUE WYE

Nominal Size	O.D.	Center to Long End	Center to Short End	Approx. Wt. Ea.
In./ DN(mm)	*In./mm*	*In./mm*	*In./mm*	*Lbs./Kg*
1 25	1.315 33.4	2¼ 57	2¼ 57	1.1 0.5
1¼ 32	1.660 42.2	2¾ 70	2½ 64	1.5 0.7
1½ 40	1.900 48.3	2¾ 70	2¾ 70	1.8 0.8
2 50	2.375 60.3	3¼ 83	2¾ 70	2.3 1.0
2½ 65	2.875 73.0	3¾ 95	3 76	5.0 2.3
3 80	3.500 88.9	4¼ 108	3¼ 83	6.1 2.8
3½ 90	4.000 101.6	4½ 114	3½ 89	8.3 3.8
4 100	4.500 114.3	5 127	3¾ 95	10.5 4.8
5 125	5.563 141.3	5½ 140	4 102	15 6.8
6 150	6.625 168.3	6½ 165	4½ 114	21.6 9.8
8 200	8.625 219.1	7¾ 197	6 152	36.0 16.3
10 250	10.750 273.1	9 229	6½ 165	51.0 23.1
12 300	12.750 323.9	10 254	7 178	160.0 72.6
14 350	14.000 355.6	11 279	7½ 191	136.0 61.7
16 400	16.000 406.4	12 305	8 203	166.0 75.3
18 450	18.000 457.2	15½ 394	8½ 216	234 106
20 500	20.000 508.0	17¼ 438	9 229	281 128
24 600	24.000 609.6	20 508	10 254	523 237

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FIG. 7055 GR x MPT

90° ADAPTER ELBOW

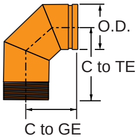

FIGURE 7055 90° ADAPTER ELBOWS

Nominal Size	O.D.	Center to Grooved End	Center to Threaded End	Approx. Wt. Ea.
In./DN(mm)	In./mm	In./mm	In./mm	Lbs./Kg
1 25	1.315 33.4	2¼ 57	2¼ 57	0.6 0.3
1¼ 32	1.660 42.2	2¾ 70	2¾ 70	1.0 0.5
1½ 40	1.900 48.3	2¾ 70	2¾ 70	1.2 0.5
2 50	2.375 60.3	3¼ 83	4¼ 108	2.3 1.0
2½ 65	2.875 73.0	3¾ 95	3¾ 95	3.7 1.7
3 80	3.500 88.9	4¼ 108	6 152	6.5 2.9
3½ 90	4.000 101.6	4½ 114	6¼ 159	8.2 3.7
4 100	4.500 114.3	5 127	7¼ 184	11 5.0
6 150	6.625 168.3	6½ 165	6½ 165	19.8 9.0

FIG. 7056 GR x MPT

45° ADAPTER ELBOW

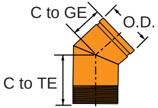

FIGURE 7056 45° ADAPTER ELBOWS

Nominal Size	O.D.	Center to Grooved End	Center to Threaded End	Approx. Wt. Ea.
In./DN(mm)	In./mm	In./mm	In./mm	Lbs./Kg
1 25	1.315 33.4	1¾ 44	1¾ 44	0.6 0.3
1¼ 32	1.660 42.2	1¾ 44	1¾ 44	0.7 0.3
1½ 40	1.900 48.3	1¾ 44	1¾ 44	0.8 0.4
2 50	2.375 60.3	2 51	3 76	1.6 0.7
2½ 65	2.875 73.0	2¼ 57	2¼ 57	2.2 1.0
3 80	3.500 88.9	2½ 64	4¼ 108	4.3 2.0
3½ 90	4.000 101.6	2¾ 70	2¾ 70	4.2 1.9
4 100	4.500 114.3	3 76	5¼ 133	7.5 3.4
6 150	6.625 168.3	3½ 89	3½ 89	11.1 5.0

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FIG. 7087 GR x FPT

FEMALE THREAD ADAPTER

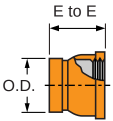

FIGURE 7087 FEMALE THREAD ADAPTER

Nominal Size	Grooved End O.D.	End to End	Approx. Wt. Ea.
In./DN(mm)	In./mm	In./mm	Lbs./Kg
1 25	1.315 33.4	2¹⁄₁₆ 52	0.7 0.3
1¼ 32	1.660 42.2	2⁵⁄₁₆ 59	1.4 0.6
1½ 40	1.900 48.3	2⁵⁄₁₆ 59	1.5 0.7
2 50	2.375 60.3	2½ 64	1.6 0.7
3 80	3.500 88.9	2¾ 70	2.5 1.1
4 100	4.500 114.3	3¼ 83	4.5 2.0

FIG. 7050RF

GROOVED x 150# FLANGED (GxF)

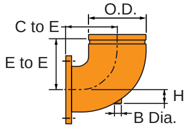

FIGURE 7050 RF REDUCING BASE SUPPORT ELBOWS

Nominal Size	Grooved End O.D.	Center to End	H	B Dia. Threaded	Approx. Wt. Ea. GxF
In./DN(mm)	In./mm	In./mm	In./mm	NPSC	Lbs./Kg
6 x 4 150 x 100	6.625 168.3	12 305	2½ 64	1½ 38	38.5 17.5
6 x 5 150 x 125	6.625 168.3	12½ 318	2½ 64	1½ 38	45.4 20.6
8 x 5 200 x 125	8.625 219.1	16 406	3 76	1½ 38	65.5 29.7
8 x 6 200 x 150	8.625 219.1	16 406	3 76	1½ 38	73 33.1
10 x 6 250 x 150	10.750 273.1	19 483	3½ 89	1½ 38	100 45.4
10 x 8 250 x 200	10.750 273.1	19 483	3½ 89	1½ 38	127 57.6
12 x 8 300 x 200	12.750 323.9	22 559	4 102	1½ 38	155 70.3
12 x 10 300 x 250	12.750 323.9	22 559	4 102	1½ 38	186 84.4

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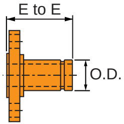
FIG. 7084

GROOVE x CLASS 150
FLANGE NIPPLES



* Contact a Anvil Representative for dimensions & weights.

FIG. 7085

GROOVE x CLASS 300
FLANGE NIPPLES

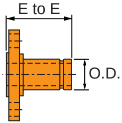


FIGURE 7084 GROOVE x CLASS 150 FLANGE NIPPLES

Nominal Size	O.D.	End to End	Approx. Wt. Ea.
In./ DN(mm)	In./mm	In./mm	Lbs./Kg
1 25	1.315 33.4	3 76	2.5 1.1
1¼ 32	1.660 42.2	4 102	3.8 1.7
1½ 40	1.900 48.3	4 102	4.1 1.9
2 50	2.375 60.3	4 102	6.0 2.7
2½ 65	2.875 73.0	4 102	9.2 4.2
3 80	3.500 88.9	4 102	10.4 4.7
3½ 90	4.000 101.6	4 102	14.0 6.4
4 100	4.500 114.3	6 152	19.1 8.7
5 125	5.563 141.3	6 152	23.0 10.4
6 150	6.625 168.3	6 152	29.5 13.4
8 200	8.625 219.1	6 152	43.5 19.7
10 250	10.750 273.1	8 203	68.2 30.9
12 300	12.750 323.9	8 203	96.1 43.6
14 350	14.000 355.6	* *	* *
16 400	16.000 406.4	* *	* *
18 450	18.000 457.2	* *	* *
20 500	20.000 508.0	* *	* *
24 600	24.000 609.6	* *	* *

FIGURE 7085 GROOVE x CLASS 300 FLANGE NIPPLES

Nominal Size	O.D.	End to End	Approx. Wt. Ea.
In./ DN(mm)	In./mm	In./mm	Lbs./Kg
1 25	1.315 33.4	3 76	3.6 1.6
1¼ 32	1.660 42.2	4 102	4.6 2.1
1½ 40	1.900 48.3	4 102	7.1 3.2
2 50	2.375 60.3	4 102	8.2 3.7
2½ 65	2.875 73.0	4 102	11.9 5.4
3 80	3.500 88.9	4 102	15.5 7.0
3½ 90	4.000 101.6	4 102	21.0 9.5
4 100	4.500 114.3	6 152	28.0 12.7
5 125	5.563 141.3	6 152	35.0 15.9
6 150	6.625 168.3	6 152	35.0 15.9
8 200	8.625 219.1	6 152	50.0 22.7
10 250	10.750 273.1	6 152	72.0 32.7
12 300	12.750 323.9	8 203	* *
14 350	14.000 355.6	8 203	* *
16 400	16.000 406.4	* *	* *
18 450	18.000 457.2	* *	* *
20 500	20.000 508.0	* *	* *
24 600	24.000 609.6	* *	* *

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FIG. 7074

CAP

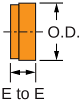

FIGURE 7074 CAP

Nominal Size	O.D.	End to End	Approx. Wt. Ea.
In./DN(mm)	In./mm	In./mm	Lbs./Kg
1 25	1.315 33.4	1¼ 32	0.3 0.1
1¼ C 32	1.660 42.2	1¼ 32	0.4 0.2
1½ C 40	1.900 48.3	1¼ 32	0.5 0.2
2 C 50	2.375 60.3	1 25	0.5 0.2
2½ C 65	2.875 73.0	1 25	0.7 0.3
3 O.D. C 76.1	2.996 76.1	1 25	0.8 0.4
3 C 80	3.500 88.9	1 25	1.1 0.5
3½ C 90	4.000 101.6	1 25	1.4 0.6
4¼ O.D. C 108.0	4.250 108.0	1⅛ 29	2.0 0.9
4 C 100	4.500 114.3	1⅛ 29	2.8 1.3
5¼ O.D. C 133.0	5.236 133.0	1⅛ 29	3.2 1.5
5½ O.D. C 139.7	5.500 139.7	1⅛ 29	4.0 1.8
5 C 125	5.563 141.3	1⅛ 29	4.0 1.8
6¼ O.D. C 159.0	6.259 159.0	1⅛ 29	5.1 2.3
6½ O.D. C 165.1	6.500 165.1	1⅛ 29	6.0 2.7
6 C 150	6.625 168.3	1⁵⁄₁₆ 33	6.0 2.7
8 C 200	8.625 219.1	1½ 38	12.5 5.7
10 C 250	10.750 273.1	1½ 38	21.9 9.9
12 C 300	12.750 323.9	1½ 38	33.8 15.3
14* 350	14.000 355.6	8½ 216	40 18.1
16* 400	16.000 406.4	9 229	45 20.4
18* 450	18.000 457.2	10 254	58 26.3
20* 500	20.000 508.0	11 279	79 35.8
24* 600	24.000 609.6	12½ 318	100 45.4

* Machined Cap

C - Cast Malleable or Ductile Iron

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FIG. 7075

BULL PLUG

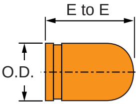

FIGURE 7075 BULL PLUG

Nominal Size	Fitting O.D.	End to End	Approx. Wt. Ea.
In./DN(mm)	In./mm	In./mm	Lbs./Kg
2 50	2.375 60.3	4 102	2.5 1.1
2½ 65	2.875 73.0	5 127	3.1 1.4
3 80	3.500 88.9	6 152	4.4 2.0
4 100	4.500 114.3	7 178	7.4 3.4
5 125	5.563 141.3	* *	* *
6 150	6.625 168.3	10 254	18.5 8.4

* Contact a Anvil Representative for dimensions & weights.

FIG. 7068

CROSS

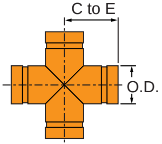

FIGURE 7068 CROSS

Nominal Size	O.D.	Center to End	Approx. Wt. Ea.
In./DN(mm)	In./mm	In./mm	Lbs./Kg
1 25	1.315 33.4	2¼ 57	1.3 0.6
1¼ 32	1.660 42.2	2¾ 70	2.1 1.0
1½ 40	1.900 48.3	2¾ 70	2.5 1.1
2 50	2.375 60.3	3¼ 83	2.9 1.3
2½ 65	2.875 73.0	3¾ 95	5.2 2.4
3 80	3.500 88.9	4¼ 108	7.5 3.4
3½ 90	4.000 101.6	4½ 114	9.8 4.4
4 100	4.500 114.3	5 127	12.2 5.5
5 125	5.563 141.3	5½ 140	17.6 8.0
6 150	6.625 168.3	6½ 165	28.3 12.8
8 200	8.625 219.1	7¾ 197	48.0 21.8
10 250	10.750 273.1	9 229	70.0 31.8
12 300	12.750 323.9	10 254	110 49.9
14 350	14.000 355.6	11 279	140 63.5
16 400	16.000 406.4	12 305	170 77.1
18 450	18.000 457.2	15½ 394	260 118
20 500	20.000 508.0	17¼ 438	320 145
24 600	24.000 609.6	20 508	585 265

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Fig. 7086

GR x HOSE Nipples

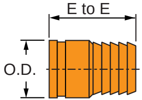

Fig. 7080

GR x GR

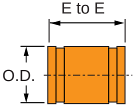

Fig. 7081

GR x MPT

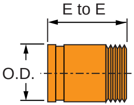

Fig. 7082

GR x BEV

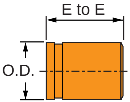

Figure 7086 Hose Nipples

Nom. Size	O.D.	End to End	Approx. Wt. Ea.
In./ DN(mm)	In./mm	In./mm	Lbs./Kg
1 25	1.315 33.4	3¼ 83	0.4 0.2
1¼ 32	1.660 42.2	3⅝ 92	0.7 0.3
1½ 40	1.900 48.3	4 102	0.8 0.4
2 50	2.375 60.3	4⅝ 117	1.3 0.6
2½ 65	2.875 73.0	5½ 140	2.1 1.0
3 80	3.500 88.9	6 152	3.3 1.5
4 100	4.500 114.3	7¼ 184	5.5 2.5
5 125	5.563 141.3	9¾ 248	8.1 3.7
6 150	6.625 168.3	11 279	13.2 6.0
8 200	8.625 219.1	12½ 318	24.0 10.9
10 250	10.750 273.1	14 356	29.0 13.2
12 300	12.750 323.9	16 406	46.0 20.9

Figures 7080, 7081 & 7082 Adapter Nipples

Nom. Size	O.D.	End to End	Approx. Wt. Ea.
In./ DN(mm)	In./mm	In./mm	Lbs./Kg
1 25	1.315 33.4	3 76	0.4 0.2
1¼ 32	1.660 42.2	4 102	0.8 0.4
1½ 40	1.900 48.3	4 102	0.9 0.4
2 50	2.375 60.3	4 102	1.2 0.5
2½ 65	2.875 73.0	4 102	1.9 0.9
3 80	3.500 88.9	4 102	2.5 1.1
3½ 90	4.000 101.6	4 102	3.1 1.4
4 100	4.500 114.3	6 152	5.5 2.5
5 125	5.563 141.3	6 152	7.4 3.4
6 150	6.625 168.3	6 152	9.5 4.3
8 200	8.625 219.1	6 152	14.2 6.4
10 250	10.750 273.1	8 203	27.0 12.2
12 300	12.750 323.9	8 203	33.0 15.0

This product is not UL/ULC Listed or FM Approved.

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Fig. 7065

Standpipe Tee (GR x GR x FPT)

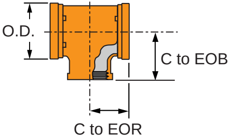

Figure 7065 Standpipe Tee (GR x GR x FPT)

Nominal Size	O.D.	Center to End of Run	Center to End of Branch	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*In./mm*	*Lbs./Kg*
4 x 4 x 2½ *100 x 100 x 65*	4.500 *114.3*	3¼ *83*	4 *102*	7.6 *3.4*
6 x 6 x 2½ *150 x 150 x 65*	6.625 *168.3*	3¼ *83*	5⅛ *130*	11.2 *5.1*

See Fitting Size Chart on page 148 for O.D. sizes.

These fittings are designed to provide minimal pressure drop and uniform strength. Pressure ratings of Gruvlok Fittings conforms to those of Fig. 7001 Gruvlok Standard Coupling.

Fig. 7062

Bullhead Tee Specialty Tees (GR x GR x FPT)

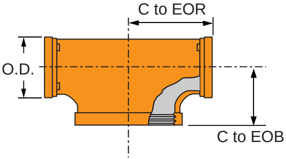

Figure 7065 Standpipe Tee (GR x GR x FPT)

Nominal Size	O.D.	Center to End of Run	Center to End of Branch	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*In./mm*	*Lbs./Kg*
5 x 5 x 8 *125 x 125 x 200*	7¾ *197*	5½ *140*	31.0 *14.1*	7.6 *3.4*
6 x 6 x 8 *150 x 150 x 200*	7¾ *197*	6½ *165*	37.6 *17.1*	11.2 *5.1*

See Fitting Size Chart on page 148 for O.D. sizes

These fittings are designed to provide minimal pressure drop and uniform strength. Pressure ratings of Gruvlok Fittings conforms to those of Fig. 7001 Gruvlok Standard Coupling.

FIG. 7050DR

STANDPIPE TEE (GR x GR x FPT)

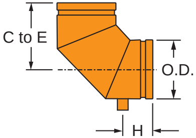

FIGURE 7050DR 90° DRAIN ELBOW

Nominal Size	O.D.	Max Working Pressure	Dimensions		Approx. Wt. Ea.
			C to E	H	
In./DN(mm)	In./mm	psi/bar	In./mm	In./mm	Lbs./Kg
1¼ 32	1.660 42.2	300 20.7	2¾ 69	1¾ 44	0.70 0.30
1½ 40	1.900 48.3	300 20.7	2¾ 69	1¾ 44	1.70 0.8
2 50	2.375 60.3	300 20.7	3¼ 83	1¾ 44	2.00 0.90
2½ 65	2.875 73.0	300 20.7	3¾ 95	1⅞ 48	2.50 1.10
3 80	3.500 88.9	300 20.7	4¼ 108	2 51	3.20 1.50
4 100	4.500 114.3	300 20.7	5 127	2¼ 57	4.60 2.10
5 125	5.583 141.3	300 20.7	5½ 140	2⅜ 60	11.5 5.2
6 150	6.625 168.3	300 20.7	6½ 165	2⅜ 60	9.60 4.40
8 200	8.625 219.1	300 20.7	7¾ 197	2½ 64	15.8 7.20
10 250	10.750 273.1	300 20.7	9 229	2¾ 69	48.5 22.0
12 300	12.750 323.9	300 20.7	10 254	2¾ 69	66.0 29.0

Available fabricated Schedule 10 only.

Drain elbow has a standard 1" female NPT outlet

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FIG. 7091

END-OF-LINE FITTING

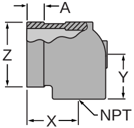

FIGURE 7091 END-OF-LINE FITTING

Nominal Size Run x Branch	O.D.	Max. Wk. Pressure	Coupling Dimensions			Approx. Wt. Ea.
			A	X	Y	
In./DN(mm)	*In./mm*	*PSI/bar*	*In./mm*	*In./mm*	*In./mm*	*Lbs./kg*
1½ x ½ *40 x 15*	1.900 *48*	300 *20.7*	⅝ *16*	1¾ *44*	1⁵⁄₁₆ *33*	0.8 *0.3*
1½ x ¾ *40 x 20*	1.900 *48*	300 *20.7*	⅝ *16*	1¾ *44*	1⁵⁄₁₆ *33*	0.8 *0.3*
1½ x 1 *40 x 25*	1.900 *48*	300 *20.7*	⅝ *16*	1⅞ *48*	1⅜ *35*	0.8 *0.3*
2 x ½ *50 x 15*	2.375 *60*	300 *20.7*	⅝ *16*	1¾ *44*	1⁹⁄₁₆ *40*	1.0 *0.4*
2 x ¾ *50 x 20*	2.375 *60*	300 *20.7*	⅝ *16*	1¾ *44*	1⁹⁄₁₆ *40*	1.0 *0.4*
2 x 1 *50 x 25*	2.375 *60*	300 *20.7*	⅝ *16*	1⅞ *48*	1⅝ *41*	1.0 *0.4*
2½ x ½ *65 x 15*	2.875 *73*	300 *20.7*	⅝ *16*	1¾ *44*	1¾ *44*	1.4 *0.6*
2½ x ¾ *65 x 20*	2.875 *73*	300 *20.7*	⅝ *16*	1¾ *44*	1¾ *44*	1.4 *0.6*
2½ x 1 *65 x 25*	2.875 *73*	300 *20.7*	⅝ *16*	1⅞ *48*	1¹³⁄₁₆ *46*	1.4 *0.6*

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Fig. 7450

90° Short Pattern Elbow

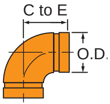

Figure 7450 90° Elbow

Nominal Size	O.D.	Center to End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	2¾ *70*	1.7 *0.8*
2½ *65*	2.875 *73.0*	3 *76*	2.6 *1.2*
3 *80*	3.500 *88.9*	3⅜ *86*	3.5 *1.6*
4 *100*	4.500 *114.3*	4 *102*	6.5 *3.0*
6 *150*	6.625 *168.3*	5½ *140*	14.8 *6.7*
8 *200*	8.625 *219.1*	6⅞ *175*	25.6 *11.6*

See the Gruvlok Catalog for additional information

Fig. 7460

Short Pattern Tee

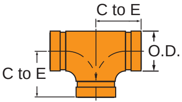

Figure 7460 Tee

Nominal Size	O.D.	Center to End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	2¾ *70*	2.5 *1.1*
2½ *65*	2.875 *73.0*	3 *76*	3.5 *1.6*
3 *80*	3.500 *88.9*	3⅜ *86*	4.8 *2.2*
4 *100*	4.500 *114.3*	4 *102*	8.1 *3.7*
6 *150*	6.625 *168.3*	5½ *140*	19.1 *8.7*
8 *200*	8.625 *219.1*	6⅞ *175*	35.2 *16.0*

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Fig. 7050 3D

Long Radius 90° Elbow

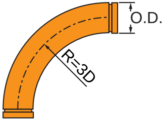

Figure 7050-3D 90° Elbow

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	In./mm	In./mm	Lbs./Kg
2 50	2.375 60.3	10 254	5.3 2.4
2½ 65	2.875 73	11½ 292	9.5 4.3
3 80	3.500 88.9	13 330	14.0 6.4
3½ 90	4.000 101.6	14½ 368	18.6 8.4
4 100	4.500 114.3	16 406	24.1 10.9
5 125	5.563 141.3	20 508	40.9 18.6
6 150	6.625 168.3	24 610	63.7 28.9
8 200	8.625 219.1	32 813	127.8 58.0
10 250	10.750 273.1	40 1016	226.4 102.7
12 300	12.750 323.9	48 1219	332.7 150.9
14 350	14.000 355.6	56 1422	427.3 193.8
16 400	16.000 406.4	64 1626	560.1 254.1
18 450	18.000 457.2	72 1829	710.7 322.4
20 500	20.000 508	80 2032	879.3 398.8
24 600	24.000 609.6	96 2438	1270.3 576.2

Fig. 7057 3D

Long Radius 60° Elbow

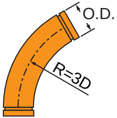

Figure 7057-3D 60° Elbow

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	In./mm	In./mm	Lbs./Kg
2 50	2.375 60.3	7½ 191	4.3 2.0
2½ 65	2.875 73	8¼ 210	7.7 3.5
3 80	3.500 88.9	9¼ 235	11.0 5.0
3½ 90	4.000 101.6	10 254	14.4 6.5
4 100	4.500 114.3	11 279	18.5 8.4
5 125	5.563 141.3	13¾ 349	31.3 14.2
6 150	6.625 168.3	16½ 419	48.8 22.1
8 200	8.625 219.1	22 559	97.9 44.4
10 250	10.750 273.1	27¼ 692	173.4 78.7
12 300	12.750 323.9	32¾ 832	254.8 115.6
14 350	14.000 355.6	38¼ 972	327.3 148.5
16 400	16.000 406.4	43¾ 1111	429.0 194.6
18 450	18.000 457.2	49¼ 1251	544.4 246.9
20 500	20.000 508	54¾ 1391	673.5 305.5
24 600	24.000 609.6	65½ 1664	973.0 441.3

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FIG. 7051 3D

LONG RADIUS 45° ELBOW

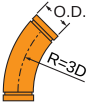

FIGURE 7051-3D 45° ELBOW

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	6½ *165*	3.9 *1.8*
2½ *65*	2.875 *73*	7¼ *184*	6.7 *3.0*
3 *80*	3.500 *88.9*	7¾ *197*	9.5 *4.3*
3½ *90*	4.000 *101.6*	8½ *216*	12.3 *5.6*
4 *100*	4.500 *114.3*	9 *229*	15.7 *7.1*
5 *125*	5.563 *141.3*	11¼ *286*	26.5 *12.0*
6 *150*	6.625 *168.3*	13½ *343*	41.3 *18.7*
8 *200*	8.625 *219.1*	18 *457*	82.9 *37.6*
10 *250*	10.750 *273.1*	22½ *572*	146.9 *66.6*
12 *300*	12.750 *323.9*	27 *686*	215.9 *97.9*
14 *350*	14.000 *355.6*	31½ *800*	227.3 *103.1*
16 *400*	16.000 *406.4*	36 *914*	363.5 *164.9*
18 *450*	18.000 *457.2*	40½ *1029*	461.3 *209.2*
20 *500*	20.000 *508*	45 *1143*	540.7 *245.3*
24 *600*	24.000 *609.6*	53¾ *1365*	824.4 *373.9*

FIG. 7058 3D

LONG RADIUS 30° ELBOW

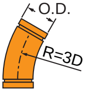

FIGURE 7058-3D 30° ELBOW

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	5¾ *146*	3.4 *1.5*
2½ *65*	2.875 *73*	6 *152*	5.8 *2.6*
3 *80*	3.500 *88.9*	6½ *165*	8.0 *3.6*
3½ *90*	4.000 *101.6*	6¾ *171*	10.2 *4.6*
4 *100*	4.500 *114.3*	7¼ *184*	12.8 *5.8*
5 *125*	5.563 *141.3*	9 *229*	21.8 *9.9*
6 *150*	6.625 *168.3*	10¾ *273*	33.9 *15.4*
8 *200*	8.625 *219.1*	14½ *368*	68.0 *30.8*
10 *250*	10.750 *273.1*	18 *457*	120.5 *54.7*
12 *300*	12.750 *323.9*	21¾ *552*	177.0 *80.3*
14 *350*	14.000 *355.6*	25¼ *641*	227.3 *103.1*
16 *400*	16.000 *406.4*	29 *737*	297.9 *135.1*
18 *450*	18.000 *457.2*	32½ *826*	378.1 *171.5*
20 *500*	20.000 *508*	36 *914*	467.8 *212.2*
24 *600*	24.000 *609.6*	43¼ *1099*	675.7 *304.1*

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FIG. 7052 3D

LONG RADIUS 22½° ELBOW

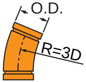

FIGURE 7052-3D 22½° ELBOW

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	5¼ *133*	3.2 *1.5*
2½ *65*	2.875 *73*	5½ *140*	5.3 *2.4*
3 *80*	3.500 *88.9*	5¾ *146*	7.3 *3.3*
3½ *90*	4.000 *101.6*	6 *152*	9.2 *4.2*
4 *100*	4.500 *114.3*	6½ *165*	11.4 *5.2*
5 *125*	5.563 *141.3*	8 *203*	19.4 *8.8*
6 *150*	6.625 *168.3*	9½ *241*	30.1 *13.7*
8 *200*	8.625 *219.1*	12¾ *324*	60.5 *27.4*

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
10 *250*	10.750 *273.1*	16 *406*	107.2 *48.6*
12 *300*	12.750 *323.9*	19¼ *489*	157.5 *71.4*
14 *350*	14.000 *355.6*	22½ *572*	202.3 *91.8*
16 *400*	16.000 *406.4*	25½ *648*	265.2 *120.3*
18 *450*	18.000 *457.2*	28¾ *730*	336.5 *152.6*
20 *500*	20.000 *508*	32 *813*	416.3 *188.8*
24 *600*	24.000 *609.6*	38¼ *972*	601.4 *272.8*

FIG. 7053 3D

LONG RADIUS 11¼° ELBOW

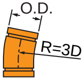

FIGURE 7053-3D 11¼° ELBOW

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	4½ *114*	2.8 *1.3*
2½ *65*	2.875 *73*	4¾ *121*	4.6 *2.1*
3 *80*	3.500 *88.9*	5 *127*	6.2 *2.8*
3½ *90*	4.000 *101.6*	5 *127*	7.6 *3.4*
4 *100*	4.500 *114.3*	5¼ *133*	9.3 *4.2*
5 *125*	5.563 *141.3*	6½ *165*	15.8 *7.2*
6 *150*	6.625 *168.3*	7¾ *197*	24.6 *11.2*
8 *200*	8.625 *219.1*	10½ *267*	49.3 *22.4*

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
10 *250*	10.750 *273.1*	13 *330*	87.3 *39.6*
12 *300*	12.750 *323.9*	15½ *394*	128.3 *58.2*
14 *350*	14.000 *355.6*	18¼ *464*	164.8 *74.8*
16 *400*	16.000 *406.4*	20¾ *527*	216.0 *98.0*
18 *450*	18.000 *457.2*	23.35 *593*	274.1 *124.3*
20 *500*	20.000 *508*	26 *660*	339.2 *153.9*
24 *600*	24.000 *609.6*	31 *787*	490.0 *222.3*

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FIG. 7050 5D

LONG RADIUS 90° ELBOW

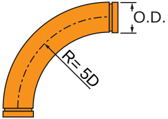

FIG. 7057 5D

LONG RADIUS 60° ELBOW

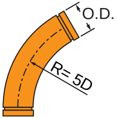

FIGURE 7050-5D 90° ELBOW

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	14 *356*	7.2 *3.3*
2½ *65*	2.875 *73*	16½ *419*	13.3 *6.0*
3 *80*	3.500 *88.9*	19 *483*	19.9 *9.0*
3½ *90*	4.000 *101.6*	21½ *546*	26.9 *12.2*
4 *100*	4.500 *114.3*	24 *610*	35.4 *16.1*
5 *125*	5.563 *141.3*	30 *762*	60.0 *27.2*
6 *150*	6.625 *168.3*	36 *914*	93.5 *42.4*
8 *200*	8.625 *219.1*	48 *1219*	187.6 *85.1*
10 *250*	10.750 *273.1*	60 *1524*	332.4 *150.8*
12 *300*	12.750 *323.9*	72 *1829*	488.4 *221.5*
14 *350*	14.000 *355.6*	84 *2134*	627.4 *284.6*
16 *400*	16.000 *406.4*	96 *2438*	822.2 *372.9*
18 *450*	18.000 *457.2*	108 *2743*	1,043.4 *473.3*
20 *500*	20.000 *508*	120 *3048*	1,290.9 *585.5*
24 *600*	24.000 *609.6*	144 *3658*	1,864.8 *845.9*

FIGURE 7057-5D 60° ELBOW

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	9¾ *248*	5.6 *2.5*
2½ *65*	2.875 *73*	11¼ *286*	10.2 *4.6*
3 *80*	3.500 *88.9*	12¾ *324*	15.0 *6.8*
3½ *90*	4.000 *101.6*	12¼ *311*	20.0 *9.1*
4 *100*	4.500 *114.3*	15½ *394*	26.0 *11.8*
5 *125*	5.563 *141.3*	19½ *495*	44.1 *20.0*
6 *150*	6.625 *168.3*	23¼ *591*	68.6 *31.1*
8 *200*	8.625 *219.1*	31 *787*	137.7 *62.5*
10 *250*	10.750 *273.1*	39 *991*	244.1 *110.7*
12 *300*	12.750 *323.9*	46¾ *1187*	358.6 *162.7*
14 *350*	14.000 *355.6*	54½ *1384*	460.7 *209.0*
16 *400*	16.000 *406.4*	62¼ *1581*	603.8 *273.9*
18 *450*	18.000 *457.2*	70 *1778*	766.2 *347.5*
20 *500*	20.000 *508*	77¾ *1975*	947.9 *430.0*
24 *600*	24.000 *609.6*	93¼ *2369*	1,369.3 *621.1*

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FIG. 7051 5D

LONG RADIUS 45° ELBOW

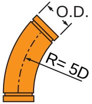

FIGURE 7051-5D 45° ELBOW

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	In./mm	In./mm	Lbs./Kg
2 50	2.375 60.3	8¼ 210	4.8 2.2
2½ 65	2.875 73	9¼ 235	8.6 3.9
3 80	3.500 88.9	10¼ 260	12.5 5.7
3½ 90	4.000 101.6	11¼ 286	16.5 7.5
4 100	4.500 114.3	12½ 318	21.3 9.7
5 125	5.563 141.3	15½ 394	36.1 16.4
6 150	6.625 168.3	18½ 470	56.2 25.5
8 200	8.625 219.1	24½ 622	112.8 51.2
10 250	10.750 273.1	30¾ 781	199.9 90.7
12 300	12.750 323.9	37 940	293.7 133.2
14 350	14.000 355.6	43 1092	377.3 171.1
16 400	16.000 406.4	49¼ 1251	494.5 224.3
18 450	18.000 457.2	55¼ 1403	627.6 284.7
20 500	20.000 508	61½ 1562	776.4 352.2
24 600	24.000 609.6	73¾ 1873	1,121.6 508.7

FIG. 7058 5D

LONG RADIUS 30° ELBOW

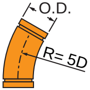

FIGURE 7058-5D 30° ELBOW

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	In./mm	In./mm	Lbs./Kg
2 50	2.375 60.3	6¾ 171	4.0 1.8
2½ 65	2.875 73	7½ 191	7.0 3.2
3 80	3.500 88.9	8 203	10.0 4.5
3½ 90	4.000 101.6	8¾ 222	13.0 5.9
4 100	4.500 114.3	9½ 241	16.6 7.5
5 125	5.563 141.3	11¾ 298	28.1 12.7
6 150	6.625 168.3	14 356	43.8 19.9
8 200	8.625 219.1	18¾ 476	87.9 39.9
10 250	10.750 273.1	23½ 597	155.8 70.7
12 300	12.750 323.9	28 711	228.9 103.8
14 350	14.000 355.6	32¾ 832	294.0 133.4
16 400	16.000 406.4	37½ 953	385.3 174.8
18 450	18.000 457.2	42¼ 1073	489.0 221.8
20 500	20.000 508	46¾ 1187	605.0 274.4
24 600	24.000 609.6	56¼ 1429	873.9 396.4

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Fig. 7052 5D

Long Radius 22½° Elbow

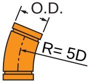

Fig. 7053 5D

Long Radius 11¼° Elbow

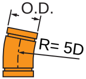

Figure 7052-5D 22½° Elbow

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	6 *152*	3.6 *1.6*
2½ *65*	2.875 *73*	6½ *165*	6.2 *2.8*
3 *80*	3.500 *88.9*	7 *178*	8.8 *4.0*
3½ *90*	4.000 *101.6*	7½ *191*	11.3 *5.1*
4 *100*	4.500 *114.3*	8 *203*	14.3 *6.5*
5 *125*	5.563 *141.3*	10 *254*	24.1 *10.9*
6 *150*	6.625 *168.3*	12 *305*	37.6 *17.1*
8 *200*	8.625 *219.1*	16 *406*	75.4 *34.2*
10 *250*	10.750 *273.1*	20 *508*	133.7 *60.6*
12 *300*	12.750 *323.9*	24 *610*	196.4 *89.1*
14 *350*	14.000 *355.6*	28 *711*	252.3 *114.4*
16 *400*	16.000 *406.4*	32 *813*	330.7 *150.0*
18 *450*	18.000 *457.2*	36 *914*	419.7 *190.4*
20 *500*	20.000 *508*	40 *1016*	519.2 *235.5*
24 *600*	24.000 *609.6*	48 *1219*	750.1 *340.2*

Figure 7053-5D 11¼° Elbow

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	5 *127*	3.0 *1.4*
2½ *65*	2.875 *73*	5¼ *133*	5.0 *2.3*
3 *80*	3.500 *88.9*	5½ *140*	6.9 *3.1*
3½ *90*	4.000 *101.6*	5¾ *146*	8.7 *3.9*
4 *100*	4.500 *114.3*	6 *152*	10.7 *4.9*
5 *125*	5.563 *141.3*	7½ *191*	18.2 *8.3*
6 *150*	6.625 *168.3*	9 *229*	28.3 *12.8*
8 *200*	8.625 *219.1*	12 *305*	56.8 *25.8*
10 *250*	10.750 *273.1*	15 *381*	100.6 *45.6*
12 *300*	12.750 *323.9*	18 *457*	147.8 *67.0*
14 *350*	14.000 *355.6*	21 *533*	189.8 *86.1*
16 *400*	16.000 *406.4*	24 *610*	248.8 *112.9*
18 *450*	18.000 *457.2*	27 *686*	315.7 *143.2*
20 *500*	20.000 *508*	30 *762*	390.6 *177.2*
24 *600*	24.000 *609.6*	35¾ *908*	564.3 *256.0*

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Fig. 7050 6D

Long Radius 90° Elbow

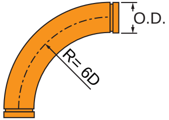

Figure 7050-6D 90° Elbow

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	In./mm	In./mm	Lbs./Kg
2 50	2.375 60.3	16 406	8.2 3.7
2½ 65	2.875 73	19 483	15.2 6.9
3 80	3.500 88.9	22 559	22.9 10.4
3½ 90	4.000 101.6	25 635	31.1 14.1
4 100	4.500 114.3	28 711	41.1 18.6
5 125	5.563 141.3	35 889	69.6 31.6
6 150	6.625 168.3	42 1067	108.4 49.2
8 200	8.625 219.1	56 1422	217.5 98.7

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	In./mm	In./mm	Lbs./Kg
10 250	10.750 273.1	70 1778	385.4 174.8
12 300	12.750 323.9	84 2134	566.2 256.8
14 350	14.000 355.6	98 2489	727.4 329.9
16 400	16.000 406.4	112 2845	953.3 432.4
18 450	18.000 457.2	126 3200	1,209.7 548.7
20 500	20.000 508	140 3556	1,496.6 678.8
24 600	24.000 609.6	168 4267	2,162.0 980.7

Fig. 7057 6D

Long Radius 60° Elbow

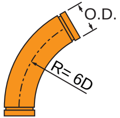

Figure 7057-6D 60° Elbow

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	In./mm	In./mm	Lbs./Kg
2 50	2.375 60.3	11 279	6.3 2.9
2½ 65	2.875 73	12¾ 324	11.4 5.2
3 80	3.500 88.9	14½ 368	17.0 7.7
3½ 90	4.000 101.6	16¼ 413	22.8 10.3
4 100	4.500 114.3	18 457	29.8 13.5
5 125	5.563 141.3	22¼ 565	50.5 22.9
6 150	6.625 168.3	26¾ 679	78.6 35.7
8 200	8.625 219.1	35¾ 908	157.7 71.5

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	In./mm	In./mm	Lbs./Kg
10 250	10.750 273.1	44¾ 1137	279.4 126.7
12 300	12.750 323.9	53½ 1359	410.5 186.2
14 350	14.000 355.6	62½ 1588	527.3 239.2
16 400	16.000 406.4	71½ 1816	691.1 313.5
18 450	18.000 457.2	80½ 2045	877.1 397.8
20 500	20.000 508	89¼ 2267	1,085.1 492.2
24 600	24.000 609.6	107¼ 2724	1,567.5 711.0

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FIG. 7051 6D

LONG RADIUS 45° ELBOW

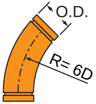

FIGURE 7051-6D 45° ELBOW

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	9 *229*	5.3 *2.4*
2½ *65*	2.875 *73*	10¼ *260*	9.5 *4.3*
3 *80*	3.500 *88.9*	11½ *292*	14.0 *6.4*
3½ *90*	4.000 *101.6*	12¾ *324*	18.6 *8.4*
4 *100*	4.500 *114.3*	14 *356*	24.1 *10.9*
5 *125*	5.563 *141.3*	17½ *445*	40.9 *18.6*
6 *150*	6.625 *168.3*	21 *533*	63.7 *28.9*
8 *200*	8.625 *219.1*	28 *711*	127.8 *58.0*
10 *250*	10.750 *273.1*	35 *889*	226.4 *102.7*
12 *300*	12.750 *323.9*	41¾ *1060*	332.7 *150.9*
14 *350*	14.000 *355.6*	48¾ *1238*	427.3 *193.8*
16 *400*	16.000 *406.4*	55¾ *1416*	560.1 *254.1*
18 *450*	18.000 *457.2*	62¾ *1594*	710.7 *322.4*
20 *500*	20.000 *508*	69¾ *1772*	879.3 *398.8*
24 *600*	24.000 *609.6*	83¾ *2127*	1,270.3 *576.2*

FIG. 7058 6D

LONG RADIUS 30° ELBOW

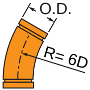

FIGURE 7058-6D 30° ELBOW

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	7¼ *184*	4.3 *2.0*
2½ *65*	2.875 *73*	8 *203*	7.7 *3.5*
3 *80*	3.500 *88.9*	8¾ *222*	11.0 *5.0*
3½ *90*	4.000 *101.6*	9¾ *248*	14.4 *6.5*
4 *100*	4.500 *114.3*	10½ *267*	18.5 *8.4*
5 *125*	5.563 *141.3*	13 *330*	31.3 *14.2*
6 *150*	6.625 *168.3*	15¾ *400*	48.8 *22.1*
8 *200*	8.625 *219.1*	21 *533*	97.9 *44.4*
10 *250*	10.750 *273.1*	26 *660*	173.4 *78.7*
12 *300*	12.750 *323.9*	31¼ *794*	254.8 *115.6*
14 *350*	14.000 *355.6*	36½ *927*	327.3 *148.5*
16 *400*	16.000 *406.4*	41¾ *1060*	429.0 *194.6*
18 *450*	18.000 *457.2*	47 *1194*	544.4 *246.9*
20 *500*	20.000 *508*	52¼ *1327*	673.5 *305.5*
24 *600*	24.000 *609.6*	62½ *1588*	973.0 *441.3*

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FIG. 7052 6D

LONG RADIUS 22½° ELBOW

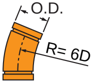

FIGURE 7052-6D 22½° ELBOW

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	In./mm	In./mm	Lbs./Kg
2 50	2.375 60.3	6½ 165	3.9 1.8
2½ 65	2.875 73	7 178	6.7 3.0
3 80	3.500 88.9	7½ 191	9.5 4.3
3½ 90	4.000 101.6	8¼ 210	12.3 5.6
4 100	4.500 114.3	8¾ 222	15.7 7.1
5 125	5.563 141.3	11 279	26.5 12.0
6 150	6.625 168.3	13¼ 337	41.3 18.7
8 200	8.625 219.1	17½ 445	82.9 37.6
10 250	10.750 273.1	22 559	146.9 66.6
12 300	12.750 323.9	26¼ 667	215.9 97.9
14 350	14.000 355.6	30¾ 781	277.3 125.8
16 400	16.000 406.4	35¼ 895	363.5 164.9
18 450	18.000 457.2	39½ 1003	461.3 209.2
20 500	20.000 508	44 1118	570.7 258.9
24 600	24.000 609.6	52.34 1329	824.4 373.9

FIG. 7053 6D

LONG RADIUS 11¼° ELBOW

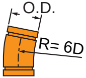

FIGURE 7053-6D 11¼° ELBOW

Nom. Size	O.D.	Center to End	Approx. Wt. Ea.
In./ DN(mm)	In./mm	In./mm	Lbs./Kg
2 50	2.375 60.3	5¼ 133	3.2 1.5
2½ 65	2.875 73	5½ 140	5.3 2.4
3 80	3.500 88.9	5¾ 146	7.3 3.3
3½ 90	4.000 101.6	6 152	9.2 4.2
4 100	4.500 114.3	6½ 165	11.4 5.2
5 125	5.563 141.3	8 203	19.4 8.8
6 150	6.625 168.3	9½ 241	30.1 13.7
8 200	8.625 219.1	12¾ 324	60.5 27.4
10 250	10.750 273.1	16 406	107.2 48.6
12 300	12.750 323.9	19 483	157.5 71.4
14 350	14.000 355.6	22¼ 565	202.3 91.8
16 400	16.000 406.4	25½ 648	265.2 120.3
18 450	18.000 457.2	28¾ 730	336.5 152.6
20 500	20.000 508	31¾ 806	416.3 188.8
24 600	24.000 609.6	38¼ 972	601.4 272.8

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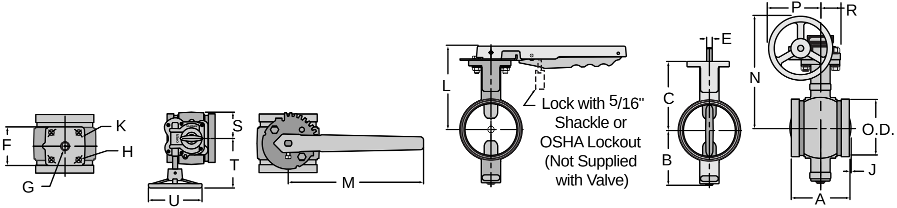
SERIES 7700

BUTTERFLY VALVE



Lock with 5/16" Shackle or OSHA Lockout (Not Supplied with Valve)

SERIES 7700 - BUTTERFLY VALVE DIMENSIONS

Dimensions	Valve Size (ANSI/DN)								
	2	2½	3	4	5	6	8	10	12
In./mm	***50***	***65***	***80***	***100***	***125***	***150***	***200***	***250***	***300***
O.D. *In./mm*	2⅜ *60.3*	2⅞ *73.0*	3½ *88.9*	4½ *114.3*	5 9/16 *141.3*	6⅝ *168.3*	8⅝ *219.1*	10¾ *273.1*	12¾ *323.9*
A	3 3/16 *81.0*	3 13/16 *96.8*	3 13/16 *96.8*	4⅝ *117.3*	5 13/16 *147.6*	5 13/16 *147.6*	5¼ *133.4*	6¼ *158.8*	6½ *165.1*
B	3 *75.4*	3 3/16 *80.8*	3 13/16 *96.5*	4¼ *108.5*	5 *126.5*	5½ *138.9*	6 15/16 *175.8*	8 *202.9*	9 *229.4*
C	4 3/16 *105.9*	4⅜ *111.3*	5 1/16 *129.0*	5⅜ *136.7*	5⅞ *149.4*	6⅜ *161.8*	7¾ *196.9*	9½ *240.3*	10½ *266.7*
D	1 1/16 *26.9*	1 1/16 *26.9*	1 1/16 *26.9*	1 1/16 *26.9*	1 1/16 *26.9*	1 1/16 *26.9*	1⅝ *41.1*	1⅝ *41.1*	1⅝ *41.1*
E	7/16 *11.1*	7/16 *11.1*	7/16 *11.1*	7/16 *11.1*	7/16 *11.1*	7/16 *11.1*	¾ *19.1*	¾ *19.1*	¾ *19.1*
F	3 *76.2*	3 *76.2*	3 *76.2*	3 *76.2*	3 *76.2*	3 *76.2*	5 *127.0*	5 *127.0*	5 *127.0*

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Series 7700 - Butterfly Valve Dimensions

Dimensions	Valve Size (ANSI/DN)								
	2	2½	3	4	5	6	8	10	12
In./mm	*50*	*65*	*80*	*100*	*125*	*150*	*200*	*250*	*300*
G	9⁄16 *14.3*	9⁄16 *14.3*	9⁄16 *14.3*	9⁄16 *14.3*	7⁄8 *22.2*	7⁄8 *22.2*	1 *25.4*	1¼ *31.8*	1¼ *31.8*
H	7⁄16 *11.1*	7⁄16 *11.1*	7⁄16 *11.1*	7⁄16 *11.1*	7⁄16 *11.1*	7⁄16 *11.1*	½ *13.5*	½ *13.5*	½ *13.5*
J	- *-*	- *-*	- *-*	- *-*	- *-*	⅛ *3.3*	1⅜ *34.8*	1⅞ *47.0*	2¾ *70.1*
K	3 *76.2*	3 *76.2*	3 *76.2*	3 *76.2*	3 *76.2*	3 *76.2*	5 *127.0*	5 *127.0*	5 *127.0*
L	5 5⁄16 *135.1*	5½ *140.5*	6¼ *158.2*	6½ *165.9*	7 *178.6*	7½ *191.0*	9 7⁄16 *240.3*	- *-*	- *-*
M	10½ *266.7*	10½ *266.7*	10½ *266.7*	10½ *266.7*	10½ *266.7*	10½ *266.7*	15 *381.0*	- *-*	- *-*
N	7 13⁄16 *198.0*	8 *203.3*	8 11⁄16 *221.1*	9 *228.7*	9½ *241.4*	10 *253.9*	14 15⁄16 *379.2*	16⅝ *422.7*	20 11⁄16 *525.3*
P	4 *102.1*	4 *102.1*	4 *102.1*	4 *102.1*	4 *102.1*	4 *102.1*	8 1⁄16 *204.5*	8 1⁄16 *204.5*	11⅝ *295.4*
R	1½ *38.2*	1½ *38.2*	1½ *38.2*	1½ *38.2*	1½ *38.2*	1½ *38.2*	2 5⁄16 *58.5*	2 5⁄16 *58.5*	2 9⁄16 *65.5*
S	2 *51.0*	2 *51.0*	2 *51.0*	2 *51.0*	2 *51.0*	2 *51.0*	2⅝ *66.0*	2⅝ *66.0*	3¼ *83.0*
T	6 5⁄16 *160.3*	6 5⁄16 *160.3*	6 5⁄16 *160.3*	6 5⁄16 *160.3*	6 5⁄16 *160.3*	6 5⁄16 *160.3*	10 13⁄16 *275.3*	10 13⁄16 *275.3*	13 13⁄16 *350.3*
U	5 *127.0*	5 *127.0*	5 *127.0*	5 *127.0*	5 *127.0*	5 *127.0*	12 *304.8*	12 *304.8*	18 *457.2*

3" or 5" handwheels may be included on valves sizes 2" - 4". Contact your Anvil Rep. for additional information.

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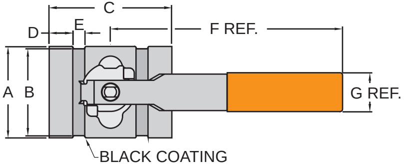
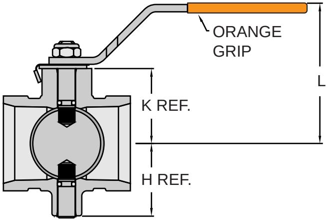
SERIES 7600

BUTTERFLY VALVES





SERIES 7600 - BUTTERFLY VALVE DIMENSIONS

Nom. Size	Dimensions									
	A	B	C	D	E	F	G	H	K	L
In./mm	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*
2 *50*	2⅜ *60.3*	2¼ *57.2*	3⁷⁄₁₆ *87.4*	⅝ *15.9*	⁵⁄₁₆ *8.7*	6 *152.4*	1 *25.4*	1¹³⁄₁₆ *46.0*	2 *50.8*	3³⁄₁₆ *81.0*
2½ *65*	2¹⁵⁄₁₆ *74.2*	2¾ *70.2*	3¹³⁄₁₆ *96.8*	⅝ *15.9*	⅜ *8.9*	6 *152.4*	1 *25.4*	2¹⁄₁₆ *52.3*	2⁷⁄₁₆ *62.0*	3⅝ *91.9*
3 *80*	3⁹⁄₁₆ *90.3*	3⅜ *86.4*	3¹³⁄₁₆ *96.8*	⅝ *15.9*	⅜ *8.9*	8⁷⁄₁₆ *214.4*	1 *25.4*	2⅝ *66.5*	2¹¹⁄₁₆ *68.1*	4¼ *108.0*
4 *100*	4⁹⁄₁₆ *116.1*	4⅜ *111.8*	4⅝ *117.3*	⅝ *15.9*	⅜ *8.9*	8⁷⁄₁₆ *214.4*	1 *25.4*	3⁵⁄₁₆ *84.1*	3⁵⁄₁₆ *84.1*	4¹⁵⁄₁₆ *125.5*
6 *150*	6¾ *171.0*	6⁹⁄₁₆ *166.6*	5¼ *133.4*	⅝ *15.9*	⅜ *8.9*	12¼ *311.2*	1¼ *31.8*	4⅜ *111.3*	4⅜ *111.3*	7 *177.8*

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SERIES 8000GR

Butterfly Valve

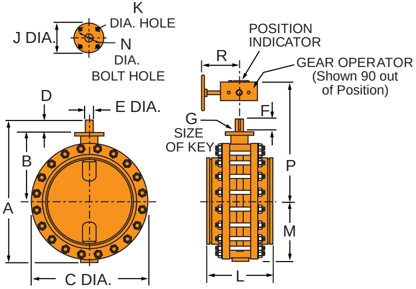

Figure 8000GR - Butterfly Valve Dimensions

Nominal Size	O.D.	A	B	C	D	E	F	G	J	K	L	M	N	P	R
In./DN(mm)	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*
14 *350*	14.000 *356*	26.25 *667*	13.25 *337*	21.00 *533*	2.25 *57*	1.50 *38*	2.00 *51*	⅜ x ⅜ *87*	6.00 *152*	0.53 *13*	13.06 *332*	10.75 *273*	5.00 *127*	17.94 *456*	10.00 *254*
16 *400*	16.000 *406*	29.50 *749*	14.75 *375*	23.50 *597*	2.25 *57*	1.50 *38*	2.00 *51*	⅜ x ⅜ *87*	6.00 *152*	0.53 *13*	14.33 *364*	12.5 *318*	5.00 *127*	19.44 *494*	10.00 *254*
18 *450*	18.000 *457*	32.75 *832*	15.75 *400*	25.00 *635*	3.00 *76*	1.75 *44*	2.38 *60*	⅜ x ⅜ *87*	6.75 *171*	0.53 *13*	15.40 *391*	14.00 *356*	5.00 *127*	20.44 *519*	10.00 *254*
20 *500*	20.000 *508*	34.00 *864*	16.25 *413*	27.50 *699*	3.00 *76*	1.75 *44*	2.60 *66*	⅜ x ⅜ *87*	6.75 *171*	0.53 *13*	16.38 *416*	15.00 *381*	5.00 *127*	20.94 *532*	10.00 *254*
24 *600*	24.000 *610*	39.37 *1,000*	19.12 *486*	32.00 *813*	3.00 *76*	2.25 *57*	3.25 *83*	½ x ½ *116*	9.50 *241*	0.81 *21*	18.26 *464*	16.75 *425*	6.50 *165*	24.38 *619*	10.25 *260*

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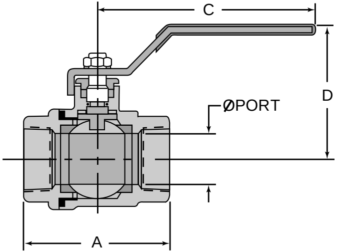
FIG. 141S, FIG. 171N & FIG. 171S

INTERNATIONAL BRASS BALL VALVES



DIMENSIONS							
Valve Code	Size	Port Dia.	A	C	D	Cv	Approx. Wt. Ea.
	In./mm	In./mm	In./mm	In./mm	In./mm		Lbs./Kg
141S Standard Port Soldered End	½ 15	½ 12	2¹⁄16 52	3⁷⁄8 98	1¹³⁄16 46	6.3	0.7 0.3
	¾ 20	⁹⁄16 14	2¹¹⁄16 68	3⁷⁄8 98	1¹⁵⁄16 49	9.5	0.8 0.4
	1 25	¾ 19	3³⁄16 81	4¹³⁄16 122	2⁵⁄16 59	22.2	1.1 0.5
	1¼ 32	1 25	3⁹⁄16 90	4¹³⁄16 122	2½ 63	30.8	1.5 0.7
	1½ 40	1¼ 32	4 102	6 152	3¹⁄16 78	60.9	2.2 1.0
	2 50	1⁹⁄16 40	5¹⁄16 128	6 152	3⁵⁄16 84	92.9	3.1 1.4

NOTES

1. Dimensions of solder joint ends conform to ANSI B16.22. Solder end valves are designed to be used with solders not exceeding a melting point of 470°F/250°C. Higher temperatures may damage the seal material.

2. For solder joint valves, the pressure/temperature rating is dependent on the solder material used. Please refer to the limitations listed in ANSI B16.18.

3. Rate of Flow Calculations for liquids:

   To determine the flow rate of a liquid passing through a valve, use the following formula:

$$Q_L = C_V \left(\sqrt{\frac{\Delta P}{S_L}} \right)$$

Where: Q_L = flow of liquid in gallons per minute (GPM)

C_V = flow coefficient
ΔP = pressure drop (PSI)
S_L = specific gravity of liquid

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FIG. 141S, FIG. 171N & FIG. 171S

INTERNATIONAL BRASS BALL VALVES

DIMENSIONS							
Valve Code	Size	Port Dia.	A	C	D	Cv	Approx. Wt. Ea.
	In./mm	In./mm	In./mm	In./mm	In./mm		Lbs./Kg
171N Full Port Threaded End	¼ 8	⅜ 10	2 51	3⅞ 98	1¾ 45	6	0.3 0.1
	⅜ 10	⅜ 10	2 51	3⅞ 98	1¾ 45	7	0.3 0.1
	½ 15	9/16 14	2 7/16 62	3⅞ 98	1⅞ 48	19	0.4 0.2
	¾ 20	¾ 19	2 11/16 68	4 13/16 122	2¼ 57	35	0.7 0.3
	1 25	15/16 24	3 1/16 78	4 13/16 122	2 7/16 62	50	1.0 0.5
	1¼ 32	1¼ 32	3 7/16 87	6 152	3 1/16 78	104	2.0 0.9
	1½ 40	1 9/16 40	3⅞ 98	6 152	3 5/16 84	268	3.1 1.4
	2 50	1 15/16 49	4 5/16 110	6⅜ 162	3 13/16 97	309	4.2 1.9
	2½ 65	2 9/16 65	5 9/16 141	8 1/16 205	5 127	629	8.0 3.7
	3 75	3⅛ 79	6 7/16 164	8 5/16 205	5 7/16 138	1018	12.0 5.9
	4 100	3 15/16 100	7⅝ 194	10¼ 260	6 5/16 160	1622	22.0 10.0

DIMENSIONS							
Valve Code	Size	Port Dia.	A	C	D	Cv	Approx. Wt. Ea.
	In./mm	In./mm	In./mm	In./mm	In./mm		Lbs./Kg
171S Full Port Soldered End	½ 15	9/16 14	2½ 64	3⅞ 98	1⅞ 48	19	0.5 0.2
	¾ 20	¾ 19	3 76	4 13/16 122	2 5/16 59	35	0.7 0.3
	1 25	1 25	3 9/16 91	4 13/16 122	2½ 64	50	1.1 0.5
	1¼ 32	1¼ 32	4 9/16 103	6 152	3⅛ 79	104	2.0 0.9
	1½ 40	1 9/16 40	4 9/16 116	6 152	3⅜ 86	268	2.7 1.2
	2 50	1 15/16 49	5 7/16 138	6 7/16 164	3 11/16 94	309	3.9 1.8
	2½ 65	2 9/16 65	6⅞ 175	8 7/16 205	5 127	629	9.4 4.3
	3 75	3⅛ 79	8 3/16 208	8 1/16 205	5 7/16 138	1018	14.5 6.6
	4 100	3 15/16 100	10 5/16 262	10¼ 260	6 5/16 160	1622	24.7 11.2

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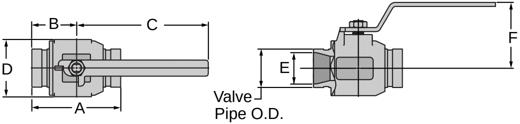
Fig. 7500

Ball Valves



Series 7500 - Ball Valve

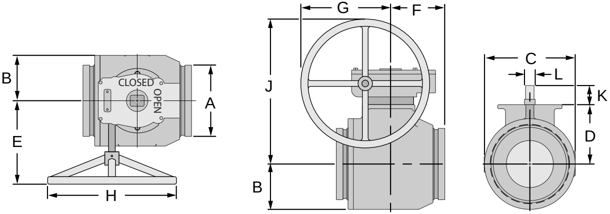
Size ANSI	O.D.	Dimensions							Approx. Wt. Ea.
		A	B	C	D	E	F	Cv	
In./DN(mm)	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*		*Lbs./Kg*
2 *50*	2.375 *60.3*	5½ *140*	2¾ *70*	8¼ *209*	3¹³⁄₁₆ *81*	1¹⁵⁄₁₆ *49*	4⅛ *105*	165	8 *3.6*
3 *80*	3.500 *88.9*	6¾ *171*	3⅜ *85*	10 *254*	4¹³⁄₁₆ *122*	2⅞ *74*	4¹³⁄₁₆ *121*	310	18 *8.2*
4 *100*	4.500 *114.3*	8¼ *210*	4⅛ *105*	16 *406*	6⁵⁄₁₆ *176*	3¹³⁄₁₆ *97*	6 *152*	815	38 *17.2*
6 * *150*	6.625 *168.3*	10⅛ *257*	5¹⁄₁₆ *128*	28 *711*	8⁷⁄₁₆ *215*	5¹¹⁄₁₆ *144*	7⅝ *194*	1500	106 *48.1*

* Bare Stem

GRUVLOK®

SERIES 7500

Ball Valves



Series 7500 - Ball Valve With Gear Actuator													
Size ANSI	O.D.	Dimensions											Approx. Wt. Ea.
		A	B	C	D	E	F	G	H	J	K	L	
In./DN(mm)	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	Lbs./Kg
6 150	6.625 168.3	6⅝ 168.7	4¼ 107.4	8 7⁄16 214.6	5½ 140.5	10¼ 260.4	5 1⁄16 128.0	8⅛ 206.4	12 304.8	13½ 342.9	1 13⁄16 45.2	1 25.4	9.6 4.4

FIG. 400G

GROOVED-END SILENT CHECK VALVE

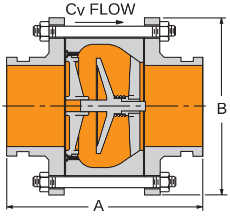


FIGURE 400G - GROOVED-END SILENT CHECK VALVE

Nom. Size	O.D.	Model	A	B	C_v Flow	Approx. Wt. Each
In./mm	*In./mm*	*Number*	*In./mm*	*In./mm*		*Lbs./Kg*
2 *50*	2.375 *60.3*	402G	6 *152*	6 *152*	66 *1,676*	12 *5.4*
2½ *65*	2.875 *73.0*	4025G	6¼ *159*	7 *178*	88 *2,235*	15 *6.8*
3 *80*	3.500 *88.9*	403G	6⁷⁄₁₆ *164*	7½ *191*	130 *3,302*	20 *9.1*
4 *100*	4.500 *114.3*	404G	8⅛ *206*	9 *229*	228 *5,791*	36 *16.3*
5 *125*	5.563 *141.3*	405G	11¼ *286*	10 *254*	350 *8,890*	50 *22.7*
6 *150*	6.625 *168.3*	406G	12¼ *311*	11 *279*	520 *13,208*	68 *30.8*
8 *200*	8.625 *219.1*	408G	13¾ *349*	13½ *343*	900 *22,860*	140 *63.5*
10 *250*	10.750 *273.1*	410G	16 *406*	16 *406*	1,450 *36,830*	198 *89.8*

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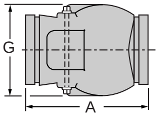
SERIES 7800

CHECK VALVES



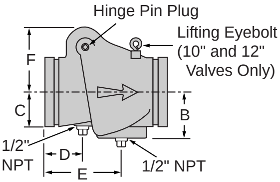


FIGURE 7800 - CHECK VALVE

Nom. Size	O.D.	Nominal Dimensions							Approx. Wt. Ea.
		A	B	C	D	E	F	G	
In./DN(mm)	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	Lbs./Kg.
2 50	2.375 60.3	6¾ 171	2⅜ 60	1⁷⁄₁₆ 36	1¾ 44	4½ 114	3³⁄₁₆ 81	4⅜ 111	7.5 3.4
2½ 65	2.875 73.0	7¼ 184	2⁷⁄₁₆ 61	1⁹⁄₁₆ 39	1¾ 44	3¹³⁄₁₆ 96	3⅝ 92	4½ 114	10.5 4.8
3 80	3.500 88.9	7¾ 197	2⅝ 67	2 51	1¹³⁄₁₆ 46	4¹⁄₁₆ 103	3¹¹⁄₁₆ 93	4¹⁵⁄₁₆ 125	11.5 5.2
4 100	4.500 114.3	8⅛ 206	3⅛ 79	2¼ 57	2½ 64	5¹⁄₁₆ 128	4¼ 108	6 152	13.5 6.1
5 125	5.563 141.3	9¾ 248	3½ 89	2¾ 70	2⁷⁄₁₆ 61	5¹³⁄₁₆ 147	4⅝ 117	6¾ 171	19.0 8.6
6 150	6.625 168.3	12¾ 324	4¼ 108	3⁵⁄₁₆ 84	3⅛ 79	6¼ 159	6¾ 171	8½ 216	33.5 15.2
8 200	8.625 219.1	14⅜ 365	5¹⁄₁₆ 128	3¹⁵⁄₁₆ 100	4 102	5¹⁵⁄₁₆ 150	8 203	10¼ 260	59.0 26.8
10 250	10.750 273.1	18 457	6⁵⁄₁₆ 160	4¹⁵⁄₁₆ 125	4⁹⁄₁₆ 115	6⅞ 175	9³⁄₁₆ 233	12¹¹⁄₁₆ 322	130.0 59.0
12 300	12.750 323.9	21 533	7⁵⁄₁₆ 185	6 152	5¹⁄₁₆ 128	7¼ 184	10⅜ 264	14¾ 375	183.0 83.0

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GBV-G

BALANCING VALVES

2½" to 12" Ductile Iron, Grooved-End Straight

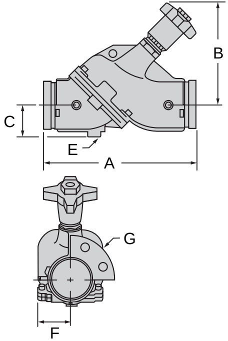

FIGURE GBV-G - GROOVED-END STRAIGHT BALANCING VALVES

Nom. Size	O.D.	A	B Open	C	E	F	Flange Diameter G Flange 125#	Flange Diameter G Flange 250#	Approx. Wt. Each
In./DN(mm)	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*Lbs./Kg*
2½ *65*	2.875 *73.0*	12 *305*	9⅝ *244*	2¾ *70*	1 *25*	2 9/16 *65*	7 *178*	7½ *191*	25 *11.3*
3 *80*	3.500 *88.9*	12 *305*	10½ *267*	2 7/16 *61*	1 *25*	3 *76*	7½ *191*	8¼ *210*	28 *12.7*
4 *100*	4.500 *114.3*	14 *356*	10 9/16 *268*	3 *76*	1¼ *32*	3 7/16 *87*	9¼ *235*	10 *254*	41 *18.6*
5 *125*	5.563 *141.3*	17½ *445*	13 1/16 *331*	3⅝ *92*	1¼ *32*	4 15/16 *125*	10 *254*	11 *279*	90 *40.8*
6 *150*	6.625 *168.3*	20 11/16 *525*	13 ¾ *349*	4 7/16 *112*	2 *51*	5⅞ *149*	11 *279*	12½ *318*	130 *59.0*
8 *200*	8.625 *219.1*	28 3/16 *716*	24⅝ *625*	5 11/16 *144*	2¼ *57*	7⅞ *200*	13½ *343*	15 *381*	310 *140.6*
10 *250*	10.750 *273.1*	30 *762*	26½ *673*	6 9/16 *166*	2¼ *57*	9 15/32 *240*	16 *406*	17½ *445*	460 *208.7*
12 *300*	12.750 *323.9*	38 1/16 *966*	28 7/16 *722*	7⅝ *194*	2¼ *57*	12⅝ *321*	19 *483*	20½ *521*	870 *394.6*

NOTE: Grooved-Ends are for connection of components with dimensions conforming to Gruvlok® standard grooved specifications for IPS pipe.

