Schedule 80 PVC and CPVC Pipe and Fittings

Schedule 40 PVC Fittings

- **Sch 80 PVC Pipe and Fittings 1/4" – 16"**
- **Sch 80 CPVC Pipe and Fittings 1/4" – 12"**
- **Sch 40 Fittings 1/2" – 16"**

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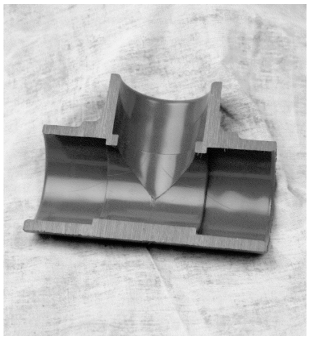


The +GF+ Hi-Strength Schedule 80 fitting design.

Product Summary

Thermoplastics, PVC (Polyvinyl Chloride) and CPVC (Chlorinated Polyvinyl Chloride), are the only materials that are simultaneously light, flexible, tough and exceptionally corrosion-resistant. Because of these and other remarkable properties of high quality, engineered thermoplastics, the savings that can be achieved both in initial installation cost and in continuing maintenance costs are substantial.

Temperature

PVC can handle temperatures up to 140°F. CPVC handles temperatures up to 210°F.

Chemical Resistance

PVC and CPVC thermoplastics are highly resistant to acids, alkalis, alcohols and many other corrosive materials. Both materials are ideal for process piping installation and most service piping applications. For details, please consult our Chemical Resistance Chart.

Maintenance Free Service

PVC and CPVC thermoplastics will not rust, scale, pit or corrode, nor are they subject to electrolysis. You are assured many years of leak-free maintenance-free service. For buried applications, PVC and CPVC are not affected by soil conditions. Painting is not required for indoor non-exposed installations. For outdoor, sunlight exposted installations, painting with two coats of white colored water base latex paint provides added protection.

Lower Installed Cost

Both PVC and CPVC have installed costs which are substantially lower than with steel alloys or lined steel and are competitive with carbon steel. Solvent cemented connections contribute to lower installed costs. The much lighter weight (about one-sixth as much as steel) speeds and simplifies handling during installation.

Applications: Versatility and Dependability

PVC and CPVC fittings, pipe and valves have been found suitable for more than 50% of the corrosive and non-corrosive applications within the chemical process industry.

Hi-Strength Fittings Design - Stronger Fittings

The +GF+ Hi-Strength Schedule 80 fitting design puts extra material at the points of greatest stress concentration. Quick burst and long-term tests show most tee and elbow failures occur in the crotch and side walls. Conversely, little or no stress occurs in the socket walls since these areas are reinforced by the pipe inside them. Thus, by thickening the crotch and side walls the ability of the fitting to withstand the pressure is substantially improved. In fact, quick bursts tests reveal +GF+ Hi-Strength Schedule 80 fittings are at least 10% stronger than conventionally designed ells and 5.7% stronger than coventionally designed couplings.

Material Data

Physical Properties of Rigid PVC & CPVC Thermoplastic Materials

The following table lists typical physical properties of PVC and CPVC thermoplastic materials.
Variations may exist depending on specific compounds and product.

Mechanical

Properties	Unit	PVC	CPVC	Remarks	ASTM Test
Specific Gravity	g/cm^3	1.40 ± .02	1.55 ± .02		D-792
Tensile Strength @ 73°F	PSI	7,200	8,000	Same in Circumferential Direction	D-638
Modules of Elasticity Tensile @ 73°F	PSI	430,000	360,000	Ratio of Stress on Bent Sample at Failure	D-638
Compressive Strength @ 73°F	PSI	9,500	10,100		D-695
Flexural Strength @ 73°F	PSI	13,000	15,100	Tensile Stress on Bent Sample at Failure	D-790
Izod Impact @ 73°F	Ft-Lbs/In of Notch	1.0	1.5	Impact Resistance of a Notched Sample to a Sharp Blow	D-256
Relative Hardness @ 73°F	Durometer "D" Rockwell "R"	80 ± 3 110-120	— 119	Equivalent to Aluminum —	D-2240 D-785

Thermodynamics

Properties	Unit	PVC	CPVC	Remarks	ASTM Test
Coefficient of Thermal Linear Expansion per °F	in/in/°F	2.8×10^{-5}	3.4×10^{-5}		D-696
Thermal Conductivity	BTU/hr/ft^2/°F/in	1.3	0.95	Average Specific Heat of 0-100°C	C-177
Specific Heat	CAL/g/°C	0.20-0.28		Ratio of Thermal Capacity to that of Water at 15°C	
Maximum Operating Temperature	°F	140	210	Pressure Rating is Directly Related to Temperature	
Heat Distortion Temperature @ 264 PSI	°F	158	217	Thermal Vibration and Softening Occurs	D-648
Decomposition Point	°F	400+	400+	Scorching by Carbonization and Dehydrochloration	

Flammability

Properties	Unit	PVC	CPVC	Remarks	ASTM Test
Average Time of Burning	sec.	<5	<5		D-635
Average Extent of Burning	mm	<10	<10		
Flame Spread Index		<10	<10		E-162
Flame Spread		10-25	4-18		E-84
Flash Ingnition	°F	730	900		
Smoke Developed*		600-1000	9-285		
Flammability (.062")		V-O	V-O, 5VB 5VA		UL-94
Softening Starts, approx.	°F	250	295		
Material Become Viscous	°F	350	395		
Material Carbonizes	°F	425	450		
Limiting Oxygen Index (LOI)		43	60		D-2863

*Tests performed on pipe sizes 3/4" - 4" with a single pipe exposed each test. Some of the CPVC pipes were water filled and these resulted in lower smoke development values. The highest values for CPVC are indicative of testing criteria ASTM-E/84 for 1" dry pipe, 24 pipes tested in one test per ASTM-E/84 criteria.

Electrical

Properties	Unit	PVC	CPVC	Remarks	ASTM Test
Dielectric Strength	VOLTS/MIL	1400	1250	Electric Insulator and Non-Magnetic	D-147
Dielectric Constant 60 Hz @ 30°F		3.70	3.25 @ 1000 Hz		D-150
Power Factor 60 Hz @ 30°F	%	1.255	.007@ 1000 Hz		D-150
Specific Volume Resistivity @ 73°F	Ohm/CM	3-5 x 10^{15}	3.4 x 10^{15}		D-257

Other

Properties	Unit	PVC	CPVC	Remarks	ASTM Test
Water Absorption	%	+0.05	+0.03 @ 73°F +0.55 @ 212°F	Weight Gain in 24 Hours	D-570
Poisson's Ratio @ 73°F		0.38	0.27		
ASTM Cell Classification		12454-B	23447-B		D-1784
Industry Standard Color		Dark Gray/ White	Medium Gray		
NSF Potable Water Approved		Yes	Yes		

Note: This data is based on information supplied by the raw materials manufacturers. It should be used as a general recommendation only and not as a guarantee of performance or longevity.

Engineering Data

In the engineering of thermoplastic piping systems, it is necessary to have not only a working knowledge of piping design but also an awareness of a number of the unique properties of thermoplastics.

In addition to chemical resistance, important factors to be considered in designing piping systems employing thermoplastics are:

1. Pressure ratings
2. Water hammer
3. Temperature-Pressure relationships
4. Thermal expansion and contraction
5. Friction-loss characteristics

These factors are considered in detail in this manual.

Pressure Rating

Determining pressure-stress pipe relationships

ISO Equation: Circumferential stress is the largest stress present in any pressurized piping system. It is the factor that determines the pressure that a section of pipe dimensions is described by the ISO (for International Standardization Organization) Equation. In various forms this equation is:

$$P = \frac{2S}{R-1} = \frac{2St}{D_0 - t} \qquad \frac{2S}{P} = \left(\frac{D_0}{t}\right) - 1$$

$$\frac{2S}{P} = R - 1 \qquad S = \frac{P(R-1)}{2}$$

Where:
- P = Internal Pressure, psi
- S = Circumferential Stress, psi
- t = Wall Thickness, in.
- D_0 = Outside Pipe Diameter, in.
- R = D_0/t

Long-Term Strength: To determine the long-term strength of thermoplastic pipe, lengths of pipe are capped at both ends (see Fig. 1-C) and subjected to various internal pressures, to produce circumferential stresses that will produce failure in from 10 to 10,000 hours. The test is run according to ASTM D 1598 — Standard Test for Time Hydrostatic Pressure.

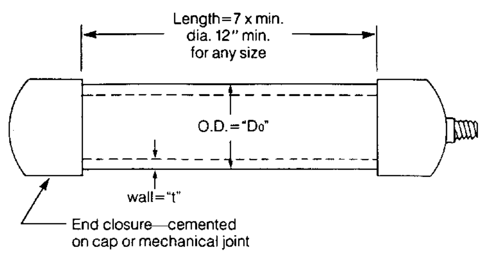
The resulting failure points are used in a statistical analysis (outlined in ASTM D 2837) to determine the characteristic regression curve that represents the stress/time-to-failure relationship for the particular thermoplastic pipe compound under test. This curve is represented by the equation:

$$\text{Log } T = a + b \log S$$

Where:
a and b are constants describing the slope and intercept of the curve, and T and S are time-to-failure and stress, respectively.

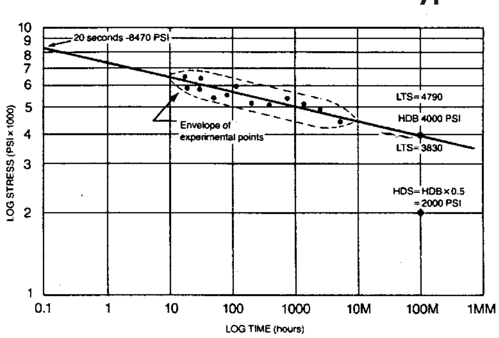
The regression curve may be plotted on a log-log paper, as shown in the Regression Curve figure below, and extrapolated from 10,000 to 100,000 hours (11.4 years). The stress at 100,000 hours is known as the Long Term Hydrostatic Strength (LTHS) for that particular thermoplastic compound. From this (LTHS) the Hydrostatic Design Stress (HDS) is determined by applying the service factor multiplier, as described below.

Long-Term Strength Test per ASTM D-1598



Pipe test specimen per ASTM D-1598 for "Time-to-Failure of Plastic Pipe Under Long-Term Hydrostatic Pressure"

Regression Curve — Stress/Time-to-Failure for PVC Type 1



<u>Service Factor:</u> The Hydrostatic Stress Committee of the Plastics Pipe Institute (PPI) has determined that a service (design) factor of one-half the Hydrostatic Design Basis would provide an adequate safety margin for use with water to ensure useful plastic-pipe service for a long period of time. While not stated in the standards, it is generally understood within the industry that this "long period of time" is a minimum of 50 years.

Accordingly, the standards for plastic pipe, using the 0.5 service factor, required that the pressure rating of the pipe be based upon this Hydrostatic Design Stress, again calculated with the ISO equation.

While early experience indicated that this service factor, or multiplier, of 0.5 provided adequate safety for many if not most uses, some experts felt that a more conservative service factor of 0.4 would better compensate for water hammer pressure surges, as well as for slight manufacturing variations and damage suffered during installation.

The PPI has issued a policy statement officially recommending this 0.4 service factor. This is equivalent to recommending that the pressure rating of the pipe should equal 1.25 times the system design pressure for any particular installation. Based upon this policy, many thousands of miles of thermoplastic pipe have been installed in the United States without failure.

It is best to consider the actual surge conditions, as outlined later in this section. In addition, substantial reductions in working pressure are advisable when handling aggressive chemical solutions and in high-temperature service.

Numerical relationships for service factors and design stresses of PVC are shown in the table below.

Service Factors and Hydrostatic Design Stress (HDS)*

(Hydrostatic Design Basis equal 4000 psi) (27.6 MPa)

Service Factor	HDS
0.5	2000 psi (13.8 MPa)
0.4	1600 psi (11 MPa)

*Material: PVC Type I & CPVC

Maximum Pressures: The pressure ratings of thermoplastic pipe represent the maximum allowable operating pressure within a piping system for water at 72°F (23.4°C) based upon a service factor of 0.5.

External Pressures — Collapse Rating

Thermoplastic pipe is frequently specified for situations where uniform external pressures are applied to the pipe, such as underwater applications. In these applications, the collapse rating of the pipe determines the maximum permissible pressure differential between external and internal pressures. The basic formulas for collapsing external pressure applied uniformly to a long pipe are:

1. For thick wall pipe where collapse is caused by elastic instability of the pipe wall:

$$Pc = \frac{\acute{o}}{2Do^2}(Do^2 - Di^2)$$

2. For thin wall pipe where collapse is caused by elastic instability of the pipe wall:

$$Pc = \frac{2cE}{1-v^2}\left(\frac{t}{Dm}\right)^3$$

Where:
- Pc = Collapse Pressure (external minus internal pressure), psi
- ó = Compressive Strength, psi
- v = Poisson's Ratio
- E = Modulus of Elasticity, psi
- D_0 = Outside Pipe Diameter, in.
- Dm = Mean Pipe Diameter, in.
- Di = Inside Pipe Diameter, in.
- t = Wall Thickness, in.
- c = Out of Roundness Factor, Approximately 0.66

Choice of Formula: By using formula 2 on thick wall pipe an excessively large pressure will be obtained. It is, therefore, necessary to calculate, for a given pipe size, the collapse pressure using both formulas and use the lower value as a guide to safe working pressure. See the following table for short term collapse pressures at 73°F. For long term loading conditions, appropriate long term data should be used.

Short Term Collapse Pressure in psi at 73°F.

1/2″	3/4″	1″	1 1/4″	1 1/2″	2″	3″	4″	6″	8″	10″	12″
Schedule 40 PVC											
2095	1108	900	494	358	211	180	109	54	39	27	29
Schedule 80 PVC/CPVC											
2772	2403	2258	1389	927	632	521	335	215	147	126	117

Note: These are short term ratings; long term should be reduced by 1/3 to 1/2 of the short term ratings.

Vacuum Service

As implied by the collapse rating, thermoplastic pipe is suitable for vacuum or negative pressure conditions that are found in many piping application.

Laboratory tests have been conducted on Schedule 80 pipe to determine performance under vacuum at temperatures above recommended operating conditions. Pipe sizes under 6 inches show no deformation at temperatures to 170°F and 27 inches of mercury vacuum.

The 6 inch pipe showed slight deformation at 165°F, and 20 inches of mercury. Above this temperature, failure occurred due to thread deformation.

Conclusion: All sizes of Schedule 80 thermoplastic pipe are suitable for vacuum service up to 140°F and 30 inches of mercury. Solvent-cemented joints are recommended for vacuum applications.

Water Hammer

Surge pressures due to water hammer are a major factor contributing to pipe failure in liquid transmission systems. A column of moving fluid within a pipeline, owing to its mass and velocity, contains stored energy. Since liquids are essentially incompressible, this energy cannot be absorbed by the fluid when a valve is suddenly closed.

The result is a high momentary pressure surge usually called water hammer. The five factors that determine the severity of water hammer are:

1. Velocity (The primary factor in excessive water hammer see discussion of "Velocity" and "Safety Factor" below)
2. Modulus of elasticity of material of which pipe is made.
3. Inside diameter of pipe.
4. Wall thickness of pipe.
5. Valve closing time.

Maximum pressure surges caused by water hammer can be calculated by using the equation below. This surge pressure should be added to the existing line pressure to arrive at a maximum operating pressure figure.

$$Ps = V \left(\frac{Et\ 3960}{Et + 3 \times 10^5 Di} \right)^{1/2}$$

Where:
- Ps = Surge Pressure, in psi
- V = Liquid Velocity, in ft. per sec.
- Di = Inside Pipe Diameter, in.
- E = Modulus of Elasticity of Pipe Material, psi
- t = Wall Thickness, in.

Calculated surge pressure, which assumes instantaneous valve closure, can be calculated for any material using the values for E (Modulus of Elasticity).

However, to keep water hammer pressures within reasonable limits, it is common practice to design valves for closure times considerably greater than 2L/c.

$$Tc > \frac{2L}{c}$$

Where:
- Tc = Valve Closure Time, sec.
- L = Length of Pipe Run, ft.
- c = Sonic Velocity of the Pressure Wave = 4720 ft/sec.

Velocity

Thermoplastic piping systems have been installed that have successfully handled water velocities in excess of 10 feet per second. Thermoplastic pipe is not subject to erosion caused by high velocities and turbulent flow and in this respect is superior to metal piping systems, particularly where corrosive or chemically aggressive fluids are involved. The Plastics Pipe Institute has issued the following policy statement on water velocity.

The maximum safe water velocity in a thermoplastic piping system depends on the specific details of the system and the operating conditions. In general, 5 feet per second is considered to be safe. Higher velocities may be used in cases where the operating characteristics of valves and pumps are known so that sudden changes in flow velocity can be controlled. The total pressure in the system at any time (operating plus surge or water hammer) should not exceed 150 percent of the pressure rating of the system.

Safety Factor

As the duration of pressure surges due to water hammer is extremely short — seconds, or more likely, fractions of a second — in determining the Safety Factor the maximum fiber stress due to internal pressure must be compared to some very short-term strength value. Referring to the "Regression Curve" graphic on page 8, it will be seen that the failure stress for very short time periods is very high when compared to the Hydrostatic Design Stress.

The calculation of Safety Factor may thus be based very conservatively on the 20-second strength value given in the "Regression Curve" graphic (page 8) — 8470 psi for PVC Type I.

A sample calculation is shown below, based upon the listed criteria:

Pipe = $1^1/_4$" Schedule 80 PVC I
O.D. = 1.660; Wall = 0.191
HDS = 2000 psi
The calculated surge pressure for $1^1/_4$" Schedule 80 PVC pipe at a velocity of 1 ft/sec. is 26.2 psi/ft/sec.

Water Velocity = 5 feet per second
Static Pressure in System = 300 psi
Total System Pressure = Total Static + Surge Pressure

$$Pt = P + PS = 300 + 5 \times 26.2 = 431.0 \text{ psi}$$

Maximum circumferential stress is calculated from a variation of the ISO Equation:

$$S = \frac{Pt\,(Do\text{-}t)}{2\,t} = \frac{431\ (1.660 - 191)}{2 \times 191} = 1657.4$$

$$\text{Safety Factor} = \frac{\text{20-second strength}}{\text{Maximum Stress}} = \frac{8470}{1657} = 5.11$$

Surge Pressure, Ps in psi at 73°F.

water Velocity (ft./sec.)	$^1/_2$"	$^3/_4$"	1"	$1^1/_4$"	$1^1/_2$"	2"	3"	4"	6"	8"	10"	12"
Schedule 40 PVC												
1	27.9	25.3	24.4	22.2	21.1	19.3	18.9	17.4	15.5	14.6	13.9	13.4
2	55.8	50.6	48.8	44.4	42.2	38.6	37.8	34.8	31.0	29.2	27.8	26.8
3	83.7	75.9	73.2	66.6	63.3	57.9	56.7	52.2	46.5	43.8	41.7	40.2
4	111.6	101.2	97.6	88.8	84.4	77.2	75.6	69.6	62.0	58.4	55.6	53.6
5	139.5	126.5	122.0	111.0	105.5	96.5	94.5	87.0	77.5	73.0	69.5	67.0
6	167.4	151.8	146.4	133.2	126.6	115.8	113.4	104.4	93.0	87.6	83.4	80.4
Schedule 80 PVC/CPVC												
1	32.9	29.9	28.7	26.2	25.0	23.2	22.4	20.9	19.4	18.3	17.3	17.6
2	65.6	59.8	57.4	52.4	50.0	46.4	44.8	41.8	38.8	36.6	35.6	35.2
3	98.7	89.7	86.1	78.6	75.0	69.6	67.2	62.7	58.2	59.9	53.4	52.8
4	131.6	119.6	114.8	104.8	107.0	92.8	89.6	83.6	77.6	73.2	71.2	70.4
5	164.5	149.5	143.5	131.0	125.0	1163.0	112.0	104.5	97.0	91.5	89.0	88.0
6	197.4	179.4	172.2	157.2	150.0	133.2	134.4	125.4	116.4	109.8	106.8	105.6

The "Safety Factors vs. Service Factors" table (see below) gives the results of Safety Factor calculations based upon Service Factors of 0.5 and 0.4 for the $1^1/_4$" PVC I Schedule 80 pipe of the example shown at left using the full pressure rating calculated from the listed Hydrostatic Design Stress. In each case, the Hydrostatic Design Basis = 4000 psi, and the water velocity = 5 feet per second.

Safety Factors vs. Service Factors — PVC Type I Thermoplastic Pipe

Pipe Class	Service Factor	HDS, psi	Pressure Rating psi	Surge Pressure at 5 ft./sec.	Maximum Pressure psi	Maximum Stress psi	Safety Factor
$1^1/_4$" Sch. 80	0.5	2000	520	131.0	651.0	2503.5	3.38
$1^1/_4$" Sch. 80	0.4	1600	416	131.0	547.0	2103.5	4.03

Pressure Rating values are for PVC I pipe, and for most sizes are calculated from the experimentally determined Long Term Strength of PVC I extrusion compounds. Because molding compounds may differ in Long Term Strength and elevated temperature properties from pipe compounds, piping systems consisting of extruded pipe and molded fittings may have lower pressure ratings than those shown here, particularly at the highter temperatures. Caution should be exercised in design of systems operating above 100°F.

Comparing Safety Factors for this $1^1/_4$" Schedule 80 pipe at different Service Factors, it is instructive to note that changing from a Service Factor of 0.5 to a more conservative 0.4 increases the Safety Factor only by 16%.

From these comparisons it is obvious that little is to be gained in safety from surge pressures by fairly large changes in the Hydrostatic Design Stress resulting from choice of more conservative Service Factors.

Temperature-Pressure Relationship

Surge pressures

Pressure ratings for thermoplastic pipe are generally determined in a water medium at room temperature (73°F). As the system temperature increases, the thermoplastic pipe becomes more ductile, increases in impact strength and decreases in tensile strength. The pressure ratings of thermoplastic pipe must, therefore, be decreased accordingly.

The effects of temperature have been exhaustively studied and correction (derating) factors developed for each thermoplastic piping material. To determine the maximum operating pressure at any given temperature, multiply the pressure rating for the pipe size and type found in the following table by the temperature derating factor.

Solvent-Welded Pressure Rating vs. Service Temperature — CPVC and PVC

				P														
				73°F		90°F	100°F	110°F	120°F		130°F		140°F		160°F	180°F	200°F	210°F
	D			PVC	CPVC	PVC	PVC	PVC	PVC	CPVC	PVC	CPVC	PVC	CPVC	CPVC	CPVC	CPVC	CPVC
Nom.	Outside	t	DR=	f=1	f=1	f=0.75	f=0.62	f=0.50	f=0.40	f=0.65	f=0.30	f=0.57	f=0.22	f=0.50	f=0.40	f=0.25	f=0.20	f=0.16
Size	Dia.	Wall		S=2000	S=2000	S=1500	S=1240	S=1000	S=800	S=1300	S=600	S=1135	S=440	S=1000	S=800	S=500	S=400	S=320
1/2	.840	.147	5.714	848	848	636	526	424	339	552	255	484	187	424	339	212	170	136
3/4	1.050	.154	6.818	688	688	516	426	344	275	447	206	392	151	344	275	172	138	110
1	1.315	.179	7.346	630	630	473	390	315	252	410	189	359	139	315	252	158	126	101
1 1/4	1.660	.191	8.691	520	520	390	322	260	208	338	156	296	114	260	208	130	104	83
1 1/2	1.900	.200	9.500	471	471	353	292	235	188	306	141	268	104	235	188	118	94	75
2	2.375	.218	10.894	404	404	303	251	202	162	263	121	230	89	202	162	101	81	65
2 1/2	2.875	.276	10.417	425	425	319	263	212	170	276	127	242	93	212	170	106	85	68
3	3.500	.300	11.667	375	375	281	233	188	150	244	113	214	83	188	150	94	75	60
4	4.500	.337	13.353	324	324	243	201	162	130	210	97	185	71	162	130	81	65	52
6	6.625	.432	15.336	279	279	209	173	140	112	181	84	159	61	140	112	70	56	45
8	8.625	.500	17.250	246	246	185	153	123	98	160	74	140	54	123	98	62	49	39

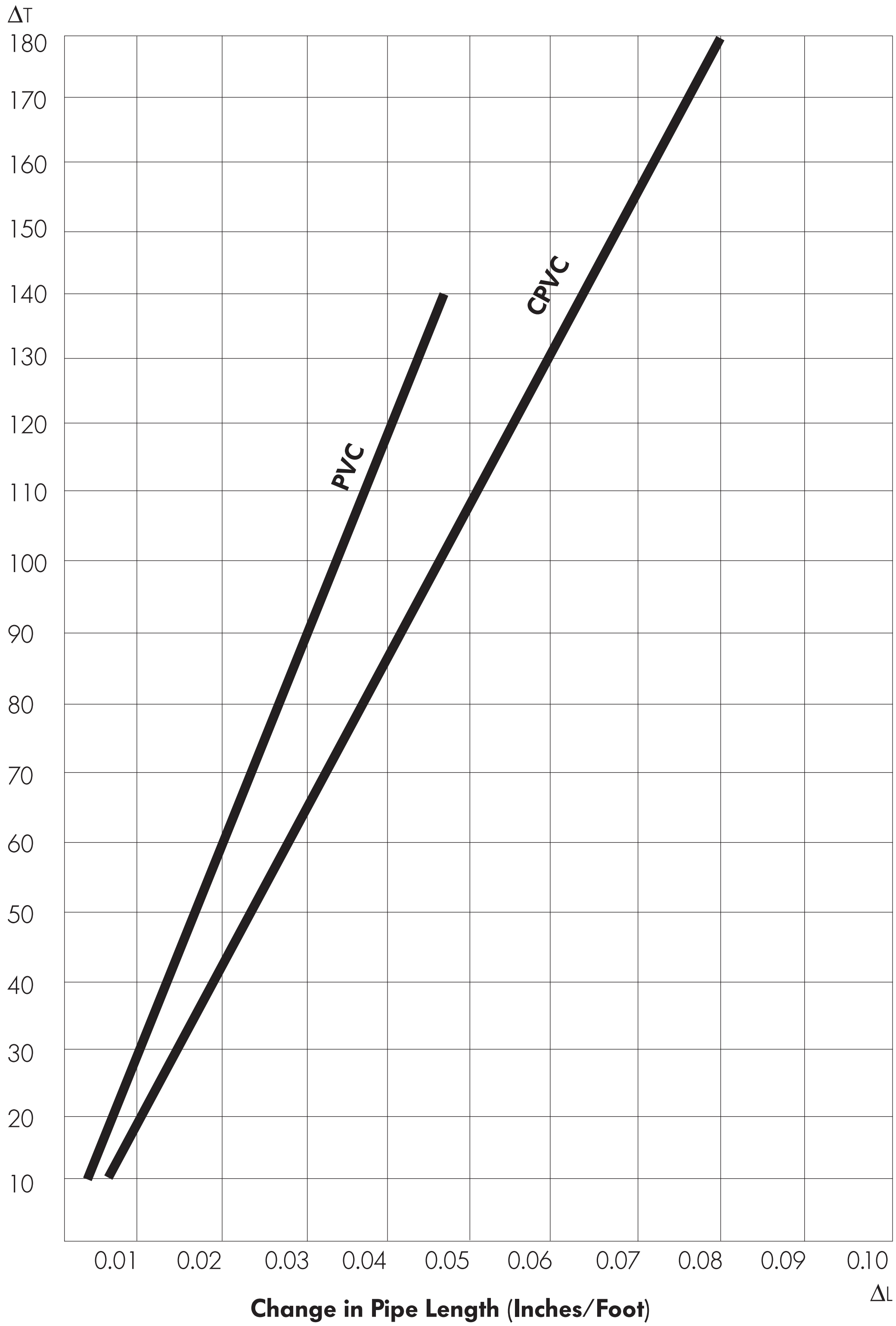
P = Pressure rating of pipe at service temperatures (psi)
S = Hydrostatic design stress (psi)
D = Outside diameter of pipe (inches)

1) Figures for pressure rating at 73°F are rounded off from actual calculated values. Pressure ratings for other temperatures are calculated from 73°F values.
2) Pressure rating values are for PVC (12454-B) and CPVC (23447-B) pipe and for most sizes are calculated from the experimentally determined long-term strength of PVC1 and CPVC extrusion compounds. Because molding compounds may differ in long-term strength and elevated temperature properties from pipe compounds, piping systems consisting of extruded pipe and molded fittings may have lower pressure ratings than those shown here, particularly at the higher temperatures. Caution should be exercised when designing PVC systems operating above 100°F and CPVC systems operating above 180°F.
3) The pressure ratings given are for solvent-cemented systems. When adding valves, flanges or other components, the system must be derated to the rating of the lowest component. (Pressure ratings: molded or cut threads are rated at 50% of solvent-cemented systems; flanges and unions are 150 psi; for valves, see manufacturer's recommendation.)