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GBV-A

BALANCING VALVE

2½" to 12" Ductile Iron, Grooved-End Angle

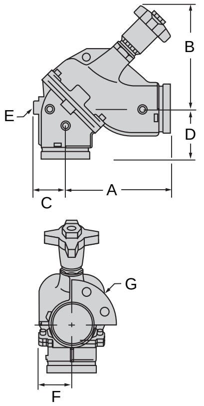

FIGURE GBV-A - GROOVED-END ANGLE BALANCING VALVES

Nom. Size	O.D.	A	B Open	C	D	E	F	Flange Diameter		Approx. Wt. Each
								G Flange 125#	G Flange 250#	
In./DN(mm)	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	Lbs./Kg
2½ 65	2.875 73.0	7⅜ 187	9⅝ 244	2¾ 70	4⅝ 117	1 25	2⁹⁄₁₆ 65	7 178	7½ 191	25 11.3
3 80	3.500 88.9	8⅜ 213	10½ 267	2⁷⁄₁₆ 61	3⅞ 98	1 25	3 76	7½ 191	8¼ 210	28 12.7
4 100	4.500 114.3	9⅝ 244	10⁹⁄₁₆ 268	3 76	4⅜ 111	1¼ 32	3⁷⁄₁₆ 87	9¼ 235	10 254	41 18.6
5 125	5.563 141.3	12 305	13¹⁄₁₆ 331	3⅝ 92	5½ 140	1¼ 32	4¹⁵⁄₁₆ 125	10 254	11 279	90 40.8
6 150	6.625 168.3	14⅛ 359	13 ¾ 349	4⁷⁄₁₆ 112	6⅝ 168	2 51	5⅞ 149	11 279	12½ 318	130 59.0
8 200	8.625 219.1	18¹⁵⁄₁₆ 481	24 ⅝ 625	5¹¹⁄₁₆ 144	9³⁄₁₆ 233	2¼ 57	7⅞ 200	13½ 343	15 381	310 140.6
10 250	10.750 273.1	20⁵⁄₁₆ 515	26½ 673	6⁹⁄₁₆ 166	9¾ 248	2¼ 57	9¹⁵⁄₃₂ 240	16 406	17½ 445	460 208.7
12 300	12.750 323.9	24¹⁄₁₆ 611	28⁷⁄₁₆ 722	7⅝ 194	14 356	2¼ 57	12⅝ 321	19 483	20½ 521	870 394.6

NOTE: Grooved-Ends are for connection of components with dimensions conforming to Gruvlok® standard grooved specifications for IPS pipe.

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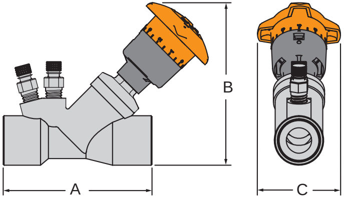
GBV-S (Solder)

Five Turn Circuit Balancing Valves



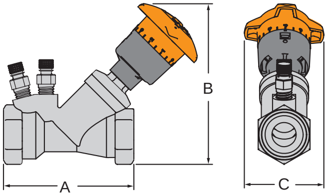
Model: GBV-S - ½" - 2"

Model	Nominal Size	A	B	C	Approx. Wt. Ea.
	In./DN(mm)	In./mm	In./mm	In./mm	Lbs./Kg
GBV050VS	½" 15	3 3/16 81	4 9/16 116	2¾ 70	1.1 0.5
GBV075VS	¾" 20	3 9/16 93	4 9/16 118	2¾ 70	1.1 0.5
GBV100VS	1" 25	4¼ 108	4 15/16 126	2¾ 70	1.7 0.8
GBV125VS	1¼" 32	4 15/16 125	5⅜ 137	2¾ 70	2.3 1.0
GBV150VS	1½" 40	5 11/16 144	5⅝ 142	2¾ 70	3.2 1.5
GBV200VS	2" 50	7 179	6⅜ 162	2¾ 70	5.4 2.5

See Installation & Assembly directions on pages 186-191.

GBV-T (NPT-threaded)

Five Turn Circuit Balancing Valves



Model: GBV-T - ½" - 2"

Model	Nominal Size	A	B	C	Approx. Wt. Ea.
	In./DN(mm)	In./mm	In./mm	In./mm	Lbs./Kg
GBV050VT	½" 15	3 76	4⅝ 117	2¾ 70	1.1 0.5
GBV075VT	¾" 20	3¼ 83	4⅞ 125	2¾ 70	1.2 0.6
GBV100VT	1" 25	3 13/16 97	5¼ 135	2¾ 70	1.9 0.8
GBV125VT	1¼" 32	4 5/16 110	5⅝ 143	2¾ 70	2.3 1.1
GBV150VT	1½" 40	5 1/16 129	5⅞ 150	2¾ 70	3.5 1.6
GBV200VT	2" 50	6 153	6 11/16 170	2¾ 70	6.0 2.5

See Installation & Assembly directions on pages 186-191.

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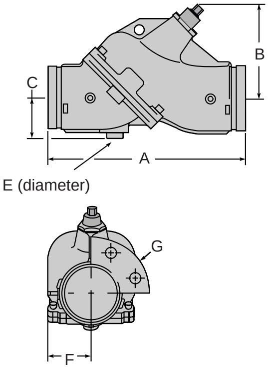
FTV-S (STRAIGHT)

TRI-SERVICE VALVE



MODEL FTV-S - (STRAIGHT)								
Connection Size	A	B (fully open)	C	E	F	Flange 125/150 PSI G	Flange 250/300 PSI G	Approx. Wt. Each
In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	lbs/kg
2 1/2 65	12 305	7 178	2 3/4 70	1 25	2 9/16 65	7 178	7 1/2 191	19 9
3 880	12 305	7 13/16 198	2 7/16 62	1 25	3 76	7 1/2 191	8 1/4 210	24 11
4 100	14 356	8 203	3 76	1 1/4 32	3 7/16 87	9 1/4 235	10 254	42 19
5 125	17 1/2 445	10 1/8 257	3 5/8 92	1 1/4 32	4 15/16 125	10 254	11 279	81 37
6 150	20 11/16 525	10 3/8 264	4 7/16 113	2 51	5 7/8 149	11 279	12 1/2 318	120 54
8 200	28 3/16 716	22 13/16 579	5 11/16 144	2 1/4 57	7 7/8 200	13 1/2 343	15 381	300 136
10 250	30 762	28 5/8 727	6 9/16 167	2 1/4 57	9 15/32 241	16 409	17 1/2 445	450 204
12 300	38 1/16 967	32 5/8 829	7 5/8 194	2 1/4 57	12 5/8 321	19 483	20 1/2 521	850 390

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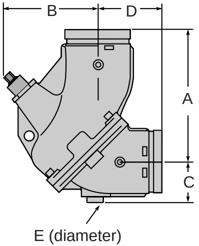
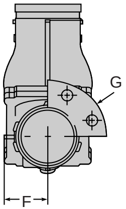
FTV-A (ANGLE BODY)

TRI-SERVICE VALVE





MODEL FTV-A - (ANGLE)									
Connection Size	A	B (fully open)	C	D	E	F	Flange 125/150 PSI G	Flange 250/300 PSI G	Approx. Wt. Each
In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	lbs/kg
$2\frac{1}{2}$ 65	$7\frac{3}{8}$ 187	7 178	$2\frac{3}{4}$ 70	$4\frac{5}{8}$ 117	1 25	$2\frac{9}{16}$ 65	7 178	$7\frac{1}{2}$ 191	19 9
3 880	$8\frac{3}{16}$ 208	$7\frac{13}{16}$ 198	$2\frac{7}{16}$ 62	$3\frac{7}{8}$ 98	1 25	3 76	$7\frac{1}{2}$ 191	$8\frac{1}{4}$ 210	24 11
4 100	$9\frac{5}{8}$ 244	8 203	3 76	$4\frac{3}{8}$ 111	$1\frac{1}{4}$ 32	$3\frac{7}{16}$ 87	$9\frac{1}{4}$ 235	10 254	42 19
5 125	12 305	$10\frac{1}{8}$ 257	$3\frac{5}{8}$ 92	$5\frac{1}{2}$ 140	$1\frac{1}{4}$ 32	$4\frac{15}{16}$ 125	10 254	11 279	81 37
6 150	$14\frac{1}{8}$ 359	$10\frac{3}{8}$ 264	$4\frac{7}{16}$ 113	$6\frac{5}{8}$ 168	2 51	$5\frac{7}{8}$ 149	11 279	$12\frac{1}{2}$ 318	120 54
8 200	$18\frac{15}{16}$ 481	$18\frac{3}{4}$ 476	$5\frac{11}{16}$ 144	$9\frac{3}{16}$ 233	$2\frac{1}{4}$ 57	$7\frac{7}{8}$ 200	$13\frac{1}{2}$ 343	15 381	300 136
10 250	$20\frac{5}{16}$ 516	24 610	$6\frac{9}{16}$ 167	$9\frac{3}{4}$ 248	$2\frac{1}{4}$ 57	$9\frac{15}{32}$ 241	16 409	$17\frac{1}{2}$ 445	450 204
12 300	$24\frac{1}{16}$ 611	$26\frac{1}{4}$ 667	$7\frac{5}{8}$ 194	14 356	$2\frac{1}{4}$ 57	$12\frac{5}{8}$ 321	19 483	$20\frac{1}{2}$ 521	860 390

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FTV-S (STRAIGHT) AND FTV-A (ANGLE BODY)

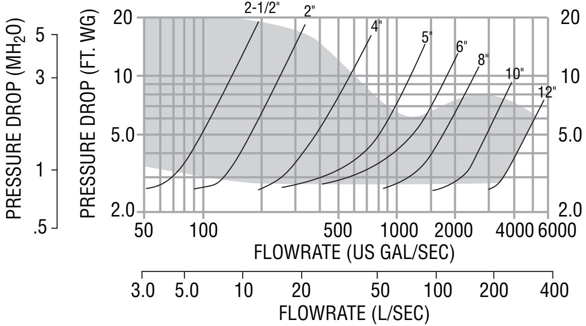
TRI-SERVICE VALVE PERFORMANCE CURVE

Performance Curve
Valve in Full Open Position

1. **Minimum Flow Rate** – To ensure sufficient flow to hold disc in full open position during operation, size valves in shaded area only of Performance Curve.

2. **Maximum Flow Rate** – Select valve in shaded area only. However, consideration should be given to selecting the valve with the lowest pressure drop and velocity in accordance with ASHRAE practice. This will ensure a quiet, energy-efficient system and maximum valve life.

Tri-Service Performance Curve
with Valve in Full Open Position



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FTV-S (STRAIGHT) AND FTV-A (ANGLE BODY)

TRI-SERVICE VALVE PERFORMANCE CURVE

1. Record the size of valve and stem position using the Flow Indicator Scale. Calculate percentage of valve opening referring to table below:

Valve Size	2½	3	4	5	6	8	10	12
Number of Rings (Valve Full Open)	5	5	6	9	10	12	18	28

2. Measure and record the differential pressure across the valve in the throttled position.
3. Locate percentage of valve opening on the bottom of Flow Characteristic Curve. Project line vertically up to intersect with the Valve Characteristic Curve and from this point project line horizontally across to the left of the chart and record the percentage of maximum flow rate.
4. On the Tri-Service Performance Curve locate the differential pressure obtained in Step 2 and project line horizontally across to intercept with Valve Performance Curve. Drop a line vertically down to read the flow rate at the bottom of the chart.
5. To calculate flow rate of valve in the throttled position, multiply the flow rate from Step 4 by the percentage flow rate from Step 4 by the percentage flow rate from Step 2 divided by 100.

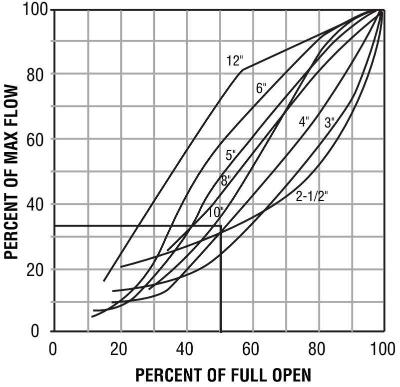
Example:

Valve size 4 in., Differential Pressure in 5.4 ft. (1.65m)•
Number of rings open 3, (3 rings / 6 rings x 100) = 50% throttled

Solution:

- From the Tri-service performance Curve, a 4 in. valve with 5.4 ft. pressure drop (1.65m.) represents a flow of 400 USgpm (25.2 l/s).
- From Flow Characteristic, a 4 in. valve, 50% open, represents 34% of maximum flow.
- Approximate flow of a 4 in. valve, with a 5.4 ft. (1.65m) pressure drop when 50% throttled is: (400 x 34)/100 = 136 USgpm, (25.2 x 34)/100 = 8.57 L/sec.

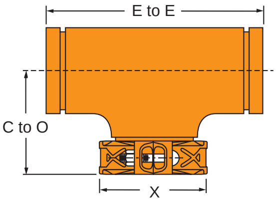
Inherent Flow Characteristic Curve with Valve in Throttled Position

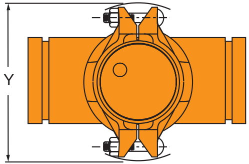


Note: To prevent premature valve failure, it is not recommended that the valve operate in the throttled position with more than 25 ft. pressure differential. Instead the pump inpeller should be trimmed or valves located elsewhere in the system to partially throttle the flow.

FIG. 7260

GRUVLOK TEE STRAINER





NOTE: This illustration shows the required orientation of the Rigidlok access coupling for assembly with a grooved-end flange.

FIGURE 7260 - TEE STRAINER (CONTINUES ON NEXT PAGE)

Nom. Size	O.D.	Max.* Working Pressure	E to E	C to O	X	Y	Basket Removal	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*PSI/bar*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*Clearance*	*Lbs./Kg*
2 *50*	2.375 *60.3*	750 *51.7*	6½ *165*	4¼ *108*	3½ *89*	5⅞ *149*	4⅜ *111*	6.0 *2.7*
2½ *65*	2.875 *73.0*	750 *51.7*	7½ *191*	4¾ *121*	4 *102*	6½ *165*	5⅛ *130*	8.0 *3.6*
3 *80*	3.500 *88.9*	750 *51.7*	8½ *216*	5¼ *133*	4¾ *121*	7 *178*	6 *152*	13.0 *5.9*
4 *100*	4.500 *114.3*	750 *51.7*	10 *254*	6⅛ *156*	5⅞ *149*	8⅜ *213*	7¼ *184*	19.0 *8.6*
5 *125*	5.563 *141.3*	750 *51.7*	11 *279*	6⅝ *168*	7 *178*	10⅛ *257*	8¼ *210*	30.0 *13.6*
6 *150*	6.625 *168.3*	750 *51.7*	13 *330*	7⅝ *194*	8⅛ *206*	11⅛ *283*	9¾ *248*	45.0 *20.4*
8 *200*	8.625 *219.1*	600 *41.4*	15½ *394*	9⅛ *232*	10½ *267*	14⅛ *359*	12 *305*	79.0 *35.8*

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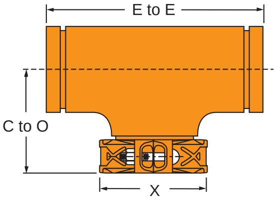
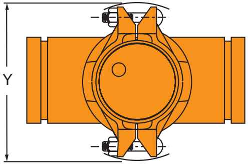
FIG. 7260 (CONT'D.)

GRUVLOK TEE STRAINER





NOTE: This illustration shows the required orientation of the Rigidlok access coupling for assembly with a grooved-end flange.

FIGURE 7260 - TEE STRAINER (CONTINUES FROM PREVIOUS PAGE)

Nom. Size	O.D.	Max.* Working Pressure	E to E	C to O	X	Y	Basket Removal	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*PSI/bar*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*Clearance*	*Lbs./Kg*
10 *250*	10.750 *273.1*	500 *34.5*	18 *457*	10⅜ *264*	12⅞ *327*	17⅛ *435*	14¼ *362*	133 *60.3*
12 *300*	12.750 *323.9*	400 *27.6*	20 *508*	11⅜ *289*	15 *381*	19⅛ *486*	16¼ *413*	187 *84.8*
14 *350*	14.000 *355.6*	300 *20.7*	22 *559*	12¾ *324*	16⅛ *410*	20½ *521*	17¼ *438*	272 *123.4*
16 *400*	16.000 *406.4*	300 *20.7*	24 *610*	12 *305*	18⅛ *460*	22¼ *565*	20 *508*	350 *158.8*
18 *450*	18.000 *457.2*	300 *20.7*	31 *787*	15½ *394*	20½ *521*	24⅜ *619*	24½ *622*	400 *181.4*

*Maximum working pressure is based upon the performance capability of the Gruvlok Strainer. Maximum system working pressure is dependent upon the couplings used for installation and the pressure capability of other system components.

14" - 18" Fabricated

Not for use with copper systems.

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MODEL 758G

GROOVED-END "WYE" STRAINER

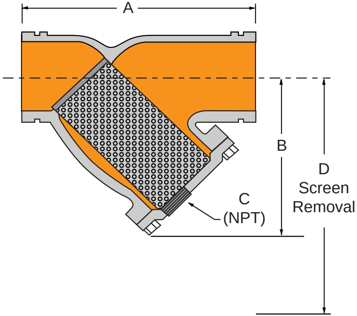

FIGURE 758 G - GROOVED-END "WYE" STRAINER

Nominal Size	O.D.	Dimensions				Approx. Wt. Each
		A	B	C Plug Size	D	
In./DN(mm)	In./mm	In./mm	In./mm	In./mm	In./mm	Lbs./Kg
2 50	2.375 60.3	7⅞ 200	5¼ 133	½ 25	7 178	12.0 5.4
2½ 65	2.875 73.0	10 254	6½ 165	1 25	9¾ 248	18.0 8.2
3 80	3.500 88.9	10⅛ 257	7 178	1 25	10 254	23.0 10.4
4 100	4.500 114.3	12⅛ 308	8¼ 210	1½ 38	12 305	42.0 19.1
5 125	5.563 141.3	15⅝ 396	11¼ 286	2 51	17 432	80.0 36.3
6 150	6.625 168.3	18½ 470	13½ 343	2 51	20 508	112.0 50.8
8 200	8.625 219.1	21⅝ 549	15½ 394	2 51	22¾ 577	205.0 93.0
10 250	10.750 273.1	25¾ 654	18½ 470	2 51	28 711	277.0 125.6
12 300	12.750 323.9	30 762	21¾ 552	2 51	30 762	470.0 213.2

*Maximum working pressure is based upon the performance capability of the Gruvlok® Strainer. Maximum system working pressure is dependant upon the couplings used for installation and the pressure capacity of other system components.

Not for use with copper systems.

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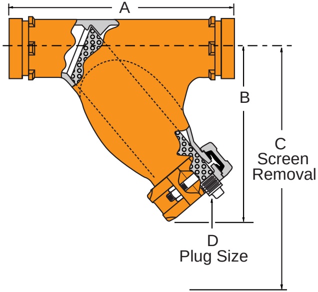
MODEL 768G

GROOVED-END "WYE" STRAINER



Not for use in copper systems.

- Pressure ratings listed are CWP (cold water pressure) or maximum working pressure within the service temperature range of the gasket used in the coupling. This rating may occasionally differ from maximum working pressures listed and/or approved by UL, ULC, and/or FM as testing conditions and test pipes differ.
- Maximum working pressure and end loads listed are total of internal and external pressures and loads based on Sch. 40 steel pipe with roll grooves to ANSI C606-97 specifications.
- For one time field test only the maximum joint working pressure may be increased 1½ times the figures shown.
- Warning: Piping systems must always be depressurized and drained before attempting disassembly and or removal of any components.

FIGURE 768 G - GROOVED-END "WYE" STRAINER

Nominal Size	O.D.	Working Pressure	Dimensions				Cv Values	Approx. Wt. Each
			A	B	C	D Plug Size		
In./DN(mm)	In./mm	PSI/bar	In./mm	In./mm	In./mm	In./mm		Lbs./Kg
2 50	2.375 60.3	300 20.7	9¾ 248	7⅛ 192	4⁹⁄₁₆ 116	½ 12	59	9.3 4.2
2½ 65	2.875 73.0	300 20.7	10¾ 273	7¹³⁄₁₆ 211	4¹³⁄₁₆ 122	½ 12	92	13.2 6.0
3 80	3.500 88.9	300 20.7	11¾ 298	8¹¹⁄₁₆ 231	5¹⁄₁₆ 129	1 25	162	18.0 8.2
4 100	4.500 114.3	300 20.7	14¼ 362	10⅝ 281	6⅝ 168	1 25	284	26.4 12.0
5 125	5.563 141.3	300 20.7	16½ 419	13 330	10³⁄₁₆ 258	1 25	410	46.4 22.0
6 150	6.625 168.3	300 20.7	18½ 470	14¹⁄₁₆ 357	8⅝ 219	1½ 38	770	70.4 32.0
8 200	8.625 219.1	300 20.7	24 610	17⅞ 454	11³⁄₁₆ 284	1½ 38	1010	121.0 55.0
10 250	10.750 273.1	300 20.7	27 686	20⁹⁄₁₆ 522	12⅝ 320	1½ 38	1800	182.6 83.0
12 300	12.750 323.9	300 20.7	30 762	24 609	14⅜ 366	1½ 38	2800	277.2 126.0
14 350	14.000 355.6	300 20.7	40 1016	29¹⁵⁄₁₆ 760	18⅞ 480	1½ 38	4600	418.0 190.0
16 400	16.000 406.4	300 20.7	42 1067	30⁹⁄₁₆ 777	19 483	1½ 38	5800	495.0 225.0

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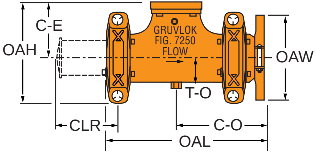
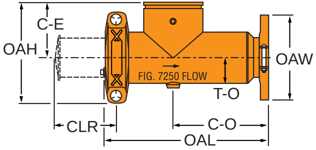
Fig. 7250

Suction Diffuser



2½" x 2½" thru 10" x 8"



10" x 10" thru 16" x 14"

Figure 7250 - Suction Diffuser

Nominal Size	O.D.	System Side (Grooved)	Pump Side (Flanged)	C-E	C-O	OAL	OAH	OAW	CLR	T-O	Orifice Cylinder Open Area	Max. Working Pressure	Approx. Wt. Each
In./DN(mm)	*In./mm*	*In./DN(mm)*	*In./DN(mm)*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In. Sq./cm. Sq.*	*PSI/bar*	*Lbs./Kg*
2½ x 2½ *65 x 65*	2.875 x 2.875 *73.0 x 73.0*	2½ *65*	2½ *65*	5 *127*	8¼ *210*	13½ *343*	9 *229*	9½ *241*	12½ *318*	2 3/16 *56*	47.0 *303*	300 *20.7*	36 *16.3*
3 x 2 *80 x 65*	3.500 x 2.375 *88.9 x 60.3*	3 *80*	2 *50*	5 *127*	8 *203*	14 *356*	9 *229*	8 3/8 *213*	13½ *343*	2 3/16 *56*	47.0 *303*	300 *20.7*	36 *16.3*
3 x 2½ *80 x 65*	3.500 x 2.875 *88.9 x 73.0*	3 *80*	2½ *65*	5 *127*	8¼ *210*	13½ *343*	9 *229*	9½ *241*	12½ *318*	2 3/16 *56*	47.0 *303*	300 *20.7*	36 *16.3*
3 x 3 *80 x 80*	3.500 x 3.500 *88.9 x 88.9*	3 *80*	3 *80*	5 *127*	8¼ *210*	13½ *343*	9 *229*	9½ *241*	12½ *318*	2 3/16 *56*	51.0 *329*	300 *20.7*	37 *16.8*
4 x 2½ *100 x 65*	4.500 x 2.875 *114.3 x 2.875*	4 *100*	2½ *65*	5 *127*	8¼ *210*	13½ *343*	9 *229*	9½ *241*	12½ *318*	2 3/16 *56*	51.0 *329*	300 *20.7*	38 *17.2*
4 x 3 *100 x 80*	4.500 x 3.500 *114.3 x 88.9*	4 *100*	3 *80*	5 *127*	8¼ *210*	13½ *343*	9 *229*	10 *254*	12½ *318*	2 3/16 *56*	51.0 *329*	300 *20.7*	38 *17.2*
4 x 4 *100 x 100*	4.500 x 4.500 *114.3 x 114.3*	4 *100*	4 *100*	6½ *165*	10½ *267*	17½ *445*	11¾ *298*	11½ *292*	16½ *419*	3¼ *83*	95.0 *613*	300 *20.7*	72 *32.7*

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FIG. 7250 (CONT'D.)

SUCTION DIFFUSER

FIGURE 7250 - SUCTION DIFFUSER													
Nominal Size	O.D.	System Side (Grooved)	Pump Side (Flanged)	C-E	C-O	OAL	OAH	OAW	CLR	T-O	Orifice Cylinder Open Area	Max. Working Pressure	Approx. Wt. Each
In./DN(mm)	*In./mm*	*In./DN(mm)*	*In./DN(mm)*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In. Sq./cm. Sq.*	*PSI/bar*	*Lbs./Kg*
5 x 4 *125 x 100*	5.563 x 4.500 *141.3 x 114.3*	5 *125*	4 *100*	6½ *165*	10½ *267*	17½ *445*	11¾ *298*	11½ *292*	16½ *419*	3¼ *83*	95.0 *613*	300 *20.7*	74 *33.6*
5 x 5 *125 x 125*	5.563 x 5.563 *141.3 x 141.3*	5 *125*	5 *125*	6½ *165*	10½ *267*	17½ *445*	11¾ *298*	12½ *318*	16½ *419*	3¼ *83*	124.0 *800*	300 *20.7*	75 *34.0*
6 x 3 *150 x 80*	6.625 x 3.500 *168.3 x 88.9*	6 *150*	3 *80*	6½ *165*	10½ *267*	18 *457*	11¾ *298*	10½ *268*	17½ *445*	3¼ *83*	94.0 *607*	300 *20.7*	72 *34.0*
6 x 4 *150 x 100*	6.625 x 4.500 *168.3 x 114.3*	6 *150*	4 *100*	6½ *165*	10½ *267*	17½ *445*	11¾ *298*	11½ *292*	16½ *419*	3¼ *83*	95.0 *613*	300 *20.7*	72 *32.7*
6 x 5 *150 x 125*	6.625 x 5.563 *168.3 x 141.3*	6 *150*	5 *125*	6½ *165*	10½ *267*	17½ *445*	11¾ *298*	12½ *318*	16½ *419*	3¼ *83*	124.0 *800*	300 *20.7*	74 *33.6*
6 x 6 *150 x 150*	6.625 x 6.625 *168.3 x 168.3*	6 *150*	6 *150*	7¾ *197*	13¼ *337*	21½ *546*	14¾ *375*	13½ *343*	20½ *521*	4⅞ *124*	182.0 *1,174*	300 *20.7*	133 *60.3*
8 x 5* *200 x 125*	8.625 x 5.563 *219.1x 141.3*	8 *200*	5 *125*	7¾ *197*	13¼ *337*	21½ *546*	10¹⁵⁄₁₆ *278*	10 *254*	19½ *495*	4⅞ *124*	182.0 *1,174*	300 *20.7*	118 *53.5*
8 x 6 *200 x 150*	8.625 x 6.625 *219.1 x 168.3*	8 *200*	6 *150*	7¾ *197*	13¼ *337*	21½ *546*	14¾ *375*	13½ *343*	20½ *521*	4⅞ *124*	182.0 *1,174*	300 *20.7*	118 *53.5*
8 x 8 *200 x 200*	8.625 x 8.625 *219.1 x 219.1*	8 *200*	8 *200*	9 *229*	15¼ *387*	24½ *622*	17½ *445*	19 *483*	23½ *597*	5⅞ *149*	283.5 *1,829*	300 *20.7*	190 *86.2*
10 x 8 *250 x 200*	10.750 x 8.625 *273.1 x 219.1*	10 *250*	8 *200*	9 *229*	15¼ *387*	24½ *622*	17½ *445*	19 *483*	23½ *597*	5⅞ *149*	283.5 *1,829*	300 *20.7*	203 *92.1*
10 x 10* *250 x 250*	10.750 x 10.750 *273.1 x 273.1*	10 *250*	10 *250*	10 *254*	17¼ *438*	28 *711*	19⅝ *498*	22 *559*	26 *660*	7⅜ *187*	397.0 *2,561*	300 *20.7*	192 *87.1*

For Gruvlok Technical Detail Refer to the Gruvlok Catalog or contact your local Anvil sales representative.

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Fig. 7250 (cont'd.)

Suction Diffuser

Figure 7250 - Suction Diffuser

Nominal Size	O.D.	System Side (Grooved)	Pump Side (Flanged)	C-E	C-O	OAL	OAH	OAW	CLR	T-O	Orifice Cylinder Open Area	Max. Working Pressure	Approx. Wt. Each
In./DN(mm)	*In./mm*	*In./DN(mm)*	*In./DN(mm)*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In. Sq./cm. Sq.*	*PSI/bar*	*Lbs./Kg*
12 x 10* *300 x 250*	12.750 x 10.750 *323.9 x 273.1*	12 *300*	10 *250*	10 *254*	17¼ *438*	28 *711*	19⅝ *498*	22 *559*	26 *660*	7⅜ *187*	397.0 *2,561*	300 *20.7*	196 *88.9*
12 x 12* *300 x 300*	12.750 x 12.750 *323.9 x 323.9*	12 *300*	12 *300*	11 *279*	24¼ *616*	36 *914*	20½ *521*	24 *610*	34 *864*	8 *203*	571.0 *3,684*	300 *20.7*	382 *173.3*
14 x 10* *350 x 250*	14.000 x 10.750 *355.6 x 273.1*	14 *350*	10 *250*	11 *279*	24¼ *616*	36 *914*	20½ *521*	24 *610*	34 *864*	8 *203*	571 *3,684*	300 *20.7*	382 *173.3*
14 x 12* *350 x 300*	14.000 x 12.750 *355.6 x 323.9*	14 *350*	12 *300*	11 *279*	24¼ *616*	36 *914*	20½ *521*	24 *610*	34 *864*	8 *203*	571.0 *3,684*	300 *20.7*	382 *173.3*
14 x 14* *350 x 350*	14.000 x 14.000 *355.6 x 355.6*	14 *350*	14 *350*	12 *305*	26¼ *667*	39 *991*	23 *584*	26¼ *667*	37 *940*	9 *229*	993.0 *6,406*	300 *20.7*	467 *211.8*
16 x 14* *400 x 350*	16.000 x 14.000 *406.4 x 355.6*	16 *400*	14 *350*	12 *305*	26¼ *667*	39 *991*	23 *584*	26¼ *667*	37 *940*	9 *229*	993.0 *6,406*	300 *20.7*	467 *211.8*

* Fabricated

Other sizes available on special request. Contact Anvil Rep. for ordering information.

Dimensions may vary Contact Anvil Rep. for certified values.

Not for use in copper systems.

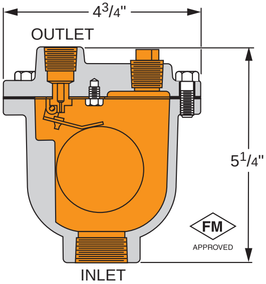
Product must be supported by pipe supports (supports not included).

NOTES:

1. "CLR" Dimension indicates clearance needed for diffuser basket removal.
2. Drain Holes: (End Cap)— ¾" NPT for sizes 2½ x 2½ thru 6 x 5,
   -1" NPT for sizes 6 x 6 thru 16 x 14.
3. Pipe Support - Use 1¼" SCH. 40 Pipe for 2½" thru 10" pipe & 2" SCH. 40 Pipe for 12"& larger diffusers.
4. "Orifice Cylinder Open Area" is the total area of the opening in the diffuser basket after the pre-filter screen has been removed.

MODELS GAV-15

AUTOMATIC AIR VENTS FOR ULTIMATE PERFORMANCE



MODEL GAV-15 - AUTOMATIC AIR VENT

Valve Size	Maximum Temp.	Inlet Size NPT	Outlet Size NPT	Orifice Size	Approx. Wt. Ea.
In./DN(mm)	*°F/°C*	*In./DN(mm)*	*In./DN(mm)*	*In./DN(mm)*	*Lbs/Kg*
½ *15*	250 *120*	½ *15*	½ *15*	1⁄16 *2*	5½ *3*
¾ *20*	250 *120*	¾ *20*	½ *15*	1⁄16 *2*	5½ *3*
1 *25*	250 *120*	1 *25*	½ *15*	1⁄16 *2*	5½ *3*

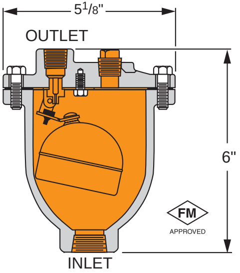
MODEL GAV-15 - AUTOMATIC AIR VENT

Type	Max. Water Pressure	Max. Temp.	Inlet Size	Outlet Size NPT	Valve Orifice	Overall			Approx. Wt. Ea
						Height	Width	Length	
	psi/bar	*°F/°C*	*In./DN(mm)*	*In./DN(mm)*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*Lbs/Kg*
GAV-15	150 *10*	250 *120*	½, ¾ & 1 *15, 20 & 25*	⅜ *10*	1⁄16 *2*	5¼ *130*	4¾ *100*	4¾ *100*	5½ *2.5*

For Gruvlok Technical Detail Refer to the Gruvlok Catalog or contact your local Anvil sales representative.

MODELS GAV-30

AUTOMATIC AIR VENTS FOR ULTIMATE PERFORMANCE



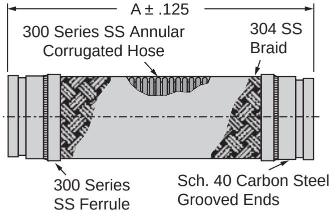
MODEL GAV-30 - AUTOMATIC AIR VENT					
Valve Size	Maximum Temp.	Inlet Size NPT	Outlet Size NPT	Orifice Size	Approx. Wt. Ea.
In./DN(mm)	*°F/°C*	*In./DN(mm)*	*In./DN(mm)*	*In./DN(mm)*	*Lbs/Kg*
½ *15*	250 *120*	½ *15*	½ *15*	1⁄16 *2*	8 *3*
¾ *20*	250 *120*	¾ *20*	½ *15*	1⁄16 *2*	8 *3*

MODEL GAV-30 - AUTOMATIC AIR VENT									
Type	Max. Water Pressure	Max. Temp.	Inlet Size	Outlet Size NPT	Valve Orifice	Overall			Approx. Wt. Ea
						Height	Width	Length	
	psi/bar	*°F/°C*	*In./DN(mm)*	*In./DN(mm)*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*Lbs/Kg*
GAV-30	300 *20.7*	250 *120*	½, ¾ & 1 *15, 20 & 25*	½ *15*	1⁄16 *2*	6 *150*	5⅛ *125*	5⅛ *125*	7½ *3.4*

For Gruvlok Technical Detail Refer to the Gruvlok Catalog or contact your local Anvil sales representative.

FIG. AF21-GG

GROOVED ENDS FLEX CONNECTOR



AF21-GG - GRxGR FLEX CONNECTORS

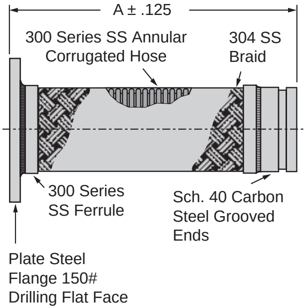
Nominal Size	Pipe O.D.	Model or 10 dig. #	A	Pressure 70°F	Parallel Offset *		Approx. Wt. Ea.
					Permanent	Intermittent	
In./DN(mm)	In./mm		In./mm	psi/bar	In./mm	In./mm	Lbs./kN
2 *50*	2.375 *60.3*	AF0390232007	12 *304.8*	450 *31.0*	1¼ *31.8*	⅜ *9.5*	3.9 *1.8*
2½ *65*	2.875 *73.0*	AF0390232106	12 *304.8*	300 *20.7*	1¼ *31.8*	⅜ *9.5*	4.7 *2.1*
3 *80*	3.500 *88.9*	AF0390232031	12 *304.8*	275 *19.0*	¾ *19.1*	¼ *6.4*	6.1 *2.8*
4 *100*	4.500 *114.3*	AF0390232114	14 *355.6*	270 *18.6*	½ *12.7*	¼ *6.4*	9.3 *4.2*
5 *125*	5.563 *141.3*	AF0390232122	16 *406.4*	225 *15.5*	⅞ *22.2*	⅜ *9.5*	11.8 *5.8*
6 *150*	6.625 *168.3*	AF0390232130	16 *406.4*	165 *11.4*	⅝ *15.9*	¼ *6.4*	16.8 *7.6*
8 *200*	8.625 *219.1*	AF0390232148	16 *406.4*	155 *10.7*	½ *12.7*	¼ *6.4*	23.5 *10.7*
10 *250*	10.750 *273.1*	AF0390232155	20 *508.0*	150 *10.3*	½ *12.7*	¼ *6.4*	44.1 *20.0*
12 *300*	12.750 *323.9*	AF0390232163	20 *508.0*	145 *10.0*	½ *12.7*	¼ *6.4*	51.5 *23.4*

* See Motion Classification to the left for additional information.

See Installation & Assembly directions on pages 192-193.

FIG. AF21-GF

CLASS 150 FLANGED X GROOVED FLEX CONNECTOR



See Installation & Assembly directions on pages 192-193.

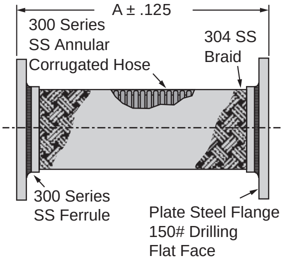
AF21-GF - GRxFL FLEX CONNECTORS

Nominal Size	Flange O.D.	Pipe O.D.	Model or 10 dig. #	A	Pressure 70°F	Parallel Offset Permanent	Parallel Offset Intermittent	Approx. Wt. Ea.
In./DN(mm)	In./mm	In./mm		In./mm	psi/bar	In./mm	In./mm	Lbs./kN
2	6	2.375	AF0390232197	12	450	1⅞	⅝	7.2
50	152.4	60.3		304.8	31.0	47.6	15.9	3.3
2½	7	2.875	AF0390232213	12	300	1⅝	⅝	8.5
65	177.8	73.0		304.8	20.7	41.3	15.9	3.9
3	7½	3.500	AF0390232171	12	275	1⅛	½	10.4
80	190.5	88.9		304.8	19.0	28.6	12.7	4.7
4	9	4.500	AF0390232189	12	270	⅝	¼	14.0
100	228.6	114.3		304.8	18.6	15.9	6.4	6.4
5	10	5.563	AF0390232247	14	225	⅞	⅜	18.4
125	254.0	141.3		355.6	15.5	22.2	9.5	8.3
6	11	6.625	AF0390232254	14	165	¾	⅜	23.7
150	279.4	168.3		355.6	11.4	19.1	9.5	10.8
8	13½	8.625	AF0390232262	15	155	½	¼	39.6
200	342.9	219.1		381.0	10.7	12.7	6.4	18.0
10	16	10.750	AF0390232270	16	150	⅝	¼	61.5
250	406.4	273.1		406.4	10.3	15.9	6.4	27.9
12	19	12.750	AF0390232288	17	145	½	¼	81.0
300	482.6	323.9		431.8	10.0	12.7	6.4	36.7

* See Motion Classification on previous page for additional information.

FIG. AF21-FF

CLASS 150 FLANGED x CLASS 150 FLANGED FLEX CONNECTOR



See Installation & Assembly directions on pages 192-193.

Anvil also provides AnvilFlex™ Increaseres contact your Anvil Rep. for additional information

AF21-FF - FLxFL FLEX CONNECTORS

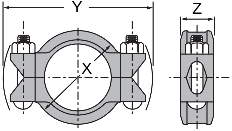
Nominal Size	Flange O.D.	Pipe O.D.	Model or 10 dig. #	A	Pressure 70°F	Parallel Offset		Approx. Wt. Ea.
						Permanent	Intermittent	
In./DN(mm)	*In./mm*	*In./mm*		*In./mm*	*psi/bar*	*In./mm*	*In./mm*	*Lbs./kN*
2	6	2.375	AF0390232387	9	450	1⅛	⅜	10.0
50	*152.4*	*60.3*		*228.6*	*31.0*	*28.6*	*9.5*	*4.5*
2½	7	2.875	AF0390232395	9	300	1	⅜	12.0
65	*177.8*	*73.0*		*228.6*	*20.7*	*25.4*	*9.5*	*5.4*
3	7½	3.500	AF0390232403	9	275	⅝	¼	14.0
80	*190.5*	*88.9*		*228.6*	*19.0*	*15.9*	*6.4*	*6.4*
4	9	4.500	AF0390232429	9	270	½	¼	19.0
100	*228.6*	*114.3*		*228.6*	*18.6*	*12.7*	*6.4*	*8.6*
5	10	5.563	AF0390232437	11	225	¾	⅜	25.0
125	*254.0*	*141.3*		*279.4*	*15.5*	*19.1*	*9.5*	*11.3*
6	11	6.625	AF0390232445	11	165	⅝	¼	30.0
150	*279.4*	*168.3*		*279.4*	*11.4*	*15.9*	*6.4*	*13.6*
8	13½	8.625	AF0390232452	12	155	½	¼	54.0
200	*342.9*	*219.1*		*304.8*	*10.7*	*12.7*	*6.4*	*24.5*
10	16	10.750	AF0390232460	13	150	½	¼	75.0
250	*406.4*	*273.1*		*330.2*	*10.3*	*12.7*	*6.4*	*34.0*
12	19	12.750	AF0390232478	14	145	½	¼	105.0
300	*482.6*	*323.9*		*355.6*	*10.0*	*12.7*	*6.4*	*47.6*

* See Motion Classification on previous page for additional information.

Return

Fig. 7004 HPR®

Coupling



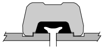


Fig. 7004 HPR®
with standard gasket.

Figure 7004 - HPR Coupling

Nom. Size	O.D.	Max. Wk. Pressure	Max. End Load	Range of Pipe End Separation	Coupling Dimensions			Coupling Bolts		Approx. Wt. Ea.
					X	Y	Z	Qty.	Size	
In./DN(mm)	In./mm	PSI/bar	Lbs./kN	In./mm	In./mm	In./mm	In./mm		In./mm	Lbs./Kg
2 50	2.375 60.3	1200 82.8	5,316 23.65	0 -⅛ 0 - 3.2	3⅝ 92	6¼ 159	1⅞ 48	2	⅝ x 2¾ –	3.9 1.8
2½ 65	2.875 73.0	1200 82.8	7,790 34.65	0 -⅛ 0 - 3.2	4¼ 108	6⅞ 175	1⅞ 48	2	⅝ x 3½ M16 x 85	4.6 2.1
3 80	3.500 88.9	1200 82.8	11,545 51.36	0 -⅛ 0 - 3.2	4⅞ 124	7½ 191	1⅞ 48	2	⅝ x 3½ M16 x 85	5.2 2.4
4 100	4.500 114.3	1200 82.8	19,085 84.90	0 -¼ 0 - 6.4	6¼ 159	9½ 241	2¼ 57	2	¾ x 4½ M20 x 110	8.6 3.9
5 125	5.563 141.3	1200 82.8	29,167 129.74	0 -¼ 0 - 6.4	7½ 191	11 279	2¼ 57	2	⅞ x 5½ M22 x 150	14.0 6.4
6 150	6.625 168.3	1200 82.8	41,366 184.00	0 -¼ 0 - 6.4	8¾ 222	12⅛ 308	2¼ 57	2	⅞ x 5½ M22 x 150	15.5 7.0
8 200	8.625 219.1	1000 68.9	58,426 259.89	0 -¼ 0 - 6.4	11⅛ 283	14⅞ 378	2⅝ 67	2	1 x 5½ –	25.6 11.6
10 250	10.750 273.1	800 55.2	72,610 322.99	0 -¼ 0 - 6.4	13½ 343	17 432	2⅝ 67	2	1 x 6½ –	32.3 14.7
12 300	12.750 323.9	800 55.2	102,141 454.35	0 -¼ 0 - 6.4	15⅞ 403	19¼ 489	2⅝ 67	2	1 x 6½ –	43.9 19.9

For additional details, see coupling data chart notes on page 264.

Not for use in copper systems.

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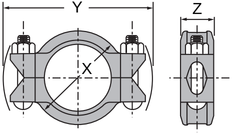
FIG. 7004 EG®

END GUARD® COUPLING



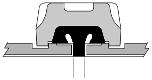


Fig. 7004 EG
with "EG" gasket.

FIGURE 7004 - END GUARD (EG) COUPLING

Nominal Size	O.D.	Max. Wk. Pressure	Max. End Load	Range of Pipe End Separation	Coupling Dimensions X	Coupling Dimensions Y	Coupling Dimensions Z	Coupling Bolts Qty.	Coupling Bolts Size	Approx. Wt. Ea.
In./DN(mm)	In./mm	PSI/bar	Lbs./kN	In./mm	In./mm	In./mm	In./mm		In./mm	Lbs./Kg
2 *50*	2.375 *60.3*	2500 *172.4*	11,075 *49.27*	0 -⅛ *0 - 3.2*	3⅝ *92*	6¼ *159*	1⅞ *48*	2	⅝ x 2¾ –	4.1 *1.9*
2½ *65*	2.875 *73.0*	2500 *172.4*	16,230 *72.19*	0 -⅛ *0 - 3.2*	4¼ *108*	6⅞ *175*	1⅞ *48*	2	⅝ x 3½ *M16 x 85*	5.1 *2.3*
3 *80*	3.500 *88.9*	2500 *172.4*	24,053 *106.99*	0 -⅛ *0 - 3.2*	4⅞ *124*	7½ *191*	1⅞ *48*	2	⅝ x 3½ *M16 x 85*	5.5 *2.5*
4 *100*	4.500 *114.3*	2500 *172.4*	39,761 *176.86*	0 -¼ *0 - 6.4*	6¼ *159*	9½ *241*	2¼ *57*	2	¾ x 4½ *M16 x 85*	9.0 *4.1*
6 *150*	6.625 *168.3*	2000 *137.9*	68,943 *306.67*	0 -¼ *0 - 6.4*	8¾ *222*	12⅛ *308*	2¼ *57*	2	⅞ x 5½ *M22 x 150*	15.5 *7.0*
8 *200*	8.625 *219.1*	1500 *103.4*	87,639 *389.84*	0 -¼ *0 - 6.4*	11⅛ *283*	14⅞ *378*	2⅝ *67*	2	1 x 5½ –	25.6 *11.6*
10 *250*	10.750 *273.1*	1250 *86.2*	113,453 *504.66*	0 -¼ *0 - 6.4*	13½ *343*	17 *432*	2⅝ *67*	2	1 x 6½ –	32.3 *14.7*
12 *300*	12.750 *323.9*	1250 *86.2*	159,595 *709.92*	0 -¼ *0 - 6.4*	15⅞ *403*	19¼ *489*	2⅝ *67*	2	1 x 6½ –	43.9 *19.9*

For additional details, see coupling data chart notes on page 264. Not for use in copper systems.

FIG. 7068 EG

HIGH PRESSURE CROSS

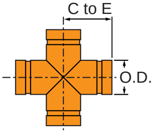


FIG. 7068 EG HIGH PRESSURE CROSS

Nom. Size	O.D.	Center To-End	Approx. Wt. Ea.
In./DN(mm)	In./mm	In./mm	Lbs./Kg
2 *50*	2.375 *60.3*	3¼ *83*	3.9 *1.8*
2½ *65*	2.875 *73.0*	3¾ *95*	6.8 *3.1*
3 *80*	3.500 *88.9*	4¼ *108*	11.5 *5.2*
4 *100*	4.500 *114.3*	5 *127*	19.3 *8.8*
6 *150*	6.625 *168.3*	6½ *165*	46.0 *20.9*

For Gruvlok Technical Detail Refer to the Gruvlok Catalog or contact your local Anvil sales representative.

High Pressure System

FIG. 7050 EG

HIGH PRESSURE 90° LR ELBOW

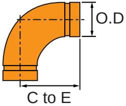


FIGURE 7050 EG, HIGH PRESSURE 90° LR ELBOW

Nom. Size	O.D.	Center To-End	Approx. Wt. Ea.
In./ DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	3¼ *83*	2.5 *1.1*
2½ *65*	2.875 *73.0*	3¾ *95*	4.2 *1.9*
3 *80*	3.500 *88.9*	4¼ *108*	6.0 *2.7*
4 *100*	4.500 *114.3*	5 *127*	11.0 *5.0*
6 *150*	6.625 *168.3*	6½ *165*	27.2 *12.4*
8 *200*	8.625 *219.1*	* *	* *
10 *250*	10.750 *273.0*	* *	* *
12 *300*	12.750 *323.9*	* *	* *

*Contact a Anvil Representative for more information.

FIG. 7051 EG

HIGH PRESSURE 45° LR ELBOW

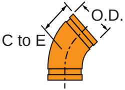


FIGURE 7051 EG, HIGH PRESSURE 45° LR ELBOW

Nom. Size	O.D.	Center To-End	Approx. Wt. Ea.
In./ DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	2 *51*	1.8 *0.8*
2½ *65*	2.875 *73.0*	2¼ *57*	2.9 *1.3*
3 *80*	3.500 *88.9*	2½ *64*	4.3 *2.0*
4 *100*	4.500 *114.3*	3 *76*	7.5 *3.4*
6 *150*	6.625 *168.3*	3½ *89*	16.5 *7.5*

FIG. 7022 EG

HIGH PRESSURE HEADER TEE

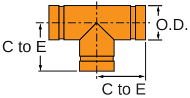


FIG. 7022 EG HIGH PRESSURE HEADER TEE

Nom. Size	O.D.	Center To-End	Approx. Wt. Ea.
In./ DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	6½ *165*	4.9 *2.2*
2 *50*	2.375 *60.3*	5 *127*	3.6 *1.6*

FIG. 7060 EG

HIGH PRESSURE TEE

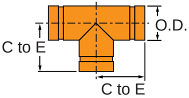


FIGURE 7060 EG HIGH PRESSURE TEE

Nom. Size	OD	Center To-End	Approx. Wt. Ea.
In./ DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	3¼ *83*	3.3 *1.5*
2½ *65*	2.875 *73.0*	3¾ *95*	5.1 *2.3*
3 *80*	3.500 *88.9*	4¼ *108*	9.3 *4.2*
4 *100*	4.500 *114.3*	5 *127*	15.9 *7.2*
6 *150*	6.625 *168.3*	6½ *165*	38.5 *17.5*

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FIG. 7400

RIGIDLITE® COUPLING

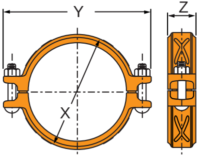

FIGURE 7400 - RIGIDLITE COUPLING

Nominal Size	O.D.	Range of Pipe End Separation	Coupling Dimensions			Coupling Bolts.		Specified Torque §		Approx Wt. Ea.
			X	Y	Z	Qty.	Size	Min.	Max.	
In./DN(mm)	In./mm	In./mm	In./mm	In./mm	In./mm		In./mm	Ft. -Lbs./N-M		Lbs./Kg
2 50	2.375 60.3	0 -⅛ 0 - 3.2	3¼ 83	5½ 140	1¾ 44	2	⅜ x 2¼ M10 x 57	30 40	45 60	1.6 0.7
2½ 65	2.875 73.0	0 -⅛ 0 - 3.2	3⅞ 98	5 127	1¾ 44	2	⅜ x 2¼ M10 x 57	30 40	45 60	1.9 0.9
3 80	3.500 88.9	0 -⅛ 0 - 3.2	4½ 114	6¾ 171	1¾ 44	2	⅜ x 2¾ M10 x 70	30 40	45 60	2.1 1.0
4 100	4.500 114.3	0 -¼ 0 - 6.4	5⅝ 143	7¾ 197	1⅞ 48	2	⅜ x 2¾ M10 x 70	30 40	45 60	3.1 1.4
5 125	5.563 141.3	0 -¼ 0 - 6.4	6⅞ 175	9¼ 235	2 51	2	½ x 3 M12 x 76	80 110	100 150	4.6 2.1
6 150	6.625 168.3	0 -¼ 0 - 6.4	7⅞ 200	10⅜ 264	2 51	2	½ x 3 M12 x 76	80 110	100 150	5.5 2.5
8 200	8.625 219.1	0 -⅛ 0 - 3.2	10¼ 260	12¾ 324	2⅜ 60	2	½ x 3 M12 x 76	80 110	100 150	8.4 3.8

§ – For additional Bolt Torque information on page 202.
see “Coupling Data Chart Notes” on page 264.
See Installation & Assembly directions on pages 158-159.

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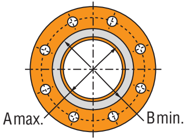
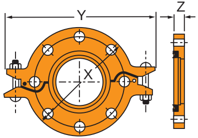
FIG. 7012 (NOTES CONTINUED ON NEXT PAGE)

GRUVLOK FLANGES FOR GRUVLOK ADVANCED COPPER METHOD





GRUVLOK FIGURE 7012 - FLANGE: ANSI CLASS 150 OR ISO PN10 OR PN16 BOLT PATTERNS

Nom. Size	O.D.	Max. Working Pressure▼	Max. End Load▼	Latch Bolt: Latch* Bolt Size	Latch Bolt: Specified Torque § Min.	Latch Bolt: Specified Torque § Max.	Range Dimensions X	Range Dimensions Y	Range Dimensions Z	Sealing Surface A Max.	Sealing Surface B Min.	Mating Flange Bolts: Qty. ANSI	Mating Flange Bolts: Size (ANSI)	Mating Flange Bolts: Specified Torque § Min.	Mating Flange Bolts: Specified Torque § Max.	Approx. Wt. Ea.
In./DN(mm)	In./mm	PSI/bar	Lbs./kN	In./mm	Ft.-Lbs/N-M		In./mm	In./mm	In./mm	In./mm	In./mm	PN10 (16)	In. (ISO) mm	Ft.-Lbs/N-M		Lbs./Kg
2 *50*	2.375 *60.3*	300 *20.7*	1,329 *5.91*	⅜ x 2¾ *M10 x 70*	30 *40*	45 *60*	6¼ *159*	8⅜ *213*	¾ *19*	2⅜ *60*	3⁷⁄₁₆ *87*	4 *4*	⅝ x 2¾ *M16 x 70*	110 *149*	140 *190*	4.2 *1.9*
2½ *65*	2.875 *73.0*	300 *20.7*	1,948 *8.66*	⅜ x 2¾ *M10 x 70*	30 *40*	45 *60*	7 *178*	9½ *241*	¾ *19*	2⅞ *73*	4 *102*	4 *-*	⅝ x 2¾ *M16 x 70-*	110 *149*	140 *190*	4.6 *2.1*
3 *80*	3.500 *88.9*	300 *20.7*	2,886 *12.84*	⅜ x 2¾ *M10 x 70*	30 *40*	45 *60*	7⅞ *200*	10½ *267*	¾ *19*	3½ *89*	4⁹⁄₁₆ *116*	4 *8*	⅝ x 2¾ *M16 x 70*	110 *149*	140 *190*	6.0 *2.7*
4 *100*	4.500 *114.3*	300 *20.7*	4,771 *21.22*	⅜ x 2¾ *M10 x 70*	30 *40*	45 *60*	9 *229*	11½ *292*	¾ *19*	4½ *114*	5⁹⁄₁₆ *141*	8 *8*	⅝ x 2¾ *M16 x 70*	110 *149*	140 *190*	6.3 *2.9*
5 *125*	5.563 *141.3*	300 *20.7*	7,292 *32.44*	⅜ x 2¾ *M10 x 70*	30 *40*	45 *60*	10 *254*	12½ *318*	⅞ *22*	5⁹⁄₁₆ *141*	6¾ *171*	8 *-*	¾ x 2⅞ *-*	220 *298*	250 *339*	8.8 *4.0*
6 *150*	6.625 *168.3*	300 *20.7*	10,341 *46.00*	⅜ x 2¾ *M10 x 70*	30 *40*	45 *60*	11 *279*	14 *356*	⅞ *22*	6⅝ *168*	7¹³⁄₁₆ *198*	8 *8*	¾ x 3⅛ *M20 x 80*	220 *298*	250 *339*	9.6 *4.4*
8 *200*	8.625 *219.1*	300 *20.7*	17,528 *77.97*	⅜ x 2¾ *M10 x 70*	30 *40*	45 *60*	13½ *343*	16½ *419*	1 *25*	8⅝ *219*	10 *254*	8 *8 (12)*	¾ x 3¼ *M20 x 80*	220 *298*	250 *339*	15.6 *7.1*

For Gruvlok Technical Detail Refer to the Gruvlok Catalog or contact your local Anvil sales representative.

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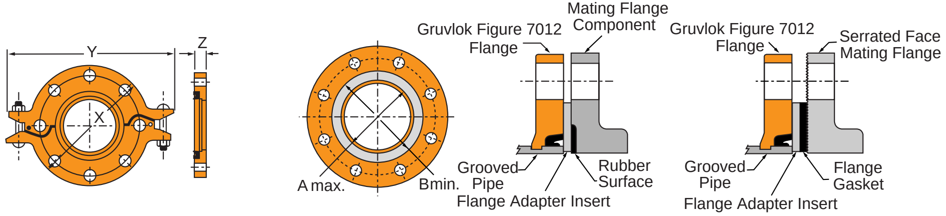
FIG. 7012 (NOTES CONTINUED FROM PREVIOUS PAGE)

GRUVLOK FLANGES FOR GRUVLOK ADVANCED COPPER METHOD



+ PN 16 uses M24 x 90 (PN) Dimensions for bolt circle PN 10 & 16 Flange

* Available in ANSI or metric bolt sizes only as indicated.

▼ Based on use with standard wall pipe.

§ – For additional Bolt Torque information see page 202.

See “Coupling Data Chart Notes” on page 264.

See Installation & Assembly directions on pages 164-169.

The Gruvlok Flange bolt hole pattern conforms to ANSI Class 150 and Class 125 flanges.

Effective sealing area of mating flange must be free from gouges, undulations or deformities of any type to ensure proper sealing of the gasket.

To avoid interference issues, flanges cannot be assembled directly to Series 7700 butterfly valve. Flange can be assembled to one side of series 7500 and 7600 valve only.

Gruvlok Flange adapter insert required when mating to rubber surfaces or serrated faced mating flanges.

Mating flange bolts must be at least Intermediate Strength Bolting per ASME B16.5. Bolts with material properties equal or greater than SAE J429 Grade 5 are acceptable.

Refer to Gruvlok Products Catalog or Anvil's web site for more information on installing this flange

Fig. 7550

90° Elbow

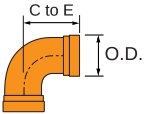


Figure 7550 - 90° Elbow

Nom. Size In./DN(mm)	O.D. In./mm	Center to End In./mm	Approx. Wt. Ea. Lbs./Kg
2 50	2.375 60.3	3¼ 83	0.9 0.4
2½ 65	2.875 73.0	3¾ 95	1.5 0.7
3 80	3.500 88.9	4¼ 108	2.4 1.1
4 100	4.500 114.3	5 127	5.5 2.5
5 125	5.563 141.3	5½ 140	9.3 4.2
6 150	6.625 168.3	6½ 165	17.6 8.0
8 200	8.625 219.1	12 305	29.4 13.3

8" fittings are copper coated stainless steel.

Fig. 7551

45° Elbow

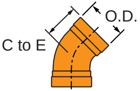


Figure 7551 - 45° Elbow

Nom. Size In./DN(mm)	O.D. In./mm	Center to End In./mm	Approx. Wt. Ea. Lbs./Kg
2 50	2.375 60.3	2⅛ 54	0.6 0.3
2½ 65	2.875 73.0	2⅜ 60	1.1 0.5
3 80	3.500 88.9	2⅝ 67	1.6 0.7
4 100	4.500 114.3	3⅜ 86	3.5 1.6
5 125	5.563 141.3	3¼ 83	6.1 2.8
6 150	6.625 168.3	3½ 89	11.7 5.3
8 200	8.625 219.1	7½ 191	19.4 8.8

8" fittings are copper coated stainless steel.

Fig. 7560

Tees

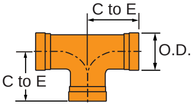


Figure 7560 - Tees

Nom. Size In./DN(mm)	O.D. In./mm	Center to End In./mm	Approx. Wt. Ea. Lbs./Kg
2 50	2.375 60.3	3¼ 83	1.7 0.8
2½ 65	2.875 73.0	3¾ 95	2.5 1.1
3 80	3.500 88.9	4¼ 108	3.5 1.6
4 100	4.500 114.3	5 127	7.3 3.3
5 125	5.563 141.3	5½ 140	7.9 3.6
6 150	6.625 168.3	6½ 165	13.4 6.1
8 200	8.625 219.1	7¾ 197	41.7 18.9

8" fittings are copper coated stainless steel.

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Fig. 7572

(gr x gr) Concentric Reducer

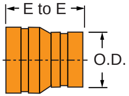

Figure 7572 - (gr x gr) Concentric Reducer

Nom. Size	End to End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*Lbs./Kg*
2½ x 2 *65 x 50*	3¼ *83*	0.6 *0.3*
3 x 2 *80 x 50*	3⅞ *98*	1.0 *0.5*
3 x 2½ *80 x 65*	3⅝ *92*	0.9 *0.4*
4 x 2 *100 x 50*	5 *127*	2.2 *1.0*
4 x 2½ *100 x 65*	4¾ *121*	2.0 *0.9*
4 x 3 *100 x 80*	4¾ *121*	2.0 *0.9*
5 x 3 *125 x 80*	5½ *140*	2.8 *1.3*
5 x 4 *125 x 100*	5⅝ *143*	3.3 *1.5*
6 x 3 *150 x 80*	6½ *165*	4.9 *2.2*
6 x 4 *150 x 100*	6½ *165*	4.8 *2.2*
6 x 5 *150 x 125*	6½ *165*	5.2 *2.4*

8" fittings fabricated upon request.