Thermal Expansion and Contraction

Thermoplastics exhibit a relatively high coefficient of thermal expansion — as much as ten times that of steel. When designing plastic piping systems, expansion of long runs must be considered. Installation temperature versus working temperature or summer to winter extremes must be considered.

Linear Expansion and Contraction



Coefficient of Thermal Linear Expansion

PVC = 2.8×10^{-5} in/in/°F
CPVC = 3.4×10^{-5} in/in/°F

To Calculate:

ΔL = Change in pipe length due to thermal changes.

L = Straight runs of pipe with no changes in direction.

Y = Coefficient of thermal expansion (see above).

ΔT = maximum change in temperature between installation and operation (T MAX. - T. MIN.)

$\Delta L = Y \times L \times \Delta T$

Example:

- A system has 350 feet (4,200") of straight run (L) with no direction change.
- Pipe material is CPVC. Coefficient (Y) is 3.4×10^{-5} (0.000034").
- Pipe is installed at an ambient temperature of 60°F. Maximum anticipated operating temperature is 140°F. The difference (ΔT) is 80°F.

$\Delta L = 0.000034 \times 4200 \times 80$

ΔL = 11.4" of linear expansion in 350 ft. in pipe.

1. Offsets: Most piping systems have occasional changes in direction which will allow the thermally induced length changes to be taken up in offsets of the pipe beyond the bends. Where this method is employed, the pipe must be able to float except at anchor points.

2. Expansion Joints: Expansion joints for pressure applications are generally expensive.

The expansion loops and offset tables have been generated for elevated temperatures as noted beneath each table. If the change in temperature and working temperatures are lower than those used to derive expansion loop and offset tables, the figures will be conservative. These tables can be generated for any temperature and expansion by using the following equations and the modulus of elasticity and working stress at the given temperature.

Assume the pipe to be a cantilevered beam.

For a beam, the bending stress can be calculated by **"Equation 1:"**

$$S = \frac{M * C}{I}$$

Where:
- S = Stress (psi)
- M = Moment (in lbs.)
- C = Distance from neutral axis (in.)
- I = Moment of Inertia (in^4)

The maximum stress occurs where C equals the radius of the pipe. Substituting the radius for C and re-arranging the equation to solve for the Moment is shown in **"Equation 2:"**

$$M = \frac{2 * S * I}{OD}$$

Where:
- OD = Pipe Outer Diamter (in)
- C = Radius of pipe = OD/2 (in)

The free body diagram which most closely approximates the deflected pipe in an expansion loop, offset or change in direction is shown in Figure A (see page 16). This is not a cantilever beam but rather a guided cantilever beam. For a guided cantilever, the moment induced by an imposed deflection is calculated by **"Equation 3:"**

$$M = \frac{6 * E * I * y}{DPL^2}$$

Where:
- E = Modulus of Elasticity (psi)
- y = imposed deflection (in)
- DPL = deflected pipe length (in)

By equating "2" and "3", the equation for the deflected beam length (DPL) can be solved:

$$\frac{2 * S * I}{OD} = \frac{6 * E * I *}{DPL^2}$$

"Equation 4:"

$$DPL = \sqrt{\frac{3 * E * OD * y}{S}}$$

After determining the proper allowable stress, "Equation 4" gives an estimate of the minimum deflected pipe length (DPL) required to sustain a piping thermal movement of length y normal to the piping.

"Equation 4" can be used to calculate the minimum deflected pipe length for expansion loops, offsets and change of directions:

Note: In some cases, a stress intensification factor (i) is added as shown in "Equation 5." The stress intensification factor is used as a safety factor to account for the effect of localized stresses on piping under repetitive loading. For example, the stress intensification factor for socket welded joints in 1.3 and for threaded joints the factor is 2.3 per ANSI/ASME B31.3, B31.4, B31.5 and B31.8 codes.

"Equation 5:"

$$DPL = \sqrt{\frac{3 * E * OD * y * i}{S}}$$

"Equation 6" is used to calculate the change in length caused by thermal expansion:

$$\Delta L = 12 * e * L * \Delta T$$

Where:
- ΔL = Change in length (in)
- e = Coeffecient of Thermal Expansion (in/in °F)
- L = Length of Straight Pipe Run (ft)
- ΔT = Change in Temperature (°F)

For the expansion loop, shown in Figure B, the imposed deflection is one half the change in length as represented in **"Equation 7":**

$$y = \frac{\Delta L}{2}$$

"Equation 4" can be modified to replace the deflection (y) with equation 6 for the change in length (ΔL) according to the relationship shown in "Equation 7".

"Equation 8:" Expansion Loop

$$DPL = 4.243 * \sqrt{\frac{E * OD * e * L * \Delta T}{S}}$$

Where:
- DPL = Deflected Pipe Length (in)
- E = Modulus of Elasticity (psi)
- OD = Pipe Outer Diameter (in)
- e = Coeffecient of Thermal Expansion (in/in °F)
- L = Length of Straight Pipe Run (ft)
- ΔT = Change in Temperature (°F)
- S = Allowable Stress (psi)

For the offset shown in Figure C and the change in direction shown in Figure D, the imposed deflection is equal to the change in length caused by thermal expansion.

"Equation 9:"

$$y = \Delta L$$

"Equation 4" can be modified to replace the deflection (y) with "Equation 6" for the change in length ΔL according to the relationship shown in "Equation 9."

"Equation 10:" Offsets and Change of Direction

$$DPL = 6.0 * \sqrt{\frac{E * OD * e * L * \Delta T}{S}}$$

Where:
- DPL = Deflected Pipe Length (in)
- E = Modulus of Elasticity (psi)
- OD = Pipe Outer Diameter (in)
- e = Coeffecient of Thermal Expansion (in/in °F)
- L = Length of Straight Pipe Run (ft)
- ΔT = Change in Temperature (°F)
- S = Allowable Stress (psi)

Note: In the tables to follow, we have chosen to use values for the allowable stress (S) and the modulus of elasticity (E) at the upper temperature limit.

Many calculations (in other manufacturers' literature) are based on the allowable stress and the modulus of elasticity at ambient conditions. This simplification is allowed because for most plastics (S) and (E) vary with temperature at approximately the same rate.

PVC Expansion Loops

PVC		Length of Run (feet)									
		10	20	30	40	50	60	70	80	90	100
Pipe Size (in.)	O.D. of Pipe (in.)	Minimum Deflected Pipe Length (DPL) (inches)									
1/2	0.840	11	15	19	22	24	27	29	31	32	34
3/4	1.050	12	17	21	24	27	30	32	34	36	38
1	1.315	14	19	23	27	30	33	36	38	41	43
1 1/4	1.660	15	22	26	30	34	37	40	43	46	48
1 1/2	1.900	16	23	28	33	36	40	43	46	49	51
2	2.375	18	26	32	36	41	45	48	51	55	58
3	3.500	22	31	38	44	49	54	58	62	66	70
4	4.500	25	35	43	50	56	61	66	71	75	79
6	6.625	30	43	53	61	68	74	80	86	91	96
8	8.625	35	49	60	69	78	85	92	98	104	110
10	10.750	39	55	67	77	87	95	102	110	116	122
12	12.750	42	60	73	84	94	103	112	119	127	133

PVC Offsets and Change of Directions

PVC		Length of Run (feet)									
		10	20	30	40	50	60	70	80	90	100
Pipe Size (in.)	O.D. of Pipe (in.)	Minimum Deflected Pipe Length (DPL) (inches)									
1/2	0.840	15	22	27	31	34	37	41	43	46	48
3/4	1.050	17	24	30	34	38	42	45	48	51	54
1	1.315	19	27	33	38	43	47	51	54	57	61
1 1/4	1.660	22	30	37	43	48	53	57	61	65	68
1 1/2	1.900	23	33	40	46	51	56	61	65	69	73
2	2.375	26	36	45	51	58	63	68	73	77	81
3	3.500	31	44	54	62	70	77	83	88	94	99
4	4.500	35	50	61	71	79	87	94	100	106	112
6	6.625	43	61	74	86	96	105	114	122	129	136
8	8.625	49	69	85	98	110	120	130	139	147	155
10	10.750	55	77	95	110	122	134	145	155	164	173
12	12.750	60	84	103	119	133	146	158	169	179	189

Figure A: Guided Cantilever Beam

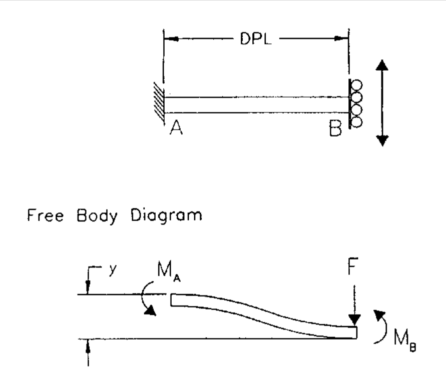
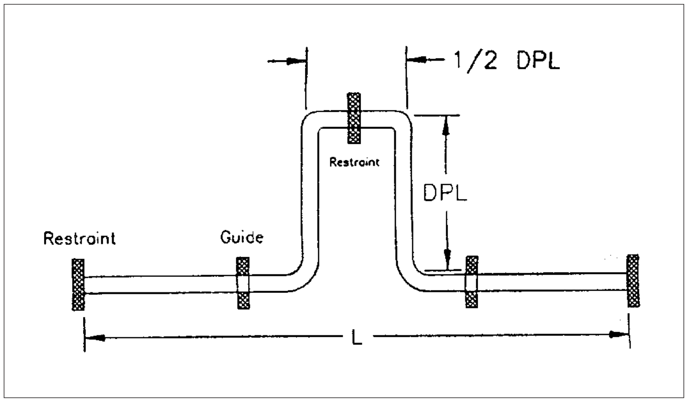


Figure B: Expansion Loop



CPVC Expansion Loops

CPVC		Length of Run (feet)									
		10	20	30	40	50	60	70	80	90	100
Pipe Size (in.)	O.D. of Pipe (in.)	Minimum Deflected Pipe Length (DPL) (inches)									
1/2	0.840	15	21	26	30	33	36	39	42	44	47
3/4	1.050	17	23	29	33	37	40	44	47	50	52
1	1.315	18	26	32	37	41	45	49	52	55	58
1 1/4	1.660	21	29	36	42	46	51	55	59	62	66
1 1/2	1.900	22	31	39	44	50	54	59	63	67	70
2	2.375	25	35	43	50	56	61	66	70	75	79
3	3.500	30	43	52	60	67	71	80	85	91	95
4	4.500	34	4	59	68	77	84	91	97	103	108
6	6.625	42	59	72	83	93	102	110	117	125	131
8	8.625	47	67	82	95	106	116	125	134	142	150
10	10.750	53	75	92	106	118	130	140	150	159	167
12	12.750	58	81	100	115	129	141	152	163	173	182

CPVC Offsets and Change of Directions

CPVC		Length of Run (feet)									
		10	20	30	40	50	60	70	80	90	100
Pipe Size (in.)	O.D. of Pipe (in.)	Minimum Deflected Pipe Length (DPL) (inches)									
1/2	0.840	21	30	36	42	47	51	55	59	63	66
3/4	1.050	23	33	40	47	22	57	62	66	70	74
1	1.315	26	37	45	52	58	61	69	74	78	83
1 1/4	1.660	29	42	51	59	66	72	78	86	88	93
1 1/2	1.900	31	44	54	63	70	77	83	89	94	99
2	2.375	35	50	61	70	79	86	93	99	105	111
3	3.500	43	60	74	85	95	105	113	121	128	135
4	4.500	48	68	84	97	108	119	128	137	145	153
6	6.625	59	53	102	117	131	144	155	166	176	186
8	8.625	67	95	116	134	150	164	177	189	201	212
10	10.750	75	106	130	150	167	183	198	212	224	237
12	12.750	81	115	141	163	182	200	216	230	244	258

Figure C: Expansion Offset

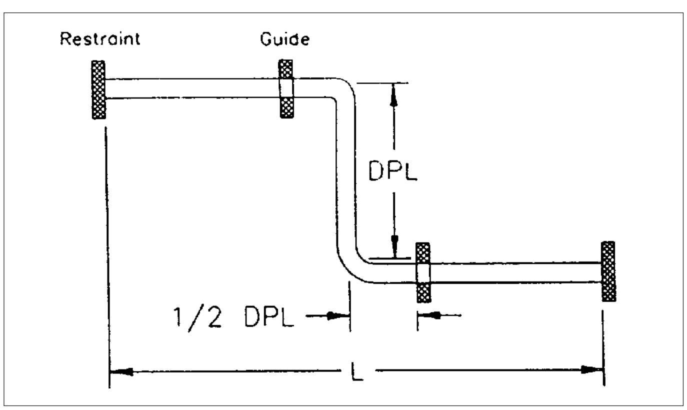
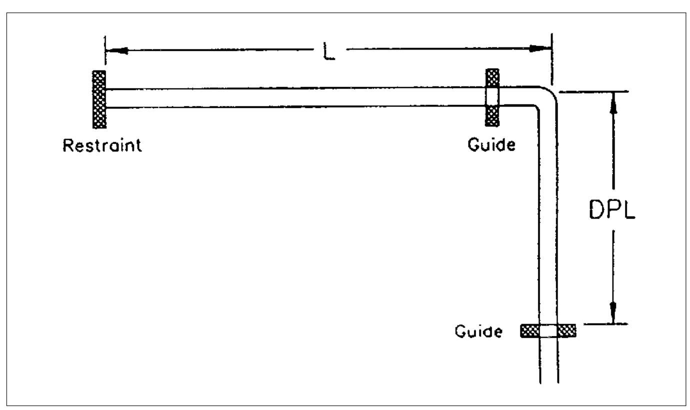


Figure D: Change of Direction



Friction-Loss Characteristics

Introduction

A major advantage of thermoplastic pipe is its exceptionally smooth inside surface area, which reduces friction loss compared to other materials.

Friction loss in plastic pipe remains constant over extended periods of time, in contrast to some other materials where the value of the Hazen and Williams C factor (constant for inside roughness) decreases with time. As a result, the flow capacity of thermoplastics is greater under fully turbulent flow conditions like those encountered in water service.

C Factors

Tests made both with new pipe and pipe that had been in service revealed C factor values for plastic pipe between 160 and 165. Thus, the factor of 150 recommended for water in the equation below is on the conservative side. On the other hand, the C factor for metallic pipe varies from 65 to 125, depending upon age and interior roughening. The obvious benefit is that with plastic systems it is often possible to use a smaller diameter pipe and still obtain the same or even lower friction losses.

Hazen and Williams Formula

The head losses resulting from various water flow rates in plastic piping may be calculated by means of the Hazen and Williams formula:

$$f = 0.2083 \left(\frac{100}{C}\right)^{1.852} \times \frac{g^{1.852}}{Di^{4.8655}}$$

$$= .0983 \frac{q^{1.852}}{Di^{4.8655}} \quad \text{for } C = 150$$

$$P = 4335f$$

Where:
- f = Friction Head in ft. of Water per 100 ft. of Pipe
- P = Pressure Loss in psi per 100 ft. of Pipe
- Di = Inside Pipe Diameter, in.
- g = Flow Rate in U.S. gal./min.
- C = Constant for Inside Roughness (C equals 150 for thermoplastics)

Friction Loss — Schedule 40 Pipe

Carrying capacity, friction loss and flow data for Schedule 40 thermoplastic pipe are presented in tabular form in the table below. This table is applicable to pipe made of any of the thermoplastic piping materials as all have equally smooth interior surfaces.

Carrying Capacity and Friction Loss — Schedule 40 Thermoplastics Pipe

Independent variables: Gallons per minute and nominal pipe size O.D. (Min. I.D.)
Dependent variables: Velocity, friction head and pressure drop per 100 feet of pipe, interior smooth.

GALLONS PER MINUTE	VELOCITY FEET PER SCOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH	VELOCITY FEET PER SCOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH	VELOCITY FEET PER SCOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH	VELOCITY FEET PER SCOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH	VELOCITY FEET PER SCOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH	VELOCITY FEET PER SCOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH	VELOCITY FEET PER SCOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH
		1/2 in.			**3/4 in.**			**1 in.**			**1 1/4 in.**			**1 1/2 in.**			**2 in.**			**3 in.**	
1	1.13	2.08	0.90	0.63	0.51	0.22															
2	2.26	4.16	1.80	1.26	1.02	0.44	0.77	0.55	0.24	0.44	0.14	0.06	0.33	0.07	0.03						
5	5.64	23.44	10.15	3.16	5.73	2.48	1.93	1.72	0.75	1.11	0.44	0.19	0.81	0.22	0.09	0.49	0.066	0.029	0.30	0.015	0.007
7	7.90	43.06	18.64	4.43	10.52	4.56	2.72	3.17	1.37	1.55	0.81	0.35	1.13	0.38	0.17	0.69	0.11	0.048	0.49	0.021	0.009
10	11.28	82.02	35.51	6.32	20.04	8.68	3.86	6.02	2.61	2.21	1.55	0.67	1.62	0.72	0.31	0.98	0.21	0.091	0.68	0.03	0.013
15		**4 in.**		9.48	42.46	18.39	5.79	12.77	5.53	3.31	3.28	1.42	2.42	1.53	0.66	1.46	0.45	0.19	1.03	0.07	0.030
20	0.51	0.03	0.013	12.65	72.34	31.32	7.72	21.75	9.42	4.42	5.59	2.42	3.23	2.61	1.13	1.95	0.76	0.33	1.37	0.11	0.048
25	0.64	0.04	0.017		**5 in.**		9.65	32.88	14.22	5.52	8.45	3.66	4.04	3.95	1.71	2.44	1.15	0.50	1.71	0.17	0.074
30	0.77	0.06	0.026	0.49	0.02	0.009	11.58	46.08	19.95	6..63	11.85	5.13	4.85	5.53	2.39	2.93	1.62	0.70	2.05	0.23	0.10
35	0.89	0.08	0.035	0.57	0.03	0.013				7.73	15.76	6.82	5.66	7.36	3.19	3.41	2.15	0.93	2.39	0.31	0.13
40	1.02	0.11	0.048	0.65	0.03	0.013				8.84	20.18	8.74	6.47	9.43	4.08	3.90	2.75	1.19	2.73	0.40	0.17
45	1.15	0.13	0.056	0.73	0.04	0.017		**6 in.**		9.94	25.10	10.87	7.27	11.73	5.08	4.39	3.43	1.49	3.08	0.50	0.22
50	1.28	0.16	0.069	0.81	0.05	0.022	0.56	0.02	0.009	11.05	30.51	13.21	8.08	14.25	6.17	4.88	4.16	1.80	3.42	0.60	0.26
60	1.53	0.22	0.095	0.97	0.07	0.030	0.67	0.03	0.013				9.70	19.98	8.65	5.85	5.84	2.53	4.10	0.85	0.37
70	1.79	0.30	0.13	1.14	0.10	0.043	0.79	0.04	0.017							6.83	7.76	3.36	4.79	1.13	0.49
75	1.92	0.34	0.15	1.22	0.11	0.048	0.84	0.05	0.022							7.32	8.82	3.82	5.13	1.28	0.55
80	2.05	0.38	0.16	1.30	0.13	0.056	0.90	0.05	0.022		**8 in.**					7.80	9.94	4.30	5.47	1.44	0.62
90	2.30	0.47	0.20	1.46	0.16	0.069	1.01	0.06	0.026							8.78	12.37	5.36	6.15	1.80	0.78
100	2.56	0.58	0.25	1.62	0.19	0.082	1.12	0.08	0.035	0.65	0.03	0.012				9.75	15.03	6.51	6.84	2.18	0.94
125	3.20	0.88	0.38	2.03	0.29	0.125	1.41	0.12	0.052	0.81	0.035	0.015		**10 in.**					8.55	3.31	1.43
150	3.84	1.22	0.53	2.44	0.40	0.17	1.69	0.16	0.069	0.97	0.04	0.017							10.26	4.63	2.00
175	4.48	1.63	0.71	2.84	0.54	0.235	1.97	0.22	0.096	1.14	0.055	0.024								6.16	2.67
200	5.11	2.08	0.90	3.25	0.69	0.30	2.25	0.28	0.12	1.30	0.07	0.030	0.82	0.027	0.012		**12 in.**			7.88	3.41
250	6.40	3.15	1.36	4.06	1.05	0.45	2.81	0.43	0.19	1.63	0.11	0.048	1.03	0.035	0.015					11.93	5.17
300	7.67	4.41	1.91	4.87	1.46	0.63	3.37	0.60	0.26	1.94	0.16	0.069	1.23	0.05	0.022						
350	8.95	5.87	2.55	5.69	1.95	0.85	3.94	0.79	0.34	2.27	0.21	0.091	1.44	0.065	0.028	1.01	0.027	0.012			
400	10.23	7.52	3.26	6.50	2.49	1.08	4.49	1.01	0.44	2.59	0.27	0.12	1.64	0.09	0.039	1.16	0.04	0.017			
450				7.31	3.09	1.34	5.06	1.26	0.55	2.92	0.33	0.14	1.85	0.11	0.048	1.30	0.05	0.022			
500				8.12	3.76	1.63	5.62	1.53	0.66	3.24	0.40	0.17	2.05	0.13	0.056	1.45	0.06	0.026			
750							8.43	3.25	1.41	4.86	0.85	0.37	3.08	0.28	0.12	2.17	0.12	0.052			
1000							11.24	5.54	2.40	6.48	1.45	0.63	4.11	0.48	0.21	2.89	0.20	0.087			
1250										8.11	2.20	0.95	5.14	0.73	0.32	3.62	0.31	0.13			
1500										9.72	3.07	1.33	6.16	1.01	0.44	4.34	0.43	0.19			
2000													8.21	1.72	0.74	5.78	0.73	0.32			
2500													10.27	2.61	1.13	7.23	1.11	0.49			

Friction Loss — Schedule 80 Pipe

Carrying capacity, friction loss and flow data for Schedule 80 thermoplastic pipe are presented in tabular form in the table below. This table is applicable to pipe made of any of the thermoplastic piping materials as all have equally smooth interior surfaces.

Friction Loss — Schedule 80 Fittings

The table "Friction Loss in Equivalent Feet of Pipe" gives the estimated friction loss, in equivalent feet of pipe, through thermoplastic fittings of various sizes and configurations.

Carrying Capacity and Friction Loss — Schedule 80 Thermoplastics Pipe

Independent variables: Gallons per minute and nominal pipe size O.D. (Min. I.D.)
Dependent variables: Velocity, friction head and pressure drop per 100 feet of pipe, interior smooth.

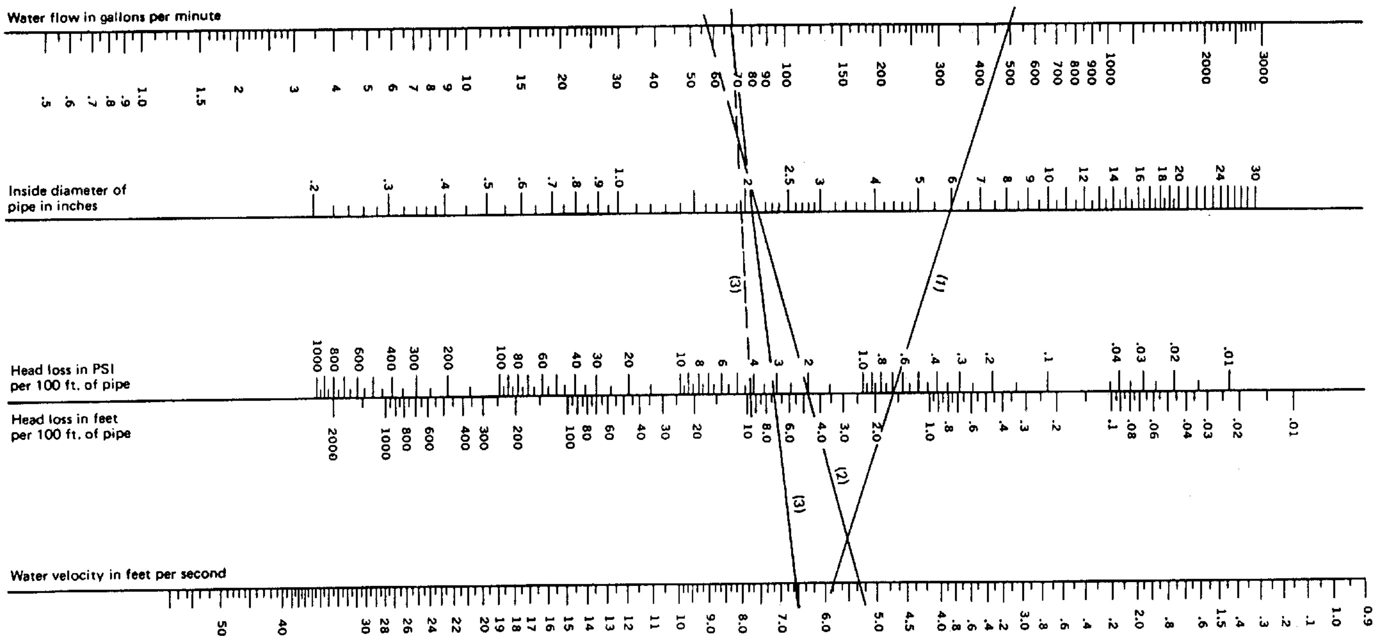
GALLONS PER MINUTE	VELOCITY FEET PER SCOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH	VELOCITY FEET PER SCOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH	VELOCITY FEET PER SCOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH	VELOCITY FEET PER SCOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH	VELOCITY FEET PER SCOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH	VELOCITY FEET PER SCOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH	VELOCITY FEET PER SCOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH	VELOCITY FEET PER SCOND	FRICTION HEAD FEET	FRICTION LOSS POUNDS PER SQUARE INCH
		1/2 in.			3/4 in.			1 in.			1 1/4 in.			1 1/2 in.			2 in.			2 1/2 in.			3 in.	
1	1.43	4.02	1.74	0.74	0.86	0.37																		
2	2.95	8.03	3.48	1.57	1.72	0.74	0.94	0.88	0.33	0.52	0.21	0.09	0.38	0.10	0.041									
5	7.89	45.23	19.59	3.92	9.67	4.19	2.34	2.78	1.19	1.30	0.66	0.29	0.94	0.30	0.126	0.56	0.10	0.040	0.39	0.05	0.022	0.25	0.02	0.009
7	10.34	83.09	35.97	5.49	17.76	7.59	3.23	5.04	2.19	1.82	1.21	0.53	1.32	0.55	0.24	0.78	0.15	0.088	0.54	0.07	0.032	0.35	0.023	0.013
10				7.84	33.84	14.65	4.68	9.61	4.16	2.60	2.30	1.00	1.88	1.04	0.45	1.12	0.29	0.13	0.78	0.12	0.052	0.50	0.04	0.017
15		4 in.		11.76	71.70	31.05	7.01	20.36	8.82	3.90	4.87	2.11	2.81	2.20	0.95	1.63	0.62	0.27	1.17	0.26	0.11	0.75	0.09	0.039
20	0.57	0.04	0.017				9.35	34.68	15.02	5.20	8.30	3.59	3.75	3.75	1.62	2.23	1.06	0.46	1.56	0.44	0.19	1.00	0.15	0.055
25	0.72	0.06	0.026		5 in.		11.69	52.43	22.70	6.50	12.55	5.43	4.69	5.67	2.46	2.79	1.60	0.69	1.95	0.67	0.29	1.25	0.22	0.095
30	0.86	0.08	0.035	0.54	0.03	0.013	14.03	73.48	31.62	7.80	17.59	7.62	5.63	7.95	3.44	3.35	2.25	0.97	2.34	0.94	0.41	1.49	0.31	0.13
35	1.00	0.11	0.048	0.63	0.04	0.017				9.10	23.40	10.13	6.57	10.58	4.58	3.91	2.99	1.29	2.73	1.25	0.64	1.74	0.42	0.13
40	1.15	0.14	0.061	0.72	0.04	0.017				10.40	29.97	12.98	7.50-	13.55	5.87	4.47	3.86	1.66	3.12	1.60	0.89	1.99	0.54	0.23
45	1.29	0.17	0.074	0.81	0.05	0.020		6 in.		11.70	37.27	16.14	8.44	16.85	7.30	5.03	4.76	2.07	3.51	1.90	0.86	2.24	0.67	0.29
50	1.43	0.21	0.091	0.90	0.07	0.030	0.63	0.03	0.013	13.00	45.30	19.61	9.38	20.48	8.87	5.58	5.79	2.51	3.90	2.42	1.05	2.49	0.81	0.35
60	1.72	0.30	0.13	1.08	0.10	0.043	0.75	0.04	0.017				11.26	28.70	12.43	6.70	8.12	3.52	4.68	3.39	1.47	2.98	1.14	0.49
70	2.01	0.39	0.17	1.26	0.13	0.056	0.88	0.05	0.022							7.82	10.80	4.68	5.46	4.51	1.35	3.49	1.51	0.65
75	2.15	0.45	0.19	1.35	0.14	0.061	0.94	0.06	0.026							8.38	12.27	5.31	5.85	5.12	2.22	3.74	1.72	0.74
80	2.29	0.50	0.22	1.44	0.16	0.069	1.00	0.07	0.030		8 in.					8.93	13.83	5.99	6.24	6.77	2.50	3.99	1.94	0.84
90	2.58	0.63	0.27	1.62	0.20	0.087	1.13	0.08	0.035							10.05	17.20	7.45	7.02	7.18	3.11	4.48	2.41	1.04
100	2.87	0.76	0.33	1.80	0.24	0.10	1.25	0.10	0.043							11.17	20.90	9.05	7.80	8.72	3.78	4.98	2.93	1.27
125	3.59	1.16	0.50	2.25	0.37	0.16	1.57	0.16	0.068	0.90	0.045	0.019							9.75	13.21	5.72	6.23	4.43	1.92
150	4.30	1.61	0.70	2.70	0.52	0.23	1.88	0.22	0.095	1.07	0.05	0.022		10 in.					11.70	18.48	8.00	7.47	6.20	2.68
175	5.02	2.15	0.93	3.15	0.69	0.30	2.20	0.29	0.12	1.25	0.075	0.033										8.72	8.26	3.58
200	5.73	2.75	1.19	3.60	0.88	0.38	2.51	0.37	0.16	1.43	0.09	0.039	0.90	0.036	0.015							9.97	10.57	4.58
250	7.16	4.16	1.81	4.50	1.34	0.58	3.14	0.56	0.24	1.79	0.14	0.61	1.14	0.045	0.02		12 in.					12.46	16.00	8.93
300	8.60	5.33	2.52	5.40	1.87	0.81	3.76	0.78	0.34	2.14	0.20	0.087	1.36	0.07	0.03									
350	10.03	7.76	3.35	6.30	2.49	1.08	4.39	1.04	0.45	2.50	0.27	0.12	1.59	0.085	0.037	1.12	0.037	0.016						
400	11.47	9.93	4.30	7.19	3.19	1.38	5.02	1.33	0.68	2.86	0.34	0.15	1.81	0.11	0.048	1.28	0.05	0.022						
450				8.09	3.97	1.72	5.64	1.65	0.71	3.21	0.42	0.18	2.04	0.14	0.061	1.44	0.06	0.026						
500				8.99	4.82	2.09	6.27	2.00	0.87	3.57	0.51	0.22	2.27	0.17	0.074	1.60	0.07	0.030						
750							9.40	4.25	1.84	5.36	1.08	0.47	3.40	0.36	0.16	2.40	0.15	0.065						
1000							12.54	7.23	3.13	7.14	1.84	0.80	4.54	0.61	0.26	3.20	0.20	0.11						
1250										8.93	2.78	1.20	5.67	0.02	0.40	4.01	0.40	0.17						
1500										10.71	3.89	1.68	6.80	1.29	0.56	4.81	0.55	0.24						
2000													9.07	2.19	0.95	6.41	0.84	0.41						
2500													11.34	3.33	1.44	8.01	1.42	0.62						
3000																9.61	1.99	0.86						
3500																11.21	2.65	1.15						
4000																12.82	3.41	1.48						

Friction Loss in Equivalent Feet of Pipe — Schedule 80 Thermoplastics Fittings

Nominal Pipe Size, In.	**3/8**	**1/2**	**3/4**	**1**	**1 1/4**	**1 1/2**	**2**	**2 1/2**	**3**	**3 1/2**	**4**	**6**	**8**
Tee, Side Outlet	3	4	5	6	7	8	12	15	16	20	22	32	38
90° Ell	1 1/2	1 1/2	2	2 3/4	4	4	6	8	8	10	12	18	22
45° Ell	3/4	3/4	1	1 3/8	1 3/4	2	2 1/2	3	4	4 1/2	5	8	10
Insert Coupling	—	1/2	3/4	1	1 1/4	1 1/2	2	3	3	—	4	6 1/4	—
Male-Female Adapters	—	1	1 1/2	2	2 3/4	3 1/2	4 1/2	—	6 1/2	—	9	14	—

Head Loss Characteristics of Water Flow Thru Rigid Plastic Pipe

This nomograph provides approximate values for a wide range of plastic pipe sizes. More precise values should be calculated from the Williams and Hazen formula. Experimental test value of C (a constant for inside pipe roughness) ranges from 155 to 165 for various types of plastic pipe. Use of a value of 150 will ensure conservative friction loss values.



The values of this chart are based on the Williams & Hazen formula:

$$f = 0.2083 \left(\frac{100}{C}\right)^{1.852} \times \frac{g^{1.852}}{Di^{4.8655}}$$

$$= .0983 \frac{g^{1.852}}{Di^{4.8655}} \quad \text{for } C = 150$$

$$P = .4335f$$

Where:
- f = Friction Head in ft. of Water per 100 ft. of Pipe
- P = Pressure Loss in psi per 100 ft. of Pipe
- Di = Inside Pipe Diameter, in.
- g = Flow Rate in U.S. gal./min.
- C = Constant for Inside Roughness (C equals 150 for thermoplatics)

The nomograph is used by lining up values on the scales by means of a ruler or straight edge. Two independent variables must be set to obtain the other values. For example: line (1) indicates that 500 gallons per minute may be obtained with a 6-inch inside diameter pipe at a head loss of about 0.65 pounds per square inch at a velocity of 6.0 feet per second. Line (2) indicates that a pipe with 2.1 inch inside diameter will give a flow of about 60 gallons per minute at a loss in head of 2 pounds per square inch per 100 feet of pipe. Line (3) and lotted line (3) show that in going from a pipe 2.1 inch inside diameter to one of 2 inches inside diameter, the head loss goes from 3 to 4 pounds per square inch in obtaining a flow of 70 gallons per minute. Remember, velocities in excess of 5.0 feet per second are not recommended.

Nomograph courtesy of Plastics Pipe Institute, a division of The Society of The Plastics Industry.

Installation Instructions

Storage and Handling

George Fischer Sloane thermoplastics have excellent resistance to weathering and can be stored outside for periods up to one year. For extended storage, the piping components should be covered with a light tarpaulin or kept under cover in a warehouse or shed that is well ventilated to prevent excessive temperature buildup and possible warpage. The storage area should not be located near steam lines or other heat sources.

To prevent sagging or "draping," particularly of the longer sections, pipe should be stored on racks that provide close or continuous support. Any sharp edges or burrs on the racks should be removed or covered. To prevent excessive deflection, loose stacks of pipe should not exceed a height of three feet. Bundled pipe can be stacked twice as high.

Fittings and flanges should be kept in their original packaging or in separate bins until they are needed. They should never be mixed in with metal piping components.

Since plastic pipe has lower impact strength and resistance to mechanical abuse than steel, it requires somewhat more care in handling. Pulling a length of pipe off a truck bed and letting the free end plummet to the ground should be avoided. So should dragging the pipe over rough ground, dropping heavy objects on it, or using any kind of chains. The resulting scratches, splits or gouges can reduce the pressure rating.

If damage from careless handling does occur, one of the advantages of plastic pipe is readily apparent. The damaged section can be quickly cut out and the pipe ends rejoined using the cutting and joining techniques described below.

Solvent Welding PVC and CPVC Pipe and Fittings

Basic Principles

The solvent cemented connection in thermoplastic pipe and fittings is the last vital link in a plastic pipe installation. It can mean the success or failure of the system as a whole. Accordingly, it requires the same professional care and attention that are given to other components of the system.

There are many solvent cementing techniques published covering step by step procedures on just how to make solvent cemented joints. However, we feel that if the basic principles involved are explained, known and understood, a better understanding would be gained, as to what techniques are necessary to suit particular applications, temperature conditions, and variations in sizes and fits of pipe and fittings.

To consistently make good joints the following should be clearly understood:

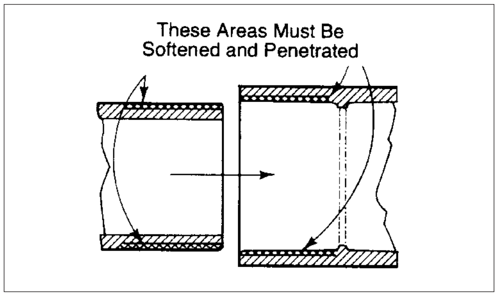
1. The joining surfaces must be dissolved and made semi-fluid.

2. Sufficient cement must be applied to fill the gap between pipe and fitting.

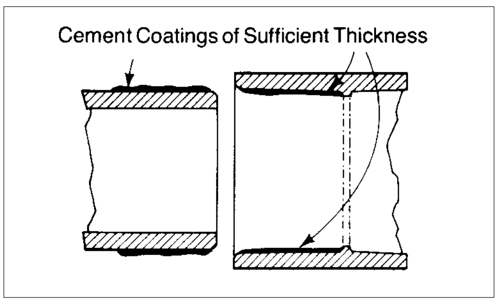
3. Assembly of pipe and fittings must be made while the surfaces are still wet and fluid.

4. Joint strength develops as the cement dries. In the tight part of the joint the surfaces will tend to fuse together, in the loose part the cement will bond to both surfaces.

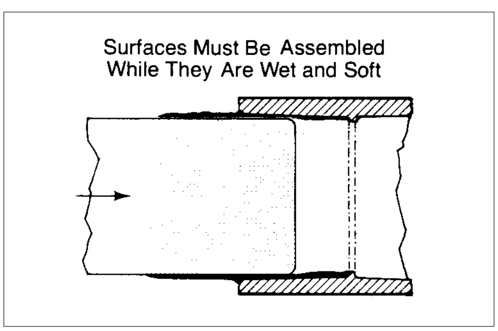
Penetration and dissolving can be achieved by a suitable primer, or by the use of both primer and cement. A suitable primer will penetrate and dissolve the plastic more quickly than cement alone. The use of a primer provides a safety factor for the installer for he can know, under various temperature conditions, when he has achieved sufficient softening.



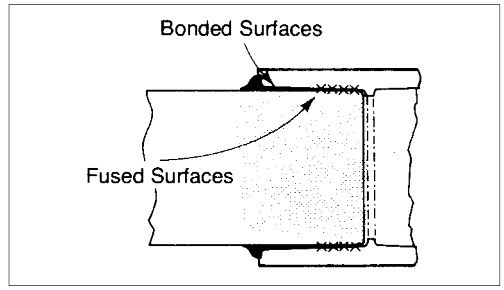
More than sufficient cement to fill the loose part of the joint must be applied. Besides filling the gap, adequate cement layers will penetrate the surface and also remain wet until the joint is assembled. Prove this for yourself. Apply on the top surface of a piece of pipe two separate layers of cement. First flow on a heavy layer of cement, then along side it a thin brushed out layer. Test the layers every 15 seconds or so by a gentle tap with your finger. You will note that the thin layer becomes tacky and then dries quickly (probably within 15 seconds). The heavy layer will remain wet much longer. Now check for penetration a few minutes after applying these layers. Scrape them with a knife. The thin layer will have achieved little or no penetration. The heavy one much more penetration.



If the cement coatings on the pipe and fittings are wet and fluid when assembly takes place,they will tend to flow together and become one cement layer. Also, if the cement is wet the surfaces beneath them will still be soft, and these softened surfaces in the tight part of the joint will tend to fuse together.



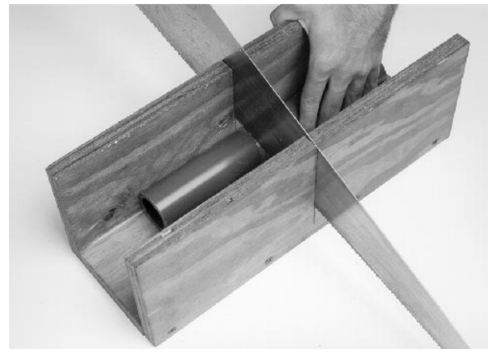
As the solvent dissipates, the cement layer and the dissolved surfaces will harden with a corresponding increase in joint strength. A good joint will take the required working pressure long before the joint is fully dry and final strength will develop more quickly than in the looser (bonded) part of the joint.

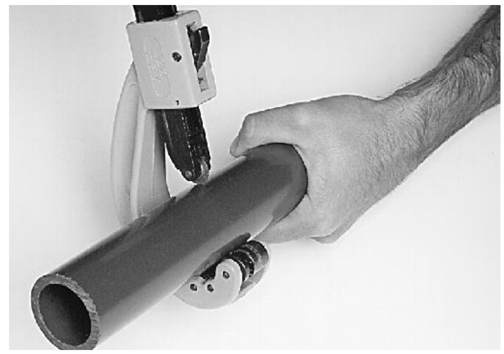


Making the Joint

1. Cutting: Pipe must be squarely cut to allow for the proper interfacing of the pipe end and the fitting socket bottom. This can be accomplished with a mitre box saw or wheel type cutter. Wheel type cutters are not generally recommended for larger diameters since they tend to flare the corner of the pipe end. If this type of cutter is used, the flare on the end must be completely removed.

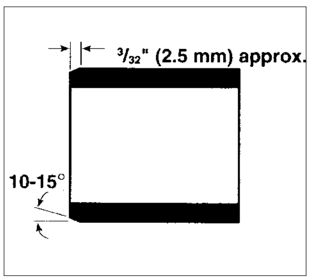
Step 1:





Note: Power saws should be specifically designed to cut plastic pipe.

2. Deburring: Use a knife, plastic deburring tool, or file to remove burrs from the end of small diameter pipe. Be sure to remove all burrs from around the inside as well as the outside of the pipe. A slight chamfer (bevel) of about 10°-15° should be added to the end to permit easier insertion of the pipe into the fitting. Failure to chamfer the edge of the pipe may remove cement from the fitting socket, causing the joint to leak. For pressure pipe systems of 2" and above, the pipe must be end-treated with a 15° chamfer cut to a depth of approximately $^{3}/_{32}$."
Commercial power bevelers are recommended.



A 15° chamfer cut to a depth of approx. $^{3}/_{32}$."

Step 2:

3. Test Dry Fit of the Joint: Tapered fitting sockets are designed so that an interference fit should occur when the pipe is inserted about $^{1}/_{3}$ to $^{2}/_{3}$ of the way into the socket. Occasionally, when pipe and fitting dimensions are at the tolerance extremes, it will be possible to fully insert dry pipe to the bottom of the fitting socket. When this happens, a sufficient quantity of cement must be applied to the joint to fill the gap between the pipe and fitting. The gap must be filled to obtain a strong, leak-free joint.

Step 3:

4. Inspection, Cleaning, Priming: Visually inspect the inside of the pipe and fitting sockets and remove all dirt, grease or moisture with a clean, dry rag or cloth. If wiping fails to clean the surfaces, a chemical cleaner must be used. Check for possible damage such as splits or cracks and replace if necessary.

   Depth-of-Entry Mark: Marking the depth of entry is a way to check if the pipe has reached the bottom of the fitting socket in step #6. Measure the fitting socket depth and mark this distance on the pipe O.D. You may want to add several inches to the distance and make a second mark as the primer and cement will most likely destroy your first one.

   Apply primer to the surface of the pipe and fitting socket with a natural bristle brush. This process softens and prepares the PVC or CPVC for the solvent cementing step. Move quickly without hesitation to the cementing procedure **while surfaces are still wet** with primer.

5. Application of Solvent Cement: Apply the solvent cement evenly and quickly around the outside of the *pipe* and at a width a little greater than the depth of the fitting socket while the primer is still wet.

   Apply a light coat of cement evenly around the inside of the fitting socket. Avoid puddling.

   Apply a second coat of cementing to the pipe end.

Note: When cementing bell-end pipe be careful not to apply an excessive amount of cement to the bell socket or spigot end. This will prevent solvent damage to the pipe. For buried pipe applications, do not throw empty primer or cement cans into the trench along side the pipe. Cans of cement and primer should be closed at all times when not in use to prevent evaporation of chemicals and hardening of cement.

> **Caution:** Primers and cements are extremely flammable and must not be stored or used near heat or open flame. Read all warnings on primer and cement cans.

Step 4:

Note: Individual scrape tests may be needed for pipes and fittings from different manufactures or even for pipes of different surface finishes to determine satisfactory penetration and softening of the material.

Note: It may be necessary for two workers to perform this operation for larger sizes of pipe.

Step 5:

6. Joint Assembly: Working quickly, squarely insert the pipe into the fitting socket, giving the pipe or fitting a $^1/_4$ turn during insertion to evenly distribute the cement. Do not continue to rotate the pipe after it has hit the bottom of the fitting socket. A good joint will have sufficient cement to make a bead all the way around the outside of the fitting hub. The fitting will have a tendency to slide back on the pipe while the cement is wet, so hold the joint tightly together for about 15 seconds. For pipe sizes 4" and above, greater axial forces are necessary for the assembly of interference fit joints. Mechanical forcing equipment may be needed to join the pipe and hold the joint until the cement "sets." The joint may have to be held together for up to 3 minutes.
   Consult the factory for specifics.

Step 6:

Note: Always wait at least 24 hours before pressure testing a piping system to allow cemented joints to cure properly. For colder temperatures, it may be necessary to wait a longer period of time. Please reference the solvent cement manufacturer's curing time.

7. Clean-up & Joint Movement: Remove all excess cement from around the pipe and fitting with a dry, cotton rag or cloth. This must be done while the cement is still soft.

   The joint should not be disturbed immediately after the cementing procedure and sufficient time should be allowed for proper curing of the joint. Exact drying time is difficult to predict because it depends on variables such as temperature, humidity and cement integrity. For

Step 7:

Joining Plastic Pipe in Hot Weather

There are many occasions when solvent cementing plastic pipe in 95°F temperatures and over cannot be avoided. If special precautions are taken, problems can be avoided.

Solvent cements for plastic pipe contain high-strength solvents which evaporate faster at elevated temperatures. This is especially true when there is a hot wind blowing. If the pipe is stored in direct sunlight, surface temperatures may be 20°F to 30°F above air temperature. Solvents attack these hot surfaces faster and deeper, especially inside a joint. Thus it is very important to avoid puddling inside socket and to wipe off excess cement outside.

By following our standard instructions and using a little extra care, as outlined below, successful solvent cemented joints can be made in even the most extreme hot weather conditions.

Tips to Follow When Solvent Cementing in High Temperatures

1. Store solvent cements and primers in a cool or shaded area prior to use.

2. If possible, store fitting and the pipe, or at least the ends to be solvent welded, in shady area before cementing.

3. Cool surfaces to be joined by wiping with a damp rag. Be sure that surface s dry prior to applying solvent cement.

4. Try to do the solvent cementing in cooler morning hours.

5. Make sure that both surfaces to be oined are still wet with cement when putting them together. With large size pipe more people on the crew may be necessary.

6. Use one of our heavier, high viscosity cements since they will provide a little more working time.

As you know, during hot weather there can be a greater expansion-contraction factor.

Joining Plastic Pipe in Cold Weather

Working in freezing temperatures is never easy. But sometimes the job is necessary. If that unavoidable job includes cementing plastic pipe . . . you can DO IT SUCCESSFULLY WITH REGULAR CEMENTS.

Good Joints Can Be Made at Sub-Zero Temperatures

By following our standard instructions and using a little extra care and patience, successful solvent cemented joints can be made at temperatures even as low as -15°F. In cold weather, solvents penetrate and soften the surfaces more slowly than in warm weather. Also the plastic is more resistant to solvent attack. Therefore, it becomes more important to presoften surfaces with a primer. And, because of slower evaporation, a longer cure time is necessary. Cure schedules already allow a wide margin for safety. For colder weather, simply allow more time.

Tips to Follow in Solvent Cementing During Cold Weather

1. Prefabricate as much of the system as possible in a heated working area.

2. Store cements and primers in a warmer area when not in use and make sure they remain fluid.

3. Take special care to remove moisture including ice and snow.

4. Use a primer to soften the joining surfaces before applying cement.

5. Allow a longer cure period before the system is used.

6. Read and follow all of our directions carefully before installation.

Regular cements are formulated to have well balanced drying characteristics and to have good stability in sub-freezing temperatures. Some manufacturers offer special cements for cold weather because their regular cements do not have that same stability.

For all practical purposes, good solvent cemented joints can be made in very cold conditions with our existing products provided proper care and a little common sense are used.

Threading

While threaded thermoplastic systems are not recommended for high-pressure systems, piping layouts where leaks would be dangerous, or for larger pipe sizes (more than two inches), they have two definite advantages. They quickly can be dismantled for temporary or take-down applications; and they can be used to join plastic to nonplastic materials.

The following recommendations for making threaded joints with thermoplastic pipe and fittings are adapted from PPI (Plastics Pipe Institute) Technical Note No. 8:

1. Thread only pipes that have wall thicknesses equal to or greater than those of Schedule 80 pipe.

2. For pressure-rated pipes of PVC and CPVC reduce the pressure rating of threaded pipe to one-half that of unthreaded pipe.

3. To cut the threads, use only pipe dies designed for plastic pipes. Keep the dies clean and sharp. Do not cut other materials with them.

4. Vises for holding the pipe during thread cutting and pipe wrenches should be designed and used in such a manner that the pipe is not damaged. Strap wrenches are recommended. Wooden plugs can be inserted into the end of the pipe, if needed to prevent distortion of the pipe walls and cutting of off-center threads.

5. The following general procedure for cutting threads may be used:

   A. Use a die stock with a proper guide so the die will start and go on square to the pipe axis. Any burrs or sharp edges on the guide that can scratch the pipe must be removed.

   B. Do not use cutting oil. However, a drop of oil may be rubbed onto the chasers occasionally. This prevents tearing and helps to promote clean, smooth threads.

6. Before assembly, the threads should be lubricated and sealed with a non-hardening pipe dope or wrapped with Teflon® tape.

7. In making up threaded joints, care must be taken not to overtighten the joints. Generally, 1/2 to one thread past hand-tight is adequate if the male thread is wrapped with Teflon tape. Further tightening may split female threaded plastic parts.

8. In general, applications for threaded plastic pipe fittings fall into two categories:

   A. Fittings for use in an all plastic system where both the male and female parts are plastic.

   B. Fittings for use as transition fittings from plastic to metal.

Theoretically, it is possible to use any combination of threaded parts such as:

1. Metal male to plastic female.

2. Plastic male to plastic female.

3. Metal female to plastic male.

Practical experience, however, suggests that the METAL MALE TO PLASTIC FEMALE combination is more susceptible to premature failure than the other two applications.

The reason for this is due to the incompressability of metal. Standard instructions call for the male part to be run in hand tight and then tightened 1/2 turn more. It has been our observation, however, that it is very common to find male metal parts screwed in for a total of 7 to 8 threads. This results in excessively high stress levels in the plastic female part.

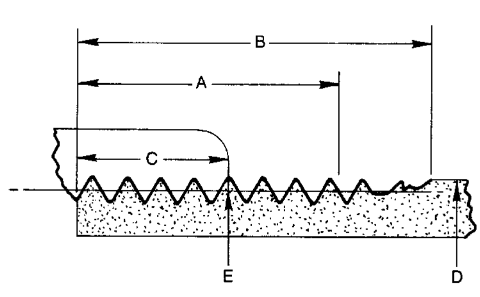
The tensile strength of the Type I PVC is 7200 psi. However, all fittings have bondlines (where the melted material joins together after flowing around the core which forms the waterway) which are the weakest portions of the fitting. The tensile strength at the bondline is therefore lower than the minimum of 7200 psi. A metal nipple screwed in 7 1/2 turns will generate a stress of approximately 6600 psi. This means that if the fitting doesn't crack open immediately, there will probably be a small crack initiated on the inside which will ultimately cause failure. It is for this reason that George Fischer Sloane recommends that its threaded plastic pipe fittings be used only in the following two combinations:

1. PLASTIC MALE TO PLASTIC FEMALE

2. PLASTIC MALE TO METAL FEMALE

If it is absolutely necessary to use a plastic female thread for transition to metal nipple, then it is IMPERATIVE that the nipple not be turned more than $^1/_2$ turn past HANDTIGHT ("fingertight"for strong hands). To insure a leakproof joint, a good sealant is recommended (Teflon® tape or Teflon® pipe dope).

Note: If metal male to plastic female connections are used it is recommended that a steel ring or band clamp be used on the outside of the female adapter.



Teflon® is a registered trademark of E.I. DuPont de Nemours & Co.

Note: Angle between sides of thread is 60 degrees. Taper of thread, on diameter, is 3/4 inch per foot.

The basic thread is 0.8 x pitch of thread and the crest and root are truncated an amount equal to 0.033 x pitch, excepting 8 threads per inch which have a basic depth of 0.788 x pitch and are truncated 0.045 x pitch at the crest and 0.033 x pitch at the root.

American Standard Taper Pipe Thread Dimensions

Pipe		Thread					
Nominal Size (in.)	Outside Diameter (in.) D	Number of Threads Per Inch	Normal Engagement by hand (in.) C	Length of Effective Thread (in.) A	Total Length End of Pipe to Vanish Point (in.) B	Pitch Diameter at End of Internal Thread (in.) E	Depth of Thread (Max.) (in.)
$^1/_8$	.405	27	.180	.2639	.3924	.39476	.02963
$^1/_4$	.540	18	.200	.4018	.5946	.48989	.04444
$^3/_8$	.675	18	.240	.4078	.6006	.62701	.04444
$^1/_2$	.840	14	.320	.5337	.7815	.77843	.05714
$^3/_4$	1.050	14	.339	.5457	.7935	.98887	.05714
1	1.315	$11^1/_2$	.400	.6828	.9845	1.23863	.06957
$1^1/_4$	1.660	$11^1/_2$	.420	.7068	1.0085	1.58338	.06957
$1^1/_2$	1.900	$11^1/_2$	.420	.7235	1.0252	1.82234	.06957
2	2.375	$11^1/_2$	.436	.7565	1.0582	2.29627	.06957
$2^1/_2$	2.875	8	.682	1.1375	1.5712	2.76216	.10000
3	3.500	8	.766	1.2000	1.6337	3.38850	.10000
$3^1/_2$	4.000	8	.821	1.2500	1.6837	3.88881	.10000
4	4.500	8	.844	1.3000	1.7337	4.38713	.10000
5	5.563	8	.937	1.4063	1.8400	5.44929	.10000
6	6.625	8	.958	1.5125	1.9472	6.50597	.10000
8	8.625	8	1.063	1.7125	2.1462	8.50003	.10000
10	10.750	8	1.210	1.9250	2.3587	10.62094	.10000
12	12.750	8	1.360	2.1250	2.5587	12.61781	.10000

Flanging

Flanged PVC and CPVC pipe has an advantage when used in a system where there is need to dismantle the pipe occasionally or when the system is temporary and mobility is required. Flanging can also be used when it is environmentally impossible to make solvent cemented joints on location.

Selection of Materials

1. <u>Gasket:</u> full-faced elastomeric (Durometer "A" scale of 55 to 80, usually 1/8" thick). Must be resistant to chemicals flowing through the line.

2. <u>Fasteners:</u> bolts, nuts and washers, also resistant to the chemical environment. (Threads should be well lubricated.)

3. <u>Torque Wrench:</u> a necessity for tightening bolts in a manner that guards against excessive torque.

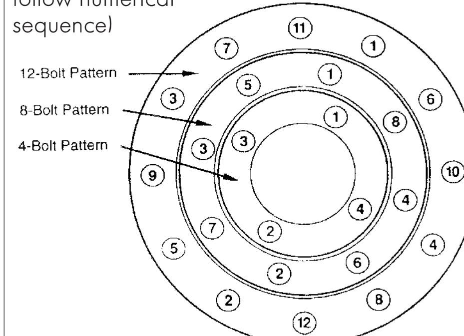
Flange Assembly

1. <u>Join the flange to the pipe</u> as outlined in the solvent cementing section or in the threading section depending on the joining method desired.

2. <u>Align the flanges and gasket</u> by inserting all of the bolts through the matching bolt holes. Proper mating of flanges and gaskets is very important for a positive seal.

3. <u>Using a torque wrench, tighten each bolt</u> in a gradual sequence as outlined by the flange sketch. For final tightening of all bolts, find the recommended torque value in the chart on page 31.

Flange Bolt Tightening Pattern
(tighten bolts evenly: follow numerical sequence)



Note:
1. Do not over-torque flange bolts.
2. Use the proper bolt tightening sequence.
3. Make sure the system is in proper alignment.
4. Flanges should not be used to draw piping assemblies together.
5. Flat washers must be used under every nut and bolt head.

Recommended Torque

Pipe Size (IPS)	No. Bolt Holes	Bolt Diameter	Approx. Bolt Length*	Recommended Torque ft/lbs
1/2	4	1/2	2 1/2	10-15
3/4	4	1/2	2 1/2	10-15
1	4	1/2	2 1/2	10-15
1 1/4	4	1/2	3	10-15
1 1/2	4	1/2	3	10-15
2	4	5/8	3	20-30
2 1/2	4	5/8	3 1/2	20-30
3	4	5/8	3 3/4	20-30
4	8	5/8	4	20-30
6	8	3/4	4 3/4	33-50
8	8	7/8	5 1/4	33-50
10	12	7/8	6	53-75
12	12	7/8	6 1/2	53-75

*Bolt lengths were calculated using two flanges. Additional accessories or different mating surfaces will alter these numbers.