Contact your Anvil Representative for more information.
See Fitting Size Chart on page 148 for O.D. sizes

Fig. 7574

End Cap

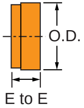

Figure 7574 - End Caps

Nominal Size	O.D.	End to End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	1¼ *32*	0.3 *0.1*
2½ *65*	2.875 *73.0*	1¼ *32*	0.4 *0.2*
3 *80*	3.500 *88.9*	1¼ *32*	0.6 *0.3*
4 *100*	4.500 *114.3*	1¼ *32*	1.0 *0.5*
5 *125*	5.563 *141.3*	1¼ *32*	2.2 *1.0*
6 *150*	6.625 *168.3*	1¼ *32*	2.8 *1.3*
8 *200*	8.625 *219.1*	4 *203*	11.0 *5.0*

8" fittings are copper coated stainless steel.

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Fig. 7561A

(Gr x Gr x Gr) Reducing Tee

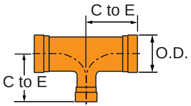

Figure 7561A - (Gr x Gr x Gr) Reducing Tee

Nominal Size	Center to End	Cup	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2½ x 2½ x 2 *65 x 65 x 50*	7½ *191*	3¾ *95*	1.8 *0.8*
3 x 3 x 2 *80 x 80 x 50*	8½ *216*	4¼ *108*	2.7 *1.2*
3 x 3 x 2½ *80 x 80 x 65*	8½ *216*	4¼ *108*	2.1 *1.0*
4 x 4 x 2 *100 x 100 x 50*	10 *254*	5 *127*	4.8 *2.2*
4 x 4 x 2½ *100 x 100 x 65*	10 *254*	5 *127*	4.9 *2.2*
4 x 4 x 3 *100 x 100 x 80*	10 *254*	5 *127*	5.1 *2.3*
5 x 5 x 3 *125 x 125 x 80*	11 *279*	5½ *140*	7.5 *3.4*
5 x 5 x 4 *125 x 125 x 100*	11 *279*	5½ *140*	7.8 *3.5*
6 x 6 x 2½ *150 x 150 x 65*	13 *330*	6½ *165*	11.5 *5.2*
6 x 6 x 3 *150 x 150 x 80*	13 *330*	6½ *165*	11.7 *5.3*
6 x 6 x 4 *150 x 150 x 100*	13 *330*	6½ *165*	12.1 *5.5*
6 x 6 x 5 *150 x 150 x 125*	13 *330*	6½ *165*	12.4 *5.6*
8 x 8 x 2½ *200 x 200 x 65*	15 *381*	7¾ *197*	18 *8.2*
8 x 8 x 3 *200 x 200 x 80*	15 *381*	7¾ *197*	18.2 *8.3*
8 x 8 x 4 *200 x 200 x 100*	15 *381*	7¾ *197*	18.4 *8.3*
8 x 8 x 5 *200 x 200 x 125*	15 *381*	7¾ *197*	18.8 *8.5*
8 x 8 x 6 *200 x 200 x 150*	15 *381*	7¾ *197*	19 *8.6*

8" fittings are copper coated stainless steel.

See Fitting Size Chart on page 148 for O.D. sizes

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Fig. 7564A

(gr x gr x Cup) Reducing Tee

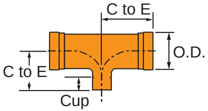

Figure 7564A - (Gr x Gr x cup) Reducing Tee

Nom. Size	Center to End	Cup	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 x 2 x ¾ *50 x 50 x 20*	6½ *165*	3¼ *83*	1.0 *0.5*
2 x 2 x 1 *50 x 50 x 25*	6½ *165*	3¼ *83*	1.0 *0.5*
2 x 2 x 1¼ *50 x 50 x 32*	6½ *165*	3¼ *83*	1.1 *0.5*
2 x 2 x 1½ *50 x 50 x 40*	6½ *165*	3¼ *83*	1.1 *0.5*
2½ x 2½ x ¾ *65 x 65 x 80*	7½ *191*	3¾ *95*	1.6 *0.7*
2½ x 2½ x 1 *65 x 65 x 25*	7½ *191*	3¾ *95*	1.7 *0.8*
2½ x 2½ x 1¼ *65 x 65 x 32*	7½ *191*	3¾ *95*	1.7 *0.8*
2½ x 2½ x 1½ *65 x 65 x 40*	7½ *191*	3¾ *95*	1.7 *0.8*
2½ x 2½ x 2 *65 x 65 x 50*	7½ *191*	3¾ *95*	1.8 *0.8*
3 x 3 x ¾ *80 x 80 x 20*	8½ *216*	4¼ *108*	2.5 *1.1*
3 x 3 x 1 *80 x 80 x 25*	8½ *216*	4¼ *108*	2.5 *1.1*
3 x 3 x 1¼ *80 x 80 x 32*	8½ *216*	4¼ *108*	2.5 *1.1*
3 x 3 x 1½ *80 x 80 x 40*	8½ *216*	4¼ *108*	2.6 *1.2*
3 x 3 x 2 *80 x 80 x 50*	8½ *216*	4¼ *108*	2.7 *1.2*
4 x 4 x ¾ *100 x 100 x 20*	10 *254*	5 *127*	4.5 *2.0*
4 x 4 x 1 *100 x 100 x 25*	10 *254*	5 *127*	4.6 *2.1*
4 x 4 x 1¼ *100 x 100 x 32*	10 *254*	5 *127*	4.7 *2.1*
4 x 4 x 1½ *100 x 100 x 40*	10 *254*	5 *127*	4.7 *2.1*
4 x 4 x 2 *100 x 100 x 50*	10 *254*	5 *127*	4.8 *2.2*

See Fitting Size Chart on page 148 for O.D. sizes

Advanced Copper Method

FIG. 7575

(GR X CUP) REDUCING ADAPTER

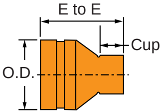

FIGURE 7575 - (GR X CUP) REDUCING ADAPTER			
Nom. Size	**End to End**	**Cup**	**Approx. Wt. Ea.**
In./DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 x 1 *50 x 25*	3 *76*	⅞ *23*	0.4 *0.2*
2 x 1¼ *50 x 32*	3 *76*	15/16 *25*	0.4 *0.2*
2 x 1½ *50 x 40*	2⅞ *73*	1 1/16 *28*	0.4 *0.2*
2½ x 1 *65 x 25*	3½ *89*	⅞ *23*	0.6 *0.3*
2½ x 1¼ *65 x 32*	3½ *89*	15/16 *25*	0.6 *0.3*
2½ x 1½ *65 x 40*	3½ *89*	1 1/16 *28*	0.7 *0.3*
2½ x 2 *65 x 50*	3¼ *83*	1 5/16 *34*	0.7 *0.3*
3 x 1½ *80 x 40*	3⅞ *98*	1 1/16 *28*	1.1 *0.5*
3 x 2 *80 x 50*	3⅞ *98*	1 5/16 *34*	1.0 *0.5*
4 x 2 *100 x 50*	5 *127*	1 5/16 *34*	2.2 *1.0*

FIG. 7582

TRANSITION FITTING

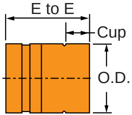

FIGURE 7582 - TRANSITION FITTING				
Nominal Size	**O.D.**	**End to End**	**Cup**	**Approx. Wt. Ea.**
In./DN(mm)	*In./mm*	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	2¾ *70*	1⅜ *35*	0.4 *0.2*
2½ *65*	2.875 *73.0*	3 *76*	1½ *38*	0.6 *0.3*
3 *80*	3.500 *88.9*	3 7/16 *87*	1 11/16 *42*	1.0 *0.5*
4 *100*	4.500 *114.3*	4 7/16 *112*	2 3/16 *55*	2.0 *0.9*
5 *125*	5.563 *141.3*	5 7/16 *138*	2⅝ *67*	3.3 *1.5*
6 *150*	6.625 *168.3*	6⅜ *162*	3⅛ *79*	5.3 *2.4*

See Fitting Size Chart on page 148 for O.D. sizes

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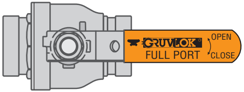
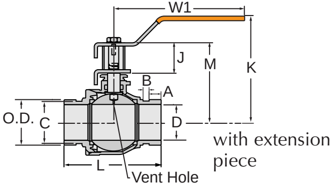
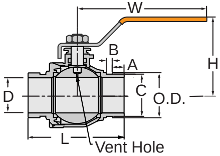
SERIES 7500B

GROOVED-END BRONZE BALL VALVE - **FULL PORT**



FULL PORT





SERIES 7500B - FULL PORT - DIMENSIONS

Nominal Size	O.D.	A	B	C	D	H	J	K	L	M	W	W1
In./DN(mm)	*In./mm*	*In./mm*										
1½ *40*	1.910 *48.5* 1.888 *48.0*	⅝ *16.0*	5⁄16 *7.9*	1¾ *45.1*	1½ *38.1*	2¹¹⁄₁₆ *67.8*	2¼ *57.1*	4¾ *120.9*	4¼ *108.0*	3⅝ *91.4*	5⅛ *129.8*	6⁵⁄₁₆ *159.8*
2 *50*	2.375 *60.3* 2.365 *60.1*	⅝ *16.0*	5⁄16 *7.9*	2¼ *57.2*	2 *50.8*	3⁹⁄₁₆ *90.9*	2¼ *57.1*	5¹¹⁄₁₆ *144.0*	5¹⁄₁₆ *128.5*	4½ *114.6*	6.29 *159.8*	6⁵⁄₁₆ *159.8*
2½ *65*	2.876 *73.1* 2.870 *72.9*	⅝ *16.0*	5⁄16 *7.9*	2¹¹⁄₁₆ *69.1*	2½ *63.5*	4¹⁵⁄₁₆ *126.0*	2¼ *57.1*	7¹⁄₁₆ *179.1*	6⅛ *155.4*	5¾ *146.6*	9¼ *235.0*	9¼ *235.0*
3 *80*	3.500 *88.9* 3.490 *88.6*	⅝ *16.0*	5⁄16 *7.9*	3⁵⁄₁₆ *84.9*	3 *76.2*	5⁷⁄₁₆ *137.2*	2¼ *57.1*	7½ *190.5*	7 *177.8*	6¼ *159.5*	9¼ *235.0*	9¼ *235.0*

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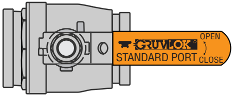
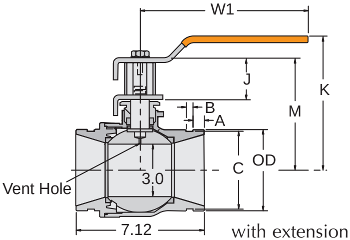
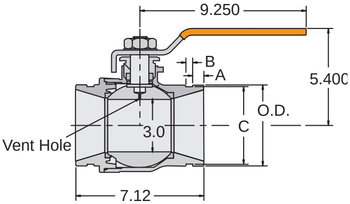
Series 7500B

Grooved-End Bronze Ball Valve - **Standard Port 4"**





with extension piece



Series 7500B - Standard Port 4" - Dimensions									
Nominal Size	O.D.	A	B	C	J	K	L	M	W1
In./DN(mm)	In./mm	In./mm							
4 100	4.545 115.4 4.469 113.5	5⁄8 16.0	3⁄8 9.5	4 5⁄16 109.5	2 1⁄4 57.1	7 1⁄2 190.5	7 1⁄8 180.8	6 1⁄4 159.5	9 1⁄4 235.0

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FIG. 7088, FIG. 7089 & FIG. 7090

GRUVLOK DI-LOK® NIPPLE
DI-ELECTRIC PIPE CONNECTION

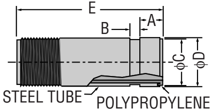

FIG. 7088
GROOVE BY THREAD

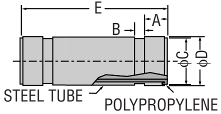

FIG. 7089
GROOVE BY GROOVE

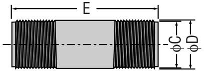

FIG. 7090
THREAD BY THREAD

FIGURE 7088, 7089 & 7090 - DI-LOK® NIPPLES

Nom. IPS Pipe Size	O.D.	A +/-.030 +/-.76	B +/-.030 +/-.76	C Actual	Tolerance +0.000	D Actual	Tolerance	E +/-.090 +/-2.29
NIPS/DN	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*
¾ *19*	1.050 *26.7*	n/a	n/a	0.881 *22*	n/a	1.050 *26.7*	+.005/-.000 *+.13/-.00*	3.000 *76*
1 *25*	1.315 *33.7*	n/a	n/a	1.114 *28*	n/a	1.315 *33.7*	+.005/-.000 *+.13/-.00*	4.000 *102*
1¼ *32*	1.660 *42.4*	n/a	n/a	1.458 *37*	n/a	1.660 *42.4*	+.006/-.000 *+.15/-.00*	4.000 *102*
1½ *40*	1.900 *48.3*	n/a	n/a	1.697 *43*	n/a	1.900 *48.3*	+.006/-.000 *+.15/-.00*	4.00 *102*
2 *50*	2.375 *60.3*	0.625 *15.88*	0.312 *7.92*	2.250 *57*	-0.015 *-0.37*	2.375 *60.3*	+.007/-.000 *+.18/-.00*	4.000 *102*
2½ *65*	2.875 *73.0*	0.625 *15.88*	0.312 *7.92*	2.720 *69*	-0.018 *-0.45*	2.875 *73.0*	+.008/-.000 *+.20/-.00*	6.000 *152*
3 *80*	3.500 *88.9*	0.625 *15.88*	0.312 *7.92*	3.344 *85*	-0.018 *-0.45*	3.500 *88.9*	+.010/-.000 *+.25/-.00*	6.000 *152*
4 *100*	4.500 *114.3*	0.625 *15.88*	0.375 *9.53*	4.334 *110*	-0.020 *-0.50*	4.500 *114.3*	+013/-.000 *+.33/-.00*	6.000 *152*
5 *125*	5.563 *141.3*	0.625 *15.88*	0.375 *9.53*	5.395 *137*	-0.022 *-0.55*	5.563 *141.3*	±.010 *±.25*	6.000 *152*
6 *150*	6.625 *168.3*	0.625 *15.88*	0.375 *9.53*	6.455 *164*	-0.022 *-0.55*	6.625 *168.3*	±.015 *±.38*	6.000 *152*

Figure 7088 available in Nominal Pipe Sizes 2" through 4" only.
Figure 7089 available in Nominal Pipe Sizes 2" through 6" only.
Figure 7090 available in Nominal Pipe Sizes ¾" through 2" only.

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FIG. 7005

ROUGHNECK® COUPLING

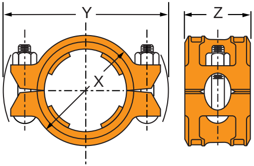

FIGURE 7005 - ROUGHNECK® COUPLING

Nominal Size	O.D.	Max. Wk. Pressure	Max. End Load	No. of Grippers	Coupling Dimensions			Coupling Bolts		Specified Torque §		Approx. Wt. Ea.
					X	Y	Z	Qty.	Size	Min.	Max.	
In./DN(mm)	In./mm	PSI/bar	Lbs./kN		In./mm	In./mm	In./mm		In./mm	LbFt/ N-m	LbFt/ N-m	Lbs./Kg
2 *50*	2.375 *60.3*	750 *51.7*	3,323 *1,507*	8	3¾ *95*	6⅜ *162*	3½ *89*	2	⅝ x 3¼ -	150 *203*	190 *257*	6.6 *3.0*
2½ *65*	2.875 *73.0*	600 *41.4*	3,895 *1,766*	8	4¼ *108*	7⅛ *181*	3½ *89*	2	⅝ x 3¼ -	150 *203*	190 *257*	7.4 *3.4*
3 *80*	3.500 *88.9*	600 *41.4*	5,773 *2,618*	8	4⅞ *124*	8⅛ *206*	3½ *89*	2	¾ x 4½ -	200 *271*	250 *339*	10.5 *4.8*
4 *100*	4.500 *114.3*	450 *31.0*	7,157 *3,246*	8	6⅜ *162*	9⅜ *238*	4⅛ *105*	2	¾ x 4½ -	200 *271*	250 *339*	16.4 *7.4*
5 *125*	5.563 *141.3*	350 *24.1*	8,507 *3,858*	8	7½ *191*	11⅛ *283*	4⅜ *111*	2	⅞ x 5 -	250 *339*	300 *406*	23.8 *10.8*
6 *150*	6.625 *168.3*	300 *20.7*	10,341 *4,690*	12	8¾ *222*	12⅞ *327*	4⅜ *111*	2	1 x 6 -	250 *339*	300 *406*	31.7 *14.4*
8 *200*	8.625 *219.1*	300 *20.7*	17,528 *7,950*	12	10⅞ *276*	14½ *368*	4½ *114*	4	⅞ x 5 -	250 *339*	300 *406*	38.6 *17.5*
10 *250*	10.750 *273.1*	300 *20.7*	27,229 *12,377*	8	12⅝ *321*	18 *457*	5⅜ *137*	4	1 x 6½ -	500 *678*	600 *814*	40 *18.1*
12 *300*	12.750 *323.9*	300 *20.7*	31,919 *14,509*	12	14⅞ *378*	20¼ *514*	5⅜ *137*	4	1 x 6½ -	550 *746*	700 *949*	56 *25.4*
14 *350*	14.000 *355.6*	300 *20.7*	30,788 *13,995*	12	16¾ *425*	22⅛ *562*	6¼ *159*	4	1 x 6½ -	550 *746*	700 *949*	88 *39.9*
16 *400*	16.000 *406.4*	300 *20.7*	30,159 *13,709*	12	18¾ *476*	24 *610*	6¼ *159*	4	1 x 6½ -	550 *746*	700 *949*	95 *43.1*

NOTES:

See Coupling data chart notes in technical data section for additional information.

§ – For additional Bolt Torque information see page 202

see “Coupling Data Chart Notes” on page 264.

Not for use in copper or PVC systems.

See Installation & Assembly directions on pages 176-177.

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Fig. 7050P

90° Elbow

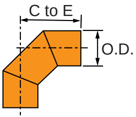

Figure 7050P - 90° Elbow

Nominal Size	O.D.	Center To End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2	2.375	4¾	2.7
50	*60.3*	*121*	*1.2*
2½	2.875	5½	4.8
65	*73.0*	*140*	*2.2*
3	3.500	6¼	7.2
80	*88.9*	*159*	*3.3*
3½	4.000	7	9.4
90	*101.6*	*178*	*4.3*
4	4.500	7¾	12.3
100	*114.3*	*197*	*5.6*
5	5.563	9½	13.4
125	*141.3*	*241*	*6.1*
6	6.625	11	31
150	*168.3*	*279*	*14.1*
8	8.625	11	38.7
200	*219.1*	*279*	*17.6*

Fig. 7051P

45° Elbow

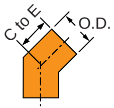

Figure 7051P - 45° Elbow

Nominal Size	O.D.	Center To End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2	2.375	3⅛	2.0
50	*60.3*	*79*	*0.9*
2½	2.875	3½	3.5
65	*73.0*	*89*	*1.6*
3	3.500	3¾	4.8
80	*88.9*	*95*	*2.2*
3½	4.000	4	6.2
90	*101.6*	*102*	*2.8*
4	4.500	4¼	8.0
100	*114.3*	*108*	*3.6*
5	5.563	5⅛	9.2
125	*141.3*	*130*	*4.2*
6	6.625	5¾	18.5
150	*168.3*	*146*	*8.4*
8	8.625	6	24.9
200	*219.1*	*152*	*11.3*

Fig. 7060P

Tee

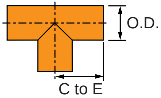

Figure 7060P - Tee

Nominal Size	O.D.	Center To End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2	2.375	4¼	3.5
50	*60.3*	*108*	*1.6*
2½	2.875	4¾	6.2
65	*73.0*	*121*	*2.8*
3	3.500	5⅛	8.6
80	*88.9*	*130*	*3.9*
3½	4.000	5½	11
90	*101.6*	*140*	*5.0*
4	4.500	5⅞	13.8
100	*114.3*	*149*	*6.3*
5	5.563	6⅞	21.7
125	*141.3*	*175*	*9.8*
6	6.625	7⅝	30.9
150	*168.3*	*194*	*14.0*
8	8.625	10	61.1
200	*219.1*	*254*	*27.7*

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FIG. 7068P

CROSS

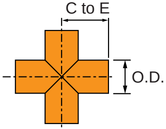

FIG. 7069P

45° LATERAL

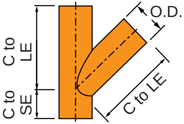

FIG. 7071P

90° TRUE WYE

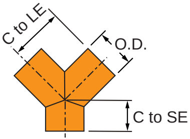

FIGURE 7068P - CROSS

Nominal Size	O.D.	Center To End	Approx. Wt. Ea.
In./DN(mm)	In./mm	In./mm	Lbs./Kg
2 *50*	2.375 *60.3*	4¼ *108*	4.4 *2.0*
2½ *65*	2.875 *73.0*	4¾ *121*	7.8 *3.5*
3 *80*	3.500 *88.9*	5⅛ *130*	10.7 *4.9*
3½ *90*	4.000 *101.6*	5½ *140*	13.7 *6.2*
4 *100*	4.500 *114.3*	5⅞ *149*	17 *7.7*
5 *125*	5.563 *141.3*	6⅞ *175*	26.7 *12.1*
6 *150*	6.625 *168.3*	7⅝ *194*	37.7 *17.1*
8 *200*	8.625 *219.1*	10 *254*	74.6 *33.8*

FIGURE 7069P - 45° LATERAL

Nominal Size	O.D.	Center to Long End	Center to Short End	Approx. Wt. Ea.
In./DN(mm)	In./mm	In./mm	In./mm	Lbs./Kg
2 *50*	2.375 *60.3*	7¼ *184*	2¾ *70*	5.1 *2.3*
2½ *65*	2.875 *73.0*	7¾ *197*	3 *76*	9.5 *4.3*
3 *80*	3.500 *88.9*	8¾ *222*	3¼ *83*	12.8 *5.8*
3½ *90*	4.000 *101.6*	10 *254*	3½ *89*	20.0 *9.1*
4 *100*	4.500 *114.3*	10¾ *273*	3¾ *95*	22.2 *10.1*
5 *125*	5.563 *141.3*	12¾ *324*	4 *102*	38.0 *17.2*
6 *150*	6.625 *168.3*	14 *356*	4½ *114*	54.0 *24.5*
8 *200*	8.625 *219.1*	18 *457*	6 *152*	92.0 *41.7*

FIGURE 7071P - 90° TRUE WYE

Nominal Size	O.D.	Center to Long End	Center to Short End	Approx. Wt. Ea.
In./DN(mm)	In./mm	In./mm	In./mm	Lbs./Kg
2 *50*	2.375 *60.3*	4¼ *108*	2¾ *70*	3.5 *1.6*
2½ *65*	2.875 *73.0*	4¾ *121*	3 *76*	6.2 *2.8*
3 *80*	3.500 *88.9*	5⅛ *130*	3¼ *83*	8.5 *3.9*
3½ *90*	4.000 *101.6*	5½ *140*	3½ *89*	10.0 *4.5*
4 *100*	4.500 *114.3*	5⅞ *149*	3¾ *95*	14.0 *6.4*
5 *125*	5.563 *141.3*	6⅞ *175*	4 *102*	21.6 *9.8*
6 *150*	6.625 *168.3*	7⅝ *194*	4½ *114*	31.2 *14.2*
8 *200*	8.625 *219.1*	10 *254*	6 *152*	53.6 *24.3*

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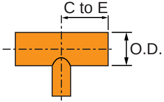
FIG. 7061P

REDUCING TEE

FIGURE 7061P - REDUCING TEE

Nominal Size	Center To End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*Lbs./Kg*
3 x 3 x 2 *80 x 80 x 50*	5½ *140*	7.1 *3.2*
4 x 4 x 2 *100 x 100 x 50*	5⅞ *149*	11.3 *5.1*
4 x 4 x 2½ *100 x 100 x 65*	5⅞ *149*	11.6 *5.3*
4 x 4 x 3 *100 x 100 x 80*	5⅞ *149*	11.9 *5.4*
6 x 6 x 2 *150 x 150 x 50*	7⅝ *194*	24.6 *11.2*
6 x 6 x 3 *150 x 150 x 80*	7⅝ *194*	25.4 *11.5*
6 x 6 x 4 *150 x 150 x 100*	7⅝ *194*	26.2 *11.9*
8 x 8 x 2 *200 x 200 x 50*	10 *254*	42.0 *19.1*
8 x 8 x 3 *200 x 200 x 80*	10 *254*	44.0 *20.0*
8 x 8 x 4 *200 x 200 x 100*	10 *254*	46.0 *20.9*
8 x 8 x 5 *200 x 200 x 125*	10 *2254*	48.0 *21.8*
8 x 8 x 6 *200 x 200 x 150*	10 *254*	50.0 *22.7*
10 x 10 x 4 *250 x 250 x 100*	11½ *292*	74.0 *33.6*
10 x 10 x 6 *250 x 250 x 150*	11½ *292*	78.0 *35.4*
10 x 10 x 8 *250 x 250 x 200*	11½ *292*	86.0 *39.0*
12 x 12 x 6 *300 x 300 x 150*	13½ *343*	112.0 *50.8*
12 x 12 x 8 *300 x 300 x 200*	13½ *343*	118.0 *53.5*
12 x 12 x 10 *300 x 300 x 250*	13½ *343*	130.0 *59.0*



See Fitting Size Chart on page 148 for O.D. sizes

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Fig. 7050LRP

90° LR Elbow

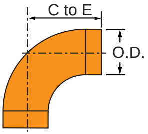

Figure 7050 LRP - 90° LR Elbow

Nominal Size	O.D.	Center To End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	5 *127*	2.5 *1.1*
2½ *65*	2.875 *73.0*	5¾ *146*	4.9 *2.2*
3 *80*	3.500 *88.9*	6½ *165*	6.5 *2.9*
3½ *90*	4.000 *101.6*	7¼ *184*	9.8 *4.4*
4 *100*	4.500 *114.3*	8 *203*	11.5 *5.2*
5 *125*	5.563 *141.3*	9¾ *248*	21.5 *9.8*
6 *150*	6.625 *168.3*	11¼ *286*	28.5 *12.9*
8 *200*	8.625 *219.1*	15 *381*	56.7 *25.7*

Fig. 7051LRP

45° LR Elbow

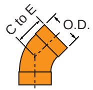

Figure 7051 LRP - 45° LR Elbow

Nominal Size	O.D.	Center To End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	3⅜ *86*	1.8 *0.8*
2½ *65*	2.875 *73.0*	3¾ *95*	3.6 *1.6*
3 *80*	3.500 *88.9*	4 *102*	4.5 *2.0*
3½ *90*	4.000 *101.6*	4¼ *108*	6.7 *3.0*
4 *100*	4.500 *114.3*	4½ *114*	7.5 *3.4*
5 *125*	5.563 *141.3*	5⅜ *137*	13.8 *6.3*
6 *150*	6.625 *168.3*	6 *152*	17.3 *7.8*
8 *200*	8.625 *219.1*	8 *203*	34.0 *15.4*

Fig. 7075P

Bull Plug

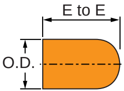

Figure 7075P - Bull Plug

Nominal Size	O.D.	Center To End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	4 *102*	2.3 *1.0*
2½ *65*	2.875 *73.0*	5 *127*	3.0 *1.4*
3 *80*	3.500 *88.9*	6 *152*	4.5 *2.0*
3½ *90*	4.000 *101.6*	6½ *165*	5.5 *2.5*
4 *100*	4.500 *114.3*	7 *178*	7.5 *3.4*
5 *125*	5.563 *141.3*	8½ *216*	12.5 *5.7*
6 *150*	6.625 *168.3*	10 *254*	17.0 *7.7*
8 *200*	8.625 *219.1*	11 *279*	29.0 *13.2*

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FIG. 7084P & FIG. 7085P

FLANGE NIPPLES

(Plain-End x Class 150 or 300)

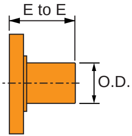

FIGURE 7084P - PLAIN-END x CLASS 150 FLANGE NIPPLES

Nominal Size	O.D.	End To End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	4 *102*	6.0 *2.7*
2½ *65*	2.875 *73.0*	4 *102*	9.2 *4.2*
3 *80*	3.500 *88.9*	4 *102*	10.4 *4.7*
3½ *90*	4.000 *101.6*	4 *102*	14.0 *6.4*
4 *100*	4.500 *114.3*	6 *152*	19.1 *8.7*
5 *125*	5.563 *141.3*	6 *152*	23.0 *10.4*
6 *150*	6.625 *168.3*	6 *152*	29.5 *13.4*
8 *200*	8.625 *219.1*	6 *152*	43.5 *19.7*

FIGURE 7085P - PLAIN-END x CLASS 300 FLANGE NIPPLES

End To End	Approx. Wt. Ea.
In./mm	*Lbs./Kg*
4 *102*	8.2 *3.7*
4 *102*	11.9 *5.4*
4 *102*	15.5 *7.0*
4 *102*	21.0 *9.5*
6 *152*	28.0 *12.7*
6 *152*	35.0 *15.9*
6 *152*	50.0 *22.7*
6 *152*	72.0 *32.7*

FIG. 7080P, FIG. 7081P & FIG. 7082P

ADAPTER NIPPLES

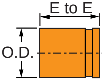

FIG. 7080P
Plain x Grooved

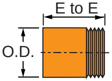

FIG. 7081P
Plain x Thread

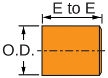

FIG. 7082P
Plain x Bevel

FIGURE 7080P, 7081P, 7082P - ADAPTER NIPPLES

Nominal Size	O.D.	End To End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
2 *50*	2.375 *60.3*	4 *102*	1.2 *0.5*
2½ *65*	2.875 *73.0*	4 *102*	1.9 *0.9*
3 *80*	3.500 *88.9*	4 *102*	2.5 *1.1*
3½ *90*	4.000 *101.6*	4 *102*	3.1 *1.4*
4 *100*	4.500 *114.3*	6 *152*	5.5 *2.5*
5 *125*	5.563 *141.3*	6 *152*	7.4 *3.4*
6 *150*	6.625 *168.3*	6 *152*	9.5 *4.3*
8 *200*	8.625 *219.1*	6 *152*	14.2 *6.4*

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FIG. 7077P

SWAGED NIPPLES

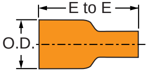

FIGURE 7077P - SWAGED NIPPLES

Nominal Size	End Center To End	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*Lbs./Kg*
2½ x 2 *65 x 50*	7 *178*	3.0 *1.4*
3 x 2 *80 x 50*	8 *203*	4.5 *2.0*
3 x 2½ *80 x 65*	8 *203*	4.5 *2.0*
4 x 2 *100 x 50*	9 *229*	7.5 *3.4*
4 x 2½ *100 x 65*	9 *229*	7.5 *3.4*
4 x 3 *100 x 80*	9 *229*	7.5 *3.4*
5 x 2 *125 x 50*	11 *279*	11.5 *5.2*
5 x 3 *125 x 80*	11 *279*	11.5 *5.2*
5 x 4 *125 x 100*	11 *279*	11.5 *5.2*
6 x 2 *150 x 50*	12 *305*	17.0 *7.7*
6 x 2½ *150 x 65*	12 *305*	17.0 *7.7*
6 x 3 *150 x 80*	12 *305*	17.0 *7.7*
6 x 4 *150 x 100*	12 *305*	17.0 *7.7*
6 x 5 *150 x 125*	12 *305*	17.0 *7.7*
8 x 3 *200 x 80*	13 *330*	29.0 *13.2*
8 x 4 *200 x 100*	13 *330*	29.0 *13.2*
8 x 5 *200 x 125*	13 *330*	29.0 *13.2*
8 x 6 *200 x 150*	13 *330*	29.0 *13.2*

See Fitting Size Chart on page 148 for O.D. sizes

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Fig. 7305

HDPE Coupling

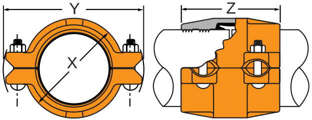

Figure 7305 - HDPE Coupling

Nominal Size	O.D.	Coupling Dimensions			Coupling Bolts		Approx. Wt. Ea.
		X	Y	Z	Qty.	Size	
In./DN(mm)	In./mm	In./mm	In./mm	In./mm		In.	Lbs./Kg
2 50	2.375 60.3	3⅜ 86	5½ 140	4⅝ 117	4	½ x 2⅜ -	4.5 2.0
3 80	3.500 88.9	4⅝ 117	6¾ 171	4⅝ 117	4	½ x 3 -	8.5 3.9
4 100	4.500 114.3	5¼ 133	8 203	5¾ 146	4	½ x 3 -	12 5.4
6 150	6.625 168.3	7½ 191	11 279	5⅞ 149	4	⅝ x 3½ -	18 8.2
8 200	8.625 219.1	10 254	13¼ 337	6 152	4	⅝ x 3½ -	30 13.6
10 250	10.750 273.1	12 305	15¾ 400	6½ 165	4	¾ x 4¾ -	43 19.5
12 300	12.750 323.9	14⅜ 365	17⅞ 454	7¼ 184	4	¾ x 4¾ -	58 26.3

See Installation & Assembly directions on pages 178-179.

Fig. 7307

HDPE Transition Coupling

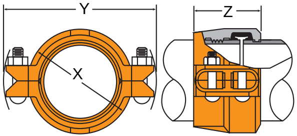

Figure 7307 - HDPE Transition Coupling

Nominal Size	O.D.	Coupling Dimensions			Coupling Bolts		Approx. Wt. Ea.
		X	Y	Z	Qty.	Size	
In./DN(mm)	In./mm	In./mm	In./mm	In./mm		In.	Lbs./Kg
2 50	2.375 60.3	3⅜ 86	6 152	3⅛ 79	4	½ x 2⅜ -	4.5 2.0
3 80	3.500 88.9	4½ 114	7⅛ 181	3⅛ 79	4	½ x 3 -	6 2.7
4 100	4.500 114.3	5¾ 146	8½ 216	3¾ 95	4	½ x 3 -	8.5 3.9
6 150	6.625 168.3	8 203	11¼ 286	3¾ 95	4	⅝ x 3½ -	12.5 5.7
8 200	8.625 219.1	10½ 267	13⅝ 346	4¼ 108	4	⅝ x 3½ -	20.5 9.3
10 250	10.750 273.1	12⅝ 321	17 432	5 127	4	⅞ x 5½ -	34.5 15.6
12 300	12.750 323.9	14¾ 375	19½ 495	5 127	4	⅞ x 5½ -	42.5 19.3

See Installation & Assembly directions on pages 180-181.

For Gruvlok Technical Detail Refer to the Gruvlok Catalog or contact your local Anvil sales representative.

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Fig. 7312

HDPE Flange Adapter

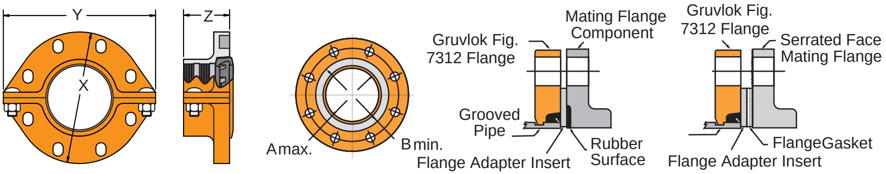

Figure 7312 - HDPE Flange Adapter											
Nominal Size	O.D.	Flange Dimensions			Sealing Surface		Latch Bolt		Mating Flange Bolts		Approx. Wt. Ea.
		X	Y	Z	A Max	B Min.	Qty.	Size	Qty.	Size	
In./DN(mm)	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*		*In./mm*		*In./mm*	*Lbs./Kg*
4 *100*	4.500 *114.3*	9 *229*	10⅜ *264*	3⅛ *79*	4½ *114*	5¾ *146*	2	⅝ x 1⅝	8	⅝ x 3	15 *6.8*
6 *150*	6.625 *168.3*	11¼ *286*	12⅜ *314*	3⅞ *98*	6⅝ *168*	7¾ *197*	2	⅝ x 1⅝	8	¾ x 3½	22 *10.0*
8 *200*	8.625 *219.1*	13½ *343*	14⅞ *378*	3½ *89*	8⅝ *219*	10¼ *260*	2	¾ x 2	8	¾ x 3½	26 *12.7*

A. The sealing surfaces A Max. to B Min. of the mating flange must be free from gouges, undulations and deformities of any type to ensure proper sealing of gasket.

B. Gruvlok Flanges are to be assembled on butterfly valves so as not to interfere with actuator or handle operation.

C. Do not use Gruvlok Flanges within 90 degrees of one another on standard fittings because the outside dimensions may cause interference.

D. Gruvlok Flanges should not be used as anchor points for tierods across non-restrained joints.

E. Fig. 7012 Gruvlok Flange sealing gaskets require a hard flat surface for adequate sealing. The use of a Gruvlok Flange Adapter Insert is required for applications against rubber faced valves or other equipment. The Gruvlok Flange Adapter Insert is installed between the Gruvlok Flange sealing gasket and the mating flange or surface to provide a good sealing surface area.

F. Gruvlok Flanges are not recommended for use against formed rubber flanges.

See Installation & Assembly directions on pages 182-183.

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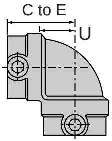
FIG. 7100

90° ELBOW (SOCK-IT® x SOCK-IT®)



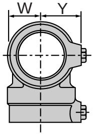


FIGURE 7100 - SOCK-IT® ELBOW (S x S)

Nominal Size	O.D.	Max. Working Pressure		Dimensions				Approx. Wt. Ea.
		UL/ULC Listed	FM Approved	Center To End	U*	W	Y	
In./DN(mm)	In./mm	PSI/bar	PSI/bar	In./mm	In./mm	In./mm	In./mm	Lbs./Kg
1 25	1.315 33.7	300 20.7	300 20.7	2 5/16 59	⅞ 22	1 1/16 27	1¾ 44	1.9 0.9
1¼ 32	1.660 42.4	300 20.7	300 20.7	2 7/16 62	1 25	1¼ 32	1 13/16 46	2.3 1.0
1½ 40	1.900 48.3	300 20.7	300 20.7	2⅝ 67	1⅛ 29	1⅜ 35	1 15/16 49	2.7 1.2
2 50	2.375 60.3	175 12.1	250 17.2	3¼ 83	1 9/16 40	1⅝ 41	2 3/16 56	4.0 1.8

* "U" - Run take-out dimension.

See Installation & Assembly directions on pages 184-185.

See Fitting Size Chart on page 148 for O.D. sizes

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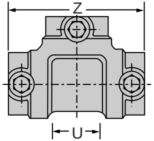
Fig. 7103

Straight Tee (Sock-It® x Sock-It® x Sock-It®)



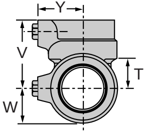


Figure 7103 - SOCK-IT® Straight Tee (S x S x S)										
Nominal Size	O.D.	Max. Working Pressure		Dimensions						Approx. Wt. Ea.
		UL/ULC Listed	FM Approved	**T	U*	V	W	Y	Z	
In./DN(mm)	In./mm	PSI/bar	PSI/bar	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	Lbs./Kg
1 25	1.315 33.7	300 20.7	300 20.7	1 3/16 30	1⅝ 41	2¼ 57	1 1/16 27	1 11/16 43	4½ 114	2.3 1.0
1¼ 32	1.660 42.4	175 12.1	300 20.7	1 25	2 51	2 7/16 62	1¼ 32	1 13/16 46	4⅞ 124	2.9 1.3
1½ 40	1.900 48.3	175 12.1	300 20.7	1 1/16 27	2⅛ 54	2 9/16 65	1⅜ 35	1 15/16 49	5⅛ 130	3.4 1.5
2 50	2.375 60.3	175 12.1	250 17.2	1 5/16 33	2⅝ 67	3 76	1 11/16 43	2 3/16 56	6 152	5.6 2.5

* "U" - Run take-out dimension.

**"T" - Outlet take-out dimension.

See Installation & Assembly directions on pages 184-185.

See Fitting Size Chart on page 148 for O.D. sizes

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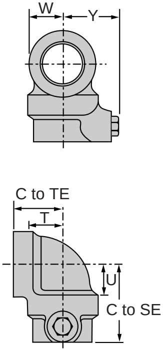
FIG. 7101

90° REDUCING ELBOW (SOCK-IT® x NPT)



See Installation & Assembly directions on pages 184-185.

See Fitting Size Chart on page 148 for O.D. sizes

FIGURE 7101 - SOCK-IT® REDUCING ELBOW (S x NPT)

Nominal Size	Max. Working Pressure		Dimensions						Approx. Wt. Ea.
	UL/ULC Listed	FM Approved	Center to TE	Center To SE	U*	T**	W	Y	
In./DN(mm)	PSI/bar	PSI/bar	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	Lbs./Kg
1 x ½ 25 x 15	300 20.7	300 20.7	1⁷⁄₁₆ 37	2⁵⁄₁₆ 59	⅞ 22	1 25	1¹⁄₁₆ 27	1¹¹⁄₁₆ 43	1.7 0.8
1 x ¾ 25 x 20	300 20.7	300 20.7	1⁷⁄₁₆ 37	2⁵⁄₁₆ 59	⅞ 22	⅞ 22	1¹⁄₁₆ 27	1¹¹⁄₁₆ 43	1.6 0.7
1 x 1 25 x 25	300 20.7	300 20.7	1⁷⁄₁₆ 37	2⁵⁄₁₆ 59	⅞ 22	⅞ 22	1¹⁄₁₆ 27	1¹¹⁄₁₆ 43	1.5 0.7
1¼ x ½ 32 x 15	300 20.7	300 20.7	1⁹⁄₁₆ 40	2½ 64	1¹⁄₁₆ 27	1⅛ 29	1¼ 32	1¹³⁄₁₆ 46	2.2 1.0
1¼ x ¾ 32 x 20	300 20.7	300 20.7	1⁹⁄₁₆ 40	2½ 64	1¹⁄₁₆ 27	1 25	1¼ 32	1¹³⁄₁₆ 46	2.1 1.0
1¼ x 1 32 x 25	300 20.7	300 20.7	1⁹⁄₁₆ 40	2½ 64	1¹⁄₁₆ 27	1 25	1¼ 32	1¹³⁄₁₆ 46	2 0.9
1½ x ½ 40 x 15	300 20.7	300 20.7	1¹¹⁄₁₆ 43	2½ 64	1 25	1¼ 32	1⅜ 35	1¹⁵⁄₁₆ 49	2.5 1.1
1½ x ¾ 40 x 20	300 20.7	300 20.7	1¹¹⁄₁₆ 43	2½ 64	1 25	1⅛ 29	1⅜ 35	1¹⁵⁄₁₆ 49	2.4 1.1
1½ x 1 40 x 25	300 20.7	300 20.7	1¹¹⁄₁₆ 43	2½ 64	1 25	1⅛ 29	1⅜ 35	1¹⁵⁄₁₆ 49	2.3 1.0

C to SE - Center to Sock-It® End
C to TE - Center to Thread End

* "U" - Take-out dimension, Sock-It® End.
** "T" - Take-out dimension, Thread End.

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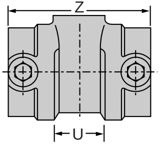
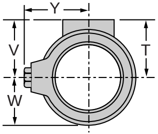
Fig. 7105

Reducing Outlet Tee
(Sock-It® x Sock-It® x NPT)





Note: Anvil® is the only manufacturer to offer a 2½" Sock-It Fitting

* "U" - Run take-out dimension.
** "T" - Outlet take-out dimension.
See Installation & Assembly directions on pages 184-185.
See Fitting Size Chart on page 148 for O.D. sizes

Figure 7105 - SOCK-IT® Reducing Outlet Tee (S x S x NPT)

Nominal Size	Max. Working Pressure		Dimensions						Approx. Wt. Ea.
	UL/ULC Listed	FM Approved	**T	U*	V	W	Y	Z	
In./DN(mm)	PSI/bar	PSI/bar	In./mm	In./mm	In./mm	In./mm	In./mm	In./mm	Lbs./Kg
1 x 1 x ½ 25 x 25 x 15	300 20.7	300 20.7	1 25	1⅜ 35	1⁷⁄₁₆ 37	1¹⁄₁₆ 27	1¹¹⁄₁₆ 43	4¼ 108	2.0 0.9
1 x 1 x ¾ 25 x 25 x 20	300 20.7	300 20.7	⅞ 22	1⅜ 35	1⁷⁄₁₆ 37	1¹⁄₁₆ 27	1¹¹⁄₁₆ 43	4¼ 108	1.9 0.9
1 x 1 x 1 25 x 25 x 25	300 20.7	300 20.7	⅞ 22	1⅜ 35	1⁷⁄₁₆ 37	1¹⁄₁₆ 27	1¹¹⁄₁₆ 43	4¼ 108	1.9 0.9
1¼ x 1¼ x ½ 32 x 32 x 15	300 20.7	300 20.7	1⅛ 29	1⅜ 35	1⅝ 41	1¼ 32	1¹³⁄₁₆ 46	4¼ 108	2.2 1.0
1¼ x 1¼ x ¾ 32 x 32 x 20	300 20.7	300 20.7	1 25	1⅜ 35	1⅝ 41	1¼ 32	1¹³⁄₁₆ 46	4¼ 108	2.2 1.0
1¼ x 1¼ x 1 32 x 32 x 25	300 20.7	300 20.7	1 25	1⅜ 35	1⅝ 41	1¼ 32	1¹³⁄₁₆ 46	4¼ 108	2.0 0.9
1½ x 1½ x ½ 40 x 40 x 15	300 20.7	300 20.7	1¼ 32	1⅜ 35	1¾ 44	1⅜ 35	1¹⁵⁄₁₆ 49	4⅜ 111	2.7 1.2
1½ x 1½ x ¾ 40 x 40 x 20	300 20.7	300 20.7	1⅛ 29	1⅜ 35	1¾ 44	1⅜ 35	1¹⁵⁄₁₆ 49	4⅜ 111	2.6 1.2
1½ x 1½ x 1 40 x 40 x 25	300 20.7	300 20.7	1⅛ 29	1⅜ 35	1¾ 44	1⅜ 35	1¹⁵⁄₁₆ 49	4⅜ 111	2.5 1.1
2 x 2 x ½ 50 x 50 x 15	175 12.1	250 17.2	1½ 38	1⅜ 35	1¹⁵⁄₁₆ 49	1⅝ 41	2³⁄₁₆ 56	4¾ 121	3.5 1.6
2 x 2 x ¾ 50 x 50 x 20	175 12.1	250 17.2	1⅜ 35	1⅜ 35	1¹⁵⁄₁₆ 49	1⅝ 41	2³⁄₁₆ 56	4¾ 121	3.4 1.5
2 x 2 x 1 50 x 50 x 25	175 12.1	250 17.2	1⅜ 35	1⅜ 35	1¹⁵⁄₁₆ 49	1⅝ 41	2³⁄₁₆ 56	4¾ 121	3.3 1.5
2½ x 2½ x ¾ 65 x 65 x 20	175 12.1	175 12.1	1½ 38	1⅜ 35	2⅛ 54	1¹⁵⁄₁₆ 49	2⁷⁄₁₆ 62	4¾ 121	5.2 2.4
2½ x 2½ x 1 65 x 65 x 25	175 12.1	175 12.1	1½ 38	1⅜ 35	2⅛ 54	1¹⁵⁄₁₆ 49	2⁷⁄₁₆ 62	4¾ 121	5.2 2.4

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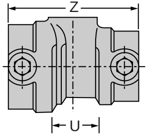
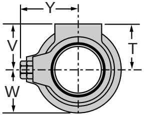
FIG. 7106

REDUCING TEE
(SOCK-IT® x SOCK-IT® x NPT)





* "U" - Run take-out dimension.

** "T" - Outlet take-out dimension.

See Installation & Assembly directions on pages 184-185.

See Fitting Size Chart on page 148 for O.D. sizes

FIGURE 7106 - SOCK-IT® REDUCING TEE (S x S x NPT)

Nominal Size	Max. Working Pressure		Dimensions						Approx. Wt. Ea.
	UL/ULC Listed	FM Approved	**T	U*	V	W	Y	Z	
In./DN(mm)	*PSI/bar*	*PSI/bar*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*Lbs./Kg*
1¼ x 1 x ½ *32 x 25 x 15*	300 *2.1*	300 *2.1*	1 *25*	1⅜ *35*	1⁷⁄₁₆ *37*	1¼ *32*	1¹³⁄₁₆ *46*	4¼ *108*	2.1 *1.0*
1¼ x 1 x ¾ *32 x 25 x 20*	300 *20.7*	300 *20.7*	⅞ *22*	1⅜ *35*	1⁷⁄₁₆ *37*	1¼ *32*	1¹³⁄₁₆ *46*	4¼ *108*	2.1 *1.0*
1¼ x 1 x 1 *32 x 25 x 25*	300 *20.7*	300 *20.7*	⅞ *22*	1⅜ *35*	1⁷⁄₁₆ *37*	1¼ *32*	1¹³⁄₁₆ *46*	4¼ *108*	2.0 *0.9*
1½ x 1¼ x ½ *40 x 32 x 15*	300 *20.7*	300 *20.7*	1⅛ *29*	1⅜ *35*	1⁹⁄₁₆ *40*	1⅜ *35*	1¹⁵⁄₁₆ *49*	4⅜ *111*	2.5 *1.1*
1½ x 1¼ x ¾ *40 x 32 x 20*	300 *20.7*	300 *20.7*	1 *25*	1⅜ *35*	1⁹⁄₁₆ *40*	1⅜ *35*	1¹⁵⁄₁₆ *49*	4⅜ *111*	2.4 *1.1*
1½ x 1¼ x 1 *40 x 32 x 25*	300 *20.7*	300 *20.7*	1 *25*	1⅜ *35*	1⁹⁄₁₆ *40*	1⅜ *35*	1¹⁵⁄₁₆ *49*	4⅜ *111*	2.2 *1.0*
2 x 1½ x ½ *50 x 40 x 15*	175 *12.1*	250 *17.2*	1¼ *32*	1⅜ *35*	1¾ *44*	1⅝ *41*	2³⁄₁₆ *56*	4⁹⁄₁₆ *116*	3.2 *1.5*
2 x 1½ x ¾ *50 x 40 x 20*	175 *12.1*	250 *17.2*	1⅛ *29*	1⅜ *35*	1¾ *44*	1⅝ *41*	2³⁄₁₆ *56*	4⁹⁄₁₆ *116*	3.1 *1.4*
2 x 1½ x 1 *50 x 40 x 25*	175 *12.1*	250 *17.2*	1⅛ *29*	1⅜ *35*	1¾ *44*	1⅝ *41*	2³⁄₁₆ *56*	4⁹⁄₁₆ *116*	3.0 *1.4*

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FIG. 7107

COUPLING
(SOCK-IT® x SOCK-IT®)

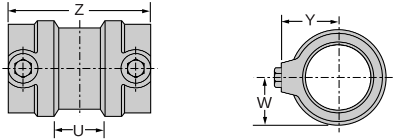

FIGURE 7107 - SOCK-IT® COUPLING (S x S)								
Nominal Size	O.D.	Max. Working Pressure		Dimensions				Approx. Wt. Ea.
		UL/ULC Listed	FM Approved	U*	W	Y	Z	
In./DN(mm)	In./mm	PSI/bar	PSI/bar	n./mm	In./mm	In./mm	In./mm	Lbs./Kg
1 25	1.315 33.7	300 20.7	300 20.7	¼ 6	1¹⁄₁₆ 27	1¹¹⁄₁₆ 43	3⅛ 79	1.7 0.8
1¼ 32	1.660 42.4	300 20.7	300 20.7	¼ 6	1¼ 32	1¹³⁄₁₆ 46	3⅛ 79	1.9 0.9
1½ 40	1.900 48.3	300 20.7	300 20.7	¼ 6	1⅜ 35	1¹⁵⁄₁₆ 49	3¼ 83	2.1 1.0
2 50	2.375 60.3	175 12.1	250 17.2	¼ 6	1⅝ 41	2³⁄₁₆ 56	3⅝ 92	2.9 1.3

* "U" - Run take-out dimension.

See Installation & Assembly directions on pages 184-185.

See Fitting Size Chart on page 148 for O.D. sizes

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Fig. 7400SS

Rigidlite® Coupling

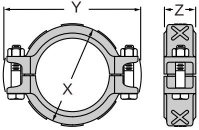

Figure 7400SS - Rigidlite Stainless Steel Coupling

Nominal Size	O.D.	Max. Wk. Pressure†	Max. End Load†	Range of Pipe End Separation	Coupling Dimensions			Coupling Bolts* Size (2 required)	Specified Torque		Approx. Wt. Ea.
					X	Y	Z		Min.	Max.	
In./mm	*In./mm*	*PSI/bar*	*Lbs./kN*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*Ft.-Lbs/N-M*		*Lbs./Kg*
1¼ *32*	1.66 *42.4*	300 *20.7*	649 *2.89*	0-⅛ *0-3.2*	2⅞ *73*	4⅛ *105*	1¾ *44*	⅜ x 2¼	15	20	1.6 *0.7*
1½ *40*	1.900 *48.3*	300 *20.7*	851 *3.78*	0-⅛ *0-3.2*	3⅛ *79*	4⅝ *117*	1¾ *44*	⅜ x 2¼	15	20	1.7 *0.8*
2 *50*	2.375 *60.3*	300 *20.7*	1,329 *5.91*	0-⅛ *0-3.2*	3⅝ *92*	5⅜ *137*	1¾ *45*	⅜ x 2¼	15	20	2.1 *1.0*
2½ *65*	2.875 *73.0*	300 *20.7*	1,785 *7.44*	0-⅛ *0-3.2*	4⅛ *105*	5⅞ *149*	1¾ *44*	⅜ x 2¼	15	20	2.3 *1.0*
3 *80*	3.500 *88.9*	300 *20.7*	2,886 *12.84*	0-⅛ *0-3.2*	4⅝ *117*	6⅝ *168*	1¾ *44*	½ x 2¾	50	60	3.1 *1.4*
4 *100*	4.500 *114.3*	300 *20.7*	4,771 *21.22*	0-¼ *0-6.4*	6 *152*	7¾ *197*	1⅞ *48*	½ x 2¾	50	60	4.4 *2.0*
6 *150*	6.625 *168.3*	275 *19.0*	9,480 *42.17*	0-¼ *0-6.4*	8⅛ *206*	11⅛ *283*	2 *51*	½ x 3	80	100	7.8 *3.5*
8 *200*	8.625 *219.1*	275 *19.0*	16,067 *71.47*	0-¼ *0-6.4*	10⅜ *264*	13⅝ *346*	2⅜ *60*	½ x 3	80	100	13.2 *6.0*

* All bolts are hex head design Type 316 Grade B8M Class 2 stainless steel to ASTM A193, with Type 316 Grade 8M stainless steel heavy hex nuts conforming to ASTM A194.

† Ratings apply when used with Schedule 40 ASTM A312 Type 304 stainless steel pipe for all sizes. Refer to ratings chart for additional data.

CAUTION: Contact your local Anvil Representative for corrosive application environments.

No Coatings or zinc options.

For Gruvlok Technical Detail Refer to the Gruvlok Catalog or contact your local Anvil sales representative.

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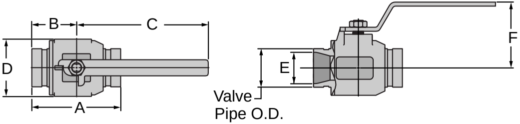
SERIES 7500 SS

GROOVED-END BALL VALVE



SERIES 7500 SS - BALL VALVE

Size ANSI	O.D.	Dimensions							Approx. Wt. Ea.
		A	B	C	D	E	F	Cv	
In./DN(mm)	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*		*Lbs./Kg*
2 *50*	2.375 *60.3*	5½ *140*	2¾ *70*	8¼ *209*	3 13/16 *81*	1 15/16 *49*	4⅛ *105*	165	8 *3.6*
3 *80*	3.500 *88.9*	6¾ *171*	3⅜ *85*	10 *254*	4 13/16 *122*	2⅞ *74*	4 13/16 *121*	310	18 *8.2*
4 *100*	4.500 *114.3*	8¼ *210*	4⅛ *105*	16 *406*	6 5/16 *176*	3 13/16 *97*	6 *152*	815	38 *17.2*
6 * *150*	6.625 *168.3*	10⅛ *257*	5 1/16 *128*	28 *711*	8 7/16 *215*	5 11/16 *144*	7⅝ *194*	1500	106 *48.1*

* Bare Stem

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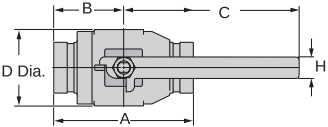
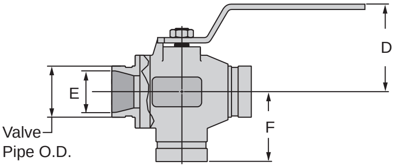
SERIES 7500 SS

GROOVED-END BALL VALVE





SERIES 7500 SS - THREE-WAY DIVERTER VALVES

Size ANSI	O.D.	Dimensions							Approx. Wt. Ea.
		A	B	C	D	E	F	Cv	
In./DN	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*	*In./mm*		*Lb./Kg*
2 RP *50*	2.375 RP *60.3*	6½ *165*	3¼ *83*	8¼ *209*	4⅛ *105*	1½ *38*	3¼ *83*	36	9.0 *19.80*
2 FP *50*	2.375 FP *60.3*	6½ *165*	3¼ *83*	10⅜ *264*	5⅜ *137*	2 *51*	3¼ *83*	135	14.2 *31.2*

NOTE: Contact your Anvil Representative for actuator mounting details.
Full port only.

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Fig. 7050SS

90° Stainless Steel Elbow

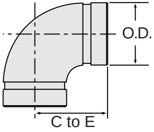

Fig. 7050SS 90° Stainless Steel Elbow		
Nominal Size	Center to End *	Approx. Wt. Ea.
In./DN(mm)	In./mm	Lbs./Kg
1¼ 32	2 13/16 71.4	0.8 0.4
1½ 40	3 76.2	1.0 0.5
2 50	3 11/16 93.7	1.3 0.6
2½ 65	4 5/16 109.5	1.8 0.8
3 80	5 1/16 128.6	2.9 1.3
4 100	6 5/16 160.3	4.6 2.1
5 125	7½ 190.5	8.3 3.7
6 150	9 228.6	11.2 5.1
8 200	12 304.8	22.7 10.3
10 250	15 381.0	35.3 16.0
12 300	18 457.2	56.9 25.8

NOTE:

1) * Dimensions may differ from those shown above. Contact a Anvil Representative for more information.

2) Series 304 SS pressure and load ratings are equal to or greater than pipe Schedule 10S values, refer to the Working Pressure Ratings Chart for Stainless Steel Roll Grooved Pipe on page 3 in the Stainless Steel Brochure.

Fig. 7051SS

45° Stainless Steel Elbow

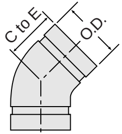

Fig. 7051SS 45° Stainless Steel Elbow		
Nominal Size	Center to End *	Approx. Wt. Ea.
In./DN(mm)	In./mm	Lbs./Kg
1¼ 32	1¾ 44.5	0.4 0.2
1½ 40	1⅞ 47.6	0.5 0.2
2 50	2⅛ 54.0	0.7 0.3
2½ 65	2⅜ 60.3	0.9 0.4
3 80	2 13/16 71.4	1.5 0.7
4 100	3 5/16 84.1	2.4 1.1
5 125	3⅞ 98.4	4.4 2.0
6 150	4½ 114.3	6.0 2.7
8 200	5⅞ 149.2	11.7 5.3
10 250	7⅛ 181.0	17.6 8.0
12 300	8⅝ 219.1	27.6 12.5

NOTE:

1) * Dimensions may differ from those shown above. Contact a Anvil Representative for more information.

2) Series 304 SS pressure and load ratings are equal to or greater than pipe Schedule 10S values, refer to the Working Pressure Ratings Chart for Stainless Steel Roll Grooved Pipe on page 3 in the Stainless Steel Brochure.

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FIG. 7060SS

STAINLESS STEEL TEES

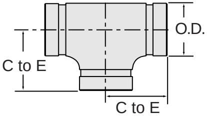

FIG. 7060SS STAINLESS STEEL TEE		
Nominal Size	Center to End *	Approx. Wt. Ea.
In./DN(mm)	In./mm	Lbs./Kg
1¼ 32	2¾ 69.9	1.1 0.5
1½ 40	2$^{15}/_{16}$ 74.6	1.3 0.6
2 50	3$^{3}/_{16}$ 81.0	3.2 1.5
2½ 65	3$^{11}/_{16}$ 93.7	4.4 2.0
3 80	4 101.6	5.8 2.6
4 100	4$^{15}/_{16}$ 125.4	8.6 3.9
5 125	5¾ 146.1	14.5 6.6
6 150	6½ 165.1	18.5 8.4
8 200	8$^{1}/_{16}$ 204.8	33.4 15.1
10 250	9½ 241.3	35.3 16.0
12 300	11 279.4	52.7 23.9

NOTE:

1) * Dimensions may differ from those shown above. Contact a Anvil Representative for more information.

2) Series 304 SS pressure and load ratings are equal to or greater than pipe Schedule 10S values, refer to the Working Pressure Ratings Chart for Stainless Steel Roll Grooved Pipe on page 3 in the Stainless Steel Brochure.

FIG. 7074SS

STAINLESS STEEL CAPS

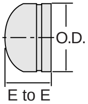

FIG. 7074SS STAINLESS STEEL CAPS		
Nominal Size	End to End *	Approx. Wt. Ea.
In./DN(mm)	In./mm	Lbs./Kg
1¼ 32	1¾ 44.5	0.4 0.2
1½ 40	1¾ 44.5	0.4 0.2
2 50	2 50.8	0.4 0.2
2½ 65	2$^{3}/_{16}$ 55.6	0.9 0.4
3 80	2$^{9}/_{16}$ 65.1	1.1 0.5
4 100	2$^{15}/_{16}$ 74.6	1.5 0.7
5 125	3⅛ 79.4	2.5 1.1
6 150	3$^{9}/_{16}$ 90.5	3.1 1.4
8 200	4 101.6	6.6 3.0
10 250	5 127.0	9.9 4.5
12 300	6 152.4	15.2 6.9

NOTE:

1) * Dimensions may differ from those shown above. Contact a Anvil Representative for more information.

2) Series 304 SS pressure and load ratings are equal to or greater than pipe Schedule 10S values, refer to the Working Pressure Ratings Chart for Stainless Steel Roll Grooved Pipe on page 3 in the Stainless Steel Brochure.

For Gruvlok Technical Detail Refer to the Gruvlok Catalog or contact your local Anvil sales representative.

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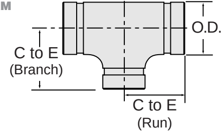
Fig. 7061SS

Stainless Steel Reducing Tees



NOTE:

1) * Dimensions may differ from those shown above. Contact a Anvil Representative for more information.

2) Series 304 SS pressure and load ratings are equal to or greater than pipe Schedule 10S values, refer to the Working Pressure Ratings Chart for Stainless Steel Roll Grooved Pipe on page 3 in the Stainless Steel Brochure.

Fig. 7061SS - Stainless Steel Reducing Tee

Nominal Size	Center to End (Run) *	Center to End (Branch) *	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
1½ x 1¼ *40 x 32*	2 15/16 *74.6*	2¾ *69.9*	1.3 *0.6*
2 x 1¼ *50 x 32*	3 3/16 *81.0*	2 15/16 *74.6*	1.8 *0.8*
2 x 1½ *50 x 40*	3 3/16 *81.0*	3 1/16 *77.8*	1.8 *0.8*
2½ x 1½ *65 x 40*	3 11/16 *93.7*	3 5/16 *84.1*	2.7 *1.2*
2½ x 2 *65 x 50*	3 11/16 *93.7*	3 9/16 *90.5*	2.7 *1.2*
3 x 1½ *80 x 40*	4 *101.6*	3 9/16 *90.5*	3.1 *1.4*
3 x 2 *80 x 50*	4 *101.6*	3 11/16 *93.7*	5.1 *2.3*
3 x 2½ *80 x 65*	4 *101.6*	3⅞ *98.4*	5.4 *2.4*
4 x 2 *100 x 50*	4 15/16 *125.4*	4 5/16 *109.5*	8.0 *3.6*
4 x 2½ *100 x 65*	4 15/16 *125.4*	4⅝ *117.5*	5.3 *2.4*

Nominal Size	Center to End (Run) *	Center to End (Branch) *	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*In./mm*	*Lbs./Kg*
4 x 3 *100 x 80*	4 15/16 *125.4*	4¾ *120.7*	8.6 *3.9*
6 x 3 *150 x 80*	6½ *165.1*	5 13/16 *147.6*	16.8 *7.6*
6 x 4 *150 x 100*	6⅛ *155.6*	6 *152.4*	16.8 *7.6*
8 x 4 *200 x 100*	8 1/16 *204.8*	7 3/16 *182.7*	29.7 *13.4*
8 x 6 *200 x 150*	8 1/16 *204.8*	7 11/16 *195.3*	33.4 *15.1*
10 x 6 *250 x 150*	9½ *241.3*	8⅞ *225.4*	21.6 *9.8*
10 x 8 *250 x 200*	9½ *241.3*	9 1/16 *230.2*	32.2 *14.6*
12 x 8 *300 x 200*	11 *279.4*	10 1/16 *255.6*	47.2 *21.4*
12 x 10 *300 x 250*	11 *279.4*	10 9/16 *268.3*	49.2 *22.3*

See Fitting Size Chart on page 148 for O.D. sizes

For Gruvlok Technical Detail Refer to the Gruvlok Catalog or contact your local Anvil sales representative.