Note: Flange bolt hole pattern meets ANSI B16.5.

Above-Ground Installation

Support Spacing

When thermoplastic piping systems are installed above-ground, they must be properly supported to avoid unnecessary stresses and possible sagging.

Horizontal runs require the use of hangers as described below, spaced approximately as indicated in tables in individual material sections. Note that additional support is required as temperatures increase. Continuous support can be accomplished by the use of smooth structural angle or channel.

Where the pipe is exposed to impact damage, protective shields should be installed.

Tables are based on the maximum deflection of a uniformly loaded, continuously supported beam calculated from:

$$y = .00541 \frac{wL^4}{EI}$$

Where:

- y = Deflection or sag (in.)
- w = Weight per unit length (lb./in.)
- L = Support spacing (in.)
- E = Modulus of elasticity at given temperature (lb./in.^{2})
- I = Moment of inertia (in.^{4})

If 0.100 in. is chosen arbitrarily as the permissible sag (y) between supports, then:

$$L^4 = 18.48 \frac{EL}{w}$$

Where:

- w = Weight of pipe + weight of liquid (lb./in.)

For a pipe $I = \frac{\pi}{64} (Do^4 - Di^4)$

Where:

- Do = Outside diameter of the pipe (in.)
- Di = Inside diameter of the pipe (in.)

Then:

$$L = \left(.907 \frac{E}{W} (Do^4 - Di^4)\right)^{1/4}$$

$$= .976 \left(\frac{E}{W} Do^4 - Di^4\right)^{1/4}$$

Recommended Support Spacing* (In Feet)

Nom. Pipe Size (In.)	PVC Pipe										CPVC Pipe					
	Schedule 40					Schedule 80					Schedule 80					
	Temp. °F					Temp °F					Temp. °F					
	60	**80**	**100**	**120**	**140**	**60**	**80**	**100**	**120**	**140**	**60**	**80**	**100**	**120**	**140**	**180**
½	4½	4½	4	2½	2½	5	4½	4½	3	2½	5½	5½	5	4½	4½	2½
¾	5	4½	4	2½	2½	5½	5	4½	3	2½	5½	5½	5½	5	4½	2½
1	5½	5	4½	3	2½	6	5½	5	3½	3	6	6	6	5½	5	3
1¼	5½	5½	5	3	3	6	6	5½	3½	3	6½	6½	6	6	5½	3
1½	6	5½	5	3½	3	6½	6	5½	3½	3½	7	7	6½	6	5½	3½
2	6	5½	5	3½	7	7	6½	6	4	3½	7	7	7	6½	6	3½
2½	7	6½	6	4	3½	7½	7½	6½	4½	4	8	7½	7½	7½	6½	4
3	7	7	6	4	3½	8	7½	7	4½	4	8	8	8	7½	7	4
4	7½	7	6½	4½	4	9	8½	7½	5	4½	9	9	9	8½	7½	4½
6	8½	8	7½	5	4½	10	9½	9	6	5	10	10½	9½	9	8	5
8	9	8½	8	5	4½	11	10½	9½	6½	5½	11	11	10½	10	9	5½
10	10	9	8½	5½	5	12	11	10	7	6	11½	11½	11	10½	9½	6
12	11½	10½	9½	6½	5½	12	11	10	7	6	12½	12½	12½	11	10½	6½
14	12	11	10	7	6	13½	13	11	8	7						
16	12½	11½	10½	7½	6½	14	13½	11½	8½	7½						

Note: This data is based on information supplied by the raw material manufacturers. It should be used as a general recommendation only and not as a guarantee of performance or longevity.

*Chart based on spacing for continuous spans and for uninsulated lines conveying fluids of specific gravity up to 1.00.

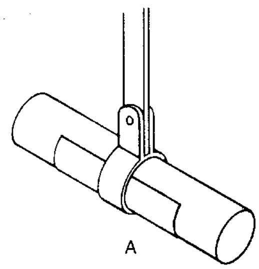
Hangers

A number of hangers designed for use with metal pipe are suitable for thermoplastic pipe as well. These include the shoe support, clamp, clevis, sling and other roller types. The hangers should, however, be modified to increase the bearing area. This is accomplished by inserting a protective sleeve of medium-gage sheet metal between the pipe and the hanger.

The pipe hangers, of whatever type, should be carefully aligned and there must be no rough or sharp edges in contact with the pipe. Plastic pipe must never be allowed to rub against any abrasive surface. If it rests on concrete piers, for example, wooden or thermoplastic pads should be used between the pipe and the concrete surface.

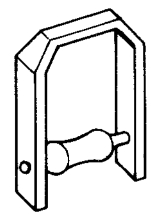
Vertical lines must also be supported at intervals so that the fittings at the lower end are not overloaded. The supports should be of the kind that do not exert a compressive strain on the pipe, such as the double-bolt type. Riser-type clamps that squeeze the pipe are not recommended. If possible, each clamp should be located just below a coupling or other fitting so that the shoulder of the coupling provides bearing support to the clamp.

Recommended Hangers for Plastic Piping Systems



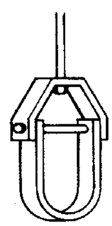
A

Band Hanger with Protective Sleeve



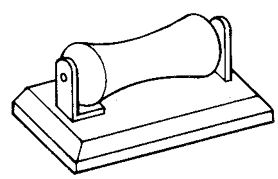
E

Roller Hanger



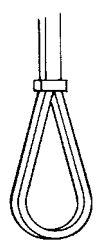
B

Clevis



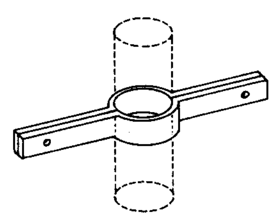
F

Pipe Roll and Plate



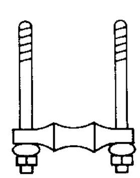
C

Adjustable Solid Ring Swivel Type



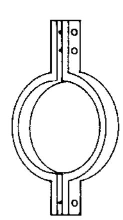
G

Riser Clamp



D

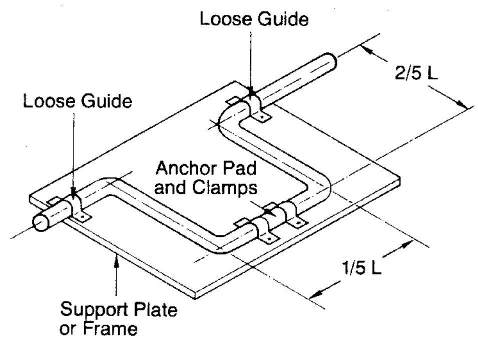
Single Pipe Roll



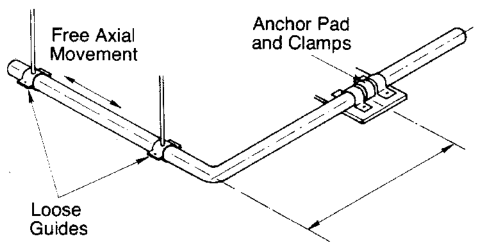
H

Double-Bolt Clamp

A Typical Method of Anchorage of a Change in Direction

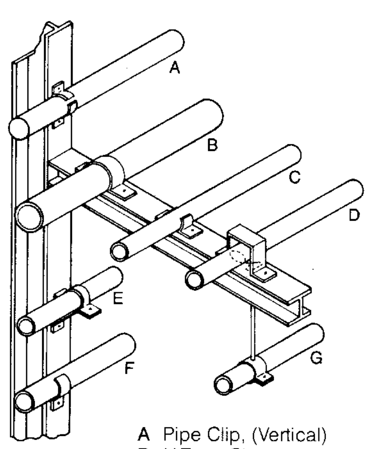


Typical Method of Anchorage



Typical Method of Anchorage

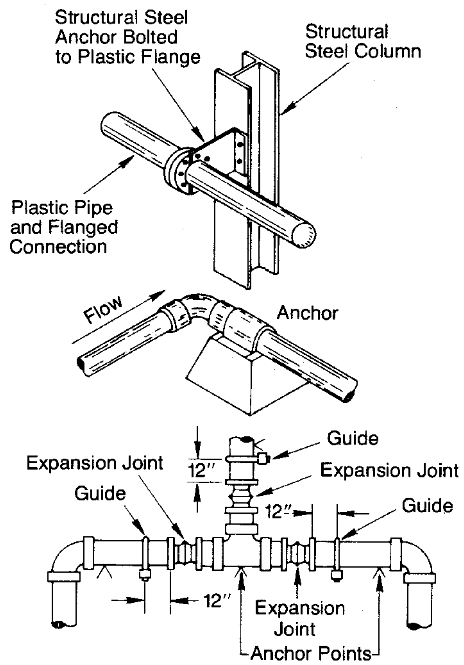
Typical Support Arrangements



Note 1:
Pipes Must Be Free to Move Axially

A Pipe Clip, (Vertical)
B U-Type Clamp
C Pipe Clip, (Horizontal)
D Roller Carrier
E Angle Bracket with U-Clamp
F Clamp (Vertical)
G Suspended Ring Clamp

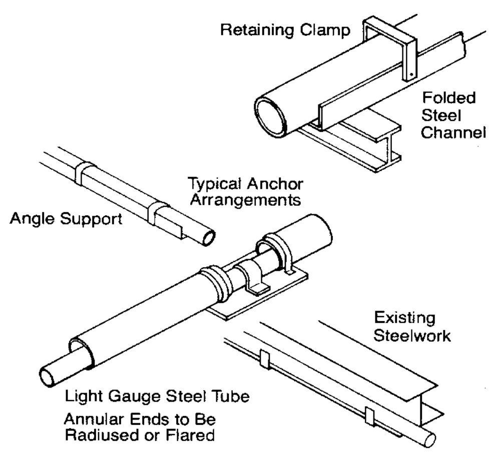
Anchors and Guides



Anchors in a piping system direct movement of pipe within a defined reference frame. At the anchoring point, there is no axial or transverse movement. Guides are used to allow axial movement of pipe but prevent transverse movement. Anchoring and guides should be engineered to provide the required function without point loading the plastic pipe.

Guides and anchors are used whenever expansion joints are used and are also on long runs and directional changes in piping.

Continuous Support Arrangements



Sunlight and Plastics

Plastic pipe and fittings are resistant to weathering, but may be degraded by intense and prolonged exposure to sunlight. Pipe and fittings can be protected from ultraviolet radiation by painting with a heavily pigmented, exterior water base latex paint. The color of the paint is of no particular importance, as the pigment acts as an ultraviolet screen and prevents damage to the pipe and fittings. However, white or some other light color is recommended as it helps reduce pipe temperature.

The latex paint must be applied thick enough to make an opaque coating. If the pipe and fittings are prepared properly for painting (cleaning and very light sanding) a good grade of exterior latex paint should last for many years.

Below-Ground Installation

Trenching and Bedding

1. Depth: When installing underground piping systems, the depth of the trench is determined by the intended service and by local conditions (as well as by local, state and national codes that may require a greater trench depth and cover than are technically necessary).

   Underground pipes are subjected to external loads caused by the weight of the backfill material and by loads applied at the surface of the fill. These can range from static to dynamic loads.

   Static loads comprise the weight of the soil above the top of the pipe plus any additional material that might by stacked above ground. An important point is that the load on a flexible pipe will be less than on a rigid pipe buried in the same manner. This is because the flexible conduit transfers part of the load to the surrounding soil and not the reverse. Soil loads are minimal with narrow trenches until a pipe of 10 feet is attained.

   Dynamic loads are loads due to moving vehicles such as trucks, trains and other heavy equipment. For shallow burial conditions live loads should be considered and added to static loads, but at depths greater than 10 feet, live loads have very little effect.

   For static and dynamic soil loading tables, refer to specific materials sections, PVC and CPVC.

   Pipe intended for potable water service should be buried at least 12 inches below the maximum expected frost penetration.

2. Bedding: The bottom of the trench should provide a firm, continuous bearing surface along the entire length of the pipe run. It should be relatively smooth and free of rocks. Where hardpan, ledge rock or boulders are present, it is recommended that the trench bottom be cushioned with at least four (4) inches of sand or compacted fine-grained soils.

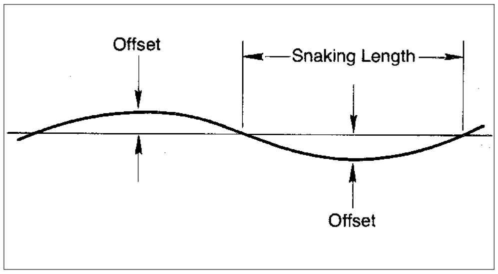
3. Snaking: To compensate for thermal contraction, the snaking technique of offsetting the pipe with relation to the trench centerline is recommended.

   Example: Snaking is particularly important when laying small diameter pipe in hot weather. For example, a 100-foot length of PVC Type I pipe will expand or contract about $^3/_4$" to reach 20°F temperature change. On a hot summer day, the direct rays of the sun on the pipe can drive the surface temperature up to 150°F. At night, the air temperature may drop to 70°F. In this hypothetical case, the pipe would undergo a temperature change of 80°F — and every 100 feet of pipe would contract 3". This degree of contraction would put such a strain on newly cemented pipe joints that a poorly made joint might pull apart.

   Installation: A practical and economical method is to cement the line together at the side of the trench during the normal working day. When the newly cemented joints have dried, the pipe is snaked from one side of the trench to the other in gentle, alternative curves. This added length will compensate for any contraction after the trench is back filled (see "Snaking of Pipe Within Trench illustration below).

The "Snaking Length" table below gives the required loop length, in feet, and offset in inches, for various temperature variations.

Snaking of Pipe Within Trench



Snaking of thermoplastic pipe within trench to compensate for contraction.

Snaking Length vs. Offset (in.) to Compensate for Thermal Contraction.

Snaking Length, (ft.)	Maximum Temperature Variation (°F) Between Time of Cementing and Final Backfilling									
	10°	**20°**	**30°**	**40°**	**50°**	**60°**	**70°**	**80°**	**90°**	**100°**
	Loop Offset, (in.)									
20	2.5	3.5	4.5	5.20	5.75	6.25	6.75	7.25	7.75	8.00
50	6.5	9.0	11.0	12.75	14.25	15.50	17.00	18.00	19.25	20.25
100	13.0	18.0	22.0	26.00	29.00	31 .50	35.00	37.00	40.00	42.00

Anchors and Other Connections

Plastic pipe is not designed to provide structural strength beyond sustaining internal pressures up to its designed hydrostatic pressure rating and normal soil loads. Anchors, valves and other connections must be independently supported to prevent added shearing and bending stresses on the pipe.

Risers: The above piping design rule applies also where pipe is brought out of the ground. Above-ground valves or other connections must be supported independently. If pipe is exposed to external damage, it should be protected with a separate, rigidly supported metal pipe sleeve at the danger areas. Thermoplastic pipe should not be brought above ground where it is exposed to high temperatures. Elevated temperatures can lower the pipe's pressure rating below design levels.

Backfilling

Before making the final connections and backfilling, the pipeline should be cooled to near the temperature of the soil. During hot weather, for example, backfilling should be done early in the morning, when the solvent-cemented joints are completely dried and the line is fully contracted.

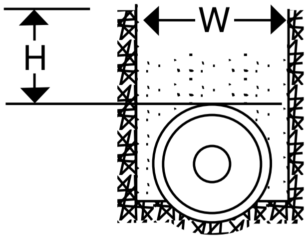
Assuming that the pipe is uniformly and continuously supported over its entire length on firm, stable material, it should first be covered with 6 to 8 inches of soil that is free of debris and rocks larger than on-half inch in diameter. This initial layer should be compacted by hand or, preferably, by mechanical tamper so that it acts as a protective cushion against the final backfill. Any large, sharp rocks that could penetrate the tampered layer around the pipe should be removed from the final backfill.

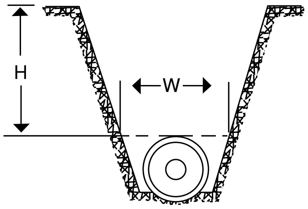
Heavy Traffic: When plastic pipe is installed beneath streets, railroads or other surfaces that are subjected to heavy traffic and resulting shock and vibration, it should be run within a protective metal or concrete casing.

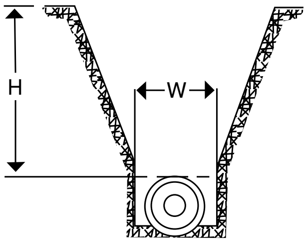
Locating Buried Pipe: The location of plastic pipelines should be accurately recorded at the time of installation. Since pipe is a non-conductor, it does not respond to the electronic devices normally used to locate metal pipelines. However, a copper or galvanized wire can be spiraled around, taped to or laid alongside or just above the pipe during installation to permit the use of a locating device.

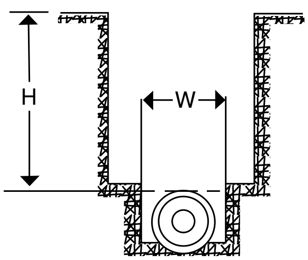
Note: For additional information, see ASTM D-2774, "Underground Installation of Thermoplastic Piping."

Trench Widths for PVC









Note: W = Trench Width at Top of Pipe.

Soil Load and Pipe Resistance for Flexible Thermoplastic Pipe — PVC Schedule 80 Pipe

Nom. Size	Wc' = Load Resistance of Pipe (lb./ft.) Schedule 80 Pipe		H=Height of fill Above Pipe	Wc = Soil Loads at Various Trench Widths at Top of Pipe (lb./ft.)			
	E' = 200	E' = 700	(ft.)	2 ft	3 ft.	4 ft.	5ft.
1 1/2	1375	1561	10	106	125	136	152
			20	138	182	212	233
			30	144	207	254	314
			40	—	214	269	318
2	1161	1400	10	132	156	170	190
			20	172	227	265	291
			30	180	259	317	392
			40	—	267	337	398
2 1/2	1593	1879	10	160	191	210	230
			20	204	273	321	352
			30	216	306	377	474
			40	—	323	408	482
3	1416	1772	10	196	231	252	280
			20	256	336	392	429
			30	266	266	384	469
			40	—	394	497	586
3 1/2	1318	1731	10	223	266	293	320
			20	284	380	446	490
			30	300	426	524	660
			40	—	450	568	670
4	1266	1735	10	252	297	324	360
			20	328	432	540	551
			30	342	493	603	743
			40	—	506	639	754
5	1206	1796	10	310	370	407	445
			20	395	529	621	681
			30	417	592	730	918
			40	—	625	790	932
6	1323	2028	10	371	437	477	530
			20	484	636	742	812
			30	503	725	888	1093
			40	—	745	941	1110
8	1319	2250	10	483	569	621	690
			20	630	828	966	1057
			30	656	945	1156	1423
			40	—	970	1225	1415
10	1481	2649	10	602	710	774	860
			20	785	1032	1204	1317
			30	817	1177	1405	1774
			40	—	1209	1527	1801
12	1676	3067	10	714	942	919	1020
			20	931	1225	1429	1562
			30	969	1397	1709	2104
			40	—	1434	1811	2136

Note 1: Figures are calculated from minimum soil resistance values (E' = 200 psi for uncompacted sandy clay foam) and compacted soil (E' = 700 for side-fill soil that is compacted to 90% or more of Proctor Density for distance of two pipe diameters on each side of the pipe). If Wc' is less than Wc at a given trench depth and width, then soil compaction will be necessary.

Note 2: These are soil loads only and do not include live loads.

Standards

ASTM — American Society for Testing and Materials

Standards provide greater assurance of product performance and consistency, and are available to assist design engineers in system specification. The most frequently referenced industry standards for plastic piping systems are ASTM Standard Specifications and Practices. Along with ASTM Standards, additional product specifications and certifications form the basis of product conformance to which George Fischer Sloane products are manufactured.

Summaries of ASTM Test Methods and Recommended Practices for Plastic Piping

The standards summarized in this section may all be found, in full, in the ASTM Book of Standards, Parts 08.01, 08.02, 08.03 and 08.04.

Test Methods

D-543: Resistance of Plastics to Chemical Reagents

This method is intended for testing all plastic materials including cast, hot molded, cold molded, laminated resinous products, extruded and sheet materials for resistance to chemical reagents. This method includes provisions for reporting changes in weight, dimensions, appearance and strength properties.

Limitations of the results obtained from this test should be recognized. The choice of types and concentrations of reagents, duration of immersion, temperature of test, and properties to be reported is necessarily arbitrary. Evaluation of plastics for special applications involving corrosive conditions should be based on the particular reagents and concentrations to be encountered. The selection of test conditions should take into account the temperature of the system, and other performance factors involved in the particular application.

The effect of stress while in contact with environmental agents is known to have significantly varying effects on different kinds of plastics and where stress is important in the use of the product, such as pipe, this must be taken into consideration when considering the effect of the environment.

D-638: Tensile Properties of Plastics

This method is intended for use in determining the comparative tensile properties of plastics in the form of standard test specimens when tested under defined conditions of pretreatment, temperature, humidity and testing machine speed.

The method is designed to produce tensile property data for the control and specification of plastic materials. These data may also be useful for material specification and qualitative characterization purposes and for research and development of plastics. Tensile properties vary with specimen preparation, testing speed and environment of testing. Consequently, where precise comparative results are desired, these factors must be carefully controlled.

Tensile properties may provide useful data for plastics engineering design purposes. However, due to the high degree of sensitivity exhibited by many plastics to the rate of straining and environmental conditions, data obtained by this method cannot be considered valid for the applications involving load-time scales or environments widely different from those of this method. In cases of such dissimilarity, no reliable estimation of the limited usefulness can be made for most plastics. This sensitivity to rate of straining and environment necessities testing over a broad load-time scale (including impact and creep) and range of environmental conditions if tensile properties are to suffice for engineering design purposes.

D-1598: Time-to-Failure of Plastic Pipe Under Long-Term Hydrostatic Pressure

This method covers the determination of the time-to-failure of all types of plastic pipe (both the thermoplastic and reinforced thermosetting) under constant internal hydrostatic pressure. It provides a way of characterizing all plastics in the form of pipe under the conditions prescribed.

The method consists of exposing specimens of pipe to constant internal hydrostatic load while in a controlled environment. Such a controlled environment may be accomplished by, but is not limited to, immersing the specimens in a controlled-temperature water bath. The time-to-failure is observed.

The values obtained by this method are useful for establishing stess versus time-to-failure relationships under controlled environment from which probable safe working stresses can be estimated when adequate margins of strength are provided. To characterize plastics as pipe, it is necessary to establish a stress-failure time relationship to at least 1000 hours in a controlled environment. Because of the nature of the test and specimens employed, no single line can adequately represent the data, and therefore, the confidence limits should be established.

The factors that affect creep and long-term strength behavior of plastic pipe are not completely known at this time. This procedure takes into account those factors that are known to have important influences and provides a tool for investigating others. Creep or nonrecoverable deformation for pipe made of some plastics is as important as actual leakage in deciding whether or not a pipe has failed. Specimens that exhibit localized ballooning, however, may lead to erroneous interpretation of creep results unless a method of determining creep is established that precludes such a possibility. Circumferential measurements at two or three selected positions on a specimen may not be adequate.

A method for estimation of time (to 1 year or more) failure stresses based on short-time tests is yet to be established. Until such a correlation is established for each type of plastic, extrapolations should be made with caution and the extrapolated failure stresses should not be interpreted as working stresses.

D-1599: Short-Term Rupture Strength of Plastic Pipe, Tubing and Fittings

This method covers the determination of the short-term rupture strength of both thermoplastic and reinforced thermosetting pipe, tubing and fittings. It is suitable for establishing laboratory testing requirements for quality control purposes or for procurement sepcifications. The pressure requirement may be stated as the internal hydraulic pressure or hoop stress or both. The method consists of loading a specimen to failure in a short-time interval by means of essentially continuously increasing internal hydraulic pressure, at a controlled temperature.

Data obtained by this method are of use only in predicting the behavior of pipe, tubing and fittings under conditions of temperature, time, method of loading and hoop stress similar to those used in the actual test. They are in no way generally indicative of the long-term strength of thermoplastic or reinforced pipe, tubing and fittings under static stress (pressure rating).

D-1784: Specifying Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds

This standard specifies compound physical requirements for PVC and CPVC materials used in the manufacture of thermoplastic valves, pipe and fittings. The standard classifies compounds on the basis of several physical and chemical properties. Conformance to a particular material classification requires meeting the minimum requirements specified.

D-1785 and F-441: Specifying Polyvinyl Chloride (PVC) Plastic Pipe, Schedule 40 and 80

This standard specifies the physical dimensions, test requirements and workmanship for Schedule 40 and 80 PVC (D-1785) and CPVC (F-441) pressure pipe.

D-2122: Determining Dimensions of Thermoplastic Pipe and Fittings

This method covers a precedure for determining diameter, wall thickness and length dimensions of thermoplastic pipe. Included are procedures for measurement of inside diameter of pipe intended to be joined by internal fittings, measurement of average outside diameter of roundable pipe where out-of-roundness is not of primary concern, out-of-roundness measurement and average outside diameter of nonroundable pipe, and for determining length and straightness.

Procedures for determining fittings socket diameters, socket depths and laying lengths and for gauging internal and external threads are included.

D-2152: Quality of Extruded Polyvinyl Chloride Pipe by Acetone Immersion

This method covers the determination of the quality of extruded rigid polyvinyl chloride (PVC) plastic pipe as indicated by its reaction to immersion in anhydrous acetone. It may be used also to determine the quality of molded PVC fittings.

This method is applicable only for distinguishing between unfused and properly fused PVC. The difference between thermally degraded and properly fused PVC cannot be detected by this method. This method may be used in purchasing specifications because it does not yield data of value in establishing the quality of extruded PVC pipe.

D-2412: External Loading Properties of Plastic Pipe by Parallel-Plate Loading

This method covers the determination of load deflection characteristics, calculation of pipe stiffness and measurement of the load deflection at rupture of plastic pipe under parallel-plate loading. A short length of pipe is loaded between two rigid parallel flat plates at a controlled rate of approach to one another. Load deflection (of the pipe diameter) data are obtained. If rupture occurs, the load and deflection at rupture are measured.

External properties of plastic pipe obtained by this method may be used for the following:

A. to determine the degree of flexibility of the pipe. This is a function of dimensions and the material from which the pipe is made;

B. to determine the load-deflection characteristics and pipe stiffness which are used for engineering design;

C. to compare the characteristics of various plastics in pipe form;

D. to study the interrelations of the dimensions and deflection properties of plastic pipe and conduit;

E. to measure the deflection at which failure may occur under parallel-plate loading.

D-2464 and F-437: Specifying Threaded Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80

This standard specifies physical dimensions, test requirements and workmanship for threaded Schedule 80 PVC (D-2464) and CPVC (F-437) pressure fittings.

D-2466 and F-438: Specifying Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40

This standard specifies physical dimensions, test requirements and workmanship for Schedule 40 PVC (D-2466) and CPVC (F-438) pressure fittings.

D-2564, F-493 and F-656: Specifying Solvent Cements for Polyvinyl Chloride (PVC) Plastic Piping Systems

This standard specifies the requirments for PVC (D-2564) and CPVC (F-493) solvent cement, including component compounds, minimum resin content, viscosity and physical performance. Standard F-656 specifies requirements for primers to be used with PVC solvent cements.

D-2837: Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials

This method describes a procedure for obtaining a hydrostatic design basis for thermoplastic pipe. It is applicable to all known types of thermoplastic pipe, and for any practical temperature and medium. Data generated in accordance with ASTM Method D-1598 is analyzed, using logarithmic coordinates and a least squares regression technique. A minimum number of points and their distribution in time are specified, and the extrapolated stress at 100,000 hours is categorized in the R 10 series of preferred numbers, to give the hydrostatic design basis for the pipe material.

D-2855: Standard Practice for Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings

This specifies the standard practice and procedures for making PVC pipe and fitting joints with solvent cement.

Recommended Practices

D-2749: Standard Symbols for Dimensions of Plastic Pipe Fittings

Recommended nomenclature and letter designations are given for specific dimensions of fittings so that a standard terminology is available for any and all types of fittings dimensions.

D-2774: Underground Installation of Thermoplastic Pressure Piping

This recommended practice covers procedures and references ASTM specifications for underground installation of thermoplastic pressure piping, 6 in. nominal size and smaller. Trenching, bedding, backfilling and general precautions are described. It recognizes that significant differences exist in kind and type of pipe material, pipe size and wall thickness, soil conditions and the specific end use. The procedures given are, therefore, quite general in nature. Specific pipe characteristics and end use requirements may dictate modification.

D-2855: Making Solvent Cemented Joints with Polyvinyl Chloride (PVC) Pipe

This recommended practice describes, in detail, procedures for making solvent cemented joints. Preparation of the surfaces, applying the cement, making the assembly, handling after assembly, testing and a schedule of drying times related to temperature and pipe sizes are covered.

F-402: Safe Handling of Solvent Cements Used for Joining Thermoplastic Pipe and Fittings

This recommended practice covers procedures for the safe handling of solvent cements containing solvents which may be flammable, toxic or irritants. It recommends precautions for the protection of personnel and safeguards against the hazards of fire.

ANSI — American National Standards Institute

ANSI B1.20.1

Specifies basic thread form, taper and tolerances of general purpose tapered pipe threads.

ANSI B16.5

Specifies standard bolt hole patterns and basic dimensions for Class 150 steel pipe flanges.

NSF — National Sanitation Foundation

NSF is a third party product approval agency which tests manufacturer's product against a variety of health and product performance standards. They are one of the most recognized agencies for issuing approval of plastic piping system products for potable water use.

NSF Standard 14

Certifies product suitability for potable water use, product conformance to applicable ASTM standards and establishes minimum requirements for manufacturer's quality control programs through routine testing and facilities inspections.

NSF Standard 14 Special Engineering Appurtenance Program (S.E.)

In addition to Standard 14 general requirements, the S.E. program establishes product performance requirements where no directly applicable ASTM specifications exist. NSF S.E. Specifications are developed from a combination of applicable portions of ASTM specifications as a standard for conformance verification.

NSF Standard 61

Developed to establish minimum requirements for the control of potential adverse health effects from products in contact with drinking water. The primary focus of this standard is on contaminants or impurities which may be imparted indirectly to drinking water through toxicological testing. While this standard does not address product performance criteria, conformance to Standard 61 is a prerequisite to NSF Standard 14 certification.

Specification

Specifications for IPS Pressure Fittings Standard Weight Schedule 40 PVC /Heavy Duty Schedule 80 PVC and CPVC

1. Scope:

1.1 This specification covers pipe fittings for pressurized pipe systems manufactured of Rigid Poly (Vinylchloride) (PVC) and Chlorinated Poly (Vinylchloride) (CPVC) material as described in paragraph 2.1 below. All fittings shall be as manufactured by George Fischer Sloane, Inc., in Little Rock, Arkansas, or shall be in all respects the equal of such fittings. The purchaser reserves the right to require that the seller furnish proof of such equality where the fittings are of different manufacture. At the purchaser's discretion contract preference may be given those suppliers able to furnish all types of fittings required under the contract from a single manufacturer in order that responsibility will not be divided in warrantee claim situations.

1.2 Fittings covered under this specification include standard weight schedule 40 and heavy duty schedule 80 fittings molded of the material described in paragraph 2.1 below.

1.3 Fittings covered under this specification are tees, elbows, couplings, reducer bushings, crosses, adapters, plugs, caps and flanges.

1.4 All fittings shall bear the company's name or trademark, material designation, size, applicable IPS schedule, and the NSF mark as indicative of compliance with paragraph 2.2 of this specification.

2. Material:

2.1 All fittings shall be injection molded of PVC fitting compound of cell classification 12454-B and of CPVC fitting compound of cell classification 23447-B as described in ASTM D-1784 Standard Specification for Rigid Poly (Vinylchloride) Compounds and Chlorinated Poly (Vinylchloride) Compounds.

2.2 <u>Material Approval</u> — All material used in pipe fittings for potable water supply shall be listed for such applications by National Sanitation Foundation Laboratories, Inc. (NSF).

3. Workmanship

3.1 Workmanship shall be in accordance with good commercial practice. Fittings shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects. The fittings shall be commerically uniform in color, opacity, density and other physical properties.

4. Fitting Design

4.1 <u>Threaded Fittings:</u>

4.1.1 All molded threads, internal or external, shall be "blunt start" threads.

4.1.2 All threads shall conform to thread standard ANSI/ASME B1.20.1 for tapered pipe threads.

4.1.3 Threads shall measure not more than $1^1/_2$ threads large or small when checked with a plug gauge or ring gauge.

4.2 <u>Solvent Cement Socket Fittings:</u>

4.2.1 Dimensions and tolerances of sockets shall conform to appended table (PVC IPS Schedule 40/80 Socket Dimensions).

4.3 <u>General:</u>

4.3.1 All reducer bushings shall be designed so as to provide for a positive and sufficient grip for cementing bushings in place.

4.3.2 Waterways shall be smooth and commerically free of flash and irregularities.

4.3.3 On tees and 90° elbows, bond lines shall not coincide with the maximum stress area (crotch).

5. Test and Test Requirements

5.1 Burst Test Requirements — The quick burst pressure of the fittings shall not be less than the calculated quick burst pressure of the corresponding schedule and size of the pipe. The burst test shall be performed as described in ASTM Standard Method of Test for Short Time Rupture Strength of Plastic Pipe, Tubing and Fittings D 1599, except that no reinforcement is to be used at the socket entrance. The fittings are to be brought up to pressure in 60 to 70 seconds while held in a jig with the sockets plugged with gasketed plugs which enter the socket $^1/_3$ to $^2/_3$ of the socket depth.

5.2 Acetone Test Requirements — PVC fittings shall show flaking or peeling over no more than 25% of the total surface after 20 minutes immersion in anhydrous acetone when tested in accordance with the ASTM test method D2152. Accentuation of the bond line caused by swelling shall not be reason for rejection.

5.3 High Temperature Stress Relief (reversion) Test — PVC fittings shall not suffer damage exceeding 25% of the wall thickness in areas adjacent to the injection point, nor shall the weld line open more than 25% of the wall thickness in areas adjacent to the injection point after exposure to an oven temperature of 302°F±4°F (150°C±3°C) for one hour per ASTM F610.

6. Relationship to Existing Pressure Fittings Standards

6.1 PVC Fittings — described in these specifications meet the requirements for pressure fittings covered in the following ASTM Standards:

D 2464 Standard Specification for THREADED POLY (VINYL-CHLORIDE) (PVC) PLASTIC PIPE FITTINGS, SCHEDULE 80.

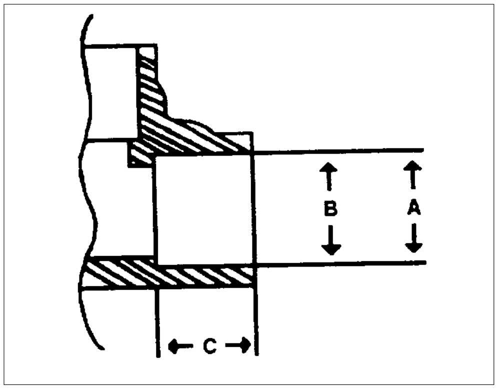
D 2466 Standard Specification for SOCKET-TYPE POLY-(VINYLCHLORIDE) (PVC) PLASTIC PIPE FITTINGS, SCHEDULE 40.

D 2467 Standard Specification for SOCKET-TYPE POLY (VINYLCHLORIDE) (PVC) PLASTIC PIPE FITTINGS, SCHEDULE 80.

6.2 CPVC Fittings — described in these specifications meet the requirements for pressure fittings covered in the following ASTM Standards:

F 437 Standard Specification for THREADED CHLORINATED POLY (VINYLCHLORIDE) (CPVC) PLASTIC PIPE FITTINGS, SCHEDULE 80.

F 439 Standard Specification for SOCKET-TYPE CHLORI-NATED POLY (VINYL-CHLORIDE) (CPVC) PLASTIC PIPE FITTINGS, SCHEDULE 80.



PVC IPS Schedule 40/80 Socket Dimensions

SIZE	PIPE O.D.	ENTRANCE (A)		BOTTOM (B)		MAX. OUT OF ROUND	SCHEDULE 40 SOCKET DEPTH (C) (MIN.)	SCHEDULE 80 SOCKET DEPTH (C) (MIN.)
		MAX.	MIN.	MAX.	MIN.			
1/4	.540	.556	.548	.540	.532	.016	.500	.625
3/8	.675	.691	.683	.675	.667	.016	.594	.750
1/2	.840	.852	.844	.840	.832	.016	.688	.875
3/4	1.050	1.062	1.054	1.050	1.042	.020	.719	1.000
1	1.315	1.330	1.320	1.315	1.305	.020	.875	1.125
1 1/4	1.660	1.675	1.665	1.660	1.650	.024	.938	1.250
1 1/2	1.900	1.918	1.906	1.900	1.888	.024	1.094	1.375
2	2.375	2.393	2.381	2.375	2.363	.024	1.156	1.500
2 1/2	2.875	2.896	2.882	2.875	2.861	.030	1.750	1.750
3	3.500	3.524	3.508	3.500	3.484	.030	1.875	1.875
3 1/2	4.000	4.024	4.008	4.000	3.984	.030	2.000	
4	4.500	4.527	4.509	4.500	4.482	.030	2.000	2.250
5	5.563	5.593	5.573	5.563	5.543	.060	3.000	
6	6.625	6.658	6.636	6.625	6.603	.060	3.000	3.000
8	8.625	8.670	8.640	8.625	8.595	.090	4.000	4.000

Standard Specifications: Schedule 80 PVC and CPVC Pipe

1. Scope

This specification covers requirements for Schedule 80 PVC and CPVC pressure pipe as described in ASTM D-1785 (PVC) and in ASTM F-441 (CPVC). All pipe shall be as manufactured by George Fischer or shall be in all respects the equal of such pipe.

The purchaser reserves the right to require that the seller furnish proof of such equality where the pipe are of different manufacture. At the purchaser's discretion contract preference may be given those suppliers able to furnish all pipe required under the contract from a single manufacturer in order that responsibility will not be divided in warranty claim situations.

2. Material

PVC used is of Type I, Grade 1 compound as stated in ASTM D-1784.

3. Dimensions

Dimensions and tolerances shall be as shown in the following tables when measured according to Method D-2122. Tolerances for out-of-roundness shall apply only to pipe prior to shipment.

4. Marking

Indicates manufacturer's name, material designation code, nominal pipe size, Schedule size with pressure rating in PSI for water at 73°F, ASTM designation, NSF seal for potable water and manufacturing date code.

Outside Diameters and Tolerances

Nominal Pipe Size	Outside Diameter	Tolerances: Average	Tolerances: For Maximum and Minimum Diameter (Out-of-Roundness) Schedule 80
1/8	0.405	±0.004	±0.008
1/4	0.540	±0.004	±0.008
3/8	0.675	±0.004	±0.008
1/2	0.840	±0.004	±0.008
3/4	1.050	±0.004	±0.010
1	1.315	±0.005	±0.010
1 1/4	1.660	±0.005	±0.012
1 1/2	1.900	±0.006	±0.012
2	2.375	±0.006	±0.012
2 1/2	2.875	±0.007	±0.015
3	3.500	±0.008	±0.015
3 1/2	4.000	±0.008	±0.015
4	4.500	±0.009	±0.015
5	5.563	±0.010	±0.030
6	6.625	±0.011	±0.035
8	8.625	±0.015	±0.075
10	10.750	±0.015	±0.075
12	12.750	±0.015	±0.075
14	14.000	±0.015	±0.100
16	16.000	±0.019	±0.160
18	18.000	±0.019	±0.180
20	20.000	±0.023	±0.200
24	24.000	±0.031	±0.240

Wall Thicknesses and Tolerances

Nominal Pipe Size	Wall Thickness Schedule 80 Minimum	Tolerance
1/8	0.095	+0.020
1/4	0.119	+0.020
3/8	0.126	+0.020
1/2	0.147	+0.020
3/4	0.154	+0.020
1	0.179	+0.021
1 1/4	0.191	+0.023
1 1/2	0.200	+0.024
2	0.218	+0.026
2 1/2	0.276	+0.033
3	0.300	+0.036
3 1/2	0.318	+0.038
4	0.337	+0.040
5	0.375	+0.045
6	0.432	+0.052
8	0.500	+0.060
10	0.593	+0.071
12	0.687	+0.082
14	0.750	+0.090
16	0.843	+0.101
18	0.937	+0.112
20	1.031	+0.124
24	1.218	+0.146

Note: The minimum is the lowest wall thickness of the pipe at any cross section. The maximum permitted wall thickness, at any cross section, is the minimum wall thickness plus the stated tolerance. All tolerances are on the plus side of the minimum requirement. These dimensions conform to nominal IPS dimensions.

Schedule 80 PVC Pipe and Fittings

Table of Contents

Glossary

MP = Master Pack
FT = Female Thread
MT = Male Thread
MC = Master Carton
S = Slip Socket
L = UPC Bar Coded
SPG = Spigot End
*** = IAPMO (UPC Listed)**

Master Pack Qty.	Inner Pack Qty. (Minimum Order Multiples)
> 50 pieces	10 pieces
5 to 50 pieces	5 pieces
2 pieces	2 pieces
1 piece	1 piece

Not for Use with Compressed Air or Gases

George Fischer, Inc. DOES NOT RECOMMEND the use of thermoplastic piping products for systems to transport or store compressed air or gases, or the testing of thermoplastic piping systems with compressed air or gases in above or below ground locations. The use of George Fischer, Inc. products in compressed air or gas systems automatically voids George Fischer, Inc. warranty for such products, and their use against our recommendation is entirely the responsibility and liability of the installer. George Fischer, Inc. will not accept responsibility for damage or impairment from its products, or other consequential or incidental damages caused by misapplication, incorrect assembly, and/or exposure to harmful substances or conditions.

For more information about any of our product lines, please call (800) 854-4090.

+GF+ Schedule 80 PVC Pressure Pipe

PVC Pressure Pipe — 20 ft. Lengths

P/L 46 Material: PVC Type I Gray (cell classification 12454-B)
Meets ASTM D1785

Inch size	Part Number		lift quantity	lbs. per 100 ft.	avg. o.d.	min. wall	psi at 73° F
1/2	8008-005AB		8400 ft.	21.07	.840	.147	848
3/4	8008-007AB		7600 ft.	28.58	1.050	.154	688
1	8008-010AB		4200 ft.	42.84	1.315	.179	630
1 1/4	8008-012AB		4000 ft.	59.13	1.660	.191	520
1 1/2	8008-015AB		3600 ft.	72.57	1.900	.200	471
2	8008-020AB		2100 ft.	97.58	2.375	.218	404
2 1/2	8008-025AB		1460 ft.	149.48	2.875	.276	425
3	8008-030AB		1160 ft.	198.45	3.500	.300	375
4	8008-040AB		1020 ft.	283.87	4.500	.337	324
6	8008-060AB		440 ft.	551.49	6.625	.432	279
8	8008-080AB		280 ft.	868.92	8.625	.500	246
10	8008-100AB		140 ft.	1195.6	10.750	0.593	230
12	8008-120AB		100 ft.	1643.7	12.750	0.687	230
14	8008-140AB		100 ft.	1979.0	14.000	0.750	220
16	8008-160AB		60 ft.	2543.0	16.000	0.843	220

Solvent-Welded Pressure Rating vs. Service Temperature — CPVC and PVC

				P														
				73°F		90°F	100°F	110°F	120°F		130°F		140°F		160°F	180°F	200°F	210°F
Nom. Size	D Outside Dia.	t Wall	DR = D/t	PVC f=1 S=2000	CPVC f=1 S=2000	PVC f=0.75 S=1500	PVC f=0.62 S=1240	PVC f=0.50 S=1000	PVC f=0.40 S=800	CPVC f=0.65 S=1300	PVC f=0.30 S=600	CPVC f=0.57 S=1135	PVC f=0.22 S=440	CPVC f=0.50 S=1000	CPVC f=0.40 S=800	CPVC f=0.25 S=500	CPVC f=0.20 S=400	CPVC f=0.16 S=320
1/2	.840	.147	5.714	848	848	636	526	424	339	552	255	484	187	424	339	212	170	136
3/4	1.050	.154	6.818	688	688	516	426	344	275	447	206	392	151	344	275	172	138	110
1	1.315	.179	7.346	630	630	473	390	315	252	410	189	359	139	315	252	158	126	101
1 1/4	1.660	.191	8.691	520	520	390	322	260	208	338	156	296	114	260	208	130	104	83
1 1/2	1.900	.200	9.500	471	471	353	292	235	188	306	141	268	104	235	188	118	94	75
2	2.375	.218	10.894	404	404	303	251	202	162	263	121	230	89	202	162	101	81	65
2 1/2	2.875	.276	10.417	425	425	319	263	212	170	276	127	242	93	212	170	106	85	68
3	3.500	.300	11.667	375	375	281	233	188	150	244	113	214	83	188	150	94	75	60
4	4.500	.337	13.353	324	324	243	201	162	130	210	97	185	71	162	130	81	65	52
6	6.625	.432	15.336	279	279	209	173	140	112	181	84	159	61	140	112	70	56	45
8	8.625	.500	17.250	246	246	185	153	123	98	160	74	140	54	123	98	62	49	39

$$P = \frac{2St}{D-t} = \frac{2S}{DR-1} = P_{73°F}f$$

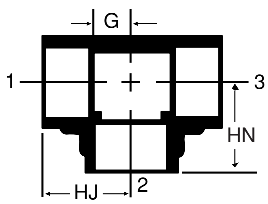
P = Pressure rating of pipe at service temperatures (psi)
S = Hydrostatic design stress (psi)
D = Outside diameter of pipe (inches)
t = Pipe wall thickness (inches)
f = Derating factor for service temperature
DR = Dimension ratio (D/t)
$P_{73°F}$ = Pressure rating at 73°F

1) Figures for pressure rating at 73°F are rounded off from actual calculated values. Pressure ratings for other temperatures are calculated from 73°F values.
2) Pressure rating values are for PVC (12454-B) and CPVC (23447-B) pipe and for most sizes are calculated from the experimentally determined long-term strength of PVC1 and CPVC extrusion compounds. Because molding compounds may differ in long-term strength and elevated temperature properties from pipe compounds, piping systems consisting of extruded pipe and molded fittings may have lower pressure ratings than those shown here, particularly at the higher temperatures. Caution should be exercised when designing PVC systems operating above 100°F and CPVC systems operating above 180°F.
3) The pressure ratings given are for solvent-cemented systems. When adding valves, flanges or other components, the system must be derated to the rating of the lowest component. (Pressure ratings: molded or cut threads are rated at 50% of solvent-cemented systems; flanges and unions are 150 psi; for valves, see manufacturer's recommendation.)

+GF+ Hi-Strength Schedule 80 PVC Pressure Fittings

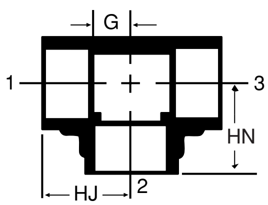
P/L 08 Material: PVC Type I Gray (cell classification 12454-B)
Meets ASTM D 2467 (Socket) and ASTM D 2464 (Threaded)

Tee (S x S x S)

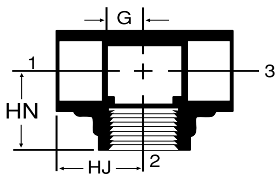


Inch Size	Part Number		mp	lbs. each	hj	hn	g
1/4	801-002		50	.05	61/64	61/64	21/64
3/8	801-003		50	.09	1 9/64	1 9/64	13/32
1/2	801-005		25	.13	1 25/64	1 25/64	33/64
3/4	801-007		25	.19	1 37/64	1 37/64	37/64
1	801-010		20	.29	1 53/64	1 53/64	45/64
1 1/4	801-012*		5	.42	2 5/32	2 5/32	29/32
1 1/2	801-015*		5	.62	2 13/32	2 13/32	1 1/32
2	801-020*		5	.82	2 25/32	2 25/32	1 9/32
2 1/2	801-025*		5	1.73	3 9/32	3 9/32	1 17/32
3	801-030*		5	2.56	3 23/32	3 23/32	1 55/64
4	801-040*		5	3.89	4 19/32	4 19/32	2 23/64
6	801-060*		2	10.59	6 9/16	6 9/16	3 9/16
8	801-080		1	20.13	8 9/16	8 9/16	4 9/16

Reducing Tee (S x S x S)

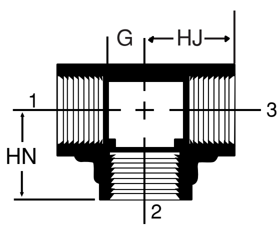


Inch Size	Part Number		mp	lbs. each	hj	hn	g
4x4x2	801-420		5	2.16	3 17/32	3 7/8	1 1/4
6x6x4	801-532		2	6.09	5 11/32	5 49/64	2 11/32
8x8x6	801-585		1	15.51	7 5/8	7 1/2	3 5/8



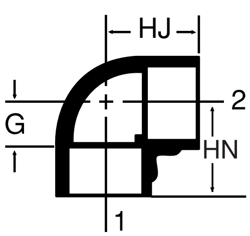
Tee (S x S x FT)

Inch Size	Part Number		mp	lbs. each	hj	hn	g
1/2	802-005		25	.14	1 25/64	1 9/32	17/32
3/4	802-007		25	.18	1 37/64	1 3/8	19/32
1	802-010		15	.29	1 27/32	1 11/16	23/32
1 1/2	802-015		5	.60	2 13/32	2 1/16	1 1/32
2	802-020		5	.82	2 25/32	2 11/32	1 9/32



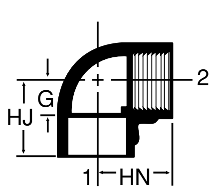
Tee (FT x FT x FT)

Inch Size	Part Number		mp	lbs. each	hj	hn	g
1/4	805-002		50	.05	59/64	59/64	21/64
3/8	805-003		50	.07	1	1	25/64
1/2	805-005		25	.14	1 9/32	1 9/32	33/64
3/4	805-007		25	.18	1 3/8	1 3/8	37/64
1	805-010		15	.31	1 11/16	1 11/16	45/64
1 1/4	805-012		10	.45	1 15/16	1 15/16	29/32
1 1/2	805-015		5	.56	2 1/16	2 1/16	1 1/32
2	805-020		5	.72	2 11/32	2 11/32	1 9/32
2 1/2	805-025		5	1.77	3 7/64	3 7/64	1 17/32
3	805-030		5	2.04	3 31/64	3 31/64	1 27/32
4	805-040		5	3.88	4 5/64	4 5/64	2 11/32



90° Ell (S x S)

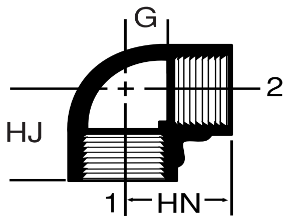
Inch Size	Part Number		mp	lbs. each	hj	hn	g
1/4	806-002		50	.04	61/64	61/64	21/64
3/8	806-003		50	.06	1 9/64	1 9/64	13/32
1/2	806-005		25	.10	1 25/64	1 25/64	33/64
3/4	806-007		25	.14	1 37/64	1 37/64	37/64
1	806-010		10	.23	1 53/64	1 53/64	45/64
1 1/4	806-012*		10	.37	2 5/32	2 5/32	29/32
1 1/2	806-015*		10	.44	2 13/32	2 13/32	1 1/32
2	806-020*		5	.70	2 25/32	2 25/32	1 9/32
2 1/2	806-025*		5	1.25	3 9/32	3 9/32	1 17/32
3	806-030*		5	1.87	3 23/32	3 23/32	1 55/64
4	806-040*		5	3.24	4 19/32	4 19/32	2 23/64
6	806-060*		1	11.00	6 9/16	6 9/16	3 9/16
8	806-080		1	15.73	8 9/16	8 9/16	4 9/16



90° Ell (S x FT)

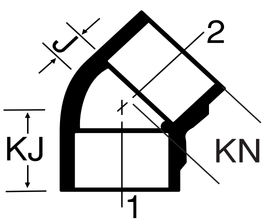
Inch Size	Part Number		mp	lbs. each	hj	hn	g
1/2	807-005		25	.09	1 25/64	1 9/32	17/32
3/4	807-007		25	.14	1 37/64	1 3/8	19/32
1	807-010		10	.21	1 27/32	1 11/16	23/32
1 1/4	807-012		10	.33	2 5/32	1 15/16	29/32
1 1/2	807-015		10	.44	2 13/32	2 1/16	1 1/32
2	807-020		5	.70	2 25/32	2 11/32	1 9/32
3	807-030		5	1.79	3 23/32	3 31/64	2 23/32

90° Ell (FT x FT)



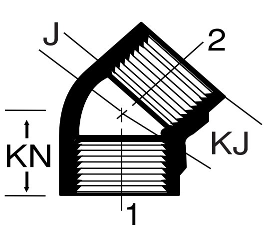
Inch Size	Part Number	mp	lbs. each	hj	hn	g
1/4	808-002	50	.04	59/64	59/64	21/64
3/8	808-003	50	.05	1	1	25/64
1/2	808-005	25	.10	1 9/32	1 9/32	33/64
3/4	808-007	20	.13	1 3/8	1 3/8	37/64
1	808-010	10	.34	1 11/16	1 11/16	45/64
1 1/4	808-012	10	.34	1 15/16	1 15/16	29/32
1 1/2	808-015	10	.40	2 1/16	2 1/16	1 1/32
2	808-020	5	.72	2 11/32	2 11/32	1 9/32
2 1/2	808-025	5	1.30	3 7/64	3 7/64	1 17/32
3	808-030	5	1.93	3 31/64	3 31/64	1 27/32
4	808-040	5	2.70	4 5/64	4 5/64	2 11/32

45° Ell (S x S)

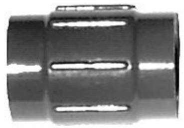


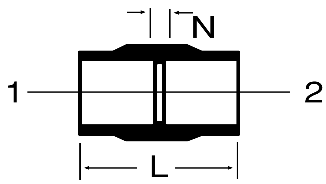
Inch Size	Part Number	mp	lbs. each	kj	kn	j
1/4	817-002	50	.04	51/64	51/64	11/64
3/8	817-003	50	.06	61/64	61/64	13/64
1/2	817-005	25	.11	1 9/64	1 9/64	9/32
3/4	817-007	20	.15	1 11/32	1 11/32	11/32
1	817-010	25	.22	1 15/64	1 15/64	11/32
1 1/4	817-012*	15	.35	1 21/32	1 21/32	13/32
1 1/2	817-015*	10	.40	1 55/64	1 55/64	31/64
2	817-020*	5	.69	2 5/32	2 5/32	21/32
2 1/2	817-025*	5	1.08	2 15/32	2 15/32	47/64
3	817-030*	5	1.40	2 21/32	2 21/32	25/32
4	817-040*	5	2.56	3 9/32	3 9/32	1 1/32
6	817-060*	1	9.35	4 13/16	4 13/16	1 13/16
8	817-080	1	11.11	6 1/6	6 13/16	2 1/16

45° Ell (FT x FT)



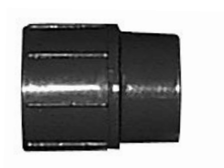
Inch Size	Part Number	mp	lbs. each	kj	kn	j
1/4	819-002	50	.03	49/64	49/64	11/64
3/8	819-003	50	.04	13/16	13/16	13/64
1/2	819-005	25	.10	1 1/64	1 1/64	9/32
3/4	819-007	20	.14	1 7/32	1 7/32	11/32
1	819-010	25	.23	1 21/64	1 21/64	11/32
1 1/4	819-012	15	.33	1 27/64	1 27/64	13/32
1 1/2	819-015	10	.39	1 1/2	1 1/2	31/64
2	819-020	5	.57	1 23/32	1 23/32	21/32
3	819-030	5	1.43	2 27/64	2 27/64	25/32
4	819-040	5	2.28	2 49/64	2 49/64	1 1/32

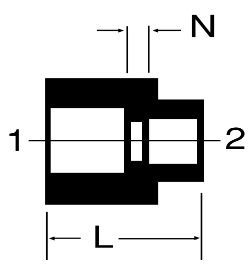




Coupling (S x S)

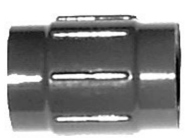
Inch Size	Part Number		mp	lbs. each	l	n
1/4	829-002		50	.03	1 23/64	3/32
3/8	829-003		50	.04	1 5/8	1/8
1/2	829-005		25	.07	1 57/64	1/8
3/4	829-007		20	.10	2 9/64	9/64
1	829-010		25	.16	2 25/64	9/64
1 1/4	829-012*		10	.24	2 21/32	5/32
1 1/2	829-015*		10	.30	2 29/32	5/32
2	829-020*		5	.43	3 5/32	5/32
2 1/2	829-025*		5	.81	3 3/4	1/4
3	829-030*		5	1.23	4	1/4
4	829-040*		5	2.12	4 3/4	1/4
6	829-060*		2	6.97	6 5/16	5/16
8	829-080		2	6.91	8 5/16	5/16

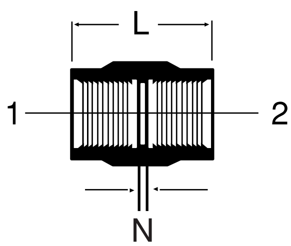




Reducer Coupling (S x S)