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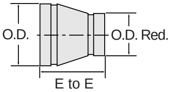
Fig. 7072SS

Stainless Steel Concentric Reducers



NOTE:

1) * Dimensions may differ from those shown above. Contact a Anvil Representative for more information.

2) Series 304 SS pressure and load ratings are equal to or greater than pipe Schedule 10S values, refer to the Working Pressure Ratings Chart for Stainless Steel Roll Grooved Pipe on page 3 in the Stainless Steel Brochure.

Figure 7072SS - Stainless Steel Concentric Reducers

Nominal Size	End to End *	Approx. Wt. Ea.
In./DN(mm)	*In./mm*	*Lbs./Kg*
1½ x 1¼ *40 x 32*	3¾ *95.3*	0.4 *0.2*
2 x 1¼ *50 x 32*	4⅛ *104.8*	0.7 *0.3*
2 x 1½ *50 x 40*	4⅛ *104.8*	0.7 *0.3*
2½ x 1½ *65 x 40*	4 7/16 *112.7*	1.1 *0.5*
2½ x 2 *65 x 50*	4 7/16 *112.7*	1.1 *0.5*
3 x 1½ *80 x 40*	4¾ *120.7*	1.3 *0.6*
3 x 2 *80 x 50*	4¾ *120.7*	1.3 *0.6*
3 x 2½ *80 x 65*	4¾ *120.7*	1.3 *0.6*
4 x 2 *100 x 50*	5 5/16 *134.9*	1.8 *0.8*
4 x 2½ *100 x 65*	5 5/16 *134.9*	1.8 *0.8*
4 x 3 *100 x 80*	5 5/16 *134.9*	2.0 *0.9*
6 x 3 *150 x 80*	6¾ *171.5*	3.8 *1.7*
6 x 4 *150 x 100*	6¾ *171.5*	4.0 *1.8*
8 x 4 *200 x 100*	7 9/16 *192.1*	6.6 *3.0*
8 x 6 *200 x 150*	7 9/16 *192.1*	7.3 *3.3*
10 x 6 *250 x 150*	8 11/16 *220.7*	9.7 *4.4*
10 x 8 *250 x 200*	8 11/16 *220.7*	10.6 *4.8*
12 x 8 *300 x 200*	9 7/16 *239.7*	15.0 *6.8*
12 x 10 *300 x 250*	9 7/16 *239.7*	15.9 *7.2*

Stainless Steel Fittings

Type 316

Stainless Steel Fittings, Type 316 are available. Please refer to Anvil's Stainless Steel Brochure pages 7 - 9 for additional information.

(Document number #078),

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MODEL 1007 & 3007

ROLL GROOVERS

Model 1007

Model 3007

Gruvlok roll grooving technology is protected by U.S. Patents 5450738, 5570603, 5778715 & others pending.

MODEL 1007 & MODEL 3007 - GROOVER CAPABILITY

Pipe Material	Pipe Size/Wall Thickness (Schedule In/DN mm)										
	2	**2½**	**3**	**4**	**5**	**6**	**8**	**10**	**12**	**14**	**16**
	50	65	80	100	125	150	200	250	300	350	400
Steel	Schedule 40									Std.	Std.
Stainless Steel	Schedule 40S									n/a	n/a
Copper								n/a	n/a	n/a	n/a

NOTES:

(1) All wall thickness shown are the maximum wall thickness for the indicated pipe material.

(2) Minimum wall thickness for each pipe materials & size is:

Steel: 2" - 12" – Sch. 10, 14" & 16" Std. Wall
Stainless Steel: 2" - 12" – Sch. 10S requires optional roller sets
Copper: 2" - 2½" – Type M
3" - 8" – Type DWV

NOTE: Some sizes may require optional equipment.

(3) Contact a Anvil Representative for information on grooving alternate materials

MODEL 1007 & MODEL 3007 - STEEL PIPE GROOVING TIMES (MIN: SEC.)

Pipe Size (In./DN mm) – Sch. 40 (Std. Wall) Steel Pipe										
2	**2½**	**3**	**4**	**5**	**6**	**8**	**10**	**12**	**14**	**16**
50	65	80	100	125	150	200	250	300	350	400
0:20	0:20	0:25	0:30	1:00	1:20	1:35	1:50	2:20	2:40	3:00

This chart shows approximate grooving times with the groover setup for the proper size and groove diameter and the pipe properly positioned on the groover. The times shown are average times from the start of rotation of the pipe in the grooving rolls to completed groove.

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MODEL 3006 & 3006C

ROLL GROOVERS

MODEL 3006 & MODEL 3006C - GROOVER CAPABILITY

Pipe Material	**Pipe Size/Wall Thickness (Schedule)**								
	2	**2½**	**3**	**4**	**5**	**6**	**8**	**10**	**12**
	50	*65*	*80*	*100*	*125*	*150*	*200*	*250*	*300*
Steel	Schedule 40							.188"	.219"
Stainless Steel	Schedule 40S						n/a	n/a	n/a
Copper	K, L, M & DWV						n/a	n/a	n/a

NOTES:

(1) All wall thickness shown are the maximum wall thickness for the indicated pipe material.

(2) Minimum wall thickness for each pipe materials & size is:

Steel: All sizes – Sch. 10
Stainless Steel: All sizes – Sch. 40S
Copper: 2", 2½" – Type M
3" - 6" – Type DWV

Note: The universal diameter gauge is part of the copper option or is available as a stand alone option

(3) Please contact a Anvil Representative for more information on grooving alternate materials & wall thickness.

MODEL 3006 & MODEL 3006C - STEEL PIPE GROOVING TIMES (MIN: SEC.)

Pipe Size (Inches)/Max Steel Pipe Wall Thickness							
2	**2½**	**3**	**4**	**6**	**8**	**10**	**12**
50	*65*	*80*	*100*	*150*	*200*	*250*	*300*
0:20	0:20	0:25	0:30	1:20	1:55	0:40	1:20

GROOVING TIMES: This chart shows approximate grooving times with the groover set-up for the proper size and groove diameter and the pipe properly positioned on the groover. The times shown are average times from the start of rotation of the pipe in the grooving rolls to completed groove.

Gruvlok roll grooving technology is protected by U.S. Patents 5450738, 5570603, 5778715 & others pending.

Fitting Size O.D. Chart & Flow Data Frictional Resistance

FITTING SIZE O.D. & FLOW DATA
FRICTIONAL RESISTANCE (EXPRESSED AS EQUIVALENT STRAIGHT PIPE)

Nominal Size	O.D.	Pipe Wall Thickness	Elbow		Tee	
			90°	45°	Branch	Run
In./DN(mm)	*In./mm*	*In./mm*	*Ft./m*	*Ft./m*	*Ft./m*	*Ft./m*
1	1.315	0.133	1.7	0.9	4.4	1.7
25	*33.4*	*3.4*	*0.5*	*0.3*	*1.3*	*0.5*
1¼	1.660	0.14	2.3	1.2	5.8	2.3
32	*42.2*	*3.6*	*0.7*	*0.4*	*1.8*	*0.7*
1½	1.900	0.145	2.7	1.3	6.7	2.7
40	*48.3*	*3.7*	*0.8*	*0.4*	*2.0*	*0.8*
2	2.375	0.154	3.4	1.7	8.6	3.4
50	*60.3*	*3.9*	*1.0*	*0.5*	*2.6*	*1.0*
2½	2.875	0.203	4.1	2.1	10.3	4.1
65	*73.0*	*5.2*	*1.2*	*0.6*	*3.1*	*1.2*
3 O.D.	*2.996*	*0.197*	*4.3*	*2.2*	*10.8*	*4.3*
76.1	76.1	5.0	1.3	0.7	3.3	1.3
3	3.500	0.216	5.1	2.6	12.8	5.1
80	*88.9*	*5.5*	*1.6*	*0.8*	*3.9*	*1.6*
4¼ O.D.	*4.250*	*0.220*	*6.4*	*3.2*	*16.1*	*6.4*
108.0	108.0	5.6	2.0	1.0	4.9	2.0
4	4.500	0.237	6.7	3.4	16.8	6.7
100	*114.3*	*6.0*	*2.0*	*1.0*	*5.1*	*2.0*
5¼ O.D.	*5.236*	*0.248*	*8.0*	*4.0*	*20.1*	*8.0*
133.0	133.0	6.3	2.4	1.2	6.1	2.4
5½ O.D.	*5.500*	*0.248*	*8.3*	*4.2*	*20.9*	*8.3*
139.7	139.7	6.3	2.5	1.3	6.4	2.5
5	5.563	0.258	8.4	4.2	21.0	8.4
125	*141.3*	*6.6*	*2.6*	*1.3*	*6.4*	*2.6*
6¼ O.D.	*6.259*	*0.280*	*9.7*	*4.9*	*24.3*	*9.7*
159.0	159.0	7.1	3.0	1.5	7.4	3.0
6½ O.D.	*6.500*	*0.280*	*10.0*	*5.0*	*24.9*	*10.0*
165.1	165.1	7.1	3.0	1.5	7.6	3.0
6	6.625	0.280	10.1	5.1	25.3	10.1
150	*168.3*	*7.1*	*3.1*	*1.6*	*7.7*	*3.1*
8	8.625	0.322	13.3	6.7	33.3	13.3
200	*219.1*	*8.2*	*4.1*	*2.0*	*10.1*	*4.1*
10	10.750	0.365	16.7	8.4	41.8	16.7
250	*273.1*	*9.3*	*5.1*	*2.6*	*12.7*	*5.1*
12	12.750	0.375	20.0	10.0	50.0	20.0
300	*323.9*	*9.5*	*6.1*	*3.0*	*15.2*	*6.1*
14	14.000	0.375	22.2	17.7	64.2	22.9
350	*355.6*	*9.5*	*6.8*	*5.4*	*19.6*	*7.0*
16	16.000	0.375	25.5	20.4	73.9	26.4
400	*406.4*	*9.5*	*7.8*	*6.2*	*22.5*	*8.0*
18	18.000	0.375	28.9	23.1	87.2	31.1
450	*457.2*	*9.5*	*8.8*	*7.0*	*26.6*	*9.5*
20	20.000	0.375	32.2	25.7	97.3	34.8
500	*508.0*	*9.5*	*9.8*	*7.8*	*29.7*	*10.6*
24	24.000	0.375	38.9	31.1	113.0	40.4
600	*609.6*	*9.5*	*11.9*	*9.5*	*34.4*	*12.3*

For the reducing tee and branches, use the value that is corresponding to the branch size. For example: for 6" x 6" x 3" tee, the branch value of 3" is 12.8 ft (3.9).

The Fitting Size Chart is used to determine the O.D. of the pipe that the fittings is to be used with. Gruvlok Fittings are identified by either the Nominal size in inches or the Pipe O.D. in/mm.

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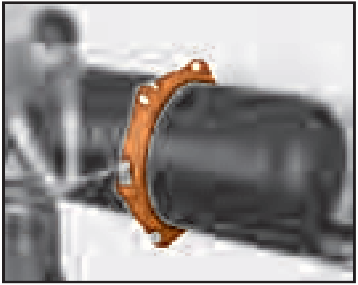

The instructions are based on pipe grooved in accordance with Gruvlok® grooving specifications. Check pipe ends for proper groove dimensions and to assure that the pipe ends are free of indentations and projections which would prevent proper sealing.

ALWAYS USE A GRUVLOK® LUBRICANT FOR PROPER COUPLING ASSEMBLY. Thorough lubrication of the external surface of the gasket is essential to prevent pinching and possible damage to the gasket. For temperatures above 150°F (65.6° C) use Gruvlok Xtreme™ Lubricant and lubricate all gasket surfaces, internal and external. See Gruvlok Lubricants in the Technical Data section of the Gruvlok catalog for additional important information.

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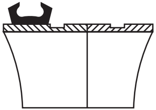
Fig. 7001

Standard Coupling

1 Check & lubricate gasket— Check gasket to be sure it is compatible for the intended service. Apply a thin coating of Gruvlok lubricant to outside and sealing lips of the gasket. Be careful that foreign particles do not adhere to lubricated surfaces.

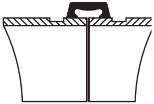
2 Gasket Installation— Slip the gasket over the pipe end making sure the gasket lip does not overhang the pipe end.

On couplings 10" and larger it may be easier to turn the gasket inside out-then lubricate and slide the gasket over the pipe end as shown.



3 Alignment— After aligning the two pipe ends, pull the gasket into position centering it between the grooves on each pipe. Gasket should not extend into the groove on either pipe.

On couplings 10" and larger, flip or roll the gasket into centered position.

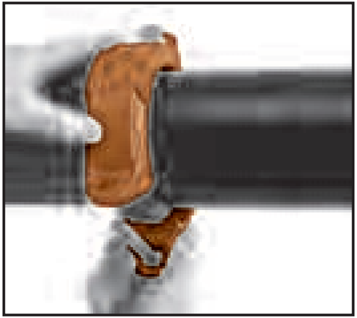


NOTE: The housings for sizes 16" and larger are cast in four or more segments.

TO INSTALL: loosely pre-assemble the segments into two “Housing Halves” making sure that the alignment tang(s) and slot(s) on the bolt pad(s) are properly mated. Install the “Housing Halves” as shown in steps 4 & 5. The coupling is properly installed when all bolt pads are firmly together - Metal-to-Metal.

FIG. 7001

STANDARD COUPLING



4 Housings— Place the coupling housing halves over the gasket making sure the housing keys engage the grooves. Insert bolts and turn nuts finger tight.

5 Tighten Nuts— Tighten the nuts alternately and equally to the specified bolt torque. The housing bolt pads must make metal-to-metal contact.

Uneven tightening may cause the gasket to pinch.

6 Assembly is Completed— Visually inspect the pipe joint to assure the coupling keys are fully engaged in the pipe grooves and the bolt pads are in firm even metal-to-metal contact on both sides of the coupling.

CAUTION: Use of an impact wrench is not recommended because the torque output can vary significantly due to many variables including air pressure supply, battery strength and operational variations.

CAUTION: Proper torquing of coupling bolts is required to obtain specified performance. Over torquing the bolts may result in damage to the bolt and/or casting which could result in pipe joint separation. Under torquing the bolts may result in lower pressure retention capabilities, lower bend load capabilities, joint leakage and pipe joint separation. Pipe joint separation may result in significant property damage and serious injury. See page 202 for bolt torque information.

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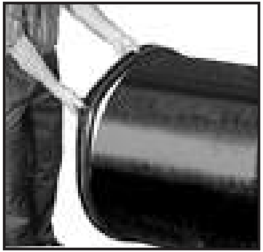
FIG. 7011

STANDARD COUPLING

1 Inspect the pipe ends making sure the criteria, in the Gruvlok Large Diameter Pipe Roll and Cut Groove Specifications, are met.



2 Turn the gasket inside out and slide the gasket completely over one of the pipe ends. Turning the gasket inside out will reduce the stretching necessary to put the gasket into position. Ideally, approximately 75% of the pipe's gasket-sealing surface, (Dimension A) should be visible when the gasket is in proper position. This will aid in step 4.

3 Lubricate the gasket sealing lips. The use of Gruvlok lubricants ensures compatibility between the lubricant and the gasket.

4 Pull the two pipes into contact aligning the pipe ends.

CAUTION: Be careful not to pinch fingers during this step. Working your way around the circumference of the pipe, flip the gasket toward the pipe end so that the proper side is facing out. The end of this procedure will result in the gasket snapping into place. Position the gasket centrally between the grooves of the two pipe ends.

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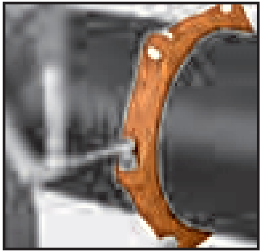
FIG. 7011, CONT'D.

STANDARD COUPLING

5 Lubricate the exterior surface of the gasket. This helps prevent pinching of the gasket during assembly.

CAUTION: Use of an impact wrench is not recommended because the torque output can vary significantly due to many variables including air pressure supply, battery strength and operational variations.

6 Secure the housings about the pipes making sure the coupling keys are engaged in the pipe end grooves. Hint: For horizontal assembly, place housing segment on top of the pipe to support the weight of the housing segment. Secure the adjacent housing with an oval neck track bolt and heavy hex nut and then rotate the secured housings, again balancing the weight of the housings on the top of the pipe. Continue this procedure for all segments.



7 Firmly torque each bolt. The specified minimum torque for each nut is 600 ft.-lbs. The specified maximum torque for each nut is 800 ft.-lbs.

8 Installation of the Figure 7011 Standard Coupling is completed.

CAUTION: Proper torquing of coupling bolts is required to obtain specified performance. Over torquing the bolts may result in damage to the bolt and/or casting which could result in pipe joint separation. Under torquing the bolts may result in lower pressure retention capabilities, lower bend load capabilities, joint leakage and pipe joint separation. Pipe joint separation may result in significant property damage and serious injury. See page 202 for bolt torque information.

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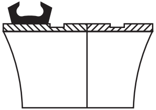
Fig. 7401

Rigidlok® Coupling

1 Check & lubricate gasket— Check gasket to be sure it is compatible for the intended service. Apply a thin coating of Gruvlok lubricant to outside and sealing lips of the gasket. Some applications require lubrication of the entire gasket surface. Be careful that foreign particles do not adhere to lubricated surfaces.

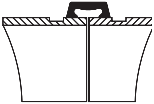
2 Gasket Installation— Slip the gasket over the pipe end making sure the gasket lip does not overhang the pipe end.

On couplings 10" and larger it may be easier to turn the gasket inside out-then lubricate and slide the gasket over the pipe end as shown.



3 Alignment— After aligning the two pipe ends, pull the gasket into position centering it between the grooves on each pipe. Gasket should not extend into the groove on either pipe.

On couplings 10" and larger, flip or roll the gasket into centered position.



NOTE: VdS - Roll Grooving Approval Specifications, see the Technical Data/ Install Instructions section on Anvil's web site - www.anvilintl.com

NOTE: Sizes 14" and larger are cast in multiple segments. To install the larger sizes align the tongue and pocket of the couplings appropriately and tighten the nuts alternately to the specified bolt torque. When properly assembled there will be a small equal gap between the adjacent bolt pads.

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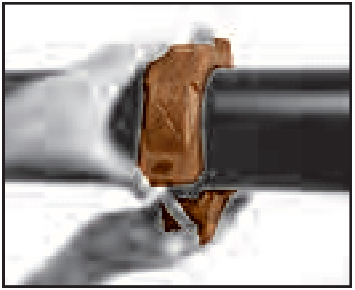
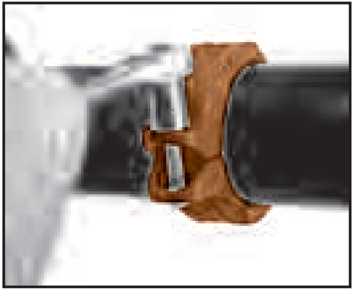
FIG. 7401, CONT'D.

RIGIDLOK® COUPLING

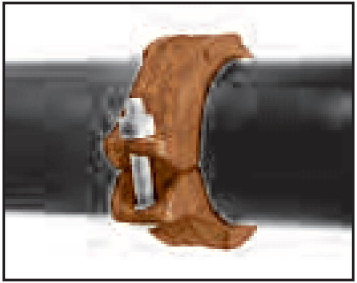


4 Housings— Remove one nut and bolt and loosen the other nut. Place one housing over the gasket, making sure the housing keys fit into the tube grooves. Swing the other housing over the gasket and into the grooves on both tubes, making sure the tongue and recess of each housing is properly mated. Re-insert the bolt and run-up both nuts finger tight.



5 Tighten Nuts— Securely tighten nuts alternately and equally to the specified bolt torque, keeping the gaps at the bolt pads evenly spaced.

CAUTION: Uneven tightening may cause the gasket to pinch. Gasket should not be visible between segments after bolts are tightened.



6 Assembly is completed— Visually inspect the pipe joint to assure the coupling keys are fully engaged in the pipe grooves. The bolt pads are to have equal gaps on each side of the coupling.

CAUTION: Use of an impact wrench is not recommended because the torque output can vary significantly due to many variables including air pressure supply, battery strength and operational variations.

CAUTION: Proper torquing of coupling bolts is required to obtain specified performance. Over torquing the bolts may result in damage to the bolt and/or casting which could result in pipe joint separation. Under torquing the bolts may result in lower pressure retention capabilities, lower bend load capabilities, joint leakage and pipe joint separation. Pipe joint separation may result in significant property damage and serious injury. See page 202 for bolt torque information.

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FIG. 7000

STANDARD COUPLING

1 Check & lubricate gasket— Check gasket to be sure it is compatible for the intended service. Apply a thin coating of Gruvlok lubricant to outside and sealing lips of the gasket. Be careful that foreign particles do not adhere to lubricated surfaces.

2 Gasket Installation— Slip the gasket over the pipe end, making sure the gasket lip does not overhang the pipe end.

3 Alignment— After aligning the two pipe ends together, pull the gasket into position, centering it between the grooves on each pipe. Gasket should not extend into the groove on either pipe.

NOTE: VdS - Roll Grooving Approval Specifications, see the Technical Data/ Install Instructions section on Anvil's web site - www.anvilintl.com

CAUTION: Use of an impact wrench is not recommended because the torque output can vary significantly due to many variables including air pressure supply, battery strength and operational variations.

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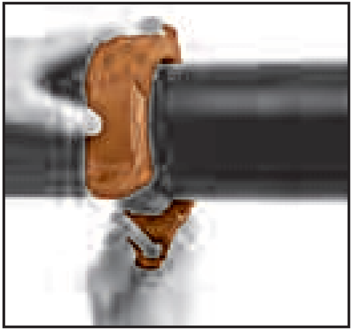
FIG. 7000, CONT'D.

STANDARD COUPLING



4 Housings— With one nut unthreaded to the end of the bolt, unthread the other nut completely and swing the coupling housing halves over the gasket, making sure the housing keys engage the grooves. Insert the bolt and turn the nuts finger tight.

5 Tighten Nuts— Tighten the nuts alternately and equally to the specified bolt torque. The housing bolt pads must make metal-to-metal contact.

CAUTION: Uneven tightening may cause the gasket to pinch.

6 Assembly is completed— Visually inspect the pipe joint to assure the coupling keys are fully engaged in the pipe grooves and the bolt pads are in firm even metal-to-metal contact on both sides of the coupling.

CAUTION: Proper torquing of coupling bolts is required to obtain specified performance. Over torquing the bolts may result in damage to the bolt and/or casting which could result in pipe joint separation. Under torquing the bolts may result in lower pressure retention capabilities, lower bend load capabilities, joint leakage and pipe joint separation. Pipe joint separation may result in significant property damage and serious injury. See page 202 for bolt torque information.

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FIG. 7400

RIGIDLITE® COUPLING

1 Check & lubricate gasket— Check the gasket to be sure it is compatible for the intended service. Apply a thin coating of Gruvlok Xtreme Lubricant to the entire surface, both internal and external, of the gasket. Be careful that foreign particles do not adhere to lubricated surfaces.

2 Gasket Installation— Slip the gasket over the one tube, making sure the gasket lip does not overhang the tube end.

3 Alignment— After aligning the two tube ends together, pull the gasket into position, centering it between the grooves on each tube. The gasket should not extend into the groove on either tube.

NOTE: VdS - Roll Grooving Approval Specifications, see the Technical Data/ Install Instructions section on Anvil's web site - www.anvilintl.com

CAUTION: Use of an impact wrench is not recommended because the torque output can vary significantly due to many variables including air pressure supply, battery strength and operational variations.

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FIG. 7400, CONT'D.

RIGIDLITE® COUPLING

4 Housings— Remove one nut and bolt and loosen the other nut. Place one housing over the gasket, making sure the housing keys fit into the tube grooves. Swing the other housing over the gasket and into the grooves on both tubes, making sure the tongue and recess of each housing is properly mated. Re-insert the bolt and run-up both nuts finger tight.

5 Tighten Nuts— Securely tighten nuts alternately and equally to the specified bolt torque, keeping the gaps at the bolt pads evenly spaced.

CAUTION: Uneven tightening may cause the gasket to pinch. Gasket should not be visible between segments after bolts are tightened.

6 Assembly is completed— Visually inspect the pipe joint to assure the coupling keys are fully engaged in the pipe grooves. The bolt pads are to have equal gaps on each side of the coupling.

CAUTION: Proper torquing of coupling bolts is required to obtain specified performance. Over torquing the bolts may result in damage to the bolt and/or casting which could result in pipe joint separation. Under torquing the bolts may result in lower pressure retention capabilities, lower bend load capabilities, joint leakage and pipe joint separation. Pipe joint separation may result in significant property damage and serious injury. See page 202 for bolt torque information.

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FIG. 7003

HINGELOK™ COUPLING

1 Check & lubricate gasket— Check gasket to be sure it is compatible for the intended service. Apply a thin coating of Gruvlok lubricant to outside and sealing lips of the gasket. Be careful that foreign particles do not adhere to lubricated surfaces.

2 Gasket Installation— Slip the gasket over the pipe end making sure the gasket lip does not overhang the pipe end.

3 Alignment— After aligning the two pipe ends, pull the gasket into position centering it between the grooves on each pipe. Gasket should not extend into the groove on either pipe.

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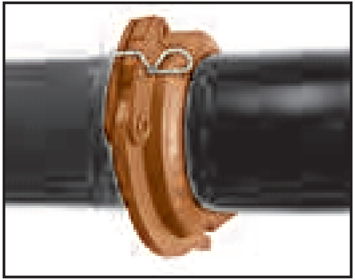
Fig. 7003, cont'd.

Hingelok™ Coupling

4 Housings— Put one half of the open coupling over the gasket as the coupling keys fit firmly into the grooves on each pipe end. Swing the other half of the coupling into position around the gasket and into the grooves.

5 Lock coupling— Fit the nose of the locking handle in the notch of the opposite housing. Press firmly down on the handle until it makes contact with the coupling housing. Insert locking pin into handle linkage to secure handle in closed position. (See Caution.)



6 Assembly is completed— Visually inspect the pipe joint to assure the coupling keys are fully engaged in the pipe grooves and the bolt pads are in firm even metal-to-metal contact on both sides of the coupling.

CAUTION:

1) Hammering or banging on the handle or coupling housing could cause serious damage to the locking device and coupling assembly. The result may be an unsuitable pipe joint and unusable coupling assembly.
2) Care needs to be taken so that fingers do not get caught or pinched when handle is placed in locked position as a result of cam action of handle assembly.
3) When re-using coupling and gasket, always inspect gasket for damage and hinge/handle assembly for looseneness, distortion or any other damage.

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FIG. 7010

REDUCING COUPLING

1 Check & lubricate gasket— Check gasket to be sure it is compatible for the intended service. Apply a thin coating of Gruvlok lubricant to outside and sealing lips of the gasket. Be careful that foreign particles do not adhere to lubricated surfaces.

2 Gasket Installation— Place the smaller opening of the gasket over the smaller pipe. Angle the gasket over the pipe end and pull the gasket lip open around the circumference of the pipe. The center leg of the gasket should make flush contact with the pipe end and will prevent telescoping of the smaller pipe inside the larger.

3 Alignment— Align the adjoining pipe center lines, and insert the larger pipe end into the gasket. Angle the pipe end slightly to the face of the gasket and tilt the pipe into the gasket and tilt the pipe into the gasket to ease assembly.

NOTE: VdS - Roll Grooving Approval Specifications, see the Technical Data/ Install Instructions section on Anvil's web site - www.anvilintl.com

CAUTION: Use of an impact wrench is not recommended because the torque output can vary significantly due to many variables including air pressure supply, battery strength and operational variations.

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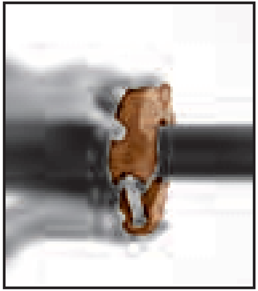
FIG. 7010, CONT'D.

REDUCING COUPLING



4 Housings— Place the coupling housing halves over the gasket making sure the housing keys engage the grooves. Insert bolts and turn nuts finger tight.

5 Tighten Nuts— Tighten the nuts alternately and equally to the specified bolt torque. The housing bolt pads must make metal-to-metal contact.

CAUTION: Uneven tightening may cause the gasket to pinch.

6 Assembly Complete— Visually inspect the pipe joint to assure the coupling keys are fully engaged in the pipe grooves and the bolt pads are in firm even metal-to-metal contact on both sides of the coupling.

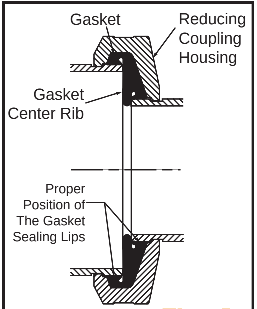


Fig. A

NOTE: Fig. A illustrates the correct position of the Fig. 7010 Reducing Coupling gasket and housing properly assembled onto adjacent pipe ends.

CAUTION: In vertical installations the pipes must be supported to prevent telescoping during installation.

CAUTION: Proper torquing of coupling bolts is required to obtain specified performance. Over torquing the bolts may result in damage to the bolt and/or casting which could result in pipe joint separation. Under torquing the bolts may result in lower pressure retention capabilities, lower bend load capabilities, joint leakage and pipe joint separation. Pipe joint separation may result in significant property damage and serious injury. See page 202 for bolt torque information.

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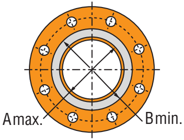
FIG. 7012

GRUVLOK FLANGE (2"–12")

APPLICATIONS WHICH REQUIRE A GRUVLOK® FLANGE ADAPTER INSERT:

1. When mating to a wafer valve (lug valve), if the valve is rubber faced in the area designated by the sealing surface dimensions (A Max. to B Min.), place the Gruvlok Flange Adapter Insert between the valve and the Gruvlok Flange.
2. When mating to a rubber-faced metal flange, the Gruvlok Flange Adapter Insert is placed between the Gruvlok Flange and the rubber-faced flange.
3. When mating to a serrated flange surface, a standard full-faced flange gasket is installed against the serrated flange face, and the Gruvlok Flange Adapter Insert is placed between the Gruvlok Flange and the standard flange gasket.
4. When mating to valves or other component equipment where the flange face has an insert, use procedure described in note 3.

Check pipe end for proper grooved dimensions and to assure that the pipe end is free of indentations and projections that would prevent proper sealing of the Gruvlok flange gasket.

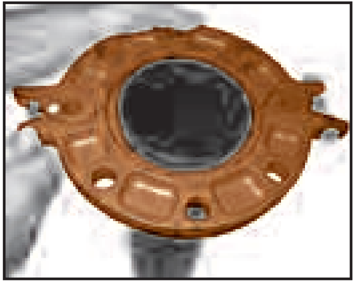


1 On the side without the hinge pin, loosen the latch bolt nut to the end of the bolt thread. (It is not necessary to remove the nut from the latch bolt.) Swing the latch bolt out of the slot. Open the Gruvlok Flange and place around the grooved pipe end with the key section fitting into the groove. The flange gasket cavity must face the pipe end.

NOTE: VdS - Roll Grooving Approval Specifications, see the Technical Data/ Install Instructions section on Anvil's web site - www.anvilintl.com

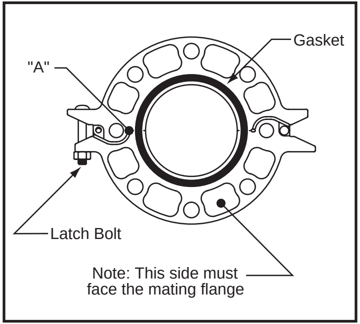
FIG. 7012, CONT'D.

GRUVLOK FLANGE (2"–12")



2 Place the latch bolt back into the slotted hole. Tighten the nut until there is a $^{1}/16$" gap between the flange halves at location "A". (See Figure below)

3 Check the gasket to assure that it is properly suited for the intended service. Lubricate the entire exterior surface of the gasket, including the sealing lips, using the proper Gruvlok lubricant.



WARNING The Gruvlok Flange gasket must be inserted so that the sealing lips face toward the pipe end and the mating flange. The lip of the gasket, sealing on the pipe, should not extend beyond the pipe end. The pipe should extend out beyond the end of the sealing lip by approximately $^{1}/_{8}$" on the 2"-6" sizes and $^{3}/_{16}$" on the 8"-12" sizes.

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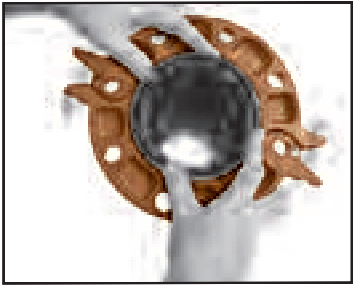
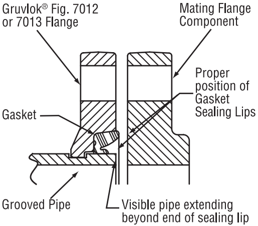
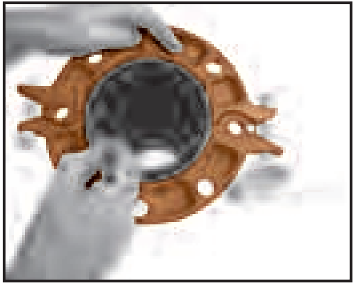
Fig. 7012, cont'd.

Gruvlok Flange (2"–12")

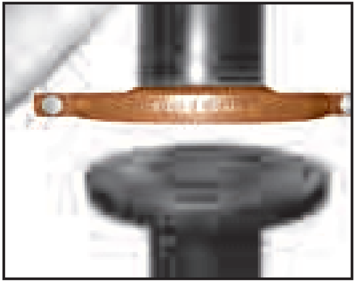


4 Stretch the Gruvlok gasket around the pipe end and then press the gasket into the cavity between the pipe O.D. and the flange. The gasket must be properly positioned as shown in the figure below.





5 With the gasket in place apply lubricant to the exposed gasket tip, which will seal on the mating flange. **Tighten the nuts on the latch bolts alternately to the specified latch bolt torque. The flange housings must be in firm metal-to-metal contact.**



6 Verify that the mating flange face is hard, flat and smooth, free of indentations, which would prevent proper sealing of the Gruvlok Flange gasket. Assure the gasket is still in the proper position and align Gruvlok Flange bolt holes with the mating flange, pump, tank, etc., bolt holes.

⚠ WARNING It is important to line up the bolt holes before bringing the two flanges together. Sliding the flanges into place will dislodge the gasket and cause leakage to occur. When using a flange insert, it is important that the insert is properly aligned with the gasket prior to tightening the bolts.

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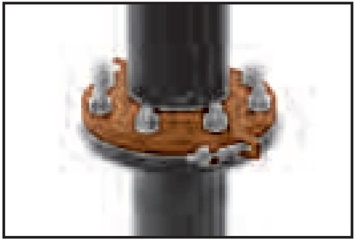
FIG. 7012, CONT'D.

GRUVLOK FLANGE (2"–12")



7 Insert a flange bolt or stud with material properties of SAE J429 Grade 5 or higher through the bolt holes and thread a nut on hand tight. Continue this procedure until all bolt holes have been fitted. Tighten the nuts alternately and evenly so the flange faces remain parallel. All the bolts or studs must be torqued to the mating flange bolts specified torque. The flange faces should have metal-to-metal contact.

CAUTION: Use of an impact wrench is not recommended because the torque output can vary significantly due to many variables including air pressure supply, battery strength and operational variations.

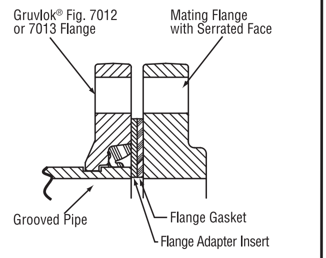


Figure C1

NOTE: The Gruvlok Fig. 7012 Flange requires the use of an Flange Adapter Insert when used against rubber surfaces (Figure C1), serrated flange surfaces or mating flanges with inserts (Figure C2). The Flange Adapter Insert will be exposed to the fluids in the system. Ensure that the Insert is compatible with the fluids in the systems and with adjacent piping components.

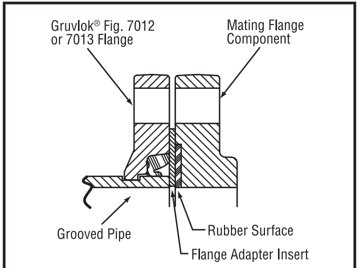


Figure C2

⚠ WARNING

Do not use a steel Flange Adapter Insert in copper systems or in systems where galvanic corrosion is possible.

CAUTION: Proper torquing of flange bolts is required to obtain specified performance. Over torquing the bolts may result in damage to the bolt and/or casting which could result in pipe joint separation. Under torquing the bolts may result in lower pressure retention capabilities, lower bend load capabilities, joint leakage and pipe joint separation. Pipe joint separation may result in significant property damage and serious injury. See page 202 for bolt torque information.

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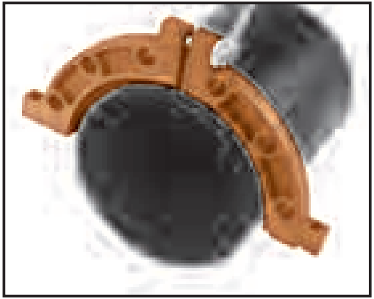
FIG. 7012

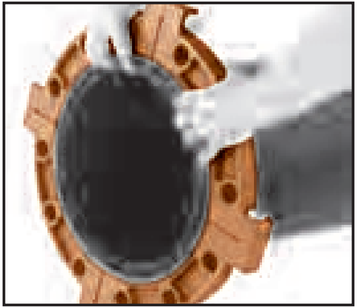
GRUVLOK FLANGE (14"–24")

Gruvlok® Flanges of 14" size and larger are cast in four segments to ease handling during assembly.



1 Place each Gruvlok Flange segment around the grooved pipe with the key section fitting into the groove and the flange gasket cavity facing the pipe end. Loosely assemble the segments using the four segment-bolts-and-nuts. Alternately and equally tighten the latch bolts and nuts to the specified latch bolt torque bring the four flange segments into full, firm metal-to-metal contact.

NOTE: An alternative method of assembly is to loosely preassemble two segments into two equal halves of the flange leaving a small gap (approximately 1/8") between the two segments of each flange-half. Place the flange halves around the pipe and complete the assembly as described in Step 1, above.



2 Check the gasket grade to verify that it is properly suited for the intended service. Lubricate the entire surface of the gasket and the flange cavity using the appropriate Gruvlok Lubricant. The gasket may be shipped with the sealing lips facing outward. If so, it will be necessary to rotate the gasket so the narrow gasket lip (marked, "This face towards mating flange" on the 16"-24" sizes) is facing out as shown in figure Step 3. Place the Gruvlok Flange Gasket around the pipe end by pressing the gasket into the cavity between the pipe O.D. and flange recess. Move around the gasket in both directions until the gasket is fully seated in the flange gasket cavity.

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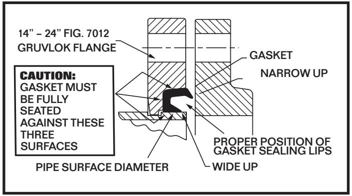
FIG. 7012, CONT'D.

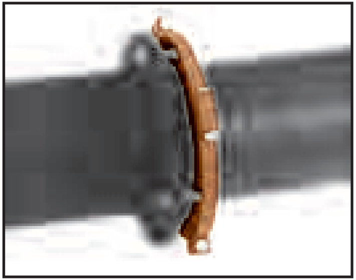
GRUVLOK FLANGE (14"–24")



3 The correct position and relationship of the components of the Gruvlok Flange assembly is shown in the Figure above. The wide gasket lip must seal on the pipe surface diameter and the narrow gasket lip must face the mating flange. Be careful that foreign particles do not adhere to lubricated surfaces.

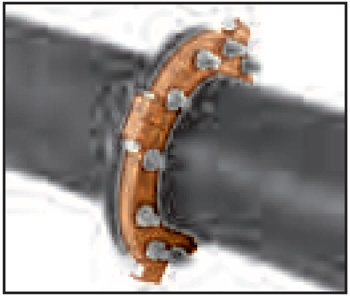
NOTE: Design of the Gruvlok Flange provides sealing only with the special Gruvlok Flange gasket. Only Gruvlok Flange gaskets may be used with Fig. 7012 flanges.

CAUTION: Use of an impact wrench is not recommended because the torque output can vary significantly due to many variables including air pressure supply, battery strength and operational variations.



4 Align the Gruvlok Flange bolt holes with mating flange bolt holes. Insert a flange bolt or stud with material properties of SAE J429 Grade 5 or higher through the bolt holes and thread a nut on hand tight. Insert the next bolt or stub opposite the first and again thread the nut on hand tight. Continue this procedure until all bolt holes have been fitted. Insertion of the flange bolts prior to contact of the flanges will help in the alignment of the flanges. Pull the two flanges into contact using care to assure that the gasket remains fully seated within the gasket cavity during assembly.

NOTE: Take care to assure that the gasket lip is not bent backwards and pinched between the two flanges.



5 Tighten the nuts evenly to the specified mating face bolt torque so that the flange faces remain parallel and make firm even contact around the entire flange.

CAUTION: Proper torquing of flange bolts is required to obtain specified performance. Over torquing the bolts may result in damage to the bolt and/or casting which could result in pipe joint separation. Under torquing the bolts may result in lower pressure retention capabilities, lower bend load capabilities, joint leakage and pipe joint separation. Pipe joint separation may result in significant property damage and serious injury. See page 202 for bolt torque information.

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FIGURE 7042

OUTLET COUPLING

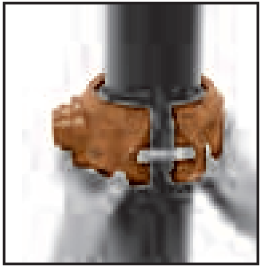
These instructions are based on pipe grooved in accordance with Gruvlok® grooving specifications. Check pipe ends for proper groove dimensions and to assure that the pipe ends are free of indentations and projections which would prevent proper sealing.

ALWAYS USE A GRUVLOK LUBRICANT FOR PROPER COUPLING ASSEMBLY. Thorough lubrication of the gasket is essential to prevent pinching and possible damage to the gasket.

1 Check & lubricate gasket—Check gasket to be sure it is compatible for the intended service. Apply a thin coating of Gruvlok lubricant to outside and sealing lips of the gasket. Be careful that foreign particles do not adhere to lubricated surfaces.

2 Gasket Installation—Slip the gasket over one pipe end making sure the pipe abuts the gasket's center ribs.

3 Alignment—Align the pipe ends and pull the pipe into the gasket until the center ribs are in contact with the pipe ends. The gasket should not extend into the groove on either pipe. Rotate the gasket to align the outlet of the gasket to the same direction as the branch outlet.



4 Housing Assembly—With one nut and bolt removed and the other loosened, place one side of the housing over the gasket. Make sure the ribs on the outside of the gasket align with the recesses in the housing and the keys in the housing are in the grooves on both pipes. Swing the other housing over the gasket and into the grooves on both sides of the pipe. Make sure the recess in the outlet of the housing is properly aligned with gasket outlet.

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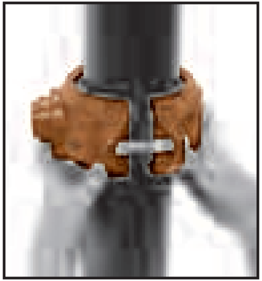
FIGURE 7042, CONT'D

OUTLET COUPLING



5 Tighten Nuts—Re-insert the bolt and run-up both nuts finger tight. Securely tighten the nuts alternately and equally until they are completely tightened and there is no gap between the bolt pads. Continue tightening the nuts alternately and equally until the specified bolt torque is reached.

CAUTION: Make sure the ribs on the exterior of the gasket are enclosed in the housing recesses.

6 Assembly is complete

CAUTION: Use of an impact wrench is not recommended because the torque output can vary significantly due to many variables including air pressure supply, battery strength and operational variations.

FIG. 7042 – SPECIFIED BOLT TORQUE

Specified bolt torque is for the oval neck track bolts used on Gruvlok® couplings and flanges. The nuts must be tightened alternately and evenly until fully tightened.

CAUTION: Proper torquing of coupling bolts is required to obtain specified performance. Over torquing the bolts may result in damage to the bolt and/or casting which could result in pipe joint separation. Under torquing the bolts may result in lower pressure retention capabilities, lower bend load capabilities, joint leakage and pipe joint separation. Pipe joint separation may result in significant property damage and serious injury. See page 202 for bolt torque information.

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FIGURE 7045 & 7046

CLAMP-T® BRANCH OUTLETS

ALWAYS USE A GRUVLOK LUBRICANT FOR PROPER COUPLING ASSEMBLY.
Thorough lubrication of the gasket is essential to assist the gasket into the proper sealing position.

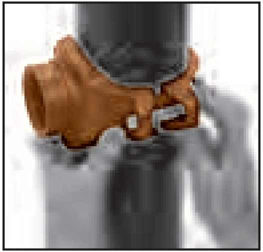
1 Pipe Preparation—Cut the appropriate size hole in the pipe and remove any burrs. Be sure to remove the slug from inside the pipe. Clean the gasket sealing surface within 5/8" of the hole and visually inspect the sealing surface for defects that may prevent proper sealing of the gasket.

PIPE PREPARATION

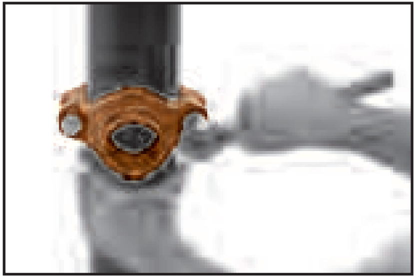
Branch Size (Inches)	Hole Saw Size (Inches) (+1/8, -0)
½, ¾, 1	1½
1¼, 1½	2
2	2½
2½	2¾
3	3½
4	4½

2 Check & lubricate gasket—Check the gasket to be sure it is compatible for the intended service. Apply a thin layer of Gruvlok lubricant to the back surface of the gasket. Be careful that foreign particles do not adhere to the lubricated surfaces. Insert the gasket back into the outlet housing making sure the tabs in the gasket line up with the tab recesses in the housing.

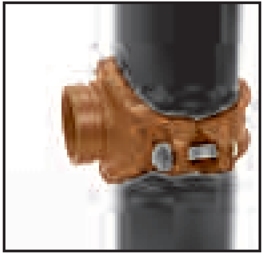
3 Gasket Installation—Lubricate the exposed surface of the gasket. Align the outlet housing over the pipe hole making sure that the locating collar is in the pipe hole.



4 Alignment—Align the strap around the pipe, insert the bolts and tighten the nuts finger tight. Some sizes use a U-bolt design.



5 Tighten nuts—Alternately and evenly tighten the nuts to the specified bolt torque.



6 Assembly is complete

FIGS. 7045 & 7046—SPECIFIED BOLT TORQUE

Specified bolt torque is for the oval neck track bolts and U-bolts used on the Gruvlok® Clamp-T's. The nuts must be tightened alternately and evenly until fully tightened.

CAUTION: Use of an impact wrench is not recommended because the torque output can vary significantly due to many variables including air pressure supply, battery strength and operational variations.

CAUTION: Proper torquing of coupling bolts is required to obtain specified performance. Over torquing the bolts may result in damage to the bolt and/or casting which could result in pipe joint separation. Under torquing the bolts may result in lower pressure retention capabilities, lower bend load capabilities, joint leakage and pipe joint separation. Pipe joint separation may result in significant property damage and serious injury. See page 202 for bolt torque information.

FIGURE 7044

BRANCH OUTLET

1 Pipe Preparation and Gasket Lubrication— Cut a $^{13}/_{16}$" hole in the pipe and remove any burrs. Be sure to remove the slug from inside the pipe. Clean the gasket sealing surface within $^{5}/_{8}$" of the hole and visually inspect the sealing surface for defects that may prevent proper sealing of the gasket. Remove the gasket from the housing and apply a thin layer of Gruvlok® lubricant to the back surface of the gasket. Be careful that foreign particles do not adhere to the lubricated surfaces. Insert the gasket back into the outlet housing making sure the tabs in the gasket line up with the tab recesses in the housing.

2 Gasket Installation— Lubricate the exposed surface of the gasket with Gruvlok® lubricant.

3 Alignment— Align the outlet housing over the pipe hole making sure that the locating collar is in the pipe hole.

FIGURE 7044, CONT'D.

BRANCH OUTLET

4 Housing Assembly— Attach the U-bolt from the other side and fasten the nuts finger tight.

5 Tighten Nuts — Making sure the fitting is properly located over the pipe hole, tighten the nuts alternately and evenly to the specifed torque of 27 to 33 Lbs.-Ft. (37 to 45 N-M).

6 Assembly is Complete — Visually inspect the assembly, the gasket will extrude out from under the housing.

ALWAYS USE A GRUVLOK LUBRICANT FOR PROPER BRANCH OUTLET ASSEMBLY. Thorough lubrication of the gasket is essential to to assist the gasket into the proper sealing position.

CAUTION: Use of an impact wrench is not recommended because the torque output can vary significantly due to many variables including air pressure supply, battery strength and operational variations.

CAUTION: Proper torquing of coupling bolts is required to obtain specified performance. Over torquing the bolts may result in damage to the bolt and/or casting which could result in pipe joint separation. Under torquing the bolts may result in lower pressure retention capabilities, lower bend load capabilities, joint leakage and pipe joint separation. Pipe joint separation may result in significant property damage and serious injury. See page 202 for bolt torque information.

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FIGURE 7005

ROUGHNECK® COUPLING

1 Make certain the pipe ends are free of indentations, projections, weld splatter, or other imperfections which could prevent proper sealing of the gasket.

Pipe Size	Distance from pipe end for mark	Bolt Torque	
		Min.	Max.
In.	*In.*	*(Ft-lbs.)*	*(Ft-lbs.)*
2-2½	1	150	190
3-4	1	200	250
5-8	1¼	250	300
10	1¾	500	600
12	1¾	550	700
14-16	1¾	550	700

2 Mark each pipe at a distance from the pipe end according to the pipe run size. See the chart.

3 Check the gasket color code to verify that the gasket grade is properly suited for the intended service. Apply a thin coating of Gruvlok Lubricant to the gasket lips and outside of the gasket and slip the gasket over one pipe. Make sure the gasket does not overhang the pipe end.

4 Align the second pipe and while holding the pipe in the butted position slide the gasket back over the second pipe end. The gasket should be equally spaced between the lines scribed on each pipe.

CAUTION: Use of an impact wrench is not recommended because the torque output can vary significantly due to many variables including air pressure supply, battery strength and operational variations.

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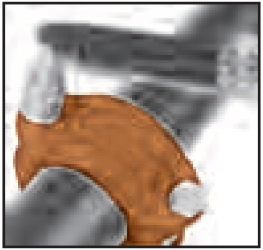
FIGURE 7005

ROUGHNECK® COUPLING

5 Place each half of the Roughneck coupling over the gasket, making sure that the tongue on one housing half is aligned with the recess on the other housing half.



6 Tighten the nuts alternately and uniformly until the required bolt torque is reached. See chart on previous page for bolt torque.

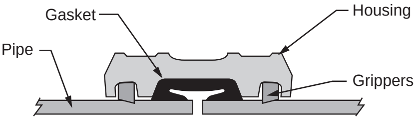
7 Reinstallation after a disassembly will require that the threads on the bolt and in the nut are clean and lubricated with a light oil.

NOTE: Torque requirements must be met and housing halves must be assembled with equal gaps between bolt pads.

Working pressure and end load are based on a properly assembled Roughneck coupling with bolts fully torqued to the above specifications, on plain-end or beveled standard wall steel pipe and Gruvlok Plain-End Fittings. Roughneck Couplings are designed to be used on plain-end pipe and Gruvlok Plain-End Fittings only. For externally coated pipe applications, contact Gruvlok.

Not recommended for use on steel pipe with a hardness greater than 150 Brinell, plastic, HDPE, cast iron or other brittle pipe.

*Bolt torque ratings shown must be applied at installation.



CAUTION: Proper torquing of coupling bolts is required to obtain specified performance. Over torquing the bolts may result in damage to the bolt and/or casting which could result in pipe joint separation. Under torquing the bolts may result in lower pressure retention capabilities, lower bend load capabilities, joint leakage and pipe joint separation. Pipe joint separation may result in significant property damage and serious injury. See page 202 for bolt torque information.

FIGURE 7305

HDPE COUPLING

1 Make certain the pipe ends are free of indentations, projections or other imperfections, which could prevent proper sealing of the gasket. Mark each pipe at a distance from the end of the pipe according to the pipe size:

Size Inches	Distance to Mark
2-4" (51 - 102 mm)	1" (25.4 mm)
5-8" (127 - 203 mm)	1¼" (31.8 mm)
10&12" (254 - 305 mm)	1¾" (44.5 mm)

NOTE: Make certain the HDPE pipe end is square cut to ⅛" maximum for the 2" to 4" and 5/32" maximum for the 6" and larger sizes.

2 Check to assure the gasket material is accept able for the intended service. The Gasket color code is green for EPDM and orange for Nitrile (Buna-N).

CAUTION: Use only Gruvlok Xtreme™ Lubricant with HDPE pipe products. Gruvlok Xtreme™ Lubricant contains silicone. If silicone is unacceptable for the application contact Gruvlok for the lubrication recommendation. Apply a thin coating of Gruvlok Xtreme™ Lubricant to the gasket lip and outside surface of the gasket.

3 Slip the gasket over one of the pipe ends. Make sure the gasket does not overhang the pipe end. Align the second pipe and while keeping the pipes in the butted position slide the gasket back over the second pipe end. The gasket must be positioned centrally between the lines on the pipe ends.

⚠ WARNING

- The gasket temperature rating may exceed the manufacturer's temperature rating for the HDPE pipe. Consult the HDPE pipe manufacturer for the temperature and pressure ratings.

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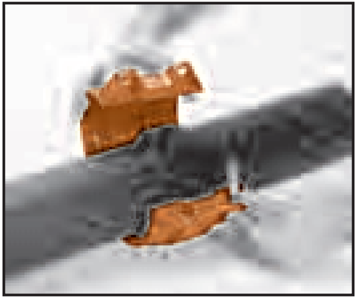
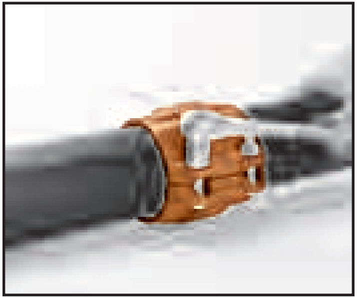
FIGURE 7305, CONT'D

HDPE COUPLING



4 Place the Figure 7305 housing casting over the gasket, making sure the tongue on one casting is aligned with the recess of the other casting.

CAUTION: Use of an impact wrench is not recommended because the torque output can vary significantly due to many variables including air pressure supply, battery strength and operational variations.



5 Insert the bolts and secure the nuts alternately and uniformly until the bolt pads are in contact. Torque all bolts to the required bolt torque levels. Refer to the Specified Bolt Torque Table. There is no gap between the bolt pads and the bolt torque should be within the range given when the coupling is properly assembled. Alternate and even tightening of the bolts will significantly reduce the torque needed to close the gap at the pipe joint.

SPECIFIED BOLT TORQUE

Specified bolt torque is for the oval neck track bolts used on Gruvlok® couplings. The nuts must be tightened alternately and evenly until fully tightened.

CAUTION: Proper torquing of coupling bolts is required to obtain specified performance. Over torquing the bolts may result in damage to the bolt and/or casting which could result in pipe joint separation. Under torquing the bolts may result in lower pressure retention capabilities, lower bend load capabilities, joint leakage and pipe joint separation. Pipe joint separation may result in significant property damage and serious injury. See page 202 for bolt torque information.

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FIGURE 7307

HDPE TRANSITION COUPLING

1 Make certain the HDPE pipe end is square cut to 1/8" maximum for the 2" to 4" and 5/32" maximum for the 6" and larger sizes. The steel pipe must be grooved in accordance with Gruvlok® Grooving Specifications for Steel Pipe. The pipe ends must be free of scratches, indentations, projections or other imperfections, which could prevent proper sealing of the gasket.

2 Check to assure the gasket material is acceptable for the intended service. The Gasket color code is green for EPDM and orange for Nitrile (Buna-N).

CAUTION: Use only Gruvlok Xtreme™ Lubricant. Gruvlok Xtreme™ Lubricant contains silicone. If silicone is unacceptable for the application contact Gruvlok for the lubrication recommendation. Apply a thin coating of Gruvlok Xtreme™ Lubricant to the gasket lips and outside surface of the gasket.

3 Slip the gasket over one of the pipe ends. Make sure the gasket does not overhang the pipe end. Align the second pipe and while holding it in the butted position, slide the gasket back over the second pipe end. The gasket must be positioned on the gasket seat surface of the grooved steel pipe. Make sure the gasket does not overhang into the pipe groove.

⚠ WARNING

- The gasket temperature rating may exceed the manufacturer's temperature rating for the HDPE pipe. Consult the HDPE pipe manufacturer for the temperature and pressure ratings.

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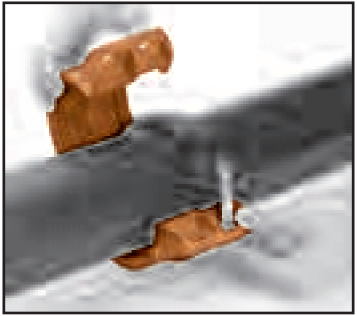
Figure 7307, cont'd

HDPE Transition Coupling



4 Place each half of the coupling housing over the gasket, making sure the housing grooved end is directed into the pipe groove.

CAUTION: Use of an impact wrench is not recommended because the torque output can vary significantly due to many variables including air pressure supply, battery strength and operational variations.

5 Insert the bolts and secure the nuts alternately and uniformly until the bolt pads are in contact. Torque all bolts to the required bolt torque levels. Refer to the Specified Bolt Torque Table. There is no gap between the bolt pads and the bolt torque should be within the range given when the coupling is properly assembled. Alternate and even tightening of the bolts will significantly reduce the torque needed to close the gap at the pipe joint.

SPECIFIED BOLT TORQUE

Specified bolt torque is for the oval neck track bolts used on Gruvlok® couplings. The nuts must be tightened alternately and evenly until fully tightened.

CAUTION: Proper torquing of coupling bolts is required to obtain specified performance. Over torquing the bolts may result in damage to the bolt and/or casting which could result in pipe joint separation. Under torquing the bolts may result in lower pressure retention capabilities, lower bend load capabilities, joint leakage and pipe joint separation. Pipe joint separation may result in significant property damage and serious injury. See page 202 for bolt torque information.

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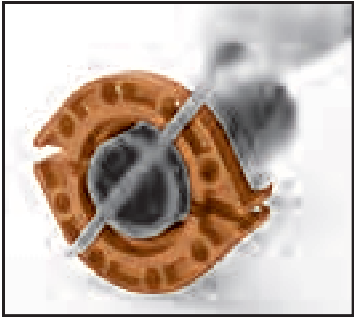
FIGURE 7312

HDPE FLANGE ADAPTER

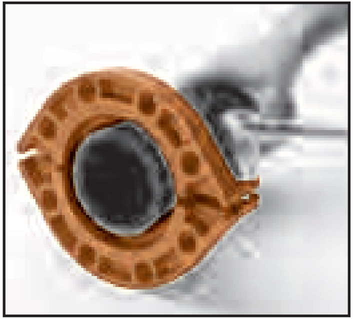
1 Make certain the pipe end is square cut to 1⁄8" maximum for the 4" and 5⁄32" maximum for the 6" and 8" sizes. Inspect the surface of the mating flange to be assured the surface is free of dimensions of the mating flange to be assured that the scratches, indentations, projections, or other imperfections, which could prevent proper sealing of the gasket.

2 Check to assure the gasket material is acceptable for the intended service. The gasket color code is green for EPDM and orange for Nitrile (Buna-N).

CAUTION: Use only Gruvlok Xtreme™ Lubricant with HDPE pipe Products. Gruvlok Xtreme™ Lubricant contains silicone. If Silicone is unacceptable for the application contact Gruvlok for the lubrication recommendation. Apply a thin coating of Gruvlok Xtreme™ Lubricant to the gasket lips and outside surface of the gasket.



3 Place the housing over the end of the pipe and using a straight edge, align the face and the flange face with the end of the pipe. Do not let the pipe extend beyond the flange face.



4 Tighten the housing nut until the housing bolt pads make firm metal to metal contact. Torque all bolts to the required latch bolt torque levels. Refer to the Specified Latch Bolt Torque Table.

⚠ WARNING

- The gasket temperature rating may exceed the manufacturer's temperature rating for the HDPE pipe. Consult the HDPE pipe manufacturer for the temperature and pressure ratings.

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FIGURE 7312, CONT'D

HDPE FLANGE ADAPTER

5 Position the Gruvlok Flange gasket around the pipe end and press the gasket into the flange gasket pocket. Be sure the flange sealing lips are facing out.

6 Align the Gruvlok Flange bolt holes with the mating flange bolt holes. Insert a standard bolt or stud through one bolt hole and thread the nut on hand tight. Insert the next bolt or stud opposite the first and thread the nut on hand tight. Continue this procedure until all holes have been fitted. Note: Take care to assure the gasket lip is not bent backwards and pinched between the two flanges.

7 Tighten the flange face nuts alternately and evenly so that the flange faces remain parallel and make firm contact around the entire flange. Torque all bolts to the required mating flange joint torque levels. Refer to the Specified Mating Flange Bolt Torque Table.

CAUTION: Use of an impact wrench is not recommended because the torque output can vary significantly due to many variables including air pressure supply, battery strength and operational variations.

SPECIFIED BOLT TORQUE FOR LATCH & MATING FLANGE BOLTS

Specified bolt torque is for the latch and mating flange bolts used on Gruvlok® flanges. The nuts must be tightened alternately and evenly until fully tightened.

CAUTION: Proper torquing of coupling bolts is required to obtain specified performance. Over torquing the bolts may result in damage to the bolt and/or casting which could result in pipe joint separation. Under torquing the bolts may result in lower pressure retention capabilities, lower bend load capabilities, joint leakage and pipe joint separation. Pipe joint separation may result in significant property damage and serious injury. See page 202 for bolt torque information.

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GRUVLOK SOCK-IT® FITTING

1 Pipe surface shall be cleaned at least 1" from the end of the pipe to remove any coating, indentations, projections, and sharp edges which could affect proper gasket sealing. As a guide for installation, mark the pipe at a distance of 1½" from the end for 1", 1¼", and 1½" size fittings and 1¾" for the 2" & 2½" size fittings.

NOTE: When Allied XL pipe is used it is necessary only to remove sharp edges and burrs at the end of the pipe. No additional cleaning is required.

2 Check all lock bolts to be sure they do not extend into the I.D. of the Sock-It Fittings as this would prevent proper insertion of the pipe.

3 Apply a light coating of GRUVLOK Lubricant to the gaskets located in each end of the Sock-It Fitting. Also apply a light coating of lubricant to the pipe ends to further ease insertion of the pipe into the Sock-It Fitting.

NOTE: Use only Gruvlok Lubricants. Other lubricants may affect gasket performance.

NOTE: Refer to page 274 - 275 for additional technical information.

4 Insert the prepped and lubricated pipe end into the Sock-It Fitting until the pipe end makes contact with the internal pipe stop. A slight twist while pushing fitting and pipe together will ease the required insertion force. The end of the Sock-It Fitting should be within 1/16" from the edge of the marking on the pipe. (See Step 1). Rotate the fitting until the desired position is obtained. Tighten the lock bolt until the bolt head bottoms against the threaded boss. (NOTE: The 2½" Sock-It fitting has 2 locking bolts for each pipe end.)

Install the other prepped and lubricated pipe end into the Sock-It fitting in the same manner.

CAUTION: Do NOT hammer fitting on.

NOTE: Refer to page 274 - 275 for additional technical information.

5 Sock-It Fittings may be removed by loosening the lock bolts. Re-installation may be accomplished as described in Steps 1-4.

WARNING: System pressure must be relieved and vented, and the system drained of fluid prior to loosening the lock bolts to remove or reposition the Sock-It Fitting.

Bolt end must be inspected to assure bolts ability to cut into pipe. Replace bolts in cases where bolt end sharpness has been comprised.

CAUTION: Use of an impact wrench is not recommended because the torque output can vary significantly due to many variables including air pressure supply, battery strength and operational variations.

FIGURE GBV-S & GBV-T

CIRCUIT BALANCING VALVES

1 Clean the system piping of debris (pipe scale, rust, welding slag) and other contaminants. As with any water system it is important to make provisions to keep the system clean. For optimum operation, air entrapment in the fluid must be removed.

2 The operation of the valve is dependent on the fluid characteristics such as specific gravity and viscosity, which vary with the fluid temperature. For installations using fluids other than 100% water, flow rates must be corrected for the changes created by the fluid medium. See www.anvilintl.com for appropriate correction factors, or call your local Anvil representative.

3 To ensure accuracy of measurement Circuit Balancing Valves (GBV's) should be located at least five pipe diameters downstream from any fitting and at least ten pipe diameters downstream from a pump (as illustrated in Fig. 1).

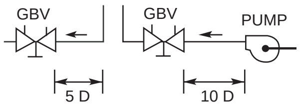


Fig. 1

4 All GBV's are marked with an arrow on the valve body to indicate direction of flow. The arrow must point in the direction of flow for proper operation.

5 GBV's may be installed in horizontal or vertical piping (as illustrated in Fig. 2). Provisions must be made for easy access to the probe metering ports (PMP's), reading scale, and memory stop.

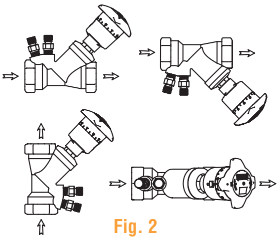


Fig. 2

GBV-S - SWEAT (SOLDER) CONNECTIONS:

6 GBV-S models are supplied with sweat style connections. Caution should be used when sweat style connection valves are installed to prevent overheating the valve.

7 Solder the valve body in line using 95/5 (95% tin, 5% antimony) type solder or equal. Always follow local plumbing codes for installation best practices.

CAUTION: Before soldering, ensure the valve is opened at least one full turn to avoid damage to the sealing O-ring due to overheating. Anvil recommends that the GBV be protected during installation by wrapping a damp rag around the handle / bonnet assembly prior to soldering the valve into the line.

GBV-T - NPT THREADED CONNECTIONS

6 GBV-T models are tapped with NPT threaded connections. All threaded connections should be sealed using an approved pipe sealant per industry standards. Once the GBV installation has been completed and the system has been filled and purged, each valve loop must be adjusted to the correct flow setting. Employ piping best practice when engaging pipe to threaded valves. Overtightening when installing valves may result in fracturing of the valve body at the threads. (Go to Step 8)

WARNING: Anvil does NOT recommend leak testing an HVAC system with air due to safety concerns. Testing HVAC systems with pressurized air can be dangerous due to the high compressibility of air, as compared to water.

OPERATION:

8 Valves are circuit balancing valves that are selected to deliver the correct flow in a piping circuit based on line size and design flow rate.

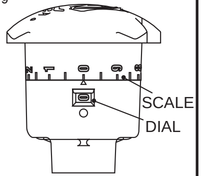
9 To set the system flow, adjust the handwheel position until the differential pressure reading across the venturi corresponds to the required GPM.

10 The valve operates from fully open to closed by a clockwise rotation of the orange handwheel using five 360° turns. Two indicators describe the position of the valve: the handwheel turns dial and the micrometer scale.

- **"Handwheel Turns" Dial:**
  This dial is printed on the outer surface of a gearing mechanism located inside the lower half of the handle assembly (Fig. 6). Each complete 360° revolution of the handwheel is visible through a display window and is scaled 0 - 5 to indicate the valve position in terms of the number of full turns. (Fig. 3)

- **Micrometer Scale:**
  This scale is marked 0 - 9 and is located on the upper half of the handle assembly. Each mark represents $^{1}/_{10}$th of a full, 360° turn of opening when lined up with an arrowhead symbol, located above the handwheel turns display window. (Fig. 3)

Fig. 3: GBV setting of 0.0 indicates that the valve is closed. Both the handwheel turns dial and the micrometer scale indicate a valve position reading of 0.



11 The valve is considered "zeroed" when fully closed hand tight. The "0" on the micrometer scale should be within one half of $^{1}/_{10}$th of a turn of the arrowhead symbol when the valve is closed hand tight.
DO NOT USE A WRENCH ON THESE VALVES – THEY SHOULD BE OPENED AND CLOSED HAND-TIGHT ONLY!

Fig. 4: GBV setting of 2.3 indicates that the valve is partially open (2.3 turns open).

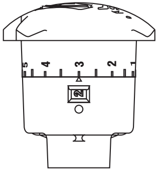


Fig. 5: GBV setting of 5.0 indicates that the valve is fully opened.
In some cases, the valve may open as much as 5.3 turns, due to the depth of the stem threads. This is not a problem with the valve; however, the performance curves for these GBVs are calibrated only to 5.0 turns.

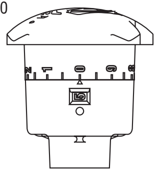
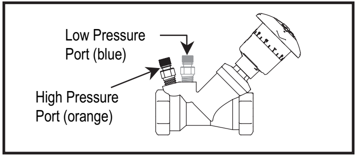


FIGURE GBV-S & GBV-T, CONT'D

CIRCUIT BALANCING VALVES

CAUTION: Hot water leakage can occur from metering ports (P.M.P.'s) during probe insertion and hookup of metering device. Wear protective eyewear and clothing to prevent personal injury when measuring pressure.



12 Connect pressure measuring device to the GBV metering ports as follows:

- Remove protective cap from metering ports ($^1/_4$" NPT connection).
- Insert the meter probe into the metering ports. The hose with orange fitting, up stream; the hose with blue fitting downstream.

CAUTION: When inserting probe, do not bend, as this will cause permanent damage to the probe, adversely affecting the pressure measurement. Do not use any lubrication on the probes when inserting them. If necessary, simply wet the probes with clean water.

The probe should not be left inserted into the fitting for prolonged periods of time, overnight, etc., as leakage of the P.M.P. may occur when the probe is removed.

The locking nut on the probe is designed to hold it in the P.M.P. when taking readings. As sealing is accomplished internally on the probe stem, it is only necessary to tighten the locking nut FINGER-TIGHT. Over-tightening may cause damage to the P.M.P. or locking nut threads.

13 Before taking a measurement reading, set the valve to its fully open position (5.0) or at a preset position. Read the pressure drop across the venturi with a digital meter. Determine flow rate by use of venturi Cv performance curves on page 4 or the Anvil Balancing Slide Rule.

14 The handle of the GBV is not designed to be removable. Do not try to take it off the valve, or it may become damaged. If for any reason, the handle is damaged, replace the entire handle / stem assembly with the appropriate replacement part indicated in the table below.

Table 1

PART NUMBER	SIZE
871158-010	½"
871158-011	¾"
871158-012	1"
871158-013	1¼"
871158-014	1½"
871158-015	2"

MEMORY SETTING:

15 After valve has been properly adjusted and without moving the handwheel, the locking memory stop should be set. The memory stop will allow the valve to be fully closed for isolation and then reopened to the preset flow position.

16 Insert a 2.5 mm (or $^3/_{32}$") Allen key through the hole provided in the valve's handle cap. (Fig. 6)

17 Turn the setscrew in a clockwise direction until it stops. It is not necessary to

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FIGURE GBV-S & GBV-T, CONT'D

CIRCUIT BALANCING VALVES

tighten. The memory has now been set. This establishes the maximum opening position for this particular valve.

18 The valve may now be closed tightly, as needed, for isolating the piping during system maintenance. To return the valve to its preset "balanced" position, simply open the valve by turning the handwheel counterclockwise until the handle stops turning (the valve stem inside the handle has hit the memory setscrew). DO NOT APPLY EXCESSIVE FORCE WHEN REOPENING THE VALVE – OPEN ONLY UNTIL THE VALVE STOPS TURNING UNDER "HAND TIGHT" CONDITIONS. DO NOT USE A WRENCH TO OPEN, CLOSE, OR TIGHTEN VALVES.

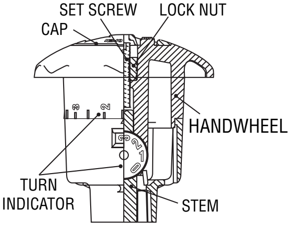

Fig. 6

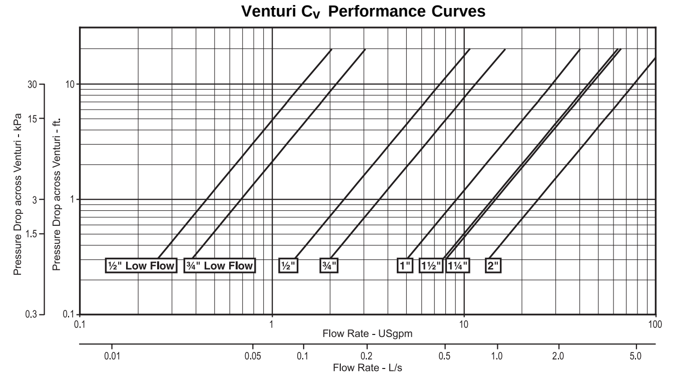

Fig. 7: These curves are for balancing contractors' use when balancing an HVAC system. For pressure drop vs. flow across the entire valve, please refer to Fig. 8.

See next two pages for Fig. 8 for both the GBV-S & GBV-T and a troubleshooting chart

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FIGURE GBV-S & GBV-T, CONT'D

CIRCUIT BALANCING VALVES

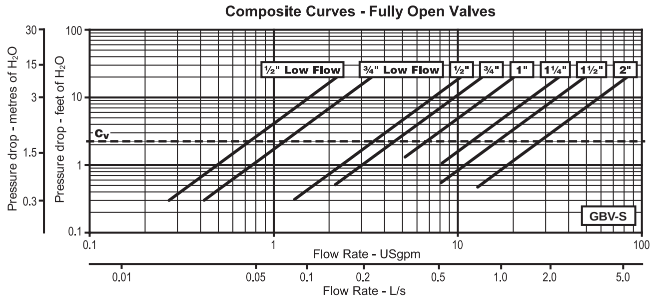

Fig. 8: These curves show the pressure drop across the balancing valves and are for use in valve sizing. For “pressure drop / flow” curves – required for system balancing, please refer to Fig. 7.

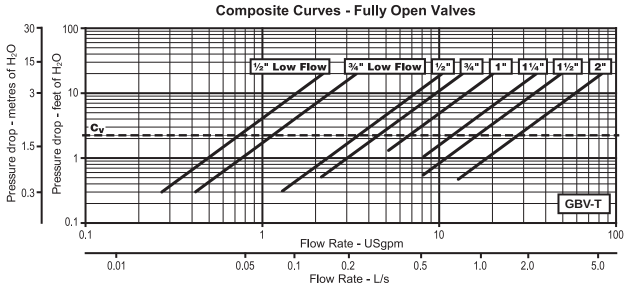

Fig. 8: These curves show the pressure drop across the balancing valves and are for use in valve sizing. For “pressure drop / flow” curves – required for system balancing, please refer to Fig. 7.

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TROUBLESHOOTING:

Symptom	Likely Cause	Solution
1. Valve is leaking:		
• At the bonnet / body joint	Bonnet O Ring has been damaged.	Remove the handle / stem assembly and replace with the appropriate replacement part indicated in Table 1.
• At the pipe connection	If solder joint - the joint has failed, or was not soldered properly.	Re-solder the connection and recheck for leakage.
	If threaded - the connection is not sufficiently tight, or	Tighten and recheck for leakage.
	the valve was over-tightened during installation and the valve body has cracked (fractured).	Remove and reinstall a new valve, being careful not to over-tighten.
2. Valve does not shut off completely when closed (hand tight).	The seat O ring has been deformed due to overheating during soldering.	Remove the handle / stem assembly and replace with the appropriate replacement part indicated in Table 1.

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FIGURE AF21-GG, AF21-GF & AF21-FF

ANVILFLEX^{TM} FLEX CONNECTORS

Installation

1 Avoid torque. Do not twist the hose assembly during installation when aligning the bolt holes in a flange or in making up pipe threads. The utilization of lap joint flanges or pipe unions will minimize this condition.

2 To install a thread end braided metal hose assembly unions must be used. Do not place wrenches on the braided portion or the collar of the braided metal hose assembly. Use care not to torque the braided metal hose assembly while tightening the union. It is recommended that two wrenches be used in making the union connection; one to prevent the hose from twisting and the other to tighten the coupling.

3 Install the braided metal hose assembly with neutral face-to-face dimension as shown on the submittal drawing. Do not install a braided metal hose assembly compressed (bagged braid). The corrugated inner hose contains the fluid, the braid is designed to lake the stress of system pressurization and contain the core.

4 If the braided metal hose assembly must be installed with an initial offset then the maximum allowable movement is reduced by the amount of the initial deflection.

5 Avoid over bending. The repetitive bending of a hose assembly to a radius smaller than the radius specified will result in early hose failure. Always provide sufficient length to prevent over bending and to eliminate strain on the hose assembly. Utilize sound geometric configurations that avoid sharp bends, especially near the end fittings of the assembly.

6 Verify that the movements of the system are within the design parameters of the braided metal hose assembly being installed.

7 Prevent out-of-plane flexing in an installation. Always install the hose assembly so that the flexing takes place in only one plane - - this being the plane in which the bending occurs

8 The maximum system test pressure must not exceed 150% of the maximum rated working pressure as shown

9 Check system pressure and temperature and do not exceed recommended performance limits. Operation beyond design limits will result in premature failure.

10 The corrugated metal hose alloy must be chemically compatible with the media in the piping system. If in doubt as to suitability, refer to a Chemical Resistance Data table or contact your Anvil Rep. for guidance.

11 The flanges on a concentric increasing braided metal hose assembly have the bolt holes straddling the hose centerline. The mating flanges should also straddle the centerline to avoid torque on the braided metal hose assembly.

12 When installing weld end, or sweat end, braided metal hose assemblies, or when welding in the area of a braided metal hose assembly, extreme care is necessary in ensure no weld spatter comes in contact with the braided hose sections.

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13 A piping system, which utilizes braided metal hose to absorb movement, must be properly anchored and/or guided. Always support the piping to prevent excessive weight from compressing the hose and relaxing the braid tension.

14 Use care when handling the braided metal hose assembly during transportation, storage, and installation. The braided hose sections must not be allowed to bend, deflect, sag, or otherwise extend beyond their rated capabilities.

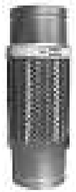
15 The shipping sticks, on flanged units, are to keep the braided metal hose assembly in its neutral end-to-end dimension during shipping and installation. After installation, the shipping sticks should be removed.

Maintenance

1 The braided metal hose assembly should he inspected during routine maintenance to ensure there are no signs of external damage. Inspect for frayed or broken braid wires. Also inspect to ensure there is no damage to the hose. In the event that such damage is found, the braided metal hose assembly should be replaced.

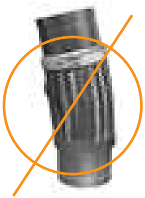
2 During system shutdown braided metal hose assembly should be examined to verify no thermal axial motion has occurred causing compression of the assembly.

PROPER INSTALLATION



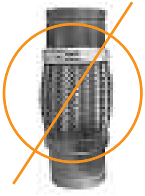
IMPROPER INSTALLATION

PARALLEL



IMPROPER INSTALLATION

COMPRESSED



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WELD-MISER™ TEE-LETS®

RECOMMENDED INSTALLATION PROCEDURES

Merit Weld-Miser Tee-Let Welding Outlet Fittings are designed and manufactured to reduce the cost of installation from both the standpoint of labor required and energy consumed. In addition, by following the recommended installation procedures, many of the problems associated with installing welding outlet fittings on standard weight or light weight pipe are eliminated, including burn through and excessive shrinkage resulting in pipe distortion.

RECOMMENDED HOLE SIZES

The hole cut in the branch or header pipe can be cut prior or subsequent to attachment of the Tee-Let. One advantage of cutting the hole after welding is that the pipe is left intact during welding thereby reducing shrinkage and possible distortion. If holes are cut prior to welding, as some codes require, then the following hold sizes are recommended. Note that the same hole diameter for a given outlet size is required for both Type A and Type C Tee-Lets 1-1½" larger.

RECOMMENDED WELDING PROCEDURES

Merit Weld-Wiser Tee-Lets are designed to be installed on standard weight or light weight pipe with one weld pass on Type A outlet sizes from ½" through 2½" inclusive, and on Type C outlet sizes through 4". Moreover, the wall thickness at the weld end of the fitting approximately matches standard weight pipe. Accordingly, heat setting can be made to optimize penetration on both the fitting and the pipe which it is being welded. Aside from reducing the likelihood of burn through and distortion resulting from excessive heat, the amount of weld required for adaquent penetration is significantly reduced.

Merit Tee-Lets are manufactured from continuous cast aluminum killed steel with a carbon range of from 0.05 to 0.25. Merit specifies that residuals, such as chrome, nickel and other metals resident in the scrap used for production of the steel be reported and kept to a minimum. On the other hand, certain grades of carbon steel pipe are manufactured from skelp whose

RECOMMENDED TEE-LET HOLE SIZES

Tee-Let Size	Type	Recommended Hole Size
In./mm		*In./mm*
½ *13*	Type A	⅝ *16*
¾ *19*	Type A	⅞ *22*
1 *25*	Type A	1⅛ *28*
1¼ *31*	Type A	1½ *38*
1¼ *31*	Type C	1⅜ *35*
1½ *38*	Type A or C	1⅝ *41*
2 *50*	Type A or C	2 *50*
2½ *63*	Type A or C	2 7/16 *61*
3 *75*	Type A or C	3 *75*
4 *100*	Type A or C	4 *100*

Holes may be cut employing mechanical means—including hole sawing, mechanical flame cutting (oxy-acetylene or propane), and air plasma cutting (constricted tungsten arc) machines. Merit offers a simple approach to cutting the hole. Hand-held templates are sized to match your plasma cutter.

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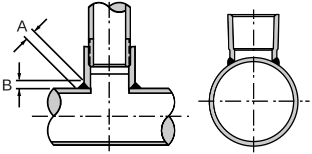
WELD-MISER™ TEE-LETS®, CONT'D.

chemical composition is not specified. When the metal inert gas shield (MIG) welding process is employed, certain residuals may cause excessive porosity, spatter or lack of penetration. Specifically, gases released during the welding process do not escape before the molten puddle sets up.

When porosity or lack of penetration occurs, one approach is to slightly increase the heat in order to give the gases time to escape from the puddle. A flux cored wire can also be used. This wire contains scavengers which allow gases in the molten weld puddle to escape before the weld solidifies. The following recommended settings for welding therefore may need to be adjusted slightly higher if any of the above mentioned adverse conditions exist.

As a general rule, the weld should be only as hot as required to allow the weld to penetrate the materials being welded while concomitantly allowing gases developed in the welding process to escape. Every effort must be made to avoid welding too hot or overheating both the pipe and the Tee-Let. **Excessive heat may cause the wrench tight threads (those in the bottom of the Tee-Let near the weld zone) to distort while also causing the branch pipe to bend.** It should be noted that Merit Tee-Lets have been subjected to exhaustive testing and evaluation, and only negligibly distort when subjected to excessive heat. The threads, on the other hand, may not return to their gauged form after cooling if excessive heat causes them to expand. The following is intended only as a guide, and assumes that the welding equipment is properly calibrated and functioning normally and the operator is qualified.



½, ¾ & 1 Outlet   1¼ - 2½ Outlet

RECOMMENDED AMOUNT OF WELD

Outlet Size	A	B
In./mm	*In./mm*	*In./mm*
½ *13*	¼ *7*	3⁄16 *5*
¾ *19*	¼ *7*	3⁄16 *5*
1 *25*	¼ *7*	3⁄16 *5*
1¼ *31*	¼ *7*	3⁄16 *5*
1½ *38*	5⁄16 *8*	¼ *7*
2 *50*	5⁄16 *8*	¼ *7*
2½ *63*	5⁄16 *8*	¼ *7*
3 *75*	⅜ *10*	5⁄16 *5*
4 *100*	⅜ *10*	5⁄16 *5*

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Weld-Miser™ Tee-Lets®, cont'd

Recommended Settings For Microwire Welding Process, continued on next page

Header Size	Pipe Wall Thickness	Tee-Let Types A, B, C	Electrode Size	Welding Current	Arc. Volts	Wire Feed	Travel Speed
In./mm	*In./mm*	*In./mm*		*AMPS-DC*	*POS.*	*IPM*	*IPM*
1¼ - 2 *31-50*	0.065 *2*	½ - 2 *13-50*	0.035	100-130	16-20	210	25-30
		2½ - 4 *63-100*	0.035	115-150	17-21	270	20-25
	0.109 *3*	½ - 2 *13-50*	0.035	110-140	18-22	220	25-30
		2½ - 4 *63-100*	0.035	120-160	19-22	290	20-25
2½ - 4 *63-100*	0.083 *2.5*	½ - 2 *13-50*	0.035	110-140	17-20	210	20-25
		2½ - 4 *63-100*	0.035	120-150	17-20	270	20-25
	0.120 *3*	½ - 2 *13-50*	0.035	120-160	19-22	290	20-25
		2½ - 4 *63-100*	0.035	130-160	19-22	240	20-25
5-6 *125-150*	0.109 *3*	½ - 2 *13-50*	0.035	120-150	17-20	210	20-25
		2½ - 4 *63-100*	0.035	130-150	18-20	270	15-20
	0.134 *3.5*	½ - 2 *13-50*	0.035	130-160	19-22	290	20-25
		2½ - 4 *63-100*	0.035	140-160	20-22	270	15-20
		2½ - 4 *63-100*	0.045	180-205	20-24	245	27-32

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RECOMMENDED SETTINGS FOR MICROWIRE WELDING PROCESS, CONTINUED FROM PREVIOUS PAGE

Header Size	Pipe Wall Thickness	Tee-Let Types A, B, C	Electrode Size	Welding Current	Arc. Volts	Wire Feed	Travel Speed
In./mm	*In./mm*	*In./mm*		*AMPS-DC*	*POS.*	*IPM*	*IPM*
8 *200*	0.109 *3*	½ - 2 *13-50*	0.035	120-150	17-20	240	20-25
		2½ - 4 *63-100*	0.035	130-150	18-20	260	15-20
		2½ - 4 *63-100*	0.045	170-220	18-22	290	12-18
	0.148 *3.5*	½ - 2 *13-50*	0.035	130-160	19-22	240	20-25
		2½ - 4 *63-100*	0.035	140-160	20-22	260	15-20
		2½ - 4 *63-100*	0.045	180-225	20-24	290	12-18

SHIELDING GAS FLOW (for all sizes) 20-25 CFH

1.) Co$_2$ - Deeper penetration, faster welding, low cost.

2.) 25% - Argon, 75% - Co$_2$, Recommended for .134 wall and lighter, high welding speeds without meltthrough, minimum distortion and spatter, good penetration.

Merit assumes no liability for any consequential damages resulting from the improper use of its Tee-Let Welding Outlet Fittings, nor for any recommendations made with respect to installation procedures.

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INSTALLATION

A) For use in wet and dry pipe automatic sprinkler systems installed in accordance with all applicable standards or codes. (See item 4)

B) Before starting the job of making sprinklers into steel threads of the above fittings, count the number of fully developed male threads on the brand of sprinkler to be installed into the fittings. If seven (7) perfect threads are counted, the sprinkler should thread into the ½" or ¾" thread from three (3) to four (4) threads hand tight. If five (5) to six (6) threads are counted, the sprinkler should thread into the ½" or ¾" thread from two (2) to three (3) threads hand tight.

C) Use an anaerobic pipe thread sealant for thread make-up. Apply pipe thread sealant only to male threads on the nipple and sprinkler only.

D) If either of the above fails to allow the sprinkler to make-up to a minimum of from five (5) to six (6) full threads, do not overtighten the sprinkler. Instead back the sprinkler out of the fitting. Clean any debris and/or pipe sealant from both the male and female threads. Gauge both the male threads of the sprinkler and the female threads of the Adjustable Drop Nipple for compliance with ANSI B1.2.1. Specification for Tapered Pipe Threads. The same procedure would apply if a leak has been detected.

If within tolerance, reapply the anaerobic pipe sealant and make-on to the required length. Refer to the pipe chart on the page 200 for correct make-up lengths. Allow twenty-four hours for setting.

E) Connect the Adjustable Drop Nipple assembly to the sprinkler system by wrenching on the make-up area on the Drop Nipple DO NOT WRENCH ON THE BARREL PORTION OF THE UNIT OR SPRINKLER. Damage to the Adjustable Drop Nipple or Sprinkler may result.

F) After the ceiling has been installed adjust the sprinkler to its final position by using the sprinkler wrench and assemble the escutcheon plate to the inner support ring. It is recommended that the system pressure be relieved when adjusting, however it is not necessary to drain the system.

1) GENERAL DESCRIPTION

Merit Eliminator Adjustable Drop Nipples Models "M" and "F" are the screw type consisting of an outer case which has one (1) inch N.P.T. or ISO-7 male or female thread on the inlet, and an inner case which has either a one-half inch (½") or a three-quarter inch (¾") N.P.T. sprinkler connection. The inner case employs 0-Ring Seals and adjusts either in or out over the range of the adjustment.

Merit Eliminator Adjustable Drop Nipples are designed for use in automatic fire sprinkler systems installed in accordance with all applicable standards or codes. (See item 4).

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The purpose of these fittings is to allow for the final adjustment of the drop nipple between a branch line and a pendant sprinkler by eliminating the need to re-cut the existing drop nipple in order to fit-up flush to the ceiling. Merit Eliminator Adjustable Drop Nipples do not require any secondary locking following final adjustment and they will not extend as a result of vibrations or pressure surges in the system.

2) APPROVALS AND STANDARDS

Merit Eliminator Adjustable Drop Nipples are listed by the Underwriters Laboratories, Inc. (UL Listing Number 57SO) and approved by the Factory Mutual Research Corporation (FM). In addition, Model "M" and "F" Adjustable Drop Nipples are approved by the New York Board of Materials and Equipment Standard (BSA-886-86-5A) and verband der Schadenversicherer e.V., (Vds).

3) TECHNICAL DATA

Merit Adjustable Drop Nipples are rated for use at a maximum temperature of 300° F, and a maximum service pressure of 300 psi.

The approximate friction loss based on the Hazen and Williams Formula expressed in equivalent length of one (1) inch, schedule 40 pipe (where C= 120) is 1' for ½" outlet Model 'M', 2.6' for ¾" outlet Model 'M', 4.2' for F1, 1.3' for F2, 1.5' for F3.150, and 2.9' for F3.175.

Merit Eliminator Drop nipples maximum sprinkler orifice size for Models M3.150, ME3.150, M1.150, and F3.150 is $^{17}/_{32}$" and Models F1.150, F2.150, F3.175 and M3.175 is $^{5}/_{8}$".

The inlet and outlet threads conform to ANSI B1.20.1 / ISO-7R/RC.

The O-Ring seals used in the manufacture are an ethylene propylene elastomer (EPDM). The outer and inner casings are manufactured from high strength carbon Steel.

All Model "M" and "F" Adjustable Drop Nipples are hydrostatically tested for o-ring integrity prior to shipment.

4) WARNING

Adjustable Drop Nipples described herein must be installed and maintained in compliance with this document as well as the applicable standards of the National Fire Protection Association in addition to the standards for any other authorities having jurisdiction. DO NOT USE ANY PETROLEUM BASED LUBRICANTS ON THE O-RING SEALS. Petroleum based lubricants are incompatible with EPDM and will impair serviceability of the unit.

5) DIMENSIONAL DATA

See chartson next page.

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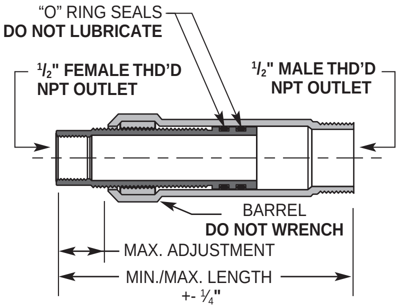
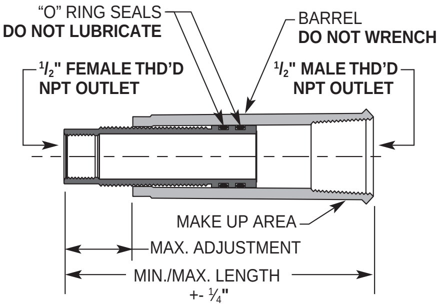
ELIMINATOR ADJUSTABLE DROP NIPPLES, CONT'D



Model M



Model F

MODEL M DIMENSIONAL DATA

Model #	Inlet	Outlet	Min. Length	Max Length	Max. Adjust
	In./mm	*In./mm*	*in./mm*	*in./mm*	*in./mm*
M1.150	1 Male *25*	½ Female *13*	4⅛ *105*	5⅛ *130*	1 *25*
M3.150	1 Male *25*	½ Female *13*	6⅛ *156*	9⅛ *232*	3 *76*
ME3.150	1 Male *25*	½ Female *13*	7⅞ *200*	10⅞ *276*	3 *76*
M3.175	1 Male *25*	¾ Female *19*	8⅛ *206*	11⅛ *283*	3 *76*

MODEL F DIMENSIONAL DATA

Model #	Inlet NPT or DIN	Outlet NPT	Min. Length	Max Length	Max. Adjust
	In./mm		*in./mm*	*in./mm*	*in./mm*
F1.150	1 Female *25*	½ Female *13*	3½ *89*	4½ *114*	1 *25*
F2.150	1 Female *25*	½ Female *13*	4½ *114*	6½ *165*	3 *76*
F3.150	1 Female *25*	½ Female *13*	5½ *14*	8½ *216*	3 *76*
F3.175	1 Female *25*	¾ Female *19*	7⁵⁄₁₆ *186*	10⁵⁄₁₆ *262*	3 *76*

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GENERAL ASSEMBLY OF THREADED FITTINGS

1) Inspect both male and female components prior to assembly.

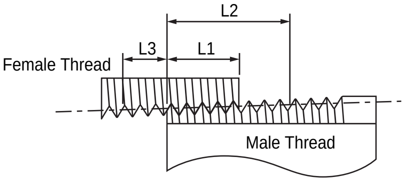
- Threads should be free from mechanical damage, dirt, chips and excess cutting oil.
- Clean or replace components as necessary.

2) Application of pipe dope

- Use a pipe dope that is fast drying, sets-up to a semi hard condition and is vibration resistant. Alternately, an anaerobic sealant may be utilized.
- Thoroughly mix the thread sealant prior to application.
- Apply a thick even coat to the male threads only. Best application is achieved with a brush stiff enough to force sealant down to the root of the threads.

3) Joint Makeup

- For sizes up to and including 1½" pipe, wrench tight makeup is considered three full turns past hand tight. Hand tight engagement for ½" through 2" thread varies from 4.48 turns to 5.01 turns.
- For 2½" through 4" sizes, wrench tight makeup is considered two full turns past hand tight. Hand tight engagement for 2½" through 4" thread varies from 5.46 turns to 6.75 turns.



NPT TAPERED PIPE THREADS—Length of Effective Threads

Drop Nipple or Tee-Let Outlet Size	L1 Dim. Hand Tight	L3 Dim. Wrench Tight	Total L1 + L3 Length	L2 Dim. Effective Threads
In./mm	*In.(mm)/Thrds*	*In.(mm)/Thrds.*	*In.(mm)/Thrds*	*In.(mm)/Thrds*
½ *13*	0.320/4.48 *2.6*	0.214/3.00 *5.4*	0.534/7.48 *13.6*	0.534/7.47 *13.6*
¾" *19*	0.339/4.75 *8.6*	0.214/3.00 *5.4*	0.553/7.75 *14.0*	0.546/7.64 *13.9*
1 *25*	0.400/4.60 *10.2*	0.261/3.00 *6.6*	0.661/7.60 *16.8*	0.683/7.85 *17.3*
1¼ *31*	0.420/4.83 *10.7*	0.261/3.00 *6.6*	0.681/7.83 *17.3*	0.707/8.13 *18.0*
1½ *38*	0.420/4.83 *10.7*	0.261/3.00 *6.6*	0.697/7.83 *17.1*	0.724/8.32 *18.4*
2 *50*	0.436/5.01 *11.1*	0.261/3.00 *6.6*	0.706/8.01 *17.9*	0.757/8.70 *19.2*
2½ *63*	0.682/5.46 *17.3*	0.250/2.00 *6.4*	0.932/7.46 *23.7*	1.138/9.10 *28.9*
3 *75*	0.766/6.13 *19.5*	0.250/2.00 *6.4*	1.016/8.13 *25.8*	1.200/9.50 *30.5*
4 *100*	0.844/6.75 *21.4*	0.250/2.00 *6.4*	1.094/8.75 *27.8*	1.300/10.40 *33.0*

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SPECIFIED BOLT TORQUE

Specified bolt torque is for the oval neck track bolts used on Gruvlok® couplings and flanges. The nuts must be tightened alternately and evenly until fully tightened.

NOTE: Specified torques are to be used unless otherwise noted on Product Installation Instructions.

CAUTION: Use of an impact wrench is not recommended because the torque output can vary significantly due to many variables including air pressure supply, battery strength and operational variations.

ANSI SPECIFIED BOLT TORQUE

Bolt Size	Wrench Size	Specified Bolt Torque *
In.	*In.*	*Ft.-Lbs*
⅜	11⁄16	30-45
½	⅞	80-100
⅝	1 1⁄16	100-130
¾	1 ¼	130-180
⅞	1 7⁄16	180-220
1	1 ⅝	200-250
1 ⅛	1 13⁄16	225-275
1 ¼	2	250-300

* Non-lubricated bolt torques

METRIC SPECIFIED BOLT TORQUE

Bolt Size	Wrench Size	Specified Bolt Torque *
mm	*mm*	*N-M*
M10	16	40-60
M12	22	110-150
M16	24	135-175
M20	30	175-245
M22	34	245-300
M24	36	270-340

* Non-lubricated bolt torques

CAUTION: Proper torquing of coupling bolts is required to obtain specified performance. Over torquing the bolts may result in damage to the bolt and/or casting which could result in pipe joint separation. **Under torquing the bolts may result in lower pressure retention capabilities, lower bend load capabilities, joint leakage and pipe joint separation.** Pipe joint separation may result in significant property damage and serious injury.

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List Of Abbreviations

Abbreviations conform to the practice of the American Standard Abbreviations for Scientific and Engineering Terms, ASA Z10.1

abs	Absolute
AGA	American Gas Association
AISI	American Iron and Steel Institute
Amer Std	American Standard
API	American Petroleum Institute
ASA	American Standards Association
Ashve	American Society of Heating and Ventilation Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing Materials
AWWA	American Water Works Association
B & S	Bell and Spigot or Brown & Sharpe (gauge)
bbl	Barrel
Btu	British thermal unit(s)
C	Centigrade
cfm	Cubic feet per minute
cfs	Cubic feet per second
CI	Cast Iron
CS	Cast Steel
Comp	Companion
C to F	Center to Face
°C	Degrees Centigrade
°F	Degrees Fahrenheit
diam	Diameter
dwg	Drawing
ex-hy	Extra-heavy
F & D	Faced and Drilled
F	Fahrenheit
F to F	Face to Face
flg	Flange or Flanges
flgd	Flanged
g	Gage or Gauge
hex	Hexagonal
hg	Mercury

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LIST OF ABBREVIATIONS

IBBM	Iron Body Bronze (or Brass) Mounted
ID	Inside Diameter
kw	Kilowatt(s)
MI	Malleable Iron
max	Maximum
min.	Minimum
mtd	Mounted
MSS	Manufacturers Standardization Society (of Value and Fittings Industry)
NEWWA	New England Water Works Association
NPS	Nominal pipe size (formerly IPS for iron pipe size)
OD	Outside diameter
OS&Y	Outside Screw and Yoke
OWG	Oil, Water, Gas (see WOG)
psig	Pounds per square inch, gage
red	Reducing
Sch or Sched	Schedule
scd	Screwed
SF	Semifinished
Spec	Specification
SSP	Steam Service Pressure
SSU	Seconds Saybolt Universal
Std	Standard
Trans	Transactions
WOG	Water, Oil, Gas (see OWG)
WWP	Working Water Pressure
XS	Extra Strong
XXS	Double Extra Strong

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DECIMAL EQUIVALENTS OF FRACTIONS

1/64	0.015625	23/64	0.359375	45/64	0.703125
1/32	0.03125	3/8	0.375	23/32	0.71875
3/64	0.046875	25/64	0.390625	47/64	0.734375
1/16	0.0625	13/32	0.40625	3/4	0.75
5/64	0.078125	27/64	0.421875	49/64	0.765625
3/32	0.09375	7/16	0.4375	25/32	0.78125
7/64	0.109375	29/64	0.453125	51/64	0.796875
1/8	0.125	15/32	0.46875	13/16	0.8125
9/64	0.140625	31/64	0.484375	53/64	0.828125
5/32	0.15625	1/2	0.5	27/32	0.84375
11/64	0.171875	33/64	0.515625	55/64	0.859375
3/16	0.1875	17/32	0.53125	7/8	0.875
13/64	0.203125	35/64	0.546875	57/64	0.890625
7/32	0.21875	9/16	0.5625	29/32	0.90625
15/64	0.234375	37/64	0.578125	59/64	0.921875
1/4	0.25	19/32	0.59375	15/16	0.9375
17/64	0.265625	39/64	0.609375	61/64	0.953125
9/32	0.28125	5/8	0.625	31/32	0.96875
19/64	0.296875	41/64	0.640625	63/64	0.984375
5/16	0.3125	21/32	0.65625	1	1
21/64	0.328125	43/64	0.671875		
11/32	0.34375	11/16	0.6875		

DECIMAL DEGREE EQUIVALENTS OF MINUTES

Min	Degree	Min	Degree	Min	Degree
1	0.0167	21	0.3500	41	0.6833
2	0.0333	22	0.3667	42	0.7000
3	0.0500	23	0.3833	43	0.7167
4	0.0667	24	0.4000	44	0.7333
5	0.0833	25	0.4167	45	0.7500
6	0.1000	26	0.4333	46	0.7667
7	0.1167	27	0.4500	47	0.7833
8	0.1333	28	0.4667	48	0.8000
9	0.1500	29	0.4833	49	0.8167
10	0.1667	30	0.5000	50	0.8333
11	0.1833	31	0.5167	51	0.8500
12	0.2000	32	0.5333	52	0.8667
13	0.2167	33	0.5500	53	0.8833
14	0.2333	34	0.5667	54	0.9000
15	0.2500	35	0.5833	55	0.9167
16	0.2667	36	0.6000	56	0.9333
17	0.2833	37	0.6167	57	0.9500
18	0.3000	38	0.6333	58	0.9667
19	0.3167	39	0.6500	59	0.9833
20	0.3333	40	0.6667	60	1.0000

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COMMERCIAL PIPE SIZES AND WALL THICKNESSES

This table lists standard pipe sizes and wall thicknesses, or specifically:

1. Traditional standard weight, extra strong & durable extra strong pipe.
2. Pipe wall thickness in ASME B36.10 for carbon steel.
3. Pipe wall thickness in ASTM Specification A409 & ASME B36.19 & applicable only to corrosion resistant materials.

NOTE: All dimensions in inches & thicknesses are nominal or average wall thickness. Actual thickness may be as much as 12.5% under nominal due to mill tolerance.

Nom.		NOMINAL WALL THICKNESS FOR																
Pipe Size	Outside Dia. (IN)	Sch 5S	Sch 10	Sch 10S	Sch 20	Sch 30	Sch Std.	Sch 40	Sch 40S	Sch 60	Sch 80	Sch 80S	Sch 100	Sch 120	Sch. 140	Sch. 160	X Strong	XX Strong
$^1/_8$	0.405	-	0.049	0.049	-	-	0.068	0.068	0.068	-	0.095	0.095	-	-	-	-	0.095	-
$^1/_4$	0.540	-	0.065	0.065	-	-	0.088	0.088	0.088	-	0.119	0.119	-	-	-	-	0.119	-
$^3/_8$	0.675	-	0.065	0.065	-	-	0.091	0.091	0.091	-	0.126	0.126	-	-	-	-	0.126	-
$^1/_2$	0.840	0.065	0.083	0.083	-	-	0.109	0.109	0.109	-	0.147	0.147	-	-	-	0.187	0.147	0.294
$^3/_4$	1.050	0.065	0.083	0.083	-	-	0.113	0.113	0.113	-	0.154	0.154	-	-	-	0.219	0.154	0.308
1	1.315	0.065	0.109	0.109	-	-	0.133	0.133	0.133	-	0.179	0.179	-	-	-	0.250	0.179	0.358
1$^1/_4$	1.660	0.065	0.109	0.109	-	-	0.140	0.140	0.140	-	0.191	0.191	-	-	-	0.250	0.191	0.382
1$^1/_2$	1.900	0.065	0.109	0.109	-	-	0.145	0.145	0.145	-	0.200	0.200	-	-	-	0.281	0.200	0.400
2	2.375	0.065	0.109	0.109	-	-	0.154	0.154	0.154	-	0.218	0.218	-	-	-	0.344	0.218	0.436
2$^1/_2$	2.875	0.083	0.120	0.120	-	-	0.203	0.203	0.203	-	0.276	0.276	-	-	-	0.375	0.276	0.552
3	3.500	0.083	0.120	0.120	-	-	0.216	0.216	0.216	-	0.300	0.300	-	-	-	0.437	0.300	0.600
3$^1/_2$	4.000	0.083	0.120	0.120	-	-	0.226	0.226	0.226	-	0.318	0.318	-	-	-	-	0.318	0.636
4	4.500	0.083	0.120	0.120	-	-	0.237	0.237	0.237	-	0.337	0.337	-	0.438	-	0.531	0.337	0.674
5	5.563	0.109	0.134	0.134	-	-	0.258	0.258	0.258	-	0.375	0.375	-	0.500	-	0.625	0.375	0.750

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COMMERCIAL PIPE SIZES AND WALL THICKNESSES

Nom.		NOMINAL WALL THICKNESS FOR																
Pipe Size	Outside Dia. (IN)	Sch 5S	Sch 10	Sch 10S	Sch 20	Sch 30	Sch Std.	Sch 40	Sch 40S	Sch 60	Sch 80	Sch 80S	Sch 100	Sch 120	Sch. 140	Sch. 160	X Strong	XX Strong
6	6.625	0.109	0.134	0.134	-	-	0.280	0.280	0.280	-	0.432	0.432	-	0.562	-	0.719	0.432	0.864
8	8.625	0.109	0.148	0.148	0.250	0.277	0.322	0.322	0.322	0.406	0.500	0.500	0.594	0.719	0.812	0.906	0.500	0.875
10	10.750	0.134	0.165	0.165	0.250	0.307	0.365	0.365	0.365	0.500	0.594	0.500	0.719	0.844	1.000	1.125	0.500	1.000
12	12.750	0.156	0.180	0.180	0.250	0.330	0.375	0.406	0.375	0.562	0.688	0.500	0.844	1.000	1.125	1.312	0.500	1.000
14	14.000	0.156	0.250	0.188	0.312	0.375	0.375	0.438	-	0.594	0.750	-	0.938	1.094	1.250	1.406	0.500	-
16	16.000	0.165	0.250	0.188	0.312	0.375	0.375	0.500	-	0.656	0.844	-	1.031	1.219	1.438	1.594	0.500	-
18	18.000	0.165	0.250	0.188	0.312	0.438	0.375	0.562	-	0.750	0.938	-	1.156	1.375	1.562	1.781	0.500	-
20	20.000	0.188	0.250	0.218	0.375	0.500	0.375	0.594	-	0.812	1.031	-	1.281	1.500	1.750	1.969	0.500	-
22	22.000	0.188	0.250	0.218	0.375	0.500	0.375	-	-	0.875	1.125	-	1.375	1.625	1.875	2.125	0.500	-
24	24.000	0.218	0.250	-	0.375	0.562	0.375	0.688	-	0.969	1.219	-	1.531	1.812	2.062	2.344	0.500	-
26	26.000	-	0.312	-	0.500	-	0.375	-	-	-	-	-	-	-	-	-	0.500	-
28	28.000	-	0.312	-	0.500	0.625	0.375	-	-	-	-	-	-	-	-	-	0.500	-
30	30.000	0.250	0.312	0.312	0.500	0.625	0.375	-	-	-	-	-	-	-	-	-	0.500	-
32	32.000	-	0.312	-	0.500	0.625	0.375	0.688	-	-	-	-	-	-	-	-	0.500	-
34	34.000	-	0.312	-	0.500	0.625	0.375	0.688	-	-	-	-	-	-	-	-	0.500	-
36	36.000	-	0.312	-	0.500	0.625	0.375	0.750	-	-	-	-	-	-	-	-	0.500	-
42	42.000	-		-	0.500	0.625	0.375	0.750	-	-	-	-	-	-	-	-	0.500	-

All dimensions shown are in inches.

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Standard Weight Pipe Data

Nom. Pipe Dia. (Inches)	Nom. Inside Dia. (Inches)	Nom. Outside Dia. (Inches)	Nom. Wt./Ft. (Pounds)	Length Containing One Cu. Ft. (Feet)	Gallons per Linear Ft. (Gallons)
1/8	0.269	0.405	0.245	2,526.000	0.0030
1/4	0.364	0.540	0.425	1,383.800	0.0054
3/8	0.493	0.675	0.568	754.360	0.0099
1/2	0.622	0.840	0.851	473.910	0.0158
3/4	0.824	1.050	1.131	270.030	0.0277
1	1.049	1.315	1.679	166.620	0.0449
1 1/4	1.380	1.660	2.273	96.275	0.0777
1 1/2	1.610	1.900	2.718	70.733	0.1058
2	2.067	2.375	3.653	49.913	0.1743
2 1/2	2.469	2.875	5.793	30.077	0.2487
3	3.068	3.500	7.580	19.479	0.3840
3 1/2	3.548	4.000	9.110	14.565	0.5136
4	4.026	4.500	10.790	11.312	0.6613
5	5.047	5.563	14.620	7.198	1.0393
6	6.065	6.625	18.970	4.984	1.5008
8	7.981	8.625	28.550	2.878	2.5988
10	10.020	10.750	40.480	1.826	4.0963

Barlow's Formula

Barlow's Formula is a safe, easy method for finding the relationship between internal fluid pressure and stress in the pipe wall. The formula predicts bursting pressures that have been found to be safely within the actual test bursting pressures.

It is interesting to note that the formula uses the "outside diameter" of pipe and is sometimes referred to as the "outside diameter formula."

$$\mathbf{P = (2 \bullet t \bullet S) / D}$$

Where:

P = internal units pressure, in psi
S = unit stress, in psi
D = outside diameter of pipe, in inches
t = wall thickness, in inches

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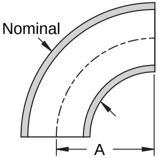
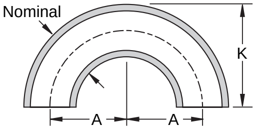
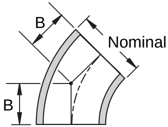
WELD FITTING—90° ELBOW, 180° RETURN, 45° ELBOW







	90° ELBOWS		180° RETURNS		45° LR
Nom. Pipe Size	Long R A	Short R A	Long R K	Short R K	Elbow B
1/2	1 1/2	–	1 7/8	–	5/8
3/4	1 1/8	–	1 11/16	–	7/16
1	1 1/2	1	2 3/16	1 5/8	7/8
1 1/4	1 7/8	1 1/4	2 3/4	2 1/16	1
1 1/2	2 1/4	1 1/2	3 1/4	2 7/16	1 1/8
2	3	2	4 3/16	3 3/16	1 3/8
2 1/2	3 3/4	2 1/2	5 3/16	3 15/16	1 3/4
3	4 1/2	3	6 1/4	4 3/4	2
3 1/2	5 1/4	3 1/2	7 1/4	5 1/2	2 1/4
4	6	4	8 1/4	6 1/4	2 1/2
5	7 1/2	5	10 5/16	7 3/4	3 1/8
6	9	6	12 5/16	9 5/16	3 3/4
8	12	8	16 5/16	12 5/16	5
10	15	10	20 3/8	15 3/8	6 1/4
12	18	12	24 3/8	18 3/8	7 1/2
14	21	14	28	21	8 3/4
16	24	16	32	24	10
18	27	18	36	27	11 1/4
20	30	20	40	30	12 1/2
22	33	22	44	–	13 1/2
24	36	24	48	36	15
26	39	26	52	–	16
30	45	30	60	45	18 1/2
34	51	34	–	–	21
36	54	36	72	54	22 1/4
42	63	48	–	–	26

All dimensions shown are in inches.

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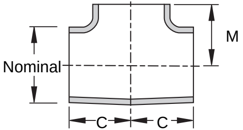
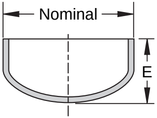
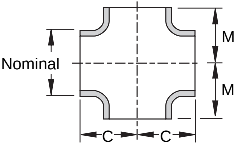
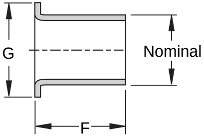
WELD FITTING—TEE, CAP, CROSS, STUB END







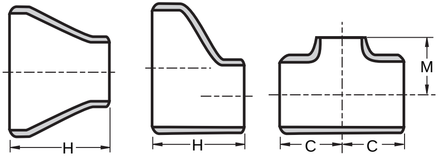


Nom. Pipe Size	Straight Tees C & M	Caps E	Straight Crosses C & M	Long Pattern Stub Ends	
				F	G
1/2	1	1	–	3	1 3/8
3/4	1 1/8	1	–	3	1 11/16
1	1 1/2	1 1/2	–	4	2
1 1/4	1 7/8	1 1/2	1 7/8	4	2 1/2
1 1/2	2 1/4	1 1/2	2 1/4	4	2 7/8
2	2 1/2	1 1/2*	2 1/2	6	3 5/8
2 1/2	3	1 1/2*	3	6	4 1/8
3	3 3/8	2*	3 3/8	6	5
3 1/2	3 3/4	2 1/2*	3 3/4	6	5 1/2
4	4 1/8	2 1/2*	4 1/8	6	6 3/16
5	4 7/8	3*	4 7/8	8	7 5/16
6	5 5/8	3 1/2*	5 5/8	8	8 1/2
8	7	4*	7	8	10 5/8
10	8 1/2	5*	8 1/2	10	12 3/4
12	10	6*	10	10	15
14	11	6 1/2*	11	12	16 1/4
16	12	7*	12	12	18 1/2
18	13 1/2	8*	13 1/2	12	21
20	15	9*	15	12	23
22	16 1/2	10	–	–	–
24	17	10 1/2	17	12	27 1/4
26	19 1/2	10 1/2	–	–	–
30	22	10 1/2	–	–	–
34	25	10 1/2	–	–	–
36	26 1/2	10 1/2	–	–	–
42	C=30,M=28	12	–	–	–

*Dimensions apply to STD and XS only.
All dimensions shown are in inches.

Return

WELD FITTING—REDUCERS AND REDUCING OUTLET TEES



H: Concentric & Eccentric Reducers **C, M:** Reducing Outlet Tees

Nom. Pipe Size	H	C	M
1/2 x 1/4	–	1	1
3/8	–	1	1
3/4 x 3/8	1 1/2	1 1/8	1 1/8
1/2	1 1/2	1 1/8	1 1/8
1 x 3/8	2	1 1/2	1 1/2
1/2	2	1 1/2	1 1/2
3/4	2	1 1/2	1 1/2
1 1/4 x 1/2	2	1 7/8	1 7/8
3/4	2	1 7/8	1 7/8
1	2	1 7/8	1 7/8
1 1/2 x 1/2	2 1/2	2 1/4	2 1/4
3/4	2 1/2	2 1/4	2 1/4
1	2 1/2	2 1/4	2 1/4
1 1/4	2 1/2	2 1/4	2 1/4
2 x 3/4	3	2 1/2	1 3/4
1	3	2 1/2	2
1 1/4	3	2 1/2	2 1/4
1 1/2	3	2 1/2	2 3/8
2 1/2 x 1	3 1/2	3	2 1/4
1 1/4	3 1/2	3	2 1/2
1 1/2	3 1/2	3	2 5/8
2	3 1/2	3	2 3/4
3 x 1	–	3 3/8	2 5/8
1 1/4	3 1/2	3 3/8	2 3/4
1 1/2	3 1/2	3 3/8	2 7/8
2	3 1/2	3 3/8	3
2 1/2	3 1/2	3 3/8	3 1/4
3 1/2 x 1 1/4	4	–	–
1 1/2	4	3 3/4	3 1/8
2	4	3 3/4	3 1/4
2 1/2	4	3 3/4	3 1/2
3	4	3 3/4	3 5/8
4 x 1 1/2	4	4 1/8	3 3/8
2	4	4 1/8	3 1/2
2 1/2	4	4 1/8	3 3/4
3	4	4 1/8	3 7/8
3 1/2	4	4 1/8	4
5 x 2	5	4 7/8	4 1/8
2 1/2	5	4 7/8	4 1/4
3	5	4 7/8	4 3/8
3 1/2	5	4 7/8	4 1/2
4	5	4 7/8	4 5/8
6 x 2 1/2	5 1/2	5 5/8	4 3/4
3	5 1/2	5 5/8	4 7/8
3 1/2	5 1/2	5 5/8	5
4	5 1/2	5 5/8	5 1/8
5	5 1/2	5 5/8	5 3/8
8 x 3	–	7	6
3 1/2	6	7	6
4	6	7	6 1/8
5	6	7	6 3/8
6	6	7	6 5/8
10 x 4	7	8 1/2	7 1/4
5	7	8 1/2	7 1/2
6	7	8 1/2	7 5/8
8	7	8 1/2	8
12 x 5	8	10	8 1/2
6	8	10	8 5/8
8	8	10	9
10	8	10	9 1/2
14 x 6	13	11	9 3/8
8	13	11	9 3/4
10	13	11	10 1/8
12	13	11	10 5/8

All dimensions shown are in inches.

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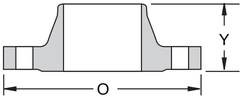
WELD FITTING—WELDING NECK FLANGES

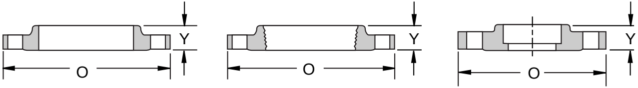


Nom.	150 LB.		300 LB.		400 LB.		600 LB.	
Pipe Size	O	Y(1)	O	Y(1)	O	Y(2)	O	Y(2)
1/2	3 1/2	1 7/8	3 3/4	2 1/16	3 3/4	2 1/16	3 3/4	2 1/16
3/4	3 7/8	2 1/16	4 5/8	2 1/4	4 5/8	2 1/4	4 5/8	2 1/4
1	4 1/4	2 3/16	4 7/8	2 7/16	4 7/8	2 7/16	4 7/8	2 7/16
1 1/4	4 5/8	2 1/4	5 1/4	2 9/16	5 1/4	2 5/8	5 1/4	2 5/8
1 1/2	5	2 7/16	6 1/8	2 11/16	6 1/8	2 3/4	6 1/8	2 3/4
2	6	2 1/2	6 1/2	2 3/4	6 1/2	2 7/8	6 1/2	2 7/8
2 1/2	7	2 3/4	7 1/2	3	7 1/2	3 1/8	7 1/2	3 1/8
3	7 1/2	2 3/4	8 1/4	3 1/8	8 1/4	3 1/4	8 1/4	3 1/4
3 1/2	8 1/2	2 13/16	9	3 3/16	9	3 3/8	9	3 3/8
4	9	3	10	3 3/8	10	3 1/2	10 3/4	4
5	10	3 1/2	11	3 7/8	11	4	13	4 1/2
6	11	3 1/2	12 1/2	3 7/8	12 1/2	4 1/16	14	4 5/8
8	13 1/2	4	15	4 3/8	15	4 5/8	16 1/2	5 1/4
10	16	4	17 1/2	4 5/8	17 1/2	4 7/8	20	6
12	19	4 1/2	20 1/2	5 1/8	20 1/2	5 3/8	22	6 1/8
14	21	5	23	5 5/8	23	5 7/8	23 3/4	6 1/2
16	23 1/2	5	25 1/2	5 3/4	25 1/2	6	27	7
18	25	5 1/2	28	6 1/4	28	6 1/2	29 1/4	7 1/4
20	27 1/2	5 11/16	30 1/2	6 3/8	30 1/2	6 5/8	32	7 1/2
22	29 1/2	5 7/8	33	6 1/2	33	6 3/4	34 1/4	7 3/4
24	32	6	36	6 5/8	36	6 7/8	37	8
26	34 1/4	5	38 1/4	7 1/4	38 1/4	7 5/8	40	8 3/4
30	38 3/4	5 1/8	43	8 1/4	43	8 5/8	44 1/2	9 3/4
34	43 3/4	5 5/16	47 1/2	9 1/8	47 1/2	9 1/2	49	10 5/8
36	46	5 3/8	50	9 1/2	50	9 7/8	51 3/4	11 1/8
42	53	5 5/8	50 3/4	7 7/8	52	8 13/16	55 1/4	11

(1) The 1/16″ raised face **is** included in length thru Hub, “Y”.
(2) The 1/4″ raised face **is not** included in length thru Hub, “Y”.
All dimensions shown are in inches.

Return

SLIP-ON, THREADED AND SOCKET FLANGES



Nom.	150 LB.		300 LB.		400 LB.†		600 LB.	
Pipe Size	O	Y$^{(1)}$	O	Y$^{(1)}$	O	Y$^{(2)}$	O	Y$^{(2)}$
1/2	3 1/2	5/8	3 3/4	7/8	3 3/4	7/8	3 3/4	7/8
3/4	3 7/8	5/8	4 5/8	1	4 5/8	1	4 5/8	1
1	4 1/4	11/16	4 7/8	1 1/16	4 7/8	1 1/16	4 7/8	1 1/16
1 1/4	4 5/8	13/16	5 1/4	1 1/16	5 1/4	1 1/8	5 1/4	1 1/8
1 1/2	5	7/8	6 1/8	1 3/16	6 1/8	1 1/4	6 1/8	1 1/4
2	6	1	6 1/2	1 5/16	6 1/2	1 7/16	6 1/2	1 7/16
2 1/2	7	1 1/8	7 1/2	1 1/2	7 1/2	1 5/8	7 1/2	1 5/8
3	7 1/2	1 3/16	8 1/4	1 11/16	8 1/4	1 13/16	8 1/4	1 13/16
3 1/2	8 1/2	1 1/4†	9	1 3/4†	9	1 15/16	9	1 15/16†
4	9	1 5/16†	10	1 7/8†	10	2	10 3/4	2 1/8†
5	10	1 7/16†	11	2†	11	2 1/8	13	2 3/8*†
6	11	1 9/16†	12 1/2	2 1/16†	12 1/2	2 1/4	14	2 5/8†
8	13 1/2	1 3/4†	15	2 7/16†	15	2 11/16	16 1/2	3†
10	16	1 15/16†	17 1/2	2 5/8†	17 1/2	2 7/8	20	3 3/8†
12	19	2 3/16†	20 1/2	2 7/8†	20 1/2	3 1/8	22	3 5/8†
14	21	2 1/4†	23	3†	23	3 5/16	23 3/4	3 11/16†
16	23 1/2	2 1/2†	25 1/2	3 1/4†	25 1/2	3 11/16	27	4 3/16†
18	25	2 11/16†	28	3 1/2†	28	3 7/8	29 1/4	4 5/8†
20	27 1/2	2 7/8†	30 1/2	3 3/4†	30 1/2	4	32	5†
22	29 1/2	3 1/8 *†	33	4*†	33	4 1/4*	34 1/4	5 1/4*†
24	32	3 1/4†	36	4 3/16†	36	4 1/2	37	5 1/2†
26	34 1/4	3 3/8*†	38 1/4	7 1/4*†	38 1/4	7 5/8*	40	8 3/4*†
30	38 3/4	3 1/2*†	43	8 1/4*†	43	8 5/8*	44 1/2	9 3/4*†
34	43 3/4	3 11/16*†	47 1/2	9 1/8*†	47 1/2	9 1/2*	49	10 5/8*†
36	46	3 3/4*†	50	9 1/2*†	50	9 7/8*	51 3/4	11 1/8*†
42	53	4*†	-	-	-	-	-	-

* Not available in Threaded type
† Not available in Socket type
(1) The 1/16″ raised face **is** included in length thru Hub, “Y”.
(2) The 1/4″ raised face **is not** included in length thru Hub, “Y”.
All dimensions shown are in inches.

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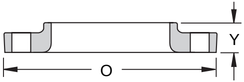
STANDARD CAST IRON COMPANION FLANGES & BOLTS

(for working pressures up to 125 psi steam, 175 psi WOG)

Size	Flange Dia.	Bolt Circle	No. Bolts	Bolt Size	Bolt Length
3/4	3 1/2	2 1/2	4	3/8	1 3/8
1	4 1/4	3 1/8	4	1/2	1 1/2
1 1/4	4 5/8	3 1/2	4	1/2	1 1/2
1 1/2	5	3 7/8	4	1/2	1 3/4
2	6	4 3/4	4	5/8	2
2 1/2	7	5 1/2	4	5/8	2 1/4
3	7 1/2	6	4	5/8	2 1/2
3 1/2	8 1/2	7	8	5/8	2 1/2
4	9	7 1/2	8	5/8	2 3/4
5	10	8 1/2	8	3/4	3
6	11	9 1/2	8	3/4	3
8	13 1/2	11 3/4	8	3/4	3 1/4
10	16	14 1/4	12	7/8	3 1/2
12	19	17	12	7/8	3 3/4
14	21	18 3/4	12	1	4 1/4
16	23 1/2	21 1/4	16	1	4 1/4

All dimensions shown are in inches.

LAP JOINT FLANGES



Nom.	150 LB.		300 LB.		400 LB.		600 LB.	
Pipe Size	O	Y	O	Y	O	Y	O	Y
1/2	3 1/2	5/8	3 3/4	7/8	3 3/4	7/8	3 3/4	7/8
3/4	3 7/8	5/8	4 5/8	1	4 5/8	1	4 5/8	1
1	4 1/4	11/16	4 7/8	1 1/16	4 7/8	1 1/16	4 7/8	1 1/16
1 1/4	4 5/8	13/16	5 1/4	1 1/16	5 1/4	1 1/8	5 1/4	1 1/8
1 1/2	5	7/8	6 1/8	1 3/16	6 1/8	1 1/4	6 1/8	1 1/4
2	6	1	6 1/2	1 5/16	6 1/2	1 7/16	6 1/2	1 7/16
2 1/2	7	1 1/8	7 1/2	1 1/2	7 1/2	1 5/8	7 1/2	1 5/8
3	7 1/2	1 3/16	8 1/4	1 11/16	8 1/4	1 13/16	8 1/4	1 13/16
3 1/2	8 1/2	1 1/4	9	1 3/4	9	1 15/16	9	1 15/16
4	9	1 5/16	10	1 7/8	10	2	10 3/4	2 1/8
5	10	1 7/16	11	2	11	2 1/8	13	2 3/8
6	11	1 9/16	12 1/2	2 1/16	12 1/2	2 1/4	14	2 5/8
8	13 1/2	1 3/4	15	2 7/16	15	2 11/16	16 1/2	3
10	16	1 15/16	17 1/2	3 3/4	17 1/2	4	20	4 3/8
12	19	2 3/16	20 1/2	4	20 1/2	4 1/4	22	4 5/8
14	21	3 1/8	23	4 3/8	23	4 5/8	23 3/4	5
16	23 1/2	3 7/16	25 1/2	4 3/4	25 1/2	5	27	5 1/2
18	25	3 13/16	28	5 1/8	28	5 3/8	29 1/4	6
20	27 1/2	4 1/16	30 1/2	5 1/2	30 1/2	5 3/4	32	6 1/2
24	32	4 3/8	36	6	36	6 1/4	37	7 1/4

All dimensions shown are in inches.