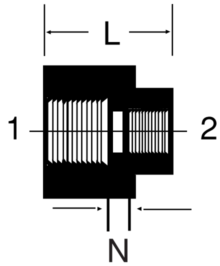
Inch Size	Part Number		mp	lbs. each	l	n
3/4 x 1/2	829-101		25	.10	2	3/32
1 x 1/2	829-130		25	.16	2 1/8	3/32
1 x 3/4	829-131		25	.15	2 1/4	3/32
1 1/4 x 1	829-168		25	.23	2 1/2	3/32
1 1/2 x1	829-211		15	.28	2 5/8	3/32
1 1/2 x 1 1/4	829-212*		20	.31	2 3/4	3/32
2 x 1 1/2	829-251*		5	.44	3	3/32
3 x 2	829-338*		5	.75	3 9/16	3/16
4 x 3	829-422*		5	1.01	4 3/8	1/4
6 x 4	829-532*		2	6.90	10 1/4	3 1/2
8 x 6	829-585		2	7.04	9 1/8	2 1





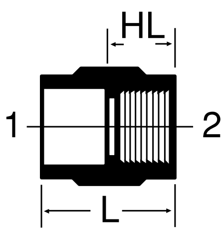
Coupling (FT x FT)

Inch Size	Part Number		mp	lbs. each	l	n
1/4	830-002		50	.03	1 9/32	3/32
3/8	830-003		50	.04	1 21/64	1/8
1/2	830-005		25	.07	1 41/64	n/a
3/4	830-007		20	.09	1 23/32	n/a
1	830-010		25	.16	2 3/32	n/a
1 1/4	830-012		10	.21	2 3/16	n/a
1 1/2	830-015		10	.26	2 7/32	n/a
2	830-020		5	.36	2 9/32	n/a
2 1/2	830-025		5	.89	3 25/64	n/a
3	830-030		5	1.20	3 33/64	n/a
4	830-040		5	1.82	3 23/32	n/a



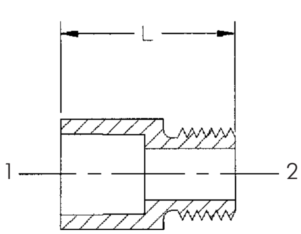
Reducer Coupling (FT x FT)

Inch Size	Part Number		mp	lbs. each	l	n
3/8 x 1/4	830-052		50	.05	1 9/32	3/32
1/2 x 1/4	830-072		50	n/a	1 7/16	7/64
1/2 x 3/8	830-073		50	.06	1 29/64	7/64
3/4 x 1/2	830-101		25	.09	1 21/32	1/8
1 x 1/2	830-130		25	.14	1 53/64	7/64
1 x 3/4	830-131		25	.14	1 7/8	7/64
1 1/4 x 3/4	830-167		25	.19	1 29/32	7/64
1 1/2 x 1	830-211		20	.25	2 7/64	7/64
2 x 1 1/2	830-251		10	.38	2 3/16	n/a



Female Adapter (S x FT)

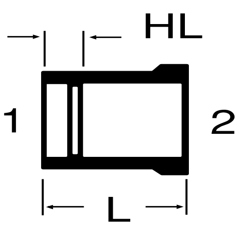
Inch Size	Part Number		mp	lbs. each	l	hl
1/4	835-002		50	.03	1 13/32	47/64
3/8	835-003		50	.04	1 35/64	3/4
1/2	835-005		25	.07	1 3/4	13/16
3/4	835-007		25	.10	1 59/64	55/64
1	835-010		25	.16	2 15/64	1 3/64
1 1/4	835-012		10	.22	2 27/64	1 5/64
1 1/2	835-015		10	.28	2 9/16	1 7/64
2	835-020		5	.41	2 23/32	1 9/64
2 1/2	835-025		5	.88	3 1/2	1 3/4
3	835-030		5	1.20	3 3/4	1 49/64
4	835-040		5	1.92	4 15/64	1 55/64



Male Adapter (S x MT)

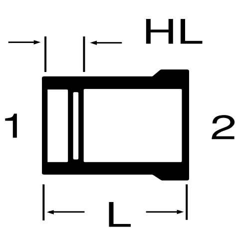
Inch Size	Part Number		mp	lbs. each	l	
1/2	836-005		50	.04	1 13/16	
3/4	836-007		25	.06	1 63/64	
1	836-010		25	.09	2 11/32	
1 1/4	836-012*		15	.14	2 1/2	
1 1/2	836-015*		10	.18	2 31/32	
2	836-020*		5	.26	2 53/64	
2 1/2	836-025*		5	.47	3 21/32	
3	836-030*		5	.68	3 7/8	
4	836-040*		5	1.12	4 13/32	

Flush Style Reducer Bushing (Spg x S)



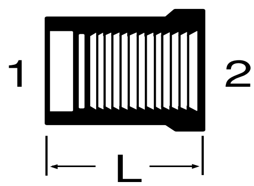
Inch Size	Part Number		mp	lbs. each	l	hl
1/2 x 1/4	837-072		50	.02	1 7/64	7/16
3/4 x 1/2	837-101		50	.04	1 9/32	13/32
1 x 1/2	837-130		25	.07	1 13/32	1/2
1 x 3/4	837-131		50	.06	1 13/32	13/32
1 1/4 x 3/4	837-167		25	.12	1 17/32	17/32
1 1/4 x 1	837-168		25	.09	1 17/32	13/32
1 1/2 x 1/2	837-209		25	.19	1 21/32	25/32
1 1/2 x 3/4	837-210		25	.17	1 21/32	21/32
1 1/2 x 1	837-211		25	.14	1 21/32	17/32
1 1/2 x 1 1/4	837-212*		25	.08	1 21/32	13/32
2 x 1/2	837-247		25	.32	1 25/32	29/32
2 x 3/4	837-248		10	.30	1 25/32	25/32
2 x 1	837-249		10	.25	1 25/32	21/32
2 x 1 1/4	837-250*		10	.20	1 25/32	17/32
2 x 1 1/2	837-251*		5	.17	1 25/32	13/32
2 1/2 x 1 1/2	837-291*		5	.40	2 5/64	41/64
2 1/2 x 2	837-292*		5	.27	2 5/64	33/64
3 x 2	837-338*		5	.61	2 5/64	33/64
3 x 2 1/2	837-339*		5	.38	2 13/64	41/64
4 x 2	837-420*		5	1.14	2 45/64	1 9/64
4 x 3	837-422*		5	1.07	2 11/16	47/64

Extended Style Reducer Bushing (Spg x S)



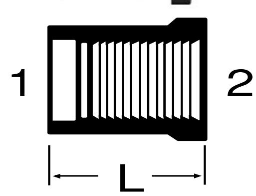
Inch Size	Part Number		mp	lbs. each	l	hl
1/2 x 3/8	837-073E		50	.02	1 29/32	1 7/64
6 x 4	837-532E*		2	3.50	6 7/8	4 5/8

Flush Style Reducer Bushing (Spg x FT)



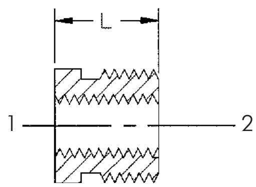
Inch Size	Part Number		mp	lbs. each	l
1/2 x 1/4	838-072		50	.02	1 7/64
3/4 x 1/2	838-101		50	.04	1 9/32
1 x 1/2	838-130		50	.08	1 13/32
1 x 3/4	838-131		50	.06	1 13/32
1 1/4 x 1/2	838-166		15	.14	1 17/32
1 1/4 x 3/4	838-167		15	.13	1 17/32
1 1/4 x 1	838-168		15	.08	1 17/32
1 1/2 x 1/2	838-209		15	.19	1 21/32
1 1/2 x 3/4	838-210		15	.18	1 21/32
1 1/2 x 1	838-211		15	.13	1 21/32
1 1/2 x 1 1/4	838-212		25	.17	1 21/32
2 x 1/2	838-247		10	.20	1 25/32
2 x 3/4	838-248		25	.33	1 25/32
2 x 1	838-249		25	.30	1 25/32
2 x 1 1/4	838-250		10	.21	1 25/32
2 x 1 1/2	838-251		10	.10	1 25/32
2 1/2 x 1 1/2	838-291		5	.40	2 3/32
2 1/2 x 2	838-292		5	.34	2 3/32
3 x 2	838-338		5	.62	2 7/32
3 x 2 1/2	838-339		5	.46	2 7/32
4 x 2	838-420		5	1.13	2 5/8

Extended Style Reducer Bushing (Spg x FT)



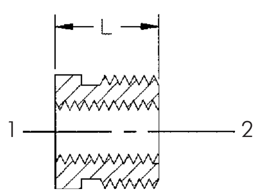
Inch Size	Part Number		mp	lbs. each	l
3/8 x 1/4	838-052E		50	.01	1 37/64
1/2 x 3/8	838-073E		50	.02	1 23/32

Flush Style Reducer Bushing (MT x FT)

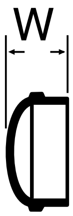


Inch Size	Part Number		mp	lbs. each	l
3/4 x 1/4	839-098		50	.03	1 1/64
1 x 1/4	839-128		25	.06	1 15/64
1 1/4 x 1/2	839-166		25	.09	1 19/64
1 1/4 x 3/4	839-167		25	.08	1 19/64
1 1/2 x 3/4	839-210		25	.12	1 11/32
2 x 1/2	839-247		25	.20	1 7/16
2 x 3/4	839-248		25	.20	1 7/16
2 x 1	839-249		10	.21	1 7/16
2 x 1 1/4	839-250		10	.16	1 7/16
3 x 2	839-338		5	.34	1 29/32
4 x 2	839-420		5	.84	2 9/32
4 x 3	839-422		5	.64	2 9/32

Extended Style Reducer Bushing (MT x FT)

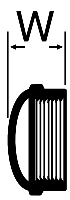


Inch Size	Part Number		mp	lbs. each	l
3/8 x 1/4	839-052E		50	.02	1 9/32
1/2 x 1/4	839-072E		50	.01	1 7/16
1/2 x 3/8	839-073E		50	.02	1 7/16
3/4 x 3/8	839-099E		50	.02	1 31/64
3/4 x 1/2	839-101E		50	.02	1 49/64
1 x 1/2	839-130E		25	.05	1 13/16
1 x 3/4	839-131E		50	.04	1 55/64
1 1/4 x 1	839-168E		25	.07	2 17/64
1 1/2 x 1	839-211E		25	.10	2 3/32
1 1/2 x 1 1/4	839-212E		20	.06	2 5/16
2 x 1 1/2	839-251E		10	.12	2 3/8



Cap (S)

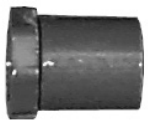
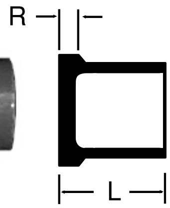
Inch Size	Part Number		mp	lbs. each	w	
1/4	847-002		50	.02	61/64	
3/8	847-003		50	.03	1 3/32	
1/2	847-005		50	.05	1 9/32	
3/4	847-007		50	.07	1 29/64	
1	847-010		25	.12	1 21/32	
1 1/4	847-012*		15	.16	1 7/8	
1 1/2	847-015*		10	.22	2 3/32	
2	847-020*		5	.37	2 5/16	
2 1/2	847-025*		5	.60	2 23/32	
3	847-030*		5	.92	3 1/32	
4	847-040*		5	1.48	3 41/64	
6	847-060*		2	5.11	4 61/64	
8	847-080		2	6.72	6 1/2	



Cap (FT)

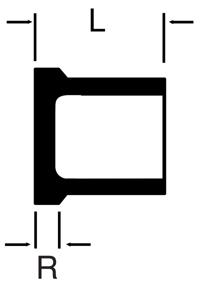
Inch Size	Part Number		mp	lbs. each	w	
1/4	848-002		50	.02	59/64	
3/8	848-003		50	.03	61/64	
1/2	848-005		50	.05	1 5/32	
3/4	848-007		25	.06	1 15/32	
1	848-010		25	.11	1 33/64	
1 1/4	848-012		15	.16	1 5/8	
1 1/2	848-015		10	.22	1 11/16	
2	848-020		5	.30	1 55/64	
2 1/2	848-025		5	.61	2 35/64	
3	848-030		5	.93	2 25/32	
4	848-040		5	1.37	3 1/8	

Plug (Spg)

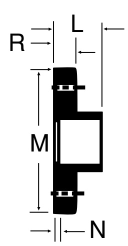
Inch Size	Part Number		mp	lbs. each	l	r
3/4	849-007		50	.05	1 7/16	7/32
1	849-010		25	n/a	1 3/8	1/4
1 1/2	849-015*		10	.16	1 11/16	5/16
2	849-020*		5	.24	1 7/8	3/8
4	849-040*		5	.95	2 5/8	3/8

Plug (MT)

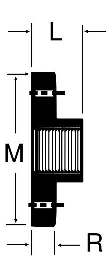
Inch Size	Part Number		mp	lbs. each	l	r
1/4	850-002		50	.01	13/16	7/32
3/8	850-003		50	.01	53/64	7/32
1/2	850-005		50	.03	31/32	7/32
3/4	850-007		50	.04	1 3/64	1/4
1	850-010		25	.06	1 1/4	17/64
1 1/4	850-012*		25	.11	1 21/64	5/16
1 1/2	850-015*		20	.13	1 3/8	21/64
2	850-020*		10	.20	1 15/32	13/32
3	850-030*		5	.44	2	n/a
4	850-040*		5	.75	2 1/8	n/a

Flange (S)

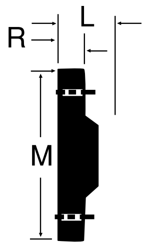
Inch Size	Part Number		mp	lbs. each	no. of holes	bolt d.	bolt circle d.	m	r	l	n
1/2	851-005		5	.21	4	1/2	2.38	3.50	.41	1 1/32	1/8
3/4	851-007		5	.28	4	1/2	2.75	3.88	.47	1 5/32	1/8
1	851-010		5	.39	4	1/2	3.13	4.25	.53	1 9/32	1/8
1 1/4	851-012*		5	.50	4	1/2	3.50	4.62	.60	1 7/16	1/8
1 1/2	851-015*		5	.64	4	1/2	3.88	5.00	.66	1 9/16	1/8
2	851-020*		5	.98	4	5/8	4.75	6.00	.71	1 11/16	1/8
2 1/2	851-025*		5	1.50	4	5/8	5.50	7.00	.77	1 31/32	5/32
3	851-030*		5	1.88	4	5/8	6.00	7.50	.89	2 3/32	5/32
4	851-040*		5	3.04	8	5/8	7.50	9.00	1.09	2 15/32	5/32
6	851-060*		1	4.35	8	3/4	9.50	11.00	1.25	3 27/32	5/16
8	851-080		1	7.55	8	3/4	11.75	13.50	1.31	4 27/32	5/16

Flange (FT)

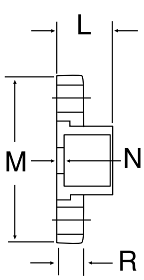
Inch size	Part Number		mp	lbs. each	no. of holes	bolt d.	bolt circle d.	m	r	l	
1/2	852-005		5	.20	4	1/2	2.38	3.50	.41	29/32	
3/4	852-007		5	.28	4	1/2	2.75	3.88	.47	31/32	
1	852-010		5	.39	4	1/2	3.13	4.25	.53	1 1/8	
1 1/4	852-012		5	.50	4	1/2	3.50	4.62	.60	1 3/16	
1 1/2	852-015		5	.62	4	1/2	3.88	5.00	.66	1 7/32	
2	852-020		5	.95	4	5/8	4.75	6.00	.71	1 1/4	
2 1/2	852-025		5	1.50	4	5/8	5.50	7.00	.77	1 25/32	
3	852-030		5	1.87	4	5/8	6.00	7.50	.89	1 27/32	
4	852-040		5	2.91	8	5/8	7.50	9.00	1.09	1 15/16	

Flange (Blind)



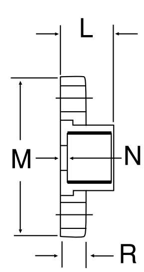
Inch size	Part Number		mp	lbs. each	no. of holes	bolt d.	bolt circle d.	m	r	l	n
1 1/2	853-015*		5	.67	4	1/2	3.88	5	.66	13/16	
2	853-020*		5	1.08	4	5/8	4.75	6	.71	15/16	
3	853-030*		5	2.13	4	5/8	6	7.50	.89	1 1/8	
4	853-040*		5	3.65	8	5/8	7.5	9	1.09	1 11/32	

Van Stone Flange (S)

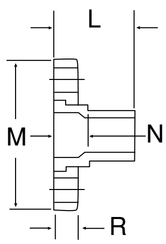


Inch size	Part Number		mp	lbs. each	no. of holes	bolt d.	bolt circle d.	m	r	l	n
1/2	854-005		5	.24	4	1/2	2.38	3.50	.56	1 1/8	3/16
3/4	854-007		5	.31	4	1/2	2.75	3.88	.58	1 1/4	3/16
1	854-010		5	.40	4	1/2	3.12	4.25	.66	1 3/8	3/16
1 1/4	854-012		5	.52	4	1/2	3.50	4.62	.69	1 1/2	3/16
1 1/2	854-015		5	.66	4	1/2	3.88	5	.75	1 11/16	1/4
2	854-020		5	1.18	4	5/8	4.75	6	.94	1 7/8	1/4
2 1/2	854-025		5	2.13	4	5/8	5.50	7	1.12	2 1/8	5/16
3	854-030		5	2.49	4	5/8	6	7.50	1.31	2 3/8	3/8
4	854-040		5	3.47	8	5/8	7.5	9	1.41	2 3/4	7/16
6	854-060		1	5.60	8	3/4	9.5	11	1.62	3 9/16	7/16
8	854-080		1	8.05	8	3/4	11.75	13.50	1.91	4 9/16	1/2
10	854-100		1	14.26	12	7/8	14.25	16	2.12	5 5/8	1/2
12	854-120		1	23.22	12	7/8	17	19	2.31	6 11/16	9/16

Van Stone Flange (FT)



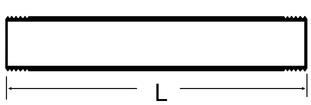
Inch size	Part Number		mp	lbs. each	no. of holes	bolt d.	bolt circle d.	m	r	l	n
1/2	855-005		5	.25	4	1/2	2.38	3.50	.56	1 1/8	3/8
3/4	855-007		5	.32	4	1/2	2.75	3.88	.58	1 1/4	7/16
1	855-010		5	.44	4	1/2	3.12	4.25	.66	1 3/8	7/16
1 1/4	855-012		5	.57	4	1/2	3.50	4.62	.69	1 1/2	1/2
1 1/2	855-015		5	.69	4	1/2	3.88	5	.75	1 11/16	5/8
2	855-020		5	1.18	4	5/8	4.75	6	.94	1 7/8	3/4
2 1/2	855-025		5	2.14	4	5/8	5.50	7	1.12	2 1/8	9/16
3	855-030		5	2.49	4	5/8	6	7.50	1.31	2 3/8	3/4
4	855-040		5	3.47	8	5/8	7.50	9	1.41	2 3/4	1



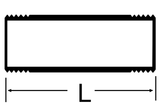
Van Stone Flange (Spg)

Inch size	Part Number		mp	lbs. each	no. of holes	bolt d.	bolt circle d.	m	r	l	n
1/2	856-005		5	.26	4	1/2	2.38	3.50	.56	1 11/16	13/16
3/4	856-007		5	.34	4	1/2	2.75	3.88	.58	1 7/8	13/16
1	856-010		5	.45	4	1/2	3.12	4.25	.66	2 1/8	7/8
1 1/4	856-012		5	.56	4	1/2	3.5	4.62	.69	2 1/4	1
1 1/2	856-015		5	.71	4	1/2	3.88	5	.75	2 1/2	1 1/16
2	856-020		5	1.28	4	5/8	4.75	6	.94	2 13/16	1 1/4
2 1/2	856-025		5	2.13	4	5/8	5.5	7	1.12	3 5/16	1 1/2
3	856-030		5	2.59	4	5/8	6	7.50	1.31	3 5/8	1 11/16
4	856-040		5	3.60	8	5/8	7.5	9	1.41	4 1/8	1 13/16
6	856-060		1	5.90	8	3/4	9.5	11	1.62	5 1/8	2
8	856-080		1	9.02	8	3/4	11.75	13.50	1.91	6 7/8	2 13/16

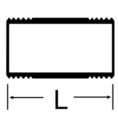
Nipple (MT x MT)



Long



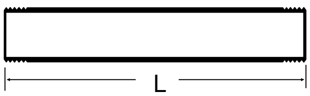
Short (SH)



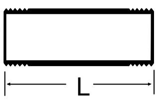
Close (CL)

Inch Size	Part Number		mp	lbs. each	l
1/2 x CL	861-077		50	.02	1 1/8
1/2 x 2	861-079		50	.04	2
1/2 x 3	861-081		50	.06	3
1/2 x 4	861-082		50	.08	4
1/2 x 5	**861-083**		**50**	**.09**	**5**
1/2 x 6	861-084		50	.11	6
1/2 x 8	861-086		50	.14	8
1/2 x 10	**861-087**		**50**	**.18**	**10**
1/2 x 12	**861-088**		**50**	**.21**	**12**
3/4 x CL	861-104		25	.04	1 3/8
3/4 x SH	861-105		25	.05	2
3/4 x 2	**861-020**		**25**	**.05**	**2**
3/4 x 3	861-106		25	.07	3
3/4 x 4	861-107		25	.09	4
3/4 x 5	**861-108**		**25**	**.12**	**5**
3/4 x 6	861-109		25	.14	6
3/4 x 8	**861-110**		**25**	**.19**	**8**
3/4 x 10	**861-111**		**25**	**.24**	**10**
3/4 x 12	**861-112**		**25**	**.29**	**12**
1 x CL	861-133		25	.05	1 1/2
1 x SH	861-134		25	.07	2
1 x 3	861-135		25	.11	3
1 x 4	861-136		25	.14	4
1 x 5	**861-137**		**25**	**.18**	**5**
1 x 6	861-138		25	.21	6
1 x 8	**861-139**		**25**	**.29**	**8**
1 x 10	**861-140**		**25**	**.36**	**10**
1 x 12	**861-141**		**25**	**.43**	**12**
1 1/4 x CL	861-170		25	.07	1 5/8
1 1/4 x SH	861-171		25	.10	2 1/2
1 1/4 x 3	861-172		25	.15	3
1 1/4 x 4	**861-173**		**25**	**.20**	**4**
1 1/4 x 5	**861-174**		**25**	**.25**	**5**
1 1/4 x 6	861-175		25	.29	6
1 1/4 x 8	**861-176**		**25**	**.39**	**8**
1 1/4 x 10	**861-177**		**25**	**.49**	**10**

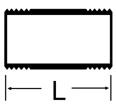
Nipple (MT x MT) (Continued)



Long



Short (SH)



Close (CL)

Inch Size	Part Number		mp	lbs. each	l
1 1/4 x 12	861-178		25	.59	12
1 1/2 x CL	861-213		25	.09	1 3/4
1 1/2 x SH	861-214		25	.12	2 1/2
1 1/2 x 3	861-215		25	.18	3
1 1/2 x 4	861-216		25	.23	4
1 1/2 x 5	861-217		25	.30	5
1 1/2 x 6	861-218		25	.35	6
1 1/2 x 8	861-219		25	.48	8
1 1/2 x 10	861-220		25	.60	10
1 1/2 x 12	861-221		25	.72	12
2 x CL	861-251		25	.12	2
2 x SH	861-252		25	.17	2 1/2
2 x 3	861-253		25	.24	3
2 x 4	861-254		25	.32	4
2 x 5	861-255		25	.41	5
2 x 6	861-256		25	.49	6
2 x 8	861-257		25	.65	8
2 x 10	861-258		25	.81	10
2 x 12	861-259		25	.98	12
2 1/2 x CL	861-291		5	.31	2 1/2
2 1/2 x SH	861-292		5	.37	3
2 1/2 x 4	861-295		5	.50	4
2 1/2 x 5	861-296		5	.62	5
2 1/2 x 6	861-297		5	.75	6
2 1/2 x 8	861-298		1	1.00	8
2 1/2 x 10	861-299		1	1.25	10
2 1/2 x 12	861-300		1	1.49	12
3 x CL	861-338		5	.43	2 5/8
3 x SH	861-340		5	.50	3
3 x 4	861-341		5	.66	4
3 x 5	861-342		5	.83	5
3 x 6	861-343		5	.99	6
3 x 8	861-344		1	1.32	8
3 x 10	861-345		1	1.65	10
3 x 12	861-346		1	1.98	12
4 x CL	861-422		5	.68	2 7/8
4 x SH	861-423		5	.95	4
4 x 5	861-425		5	1.18	5
4 x 6	861-426		5	1.42	6
4 x 8	861-427		1	1.89	8
4 x 10	861-428		1	2.37	10
4 x 12	861-429		1	2.84	12

45° Wye (S x S x S)

Inch Size	Part Number		mp	lbs. each
6 x 6 x 6	870-060**		2	12.16

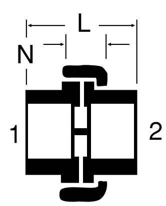
45° Wye Reducing (S x S x S)

Inch Size	Part Number		mp	lbs. each
6 x 6 x 4	870-532**		1	9.86

30° Ell (S x S)

Inch Size	Part Number		mp	lbs. each
6	873-060**			

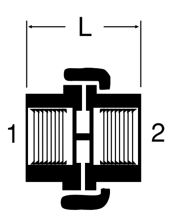
** FITTING MEETS THE REQUIREMENTS OF ASTM D-2467. FITTING DOES NOT MEET THE PRESSURE RATING FOR SCHEDULE 80; PRESSURE RATING 150 PSI AT 73°.



Union (S x S)

O-Ring Material: EPDM

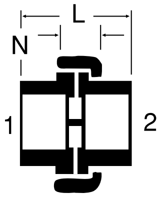
Inch Size	Part Number		mp	lbs. each	l	n
1/4	897-002		25	.08	1 55/64	39/64
3/8	897-003		25	.12	1 57/64	25/64
1/2	897-005		25	.22	2 13/32	21/32
3/4	897-007		5	.30	2 9/16	9/16
1	897-010		5	.42	2 31/32	23/32
1 1/4	897-012*		5	.64	3 1/8	5/8
1 1/2	897-015*		5	.75	3 7/16	19/32
2	897-020*		2	1.04	3 43/64	43/64
3	897-030*		2	2.89	4 17/32	29/32



Union (FT x FT)

O-Ring Material: EPDM

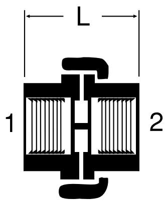
Inch Size	Part Number		mp	lbs. each	l	n
1/4	898-002		25	.08	1 55/64	
3/8	898-003		25	.10	1 57/64	
1/2	898-005		25	.23	2 13/32	
3/4	898-007		5	.30	2 1/8	
1	898-010		5	.44	2 31/32	
1 1/4	898-012		5	.60	3 1/8	
1 1/2	898-015		5	.69	3 19/32	
2	898-020		2	.97	3 3/4	
3	898-030		2	2.92	4 17/32	



Union w/ O-Ring (S x S)

O-Ring Material: FPM

Inch Size	Part Number		mp	lbs. each	l	n
1/4	857-002		25	.08	1 55/64	39/64
3/8	857-003		25	.12	1 57/64	25/64
1/2	857-005		25	.22	2 13/32	21/32
3/4	857-007		5	.30	2 9/16	9/16
1	857-010		5	.42	2 31/32	23/32
1 1/4	857-012		5	.64	3 1/8	5/8
1 1/2	857-015		5	.75	3 7/16	19/32
2	857-020		2	1.04	3 43/64	43/64
3	857-030		1	2.89	4 17/32	29/32



Union w/ O-Ring (FT x FT)

O-Ring Material: FPM

Inch Size	Part Number		mp	lbs. each	l	n
1/4	858-002		25	.08	1 55/64	39/64
3/8	858-003		25	.10	1 57/64	39/64
1/2	858-005		25	.23	2 13/32	25/64
3/4	858-007		5	.30	2 9/16	21/32
1	858-010		5	.44	2 31/32	9/16
1 1/4	858-012		5	.60	3 1/8	5/8
1 1/2	858-015		5	.69	3 19/32	19/32
2	858-020		2	.97	3 3/4	43/64
3	858-030		1	2.89	4 17/32	29/32

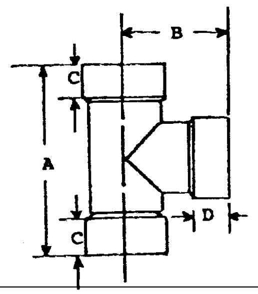
O-Rings for Unions

Inch Size	P/N EPDM	P/N FPM	Univ. Dash No.	
1/4	9153-114	9152-114	-114	
3/8	9153-115	9152-115	-115	
1/2	9153-211	9152-211	-211	
3/4	9153-214	9152-214	-214	
1	9153-219	9152-219	-219	
1 1/4	9153-326	9152-326	-326	
1 1/2	9153-328	9152-328	-328	
2	9153-332	9152-332	-332	
3	9153-341	9152-341	-341	

Large Diameter PVC Pressure Fittings

P/L 02: PVC Schedule 80 (Large Diameter) Fittings
Material: PVC Type I Gray (Cell Classification 12454-B)
Meets ASTM D-2467 (Socket) (up to 12") and ASTM D-2464 (Threaded) (up to 6")

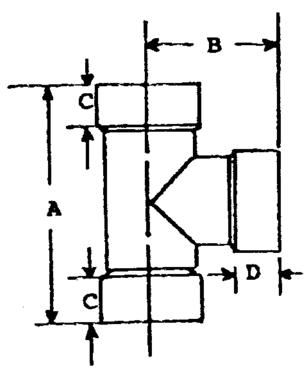
Non-Stocked Fabricated Fittings
Not all of the Fabricated Fittings are carried in our warehouse. Please check with our Customer Service Department for availability. All orders for non-stocked Fabricated Fittings are non-cancellable and non-returnable. Freight is paid by the customer (F.O.B. Plant).