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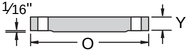
EXTRA HEAVY CAST IRON COMPANION FLANGES AND BOLTS

(for working pressures up to 250 psi steam, 400 psi WOG)

Size	Flange Dia.	Bolt Circle	No. Bolts	Bolt Size	Bolt Length
1	4 7/8	3 1/2	4	5/8	2 1/4
1 1/4	5 1/4	3 7/8	4	5/8	2 1/2
1 1/2	6 1/8	4 1/2	4	3/4	2 1/2
2	6 1/2	5	8	5/8	2 1/2
2 1/2	7 1/2	5 7/8	8	3/4	3
3	8 1/4	6 5/8	8	3/4	3 1/4
3 1/2	9	7 1/4	8	3/4	3 1/4
4	10	7 7/8	8	3/4	3 1/2
5	11	9 1/4	8	3/4	3 3/4
6	12 1/2	10 5/8	12	3/4	3 3/4
8	15	13	12	7/8	4 1/4
10	17 1/2	15 1/4	16	1	5
12	20 1/2	17 3/4	16	1 1/8	5 1/2
14 O.D.	23	20 1/4	20	1 1/8	5 3/4
16 O.D.	25 1/2	22 1/2	20	1 1/4	6
18 O.D.	28	24 3/4	24	1 1/4	6 1/4
20 O.D.	30 1/2	27	24	1 1/4	6 3/4
24 O.D.	36	32	24	1 1/2	7 1/2
30 O.D.	43	39 1/4	28	1 3/4	8 1/2
36 O.D.	50	46	32	2	9 1/2
42 O.D.	57	52 3/4	36	2	10
48 O.D.	65	60 3/4	40	2	11

BLIND FLANGES



Nom. Pipe Size	150 LB. O	150 LB. Y(1)	300 LB. O	300 LB. Y(1)	400 LB. O	400 LB. Y(2)	600 LB. O	600 LB. Y(2)
1/2	3 1/2	7/16	3 3/4	9/16	For sizes 3 1/2 and smaller use 600 LB. Standard	3 3/4	9/16	
3/4	3 7/8	1/2	4 5/8	5/8		4 5/8	5/8	
1	4 1/4	9/16	4 7/8	1 1/16		4 7/8	1 1/16	
1 1/4	4 5/8	5/8	5 1/4	3/4		5 1/4	1 3/16	
1 1/2	5	1 1/16	6 1/8	1 3/16		6 1/8	7/8	
2	6	3/4	6 1/2	7/8		6 1/2	1	
2 1/2	7	7/8	7 1/2	1		7 1/2	1 1/8	
3	7 1/2	1 5/16	8 1/4	1 1/8		8 1/4	1 1/4	
3 1/2	8 1/2	1 5/16	9	1 3/16		9	1 3/8	
4	9	1 5/16	10	1 1/4	10	1 3/8	10 3/4	1 1/2
5	10	1 5/16	11	1 3/8	11	1 1/2	13	1 3/4
6	11	1	12 1/2	1 7/16	12 1/2	1 5/8	14	1 7/8
8	13 1/2	1 1/8	15	1 5/8	15	1 7/8	16 1/2	2 3/16
10	16	1 3/16	17 1/2	1 7/8	17 1/2	2 1/8	20	2 1/2
12	19	1 1/4	20 1/2	2	20 1/2	1/4	22	2 5/8
14	21	1 3/8	23	2 1/8	23	2 3/8	23 3/4	2 3/4
16	23 1/2	1 7/16	25 1/2	2 1/4	25 1/2	2 1/2	27	3
18	25	1 9/16	28	2 3/8	28	2 5/8	29 1/4	3 1/4
20	27 1/2	1 11/16	30 1/2	2 1/2	30 1/2	2 3/4	32	3 1/2
22	29 1/2	1 13/16	33	2 5/8	33	2 7/8	34 1/4	3 3/4
24	32	1 7/8	36	2 3/4	36	3	37	4
26	34 1/4	2	38 1/4	3 1/8	38 1/4	3 1/2	40	4 1/4
30	38 3/4	2 1/8	43	3 5/8	43	4	44 1/2	4 1/2
34	43 3/4	2 5/16	47 1/2	4	47 1/2	4 3/8	49	4 3/4
36	46	2 3/8	50	4 1/8	50	4 1/2	51 3/4	4 7/8
42	53	2 5/8	57	4 5/8	57	5 1/8	58 3/4	5 1/2

(1) The 1/16" raised face **is** included in Thickness, "Y".
(2) The 1/4" raised face **is not** included in Thickness, "Y".

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BOLTING DIMENSIONS FOR 150 TO 300 LB. STEEL FLANGE

	125/150 LB. FLANGE					250/300 LB. FLANGE				
Nom. Pipe Size	Bolt Circle Dia.	Bolt Dia.	No. of Bolts	*Stud Len.	Bolt Len.	Bolt Circle Dia.	Bolt Dia.	No. of Bolts	*Stud Len.	Bolt Len.
1/2	2 3/8	1/2	4	2 1/4	1 3/4	2 5/8	1/2	4	2 1/2	2
3/4	2 3/4	1/2	4	2 1/4	2	3 1/4	5/8	4	2 3/4	2 1/2
1	3 1/8	1/2	4	2 1/2	2	3 1/2	5/8	4	3	2 1/2
1 1/4	3 1/2	1/2	4	2 1/2	2 1/4	3 7/8	5/8	4	3	2 3/4
1 1/2	3 7/8	1/2	4	2 3/4	2 1/4	4 1/2	3/4	4	3 1/2	3
2	4 3/4	5/8	4	3	2 3/4	5	5/8	8	3 1/4	3
2 1/2	5 1/2	5/8	4	3 1/4	3	5 7/8	3/4	8	3 3/4	3 1/4
3	6	5/8	4	3 1/2	3	6 5/8	3/4	8	4	3 1/2
3 1/2	7	5/8	8	3 1/2	3	7 1/4	3/4	8	4 1/4	3 3/4
4	7 1/2	5/8	8	3 1/2	3	7 7/8	3/4	8	4 1/4	3 3/4
5	8 1/2	3/4	8	3 3/4	3 1/4	9 1/4	3/4	8	4 1/2	4
6	9 1/2	3/4	8	3 3/4	3 1/4	10 5/8	3/4	12	4 3/4	4 1/4
8	11 3/4	3/4	8	4	3 1/2	13	7/8	12	5 1/4	4 3/4
10	14 1/8	7/8	12	4 1/2	3 3/4	15 1/4	1	16	6	5 1/4
12	17	7/8	12	4 1/2	4	17 3/4	1 1/8	16	6 1/2	5 3/4
14	18 3/4	1	12	5	4 1/4	20 1/4	1 1/8	20	6 3/4	6
16	21 1/4	1	16	5 1/4	4 1/2	22 1/2	1 1/4	20	7 1/4	6 1/2
18	22 3/4	1 1/8	16	5 3/4	4 3/4	24 3/4	1 1/4	24	7 1/2	6 3/4
20	25	1 1/8	20	6	5 1/4	27	1 1/4	24	8	7
22	27 1/4	1 1/4	20	6 1/2	5 1/2	29 1/4	1 1/2	24	8 3/4	7 1/2
24	29 1/2	1 1/4	20	6 3/4	5 3/4	32	1 1/2	24	9	7 3/4
26	31 3/4	1 1/4	24	7	6	34 1/2	1 5/8	28	10	8 3/4
30	36	1 1/4	28	7 1/4	6 1/4	39 1/4	1 3/4	28	11 1/4	10
34	40 1/2	1 1/2	32	8	7	43 1/2	1 7/8	28	12 1/4	10 3/4
36	42 3/4	1 1/2	32	8 1/4	7	46	2	32	12 3/4	11 1/4
42	49 1/2	1 1/2	36	8 3/4	7 1/4	52 3/4	2	36	13 3/4	13 1/2

*1/16" Raised Face

Stud lengths for lap joint flanges are equal to lengths shown plus the thickness of two laps of the stub ends.

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Bolting Dimensions for 400 Lb./600Lb. Steel Flange

	400 LB. STEEL FLANGES				600 LB. STEEL FLANGES			
Nom Pipe Size	Diam of Bolt Circle	Diam of Bolts	No. of Bolts	Length of Studs ¼" Raised Face	Diam of Bolt Circle	Diam of Bolts	No of Bolts	Length of Studs ¼" Raised Face
½	2⅝	½	4	3	2⅝	½	4	3
¾	3¼	⅝	4	3¼	3¼	⅝	4	3¼
1	3½	⅝	4	3½	3½	⅝	4	3½
1¼	3⅞	⅝	4	3¾	3⅞	⅝	4	3¾
1½	4½	¾	4	4	4½	¾	4	4
2	5	⅝	8	4	5	⅝	8	4
2½	5⅞	¾	8	4½	5⅞	¾	8	4¼
3	6⅝	¾	8	4¾	6⅝	¾	8	4¾
3½	7¼	⅞	8	5¼	7¼	⅞	8	5¼
4	7⅞	⅞	8	5¼	8½	⅞	8	5½
5	9¼	⅞	8	6½	10½	1	8	6¼
6	10⅝	⅞	12	5¾	11½	1	12	6½
8	13	1	12	6½	13¾	1⅛	12	7½
10	15¼	1⅛	16	7¼	17	1¼	16	8¼
12	17¾	1¼	16	7¾	19¼	1¼	20	8½
14	20¼	1¼	20	8	20¾	1⅜	20	9
16	22½	1⅜	20	8½	23¾	1½	20	9¾
18	24¾	1⅜	24	8¾	25¾	1⅝	20	10½
20	27	1½	24	9½	28½	1⅝	24	11¼
22	29¼	1⅝	24	10	30⅝	1¾	24	12
24	32	1¾	24	10½	33	1⅞	24	12¾
26	34½	1¾	28	11½	36	1⅞	28	13¼
30	39¼	2	28	13	40¼	2	28	14
34	43½	2	28	13¾	44½	2¼	28	15
36	46	2	32	14	47	2½	28	15¾
42	52¾	2½	32	16¼	53¾	2¾	28	17½

Stud lengths for lap joint flanges are equal to lengths shown minus ½" plus the thickness of two laps of the stub ends.

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ASTM CARBON STEEL PIPE & FLANGE SPECIFICATIONS

Pipe and Tubing Description and Applications	Spec No.	ASTM or Type	Grade Strength PSI	Yield Point or Strength PSI	Elongation (% in 2")				Chemical Composition, %			
					STD Round	Rectangular			C	MN	P	S
						t	5/16"	5/16"				
Seamless milled steel pipe for high-temperature service, suitable for bending, flanging & similar forming operations.	(1) A106	A	48,000	30,000	28 long. OR (4) 20 trans.	17.5+ or 12.5+	56t 40t	35 25	.25 max	.27 to.93	.048 max	.058 max
As above, except use Grade A for close coiling, cold bending or forge welding.	(1) A106	B	60,000	35,000	28 long. OR (4) 12 trans.	17.5+ or 6.5+	56t 32t	35 16.5	30 max	.27 to 1.06	.048 max	.058 max
Black or hot-dip galvanize seamless or res-welded steel pipe suitable for coiling, bending, flanging, & other special purposes, suitable for welding.	A 53	A	48,000	30,000	28	17.5+	56t	35	(2)	–	(3)	-
As above, except use Grade A for close coiling, cold bending or forge welding.	A 53	B	60,000	35,000	22	15+	48t	30	(2)	–	(3)	-
Black or hot-dip galvanize seamless or res. welded steel pipe suitable for ordinary uses. (When tension, flattening or bend test required, order to A-53).	A 120 (obsolete)	–	–	–	–	–	–	–	–	–	–	
Resistance welded steel pipe for liquid, gas or vapor.	A 135	A	48,000	30,000	–	17.5+	56t	35	–	–	.050 max	.060 max
As above, except use Grade A for flanging & bending.	A 135	B	60,000	35,000	–	15+	48t	30	–	–	.050 max	.060 max

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ASTM CARBON STEEL PIPE & FLANGE SPECIFICATIONS

Pipe and Tubing Description and Applications	Spec No.	ASTM or Type	Grade Strength PSI	Yield Point or Strength PSI	Elongation (% in 2")				Chemical Composition, %			
					STD Round	Rectangular						
						t	$^5/_{16}$"	$^5/_{16}$"	C	MN	P	S
Electric-fusion-welded strait- or spiral-seam pipe for liquid, gas or vapor from mill grades of plate.	A 139	A	48,000	30,000	–	17.5+	56t	35	–	.30 to 1.00	.040 max	.050 max
As above	A 139	B	60,000	35,000	–	15+	48t	30	.30 max	.30 to 1.00	.040 max	.050 max
Forged Pipe, Flanges Description and Applications												
Forged or rolled steel pipe flanges, fittings (6) values and parts for high temperature service. Heat treatment required; may be annealed or normalized.	A105	I	60,000	30,000	25		–	–	.35 (5) max	.90 max	.05 max	.05 max
As above	A 105	II	70,000	36,000	22		–	–	.35 (5) max	.90 max	.05 max	.05 max
As above except for general service. Heat treatment is not required.	A 181	I	60,000	30,000	22		–	–	.35 (5) max	.90 max	.05 max	.05 max
As above	A 181	II	70,000	36,000	18		–	–	.35 (5) max	.90 max	.05 max	.05 max

(1) 0.10% silicon minimum.

(2) Open hearth, 0.13 max for $^1/_8$" and $^1/_4$" size resistance welded pipe only

(3) Seamless: open hearth 0.048 max, acid bessemar 0.11 max; Res. welded: open hearth 0.050 max.

(4) Longitudinal or transverse direction of test specimen with respect to pipe axis

(5) When flanges will be subject to fusion welding, carbon content shall be ≤0.35%. If carbon is ≤0.35%, it may be necessary to add silicon to meet required tensile properties. The silicon content shall be ≤0.35%.

(6) Factor-made Wrought Carbon Steel and Ferritic Alloy Steel Welding Fitting Specifications are covered under ASTM A234.

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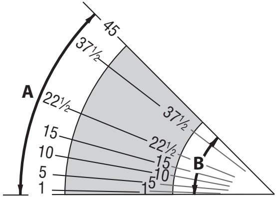
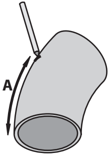
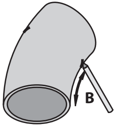
How to Cut Odd-Angle Elbows

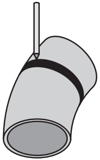




Step 1- Measure distance on outside arc using the values from the previous table & make a mark.



Step 2- Measure distance on inside arc using the values from the table below & make a mark.



Step 3- Wrap tape around elbow & mark cutting line.

Nom.	O.D.	1°		5°		10°		15°		22½°		37½°		45°	
		A	B	A	B	A	B	A	B	A	B	A	B	A	B
2	2.38	1/16	1/32	3/8	5/32	23/32	5/16	1 3/32	15/32	1 21/32	2 3/32	2 3/4	1 3/16	3 9/32	1 7/16
2½	2.88	3/32	1/32	7/16	3/16	29/32	13/32	1 11/32	19/32	2 1/32	2 9/32	3 13/32	1 1/2	4 1/16	1 13/16
3	3.50	3/32	1/16	17/32	1/4	1 3/32	15/32	1 5/8	23/32	2 15/32	1 3/32	4 3/32	1 13/16	4 29/32	2 5/32
3½	4.00	1/8	1/16	5/8	9/32	1 1/4	9/16	1 29/32	27/32	2 27/32	1 9/32	4 3/4	2 1/8	5 11/16	2 9/16
4	4.50	5/32	1/16	23/32	5/16	1 7/16	21/32	2 5/32	3 1/32	3 1/4	1 15/32	5 13/32	2 15/32	6 15/32	2 15/16
5	5.56	3/16	3/32	29/32	13/32	1 25/32	13/16	2 11/16	1 1/4	4 1/32	1 27/32	6 23/32	3 3/32	8 1/16	3 23/32
6	6.63	7/32	3/32	1 1/16	1/2	25/32	1	3 7/32	1 1/2	4 27/32	2 7/32	8 1/16	3 23/32	9 21/32	4 15/32
8	8.63	9/32	1/8	1 7/16	21/32	2 27/32	1 11/32	4 9/32	2	6 13/32	3 1/32	10 11/16	5 1/32	12 13/16	6 1/32
10	10.75	1 1/32	5/32	1 25/32	27/32	3 9/16	1 11/16	5 11/32	2 17/32	8	3 25/32	13 11/32	6 5/16	16	7 9/16
12	12.75	7/16	3/16	2 1/8	1	4 1/4	2 1/32	6 3/8	3 1/32	9 9/16	4 9/16	15 31/32	7 19/32	19 5/32	9 1/8
14	14.00	1/2	1/4	2 7/16	7/32	4 7/8	2 7/16	7 11/32	3 21/32	11	5 1/2	18 5/16	9 5/32	22	11
16	16.00	9/16	9/32	2 25/32	1 13/32	5 19/32	2 25/32	8 3/8	4 3/16	12 9/16	6 9/32	20 15/16	10 15/32	25 1/8	1 9/16
18	18.00	5/8	5/16	3 5/32	1 9/16	6 9/32	3 5/32	9 7/16	4 23/32	14 1/8	7 1/16	23 9/16	11 25/32	28 9/32	14 1/8
20	20.00	11/16	11/32	3 1/2	1 3/4	6 31/32	3 1/2	10 15/32	5 1/4	15 23/32	7 27/32	2 3/16	13 3/32	31 13/32	15 23/32
22	22.00	25/32	3/8	3 27/32	1 29/32	7 11/16	3 27/32	11 17/32	5 3/4	17 9/32	8 5/8	28 13/16	14 13/32	34 9/16	17 9/32
24	24.00	27/32	13/32	4 3/16	2 3/32	8 3/8	4 3/16	12 9/16	6 9/32	18 27/32	9 7/16	31 13/32	15 23/32	37 11/16	18 27/32
26	26.00	29/32	15/32	4 17/32	2 9/32	9 1/16	4 17/32	13 5/8	6 13/16	20 13/32	10 7/32	34 1/32	17 1/32	40 27/32	20 13/32
30	30.00	1 1/16	17/32	5 1/4	2 5/8	10 15/32	5 1/4	15 23/32	7 27/32	23 9/16	11 25/32	39 9/32	19 5/8	47 1/8	23 9/16
34	34.00	1 3/16	19/32	5 15/16	2 31/32	11 7/8	5 15/16	17 13/16	8 29/32	26 23/32	13 11/32	44 1/2	22 1/4	53 13/32	26 23/32
36	36.00	1 1/4	5/8	6 9/32	3 5/32	12 9/16	6 9/32	18 27/32	9 7/16	28 9/32	14 1/8	47 1/8	23 9/16	56 9/16	28 9/32
42	42.00	1 15/32	23/32	7 11/32	3 21/32	14 21/32	7 11/32	22	11	33	16 1/2	54 31/32	27 1/2	65 31/32	33

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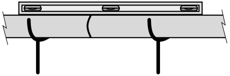
ALIGNMENT OF PIPE

Proper alignment is important if a piping system is to be correctly fabricated.

Poor alignment may result in welding difficulties and a system that does not function properly.

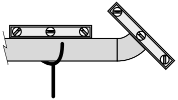
Welding rings may be employed to assure proper alignment as well as the correct welding gap. In addition to using welding rings, some simple procedures can be followed to assist the pipe fitter. Below and on the following page are alignment procedures commonly used by today's craftsmen.

PIPE-TO-PIPE



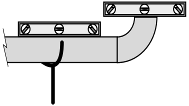
1. Level one length of pipe using spirit level.
2. Bring lengths together leaving only small welding gap.
3. Place spirit level over both pipes as shown and maneuver unpositioned length until both are level.
4. Tack weld top and bottom.
5. Rotate pipe 90°.
6. Repeat procedure.

45° ELBOW-TO-PIPE



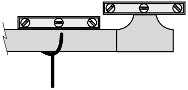
1. Level pipe using spirit level.
2. Place fitting to pipe leaving small welding gap.
3. Place 45" spirit level on face of elbow and maneuver elbow until bubble is centered.
4. Tack weld in place.

90° ELBOW-TO-PIPE



1. Level pipe using spirit level.
2. Place fitting to pipe leaving small welding gap.
3. Place spirit level on face of elbow and maneuver elbow until level.
4. Tack weld in place.

TEE-TO-PIPE



1. Level pipe using spirit level.
2. Place tee to pipe leaving small welding gap.
3. Place spirit level on face of tee and maneuver tee until level.
4. Tack weld in place.

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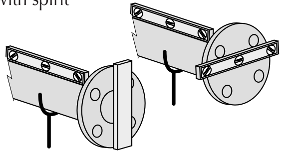
ALIGNMENT OF PIPE, CONT'D.

FLANGE-TO-PIPE

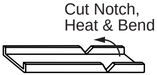
1. Bring flange to pipe end leaving small welding gap.
2. Align top two holes of flange with spirit level.
3. Tack weld in place.
4. Center square on face of flange as shown.
5. Tack weld in place.
6. Check sides in same way.

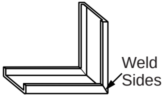


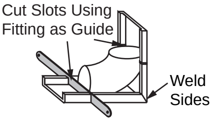
JIG FOR SMALL DIAMETER PIPING

The jig is made from channel iron 3' 9" long. Use $\frac{1}{8}$" x 1$\frac{1}{2}$" for pipe sizes 1$\frac{1}{4}$" thru 3"; $\frac{1}{8}$" x $\frac{3}{4}$" for sizes 1" or smaller.

1. Cut out 90° notches about 9" from end.
2. Heat bottom of notch with torch.
3. Bend channel iron to 90° angle and weld sides.
4. Place elbow in jig and saw half thru sides of channel iron as shown. Repeat this step with several elbows so jig may be used for different operations.
5. A used hack saw blade placed in notch as shown will provide proper welding gap.







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DRILL SIZES FOR NPT PIPE TAPS

Tap Size	Threads/In.	Drill Dia.
1/8	27	R
1/4	18	7/16
3/8	18	37/64
1/2	14	23/32
3/4	14	59/64
1	11 1/2	1 5/32
1 1/4	11 1/2	1 1/2
1 1/2	11 1/2	1 47/64
2	11 1/2	2 7/32
2 1/2	8	2 5/8
3	8	3 1/4
3 1/2	8	3 3/4
4	8	4 1/4

TAP & DRILL SIZES

(Unified National Coarse)

Tap Size	Threads/In.	Drill Size
1/4	20	7
5/16	18	F
3/8	16	5/16
7/16	14	U
1/2	13	27/64
9/16	12	31/64
5/8	11	17/32
3/4	10	21/32
7/8	9	49/64
1	8	7/8
1 1/8	7	63/64
1 1/4	7	1 7/64
1 3/8	6	1 7/32
1 1/2	6	1 11/32
1 3/4	5	1 9/16
2	4 1/2	1 25/32

PIPE & WATER WEIGHT/FOOT

	WEIGHT (Lb.)		WEIGHT (Lb.)	
Nom. Pipe Size	STD Pipe	Water	XS Pipe	Water
1/2	0.851	0.132	1.088	0.101
3/4	1.131	0.230	1.474	0.188
1	1.679	0.374	2.172	0.311
1 1/4	2.273	0.648	2.997	0.555
1 1/2	2.718	0.882	3.631	0.765
2	3.653	1.455	5.022	1.280
2 1/2	5.793	2.076	7.661	1.837
3	7.580	3.200	10.250	2.864
3 1/2	9.110	4.280	12.510	3.850
4	10.790	5.510	14.980	4.980
5	14.620	8.660	20.780	7.890
6	18.970	12.510	28.570	11.290
8	28.550	21.690	43.390	19.800
10	40.480	34.100	54.740	32.300
12	49.580	49.000	65.420	47.000
14	54.570	59.700	72.090	57.500
16	62.580	79.100	82.770	76.500
18	70.590	101.200	93.450	98.400
20	78.600	126.000	104.130	122.800
24	94.620	183.800	125.490	180.100
30	119.000	291.200	158.000	286.200

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WEIGHT/FOOT - SEAMLESS BRASS & COPPER PIPE

Nominal Pipe Size	REGULAR Yellow Brass	Red Brass	Copper	EXTRA STRONG Yellow Brass	Red Brass	Copper
½	0.91	0.93	0.96	1.19	1.23	1.25
¾	1.23	1.27	1.30	1.62	1.67	1.71
1	1.73	1.78	1.82	2.39	2.49	2.51
1¼	2.56	2.63	2.69	3.29	3.39	3.46
1½	3.04	3.13	3.20	3.99	4.10	4.19
2	4.01	4.12	4.22	5.51	5.67	5.80

BOILING POINTS OF WATER AT VARIOUS PRESSURES

Vacuum, in Inches of Mercury	Boiling Point
29	76.62
28	99.93
27	114.22
26	124.77
25	133.22
24	140.31
23	146.45
22	151.87
21	156.75
20	161.19
19	165.24
18	169.00
17	172.51
16	175.80
15	178.91

Vacuum, in Inches of Mercury	Boiling Point
14	181.82
13	184.61
12	187.21
11	189.75
10	192.19
9	194.50
8	196.73
7	198.87
6	200.96
5	202.25
4	204.85
3	206.70
2	208.50
1	210.25

Pressure Gauge Lbs	Boiling Point
0	212.0
1	215.6
2	218.5
4	224.4
6	229.8
8	234.8
10	239.4
15	249.8
25	266.8
50	297.7
75	320.1
100	337.9
125	352.9
200	387.9

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Water Pressure To Feet Head

Lbs./Sq.In.	Feet Head	Lbs./Sq.In.	Feet Head	Lbs./Sq.In.	Feet Head
1	2.31	40	92.36	180	77.96
2	4.62	50	115.45	200	86.62
3	6.93	60	138.54	250	108.27
4	9.24	70	161.63	300	129.93
5	11.54	80	184.72	350	151.58
6	13.85	90	207.81	400	173.24
7	16.16	100	43.31	500	216.55
8	18.47	110	47.64	600	259.85
9	20.78	120	51.97	700	303.16
10	23.09	130	56.30	800	346.47
15	34.63	140	60.63	900	389.78
20	46.18	150	64.96	1,000	433.00
25	57.72	160	69.29		
30	69.27	170	73.63		

Feet Head To Water Pressure

Feet Head	Lbs./Sq.In.	Feet Head	Lbs./Sq.In.	Feet Head	Lbs./Sq.In.
1	0.43	40	17.32	180	77.96
2	0.87	50	21.65	200	86.62
3	1.30	60	25.99	250	108.27
4	1.73	70	30.32	300	129.93
5	2.17	80	34.65	350	151.58
6	2.60	90	38.98	400	173.24
7	3.03	100	43.31	500	216.55
8	3.46	110	47.64	600	259.85
9	3.90	120	51.97	700	303.16
10	4.33	130	56.30	800	346.47
15	6.50	140	60.63	900	389.78
20	8.66	150	64.96	1,000	433.00
25	10.83	160	69.29		
30	12.99	170	73.63		

NOTE: One foot of water at 62°F equals 0.433 pound pressure per square inch. To find the pressure per square inch for any feet head not given in the table above, multiply the feet head by 0.433.

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FLOW CONVERSION CHART

The accompanying chart provides fast answers to many problems that may confront the pipe fitter. Procedures for using the chart are as follows:

Note that there are three sets of figures shown in connection with the extreme left-hand column **A**.

"Standard" gives the internal diameter of standard pipe (somewhat greater than 1" for 1 in. standard pipe).

"Exact" gives the exact diameter.

"Extra Heavy" gives the internal diameter of extra heavy pipe.

EXAMPLE: How much water is passing through a pipe with parameters:

I.D. of exactly 1 in.
Velocity of the water being 3 F.P.S.

To apply the chart to the problem locate 1 in. in column **"A"** using the scale "**Exact**" and run a straight line from the point through the 3 in column "**C**". From the intersection of this line with column "**B**". run a straight line horizontally to column "**G**". The intersection of this line at columns "**D**", "**E**" and "**F**" gives the following information:

"**D**" shows the cubic feet/minute flowing through the pipe.

"**E**" shows the volume of flow in gallons/minute

"**F**" gives the weight of the water in pounds/minute. (For liquids other tharn water. multiply the value of column "**F**" by the specific gravity of the liquid for accurate weight conversion.)

If a quantity in columns "**D**", "**E**" and "**F**" is known then velocity may be determined by reversing the procedure. Draw a horizontal line from the known point to column "**G**". From this intersection draw a line to the exact I.D. of the pipe in column "**A**" and extend this line to cross column "**C**". The intersection with column "**C**" gives the velocity in feet/second.

The chart can be used as a.conversion chart to determine the number of gallons in a certain number of cubic feet of liquid. The horizontal line already drawn to determine answers in columns "**C**" and "**D**" will provide the answer to the conversion in column "**E**".

A little practice will prove this chart to be a real time-saver.

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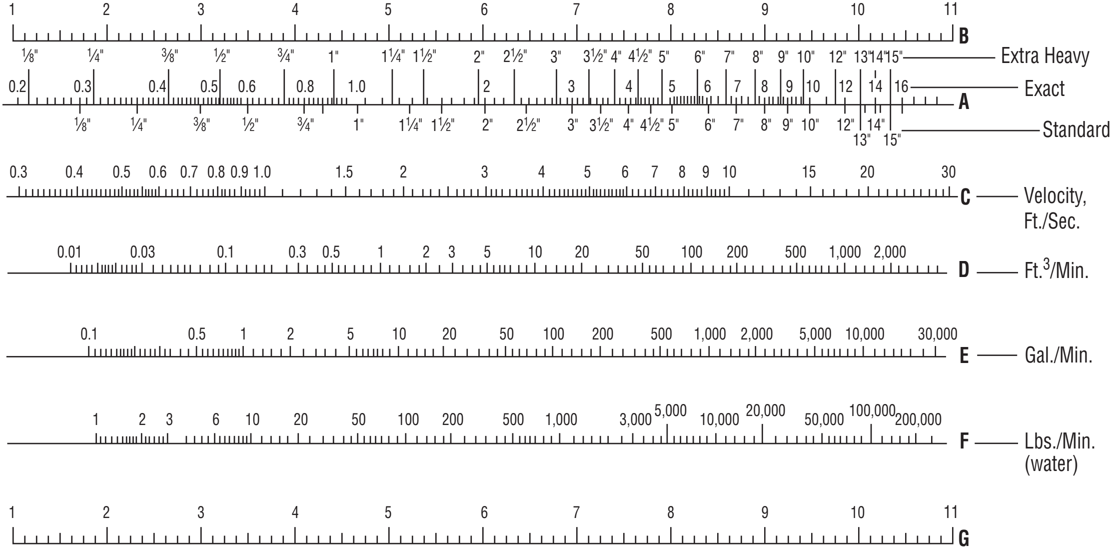
FLOW CONVERSION CHART



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HEAT LOSSES FROM HORIZONTAL BARE STEEL PIPE

(BTU per hour per linear foot at 70°F room temperature)

PIPE Nom. Pipe Size	HOT WATER (180°F)	STEAM 5 PSIG (20 PSIA)
$^{1}/_{2}$	60	96
$^{3}/_{4}$	73	118
1	90	144
$1^{1}/_{4}$	112	179
$1^{1}/_{2}$	126	202
2	155	248
$2^{1}/_{2}$	185	296
3	221	355
$3^{1}/_{2}$	244	401
4	279	448

COLORS & APPROXIMATE TEMPERATURE FOR CARBON STEEL

Black Red	990°F
Dark Blood Red	1,050°F
Dark Cherry Red	1,175°F
Medium Cherry Red	1,250°F
Full Cherry Red	1,375°F
Light Cherry, Scalding	1,550°
Salmon, Free Scalding	1,650°F
Light Salmon	1,725°F
Yellow	1,825°F
Light Yellow	1,975°F
White	2,220°F

TOTAL THERMAL EXPANSION OF PIPING MATERIAL

(Inches Per 100 Ft. Above 32°F)

Temp °F	Carbon & Carbon Molly Steel	Cast Iron	Copper	Brass & Bronze	Wrought Iron
32	0.0	0.0	0.0	0.0	0.0
100	0.5	0.5	0.8	0.8	0.5
150	0.8	0.8	1.4	1.4	0.9
200	1.2	1.2	2.0	2.0	1.3
250	1.7	1.5	2.7	2.6	1.7
300	2.0	1.9	3.3	3.2	2.2
350	2.5	2.3	4.0	3.9	2.6
400	2.9	2.7	4.7	4.6	3.1
450	3.4	3.1	5.3	5.2	3.6
500	3.8	3.5	6.0	5.9	4.1
550	4.3	3.9	6.7	6.5	4.6
600	4.8	4.4	7.4	7.2	5.2
650	5.3	4.8	8.2	7.9	5.6
700	5.9	5.3	9.0	8.5	6.1
750	6.4	5.8	–	–	6.7
800	7.0	6.3	–	–	7.2
850	7.4	–	–	–	–
900	8.0	–	–	–	–
950	8.5	–	–	–	–
1000	9.1	–	–	–	–

WEIGHTS OF METALS

Material	Chemical Symbol	Wt.in Lbs. Per Cubic In.	Wt. in Lbs. Per Cubic Ft.
Aluminum	Al	0.093	160
Antimony	Sb	0.2422	418
Brass	–	0.303	524
Bronze	–	0.32	552
Chromium	Cr	0.2348	406
Copper	Cu	0.323	558
Gold	Au	0.6975	1,205
Iron (cast)	Fe	0.26	450
Iron (wrought)	Fe	0.2834	490
Lead	Pb	0.4105	710
Maganese	Mn	0.2679	463
Mercury	Hg	0.491	849
Molybdenum	Mo	0.309	534
Monel	–	0.318	550
Platinum	Pt	0.818	1,413
Steel (mild)	–	0.2816	490
Steel (stainless)	–	0.277	484
Tin	Sn	0.265	459
Titanium	Ti	0.1278	221
Zinc	Zn	0.258	446

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Specific Gravity of Gases

Dry Air (1 cu. Ft. at 60°F. & 29.92" Hg. Weighs.07638 pound)		1.000
Acetylene	C_2H_2	0.91
Ethane	C_2H_4	1.05
Methane	CH_4	0.554
Ammonia	NH_3	0.596
Carbon-dioxide	CO_2	1.53
Carbon_monoxide	CO	0.967
Butane	C_4H_{10}	2.067
Butene	C_4H_8	1.93
Chlorine	Cl_2	2.486
Helium	He	0.138
Hydrogen	H_2	0.0696
Nitrogen	N_2	0.9718
Oxygen	O_2	1.1053

Specific Gravity of Liquids

Liquid	Temp °F	Specific Gravity
Water (1 cu.-ft. weights 62.41 lb.)	50	1.00
Brine (Sodium Chloride 25%)	32	1.20
Pennsylvania Crude Oil	80	0.85
Fuel Oil No. 1 and 2	85	0.95
Gasoline	80	0.74
Kerosene	85	0.82
Lubricating Oil SAE 10-20-30	115	0.94

Typical BTU Values of Fuels

ASTM RANK SOLIDS	BTU VALUES PER POUND
Anthracite Class I	11,230
Bitiminous Class II Group 1	14,100
Bitiminous Class II Group 3	13,080
Sub-Bituminous Class III Group 1	10,810
Sub-Bituminous Class III Group 2	9,670

LIQUIDS	BTU VALUES PER GALLON
Fuel Oil No. 1	136,000
Fuel Oil No. 2	138,000
Fuel Oil No. 4	145,000
Fuel Oil No. 5	148,000
Fuel Oil No. 6	152,000

GASES	BTU VALUES PER CU. FT.
Natural Gas	935 to 1132
Producers Gas	163
Illuminating Gas	534
Mixed (Coke oven and water gas)	545

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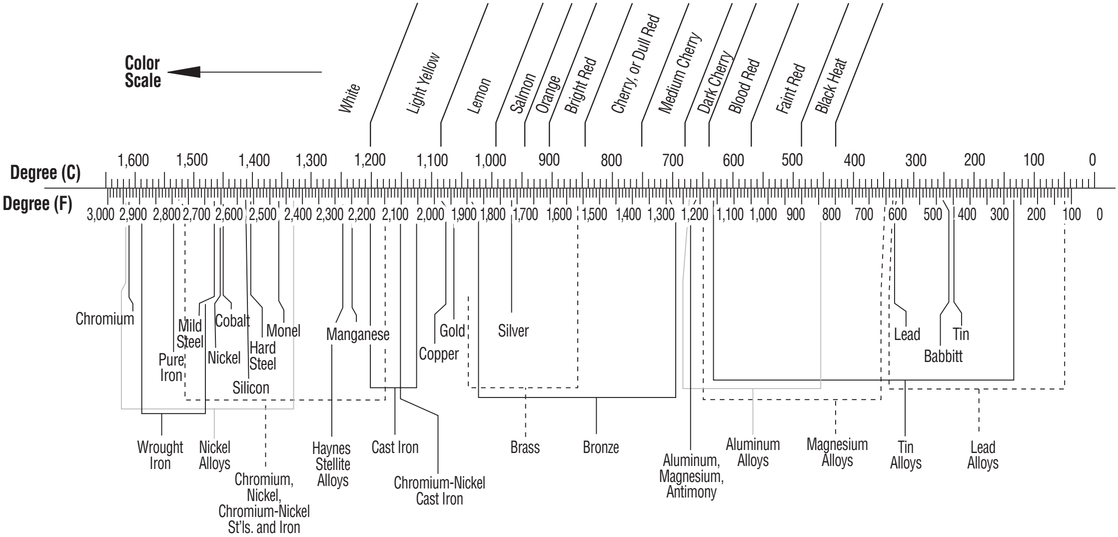
MELTING POINT OF METALS

Melting Points of Metals
& Alloys of Practical Importance



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USEFUL DEFINITIONS

ALLOY STEEL: A Steel which owes its distinctive properties to elements other than carbon.

AREA OF A CIRCLE: The measurement of the surface within a circle. To find the area of a circle, multiply the product of the radius times the radius by Pi (3.142). Commonly written $A = \pi r^2$.

BRAZE WELD OR BRAZING: A process of joining metals using a nonferrous filler metal or alloy, the melting point of which is higher than 800°F but lower than that of the metals to be joined.

BUTT WELD: A circumferential weld in pipe fusing the abutting pipe walls completely from inside wall to outside wall.

CARBON STEEL: A steel which owes its distinctive properties chiefly to the various percentages of carbon (as distinguished from the other elements) which it contains.

CIRCUMFERENCE OF A CIRCLE: The measurement around the perimeter of a circle. To find the circumference, multiply Pi (3.142) by the diameter. (Commonly written as πd).

COEFFICIENT OF EXPANSION: A number indicating the degree of expansion or contraction of a substance.

The coefficient of expansion is not constant and varies with changes in temperature. For linear expansion it is expressed as the change in length of one unit of length of a substance having one degree rise in temperature.

CORROSION: The gradual destruction or alteration of a metal or alloy caused by direct chemical attack or by electrochemical reaction.

CREEP: The plastic flow of pipe within a system; the permanent set in metal caused by stresses at high temperatures. Generally associated with a time rate of deformation.

DIAMETER OF A CIRCLE: A straight line drawn through the center of a circle from one extreme edge to the other. Equal to twice the radius.

DUCTILITY: The property of elongation, above the elastic limit, but under the tensile strength.

A measure of ductility is the percentage of elongation of the fractured piece over its original length.

ELASTIC LIMIT: The greatest stress which a material can withstand without a permanent deformation after release of the stress.

EROSION: The gradual destruction of metal or other material by the abrasive action of liquids, gases, solids or mixtures thereof.

RADIUS OF A CIRCLE: A straight line drawn from the center to the extreme edge of a circle.

SOCKET FITTING: A fitting used to join pipe in which the pipe is inserted into the fitting. A fillet weld is then made around the edge of the fitting and the outside wall of the pipe.

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USEFUL DEFINITIONS

SOLDERING: A method of joining metals using fusible alloys, formerly tin and lead, having melting points under 700°F

STRAIN: Change of shape or size of a body produced by the action of a stress.

STRESS: The intensity of the internal, distributed forces which resist a change in the form of a body. When external forces act on a body they are resisted by reactions within the body which are termed stresses.

TENSILE STRESS: One that resists a force tending to pull a body apart.

COMPRESSIVE STRESS: One that resists a force tending to crush a body.

SHEARING STRESS: One that resists a force tending to make one layer of a body slide across another layer.

TORSIONAL STRESS: One that resists forces tending to twist a body.

TENSILE STRENGTH: The maximum tensile stress which a material will develop. The tensile strength is usually considered to be the load in pounds per square inch at which a test specimen ruptures.

TURBULENCE: Any deviation from parallel flow in a pipe due to rough inner walls, obstructions or directional changes.

VELOCITY: Time rate of motion in a given direction and sense, usually expressed in feet per second.

VOLUME OF A PIPE: The measurement of the space within the walls of the pipe. To find the volume of a pipe, multiply the length (or height) of the pipe by the product of the inside radius times the inside radius by Pi (3.142). Commonly written as $V = h\pi r^2$.

WELDING: A process of joining metals by heating until they are fused together, or by heating and applying pressure until there is a plastic joining action. Filler metal may or may not be used.

YIELD STRENGTH: The stress at which a material exhibits a specified limiting permanent set. (.2% or.5%)

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Unit Conversions

FLOW

1 gpm	=	0.134 cu. ft. per min
	=	500 lb.per hr. x sp. gr.
500 lb. per hr.	=	1 gpm / sp. gr.
1 cu. ft. per min. (cfm)	=	448.8 gal. per hr. (gph)

POWER

1 Btu per hr.	=	0.293 watt
	=	12.96 ft. lb. per min.
	=	0.00039 hp
1 ton refrigeration (U.S.)	=	288,000 Btu per 24 hr.
	=	12,000 Btu per hr.
	=	200 Btu per min.
	=	83.33 lb. ice melted per 24 hr. from & at 32°F.
	=	2,000 lb. ice melted per 24 hr. from & at 32°F
1 hp	=	550 ft. lb. per sec.
	=	746 watt
	=	2,545 Btu per hr.
1 boiler hp	=	33,480 Btu per hr.
	=	34.5 lb. water evap. per hr. from & at 212°F
	=	9.8 kw.
1 kw.	=	3,413 Btu per hr.

MASS

1 lb. (avoir.)	=	16 oz. (avoir.)
	=	7,000 grain
1 ton (short)	=	2,000 lb.
1 ton (long)	=	2,240 lb.

PRESSURE

1 lb. Per sq. in.	=	3.13 ft. water at 60°F
	=	2.04 in. hg at 60°F
1 ft. water at 60°F	=	.433 lb. per sq. in.
	=	.884 in. hg at 60°F
1 in. Hg at 60°F	=	.49 lb. per sq. in.
	=	1.13 ft. water at 60°F
1 lb. Per sq. in.	=	lb. per sq. in gauge (psig)
Absolute (psia)	=	14.7

TEMPERATURE

°C	=	(°F-32) x 5/9

VOLUME

I gal. (U.S.)	=	128 fl. oz. (U.S.)
	=	231 cu. in.
	=	.833 gal. (Brit.)
1 cu. ft.	=	7.48 gal. (U.S.)

WEIGHT OF WATER

1 cu. ft. at 50°F.	=	62.41 lb.
1 gal. at 50°F.	=	8.34 lb.
1 cu. ft. of ice	=	57.2 lb.
1 cu. ft. at 39.2°F.	=	62.43 lb.

Note: Water is at its greatest density at 39.2°F

WEIGHT OF LIQUID

1 gal. (U.S.)	=	8.34 lb. x sp. gr.
1 cu. ft.	=	62.4 lb. x sp. gr.
1 lb.	=	.12 U.S. gal. / sp. gr.
	=	.016 cu. ft. / sp. gr.

WORK

1 Btu (mean)	=	778 ft. lb.
	=	.293 watt hr.
	=	$^{1}/_{180}$ of heat required to change temp of 1 lb. water from 32°F to 212°F
1 hp-hr	=	2545 Btu (mean)
	=	.746 kwhr
1 Kwhr	=	3413 Btu (mean)
	=	1.34 hp-hr

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Geometry Formulas

A = Area

A_1 = Surface area of solids

V = Volume

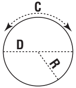
C = Circumference

π = Pi (3.14159)

Circle

$A = \pi \bullet R^2$ $C = \pi \bullet D$

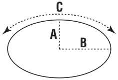
$R = D / 2$ $D = 2 \bullet R$



Ellipse

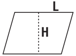
$A = \pi \bullet A \bullet B$

$C = 2 \bullet \pi \bullet \sqrt{\frac{A^2 + B^2}{2}}$



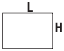
Parallelogram

$A = H \bullet L$



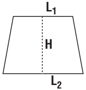
Rectangle

$A = H \bullet L$



Trapezoid

$A = H \bullet (L_1 + L_2) / 2$



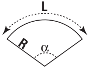
Sector of Circle

$A = (\pi \bullet R^2 \bullet \alpha) / 360$

$L = (\pi \bullet R \bullet \alpha) / 180$

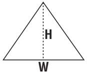
$\alpha = (L \bullet 180) / (\pi \bullet R)$

$R = (L \bullet 180) / (\pi \bullet \alpha)$



Triangle

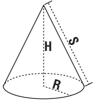
$A = (W \bullet H) / 2$



Cone

$A_1 = (\pi \bullet R \bullet S) + (\pi \bullet R^2)$

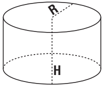
$V = (\pi \bullet R^2 \bullet H) / 3$



Cylinder

$A_1 = (2 \bullet \pi \bullet R^2) + (2 \bullet \pi \bullet R \bullet H)$

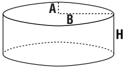
$V = \pi \bullet R^2 \bullet H$



Elliptical Tanks

$A_1 = 2 \bullet \pi \bullet \left(A \bullet B + H \bullet \sqrt{\frac{A^2 + B^2}{2}}\right)$

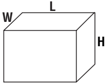
$V = \pi \bullet A \bullet B \bullet H$



Rectangular Solid

$A_1 = 2 \bullet [(W \bullet L) + (L \bullet H) + (H \bullet W)]$

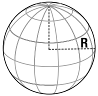
$V = W \bullet L \bullet H$



Sphere

$A_1 = 6 \bullet \pi \bullet R^2$

$V = (4 \bullet \pi \bullet R^3) / 3$



Capacity in Gallons

For the above contains, capacity in gallons (G) is:

G = (V / 231); when V is in cubic inches

G = (V • 7.48); when V is in cubic feet

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SPRINKLER SYSTEM FORMULAS

Simple Flow Rate

$Q = K \bullet P^{0.5}$, where

Q = flow rate (GPM)
K = discharge coefficient of pipe
P = pressure (PSI)

General Volumetric Flow Rate

$Q = 29.8 \bullet D^2 Cd \bullet P^{0.5}$, where

Q = flow rate (GPM)
D = outlet diameter (Inches)
Cd = discharge coefficient based on outlet geometry
P = pressure (PSI)

Pressure Tank Sizing (Tank above sprinklers)

$P = (30/A) - 15$, where

P = air pressure in tank (PSI)
A = proportion of air in the tank

Pressure Tank Sizing (Tank below sprinklers)

$P = (30/A) - 15 + (0.43 \bullet H/A)$, where

P = air pressure carried in tank (PSI)
A = proportion of air in the tank
H = height of highest sprinkler above tank bottom (Ft)

Pressure Tank Sizing (Hydraulically calculated)

$Pi = [(Pf + 15)/A] - 15$, where

Pi = tank air pressure to use (PSI)
A = proportion of air in the tank
Pf = system pressure req'd per hydraulic calc. (PSI)

Darcy-Weisbach Formula for Friction Loss

$HL = f \bullet (L/D) \bullet (v^2/2g)$, where

HL = friction loss (Ft)
Re = Reynolds number (pVD / μ)
f = friction factor (f=64/Re)
v = water velocity (Ft/Sec)
g = gravitational constant (32.174ft/sec^2)
D = pipe diameter (Ft)
L = pipe length (Ft)

PRESSURE VELOCITY

$Pv = 0.001123 \bullet Q^2 / D^4$, where

Pv = pressure velocity (PSI)
Q = flow rate (GPM)
D = internal dia. of pipe (Inches)

Hazen-Williams Formula for Pressure Loss

$P = (4.52 \bullet Q^{1.85}) / (C^{1.85} \bullet d^{4.87})$, where:]

P = pressure loss (PSI) per lineal ft.
Q = flow rate (GPM)
C = friction factor of pipe (constant)
d = internal diameter of pipe (Inches)

Typical "C" values:

Unlined cast or ductile iron.	100
Black steel (dry sys.incl.preaction). .	100
Black steel (wet sys.incl.deluge) . . .	120
Galvanized (all).	120
Plastic (listed)– all	150
Cement lined cast or ductile iron . .	140
Copper tube or stainless steel	150

Hazen-Williams Formula for Pressure Loss (in SI units)

$P = 6.05 \bullet 10^5 \bullet Q^{1.85} / (C^{1.85} \bullet d^{4.87})$, where

P = pressure loss (Bars) per lineal meter
Q = flow rate (Litre/Min)
C = friction factor of pipe (constant)
d = internal diameter of pipe (mm)

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Standard Conversions

To Change	To	Multiply By
Inches	Feet	0.0833
Inches	Millimeters	25.4
Feet	Inches	12
Feet	Yards	0.3333
Yards	Feet	3
Square Inches	Square feet	0.00694
Square feet	Square inches	144
Square feet	Square yards	0.11111
Square yards	Square feet	9
Cubic Inches	Cubic feet	0.00058
Cubic feet	Cubic inches	1728
Cubic feet	Cubic yards	0.03703
Cubic yards	Cubic feet	27
Cubic Inches	Gallons	0.00433
Cubic feet	Gallons	7.48
Gallons	Cubic inches	231
Gallons	Cubic feet	0.1337
Gallons	Pounds of water	8.33
Pounds of water	Gallons	0.12004
Ounces	Pounds	0.0625
Pounds	Ounces	16

To Change	To	Multiply By
Inches of water	Pounds per square inch	0.0361
Inches of water	Inches of mercury	0.0735
Inches of water	Ounces per square inch	0.578
Inches of water	Pounds per square foot	5.2
Inches of mercury	Inches of water	13.6
Inches of mercury	Feet of water	1.1333
Inches of mercury	Pounds per square inch	0.4914
Ounces per square inch	Inches of mercury	0.127
Ounces per square inch	Inches of water	1.733
Pounds per square inch	Inches of water	27.72
Pounds per square inch	Feet of water	2.31
Pounds per square inch	Inches of mercury	2.04
Pounds per square inch	Atmospheres	0.0681
Feet of water	Pounds per square inch	0.434
Feet of water	Pounds per square foot	62.5
Feet of water	Inches of mercury	0.8824
Atmospheres	Pounds per square inch	14.696
Atmospheres	Inches of mercury	29.92
Atmospheres	Feet of water	34
Long tons	Pounds	2240
Short tons	Pounds	2000
Short tons	Long tons	0.89285

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HARDNESS CONVERSION NUMBERS

(1) Brinell Indentation Diameter, MM.

(2) Standard or Tungsten Carbide Ball, Brinell Hardness No. – 10MM. Ball 3000–KG. Load

(3) Diamond Pyramid Hardness Number. 50-KG. Load

(4) Rockwell Hardness Number B-Scale 100-KG. Load; $^{1}/_{16}$" Diameter Ball

(5) Rockwell Hardness Number C-Scale 150-KG. Load Brale Penetrator

Rockwell Superficial Hardness Number

Superficial Brale Penetrator:

(6) 15-N Scale 15-KG. Load

(7) 30-N Scale 30-KG. Load

(8) 45-N Scale 45-KG. Load

(9) Shore Scleroscope Hardness Number

(10) Tensile Strength (Approx.) 1000 PSI.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
2.95	429	455	–	45.7	83.4	64.6	49.9	61	217
3.00	415	440	–	44.5	82.8	63.5	48.4	59	210
3.05	401	425	–	43.1	82.0	62.3	46.9	58	202
3.10	388	410	–	41.8	81.4	61.1	45.3	56	195
3.15	375	396	–	40.4	80.6	59.9	43.6	54	188
3.20	363	383	–	39.1	80.0	58.7	42.0	52	182
3.25	352	372	(110.0)	37.9	79.3	57.6	40.5	51	176
3.30	341	360	(109.0)	36.9	78.6	56.4	39.1	50	170
3.35	331	350	(108.5)	35.5	78.0	55.4	37.8	48	166
3.40	321	339	(108.0)	34.3	77.3	54.3	36.4	47	160
3.45	311	328	(107.5)	33.1	76.7	53.3	34.4	46	155
3.50	302	319	(107.0)	32.1	76.1	52.2	33.8	45	150
3.55	293	309	(106.0)	30.9	75.5	51.2	32.4	43	145
3.60	285	301	(105.5)	29.9	75.0	50.3	31.2	–	141
3.65	277	292	(104.5)	28.8	74.4	49.3	29.9	41	137
3.70	269	284	(104.0)	27.6	73.7	48.3	28.5	40	133
3.75	262	276	(103.0)	26.6	73.1	47.3	27.3	39	129
3.80	255	269	(102.0)	25.4	72.5	46.2	26.0	38	126
3.85	248	261	(101.0)	24.2	71.7	45.1	24.5	37	122
3.90	241	253	100.0	22.8	70.9	43.9	22.8	36	118
3.95	235	247	99.0	21.7	70.3	42.9	21.5	35	115
4.00	229	241	98.2	20.5	69.7	41.9	20.1	34	111
4.05	223	234	97.3	(18.8)	–	–	–	–	-
4.10	217	228	96.4	(17.5)	–	–	–	33	105
4.15	212	222	95.5	(16.0)	–	–	–	–	102
4.20	207	218	94.6	(15.2)	–	–	–	32	100
4.25	201	212	93.8	(13.8)	–	–	–	31	98
4.30	197	207	92.8	(12.7)	–	–	–	30	95
4.35	192	202	91.9	(11.5)	–	–	–	29	93
4.40	187	196	90.7	(10.0)	–	–	–	–	90
4.45	183	192	90.0	(9.0)	–	–	–	28	89
4.50	179	188	89.0	(8.0)	–	–	–	27	87
4.55	174	182	87.8	(6.4)	–	–	–	–	85
4.60	170	178	86.8	(5.4)	–	–	–	26	83
4.65	167	175	86.0	(4.4)	–	–	–	–	81
4.70	163	171	85.0	(3.3)	–	–	–	25	79
4.80	156	163	82.9	(0.9)	–	–	–	–	76
4.90	149	156	80.8	–	–	–	–	23	73
5.00	143	150	78.7	–	–	–	–	22	71
5.10	137	143	76.4	–	–	–	–	21	67
5.20	131	137	74.0	–	–	–	–	–	65
5.30	126	132	72.0	–	–	–	–	20	63
5.40	121	127	69.8	–	–	–	–	19	60
5.50	116	122	67.6	–	–	–	–	18	58
5.60	111	117	65.7	–	–	–	–	15	56

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Coated Arc Welding Electrodes - Types & Styles

A. W. S. Classification

E60**10** **Direct Current, Reverse polarity, All Positions.**
All purpose. Moderately smooth finish. Good penetration. This is the electrode used for most carbon steel pipe welding.

E60**11** **Alternating Current, All Positions.**
All purpose. Moderately smooth finish. Good penetration.

E60**12** **Direct Current, Straight Polarity, All Positions.**
High bead. Smooth. Fast. "Cold rod".

E60**13** **Alternating Current, All Positions.**
High bead. Smooth. Fast. "Cold rod".

E60**15** **Direct Current, Reverse polarity, All Positions.**
"Low hydrogen" electrode.

E60**16** **Direct Current or Alternating Current, All Positions**
"Low hydrogen" electrode.

E60**18** **Direct Current, All Positions.**
"Low hydrogen" iron powder electrodes

E60**20** **Direct Current, Straight Polarity, Flat Position Only.**
Flat bead. Smooth. Fast. Deep penetration. Can be used w/ A.C. also. "Hot rod".

E60**24** and E60**27** **Direct Current, Straight Polarity or Alternating and Current, Flat Position Only. Flat bead. Smooth. Fast. Deep penetration.** "Iron powder electrodes".

NOTE: This information also applies to E70, E80, E90, and E100 Series.

The last two numbers **(in bold type)** designate the types or styles and the first two numbers the minimum specified tensile strength in 1,000 psi of the weld deposit as welded.

Physical Properties of E60 & E70 Series Electrodes

TYPICAL VALUES

AWS ASTM Electrode	Tensile Strength	Yield Strength	Elongation	Red. in Area Min. %
E6010	62,000–70,000	52,000–58,000	22 to 28%	35
E6011	62,000–73,000	52,000–61,000		
E6012	68,000–78,000	55,000–65,000	17 to 22%	25

MINIMUM VALUES

AWS ASTM Electrode	Tensile Strength	Yield Strength	Elongation
E7010	70,000	57,000	22
E7011	70,000	57,000	22
E7015	70,000	57,000	22
E7016	70,000	57,000	22
E7020	70,000	52,000	25

WELDING AND BRAZING TEMPERATURES

Carbon Steel Welding	2700–2790°F
Stainless Steel Welding	2490–2730°F
Cast Iron Welding	1920–2500°F
Copper Welding and Brazing	1980°F
Brazing Copper-Silicon with Phosphor-Bronze	1850–1900°F
Brazing Naval Bronze with Manganese Bronze	1600–1700°F
Silver Solder	1175–1600°F
Low Temperature Brazing	1175–1530°F
Soft Solder	200–730°F
Wrought Iron	2700–2750°F

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TROUBLE SHOOTING ARC WELDING EQUIPMENT

PROBLEM: Welder will not start (Starter not operating)

Cause: Power circuit dead.
Remedy: Check voltage.

Cause: Broken power lead.
Remedy: Repair.

Cause: Wrong supply voltage.
Remedy: Check nameplate against supply.

Cause: Open power switches
Remedy: Close.

Cause: Blown fuses.
Remedy: Replace.

Cause: Overload relay tripped.
Remedy: Let set cool. Remove cause of overloading.

Cause: Open circuit to starter button.
Remedy: Repair.

Cause: Defective operating coil.
Remedy: Replace.

Cause: Mechanical obstruction in contactor.
Remedy: Remove.

PROBLEM: Welder will not start (Starter operating)

Cause: Wrong motor connections.
Remedy: Check connection diagram.

Cause: Wrong supply voltage.
Remedy: Check nameplate against supply.

Cause: Rotor stuck.
Remedy: Try turning by hand.

Cause: Power circuit single-phased.
Remedy: Replace fuse; repair open line.

Cause: Starter single-phased.
Remedy: Check contact of starter tips.

Cause: Poor motor connection.
Remedy: Tighten.

Cause: Open circuit in windings.
Remedy: Repair.

PROBLEM: Welder runs but soon stops

Cause: Wrong relay heaters.
Remedy: Renewal part recommendations.

Cause: Welder overloaded.
Remedy: Considerable overlaod can be carried only for a short time.

Cause: Duty cycle too high.
Remedy: Do not operate continually at overload currents.

Cause: Leads too long or too narrow in cross section.
Remedy: Should be large enough to carry welding current without excessive voltage drop.

Cause: Power circuit single-phased.
Remedy: Check for one dead fuse or line.

Cause: Ambient temperature too high.
Remedy: Operate at reduced loads where temperature exceeds 100° F.

Cause: Ventilation blocked.
Remedy: Check air inlet & exhaust openings.

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TROUBLE SHOOTING ARC WELDING EQUIPMENT, CONT'D.

PROBLEM: Starter operates & blows fuse

Cause: Fuse too small.
Remedy: Should be two to three times rated motor current.

Cause: Short circuit in motor connections.
Remedy: Check starter & motor leads for insulation from around & from each other

PROBLEM: Welding arc is loud & spatters excessively

Cause: Current setting too high
Remedy: Check setting & output with ammeter

Cause: Polarity wrong
Remedy: Check polarity, try reversing, or an electrode of opposite polarity

PROBLEM: Welding arc sluggish

Cause: Current too low
Remedy: Check output, & current recommended for electrode being used

Cause: Poor connections
Remedy: Check all electrode-holder, cable & ground-cable connections. Strap iron is poor ground return

Cause: Cable long or too small
Remedy: Check cable voltage drop & change cable

PROBLEM: Touching set gives shock

Cause: Frame not grounded
Remedy: Ground solidly

PROBLEM: Generator control fails to vary current

Cause: Any part of field circuit may be short circuited or open circuited
Remedy: Find faulty contact & repair

PROBLEM: Welder starts but will not deliver welding current

Cause: Wrong direction of rotation
Remedy: See INITIAL STARTING

Cause: Brushes worn or missing
Remedy: Check that all brushes bear on commutator with sufficient tension

Cause: Brush connections loose
Remedy: Tighten

Cause: Open field circuit
Remedy: Check connection to rheostat, resistor, & auxiliary brush studs

Cause: Series field & armature circuit open
Remedy: Check with test lamp or bell ringer

Cause: Wrong driving speed
Remedy: Check name plate against speed of motor or belt drive

Cause: Dirt, grounding field coils
Remedy: Clean & reinsulate

Cause: Welding terminal shorted
Remedy: Electrode holder or cable grounded

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TROUBLE SHOOTING ARC WELDING EQUIPMENT, CONT'D.

PROBLEM: Welder generating but current falls off when welding

Cause: Electrode or ground connection loose
Remedy: Clean & tighten all connections

Cause: Poor ground
Remedy: Check ground-return circuit

Cause: Brushes worn worn off
Remedy: Replace with recommended grade. Sand to fit. Blow out carbon dust.

Cause: Weak brush spring pressure.
Remedy: Replace or readjust brush springs

Cause: Brush not properly fitted
Remedy: Sand brushes to fit

Cause: Brushes in backwards
Remedy: Reverse

Cause: Wrong brushes used
Remedy: Renewal part recommendations

Cause: Brush pigtails damaged
Remedy: Replace brushes

Cause: Rough or dirty commutator
Remedy: Turn down or clean commutator

Cause: Motor connection single-phased
Remedy: Check all connections

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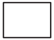
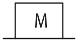
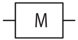
Basic Arc & Gas Welding Symbols

1. In plan or elevation, near, far, and both sides, locations refer to nearest member parallel to plane of drawing and not to others farther behind.
2. In section or end views only, when weld is not drawn, the side to which arrow points is considered near side.
3. Welds on both sides are of same size unless otherwise shown.
4. Symbols govern to break in continuity of structure or to extent of hatching or dimension lines.
5. Tail of arrow used for specification reference.
6. All welds are continuous and of user's standard propertions and all except V-grooved and bevel-grooved welds are closed unless otherwise shown.
7. When welds are drawn in section or end views, obvious information is not given by symbol.
8. In joints in which one member only is to be grooved, arrows point to that member.

Basic Weld Symbols

			GROOVE OR BUTT						
Back	**Fillet**	**Plug or Slot**	**Square**	**V**	**Bevel**	**U**	**J**	**Flare V**	**Flare Bevel**
									

Supplementary Weld Symbols

				CONTOUR		
Backing	**Spacer**	**Weld All-Around**	**Field Weld**	**Flush**	**Convex**	See AWS A2.4 for a detailed review of standard welding symbols
						

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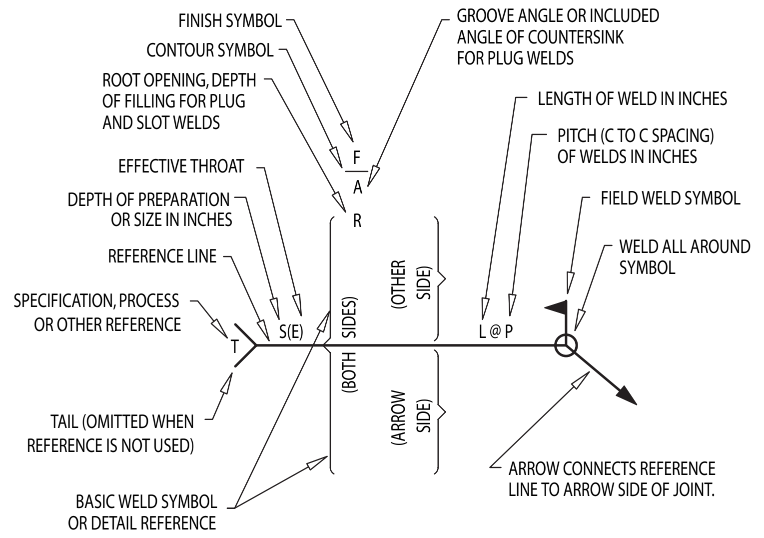
BASIC ARC & GAS WELDING SYMBOLS, CONT'D.

NOTE:

1. 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.
2. The perpendicular leg of ◺, |/, |J, |(weld symbols must be at left.
3. 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 other side symbol.
4. The point of the field weld symbol must point toward the tail.
5. Symbols apply between abrupt changes in direction of welding unless governed by the "All Around" symbol or otherwise dimensioned.

STANDARD LOCATION OF ELEMENTS OF A WELDING SYMBOL



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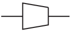
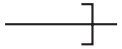
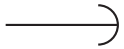
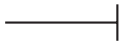
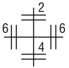
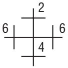
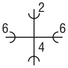
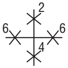
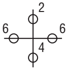
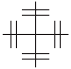
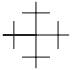
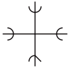
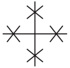
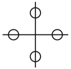
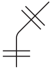
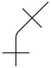
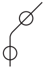
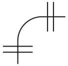
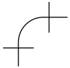
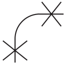
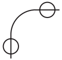
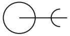
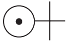
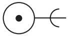
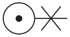
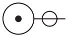
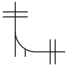
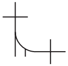
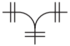
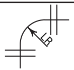
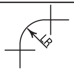
SYMBOLS FOR PIPE FITTINGS

	Flanged	Screwed	Bell & Spigot	Welded	Soldered
Bushing-Reducing					
Cap					
Cross (Reducing)					
Cross (Straight)					
Crossover					
Elbow - 45					

	Flanged	Screwed	Bell & Spigot	Welded	Soldered
Elbow - 90					
Elbow - Turned Down					
Elbow - Turned Up					
Elbow - Base					
Elbow - Double Branch					
Elbow - Long Radius					

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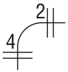
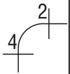
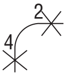
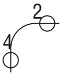
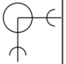
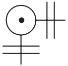
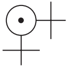
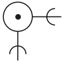
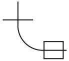
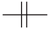
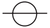
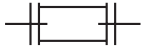
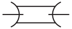
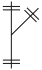
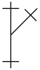
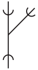
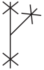
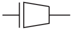
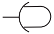
SYMBOLS FOR PIPE FITTINGS

	Flanged	Screwed	Bell & Spigot	Welded	Soldered
Elbow - Reducing					
Elbow - Side Outlet (Outlet Down)					
Elbow - Side Outlet (OutletUp)					
Elbow - Street					
Joint - Conn. Pipe					
Joint - Expansion					

	Flanged	Screwed	Bell & Spigot	Welded	Soldered
Lateral					
Orifice Plate					
Reducing Flange					
Plug - Bull					
Plug - Pipe					
Reducer - Concentric					

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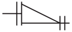
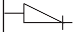
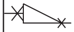
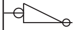
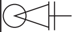
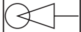
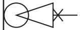
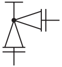
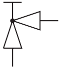
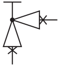
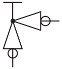
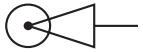
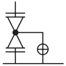
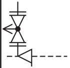
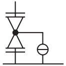
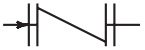
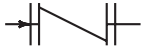
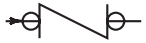
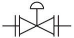
SYMBOLS FOR PIPE FITTINGS

	Flanged	Screwed	Bell & Spigot	Welded	Soldered
Reducer - Eccentric					
Valve - Gate Angle Gate (Plan)					
Valve - Globe Angle Globe (Elevation)					
Valve - Globe (Plan)					
Valve (Auto)- B-Pass					
Valve (Auto)- Governor Oper.					