Tee (S x S x S)

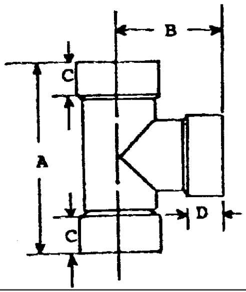
Inch Size	Part Number		mp	lbs. each	a	b	c	d
10*	801-100		1	30	22 1/2	11 1/4	5 1/2	5 1/2
12*	801-120		1	35	26 3/4	13 3/8	6 1/2	6 1/2
14	801-140H		1	40	33	16 1/2	7	7
16	801-160H		1	45	39	19 1/2	9	9

*Molded Fittings



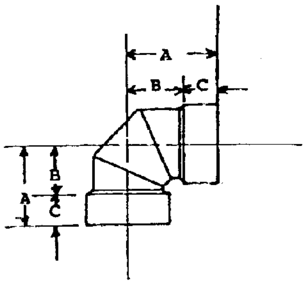
Reducing Tee (S x S x S)

Inch Size	Part Number		mp	lbs. each	a	b	c	d
10 x 2	801-619H		1	30	18 1/2	9	6	2
10 x 3	801-621H		1	30	19 1/2	9 1/2	6	2 1/2
10 x 4	801-623H		1	30	20 1/2	10 1/8	6	3 1/4
10 x 6	801-626H		1	30	22 1/2	10 5/8	6	3 1/2
10 x 8	801-628H		1	30	24 1/2	11 7/8	6	4 3/4
12 x 2	801-659H		1	35	20	10	7	2
12 x 3	801-661H		1	35	21	10	7	2 1/2
12 x 4	801-663H		1	35	22 1/2	11 1/8	7	3 1/4
12 x 6	801-666H		1	35	24 1/2	11 5/8	7	3 1/2
12 x 8	801-668H		1	35	27	12 7/8	7	4 3/4
12 x 10	801-670H		1	35	29 1/2	14 3/8	7	6
14 x 2	801-692H		1	40	20	11	7	2
14 x 3	801-694H		1	40	21	11	7	2 1/2
14 x 4	801-696H		1	40	22 1/2	11 3/4	7	3 1/4
14 x 6	801-698H		1	40	24 1/2	12 1/4	7	3 1/2
14 x 8	801-700H		1	40	27	13 1/2	7	4 3/4
14 x 10	801-702H		1	40	29	15	7	6
14 x 12	801-704H		1	40	31	17	7	7
16 x 2	801-726H		1	45	22	12	9	2
16 x 3	801-728H		1	45	23	12	9	2 1/2
16 x 4	801-730H		1	45	24 1/2	12 3/4	9	3 1/4
16 x 6	801-732H		1	45	28 1/2	13 1/4	9	3 1/2
16 x 8	801-734H		1	45	30	14 1/2	9	4 3/4
16 x 10	801-736H		1	45	32	16	9	6
16 x 12	801-738H		1	45	34	18	9	7
16 x 14	801-740H		1	45	36	18	9	7



Reducing Tee (S x S x FT)

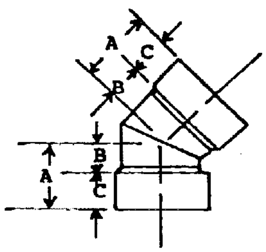
Inch Size	Part Number	mp	lbs. each	a	b	c	d
10 x 2	802-619H	1	30	18 1/2	9	6	2
10 x 3	802-621H	1	30	19 1/2	9 1/2	6	2
10 x 4	802-623H	1	30	20 1/2	10 1/2	6	2 1/2
12 x 2	802-659H	1	35	20	10	7	2
12 x 3	802-661H	1	35	21	10	7	2
12 x 4	802-663H	1	35	22 1/2	11	7	2 1/2



90° Ell (S x S)

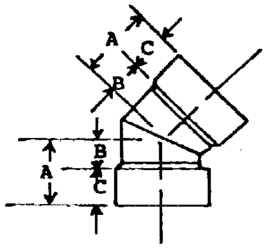
Inch Size	Part Number	mp	lbs. each	a	b	c
10*	806-100	1	45	11 1/4	5 3/4	5 1/2
12*	806-120	1	50	13 3/8	6 7/8	6 1/2
14	806-140H	1	55	21	15	6
16	806-160H	1	60	24	16	8

*Molded Fittings



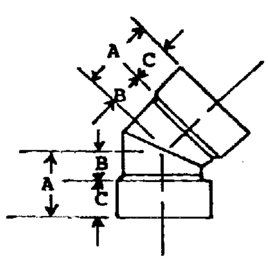
11 1/4° Ell (S x S)

Inch Size	Part Number	mp	lbs. each	a	b	c
10	811-100H	1	20	8	2	6
12	811-120H	1	25	9	2	7
14	811-140H	1	30	10	3	7
16	811-160H	1	35	11	3	9



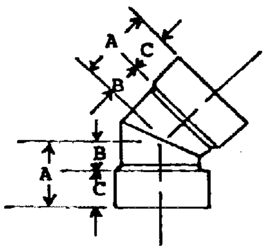
30° Ell (S x S)

Inch Size	Part Number	mp	lbs. each	a	b	c
10	815-100H	1	20	8	2	6
12	815-120H	1	25	10	3	7
14	815-140H	1	30	10	3	7
16	815-160H	1	35	12	3	9



22 1/2° Ell (S x S)

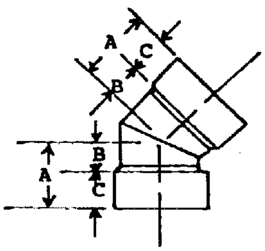
Inch Size	Part Number	mp	lbs. each	a	b	c
10	816-100H	1	20	8 1/2	2 1/2	6
12	816-120H	1	25	10	3	7
14	816-140H	1	30	10 1/2	3 1/2	7
16	816-160H	1	35	11	2	9



45° Ell (S x S)

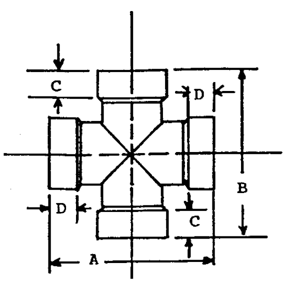
Inch Size	Part Number		mp	lbs. each	a	b	c	
10*	817-100		1	20	8 1/8	2 5/8	5 1/2	
12*	817-120		1	25	9 5/8	3 1/8	6 1/2	
14	817-140H		1	30	13 1/2	5 1/2	7	
16	817-160H		1	35	16 3/4	8 3/4	9	

*Molded Fittings



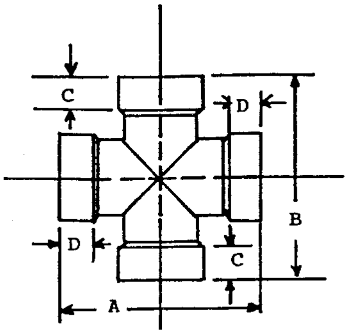
15° Ell (S x S)

Inch Size	Part Number		mp	lbs. each	a	b	c	
10	818-100H		1	20	8	2	6	
12	818-120H		1	25	9	2	7	
14	818-140H		1	30	10	3	7	
16	818-160H		1	35	11	3	9	



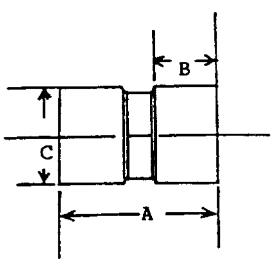
Cross (S x S x S x S)

Inch Size	Part Number		mp	lbs. each	a	b	c	d
10	820-100H		1	25	27 1/2	28	6	6
12	820-120H		1	30	32	32	7	7
14	820-140H		1	35	33	33	7	7
16	820-160H		1	40	39	39	9	9



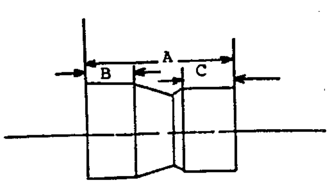
Reducing Cross (S x S x S x S)

Inch Size	Part Number		mp	lbs. each	a	b	c	d
10 x 2	820-619H		1	25	18	18 1/2	6	2
10 x 3	820-621H		1	25	19	19 1/2	6	2 1/2
10 x 4	820-623H		1	25	20 1/4	20 1/2	6	3 1/4
10 x 6	820-626H		1	25	21 1/4	22 1/2	6	3 1/2
10 x 8	820-628H		1	25	24	24 1/2	6	3 5/8
12 x 2	820-659H		1	30	20	20	7	2
12 x 3	820-661H		1	30	20	21	7	2 1/2
12 x 4	820-663H		1	30	22 1/4	22 1/2	7	3 1/4
12 x 6	820-666H		1	30	23 1/4	24 1/2	7	3 1/2
12 x 8	820-668H		1	30	25 3/4	27	7	3 5/8
12 x 10	820-670H		1	30	28 3/4	29 1/2	7	6
14 x 2	820-692H		1	35	22	20	7	2
14 x 3	820-694H		1	35	23 1/2	22 1/2	7	3 1/4
14 x 4	820-696H		1	35	24 1/2	24 1/2	7	3 1/2
14 x 6	820-698H		1	35	27	27	7	3 5/8
14 x 8	820-700H		1	35	30	29	7	6
14 x 10	820-702H		1	35	34	31	7	6
14 x 12	820-704H		1	35	34	31	7	7
16 x 2	820-726H		1	40	24	22	9	2
16 x 3	820-728H		1	40	24	23	9	2 1/2
16 x 4	820-730H		1	40	25 1/2	26 1/2	9	3 1/4
16 x 6	820-732H		1	40	26 1/2	28 1/2	9	3 1/2
16 x 8	820-734H		1	40	29	31	9	3 5/8
16 x 10	820-736H		1	40	32	33	9	6
16 x 12	820-738H		1	40	36	35	9	7
16 x 14	820-740H		1	40	36	37	9	7



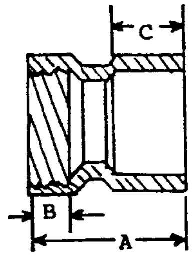
Coupling (S x S)

Inch Size	Part Number		mp	lbs. each	a	b	c	
10	829-100H		1	15	14	6	12	
12	829-120H		1	20	16	7	14	
14	829-140H		1	25	16	7	15 1/2	
16	829-160H		1	30	19 1/2	9	17 3/4	



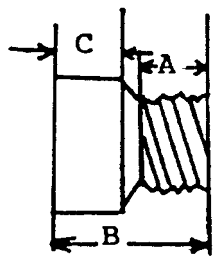
Reducer Coupling (S x S)

Inch Size	Part Number		mp	lbs. each	a	b	c	
10 x 4	829-623H		1	15	24	6	3 1/4	
10 x 6	829-626H		1	15	20	6	3 1/2	
10 x 8	829-628H		1	15	12 3/4	6	3 5/8	
12 x 8	829-668H		1	20	21	7	3 5/8	
12 x 10	829-670H		1	20	14 1/2	7	6	
14 x 10	829-702H		1	25	22 1/2	7	6	
14 x 12	829-704H		1	25	15 1/2	7	7	
16 x 12	829-738H		1	30	25	9	7	
16 x 14	829-740H		1	30	17	9	7	



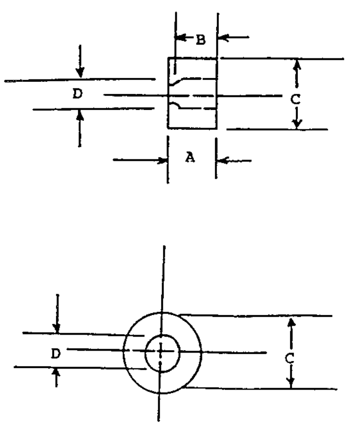
Female Adapter (S x FT)

Inch Size	Part Number	mp	lbs. each	a	b	c
10	835-100H	1	20	10 3/8	2	6
12	835-120H	1	25	12	1 3/4	6 1/2
14	835-140H	1	30	12	2 3/4	6



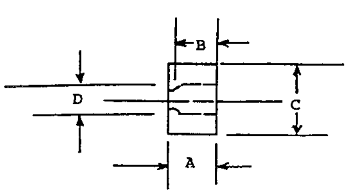
Male Adapter (S x MT)

Inch Size	Part Number	mp	lbs. each	a	b	c
10	836-100H	1	20	2	10	6
12	836-120H	1	25	2	10 1/2	6 1/2
14	836-140H	1	30	2 1/2	12	6



Reducer Bushing (flush) (Spg x S)

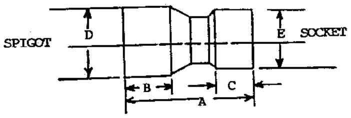
Inch Size	Part Number	mp	lbs. each	a	b	c	d
10 x 4	837-623H	1	15	4 1/2	2 1/4	10 3/4	4 1/2
10 x 6	837-626H	1	15	4 1/2	3 1/4	10 3/4	6 5/8
10 x 8	837-628H	1	15	4 1/2	3 7/8	10 3/4	8 5/8
12 x 6	837-666H	1	20	5 3/8	3 1/4	12 3/4	6 5/8
12 x 8	837-668H	1	20	5 3/8	3 7/8	12 3/4	8 5/8
12 x 10	837-670H	1	20	5 3/8	4 7/8	12 3/4	10 3/4
14 x 4	837-696H	1	25	6 1/2	2 1/4	14	4 1/2
14 x 6	837-698H	1	25	6 1/2	3 1/4	14	6 5/8
14 x 8	837-700H	1	25	6 1/2	3 7/8	14	8 5/8
14 x 10	837-702H	1	25	6 1/2	4 7/8	14	10 3/4
14 x 12	837-704H	1	25	6 1/2	5 3/8	14	12 3/4
16 x 4	837-730H	1	30	7	2 1/4	16	4 1/2
16 x 6	837-732H	1	30	7	3 1/4	16	6 5/8
16 x 8	837-734H	1	30	7	3 7/8	16	8 5/8
16 x 10	837-736H	1	30	7	4 7/8	16	10 3/4
16 x 12	837-738H	1	30	7	5 3/8	16	12 3/4
16 x 14	837-740H	1	30	7	6	16	14



Reducer Bushing (flush) (Spg x FT)

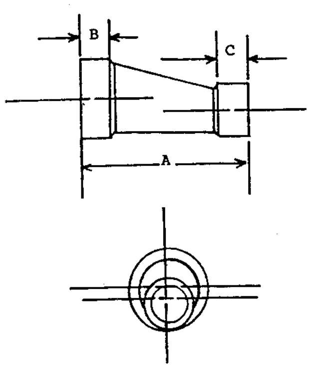
Inch Size	Part Number	mp	lbs. each	a	b	c	d
10 x 4	838-623H	1	15	4 1/2	2	10 3/4	4 1/2
10 x 6	838-626H	1	15	4 1/2	2	10 3/4	6 5/8
10 x 8	838-628H	1	15	4 1/2	2	10 3/4	8 5/8
12 x 4	838-663H	1	20	5 3/8	2	12 3/4	4 1/2
12 x 6	838-666H	1	20	5 3/8	2	12 3/4	6 5/8
12 x 8	838-668H	1	20	5 3/8	2	12 3/4	8 5/8
12 x 10	838-670H	1	20	5 3/8	2	12 3/4	10 3/4

Reducer Bushing Extended Style (Spg x S)



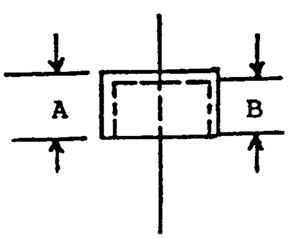
Inch Size	Part Number	mp	lbs. each	a	b	c	d	e
10 x 6	840-626H	1	15	13	6	$3\frac{1}{2}$	$10\frac{3}{4}$	$6\frac{5}{8}$
10 x 8	840-628H	1	15	$11\frac{7}{8}$	6	$3\frac{5}{8}$	$10\frac{3}{4}$	$8\frac{5}{8}$
12 x 6	840-666H	1	20	13	$6\frac{1}{2}$	$3\frac{1}{2}$	$12\frac{3}{4}$	$6\frac{5}{8}$
12 x 8	840-668H	1	20	$14\frac{1}{4}$	$6\frac{1}{2}$	$3\frac{5}{8}$	$12\frac{3}{4}$	$8\frac{5}{8}$
12 x 10	840-670H	1	20	12	$6\frac{1}{2}$	6	$12\frac{3}{4}$	$10\frac{3}{4}$
14 x 8	840-700H	1	25	15	$6\frac{1}{2}$	$3\frac{5}{8}$	14	$8\frac{5}{8}$
14 x 10	840-702H	1	25	$13\frac{1}{2}$	$6\frac{1}{2}$	6	14	$10\frac{3}{4}$
14 x 12	840-704H	1	25	$13\frac{1}{2}$	$6\frac{1}{2}$	7	14	$12\frac{3}{4}$
16 x 10	840-736H	1	30	36	9	6	16	$10\frac{3}{4}$
16 x 12	840-738H	1	30	25	9	7	16	$12\frac{3}{4}$
16 x 14	840-740H	1	30	17	9	7	16	14

Eccentric Reducers (S x S)



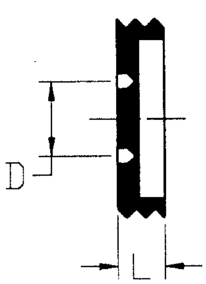
Inch Size	Part Number	mp	lbs. each	a	b	c
10 x 4	841-623H	1	15	$20\frac{1}{2}$	6	$3\frac{1}{4}$
10 x 6	841-626H	1	15	21	6	$3\frac{1}{2}$
10 x 8	841-628H	1	15	18	6	$3\frac{5}{8}$
12 x 4	841-663H	1	20	24	7	$3\frac{1}{4}$
12 x 6	841-666H	1	20	24	7	$3\frac{1}{2}$
12 x 8	841-668H	1	20	20	7	$3\frac{5}{8}$
12 x 10	841-670H	1	20	23	7	6

Caps (S)

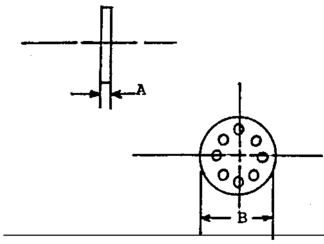


Inch Size	Part Number	mp	lbs. each	a	b
10	847-100H	1	20	$6\frac{3}{4}$	6
12	847-120H	1	25	8	7
14	847-140H	1	30	9	7
16	847-160H	1	35	$9\frac{3}{4}$	9

Plug (MT) (1" thick)



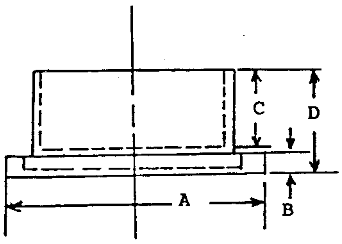
Inch Size	Part Number	mp	lbs. each	d	l
6	850-060H	1	10	4	1
8	850-080H	1	15	4	1
10	850-100H	1	20	4	1
12	850-120H	1	25	4	1



Blind Flange (1" thick)

Inch Size	Part Number		mp	lbs. each	a	b		
10	853-100H		1	20	1	16		
12	853-120H		1	25	1	19		
14	853-140H		1	30	1	21		
16	853-160H		1	35	1	23 1/2		

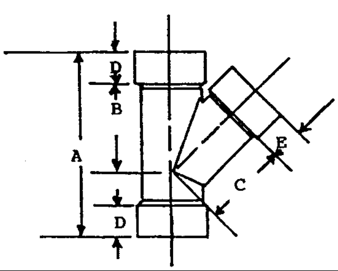
E—Bolt Circle
F—No. Holes
G—Dia. Holes



Van Stone Flange (S)

Inch Size	Part Number		mp	lbs. each	a	b	c	d	e	f	g
14*	854-140H		1	30	21	1 3/8	7	7 3/4	7 3/4	12	1 1/8
16*	854-160H		1	35	23 1/2	1 1/2	9	10 3/4	10 3/4	16	1 1/8

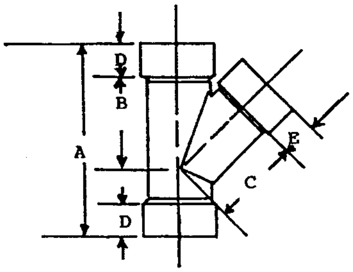
*(epoxy coated steel rings)



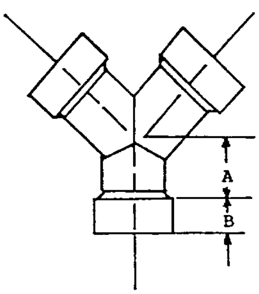
Tee 45° (Wye) (S x S x S)

Inch Size	Part Number		mp	lbs. each	a	b	c	d	e
10	875-100H		1	30	34	16	16	6	6
12	875-120H		1	35	39	19	19	6 1/2	6 1/2
14	875-140H		1	40	41	22	22	7	7
16	875-160H		1	45	47 1/2	25 1/2	25 1/2	9	9

Tee 45° (Wye) Reducing (S x S x S)



Inch Size	Part Number	sp	lbs. each	a	b	c	d	e
10 x 2	875-619H	1	30	21 1/2	12	12	6	2
10 x 2 1/2	875-620H	1	30	22	12	13	6	2 1/2
10 x 3	875-621H	1	30	22	12 1/2	13	6	2 1/2
10 x 4	875-623H	1	30	24	13	13 3/4	6	3 1/4
10 x 6	875-626H	1	30	26	13 1/2	14	6	4
10 x 8	875-628H	1	30	29	15 1/4	15 3/4	6	4 3/4
12 x 2	875-659H	1	35	24	12 1/2	12 1/2	7	2
12 x 3	875-661H	1	35	24 1/2	13	13	7	2 1/2
12 x 4	875-663H	1	35	26 1/2	13 1/4	13 1/2	7	3 1/4
12 x 6	875-666H	1	35	29	14 1/4	16 1/6	7	4
12 x 8	875-668H	1	35	32	16	16 1/2	7	4 3/4
12 x 10	875-670H	1	35	38	18	15	7	6
14 x 4	875-696H	1	40	25	12	13	7	3 1/4
14 x 6	875-698H	1	40	28	14	15 1/2	7	4
14 x 8	875-700H	1	40	31 1/2	16	16 1/2	7	4 3/4
14 x 10	875-702H	1	40	34	17 1/2	17 1/2	7	6
14 x 12	875-704H	1	40	38 1/2	19 1/2	19 1/2	7	7
16 x 4	875-730H	1	45	31	17	17	9	3 1/4
16 x 6	875-732H	1	45	34	20	20	9	4
16 x 8	875-734H	1	45	37	20 1/2	20 1/2	9	4 3/4
16 x 10	875-736H	1	45	40	21 1/2	21 1/2	9	6
16 x 12	875-738H	1	45	43	21 1/2	21 1/2	9	7
16 x 14	875-740H	1	45	45	24	24	9	7



True Wye (S x S x S)

Inch Size	Part Number	sp	lbs. each	a	b
10	876-100H	1	30	4	6
12	876-120H	1	35	5	6 1/2
14	876-140H	1	40	5 3/8	7
16	876-160H	1	45	6	9

Schedule 80 CPVC Pipe and Fittings

Table of Contents

Glossary

MP = **Master Pack**
FT = **Female Thread**
MT = **Male Thread**
MC = **Master Carton**
S = **Slip Socket**
L = **UPC Bar Coded**
SPG = **Spigot End**
***** = **IAPMO (UPC Listed)**

Master Pack Qty.	Inner Pack Qty. (Minimum Order Multiples)
> 50 pieces	10 pieces
5 to 50 pieces	5 pieces
2 pieces	2 pieces
1 piece	1 piece

Not for Use with Compressed Air or Gases

George Fischer, Inc. DOES NOT RECOMMEND the use of thermoplastic piping products for systems to transport or store compressed air or gases, or the testing of thermoplastic piping systems with compressed air or gases in above or below ground locations. The use of George Fischer, Inc. products in compressed air or gas systems automatically voids George Fischer, Inc. warranty for such products, and their use against our recommendation is entirely the responsibility and liability of the installer. George Fischer, Inc. will not accept responsibility for damage or impairment from its products, or other consequential or incidental damages caused by misapplication, incorrect assembly, and/or exposure to harmful substances or conditions.

For more information about any of our product lines, please call (800) 854-4090.

Schedule 80 CPVC Pressure Pipe

CPVC Pressure Pipe — 20 ft. Lengths

P/L 70   Material: CPVC 23447-B Gray
Meets ASTM F441

Inch Size	Part Number		lift quantity	lbs. per 100 ft.	avg. o.d.	min. wall	psi at 73° F
1/2	C8008-005AB*		8400 ft.	22.76	.840	.147	848
3/4	C8008-007AB*		7600 ft.	31.24	1.050	.154	688
1	C8008-010AB*		4200 ft.	46.23	1.315	.179	630
1 1/4	C8008-012AB*		4000 ft.	61.26	1.660	.191	520
1 1/2	C8008-015AB*		3600 ft.	76.52	1.900	.200	471
2	C8008-020AB*		2100 ft.	104.60	2.375	.218	404
2 1/2	C8008-025AB*		1460 ft.	156.55	2.875	.276	425
3	C8008-030AB*		1160 ft.	214.17	3.500	.300	375
4	C8008-040AB*		1020 ft.	301.49	4.500	.337	324
6	C8008-060AB*		440 ft.	597.86	6.625	.432	279
8	C8008-080AB		280 ft.	928.28	8.625	.500	246
10	C8008-100AB		140 ft.	1334.30	10.750	.593	230
12	C8008-120AB		100 ft.	1834.40	12.750	.687	230

*IAPMO (UPC Listed)

Solvent-Welded Pressure Rating vs. Service Temperature — CPVC and PVC

				P														
				73°F		90°F	100°F	110°F	120°F		130°F		140°F		160°F	180°F	200°F	210°F
Nom. Size	D Outside Dia.	t Wall	DR=D/t	PVC f=1 S=2000	CPVC f=1 S=2000	PVC f=0.75 S=1500	PVC f=0.62 S=1240	PVC f=0.50 S=1000	PVC f=0.40 S=800	CPVC f=0.65 S=1300	PVC f=0.30 S=600	CPVC f=0.57 S=1135	PVC f=0.22 S=440	CPVC f=0.50 S=1000	CPVC f=0.40 S=800	CPVC f=0.25 S=500	CPVC f=0.20 S=400	CPVC f=0.16 S=320
1/2	.840	.147	5.714	848	848	636	526	424	339	552	255	484	187	424	339	212	170	136
3/4	1.050	.154	6.818	688	688	516	426	344	275	447	206	392	151	344	275	172	138	110
1	1.315	.179	7.346	630	630	473	390	315	252	410	189	359	139	315	252	158	126	101
1 1/4	1.660	.191	8.691	520	520	390	322	260	208	338	156	296	114	260	208	130	104	83
1 1/2	1.900	.200	9.500	471	471	353	292	235	188	306	141	268	104	235	188	118	94	75
2	2.375	.218	10.894	404	404	303	251	202	162	263	121	230	89	202	162	101	81	65
2 1/2	2.875	.276	10.417	425	425	319	263	212	170	276	127	242	93	212	170	106	85	68
3	3.500	.300	11.667	375	375	281	233	188	150	244	113	214	83	188	150	94	75	60
4	4.500	.337	13.353	324	324	243	201	162	130	210	97	185	71	162	130	81	65	52
6	6.625	.432	15.336	279	279	209	173	140	112	181	84	159	61	140	112	70	56	45
8	8.625	.500	17.250	246	246	185	153	123	98	160	74	140	54	123	98	62	49	39

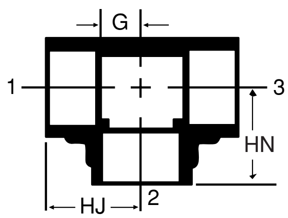
$P = \frac{2St}{D-t} = \frac{2S}{DR-1} = P_{73°F}f$

P = Pressure rating of pipe at service temperatures (psi)
S = Hydrostatic design stress (psi)
D = Outside diameter of pipe (inches)
t = Pipe wall thickness (inches)
f = Derating factor for service temperature
DR = Dimension ratio (D/t)
$P_{73°F}$ = Pressure rating at 73°F

1) Figures for pressure rating at 73°F are rounded off from actual calculated values. Pressure ratings for other temperatures are calculated from 73°F values.
2) Pressure rating values are for PVC (12454-B) and CPVC (23447-B) pipe and for most sizes are calculated from the experimentally determined long-term strength of PVC1 and CPVC extrusion compounds. Because molding compounds may differ in long-term strength and elevated temperature properties from pipe compounds, piping systems consisting of extruded pipe and molded fittings may have lower pressure ratings than those shown here, particularly at the higher temperatures. Caution should be exercised when designing PVC systems operating above 100°F and CPVC systems operating above 180°F.
3) The pressure ratings given are for solvent-cemented systems. When adding valves, flanges or other components, the system must be derated to the rating of the lowest component. (Pressure ratings: molded or cut threads are rated at 50% of solvent-cemented systems; flanges and unions are 150 psi; for valves, see manufacturer's recommendation.)