	Flanged	Screwed	Bell & Spigot	Welded	Soldered
Valve - Reducing					
Valve - Check (Straight Way)					
Valve - Cock					
Valve - Diaphragm					
Valve - Float					
Valve - Gate*					

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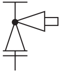
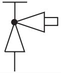
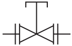
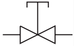
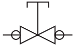
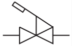
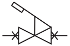
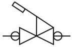
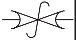
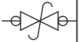
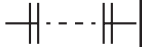
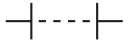
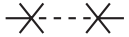
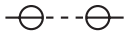
SYMBOLS FOR PIPE FITTINGS

	Flanged	Screwed	Bell & Spigot	Welded	Soldered
Valve - Gate Motor Operated					
Valve - Globe					
Valve - Globe Motor Operated					
Valve - Angle Hose Angle					
Valve - Hose Gate					
Valve - Hose Globe					

	Flanged	Screwed	Bell & Spigot	Welded	Soldered
Valve - Lockshield					
Valve - Quick Opening					
Valve - Saftey					
Sleeve					

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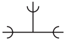
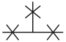
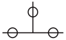
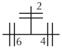
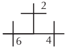
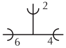
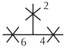
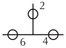
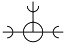
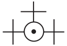
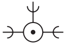
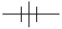
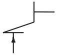
SYMBOLS FOR PIPE FITTINGS

	Flanged	Screwed	Bell & Spigot	Welded	Soldered
Tee - Straight					
Tee - Outlet Up					
Tee - Outlet Down					
Tee - Double Sweep					
Tee - Reducing					
Tee - Single Sweep					

	Flanged	Screwed	Bell & Spigot	Welded	Soldered
Tee - Side Outlet (Outlet Down)					
Tee - Side Outlet (Outlet Up)					
Union					
Angle Valve Check					
Angle Valve Gate					

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Wire Rope

Overview

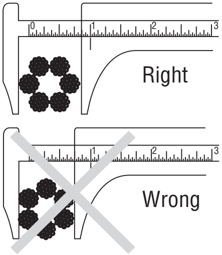
Strength of wire ropes vary, depending on the material from which the individual strands are made and the method used in forming the cable, ranging between 30 and 100 tons per square inch. Primarily there are 3 classes of wire rope:

(1) **Iron** – Iron wire is soft with low tensile strength of 30 to 40 tons per square inch. Commonly used for drum type elevator cables and to some extent for derrick guys; being replaced by low-carbon steel wire in these uses.

(2) **Cast Steel** – May have a tensile strength up to 90 tons per square inch and because of its greater strength is generally used for hoisting purposes. To check quickly whether a piece of wire is iron or cast steel, bend it. Iron will bend easily and take a long time to regain its original shape, while cast steel will be harder to bend and will snap back to its original shape very quickly.

(3) **Plow Steel** - Plow steel wire rope is made from high grade, open hearth furnace steel and has an average tensile strength of 110 tons per square inch. This is the best and safest wire rope for cranes, derricks, dredges and slings or straps for heavy loads.

Wire rope is usually larger than the nominal diameter and may exceed the nominal diameter by the amounts shown in the U.S. Federal Specification for Wire Rope.



Lubrication — Wire Rope

All wire rope, whether used indoors or out, should be considered as a group of moving wires constantly rubbing against one another. The resulting friction causes incessant wear on the moving parts of the wire rope or cable and will shorten its life very rapidly unless lubricants are used to overcome the friction. Lubrication also prevents rusting.

Lubricating intervals will depend on the types and amount of work encountered. Under average conditions, if worked steadily on equipment, wire rope or cable will require lubrication once every 3 weeks. Where heavy abrasive dusts exist, more frequent lubrication is in order. Rusty ropes may break without warning.

Sheaves

The life of wire rope or cable is directly affected by the condition and size of the sheaves over which it is used. Sheaves should be at least 16 x the diameter of the rope or cable that is used over them. In passing over a sheave, the inside portion of the cable, which is against the sheave, is shortened and compression is developed in that section of the cable. The outside portion (away from the sheave) is lengthened or stretched, causing tension in that section. These compressive and tensional stresses combine to create bending

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stresses which increase rapidly as the diameter of the sheaves decrease. As these bending stresses cause much undue wear and directly shorten the safe working life of the rope or cable, the ratio mention between sheaves and rope should be maintained.

New wire rope may be damaged and not work properly in sheaves that have become worn or in which the grooves have become irregular in shape. When sheaves are worn or damaged, it is more economical to renew the sheaves rather than to allow excessive wear on the cable.

One cause of very severe wear in wire rope or cables is reverse bending, which will shorten the life of the rope by approximately 1/2. Reverse bending refers to the bending of a cable or rope over sheaves, first in one direction then in another.

Another cause of severe rope wear is twisting of the fall rope. When the fall rope is twisted and a hoist is made, the wear produced is equal to more than that resulting from weeks of normal use. The person in charge of lifting operations should guard against twisting of the fall rope and should not allow a lift to be made if the fall rope is twisted.

No. of Crosby or Safety Clips & Dist. Between Clips Needed for Safety

Rope Dia. Inches	No. of Clips	Dist. Between Clips, Inches
1/4 – 3/8	3	2 1/4
7/16 – 5/8	3	3 3/4
3/4 – 1 1/8	4	6 3/4
1 1/4 – 1 1/2	5	9
1 5/8 – 1 3/4	6	10 1/2
2 and over	7	6 x diam. of cable

HANDLING CABLE OR WIRE ROPE

Cable or wire rope must not be coiled or uncoiled like manila rope. Cable or wire rope must be taken off the reel in a straight line, avoiding kinking. The reel may be mounted on a heavy pipe or roller to facilitate unwinding. If space is limited, the cable as it comes off the reel may be layed out in a figure 8, after which it can be reeved into the line for which it is intended.

CLAMP FASTENINGS

When it is necessary to make a short bend. as in attaching wire rope or when it is to be looped. thimbles should always be used.

In clamping a strap or an eye, the loose or “dead” end is clamped against the main part of the rope with the damps spaced apart a distance equal to 6 x diameter of the rope. Clamp fastenings seldom develop more than 4/5 of rope strength at best.

The point of greatest fatigue and/or wear in a rope usually develops at or near the end where it is clamped around the boom or where attached to the becket on the block. Clamps should be inspected at least once weekly and tightened if they show signs of loosening. All clamped or spliced fastenings, especially those on cranes or derricks, should be shifted and changed at least once every six months.

U BOLTS OF ALL CLAMPS MUST BE ON THE DEAD END OF THE ROPE.

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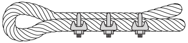
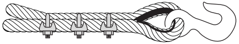
WIRE ROPE

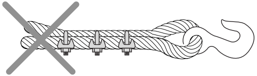


CORRECT - U-Bolts on short end of rope. (No distortion on live end of rope.)

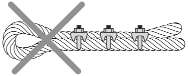


CORRECT

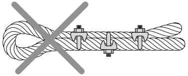
INCORRECT - Thimble should be used to increase strength of eye and reduce wear on rope.



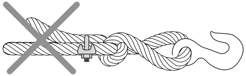
INCORRECT - U-Bolts on live end of rope. (Causes mashed spots on live end of rope.)



INCORRECT - Staggered clips. (Causes a mashed spot in live end of rope due to incorrect position of center clip.)



INCORRECT - Wire rope knot with clip efficiency 50% or less



SAFE LOAD (IN POUNDS) ON IMPROVED PLOW STEEL WIRE ROPE

(6 Strands, 19 or 37 Wires per Strand, Hempcore)

Dia. In.	Circum. In.	Single Vertical Wirerope	TWO PART SLING 60°	45°	30°	Wt./Ft. Lbs.	Breaking Strength Tons (2000 lbs)
1/4	3/4	1,100	1,900	1,550	1,100	0.10	2.74
3/8	1 1/8	2,500	4,230	3,460	2,450	0.23	6.1
1/2	1 1/2	4,300	7,450	6,080	4,300	0.40	10.7
5/8	2	6,600	11,600	9,430	6,670	0.63	16.7
3/4	2 1/4	9,400	16,500	13,450	9,520	0.90	23.8
7/8	2 3/4	12,800	22,300	18,200	12,800	1.23	32.2
1	3	16,000	29,000	23,690	16,790	1.60	41.8
1 1/8	3 1/2	21,000	36,450	29,780	21,040	2.03	52.6
1 1/4	4	26,000	44,700	36,570	25,870	2.50	64.6
1 3/8	4 1/4	31,000	53,800	43,900	31,050	3.03	77.7
1 1/2	4 3/4	37,000	63,700	52,000	36,800	3.60	92.0
1 5/8	5	43,000	74,400	60,700	42,900	4.23	107.0
1 3/4	5 1/2	49,600	86,000	70,260	49,700	4.90	124.0
2	6 1/4	64,000	110,700	90,400	64,000	6.40	160.0
2 1/8	6 5/8	63,000	125,200	102,200	72,200	7.22	181.0
2 1/4	7 1/8	81,000	140,300	114,600	79,000	8.10	202.0
2 1/2	7 7/8	98,000	170,000	139,100	98,400	10.00	246.0
2 3/4	8 5/8	117,600	203,500	166,700	117,700	12.10	294.0

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GRUVLOK® XTREME™ LUBRICANT

Gruvlok® Xtreme™ Lubricant has been developed for use with Gruvlok couplings in services where improved lubrication is beneficial. This lubricant has an operating temperature range from -65°F to 400°F, well exceeding the temperature range of Gruvlok gaskets. This lubricant is waterproof, thereby eliminating water wash-out and it will not dry out in the absence of water. There are five primary applications where the Xtreme Lubricant will provide increased benefits: low temperature applications (below -20˚F), high temperature applications (above 150˚F), applications where increased pipe joint flexibility is needed, lubrication of gaskets in copper systems, and for the lubrication of gaskets on HDPE couplings. Since it is formulated from a non-hydro carbon base, it can be used with EPDM, Nitrile and Fluoroelastomer gasket materials. **It is not to be used with Silicone gaskets.**

- In low temperature applications the gasket will shrink, thereby lowering the sealing force on the gasket sealing lips. The temperature change will also force the gasket to slightly re-position itself. This will cause pipe end sealing surfaces, with small cuts or damage, to become more susceptible to leakage. Gruvlok Xtreme Lubricant will maintain it's lubricating properties at lower temperatures allowing a properly lubricated pipe end and gasket (assembly) to re-position itself during temperature cycles.
- For high temperature service and copper systems, it is required that the gasket be lubricated not only on the outside, as with the normal installation of a Gruvlok gasket, but also on the inside. Lubrication on the inside of the gasket is easily accomplished by turning the gasket inside out and applying the lubricant. Gruvlok Xtreme Lubricant will maintain it's lubricating properties at higher temperatures, allowing a properly lubricated pipe end and gasket assembly to re-position itself during temperature cycles. Lubrication of the pipe end and gasket will help the gasket to adjust into the proper sealing position during temperature cycles. The lubricant on the interior of the gasket will act to improve the chemical resistance of the gasket material by providing a thin lubricant barrier between the piping system fluid and the gasket surface. This is particularly important at higher temperatures where oxidizing agents in the piping system become more aggressive. **However, gasket chemical compatibility must still be considered.**

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GRUVLOK® XTREME™ LUBRICANT (CONT'D)

- The Gruvlok Xtreme Lubricant has been formulated from low viscosity, non-petroleum based oils to ease spreading of the lubricant. In applications where pipe movement is expected, proper lubrication of the gasket's exterior assists the gasket into the proper sealing position as pipe system movement occurs. This lubricating film enhances our flexible coupling gasket's ability to compensate for axial, transverse and rotational pipe movements.
- Gruvlok Xtreme Lubricant is the only Gruvlok lubricant that is to be used with Gruvlok couplings and gaskets in HDPE and copper piping systems. It's low temperature capability and lubricity ensure a highly reliable connection.

Gruvlok® Xtreme™ Lubricant is a Teflon® fortified white, tasteless and odorless grease made from Silicone Oil and other ingredients that are safe to ingest. It is sanctioned by the FDA under C.F.R. 21.172.878 & 21.177.1550 (Incidental Food Contact). It is NSF approved for use with potable water.

CAUTION: Silicone based lubricants are not allowed in some facilities.
®Teflon is a registered trademark of Dupont.

GRUVLOK® QUICK DRY LUBRICANT

Gruvlok® Quick Dry Lubricant is a fast drying lubricant that has been developed for applications where the piping system is exposed. The service temperature range for this lubricant is from 0° F to 150° F and may be used with all Gruvlok gasket material grades. The lubricant is made from a water emulsion that is non-toxic, it will not impart taste or odor, and does not support bacterial growth. Gruvlok Quick Dry Lubricant is non-corrosive, non-flammable, and is NSF approved for use with potable water.

This lubricant is easy to apply by brush or hand, and it quickly dries to a thin film when in contact with air. It is water-soluble. The quick drying quality of the lubricant eliminates lubricant drips caused by over lubrication. If necessary, reapply lubricant prior to assembly. Do not thin or mix with solvents.

GRUVLOK® LUBRICANT

Gruvlok® Lubricant is the standard lubricant that has been provided for use with Gruvlok products for years. Gruvlok Lubricant is water soluble, non-toxic, non-corrosive, non-flammable, and will not impart taste or odor. It is NSF approved for use with potable water. This lubricant is acceptable for most applications, however, the Gruvlok Xtreme Lubricant and Gruvlok Quick Dry Lubricant are now available to improve the performance of the couplings and flanges in certain applications.

CAUTION: HDPE pipe requires the use of Gruvlok Xtreme Lubricant and should not be used with Gruvlok Lubricant

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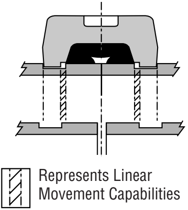
MOVEMENT:

Each flexible design Gruvlok coupling can provide for pipe system movement up to the design maximum for the specific size and type coupling being utilized. Movement is possible in the Gruvlok coupling due to two factors: (1) designed-in clearance between the key of the coupling and the groove diameter and groove width, and (2) the gap between pipe ends joined by the coupling.

LINEAR MOVEMENT:

FLEXIBLE COUPLING LINEAR MOVEMENT

Linear movement is accommodated within the coupling by allowing the pipe ends to move together or apart in response to pressure thrusts and temperature changes. The available linear movement provided by Standard Gruvlok couplings is shown below:

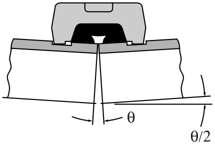


LINEAR MOVEMENT		
Sizes	**Roll Groove Pipe**	**Cut Groove Pipe**
1" thru 3½ "	1⁄16"	1⁄16"
4" thru 24"	3⁄32"	3⁄16"

ANGULAR MOVEMENT:

FLEXIBLE COUPLING ANGULAR MOVEMENT

Designed-in clearances allow limited deflection of the pipe joint within the coupling, without introducing eccentric loads into the coupling joint.



The maximum available angular movement of Gruvlok coupling joints is shown in the performance data for each coupling type. The amount of angular flexibility varies for each coupling size and type. For design purposes the published figures should be reduced by the below listed factors to account for pipe, groove and coupling tolerances.

ANGULAR MOVEMENT		
Sizes	**Design Factor**	
	Roll Groove	**Cut Groove**
1" thru 3½ "	Reduce 50%	Reduce 50%
4" thru 24"	Reduce 50%	Reduce 25%

RIGID COUPLINGS

Gruvlok rigid couplings Fig. 7400, Fig. 7401 and Fig. 7004 HPR are designed to provide a joint with the attributes of a welded or flanged connection. Therefore, these joints would remain in strict alignment and would resist deflection and linear movement during service.

FLEXIBLE COUPLINGS

Figs. 7000, 7001, 7003, 7010 are the flexible couplings provided in the Gruvlok product line. The information above on movement applies to these flexible couplings.

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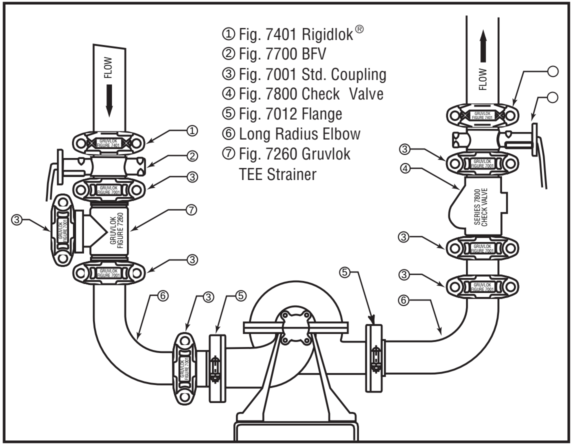
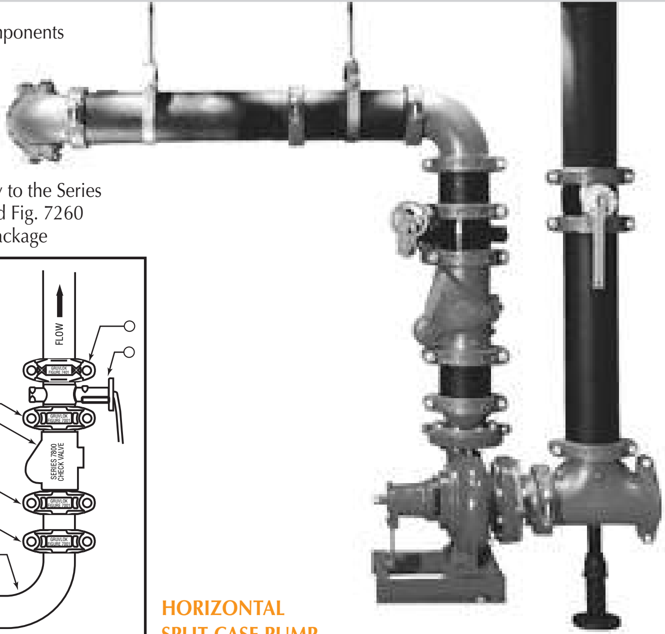
Gruvlok® Flow Control Components

Anvil has put together a complete array of Gruvlok components necessary to provide pump protection for HVAC and industrial piping needs. With the combination of the Fig. 7401 Rigidlok and Fig. 7001 Standard coupling, flex connectors can be eliminated thus reducing cost. The Series 7700 Gruvlok® Butterfly valve has superior flow characteristics. The Gruvlok® Series 7800 Check Valve is full waterway valve and can be stacked directly to the Series 7700 Butterfly Valve. The Fig. 7250 Suction Diffuser and Fig. 7260 Tee Strainer complete the Gruvlok® pump protection package





HORIZONTAL SPLIT CASE PUMP

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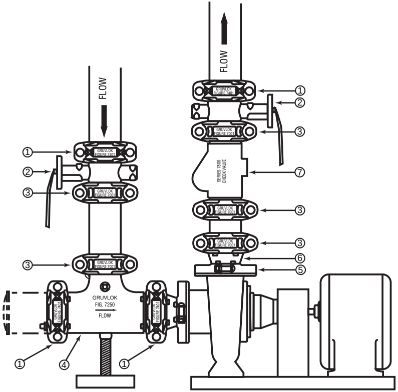
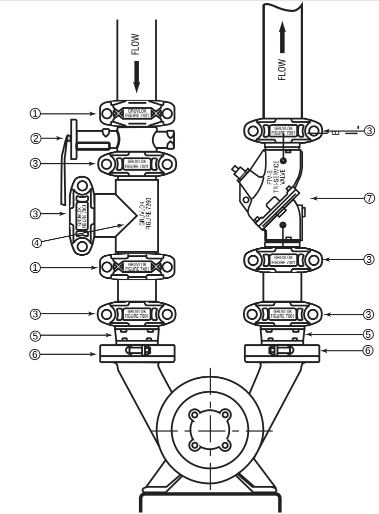
END SUCTION PUMP



① Fig. 7401 Rigidlok®
② Fig. 7700 BFV
③ Fig. 7001 Std. Coupling
④ Fig. 7250 Suction Diffuser
⑤ Fig. 7012 Flange
⑥ Fig. 7072 Conc. Reducer
⑦ Fig. 7800 Check Valve

VERTICAL SPLIT CASE PUMP



① Fig. 7401 Rigidlok®
② Fig. 7700 BFV
③ Fig. 7001 Std. Coupling
④ Fig. 7260 TEE Strainer
⑤ Fig. 7072 Conc. Reducer
⑥ Fig. 7012 Flange
⑦ FTV-S Tri Service Valve

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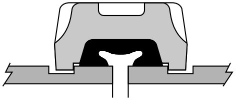
GRUVLOK® GASKET STYLES

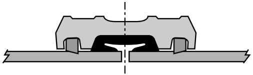
Gruvlok offers a variety of pressure responsive gasket styles. Each serves a specific function while utilizing the same basic sealing concept. Proper installation of the gasket compresses the inclined gasket lips on the pipe O.D., forming a leak-tight seal. This sealing action is reinforced when the gasket is encompassed and compressed by the coupling housings. The application of internal line pressure energizes the elastometric gasket and further enhances the gasket sealing action.

“C” STYLE



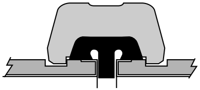
The “C” Style cross section configuration is the most widely used gasket. It is the gasket style provided as standard in many Gruvlok Couplings (Fig. 7000, 7011, 7001, 7003, 7004HPR, 7307, 7400 and 7401). Grade “E” and “T” are standard grades while other grades are available for special applications.

ROUGHNECK®



This “C” style gasket is similar in appearance and design to the Standard gasket but is only used with Fig. 7005 Roughneck Couplings and Fig. 7305 HDPE Couplings. The Roughneck gasket is wider, which allows for minor pipe end separation as line pressure sets the grippers into the plain end pipe.

END GUARD®

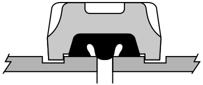


The projecting rib fits between the ends of lined pipe to prevent damage to unprotected pipe ends during coupling joint assembly.

The E.G. gasket is provided as standard with the Fig. 7004 E.G. Coupling.

Grade “E” and “T” gaskets are available.

FLUSH GAP®



Designed to prohibit contaminates from building up in the gasket cavity. The centering rib fits flush over the gap between the two pipe ends thus closing off the gasket cavity. It can be used with Fig. 7000, 7001, 7003, 7004, 7400 and 7401 Couplings for many applications. Recommended for use in dry fire protection systems. Not recommended for temperatures above 160°F.

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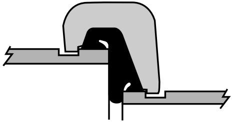
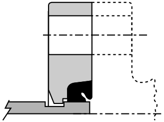
GRUVLOK® GASKET STYLES

REDUCING COUPLING



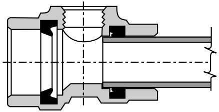
The centering rib allows for pipe positioning and serves to keep the smaller pipe from telescoping during installation. Used only with the Fig. 7010 Reducing Coupling.

FLANGE



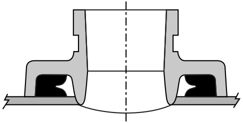
A specially designed gasket for the Fig. 7012, 7013 and 7312 Flange provides for a reliable seal on both the pipe and the mating flange.

SOCK-IT®



Used in Sock-It fittings only, this pressure energized gasket provides a leak-tight seal on plain end seal pipe. Available in Grade "E" material only.

CLAMP-T®



These gaskets conform to the curved exterior of the pipe to provide a pressure responsive seal. This unique design is only used with Fig. 7045, 7046 Clamp-T and Fig. 7047, 7048, and 7049 Clamp-T Crosses.

VACUUM SERVICE

VACUUM SERVICE

Size	Vacuum Level	Gasket Recommendation
1" - 6"	0" - 29.92" Hg	Standard or Flush Gap
8" - 12"	0" - 15 Hg	Standard or Flush Gap
1½" - 12"	0" - 29.92 Hg	Flush Gap

LARGER SIZES: Contact a Anvil Representative for more information.

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GASKET GRADE INDEX & GASKET RECOMMENDATION

The lists are provided as an aid in selecting the optimum gasket grade for a specific application to assure the maximum service life.

The recommendations have been developed from current information supplied by manufacturers of the elastomers, technical publications, and industry applications. The information supplied should be considered as a basis for evaluation but not as a guarantee.

Selection of the optimum gasket grade for a specific service requires the consideration of many factors; primarily temperature, fluid concentration, and continuity of service. Unless otherwise noted, all gasket recommendations are based on 100°F (38°C) maximum temperature service condition. Where more than one gasket grade is shown, the preferred grade is listed first.

Combinations of fluids should be referred to a Anvil Representative for an engineering evaluation and recommendation. In unusual or severe services, gasket materials should be subjected to simulated service conditions to determine the most suitable gasket grade.

Gasket recommendations apply only to Gruvlok gaskets. Contact a Anvil Representative for recommendations for services not listed. These listings do not apply to Gruvlok Butterfly Valves.

All Gruvlok products marked with UL/ULC Listed, FM approved VdS and/or LPC symbols are Listed/Approved with EPDM material. For other Listed/Approved materials, please contact a Anvil Representative for more information.

GASKET GRADE INDEX

STANDARD GASKETS

Grade	Temp. Range	Compound	Color Code	General Service Applications
E	-40°F to +230°F	EPDM	Green	Water, dilute acids, alkalies, salts, & many chemical services not involving hydrocarbons, oils, or gases. Excellent oxidation resistance. **NOT FOR USE WITH HYDROCARBONS**
T	-20°F to +180°F	Nitrile (Buna-N)	Orange	Petroleum products, vegetable oils, mineral oils, & air contaminated with petroleum oils. **NOT FOR USE IN HOT WATER SERVICES**

SPECIAL GASKETS

Grade	Temp. Range	Compound	Color Code	General Service Applications
O	+20°F to +300°F	Fluoro Elastomer	Blue	High temperature resistance to oxidizing acids, petroleum oils, hydraulic fluids, halogenated hydrocarbons & lubricants.
L	-40°F to +350°F	Silicone	Red Gasket	Dry, hot air & some high temperature chemical services.
E Type A	-40°F to +150°F	PROVIDED WITH DRI-SEAL® GASKET	Violet	Wet & Dry (oil free air) Pipe in Fire Protection Systems. For dry pipe systems, Gruvlok Xtreme™ Temperature Lubricant is required.

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GASKET RECOMMENDATION LISTING

WATER & AIR	
Service	**Gasket Grade**
Air, (no oil vapors) Temp. -40°F to 230°F (-40°C to 110°C)	E
Air, (no oil vapors) Temp. -40°F to 350°F (-40°C to 177°C)	L
Air, Oil vapor Temp. -20°F to 150°F (-29°C to 66°C)	T
Air, Oil vapor Temp. 20°F to 300°F (-7°C to 149°C)	O
Water, Temp to 150°F (66°C)	E/T
Water, Temp to 230°F (110°C)	E
Water, Acid Mine	E/T
Water, Chlorine	(E/O)
Water, Deionized	E/T
Water, Seawater	E/T
Water, Waste	E/T
Water, Lime	E/T

Where more than one gasket grade is shown the preferred gasket grade is listed first. Where the gasket grade is shown in parentheses, Contact a Anvil Representative for an engineering evaluation and recommendation. Specify gasket grade when ordering. Use Gruvlok lubricant on gasket. Check gasket color code to be certain it is recommended for the service intended.

PETROLEUM PRODUCTS	
Service	**Gasket Grade**
Crude Oil - Sour	T
Diesel Oil	T
Fuel Oil	T
Gasoline, Leaded	T
Gasoline, Unleaded*	(O)
Hydraulic Oil	T
JP-3, JP-4 and JP-5	T/O
JP-6, 100°F (38°C) Maximum Temp.	O
Kerosene	T
Lube Oil, to 150°F (66°C)	T
Motor Oil	T
Tar and Tar Oil	T
Transmission Fluid --Type A	O
Turbo Oil #15 Diester Lubricant	O

Unless otherwise noted, all gasket listings are based upon 100°F (38°C) maximum temperature service conditions. For services not listed Contact a Anvil Representative for recommendation. *Contact a Anvil Representative for service evaluation.

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COUPLING DATA CHART NOTES

COUPLING DATA CHART NOTES

Nominal Size	O.D.	Max. Wk. Pressure	Max. End Load	Range of Pipe End Separation	Deflection from CL		Coupling Dimensions			Coupling Bolts		Specified Torque		Approx. Wt. Ea.
					Per Coupling	Per in./ft.	X	Y	Z	Qty.	Size	Min.	Max.	
In./DN(mm)	*In./mm*	*PSI/bar*	*Lbs./kN*	*In./mm*	*Degrees*	*mm/m*	*In./mm*	*In./mm*	*In./mm*		*In./mm*	*Ft.-Lbs/N-M*		*Lbs./Kg*
1	2	3	4	5	6		7			8		9		10

1 Gruvlok Couplings are identified by either the nominal ANSI pipe size in inches or pipe O.D. in millimeters (see column 2).

2 Nominal Outside Diameter of Pipe.

3 Maximum line pressure, including surge, to which a joint can be subjected. Working pressure ratings are based on standard wall steel pipe with standard cut or roll grooves in accordance with Gruvlok specifications. For Performance Data on other than standard wall pipe, refer to Technical data section.
NOTE: For one time field test only the maximum joint working pressure may be increased to 1.5 times the figure shown.

4 Maximum end load from all interior and/or exterior forces to which the joint can be subjected are based on standard wall steel pipe with standard cut or roll grooves in accordance with Gruvlok specifications.

5 Range of pipe end separation is the gap between the pipe ends due to assembly.

6 Maximum allowable angular deflection of pipe from centerline when using standard cut grooved steel pipe. For details see design factors in Gruvlok Technical data section.

7 "X", "Y", and "Z" are external dimensions for reference purposes only.

8 The quantity of bolts equals the number of housing segments per coupling.

9 Nuts must be tightened alternating and evenly to the specified bolt torque. See individual product installation instructions for additional important information.

10 Approximate weight for a fully assembled coupling with gasket, bolts, and nuts.

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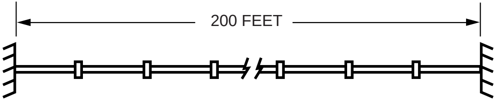
THERMAL MOVEMENT:

A sufficient amount of coupling joints must be provided to accommodate the calculated movement (expansion or contraction) in a pipe run or segment thereof.

EXAMPLE:

A 200 foot long straight run of 4" steel cut grooved pipe between anchor points. Minimum Temperature: 40°F. (at time of installation). Maximum Oper. Temperature: 160°F.



Thermal expansion tables show this system will expand a total of 1.80" due to the temperature change.

DESIGN QUESTION:

How many couplings are required to account for the thermal growth?

AVAILABLE LINEAR MOVEMENT PER FLEXIBLE COUPLING:

Using the table on the page 257, we see that there is 0.188" linear movement per coupling (4" Flexible Coupling)

COUPLINGS REQUIRED

As indicated above, the total movement is 1.80". Thus, the number of couplings is determined as follows:

No. of Couplings = Tot. Movement / Avail. Movement per Coupling

FOR OUR EXAMPLE:

No. of Couplings = (1.80") / (0.187") = 9.6,
Therefore 10 couplings are needed

POSITION OF COUPLINGS

In order for the couplings to provide for the movement indicated by the above example, it would be necessary to install all couplings with the maximum gap between pipe ends. Conversely, if the thermal movement was contraction due to a reduction of system temperature, the coupling joints would have be installed with the pipe ends butted, thus accommodating the “shrink” of the pipe system.

In either case the pipe run in question would have to be anchored at the proper locations to direct pipe system expansion or contraction into the coupling joints.

As can be seen from the above example, the pipe end gap within the coupling joint must be considered when designing a grooved-end pipe system to accommodate thermal movement. The couplings do not automatically provide for expansion and contraction of piping.

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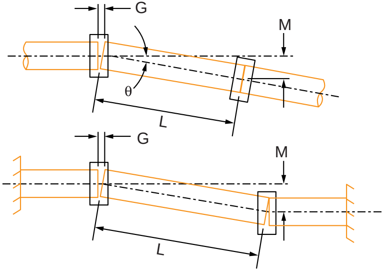
MISALIGNMENT & DEFLECTIONS:

The angular movement capability of the Gruvlok coupling permits the assembly of pipe joints where the piping is not properly aligned. At least two couplings are required to provide for lateral pipe misalignment. Deflection (longitudinal misalignment) may be accommodated within a single coupling as long as the angle of deflection does not exceed the value shown in the coupling performance data for the particular size and coupling type.

A pipe joint that utilizes the angular deflection capability of the Gruvlok coupling will react to pressure and thermal forces dependent upon the manner in which it is restrained. An unrestrained joint will react to these forces by straightening, thus reducing, if not eliminating, the deflection at the joint. If joint deflection has been designed into the pipe layout and must be maintained, then sufficient anchors must be provided to resist the lateral forces and hold the joint in the deflected condition.



The amount of deflection from pipe run centerline can be calculated utilizing the following equations:

$$
\begin{aligned}
M &= L\ (\text{Sin}\ \theta) \\
\theta &= \text{ArcSin}\ (G/D) \\
M &= (G \times L)/D
\end{aligned}
$$

WHERE:

M = Misalignment (inches)

G = Maximum Allowable Pipe End Movement (Inches) as shown under "Performance Data" (Value to be reduced by Design Factor)

θ = Maximum Deflection (Degrees) from centerline as shown under "Performance Data" (Value to be reduced by Design Factor)

D = Pipe Outside Diameter (Inches)

L = Pipe Length (Inches)

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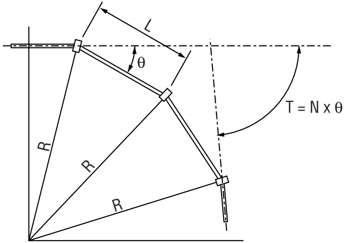
CURVE LAYOUT:

Utilizing the angular deflection at each coupling joint curves may be laid out using straight pipe lengths and Gruvlok Couplings.



This example shows how to calculate the curve radius, required pipe lengths, and number of required couplings.

$$R = L / (2 \times \mathrm{Sin}(\theta/2))$$
$$L = 2 \times R \times \mathrm{Sin}(\theta/2)$$
$$N = T / \theta$$

WHERE:

N = Number of Couplings

R = Radius of Curve (feet)

L = Pipe Length (feet)

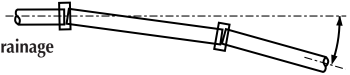
θ = Deflection from centerline (Degrees) of each Coupling (See coupling performance data, value to be reduced by Design Factor)

T =Total Angular Deflection of all Couplings.

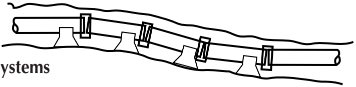
DRAINAGE, BURIED SYSTEMS, ETC.:

The flexible design of the Gruvlok coupling makes it ideal for use in a wide variety of systems in which random changes of the pipe direction can be accommodated by the Gruvlok coupling's angular deflection capability rather than requiring the use of special fittings.

Pitched drainage systems, buried pipe systems where pipe laying conditions are subject to settlement, and exposed pipe systems laid on rough ground are but a few of the many types of pipe installations that present conditions where the functional capability of the Gruvlok coupling are useful.



Pitched for Drainage



Buried Pipe Systems

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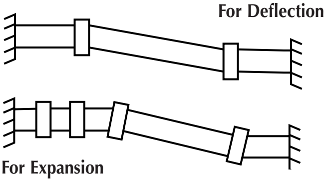
COMBINED LINEAR & ANGULAR MOVEMENT:

The clearance in the grooved coupling joint, will allow a limited capability for combined linear and angular movement. A partially deflected joint will not provide full linear movement capability. A fully detected coupling joint provides no linear movement capability. The Gruvlok coupling will not allow for both maximum linear and maximum angular movement simultaneously.

In systems where both are expected, additional joints may be required.



NOTE: Fully Deflected Joint Will Not Allow For Linear Expansion.

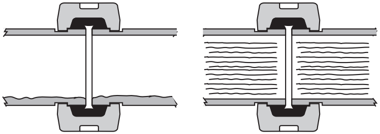
In the example above, two couplings were added to account for thermal expansion and the other couplings accommodate only the misalignment.

The additional stress from the combined movement is therefore relieved.

ROTATIONAL MOVEMENT:

Piping systems designed with Gruvlok Couplings can accommodate minor rotational movement from thermal expansion, settlement, vibration, or other similar movements. However, Gruvlok Couplings ***should never be used as a continuous swivel joint.***

EXAMPLE:



Before Pipe Rotation **After Pipe Rotation**

Utilizing the rotational capability of the Gruvlok Coupling, the pipe life of a slurry or similar coarse material piping system can be extended.

For pipe rotation, the system must be shut down and internal pressure relieved.

The pipe may then be rotated one-quarter turn, the couplings retightened, and service resumed. If performed on a regular basis, pipe rotation will evenly distribute wear over the entire inner surface of the pipe.

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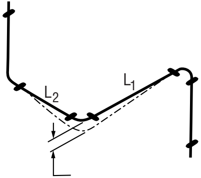
COUPLING FLEXIBILITY

The grooved coupling's capability to allow angular and rotational movement within the coupling joint must be considered when deciding hanger and support locations. Spring hangers and supports providing for movement in more than one plane are often used to allow the pipe system to move without introducing additional stress into the pipe system.

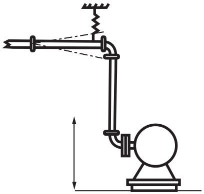
EXAMPLE 1

This example demonstrates the need for each pipe length in a grooved system to be supported. The sag due to the flexibility of the Gruvlok joint could be eliminated with the proper positioning of hangers on both pipe segments "L1" and "L2".



EXAMPLE 2

This illustrates the effect of pump oscillation on a piping system. A spring hanger should be used to support the pipe section and also respond to the induced vibrations. The couplings in the horizontal run above the riser, should accommodate the deflection without transmitting bending stresses through the pipe system.



PRESSURE THRUSTS:

Gruvlok couplings react to the application of system pressure and restrain the pipe ends from separation due to the pressure force. However, the coupling joint may not be in the self-restraining configuration prior to the application of system pressure. The Gruvlok coupling does not restrain adjacent pipe sections from separation due to pressure forces until the coupling key sections engage the groove walls.

Random flexible coupling joint installation will produce installed coupling conditions ranging from pipe ends full butted to fully separated to the maximum available gap. Thus, only after system pressurization will the self-restraining function of the coupling be in effect.

The designer must account for the movement to be encountered when the system is pressurized and the joints are fully separated. Anchor and guide positions must be defined to direct the pipe joint movement that it is not detrimental to the pipe system.

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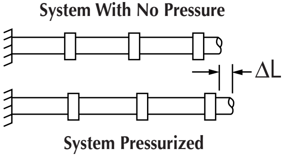
COUPLING FLEXIBILITY, CONT'D.

Examples of the effect of pressure thrust are shown in the following illustrations.

EXAMPLE 1



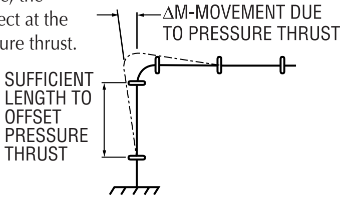
The coupling joints have been installed butted or partially open. When pressurized the pipe ends in the coupling joints will separate to the maximum amount permitted by the coupling design.

The coupling key sections will make contact with the groove walls and restrain the pipe from further separation.

The movement at each coupling joint will add with all other joints and produce ΔL.

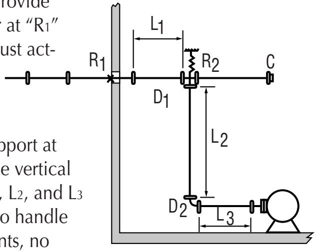
EXAMPLE 2

In the system shown here, the pipe will move and deflect at the elbow joint due to pressure thrust.



The pipe designer must assure himself that the system has the capability of deflecting sufficiently to absorb this movement without introducing additional stresses into the pipe system. In the deflected condition shown, temperature increases would produce further expansion of the pipe system thus increasing the deflection.

EXAMPLE 3



To restrain this system provide a pressure thrust anchor at “R_1” to resist the pressure thrust acting through the tee “D_1” at the cap “C”. Provide a hanger at Point “R_2”, or a base support at Point “D_2” to support the vertical column. If the offsets L_1, L_2, and L_3 are of adequate length to handle expected pipe movements, no additional anchoring is required. Thermal movement of the pipe system should also be considered, and intermediate anchors located as required, to direct the pipe movement so as to prevent introducing bending stresses into the system.

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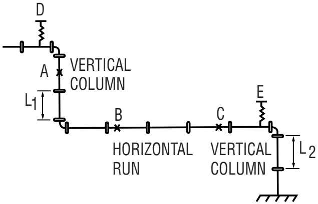
EXAMPLE 4

Anchor at "A" to support weight of vertical water column. Use spring hanger at "D" and "E" to allow movement of vertical piping.

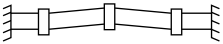


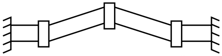
Anchors at "B" and "C" if offsets at L1 and L2 are insufficiently long to handle expected pipe movements.

LATERAL RESTRAINT

EXAMPLE 5

System with no pressure partially deflected





System pressurized fully deflected

A grooved coupling joint installed in a partially deflected condition between anchor locations will deflect to its fully deflected condition when pressurized. Hangers and supports must be selected with consideration of the hanger's capability to provide lateral restraint.

Light duty hangers, while acceptable in many installations, may deflect against the application of lateral forces and result in "snaking" conditions of the pipe system.

RISER DESIGN:

Risers assembled with Gruvlok Flexible couplings are generally installed in either of two ways. In the most common method, the pipe ends are butted together within the coupling joint. Note that when installing risers, the gasket is first placed onto the lower pipe and rolled back away from the pipe end prior to positioning the upper pipe. Anchoring of the riser may be done prior to pressurization with the pipe ends butted or while pressurized, when, due to pressure thrust, the pipe ends will be fully separated.

An alternative method or riser installation is to place a metal spacer of a predetermined thickness, between the pipe ends when an additional length of pipe is added to the riser stack. The upper pipe length is anchored, the spacer removed and the coupling is then installed. This method creates a predetermined gap at each pipe joint which can be utilized in pipe systems where thermal movement is anticipated and in systems with rigid (threaded, welded, flanged) branch connections where shear forces due to pressure thrust could damage the rigid connections.

The following examples illustrate methods of installing commonly encountered riser designs.

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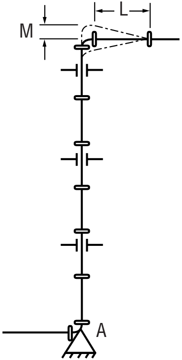
COUPLING FLEXIBILITY, CONT'D.

RISERS WITHOUT BRANCH CONNECTIONS

Install the riser with the pipe ends butted.

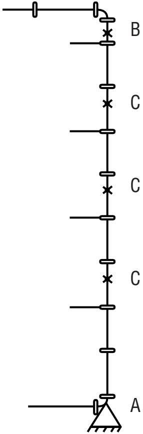
Locate an anchor at the base of the riser (A) to support the total weight of the pipe, couplings and fluid. Provide pipe guides on every other pipe length, as a minimum, to prevent possible deflection of the pipe line at the coupling joints as the riser expands due to pressure thrust or thermal growth. Note that no intermediate anchors are required.



When the system is pressurized the pipe stack will "grow" due to pressure thrust which causes maximum separation of pipe ends within the couplings. The maximum amount of stack growth can be predetermined (see Linear Movement). In this example the pipe length "L" at the top of the riser must be long enough to permit sufficient deflection (see Angular Movement) to accommodate the total movement "M" from both pressure thrust and thermal gradients.

RISERS WITH BRANCH CONNECTIONS

Install the riser with the predetermined gap method. Anchor the pipe at or near the base with a pressure thrust anchor "A" capable of supporting the full pressure thrust, weight of pipe and the fluid column. Anchor at "B" with an anchor capable of withstanding full pressure thrust at the top of the riser plus weight of pipe column. Place intermediate anchors "C" as shown, between anchors "A" and "B". Also place intermediate clamps at every other pipe length as a minimum.



When this system is pressurized, the pipe movement due to pressure thrust will be strained and there will be no shear forces acting at the branch connections.

PIPE PREPARATION

To create a Gruvlok pipe joint, all pipe must be prepared to receive Gruvlok coupling or other Gruvlok pipe system components. The required pipe preparation may be grooving or cleaning the pipe ends, or cutting a hole in the pipe wall.

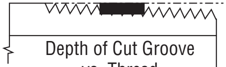
For grooved-end joints, pipe may be grooved by either of two methods; cut or roll grooving. Branch outlet connections require a properly sized and correctly located hole to be cut into the pipe. Sock-it connections require cleaning of the pipe end. Gruvlok plain-end pipe couplings require that the pipe be free of burrs and other sharp projections which could damage the gasket; grooving is not required.

Gruvlok pipe grooving and hole cutting machines are available in a wide variety of designs to meet specific or general requirements. Anvil Roll grooving machines produce a groove to proper dimensional tolerances, concentric with the pipe O.D., even on out-of-round pipe. Gruvlok hole cutting tools properly center holes for correct assembly of Gruvlok branch outlet components.

CUT GROOVING:

Cut grooving is intended for use with standard and heavier wall pipe. Cut grooving produces a groove in the pipe wall by removing metal from the pipe O.D. The groove removes less than one half of the pipe wall and does not cut as deeply into the pipe wall as do standard pipe threads. The square cut edge of the groove allows for the full expansion, contraction, and deflection capabilities of the Gruvlok coupling.

Cut Grooving

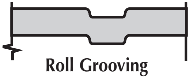


Depth of Cut Groove
vs. Thread

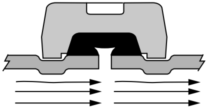
Volume of Metal Removed
Cut Groove vs. Threaded

ROLL GROOVING:

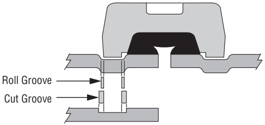
Roll grooving does not remove metal. Instead, metal is displaced while a groove is formed into the outer surface of the pipe wall. The groove configuration has slightly rounded edges resulting in a less flexible joint than a cut groove joint. This reduces available pipe joint movement by 50% over cut grooved coupling joints. Roll grooving is commonly used on a wide range of pipe thicknesses up to 0.375" wall steel pipe and sizes to 24" O.D.



Roll Grooving



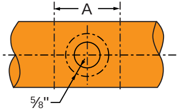
The I.D. "dimple" formed from roll grooving reduces the I.D. (on an average) less than 2%.



**Available Movement
Roll Groove vs. Cut Groove**

Return

BRANCH OUTLET PIPE: CLAMP-T®



Clamp-T installations require the cutting of a hole through the pipe wall. The hole must be properly sized and located on the centerline of the pipe to assure reliable performance of the Clamp-T gaskets.

After the hole has been cut into the pipe wall, any burrs and sharp or rough edges must be removed from the hole. The outside pipe surfaces within 5/8" of the hole must be clean and smooth. Any scale, projections or indentation which might effect the gasket sealing on the pipe must be removed. The surface around the entire circumference of the pipe within the "A" dimension in the charts must be free from dirt, scale, or projections which might effect the proper assembly of the Clamp-T.

CLAMP-T INSTALLATION

Branch Size	Hole Dimensions		Surface Prep. "A"
	Hole Saw Size	Max. Perm. Diameter	
DN/mm	*In./mm*	*In./mm*	*In./mm*
½, ¾, 1 *15, 20, 25*	1½ *38.1*	1⅝ *41.3*	3½ *88.9*
1¼, 1½ *32, 40*	2 *50.8*	2⅛ *54.0*	4 *101.6*
2 *50*	2½ *63.5*	2⅝ *66.7*	4½ *114.3*
2½ *65*	2¾ *69.9*	2⅞ *73.0*	4¾ *120.7*
3 *80*	3½ *88.9*	3⅝ *92.1*	5½ *139.7*
4 *100*	4½ *114.3*	4⅝ *117.5*	6½ *165.1*

SOCK-IT®

For Sock-It Fittings, the pipe ends must be square cut as measured from a true square line.

The maximum allowable tolerance is 0.030" (0.76mm) for all sizes. Any sharp edges, burrs, etc. left on the pipe from cutting must be removed. If these are not removed, they may damage the gasket as the pipe is inserted into the Sock-It Fitting.

After cutting, pipe ends must be completely cleaned a minimum of 1" (25.4mm) back from the pipe end to remove all pipe coating, weld beads, rust, sharp projections, etc., which might effect gasket sealing integrity.

PIPE TOLERANCES

Size	Schedule 10 & 40		Min. O.D.	XL Min. O.D.
	Nom O.D.	Max. O.D.		
DN/mm	*In./mm*	*In./mm*	*In./mm*	*In./mm*
1 *25*	1.315 *33.4*	1.325 *33.6*	1.295 *32.9*	1.285 *32.6*
1¼ *32*	1.660 *42.2*	1.670 *42.4*	1.642 *41.7*	1.630 *41.4*
1½ *40*	1.900 *48.3*	1.910 *48.5*	1.882 *47.8*	1.875 *47.6*
2 *50*	2.375 *60.3*	2.385 *60.6*	2.357 *59.9*	2.352 *59.7*
2½ *65*	2.875 *73.0*	2.904 *73.8*	2.846 *72.3*	2.837 *72.1*

NOTE: When Allied XL pipe is used it is necessary only to remove sharp edges and burrs at the end of the pipe. No additional *cleaning* is required.

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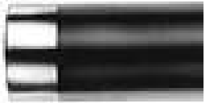
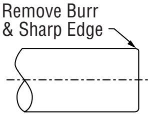
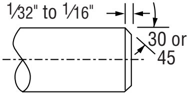
SOCK-IT®, CONT'D.

ACCEPTABLE PIPE END CONFIGURATION

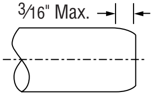




Square cut pipe with O.D. burr & sharp edge removed is preferred configuration.

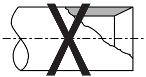


Beveled pipe. Bevel not to exceed 1/16".

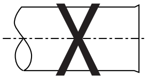


Soft pipe when roll cut may be swaged inward. Swaged portion not to exceed

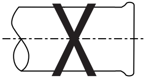
UNACCEPTABLE



Excessive chamfer on I.D. will tend to cut gasket during assembly.



Abrasive wheels & saws leave edge burrs especially pronounced on one side.



Dull wheel cutter produces a raised ridge at the pipe O.D. giving an oversize diameter.

The sharp O.D. edge left by different methods of cutting pipe ***must be removed.*** If this sharp edge is not removed, it may damage the gasket as the pipe is inserted into the Sock-It Fitting.

ROUGHNECK®

Plain-End pipe for use with Fig. 7005 Roughneck Couplings must be free of any notches, bumps, weld bead, score marks, etc. for at least 1$^{1}/_{2}$" (38mm) back from the pipe end to provide a smooth sealing surface for the gasket. Pipe ends (plain or beveled end) must be square cut as measured from a true square line with the maximum allowable tolerance as follows: 0.030" (0.7mm) for 2" through 3"; 0.045 (1.1mm) for 4" through 6"; and 0.060" (1.5mm) for 8" sizes. The nominal outside diameter of pipe should not vary more than ±1% for sizes up to 2$^{1}/_{2}$", +1%-$^{1}/_{32}$" for sizes 3"-5"; +$^{1}/_{16}$"-$^{1}/_{32}$" for sizes 6" and larger. Pipe ends must be marked a distance of 1" from the pipe end for Sizes 2"-4" and 1$^{1}/_{4}$" from the pipe end for Sizes 5"-8" as a guide for centering of the gasket on the pipe ends.

GRUVLOK STANDARD ROLL GROOVE SPECIFICATION FOR STEEL & OTHER IPS OR ISO SIZE PIPE

-1-	-2-			-3-	-4-	-5-		-6-	-7-	-8-
Nominal Pipe Size	O.D.			"A" ±0.030/ ±0.76	"B" ±0.030/ ±0.76	"C" Actual	"C" Tol. +0.000	"D" (Ref. Only)	"T" Min. Allow. Wall Thick	Max. Flare Dia.
	Actual	Tolerance								
In./DN(mm)	*In./mm*	*+In./mm*	*-In./mm*	*In./mm*	*In./mm*	*In./mm*	*-In./mm*	*In./mm*	*In./mm*	*In./mm*
1 *25*	1.315 *33.4*	+0.028 *+0.71*	-0.015 *-0.38*	0.625 *15.88*	0.281 *7.14*	1.190 *30.23*	-0.015 *-0.38*	0.063 *1.60*	0.065 *1.7*	1.430 *36.3*
1¼ *32*	1.660 *42.2*	+0.029 *+0.74*	-0.016 *-0.41*	0.625 *15.88*	0.281 *7.14*	1.535 *38.99*	-0.015 *-0.38*	0.063 *1.60*	0.065 *1.7*	1.770 *45.0*
1½ *40*	1.900 *48.3*	+0.019 *+0.48*	-0.019 *-0.48*	0.625 *15.88*	0.281 *7.14*	1.775 *45.09*	-0.015 *-0.38*	0.063 *1.60*	0.065 *1.7*	2.010 *51.1*
2 *50*	2.375 *60.3*	+0.024 *+0.61*	-0.024 *-0.61*	0.625 *15.88*	0.344 *8.74*	2.250 *57.15*	-0.015 *-0.38*	0.063 *1.60*	0.065 *1.7*	2.480 *63.0*
2½ *65*	2.875 *73.0*	+0.029 *+0.74*	-0.029 *-0.74*	0.625 *15.88*	0.344 *8.74*	2.720 *69.09*	-0.018 *-0.46*	0.078 *1.98*	0.083 *2.1*	2.980 *75.7*
3 O.D. 76.1	*2.996* 76.1	*+0.030* +0.76	*-0.030* -0.76	*0.625* 15.88	*0.344* 8.74	*2.845* 72.26	*-0.018* -0.46	*0.076* 1.93	*0.083* 2.1	*3.100* 78.7
3 *80*	3.500 *88.9*	+0.035 *+0.89*	-0.031 *-0.79*	0.625 *15.88*	0.344 *8.74*	3.344 *84.94*	-0.018 *-0.46*	0.078 *1.98*	0.083 *2.1*	3.600 *91.4*
3½ *90*	4.000 *101.6*	+0.040 *+1.02*	-0.031 *-0.79*	0.625 *15.88*	0.344 *8.74*	3.834 *97.38*	-0.020 *-0.51*	0.083 *2.11*	0.083 *2.1*	4.100 *104.1*
4¼ O.D. 108.0	*4.250* 108.0	*+0.042* +1.07	*-0.031* -0.79	*0.625* 15.88	*0.344* 8.74	*4.084* 103.73	*-0.020* -0.51	*0.083* 2.11	*0.083* 2.1	*4.350* 110.5
4 *100*	4.500 *114.3*	+0.045 *+1.14*	-0.031 *-0.79*	0.625 *15.88*	0.344 *8.74*	4.334 *110.08*	-0.020 *-0.51*	0.083 *2.11*	0.083 *2.1*	4.600 *116.8*
5¼ O.D. 133.0	*5.236* 133.0	*+0.052* +1.32	*-0.031* -0.79	*0.625* 15.88	*0.344* 8.74	*5.084* 129.13	*-0.020* -0.51	*0.076* 1.93	*0.109* 2.8	*5.350* 135.9

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GRUVLOK STANDARD ROLL GROOVE SPECIFICATION FOR STEEL & OTHER IPS OR ISO SIZE PIPE

-1-	-2-			-3-	-4-	-5-		-6-	-7-	-8-
Nominal Pipe Size	O.D.			"A" ±0.030/ ±0.76	"B" ±0.030/ ±0.76	"C" Actual	"C" Tol. +0.000	"D" (Ref. Only)	"T" Min. Allow. Wall Thick	Max. Flare Dia.
	Actual	Tolerance								
In./DN(mm)	*In./mm*	*+In./mm*	*-In./mm*	*In./mm*	*In./mm*	*In./mm*	*-In./mm*	*In./mm*	*In./mm*	*In./mm*
5½ O.D. 139.7	*5.500* 139.7	*+0.055* +1.40	*-0.031* -0.79	*0.625* 15.88	*0.344* 8.74	*5.334* 135.48	*-0.020* -0.51	*0.083* 2.11	*0.109* 2.8	*5.600* 142.2
5 *125*	5.563 *141.3*	+0.056 *+1.42*	-0.031 *-0.79*	0.625 *15.88*	0.344 *8.74*	5.395 *137.03*	-0.022 *-0.56*	0.084 *2.13*	0.109 *2.8*	5.660 *143.8*
6¼ O.D. 159.0	*6.259* 159.0	*+0.063* +1.60	*-0.031* -0.79	*0.625* 15.88	*0.344* 8.74	*6.084* 154.53	*-0.022* -0.56	*0.088* 2.24	*0.109* 2.8	*6.350* 161.3
6½ O.D. 165.1	*6.500* 165.1	*+0.063* +1.60	*-0.031* -0.79	*0.625* 15.88	*0.344* 8.74	*6.334* 160.88	*-0.022* -0.56	*0.085* 2.16	*0.109* 2.8	*6.600* 167.6
6 *150*	6.625 *168.3*	+0.063 *+1.60*	-0.031 *-0.79*	0.625 *15.88*	0.344 *8.74*	6.455 *163.96*	-0.022 *-0.56*	0.085 *2.16*	0.109 *2.8*	6.730 *170.9*
8 *200*	8.625 *219.1*	+0.063 *+1.60*	-0.031 *-0.79*	0.750 *19.05*	0.469 *11.91*	8.441 *214.40*	-0.025 *-0.64*	0.092 *2.34*	0.109 *2.8*	8.800 *223.5*
10 *250*	10.750 *273.1*	+0.063 *+1.60*	-0.031 *-0.79*	0.750 *19.05*	0.469 *11.91*	10.562 *268.27*	-0.027 *-0.69*	0.094 *2.39*	0.134 *3.4*	10.920 *277.4*
12 *300*	12.750 *323.9*	+0.063 *+1.60*	-0.031 *-0.79*	0.750 *19.05*	0.469 *11.91*	12.531 *318.29*	-0.030 *-0.76*	0.109 *2.77*	0.156 *4.0*	12.920 *328.2*
14 O.D. 355.6	*14.000* 355.6	*+0.063* +1.60	*-0.031* -0.79	*0.938* 23.83	*0.469* 11.91	*13.781* 350.04	*-0.030* -0.76	*0.109* 2.77	*0.156* 4.0	*14.100* 358.1
16 O.D. 406.4	*16.000* 406.4	*+0.063* +1.60	*-0.031* -0.79	*0.938* 23.83	*0.469* 11.91	*15.781* 400.84	*-0.030* -0.76	*0.109* 2.77	*0.165* 4.2	*16.100* 408.9

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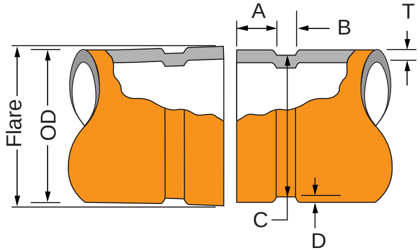
GRUVLOK STANDARD ROLL GROOVE SPECIFICATION FOR STEEL & OTHER IPS OR ISO SIZE PIPE

-1-	-2-			-3-	-4-	-5-		-6-	-7-	-8-
Nominal Pipe Size	O.D. Actual	O.D. Tolerance		"A" ±0.030/ ±0.76	"B" ±0.030/ ±0.76	"C" Actual	"C" Tol. +0.000	"D" (Ref. Only)	"T" Min. Allow. Wall Thick	Max. Flare Dia.
In./DN(mm)	*In./mm*	*+In./mm*	*-In./mm*	*In./mm*	*In./mm*	*In./mm*	*-In./mm*	*In./mm*	*In./mm*	*In./mm*
18 O.D. 457.2	*18.000* 457.2	*+0.063* +1.60	*-0.031* -0.79	*1.000* 25.40	*0.469* 11.91	*17.781* 451.64	*-0.030* -0.76	*0.109* 2.77	*0.165* 4.2	*18.160* 461.3
20 O.D. 508.0	*20.000* 508.0	*+0.063* +1.60	*-0.031* -0.79	*1.000* 25.40	*0.469* 11.91	*19.781* 502.44	*-0.030* -0.76	*0.109* 2.77	*0.188* 4.8	*20.160* 512.1
24 O.D. 609.6	*24.000* 609.6	*+0.063* +1.60	*-0.031* -0.79	*1.000* 25.40	*0.500* 12.70	*23.656* 600.86	*-0.030* -0.76	*0.172* 4.37	*0.218* 5.5	*24.200* 614.7
30 O.D. 762.0	*30.000* 762.0	*+0.093* 2.36	*-0.031* 0.79	*1.750*▼ 44.45	*0.625* 15.88	*29.500* 749.30	*-0.063* 1.60	*0.250* 6.35	*0.250* 6.35	*30.200* 761.1



NOTE: VdS - Roll Grooving Approval Specifications, see the Technical Data/Install Instructions section on Anvil's web site - www.anvilintl.com

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ROLL GROOVE SPECIFICATIONS, NOTES

COLUMN 1 - Nominal IPS Pipe size.Nominal ISO Pipe size.

COLUMN 2 - IPS outside diameter.ISO outside diameter.

COLUMN 3 - Gasket seat must be free from scores, seams, chips, rust or scale which may interfere with proper sealing of the gasket. Gasket seat width (Dimension A) is to be measured from the pipe end to the vertical flank in the groove wall.

COLUMN 4 - Groove width (Dimension B) is to be measured between vertical flank of the groove size walls.

COLUMN 5 - The groove must be of uniform depth around the entire pipe circumference. (See column 6).

COLUMN 6 - Groove depth: for reference only. Groove must conform to the groove diameter “C” listed in column 5.

COLUMN 7 - Minimum allowable wall thickness which may be roll grooved.

COLUMN 8 - Maximum allowable pipe end flare diameter. Measured at the most extreme pipe end diameter of the gasket seat area.

Out of roundness: Difference between maximum O.D. and minimum O.D. measured at 90° must not exceed total O.D. tolerance listed (reference column 2).

For IPS pipe, the maximum allowable tolerance from square cut ends is 0.03" for 1" thru 3½"; 0.045" for 4" thru 6"; and 0.060" for sizes 8" and above measured from a true square line.

For ISO size pipe, the maximum allowable tolerance from square cut ends is 0.75mm for sizes 25mm-80mm; 1.15mm for sizes 100mm-150mm; and 1.50mm for sizes 200mm and above, measured from a true square line.

Beveled-End Pipe in conformance with ANSI B16.25 (37½°) is acceptable, however square cut is preferred. Seams must be ground flush with the pipe O.D. and ID prior to roll grooving. Failure to do so may result in damage to the roll grooving machine and unacceptable roll grooves may be produced.

Weld seams must be ground flush with the pipe O.D. and ID prior to roll grooving. Failure to do so may result in damage to the roll grooving machine and unacceptable roll grooves may be produced.

▼ “A” tolerance +0.030" / -0.060" (+0.77 / -1.54 mm)

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Pipe Preparation, Cont'd.

Gruvlok Standard Cut Groove Specification for Steel & Other IPS or ISO Size Pipe

-1-	-2-			-3-	-4-	-5-		-6-	-7-
Nominal IPS Pipe Size	O.D.			Gasket Seat "A" ±0.030 ±0.76	Groove Width "B" ±0.030 ±0.76	Groove Diameter "C"		Actual Groove Depth "D" (Ref. Only)	Min. Allow. Wall Thick. "T"
	Actual	Tolerance				Actual	Tol. +0.000		
In./DN(mm)	*In./mm*	*+In./mm*	*-In./mm*	*In./mm*	*In./mm*	*In./mm*	*-In./mm*	*In./mm*	*In./mm*
1 *25*	1.315 *33.4*	+0.028 *+0.71*	-0.015 *-0.38*	0.625 *15.88*	0.312 *7.92*	1.190 *30.23*	-0.015 *-0.38*	0.062 *1.6*	0.133 *3.4*
1¼ *32*	1.660 *42.2*	+0.029 *+0.74*	-0.016 *-0.41*	0.625 *15.88*	0.312 *7.92*	1.535 *38.99*	-0.015 *-0.38*	0.062 *1.6*	0.140 *3.6*
1½ *40*	1.900 *48.3*	+0.019 *+0.48*	-0.019 *-0.48*	0.625 *15.88*	0.312 *7.92*	1.775 *45.09*	-0.015 *-0.38*	0.062 *1.6*	0.145 *3.7*
2 *50*	2.375 *60.3*	+0.024 *+0.61*	-0.024 *-0.61*	0.625 *15.88*	0.312 *7.92*	2.250 *57.15*	-0.015 *-0.38*	0.062 *1.6*	0.154 *3.9*
2½ *65*	2.875 *73.0*	+0.029 *+0.74*	-0.029 *-0.74*	0.625 *15.88*	0.312 *7.92*	2.720 *69.09*	-0.018 *-0.46*	0.078 *2.0*	0.187 *4.8*
3 O.D. 76.1	*2.996* 76.1	*+0.030* +0.76	*-0.030* -0.76	*0.625* 15.88	*0.312* 7.92	*2.845* 72.26	*-0.018* -0.46	*0.076* 1.9	*0.188* 4.8
3 *80*	3.500 *88.9*	+0.035 *+0.89*	-0.031 *-0.79*	0.625 *15.88*	0.312 *7.92*	3.344 *84.94*	-0.018 *-0.46*	0.078 *2.0*	0.188 *4.8*
3½ *90*	4.000 *101.6*	+0.040 *+1.02*	-0.031 *-0.79*	0.625 *15.88*	0.312 *7.92*	3.834 *97.38*	-0.020 *-0.51*	0.083 *2.1*	0.188 *4.8*
4¼ O.D. 108.0	*4.250* 108.0	*+0.042* +1.07	*-0.031* -0.79	*0.625* 15.88	*0.375* 9.53	*4.084* 103.73	*-0.020* -0.51	*0.083* 2.1	*0.203* 5.2
4 *100*	4.500 *114.3*	+0.045 *+1.14*	-0.031 *-0.79*	0.625 *15.88*	0.375 *9.53*	4.334 *110.08*	-0.020 *-0.51*	0.083 *2.1*	0.203 *5.2*

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GRUVLOK STANDARD CUT GROOVE SPECIFICATION FOR STEEL & OTHER IPS OR ISO SIZE PIPE

-1-	-2-			-3-	-4-	-5-		-6-	-7-
Nominal IPS Pipe Size	O.D.			Gasket Seat "A" ±0.030 ±0.76	Groove Width "B" ±0.030 ±0.76	Groove Diameter "C"		Actual Groove Depth "D" (Ref. Only)	Min. Allow. Wall Thick. "T"
	Actual	Tolerance				Actual	Tol. +0.000		
In./DN(mm)	*In./mm*	*+In./mm*	*-In./mm*	*In./mm*	*In./mm*	*In./mm*	*-In./mm*	*In./mm*	*In./mm*
5¼ O.D. 133.0	*5.236* 133.0	*+0.052* +1.32	*-0.031* -0.79	*0.625* 15.88	*0.375* 9.53	*5.084* 129.13	*-0.020* -0.51	*0.076* 1.9	*0.203* 5.2
5½ O.D. 139.7	*5.500* 139.7	*+0.055* +1.40	*-0.031* -0.79	*0.625* 15.88	*0.375* 9.53	*5.334* 135.48	*-0.020* -0.51	*0.083* 2.1	*0.203* 5.2
5 *125*	5.563 *141.3*	+0.056 *+1.42*	-0.031 *-0.79*	0.625 *15.88*	0.375 *9.53*	5.395 *137.03*	-0.022 *-0.56*	0.084 *2.1*	0.203 *5.2*
6¼ O.D. 159.0	*6.259* 159.0	*+0.063* +1.60	*-0.031* -0.79	*0.625* 15.88	*0.375* 9.53	*6.084* 154.53	*-0.022* -0.56	*0.088* 2.2	*0.249* 6.3
6½ O.D. 165.1	*6.500* 165.1	*+0.063* +1.60	*-0.031* -0.79	*0.625* 15.88	*0.375* 9.53	*6.334* 160.88	*-0.022* -0.56	*0.085* 2.2	*0.219* 5.6
6 *150*	6.625 *168.3*	+0.063 *+1.60*	-0.031 *-0.79*	0.625 *15.88*	0.375 *9.53*	6.455 *163.96*	-0.022 *-0.56*	0.085 *2.2*	0.219 *5.6*
8 *200*	8.625 *219.1*	+0.063 *+1.60*	-0.031 *-0.79*	0.750 *19.05*	0.437 *11.10*	8.441 *214.40*	-0.025 *-0.64*	0.092 *2.3*	0.238 *6.1*
10 *250*	10.750 *273.1*	+0.063 *+1.60*	-0.031 *-0.79*	0.750 *19.05*	0.500 *12.70*	10.562 *268.27*	-0.027 *-0.69*	0.094 *2.4*	0.250 *6.4*
12 *300*	12.750 *323.9*	+0.063 *+1.60*	-0.031 *-0.79*	0.750 *19.05*	0.500 *12.70*	12.531 *318.29*	-0.030 *-0.76*	0.109 *2.8*	0.279 *7.1*
14 O.D. 355.6	*14.000* 355.6	*+0.063* +1.60	*-0.031* -0.79	*0.938* 23.83	*0.500* 12.70	*13.781* 350.04	*-0.030* -0.76	*0.109* 2.8	*0.281* 7.1

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GRUVLOK STANDARD CUT GROOVE SPECIFICATION FOR STEEL & OTHER IPS OR ISO SIZE PIPE

-1-	-2-			-3-	-4-	-5-		-6-	-7-
Nominal IPS Pipe Size	O.D.			Gasket Seat "A" ±0.030 ±0.76	Groove Width "B" ±0.030 ±0.76	Groove Diameter "C"		Actual Groove Depth "D" (Ref. Only)	Min. Allow. Wall Thick. "T"
	Actual	Tolerance				Actual	Tol. +0.000		
In./DN(mm)	*In./mm*	*+In./mm*	*-In./mm*	*In./mm*	*In./mm*	*In./mm*	*-In./mm*	*In./mm*	*In./mm*
16 O.D. 406.4	*16.000* 406.4	*+0.063* +1.60	*-0.031* -0.79	*0.938* 23.83	*0.500* 12.70	*15.781* 400.84	*-0.030* -0.76	*0.109* 2.8	*0.312* 7.9
18 O.D. 457.2	*18.000* 457.2	*+0.063* +1.60	*-0.031* -0.79	*1.000* 25.40	*0.500* 12.70	*17.781* 451.64	*-0.030* -0.76	*0.109* 2.8	*0.312* 7.9
20 O.D. 508.0	*20.000* 508.0	*+0.063* +1.60	*-0.031* -0.79	*1.000* 25.40	*0.500* 12.70	*19.781* 502.44	*-0.030* -0.76	*0.109* 2.8	*0.312* 7.9
24 O.D. 609.6	*24.000* 609.6	*+0.063* +1.60	*-0.031* -0.79	*1.000* 25.40	*0.563* 14.30	*23.656* 600.86	*-0.030* -0.76	*0.172* 4.4	*0.375* 9.5
28 I.D. 733.4	*28.875* 733.4	*+0.063* +1.60	*-0.031* -0.79	*1.000* 25.40	*0.563* 14.30	*28.531* 724.69	*-0.030* -0.76	*0.172* 4.4	*0.437* 11.1
30 ID 787.4	*31.000* 787.4	*+0.063* +1.60	*-0.031* -0.79	*1.250* 31.75	*0.625* 15.88	*30.594* 777.09	*-0.030* -0.76	*0.203* 5.2	*0.500* 12.7
30 O.D. 762.0	*30.000* 762.0	*0.093* 2.36	*0.031* 0.79	*1.750*▼ 44.45	*0.625* 15.88	*29.500* 749.30	*0.063* 1.60	*0.250* 6.35	*0.625* 15.88

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CUT GROOVE SPECIFICATIONS, NOTES

COLUMN 1 -

Nominal IPS Pipe size.
Nominal ISO Pipe size.

COLUMN 2 -

IPS outside diameter.
ISO outside diameter.

COLUMN 3 & 4 -

Gasket seat must be free from scores, seams, chips, rust or scale which may interfere with proper coupling assembly.

COLUMN 5 -

The groove must be of uniform depth around the entire pipe circumference. (See column 6).

COLUMN 6 -

Groove depth: for reference only. Groove must conform to the groove diameter "C" listed in column 5.

COLUMN 7 -

Minimum allowable wall thickness which may be cut grooved.

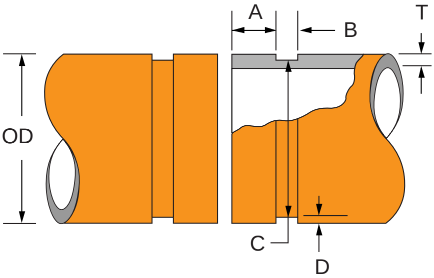
Out of roundness: Difference between maximum O.D. and minimum O.D. measured at 90° must not exceed total O.D. tolerance listed.

For IPS pipe, the maximum allowable tolerance from square cut ends is 0.03" for 1" thru 3½"; 0.045" for 4" thru 6"; and 0.060" for sizes 8" and above measured from a true square line.

For ISO size pipe, the maximum allowable tolerance from square cut ends is 0.75mm for sizes 25mm-80mm; 1.15mm for sizes 100mm-150mm; and 1.50mm for sizes 200mm and above, measured from a true square line.

Beveled-End Pipe in conformance with ANSI B16.25 (37½°) is acceptable, however square cut is preferred.
Not to be used with End Guard gaskets.

▼ "A" tolerance +0.030" / -0.060" (+0.77 / -1.54 mm)



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PIPE SUPPORT

When designing the hangers, supports and anchors for a grooved-end pipe system, the piping designer must consider certain unique characteristics of the grooved type coupling in addition to many universal pipe hanger and support design factors. As with any pipe system, the hanger or support system must provide for

1) the weight of the pipe, couplings, fluid & pipe system components;

2) reduce stresses at pipe joints; and

3) permit required pipe system movement to relieve stress.

The following factors should be considered when designing hangers and supports for a grooved-end pipe system.

PIPE HANGER SPACING:

The following charts show the maximum span between pipe hangers for straight runs of standard weight steel pipe filled with water or other similar fluids.

Do not use these values where critical span calculations are made or where there are concentrated loads between supports.

For straight runs without concentrated loads and where full linear movement is ***NOT*** required use the table on right.

HANGER SPACING
LINEAR MOVEMENT NOT REQ'D

Nominal Pipe Size Range	Maximum Span Between Supports
In./DNmm	*Feet/meters*
1 *25*	7 *2.6*
1¼-2 *32-50*	10 *3.0*
2½-4 *65-100*	12 *3.7*
5-8 *125-200*	14 *4.3*
10-12 *250-300*	16 *4.9*
14-16 *350-400*	18 *5.5*
18-24 *450-600*	20 *6.1*

For straight runs without concentrated loads and where full linear movement ***IS*** required use the table below.

HANGER SPACING - FLEXIBLE SYSTEM, STEEL PIPE
FULL LINEAR MOVEMENT IS REQ'D
AVERAGE HANGERS PER PIPE LENGTH EVENLY SPACED

Nominal Pipe Size Range	Pipe Length in Feet/Meters									
In.	*7*	*10*	*12*	*15*	*20*	*22*	*25*	*30*	*35*	*40*
DNmm	*2.1*	*3.3*	*3.7*	*4.6*	*6.1*	*6.7*	*7.6*	*9.1*	*10.7*	*12.2*
1-2 *25-50*	1	2	2	2	3	3	4	4	5	6
2½-4 *65-100*	1	1	2	2	2	2	2	3	4	4
5-24 *125-600*	1	1	1	2	2	2	2	3	3	3

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HANGER SPACING - RIGID SYSTEMS
SUGGESTED MAXIMUM SPAN BETWEEN SUPPORTS

Nominal Size	STEEL PIPE Suggested Maximum Span Between Supports-Feet/Meters						COPPER TUBE	
	Water Service			Air Service			Water Service	Gas & Air Service
In./DNmm	*	**	***	*	**	***	**	**
1 25	7 2.1	9 2.7	12 3.7	9 2.7	10 3.0	12 3.7	–	–
1¼ 32	7 2.1	11 3.4	12 3.7	9 2.7	12 3.6	12 3.7	–	–
1½ 40	7 2.1	12 3.7	15 4.6	9 2.7	13 4	15 4.6	–	–
2 50	10 3	13 4	15 4.6	13 4	15 4.6	15 4.6	9 2.7	12 3.6
2½ 65	11 3.4	15 4.6	15 4.6	14 4.3	17 5.1	15 4.6	9 2.7	12 3.6
3 OD 65	11 3.4	15 4.6	15 4.6	14 4.3	17 5.1	15 4.6	–	–
3 80	12 3.7	16 4.8	15 4.6	15 4.6	19 5.7	15 4.6	10 3	14 4.2
3½ 90	13 4	18 5.4	15 4.6	15 4.6	21 6.3	15 4.6	–	–
4 100	14 4.3	18 5.4	15 4.6	17 5.2	21 6.4	15 4.6	12 3.7	17 5.1
4¼ 100	14 4.3	18 5.4	15 4.6	17 5.2	19 5.7	15 4.6	–	–
5 125	16 4.9	20 6.0	15 4.6	20 6.1	24 7.3	15 4.6	13 4	18 5.7
5¼ 125	15 4.6	18 5.5	15 4.6	19 5.2	22 6.6	15 4.6	–	–
5½ 125	16 4.9	19 5.8	15 4.6	20 6.1	24 7.3	15 4.6	–	–

* Spacing by ANSI-B31.1 Power Piping Code.

** Spacing by ANSI-B31.9 Building Service Piping Code, (1996 Edition), Fig. 921.1.3c, Table a, 250 psi and Fig. 921.1.3D, table a

*** Spacing by NFPA-13 Installation of Sprinkler Systems, (1999 Edition), Table 6-2.2.

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HANGER SPACING - RIGID SYSTEMS
SUGGESTED MAXIMUM SPAN BETWEEN SUPPORTS

Nominal Size	STEEL PIPE Suggested Maximum Span Between Supports-Feet/Meters						COPPER TUBE	
	Water Service			Air Service			Water Service	Gas & Air Service
In./DNmm	*	**	***	*	**	***	**	**
6 *150*	17 *5.2*	21 *6.3*	15 *4.6*	21 *6.4*	26 *7.8*	15 *4.6*	14 *4.2*	21 *6.3*
6¼ *150*	16 *4.9*	20 *6.0*	15 *4.6*	20 *6.1*	24 *7.3*	15 *4.6*	–	–
6½ OD *150*	17 *5.2*	21 *6.3*	15 *4.6*	21 *6.4*	25 *7.6*	15 *4.6*	–	–
8 *200*	19 *5.8*	23 *6.9*	15 *4.6*	24 *7.3*	29 *8.7*	15 *4.6*	–	–
10 *250*	19 *5.8*	25 *7.5*	15 *4.6*	24 *7.3*	33 *9.9*	15 *4.6*	–	–
12 *300*	23 *7*	26 *7.8*	15 *4.6*	30 *9.1*	36 *10.8*	15 *4.6*	–	–
14 *350*	23 *7*	26 *7.8*	15 *4.6*	30 *9.1*	37 *11.1*	15 *4.6*	–	–
16 *400*	27 *8.2*	26 *7.8*	15 *4.6*	35 *10.7*	40 *12.0*	15 *4.6*	–	–
18 *450*	27 *8.2*	27 *8.1*	15 *4.6*	35 *10.7*	42 *12.6*	15 *4.6*	–	–
20 *500*	30 *9.1*	27 *8.1*	15 *4.6*	39 *11.9*	45 *13.5*	15 *4.6*	–	–
24 *600*	32 *9.8*	26 *7.8*	15 *4.6*	42 *12.8*	48 *14.7*	15 *4.6*	–	–

* Spacing by ANSI-B31.1 Power Piping Code.

** Spacing by ANSI-B31.9 Building Service Piping Code, (1996 Edition), Fig. 921.1.3c, Table a, 250 psi and Fig. 921.1.3D, table a

*** Spacing by NFPA-13 Installation of Sprinkler Systems, (1999 Edition), Table 6-2.2.

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Considerations for the Hanging or Supporting of Grooved Piping Systems

Grooved piping products have a very good maintenance track record out in the field. Whenever there is a “perceived” problem with installed grooved product, a high percentage are often related to the hanging or supporting method or application chosen. Although supported very similarly to welded piping systems, a few considerations should be given to assure the proper selection and application of hangers and supports used on a grooved piping system such as Anvil’s Gruvlok® brand.

REVIEW REQUIREMENTS AND LOGISTICS

A variety of hangers and supports are typically used on grooved piping systems, ranging from a simple band hanger, clevis hanger, and trapeze supports to more intricate rack designs using structural steel or a mechanical framing/strut system. All of these are acceptable hanging or supporting methods but they are dependent on the project’s type, design and specification requirements. With this in mind, a vital first step is to refer to the project and code requirements when choosing the proper hanging or supporting method.

Project logistics is another consideration regardless of system type. Quite often hangers and supports are an after thought on a project simply because the big-ticket items, such as labor, major equipment and schedule, are the focus of the project team. However, hangers and supports are one of the first components needed on a project since you cannot hang pipe without them.

In nearly every hanger or support assembly there are three components that make up the assembly. These components are an upper attachment (beam or structural attachment), intermediate attachment (rod, couplings, eye nuts, etc.) and the lower attachment (pipe clamps, U-bolts, trapezes). See accompanying illustrations for examples of typical assemblies. All three components should arrive on the project site together and early. To save costly field labor hours, consideration might be given to having the hangers or supports pre-assembled by the manufacturer or fabricated in the contractor’s shop. Components can also be bundled and tagged by system or area of the project so they can be easily assembled and located on-site.

MAKE A MATCH

The type of grooved coupling used on a project is the next consideration to choosing the correct hanger or support method. The proper maximum spacing allowables governed by project specifications, the applicable code and/or the hanger manufacturer’s recommendations all must also be reviewed. Flexible couplings used on horizontal runs of pipe need to be supported at every coupling and usually require intermediate supports to satisfy the maximum spacing allowable requirements. Rigid couplings, on the other hand, can be hung or supported based on the maximum spacing requirements only. In addition, wherever there is a change in direction of the piping system a hanger or support is usually required immediately following that change in direction and then the system is hung or supported accordingly.

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Considerations for the Hanging or Supporting of Grooved Piping Systems

PRESSURE POINT

System pressurization should also be reviewed when choosing the proper hanging or support method. As the couplings are installed, the pipe ends can either be butted up tight to one another or a gap can exist. Once the system is pressurized, those areas or joints where the pipe ends are butted up tight and held by a grooved coupling can “pop” or grow to the maximum gap depending on the coupling chosen. The joint at a flexible grooved coupling can expand about 1/4" at each coupling whereas the joint at a rigid grooved coupling can grow about 3/32". If there is a long run of horizontal or vertical pipe with multiple joints the overall length of the system will grow depending upon which grooved coupling you have chosen.

For example, if you have a grooved piping system that is 400 ft. long there will be roughly 19 grooved joints (assuming 21 ft. lengths of pipe are used). If you multiply the number of joints by the growth of each joint you can determine the overall growth of the system due to pressurization. If it is a flexible system, 19 joints x .25" = 4.75" of overall growth. A rigid system would be 19 joints x .0938" = 1.78" of overall growth.

As one can see, this growth due to pressurization can have a significant impact on the hangers or supports used on a project. One way to avoid this growth is to install the grooved joints at full gap so that pressurization has no impact at testing or start up. If this is not possible, then periodic air pressurization as the system is installed will expand the grooved joints to full gap and the hangers or supports can be adjusted accordingly.

HOT AND COLD

Thermal expansion is another important consideration when choosing hangers or supports for a grooved system. This is especially important on hot systems versus chilled systems since the amount of thermal expansion will be greater on hot systems as opposed to the thermal contraction that will occur on chilled systems. This is all due to the temperature variation from ambient conditions when the pipe is installed to operating conditions.

For example, if you again take 400 ft. of grooved piping, let us assume the system is heating hot water that will operate at 170°F. The pipe is installed under ambient conditions assumed to be at 70°F so you have a 100°F variation in temperature. At 70°F the pipe has a coefficient of thermal expansion of 0.0 in/ft but at 170°F the pipe has a coefficient of thermal expansion of 0.0076 in/ft. To determine the total thermal expansion of the pipe from ambient temperature to operating temperature you multiply the length of pipe by the coefficient of thermal expansion. In this case 400 ft. x 0.0076 in/ft. = 3.04 in. In other words the pipe has grown in length over 3 inches because of the thermal expansion.

This is significant growth especially if there is a change of direction at the end of the 400 ft. pipe run or there are branch lines coming off the main run. If this thermal growth exceeds the allowable deflection of a grooved joint, especially where a change of direction or a branch line connects, then problems could occur. Thermal growth cannot be stopped. It can only be controlled by the use of anchors and expansion joints or expansion loops.

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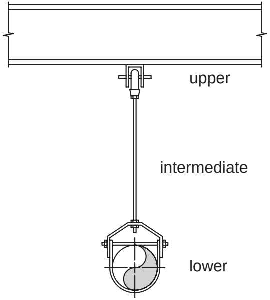
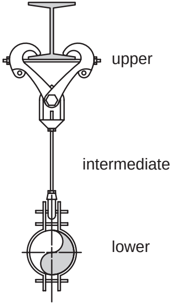
Considerations for the Hanging or Supporting of Grooved Piping Systems

It is also important to hang or support the pipe with rolls or slides and use guides to control the thermal expansion of the pipe into an expansion joint or expansion loop. The use of static hangers, such as clevis hangers, should not be considered on pipe that is thermally expanding. When using trapeze hangers for multiple systems it is important to have “like” systems on the trapeze, that is, systems that are operating near the same temperature. If you combine hot systems with cold systems on a trapeze, the thermal expansion of the hot system can cause the trapeze to possibly twist and fail or excessive stress could be induced on the grooved joints on all of the systems on the trapeze. Hot systems should be hung or supported independently of cold or ambient systems or a means should be provided, such as pipe rolls or pipe slides, to allow the hot systems to thermally expand on the trapeze.

If the pipe is a vertical riser then consideration must be given to the use of spring hangers to allow the pipe to grow vertically up or down depending upon how the pipe is anchored while still supporting the pipe. Vertical pipe thermally expands the same amount as horizontal pipe and this has to be taken into consideration relating to supports, expansion joints or expansion loops. If the vertical pipe is supported by friction/riser clamps only and the pipe expands vertically upward, the clamps will grow with the pipe off the penetration or supporting structure and no longer provide support. If the growth is downward, the friction clamps resting on the penetration or supporting structure can either fail or the pipe may overcome the friction force and push it’s way through the clamp as the pipe thermally expands downward. In either case the clamps are no longer supporting the pipe as intended and this may induce excessive stress on the grooved joints.



Clevis Hanger Assembly



Double Bolt Pipe Clamp Assembly

Whether it is horizontal or vertical grooved pipe, growth of the piping system due to pressurization and thermal expansion must be considered. On hot systems, both must be taken into account and added together to determine the overall growth of the system and the effect on the hangers or supports that are used. In the previous examples, pressurization expansion on the 400 ft. run of pipe was 4.75" for a flexible joint system and 1.78" for a rigid joint system and the thermal expansion was 3.04". Adding these combinations together would result in

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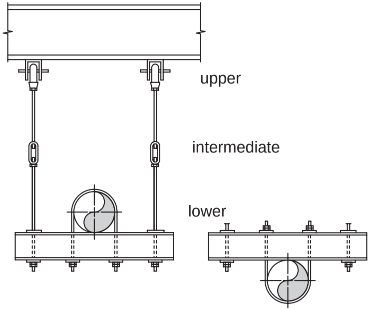
Considerations for the Hanging or Supporting of Grooved Piping Systems

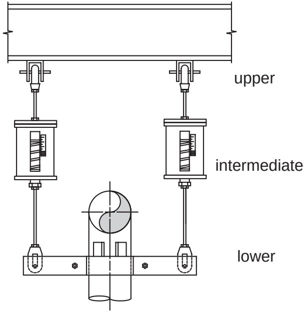
a total pipe growth of 7.79" for a flexible system or 4.82" for a rigid system, regardless of the horizontal or vertical orientation of the pipe. Again, this is a significant amount of growth relating to hangers and supports and the resulting stresses induced on grooved joints.

CONSIDER SOME RESTRAINT

Although grooved systems in seismic zones perform extremely well, consideration should be given to how a grooved system is seismically restrained. If you have growth due to pressurization and/or thermal expansion consideration should be given on how to restrain the system while still allowing growth to occur. Seismic restraints in the longitudinal direction of a long pipe run may restrict the growth of the pipe inducing stresses into the grooved couplings. Seismic restraints in the lateral direction should have little impact on expansion except where the system has a change in direction. If the seismic restraints are placed laterally after a change in direction at the end of a long run of pipe, the expansion of the long pipe run may be restricted and this could induce excessive stress into the grooved joints.



Trapeze Assembly



Spring Riser Hanger Assembly

By reviewing the couplings to be used on a project, pressurization, thermal expansion and seismic restraints, one can best determine the proper selection and application of hangers and supports for a grooved piping system. This will, in turn, help ensure that grooved piping systems will continue to enjoy a solid reputation in the areas of maintenance and downtime.

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1. SCOPE

This specification shall apply for the design and fabrication of all hangers, supports, anchors, and guides. Where piping design is such that exceptions to this specification are necessary, the particular system will be identified, and the exceptions clearly listed through an addendum which will be made a part of the specification.

2. DESIGN

(a) All supports and parts shall conform to the latest requirements of the ASME Code for Pressure Piping B31.1 and MSS Standard Practice SP-58, SP-69, SP-89 and SP-90 except as supplemented or modified by the requirements of this specification.

(b).Designs generally accepted as exemplifying good engineering practice, using stock or production parts, shall be utilized wherever possible.

(c) Accurate weight balance calculations shall be made to determine the required supporting force at each hanger location and the pipe weight load at each equipment connection.

(d) Pipe hangers shall be capable of supporting the pipe in all conditions of operation. They shall allow free expansion and contraction of the piping, and prevent excessive stress resulting from transferred weight being introduced into the pipe or connected equipment.

(e) Wherever possible, pipe attachments for horizontal piping shall be pipe clamps.

(f) For critical high-temperature piping, at hanger locations where the vertical movement of the piping is $^1/_2$" or more, or where it is necessary to avoid the transfer of load to adjacent hangers or connected equipment, pipe hangers shall be an approved constant support design, as Anvil Fig. 80-V and Fig. 81-H Constant Support Hangers, or equal.

Where transfer of load to adjacent hangers or equipment is not critical, and where the vertical movement of the piping is less than $^1/_2$", Variable Spring Hangers may be used, provided the variation in supporting effect does not exceed 25% of the calculated piping load through its total vertical travel.

(g) The total travel for Constant Support Hangers will be equal to actual travel plus 20%. In no case will the difference between actual and total travel be less than 1". The Constant Support Hanger will have travel scales on both sides of the support frame to accommodate inspections.

(h) Constant Support Hanger should be individually calibrated before shipment to support the exact load specified. The calibration record of constant support shall be maintained for a period of 20 years to assist the customer in any redesign of the piping system. Witness marks shall be stamped on the Load Adjustment Scale to establish factory calibration reference point.

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A TYPICAL PIPE HANGER SPECIFICATION, CONT'D.

(i) In addition to the requirements of ASTM-125 all alloy springs shall be shot peened and examined by magnetic particle. The spring rate tolerance shall be ±5%. All three critical parameters (free height, spring rate and loaded height) of spring coils must be tested for. Each spring coiled must be purchased with a C.M.T.R. and be of domestic manufacture.

(j) Constant Supports should have a wide range of load adjustability. No less than 10% of this adjustability should be provided either side of the calibrated load for plus or minus field adjustment. Load adjustment scale shall be provided to aid the field in accurate adjustment of loads. Additionally, the constant support should be designed so that load adjustments can be made with-out use of special tools and not have an impact on the travel capabilities of the supports.

(k) Constant Supports shall be furnished with travel stops which shall prevent upward and downward movement of the hanger. The travel stops will be factory installed so that the hanger level is at the "cold" position. The travel stops will be of such design as to permit future re-engagement, even in the event the lever is at a position other than "cold", without having to make hanger adjustments.

(l) For non-critical, low temperature systems, where vertical movements up to 2" are anticipated, an approved pre-compressed Variable Spring design similar to Anvil Fig. B-268 may be used. Where movements are of a small magnitude, spring hangers similar to Anvil Fig. 82 may be used.

(m)Each Variable Spring shall be individually calibrated at the factory and furnished with travel stops. Spring coils must be square to within 1° to insure proper alignment. Each spring coil must be purchased with a C.M.T.R. and be of domestic manufacture.

(n) All rigid rod hangers shall provide a means of vertical adjustment after erection.

(o) Where the piping system is subject to shock loads, such as seismic disturbances or thrusts imposed by the actuation of safety valves, hanger design shall include provisions for rigid restraints or shock absorbing devices of approved design, such as Anvil Fig. 200 shock and sway suppressor, or equal.

(p) Selection of vibration control devices shall not be part of the standard hanger contract. If vibration is encountered after the piping system is in operation, appropriate vibration control equipment shall be installed.

(q) Hanger rods shall be subject to tensile loading only (see Table III). At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit swing.

(r) Where horizontal piping movements are greater than $^1/_2$" and where the hanger rod angularly from the vertical is less than or equal to 4 degrees from the cold to hot position of the pipe, the hanger pipe and structural attachments shall be offset in such manner that the rod is vertical in the hot position. When the hanger rod angularity

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is greater than 4 degrees from vertical, then structural attachment will be offset so that at no point with the rod angularity exceed 4 degrees from vertical.

(t) Hangers shall be spaced in accordance with Table 1 and Table 2 on the following page.

(u) Where practical, riser piping shall be supported independently of the connected horizontal piping.

Pipe support attachments to the riser piping shall be riser clamp lugs. Welded attachments shall be of material comparable to that of the pipe, and designed in accordance with governing codes.

(v) Supports, guides, and anchors shall be so designed that excessive heat will not be transmitted to the building steel. The temperature of supporting parts shall be based on a temperature gradient of 100F° per inch distance from the outside surface of the pipe.

(w)Hanger components shall not be used for purposes other than for which they were designed. They shall not be used for rigging and erection purposes.

(x) Hydraulic Snubbers - The hydraulic units shall have a temperature stable control valve. The valve shall provide a locking and bleed rate velocity that provides for tamper proof settings. The fluid level indicator for exact reading of reservoir fluid level in any snubber orientation. The valve device shall offer a minimum amount of resistance to thermal movement. Any shock force shall cause the suppressor valve to close. With the suppressor valve closed the fluid flow shall essentially stop, thereby causing the unit to resist and absorb the disturbing forces. After the disturbing forces subside, the suppressor valve shall open again to allow free thermal movement of the piping. The suppressor shall have a means of regulating the amount of movement under shock conditions up to the design load for faulted conditions without release of fluid. The suppressor design shall include a fluid bleed system to assure continued free thermal movement after the shock force subsides. The suppressor shall have a hard surfaced, corrosion resistant piston rod supported by a rod bushings and shall be designed so that it is capable of exerting the required force in tension and compression, utilizing the distance.

(y) Paint - Variable Spring and Constant Support units will be furnished painted with Stewart Bros. Green Semi-Gloss Primer (#10947). All other material will receive one shop coat of a red chromate primer meeting the requirements of Federal Specification TT-P-636.

For corrosive conditions hangers will be galvanized or painted with carbo-zinc #11.

(z) All threads are UNC unless otherwise specified.

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A TYPICAL PIPE HANGER SPECIFICATION, CONT'D.

HANGER DESIGN SERVICE

Hanger for piping 2½" and larger, and all spring support for assemblies, shall be completely engineered.

(a) Engineered hanger assemblies shall be detailed on 8½" x 11" sheets.

Each sketch will include a location plan showing the location of the hanger in relation to columns of equipment.

Each sketch will include an exact bill of material for the component parts making up each assembly.

(b) Each engineered hanger assembly will be individually bundled and tagged as far as practical, ready for installation.

Hanger material for piping 2" and smaller shall be shipped as loose material, identified by piping system only. A piping drawing marked with approximate hanger locations and types, and hanger sketches showing typical support arrangements will be furnished.

(c) Hanger inspections shall be performed in accordance with MSS-SP-89 (Section 7.7) and ASME B31.1 (Appendix V).

TABLE 1: MAXIMUM HORIZONTAL SPACING BETWEEN PIPE SUPPORTS FOR STANDARD WEIGHT STEEL PIPE*

	Nominal Pipe Size (in)																	
	½	¾	1	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24	30
Max. Span (Ft) Water Service	7	7	7	9	10	11	12	13	14	16	17	19	22	23	25	27	28	30	32	33
Max. Span (Ft) Vapor Service	8	9	9	12	13	14	15	16	17	19	21	24	26	30	32	35	37	39	42	34
Recommended Hanger Rod Sizes	⅜					½			⅝		¾		⅞		1		1	1¼	1½	1½
																	or trapeze			

The above spacing and capacities are based on pipe filled with water. Additional valves and fittings increase the load and therefore closer hanger spacing is required.

*Many codes and specifications state "pipe hangers must be spaced every 10ft. regardless of size." This local specification must be followed.

TABLE 2: MAXIMUM HORIZONTAL SPACING BETWEEN COPPER TUBING SUPPORTS

	Nominal Tubing Size (in)									
	½	¾	1	1¼	1½	2	2½	3	3½	4
Max. Span (Ft) Water Service	5	5	6	7	8	8	9	10	11	12
Max. Span (Ft) Vapor Service	6	7	8	9	10	11	13	14	15	16

NOTE: Spans shown in Tables 1 and 2 do not apply where there are concentrated loads between supports or where temperatures exceed 750°F.

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TABLE 3: LOAD CARRYING CAPACITIES OF THREADED HANGER RODS.
MATERIALS CARBON STEEL WITH MINIMUM ACTUAL TENSILE STRENGTH OF 50 KSI.

Rod Diameter (in)	Threads per Inch	Root Area of Coarse Thread (in^2)	Maximum Safe Load (lbs) Rod Temperature, 650° F	Maximum Safe Load (lbs) Rod Temperature, 750° F
⅜	16	0.068	730	572
½	13	0.126	1,350	1,057
⅝	11	0.202	2,160	1,692
¾	10	0.302	3,230	2,530
⅞	9	0.419	4,480	3,508
1	8	0.552	5,900	4,620
1¼	7	0.889	9,500	7,440
1½	6	1.293	13,800	10,807
1¾	5	1.744	18,600	14,566
2	4½	2.292	24,600	19,265
2¼	4½	3.021	32,300	25,295
2½	4	3.716	39,800	31,169
2¾	4	4.619	49,400	38,687
3	4	5.621	60,100	47,066
3¼	8 UN	6.720	71,900	56,307
3½	8 UN	7.918	84,700	66,331
3¾	8 UN	9.214	98,500	77,139
4	8 UN	10.608	113,400	88,807
4¼	8 UN	12.100	129,400	101,337
4½	8 UN	13.690	146,600	114,807
4¾	8 UN	15.379	164,700	128,982
5	8 UN	17.165	184,000	144,096

Standard UNC thread thru 3” diameter and 8-UN-2A thread series for 3¼” diameter and larger.

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THERMAL EXPANSION OF PIPE MATERIAL

THERMAL EXPANSION OF PIPE MATERIAL – (IN/FT)

Temp F	Carbon Steel - Low Chrome Steel (thru 3% Cr)									
	0	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**
-200	-0.0180	-0.0187	-0.0192	-0.0198	-0.0203	-0.0209	-0.0215	-0.0220	-0.0225	-0.0230
-100	-0.0121	-0.0127	-0.0133	-0.0140	-0.0146	-0.0152	-0.0158	-0.0163	-0.0169	-0.0174
-0	-0.0051	-0.0058	-0.0065	-0.0073	-0.0080	-0.0087	-0.0096	-0.0103	-0.0109	-0.0116
0	-0.0051	-0.0044	-0.0037	-0.0029	-0.0022	-0.0015	-0.0007	0	0.0008	0.0015
100	0.0023	0.0030	0.0038	0.0046	0.0053	0.0061	0.0068	0.0076	0.0084	0.0091
200	0.0099	0.0107	0.0116	0.0124	0.0132	0.0141	0.0149	0.0157	0.0165	0.0174
300	0.0182	0.0191	0.0200	0.0208	0.0217	0.0226	0.0235	0.0244	0.0252	0.0261
400	0.0270	0.0279	0.0288	0.0298	0.0307	0.0316	0.0325	0.0334	0.0344	0.0353
500	0.0362	0.0372	0.0382	0.0391	0.0401	0.0411	0.0421	0.0431	0.0440	0.0450
600	0.0460	0.0470	0.0481	0.0491	0.0501	0.0512	0.0522	0.0532	0.0542	0.0553
700	0.0563	0.0574	0.0584	0.0595	0.0606	0.0617	0.0627	0.0638	0.0649	0.0659
800	0.0670	0.0681	0.0692	0.0703	0.0714	0.0726	0.0737	0.0748	0.0759	0.0770
900	0.0781	0.0792	0.0803	0.0813	0.0824	0.0835	0.0846	0.0857	0.0867	0.0878
1,000	0.0889	0.0901	0.0912	0.0924	0.0935	0.0946	0.0958	0.0970	0.0981	0.0993
1,100	0.1004	0.1015	0.1025	0.1036	0.1046	0.1057	0.1068	0.1078	0.1089	0.1099
1,200	0.1110	0.1121	0.1132	0.1144	0.1155	0.1166	0.1177	0.1188	0.1200	0.1211
1,300	0.1222	0.1233	0.1244	0.1256	0.1267	0.1278	0.1299	0.1320	0.1342	0.1363
1,400	0.1334	–	–	–	–	–	–	–	–	–

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THERMAL EXPANSION OF PIPE MATERIAL – (IN/FT)

Temp F	Austenitic Stainless Steels (304, 316, 347)									
	0	10	20	30	40	50	60	70	80	90
-200	-0.0281	-0.0295	-0.0305	-0.0314	-0.0324	-0.0334	-0.0343	-0.0353	-0.0362	-0.0372
-100	-0.0187	-0.0197	-0.0207	-0.0216	-0.0226	-0.0236	-0.0245	-0.0254	-0.0263	-0.0272
-0	-0.0078	-0.0089	-0.0100	-0.0112	-0.0123	-0.0134	-0.0145	-0.0155	-0.0166	-0.0176
0	-0.0078	-0.0067	-0.0056	-0.0044	-0.0033	-0.0022	-0.0011	0	0.0012	0.0023
100	0.0034	0.0045	0.0056	0.0068	0.0079	0.0090	0.0101	0.0112	0.0124	0.0135
200	0.0146	0.0158	0.0169	0.0181	0.0192	0.0203	0.0215	0.0227	0.0238	0.0250
300	0.0261	0.0273	0.0285	0.0297	0.0309	0.0321	0.0332	0.0344	0.0356	0.0368
400	0.0380	0.0392	0.0404	0.0416	0.0428	0.0440	0.0453	0.0465	0.0477	0.0489
500	0.0501	0.0513	0.0526	0.0538	0.0550	0.0562	0.0575	0.0587	0.0599	0.0612
600	0.0624	0.0637	0.0649	0.0662	0.0674	0.0687	0.0700	0.0712	0.0725	0.0737
700	0.0750	0.0763	0.0776	0.0789	0.0802	0.0815	0.0828	0.0841	0.0854	0.0867
800	0.0880	0.0893	0.0906	0.0920	0.0933	0.0946	0.0959	0.0972	0.0986	0.0999
900	0.1012	0.1260	0.1039	0.1053	0.1066	0.1080	0.1094	0.1107	0.1121	0.1134
1,000	0.1148	0.1162	0.1175	0.1189	0.1202	0.1216	0.1229	0.1243	0.1257	0.1270
1,100	0.1284	0.1298	0.1311	0.1325	0.1338	0.1352	0.1366	0.1379	0.1393	0.1406
1,200	0.1420	0.1434	0.1447	0.1461	0.1474	0.1488	0.1502	0.1515	0.1529	0.1542
1,300	0.1556	0.1570	0.1583	0.1597	0.1610	0.1624	0.1638	0.1651	0.1665	0.1678
1,400	0.1692	0.1704	0.1717	0.1731	0.1744	0.1757	0.1771	0.1784	0.1796	0.1811

NOTE: Intersect “10” Degree increments across the top of each table with the “100” degree increments down the left side to determine the coefficient of thermal expansion for the desired temperature.

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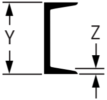
Beam Dimensions



American Standard Channels

Nom. Size Y	Weight per Ft., lb.	Flange Width	Thick. of Flange Z
3	4.1	1⅜	0.250
	5.0	1½	
	6.0	1⅝	
4	5.4	1⅝	0.313
	7.25	1¾	
5	6.7	1¾	0.313
	9.0	1⅞	
6	8.2	1⅞	0.375
	10.5	2	
	13.0	2⅛	
7	9.8	2⅛	0.375
	12.25	2¼	
	14.75	2¼	
8	11.5	2¼	0.375
	13.75	2⅜	
	18.75	2½	

American Standard Channels

Nom. Size Y	Weight per Ft., lb.	Flange Width	Thick. of Flange Z
9	13.4	2⅜	0.438
	15.0	2½	
	20.0	2⅝	
10	15.3	2⅝	0.438
	20.0	2¾	
	25.0	2⅞	
	30.0	3	
12	20.7	3	0.500
	25.0	3	
	30.0	3⅛	
15	33.9	3⅜	0.625
	40.0	3½	
	50.0	3¾	
18	42.7	4	0.625
	45.8	4	
	51.9	4⅛	
	58.0	4¼	

S Shapes

Nom. Size Y	Weight per Ft., lb.	Flange Width	Thick. of Flange Z
3	5.7	2⅜	0.250
	7.5	2½	
4	7.7	2⅝	0.313
	9.5	2¾	
5	10.0	3	0.313
	14.75	3¼	
6	12.5	3⅜	0.375
	17.25	3⅝	
7	15.3	3⅝	0.375
	20.0	3⅞	
8	18.4	4	0.438
	23.0	4⅛	
10	25.4	4⅝	0.500
	35.0	5	
12	31.8	5	0.563
	35.0	5⅛	
	40.8	5¼	0.688
	50.0	5½	

S Shapes

Nom. Size Y	Weight per Ft., lb.	Flange Width	Thick. of Flange Z
15	42.9	5½	0.625
	50.0	5⅝	
18	54.7	6	0.688
	70.0	6¼	
20	66.0	6¼	0.813
	75.0	6⅜	
20.3	86.0	7	0.938
	96.0	7¼	
24	80.0	7	0.875
	90.0	7⅛	
	100.0	7¼	

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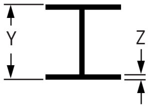
Beam Dimensions



W Shapes			
Nom. Size Y	Weight per Ft., lb.	Flange Width	Thick. of Flange Z
5	19	5	0.430
6	25	6⅛	0.455
8	18	5¼	0.330
	21	5¼	0.400
	24	6½	0.400
	28	6½	0.465
	31	8	0.435
	35	8	0.495
	40	8⅛	0.560
	48	8⅛	0.685
	58	8¼	0.810
	67	8¼	0.935
10	22	5¾	0.360
	26	5¾	0.440
	30	5¾	0.510
	33	8	0.435
	39	8	0.530
	45	8	0.620
	49	10	0.560
	54	10	0.615
	60	10⅛	0.680
	68	10⅛	0.770
	77	10¼	0.870
	88	10¼	0.990

W Shapes			
Nom. Size Y	Weight per Ft., lb.	Flange Width	Thick. of Flange Z
12	26	6½	0.380
	30	6½	0.440
	35	6½	0.520
	40	8	0.515
	45	8	0.575
	50	8⅛	0.640
	53	10	0.575
	58	10	0.640
	65	12	0.605
	72	12	0.670
	79	12⅛	0.735
	87	12⅛	0.810
	96	12⅛	0.900
	106	12¼	0.990

W Shapes			
Nom. Size Y	Weight per Ft., lb.	Flange Width	Thick. of Flange Z
14	30	6¾	0.385
	34	6¾	0.455
	38	6¾	0.515
	43	8	0.530
	48	8	0.595
	53	8	0.660
	61	10	0.645
	68	10	0.720
	74	10⅛	0.785
	82	10⅛	0.855
	90	14½	0.710
	99	14⅝	0.780
	109	14⅝	0.860
	120	14⅝	0.940
	132	14¾	1.030
16	36	7	0.430
	40	7	0.505
	45	7	0.565
	50	7⅛	0.63
	57	7⅛	0.715
	67	10¼	0.665
	77	10¼	0.760
	89	10⅜	0.875
	100	10⅜	0.985

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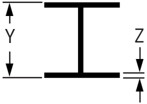
BEAM DIMENSIONS, CONT'D.



W SHAPES			
Nom. Size Y	Weight per Ft., lb.	Flange Width	Thick. of Flange Z
18	50	7½	0.570
	55	7½	0.630
	60	7½	0.695
	65	7⅝	0.750
	71	7⅝	0.810
	76	11	0.680
	86	11⅛	0.770
	97	11⅛	0.870
	106	11¼	0.940
21	62	8¼	0.615
	68	8¼	0.685
	73	8¼	0.740
	83	8⅜	0.835
	93	8⅜	0.930
	101	12¼	0.800
	111	12⅜	0.875
	122	12⅜	0.960
24	76	9	0.680
	84	9	0.770
	94	9⅛	0.875
	104	12¾	0.750
	117	12¾	0.850
	131	12⅞	0.960

W SHAPES			
Nom. Size Y	Weight per Ft., lb.	Flange Width	Thick. of Flange Z
27	94	10	0.745
	102	10	0.830
	114	10⅛	0.930
	146	14	0.975
30	108	10½	0.760
	116	10½	0.850
	124	10½	0.930
	132	10½	1.000
33	118	11½	0.740
	130	11½	0.855
	141	11½	0.960
36	135	12	0.790
	150	12	0.940
	160	12	1.020

MAXIMUM RECOMMENDED APPLIED TORQUES

FOR SET SCREWS IN MSS TYPE 19 & 23 C-CLAMP	
Thread Size	Torque Value (in.- lbs)
¼	40
⅜	60
½	125
⅝	250
¾	400
⅞	665

Extracted from MSS-SP-69

FOR FIG. 261 RISER CLAMP	
Bolt Size	Torque Value (ft.- lbs)
¼	6
⅜	21
½	46
⅝	100
¾	150
⅞	190
1	280

Bolts per ASTM A307
Nuts per ASTM A563

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STEEL PIPE DATA

STEEL PIPE DATA — SCHEDULE NO 40 & 80

Nom. Size	O.D.	Schedule No.	Wall Thick.	Weight. per Foot (lbs)	Weight of Water per Foot (lbs)
⅜	0.675	40	0.091	0.567	0.083
		80	0.126	0.738	0.061
½	0.840	40	0.109	0.850	0.132
		80	0.147	1.087	0.101
¾	1.050	40	0.113	1.130	0.230
		80	0.154	1.473	0.186
1	1.315	40	0.133	1.678	0.374
		80	0.179	2.171	0.311
1¼	1.660	40	0.140	2.272	0.647
		80	0.191	2.996	0.555
1½	1.900	40	0.145	2.717	0.882
		80	0.200	3.631	0.765
2	2.375	40	0.154	3.652	1.452
		80	0.218	5.022	1.279
2½	2.875	40	0.203	5.790	2.072
		80	0.276	7.660	1.834
3	3.500	40	0.216	7.570	3.200
		80	0.300	10.250	2.860
3½	4.000	40	0.226	9.110	4.280
		80	0.318	12.510	3.850
4	4.500	40	0.237	10.790	5.510
		80	0.337	14.980	4.980
5	5.563	40	0.258	14.620	8.660
		80	0.375	20.780	7.870
6	6.625	40	0.280	18.970	12.510
		80	0.432	28.570	11.290
8	8.625	40	0.322	28.550	21.600
		80	0.500	43.390	19.800
10	10.750	40	0.365	40.480	34.100
		80	0.593	64.400	31.100
12	12.75	40	0.406	53.600	48.500
		80	0.687	88.600	44.000
14	14.000	40	0.437	63.000	58.500
		80	0.750	107.000	51.200
16	16.000	40	0.500	83.000	76.500
		80	0.843	137.000	69.700
18	18.000	40	0.563	105.000	97.200
		80	0.937	171.000	88.500
20	20.000	40	0.593	123.000	120.400
		80	1.031	209.000	109.400
24	24.000	40	0.687	171.000	174.200
		80	1.218	297.000	158.200
30	30.000	20	0.500	158.000	286.000
36	36.000	API	0.500	190.000	417.000

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COPPER TUBE DATA

TYPE L

Tube Size	O.D. Tubing	O.D.	Wall Thick.	Weight per Foot (lbs)	Weight of Water per Foot (lbs)
¼	⅜	0.375	0.030	0.126	0.034
⅜	½	0.500	0.035	0.198	0.062
½	⅝	0.625	0.040	0.285	0.100
⅝	¾	0.750	0.042	0.362	0.151
¾	⅞	0.875	0.045	0.455	0.209
1	1⅛	1.125	0.050	0.655	0.357
1¼	1⅜	1.375	0.055	0.884	0.546
1½	1⅝	1.625	0.060	1.140	0.767
2	2⅛	2.125	0.070	1.750	1.341
2½	2⅝	2.625	0.080	2.480	2.064
3	3⅛	3.125	0.090	3.330	2.949
3½	3⅝	3.625	0.100	4.290	3.989
4	4⅛	4.125	0.110	5.380	5.188
5	5⅛	5.125	0.125	7.610	8.081
6	6⅛	6.125	0.140	10.200	11.616
8	8⅛	8.125	0.200	19.290	20.289
10	10⅛	10.125	0.250	30.100	31.590
12	12⅛	12.125	0.280	40.400	45.426

TYPE K

Tube Size	O.D. Tubing	O.D.	Wall Thick.	Weight per Foot (lbs)	Weight of Water per Foot (lbs)
¼	⅜	0.375	0.035	0.145	0.032
⅜	½	0.500	0.049	0.269	0.055
½	⅝	0.625	0.049	0.344	0.094
⅝	¾	0.750	0.049	0.418	0.144
¾	⅞	0.875	0.065	0.641	0.188
1	1⅛	1.125	0.065	0.839	0.337
1¼	1⅜	1.375	0.065	1.040	0.527
1½	1⅝	1.625	0.072	1.360	0.743
2	2⅛	2.125	0.083	2.060	1.310
2½	2⅝	2.625	0.095	2.920	2.000
3	3⅛	3.125	0.109	4.000	2.960
3½	3⅝	3.625	0.120	5.120	3.900
4	4⅛	4.125	0.134	6.510	5.060
5	5⅛	5.125	0.160	9.670	8.000
6	6⅛	6.125	0.192	13.870	11.200
8	8⅛	8.125	0.271	25.900	19.500
10	10⅛	10.125	0.338	40.300	30.423
12	12⅛	12.125	0.405	57.800	43.675

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OTHER PIPE DATA

FLANGE CAST IRON PIPE ADD WEIGHT OF FLANGES *

Pipe Size	Class	O.D. C.I. Pipe	Wall Thick.	Weight per ft. (lbs)	Weight of Water per ft. (lbs).
3	150	3.96	0.32	12.2	3.7
4	150	4.80	0.32	16.4	5.7
6	150	6.90	0.38	25.7	12.8
8	150	9.05	0.41	36.7	23.1
10	150	11.10	0.44	48.7	35.5
12	150	13.20	0.48	62.9	51.0
14	150	15.30	0.51	78.8	69.3
16	150	17.40	0.54	95.0	90.3
18	150	19.50	0.58	114.7	114.0
20	150	21.60	0.62	135.9	141.5
24	150	25.80	0.73	190.4	201.0
30	150	32.00	0.85	277.3	312.0
36	150	38.30	0.94	368.9	449.0
42	150	44.50	1.05	479.1	612.0
48	150	50.80	1.14	595.2	803.0

* Mechanical joint pipe class ISO is approximately the same weight as Bell & Spigot

GLASS PIPE - REGULAR SCHEDULE

Pipe Size	O.D.	Wall Thick.	Weight/per ft. (lbs)	Weight of Water per ft. (lbs)
1½	1.84	0.12	0.64	0.89
2	2.34	0.14	0.94	1.45
3	3.41	0.17	1.60	3.19
4	4.53	0.20	2.60	5.79
6	6.66	0.24	4.70	12.78

GLASS PIPE - HEAVY SCHEDULE

Pipe Size	O.D.	Wall Thick.	Weight per ft. (lbs)	Weightof Water per ft. (lbs)
1	1.31	0.16	0.6	0.35
1½	1.84	0.17	0.9	0.76
2	2.34	0.17	1.1	1.36
3	3.41	0.20	2.0	3.06
4	4.53	0.26	3.4	5.44
6	6.66	0.33	6.3	12.42

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PVC PIPE SUPPORT SPACING

Pipe Size (in.)	SCHEDULE 40 — Temperature (°F)					SCHEDULE 80 — Temperature (°F)					SCHEDULE 120 — Temperature (°F)				
	60	80	100	120	140	60	80	100	120	140	60	80	100	120	140
¼	4	3½	3½	2	2	4	4	3½	2½	2	–	–	–	–	–
⅜	4	4	3½	2½	2	4½	4½	4	2½	2½	–	–	–	–	–
½	4½	4½	4	2½	2½	5	4½	4½	3	2½	5	5	4½	3	2½
¾	5	4½	4	2½	2½	5½	5	4½	3	2½	5½	5	4½	3	3
1	5½	5	4½	3	2½	6	5½	5	3½	3	6	5½	5	3½	3
1¼	5½	5½	5	3	3	6	6	5½	3½	3	6½	6	5½	3½	3½
1½	6	5½	5	3½	3	6½	6	5½	3½	3½	6½	6½	6	4	3½
2	6	5½	5	3½	3	7	6½	6	4	3½	7½	7	6½	4	3½
2½	7	6½	6	4	3½	7½	7½	6½	4½	4	8	7½	7	4½	4
3	7	7	6	4	3½	8	7½	7	4½	4	8½	8	7½	5	4½
3½	7½	7	6½	4	4	8½	8	7½	5	4½	9	8½	7½	5	4½
4	7½	7	6½	4½	4	9	8½	7½	5	4½	9½	9	8½	5½	5
5	8	7½	7	4½	4	9½	9	8	5½	5	10½	10	9	6	5½
6	8½	8	7½	5	4½	10	9½	9	6	5	11½	10½	9½	6½	6
8	9	8½	8	5	4½	11	10½	9½	6½	5½	–	–	–	–	–
10	10	9	8½	5½	5	12	11	10	7	6	–	–	–	–	–
12	11½	10½	9½	6½	5½	13	12	10½	7½	6½	–	–	–	–	–
14	12	11	10	7	6	13½	13	11	8	7	–	–	–	–	–
16	12½	11½	10½	7½	6½	14	13½	11½	8½	7½	–	–	–	–	–
18	13	12	11	8	7	14½	14	12	11	9	–	–	–	–	–
20	14	12½	11½	10	8½	15½	14½	12½	11½	9½	–	–	–	–	–
24	15	13	12½	11	9½	17	15	14	12½	10½	–	–	–	–	–

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PVC Pipe Support Spacing, Cont'd.

Pipe Size (in.)	SDR 41					SDR 26					–				
	60	80	100	120	140	60	80	100	120	140	60	80	100	120	140
18	13	12	11	8	7	14½	14	12	9	8	–	–	–	–	–
20	13½	12½	11½	8½	7½	15	14½	12½	9½	8½	–	–	–	–	–
24	14	13	12	9	8	15½	15	13	10	9	–	–	–	–	–

NOTE: Although support spacing is shown at 140°F, consideration should be given to the use of CPVC or continuous support above 120°F.

The possibility of temperature overrides beyond regular working temperatures and cost may either make either of the alternatives more desirable.
This chart based on continuous spans and for un-insulated line carrying fluids of specific gravity up to 1.00.

The above table is meant as a general guideline, it is recommended that the pipe manufacturer be consulted for specific spacing recommendations relating to their pipe, load conditions, operating temperature and service conditions.

Local codes and specifications may also vary from the above recommended spacing and should be consulted for the applicable spacing requirements prior to installation.

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CPVC Pipe Support Spacing

Pipe Size (in.)	SCHEDULE 40 — Temperature (°F)						SCHEDULE 80 — Temperature (°F)					
	73°	100°	120°	140°	160°	180°	73°	100°	120°	140°	160°	180°
½	5	4½	4½	4	2½	2½	5½	5	4½	4½	3	2½
¾	5	5	4½	4	2½	2½	5½	5½	5	4½	3	2½
1	5½	5½	5	4½	3	2½	6	6	5½	5	3½	3
1¼	5½	5½	5½	5	3	3	6½	6	6	5½	3½	3
1½	6	6	5½	5	3½	3	7	6½	6	5½	3½	3½
2	6	6	5½	5	3½	3	7	7	6½	6	4	3½
2½	7	7	6½	6	4	3½	8	7½	7½	6½	4½	4
3	7	7	7	6	4	3½	8	8	7½	7	4½	4
3½	7½	7½	7	6½	4	4	8½	8½	8	7½	5	4½
4	7½	7½	7	6½	4½	4	8½	9	8½	7½	5	4½
6	8½	8	7½	7	5	4½	10	9½	9	8	5½	5
8	9½	9	8½	7½	5½	5	11	10½	10	9	6	5½
10	10½	10	9½	8	6	5½	11½	11	10½	9½	6½	6
12	11½	10½	10	8½	6½	6	12½	12	11½	10½	7½	6½
14	12	11	10	9	8	6	15	13½	12½	11	9½	8
16	13	12	11	9½	8½	7	16	15	13½	12	10	8½

NOTE: Although support spacing is shown at 140°F, consideration should be given to the use of CPVC or continuous support above 120°F.

The possibility of temperature overrides beyond regular working temperatures and cost may either make either of the alternatives more desirable.
This chart based on continuous spans and for un-insulated line carrying fluids of specific gravity up to 1.00.

The above table is meant as a general guideline, it is recommended that the pipe manufacturer be consulted for specific spacing recommendations relating to their pipe, load conditions, operating temperature and service conditions.

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ANVIL DESIGN SERVICES

Anvil offers both Basic and Extended Services…
Contact your Anvil representative for more information.

BASIC SERVICES

Anvil Design Services produces fabrication drawings and Bill of Materials of mechanical room piping 2½" and larger including chillers, heat exchangers, boilers, and pumps from contractor supplied flow diagrams, mechanical drawings, and approved submittals and specifications.

Initially, Anvil personnel meet with you to determine your piping preferences. The project scope and fee is agreed upon in a Design Services contract.

The plans and specifications are then interpreted in terms of economy, accuracy, and compliance. We may suggest modifications in arrangement, construction, equipment location, or product to attain the desired results. Piping layouts are carefully analyzed to determine whether further economies can be attained in the piping system.

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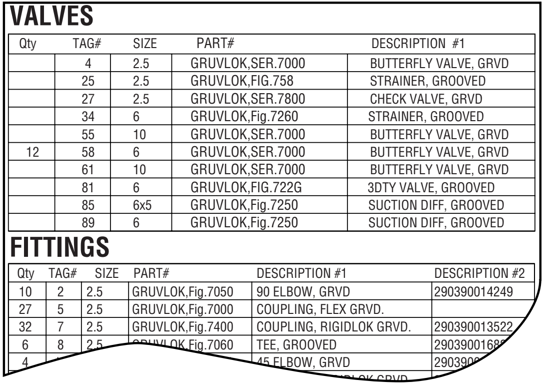
Upon approval, (4) sets of drawings with tags and Bills of Materials of the included system components are sent to you.

With Basic Services, you can plan the mechanical room. The preliminary drawings can be taken to coordination meetings with other trades to “reserve” space by “getting in” first. Also, your field supervisor can spend more time supervising and not calculating pipe lengths and pipe routing. The components can be grouped from the finished drawings for better workflow planning.



VALVES

Qty	TAG#	SIZE	PART#	DESCRIPTION #1
	4	2.5	GRUVLOK,SER.7000	BUTTERFLY VALVE, GRVD
	25	2.5	GRUVLOK,FIG.758	STRAINER, GROOVED
	27	2.5	GRUVLOK,SER.7800	CHECK VALVE, GRVD
	34	6	GRUVLOK,Fig.7260	STRAINER, GROOVED
	55	10	GRUVLOK,SER.7000	BUTTERFLY VALVE, GRVD
12	58	6	GRUVLOK,SER.7000	BUTTERFLY VALVE, GRVD
	61	10	GRUVLOK,SER.7000	BUTTERFLY VALVE, GRVD
	81	6	GRUVLOK,FIG.722G	3DTY VALVE, GROOVED
	85	6x5	GRUVLOK,Fig.7250	SUCTION DIFF, GROOVED
	89	6	GRUVLOK,Fig.7250	SUCTION DIFF, GROOVED

FITTINGS

Qty	TAG#	SIZE	PART#	DESCRIPTION #1	DESCRIPTION #2
10	2	2.5	GRUVLOK,Fig.7050	90 ELBOW, GRVD	290390014249
27	5	2.5	GRUVLOK,Fig.7000	COUPLING, FLEX GRVD.	
32	7	2.5	GRUVLOK,Fig.7400	COUPLING, RIGIDLOK GRVD.	290390013522
6	8	2.5	GRUVLOK,Fig.7060	TEE, GROOVED	2903900168
4				45 ELBOW, GRVD	2903900

We usually reduce fitting counts by 10%-15% by moving equipment whenever possible, usually less than a foot. The more movement that is allowed, the more savings can be realized.

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Extended Services

Extended Services include any scope beyond Basic Services. There are many different types of services offered as extended:

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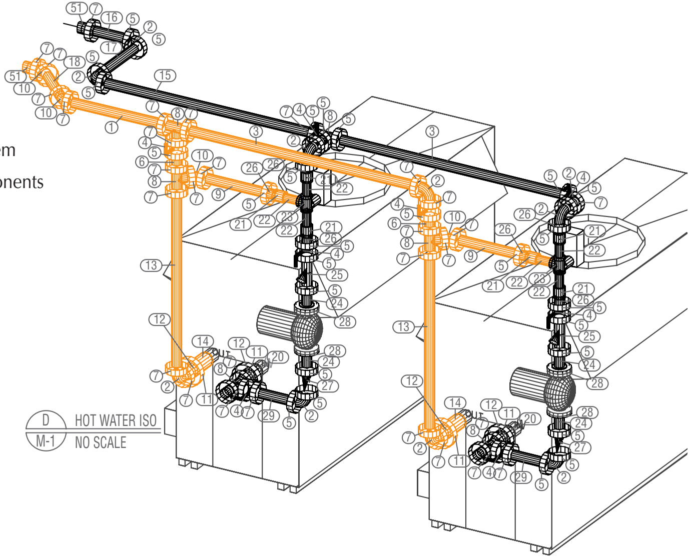
- AWWA Piping - Total Scope
- Commercial Piping
- Oil Field Piping
- Retrofit Projects - Field Survey
- Hybrid Systems
- Anything Else



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Listings and Approvals

The Gruvlok® System has been manufactured since the late 1960's. The Gruvlok product line has grown from standard couplings and fittings to today's extensive range of grooved product, plain-end product, butterfly valves, check valves, pump protection components, pipe preparation tools and various accessories.

Quality System Certificate No. 020
BS EN ISO 9001:1994

Certified to ANSI/NSF 61

APPROVED
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Industry & Government Standards & Approvals

ABS	American Bureau of Shipping
ANSI	American National Standards Institute
API	American Petroleum Institute: API Std. 5L, Sect. 7.5
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers: Power Piping, B-31.1; Chemical Plant and Petroleum Refinery Piping, B-31.3; Refrigeration Piping, B-31.5; Building Services Piping, B-31.9; Slurry Pipelines, B-31.11
ASTM	American Society of Testing and Materials: F-1476, F-1387
AWWA	American Water Works Association: C-606
BV	Bureau Veritas
CDF	California State Fire Marshal
COE	Corps of Engineers: CEGS 15000
CSA	Canadian Standards Association: B-242
DNV	Det Norske Veritas
	Hong Kong Fire Services Board
	New Zealand Insurance Council
	New Zealand Building Act. (1991)
FAA	Federal Aviation Administration: HVAC, Plumbing, Fire Protection
FHA	Federal Housing Administration
FM	Factory Mutual Engineering Corp.
GSA	General Services Administration:15000 Series
IAPMO	International Association of Plumbing & Mechanical Officials
LLOYD'S	Lloyd's Register of Shipping
LPC	Loss Prevention Council
MEA	Materials & Equipment Acceptance
MIL	Military Specifications: MILP-10388 Fittings; MIL-C-10387 Couplings; MIL-P-11087A(CE) Steel Pipe, Grooved MIL-I-45208 Inspection Procedure
NASA	National Aeronautics and Space Administration: 15000 Series
NAVFAC	Naval Facilities Engineering Command: NFGS 15000 Series
NFPA	National Fire Protection Association
NIH	National Institute of Health (Dept. of Health): 15000 Series
NSF	NSF International
NY-BSA	New York Board of Standards and Appeals
NYC	New York City
SBCCI	Southern Building Code Congress International: Standard Plumbing and Mechanical Code
TVA	Tennessee Valley Authority: Fire protection, storm drains
UL	Underwriter's Laboratories, Inc.
ULC	Underwriter's Laboratories of Canada, Bureau of Marine Inspection: Salt and fresh water, oil transfer, Bureau of Public Roads; Div. of Bridges: Drain lines and bridge crossings, Canadian Coast Guard
	U.S. Coast Guard – Approves each vessel individually
USGBC	Member - United States Green Building Council
VA	Veterans Affairs : 15000 Series
VdS	Verband der Sachversicherer e.V.

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