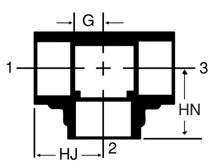
+GF+ Hi-Strength Schedule 80 CPVC Pressure Fittings

P/L 25 Material: CPVC 23447-B Gray
Meets ASTM F437 (Threaded) and F439 (Socket)



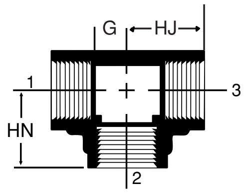
Tee (S x S x S)

Inch Size	Part Number		mp	lbs. each	hj	hn	g
1/2	9801-005*		25	.13	1 25/64	1 25/64	33/64
3/4	9801-007*		15	.19	1 37/64	1 37/64	37/64
1	9801-010*		20	.29	1 53/64	1 53/64	45/64
1 1/4	9801-012*		5	.42	2 5/32	2 5/32	29/32
1 1/2	9801-015*		5	.62	2 13/32	2 13/32	1 1/32
2	9801-020*		5	.82	2 25/32	2 25/32	1 9/32
2 1/2	9801-025*		5	1.73	3 9/32	3 9/32	1 17/32
3	9801-030*		5	2.56	3 23/32	3 23/32	1 55/64
4	9801-040*		5	3.89	4 19/32	4 19/32	2 23/64
6	9801-060*		1	10.59	6 9/16	6 9/16	3 9/16
8	9801-080		1	20.13	8 9/16	8 9/16	4 9/16



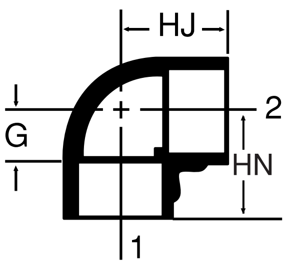
Reducing Tee (S x S x S)

Inch Size	Part Number		mp	lbs. each	hj	hn	g
6 x 6 x 4	9801-532		1	19.34	5 11/32	5 49/64	2 11/32
8 x 8 x 6	9801-585		1	15.51	7 5/8	8 1/2	3 5/8



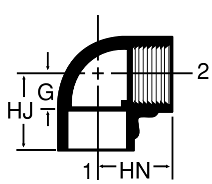
Tee (FT x FT x FT)

Inch Size	Part Number		mp	lbs. each	hj	hn	g
1/4	9805-002		50	.05	59/64	59/64	21/64
3/8	9805-003		50	.07	1	1	25/64
1/2	9805-005		25	.14	1 9/32	1 9/32	33/64
3/4	9805-007		15	.18	1 3/8	1 3/8	37/64
1	9805-010		15	.31	1 11/16	1 11/16	45/64
1 1/4	9805-012		10	.45	1 15/16	1 15/16	29/32
1 1/2	9805-015		10	.56	2 1/16	2 1/16	1 1/32
2	9805-020		5	.72	2 11/32	2 11/32	1 9/32



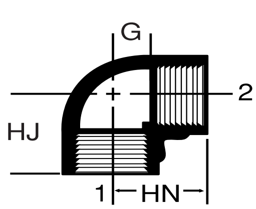
90° Ell (S x S)

Inch Size	Part Number		mp	lbs. each	hj	hn	g
1/4	9806-002		50	.04	61/64	61/64	21/64
3/8	9806-003		50	.06	1 9/64	1 9/64	13/32
1/2	9806-005*		25	.10	1 25/64	1 25/64	17/32
3/4	9806-007*		25	.14	1 37/64	1 37/64	19/32
1	9806-010*		10	.23	1 53/64	1 53/64	23/32
1 1/4	9806-012*		10	.37	2 5/32	2 5/32	29/32
1 1/2	9806-015*		10	.44	2 13/32	2 13/32	1 1/32
2	9806-020*		5	.70	2 25/32	2 25/32	1 9/32
2 1/2	9806-025*		5	1.25	3 9/32	3 9/32	1 17/32
3	9806-030*		5	1.87	3 23/32	3 23/32	1 55/64
4	9806-040*		5	3.24	4 19/32	4 19/32	2 23/64
6	9806-060*		1	11	6 9/16	6 9/16	3 9/16
8	9806-080		1	15.73	8 9/16	8 9/16	4 9/16



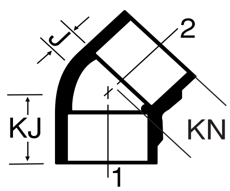
90° Ell (S x FT)

Inch Size	Part Number		mp	lbs. each	hj	hn	g
1/2	9807-005		25	.09	1 25/64	1 9/32	17/32
3/4	9807-007		25	.14	1 37/64	1 3/8	19/32
1	9807-010		10	.21	1 27/32	1 11/16	23/32



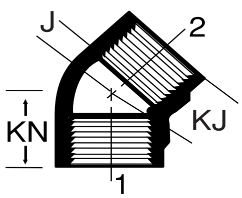
90° Ell (FT x FT)

Inch Size	Part Number		mp	lbs. each	hj	hn	g
1/4	9808-002		50	.04		59/64	
3/8	9808-003		50	.05		1	
1/2	9808-005		25	.10		1 9/32	
3/4	9808-007		20	.13		1 3/8	
1	9808-010		10	.34		1 11/16	
1 1/4	9808-012		10	.34		1 15/16	
1 1/2	9808-015		10	.40		2 1/16	
2	9808-020		5	.72		2 11/32	



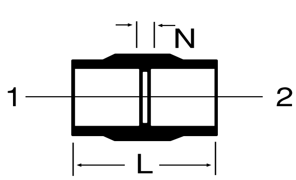
45° Ell (S x S)

Inch Size	Part Number		mp	lbs. each	kj	kn	j
1/2	9817-005*		25	.11	1 9/64		9/32
3/4	9817-007*		20	.15	1 11/32		11/32
1	9817-010*		25	.22	1 15/64		11/32
1 1/4	9817-012*		15	.35	1 21/32		13/32
1 1/2	9817-015*		25	.40	1 55/64		31/64
2	9817-020*		5	.69	2 5/32		21/32
2 1/2	9817-025*		5	1.08	2 15/32		47/64
3	9817-030*		5	1.40	2 21/32		25/32
4	9817-040*		5	2.56	3 9/32		1 1/32
6	9817-060*		1	9.35	4 13/16		1 13/16
8	9817-080		1	11.11	6 1/6		2 1/16



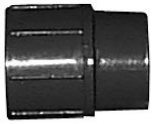
45° Ell (FT x FT)

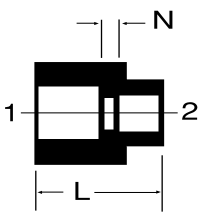
Inch Size	Part Number		mp	lbs. each	kj	kn	j
1/4	9819-002		50	.03		49/64	
3/8	9819-003		50	.04		13/16	
1/2	9819-005		25	.10		1 1/64	
3/4	9819-007		20	.14		1 7/32	
1	9819-010		25	.23		1 21/64	
1 1/4	9819-012		15	.33		1 27/64	
1 1/2	9819-015		10	.39		1 1/2	
2	9819-020		5	.57		1 23/32	



Coupling (S x S)

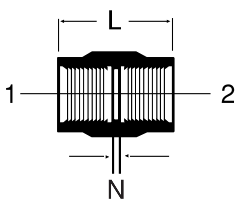
Inch Size	Part Number		mp	lbs. each	l	n
1/4	9829-002		50	.03	1 23/64	3/32
3/8	9829-003		50	.04	1 5/8	1/8
1/2	9829-005*		25	.07	1 57/64	1/8
3/4	9829-007*		20	.10	2 9/64	9/64
1	9829-010*		25	.16	2 25/64	9/64
1 1/4	9829-012*		25	.24	2 21/32	5/32
1 1/2	9829-015*		10	.30	2 29/32	5/32
2	9829-020*		5	.43	3 5/32	5/32
2 1/2	9829-025*		5	.81	3 3/4	1/4
3	9829-030*		5	1.23	4	1/4
4	9829-040*		5	2.12	4 3/4	1/4
6	9829-060*		2	6.97	6 5/16	5/16
8	9829-080		2	6.91	8 5/16	5/16





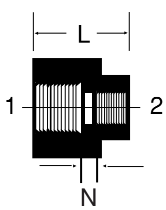
Reducer Coupling (S x S)

Inch Size	Part Number		mp	lbs. each	l	n
3/4 x 1/2	9829-101*		25	.10	2	3/32
1 x 1/2	9829-130*		25	.16	2 1/8	3/32
1 x 3/4	9829-131*		25	.15	2 1/4	3/32
1 1/2 x 1	9829-211*		15	.28	2 5/8	3/32
1 1/2 x 1 1/4	9829-212*		20	.31	2 3/4	3/32
2 x 1 1/2	9829-251*		5	.44	3	3/32
3 x 2	9829-338*		5	1.01	3 9/16	3/16
4 x 3	9829-422*		5	1.65	4 3/8	1/4
8 x 6	9829-585		2	7.04	9 1/8	2 1/16



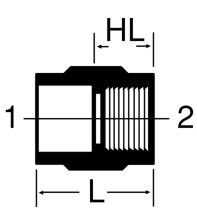
Coupling (FT x FT)

Inch Size	Part Number		mp	lbs. each	l	n
1/4	9830-002		50	.03	1 9/32	3/32
3/8	9830-003		50	.04	1 21/64	1/8
1/2	9830-005		.07	1 41/64		
3/4	9830-007		25	.09	1 23/32	
1	9830-010		25	.16	2 3/32	
1 1/2	9830-015		10	.26	2 7/32	
2	9830-020		5	.36	2 9/32	



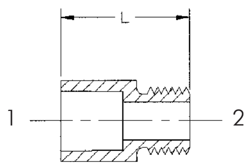
Reducer Coupling (FT x FT)

Inch Size	Part Number		mp	lbs. each	l	n
1/2 x 1/4	9830-072		50	n/a	1 7/16	7/64
1/2 x 3/8	9830-073		50	.06	1 29/64	7/64
3/4 x 1/2	9830-101		25	.09	1 21/32	1/8
1 x 1/2	9830-130		25	.14	1 53/64	7/64
1 x 3/4	9830-131		25	.14	1 7/8	7/64
1 1/2 x 1	9830-211		20	.25	2 7/64	7/64



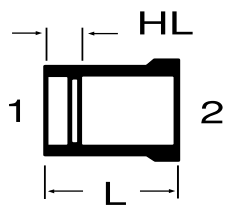
Female Adapter (S x FT)

Inch Size	Part Number		mp	lbs. each	l	hl
1/4	9835-002		50	.03	1 13/32	47/64
1/2	9835-005*		25	.07	1 3/4	13/16
3/4	9835-007*		20	.10	1 59/64	55/64
1	9835-010*		25	.16	2 15/64	1 3/64
1 1/4	9835-012*		10	.22	2 27/64	1 5/64
1 1/2	9835-015*		10	.28	2 9/16	1 7/64
2	9835-020*		5	.41	2 23/32	1 9/64
3	9835-030*		5	1.20	3 3/4	1 49/64
4	9835-040*		5	1.92	4 15/64	1 55/64



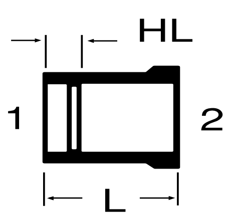
Male Adapter (S x MT)

Inch Size	Part Number		mp	lbs. each	l
1/2	9836-005		50	.04	1 13/16
3/4	9836-007		25	.06	1 63/64
1	9836-010		25	.10	2 11/32
1 1/4	9836-012		15	.15	2 1/2
1 1/2	9836-015		15	.18	2 21/32



Flush Style Reducer Bushing (Spg x S)

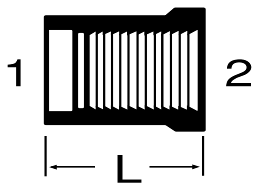
Inch Size	Part Number		mp/mc	lbs. each	l	hl
1/2 x 1/4	9837-072		50	.02	1 7/64	7/16
3/4 x 1/2	9837-101*		50	.04	1 9/32	13/32
1 x 1/2	9837-130*		50	.07	1 13/32	1/2
1 x 3/4	9837-131*		50	.06	1 13/32	13/32
1 1/4 x 1/2	9837-166*		25	.14	1 17/32	21/32
1 1/4 x 3/4	9837-167*		25	.12	1 17/32	17/32
1 1/4 x 1	9837-168*		25	.09	1 17/32	13/32
1 1/2 x 1/2	9837-209*		25	.19	1 21/32	25/32
1 1/2 x 3/4	9837-210*		25	.17	1 21/32	21/32
1 1/2 x 1	9837-211*		25	.14	1 21/32	17/32
1 1/2 x 1 1/4	9837-212*		25	.08	1 21/32	13/32
2 x 1/2	9837-247*		10	.32	1 25/32	29/32
2 x 3/4	9837-248*		25	.30	1 25/32	25/32
2 x 1	9837-249*		25	.25	1 25/32	21/32
2 x 1 1/4	9837-250*		10	.20	1 25/32	17/32
2 x 1 1/2	9837-251*		10	.17	1 25/32	13/32
2 1/2 x 1 1/2	9837-291*		5	.40	2 5/64	41/64
2 1/2 x 2	9837-292*		5	.27	2 3/32	33/64
3 x 2	9837-338*		5	.61	2 7/32	23/32
3 x 2 1/2	9837-339		5	.38	2 13/64	41/64
4 x 2	9837-420*		5	1.14	2 45/64	1 9/64
4 x 3	9837-422*		5	1.07	2 11/16	3/4



Extended Style Reducer Bushing (Spg x S)

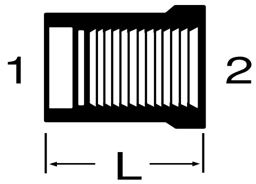
Inch Size	Part Number		mp/mc	lbs. each	l	hl
1/2 x 3/8	9837-073E		50	.02	1 29/32	1 7/64
6 x 4	9837-532E		2	3.50	6 7/8	4 5/8

Flush Style Reducer Bushing (Spg x FT)



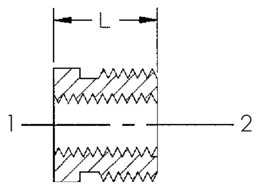
Inch Size	Part Number		mp	lbs. each	l
1/2 x 1/4	9838-072		50	.02	1 7/64
3/4 x 1/2	9838-101*		50	.04	1 9/32
1 x 1/2	9838-130*		50	.08	1 13/32
1 x 3/4	9838-131*		50	.06	1 13/32
1 1/4 x 1/2	9838-166*		15	.14	1 17/32
1 1/4 x 3/4	9838-167*		15	.13	1 17/32
1 1/4 x 1	9838-168*		15	.08	1 17/32
1 1/2 x 1/2	9838-209*		15	.19	1 21/32
1 1/2 x 3/4	9838-210*		15	.18	1 21/32
1 1/2 x 1	9838-211*		15	.13	1 21/32
1 1/2 x 1 1/4	9838-212*		25	.17	1 21/32
2 x 1/2	9838-247*		10	.20	1 25/32
2 x 3/4	9838-248*		10	.33	1 25/32
2 x 1	9838-249*		10	.30	1 25/32
2 x 1 1/4	9838-250*		10	.21	1 25/32
2 x 1 1/2	9838-251*		10	.10	1 25/32
2 1/2 x 1 1/2	9838-291*		5	.40	2 3/32
2 1/2 x 2	9838-292*		5	.34	2 3/32
3 x 2	9838-338*		5	.62	2 7/32
4 x 2	9838-420*		5	1.14	2 5/8
4 x 3	9838-422*		5	1.07	2 5/8

Extended Style Reducer Bushing (Spg x FT)



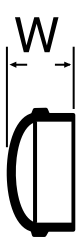
Inch Size	Part Number		mp	lbs. each	l
3/8 x 1/4	9838-052E		50	.01	1 37/64
1/2 x 3/8	9838-073E		50	.02	1 23/32

Extended Style Reducer Bushing (MT x FT)



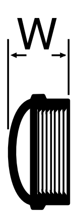
Inch Size	Part Number		mp	lbs. each	l
3/4 x 1/2	9839-101E		50	.02	1 49/64
1 x 3/4	9839-131E		50	.04	1 55/64
1 1/4 x 1	9839-168E		25	.07	2 17/64
1 1/2 x 1 1/4	9839-212E		10	.06	2 5/16
2 x 1 1/2	9839-251E		10	.12	2 3/8

Cap (S)

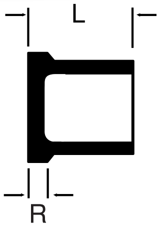


Inch Size	Part Number		mp	lbs. each	w	hl
1/2	9847-005*		50	.05	1 9/32	13/32
3/4	9847-007*		25	.07	1 29/64	29/64
1	9847-010*		25	.12	1 21/32	17/32
1 1/4	9847-012*		15	.16	1 55/64	39/64
1 1/2	9847-015*		10	.22	2 1/16	11/16
2	9847-020*		5	.37	2 19/64	51/64
2 1/2	9847-025*		5	.60	2 23/32	31/32
3	9847-030*		5	.92	3 1/32	1 5/32
4	9847-040*		5	1.48	3 41/64	1 25/64
6	9847-060*		2	5.11	4 61/64	1 61/64
8	9847-080		2	6.72	6 1/2	2 1/2

Cap (FT)

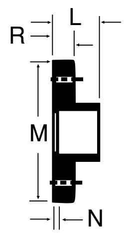


Inch Size	Part Number		mp	lbs. each	w	
1/4	9848-002		50	.02	29/32	
3/8	9848-003		50	.03	15/16	
1/2	9848-005		50	.05	1 5/32	
3/4	9848-007		25	.06	1 15/32	
1	9848-010		25	.11	1 33/64	
1 1/4	9848-012		15	.16	1 5/8	
1 1/2	9848-015		10	.22	1 11/16	
2	9848-020		5	.30	1 55/64	



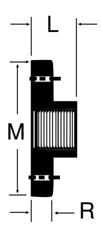
Plug (MT)

Inch Size	Part Number		mp	lbs. each	l	r
1/4	9850-002		50	.01	13/16	7/32
3/8	9850-003		50	.01	53/64	7/32
1/2	9850-005		50	.03	31/32	7/32
3/4	9850-007		50	.04	1 3/64	1/4
1	9850-010		25	.06	1 1/4	17/64
1 1/2	9850-015		20	.13	1 3/8	21/64
2	9850-020		10	.20	1 15/32	13/32



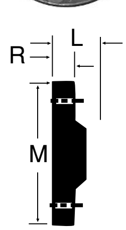
Flange (S)

Inch Size	Part Number		mp	lbs. each	no. of holes	bolt d.	bolt circle d.	m	r	l	n
1/2	9851-005*		5	.21	4	1/2	2.38	3.50	.41	1 1/32	1/8
3/4	9851-007*		5	.28	4	1/2	2.75	3.88	.47	1 5/32	1/8
1	9851-010*		5	.39	4	1/2	3.13	4.25	.53	1 9/32	1/8
1 1/4	9851-012*		5	.50	4	1/2	3.50	4.62	.60	1 7/16	1/8
1 1/2	9851-015*		5	.64	4	1/2	3.88	5.00	.66	1 9/16	1/8
2	9851-020*		5	.98	4	5/8	4.75	6.00	.71	1 11/16	1/8
2 1/2	9851-025*		5	1.50	4	5/8	5.50	7.00	.77	1 31/32	5/32
3	9851-030*		5	1.88	4	5/8	6.00	7.50	.89	2 3/32	5/32
4	9851-040*		5	3.04	8	5/8	7.50	9.00	1.09	2 15/32	5/32
6	9851-060*		1	4.35	8	3/4	9.50	11.00	1.25	3 27/32	5/16



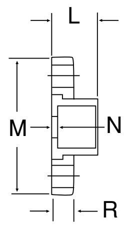
Flange (FT)

Inch Size	Part Number		mp	lbs. each	no. of holes	bolt d.	bolt circle d.	m	r	l	n
1	9852-010		5	.39	4	1/2	3.13	4.25	.53	1 1/8	
1 1/2	9852-015		5	.62	4	1/2	3.88	5	.66	1 7/32	
2	9852-020		5	.95	4	5/8	4.75	6	.71	1 1/4	
3	9852-030		5	1.87	4	5/8	6	7.5	.89	1 27/32	
4	9852-040		5	2.91	8	5/8	7.5	9	1.09	1 15/16	



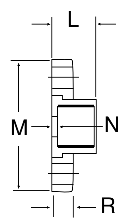
Flange (Blind)

Inch Size	Part Number		mp	lbs. each	no. of holes	bolt d.	bolt circle d.	m	r	l	n
1 1/2	9853-015		5	.67	4	1/2	3.88	5	.66	13/16	
2	9853-020		5	1.08	4	5/8	4.75	6	.71	15/16	
3	9853-030		5	2.13	4	5/8	6	7.5	.89	1 1/8	
4	9853-040		5	3.65	8	5/8	7.5	9	1.09	1 11/32	



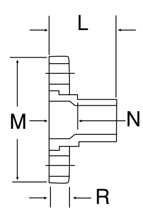
Van Stone Flange (S)

Inch Size	Part Number		mp	lbs. each	no. of holes	bolt d.	bolt circle d.	m	r	l	n
1/2	9854-005		5	.24	4	1/2	2.38	3.5	.56	1 1/8	3/16
3/4	9854-007		5	.31	4	1/2	2.75	3.88	.58	1 1/4	3/16
1	9854-010		5	.40	4	1/2	3.12	4.25	.66	1 3/8	3/16
1 1/4	9854-012		5	.52	4	1/2	3.5	4.62	.69	1 1/2	3/16
1 1/2	9854-015		5	.66	4	1/2	3.88	5	.75	1 11/16	1/4
2	9854-020		5	1.18	4	5/8	4.75	6	.94	1 7/8	1/4
2 1/2	9854-025		5	2.13	4	5/8	5.5	7	1.12	2 1/8	5/16
3	9854-030		5	2.49	4	5/8	6	7.5	1.31	2 3/8	3/8
4	9854-040		5	3.47	8	5/8	7.5	9	1.41	2 3/4	7/16
6	9854-060		1	5.60	8	3/4	9.5	11	1.62	3 9/16	7/16
8	9854-080		1	8.05	8	3/4	11.75	13.5	1.91	4 9/16	1/2
10	9854-100		1	14.26	12	7/8	14.25	16	2.12	5 5/8	1/2
12	9854-120		1	23.22	12	7/8	17	19	2.31	6 11/16	9/16



Van Stone Flange (FT)

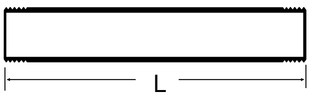
Inch Size	Part Number		mp	lbs. each	no. of holes	bolt d.	bolt circle d.	m	r	l	n
1	9855-010		5	.44	4	1/2	3.12	4.25	.66	1 3/8	7/16
1 1/4	9855-012		5	.57	4	1/2	3.5	4.62	.69	1 1/2	1/2
1 1/2	9855-015		5	.69	4	1/2	3.88	5	.75	1 11/16	5/8
2	9855-020		5	1.18	4	5/8	4.75	6	.94	1 7/8	3/4



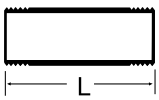
Van Stone Flange (Spg)

Inch Size	Part Number		mp	lbs. each	no. of holes	bolt d.	bolt circle d.	m	r	l	n
1	9856-010		5	.45	4	1/2	3.12	4.25	.66	2 1/8	7/8
1 1/4	9856-012		5	.56	4	1/2	3.5	4.62	.69	2 1/4	1
1 1/2	9856-015		5	.71	4	1/2	3.88	5	.75	2 1/2	1 1/16
2	9856-020		5	1.28	4	5/8	4.75	6	.94	2 13/16	1 1/4

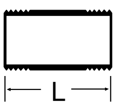
Nipple (MT x MT)



Long



Short (SH)

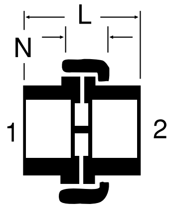


Close (CL)

Inch Size	Part Number		mp	lbs. each	l
1/2 x CL	9861-077*		50	.02	1 1/8
1/2 x SH	**9861-015**		**50**	**.02**	**1 1/8**
1/2 x 2	9861-079*		50	.04	2
1/2 x 3	**9861-081**		**50**	**.06**	**3**
1/2 x 4	**9861-082**		**50**	**.08**	**4**
1/2 x 5	**9861-083**		**50**	**.09**	**5**
1/2 x 6	9861-084*		50	.12	6
3/4 x CL	9861-104*		25	.04	1 3/8
3/4 x 2	**9861-020**		**25**	**.05**	**2**
3/4 x 3	9861-106*		25	.08	3
3/4 x 4	**9861-107**		**25**	**.10**	**4**
3/4 x 5	**9861-108**		**25**	**.13**	**5**
3/4 x 6	9861-109*		25	.15	6
1 x CL	9861-133*		25	.06	1 1/2
1 x SH	9861-134*		25	.08	2
1 x 3	**9861-135**		**25**	**.12**	**3**
1 x 4	**9861-136**		**25**	**.15**	**4**
1 x 5	**9861-137**		**25**	**.19**	**5**
1 x 6	9861-138*		25	.23	6
1 1/4 x CL	**9861-170**		**25**	**.08**	**1 5/8**
1 1/4 x SH	9861-171*		25	.10	2 1/2
1 1/4 x 3	**9861-172**		**25**	**.15**	**3**
1 1/4 x 4	**9861-173**		**25**	**.20**	**4**
1 1/4 x 5	**9861-174**		**25**	**.26**	**5**
1 1/4 x 6	**9861-175**		**25**	**.31**	**6**
1 1/2 x CL	9861-213*		25	.09	1 3/4
1 1/2 x SH	9861-214*		25	.13	2 1/2
1 1/2 x 3	**9861-215**		**25**	**.19**	**3**
1 1/2 x 4	**9861-216**		**25**	**.25**	**4**
1 1/2 x 5	**9861-217**		**25**	**.32**	**5**
1 1/2 x 6	9861-218*		25		6
2 x CL	9861-251*		25	.14	2
2 x SH	9861-252*		25	.18	2 1/2
2 x 3	9861-253*		25	.26	3
2 x 4	**9861-254**		**25**	**.35**	**4**
2 x 5	**9861-255**		**25**	**.44**	**5**
2 x 6	9861-256*		25	.52	6
2 1/2 x CL	**9861-005**		**5**	**.33**	**2 1/2**
2 1/2 x SH	**9861-030**		**5**	**.39**	**3**
2 1/2 x 4	**9861-040**		**5**	**.52**	**4**
2 1/2 x 5	**9861-050**		**5**	**.65**	**5**
2 1/2 x 6	**9861-060**		**5**	**.78**	**6**
3 x CL	**9861-338**		**5**	**.47**	**2 5/8**
3 x SH	**9861-339**		**5**	**.54**	**3**
3 x 4	**9861-341**		**5**	**.71**	**4**
3 x 5	**9861-342**		**5**	**.89**	**5**
3 x 6	**9861-343**		**5**	**1.07**	**6**
4 x CL	**9861-422**		**5**	**.72**	**2 7/8**
4 x SH	**9861-433**		**5**	**1.00**	**4**
4 x 5	**9861-425**		**5**	**1.26**	**5**
4 x 6	**9861-426**		**5**	**1.51**	**6**

Union w/ O-Ring (S x S)

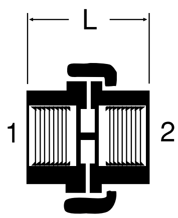
O-Ring Material: EPDM



Inch Size	Part Number		mp	lbs. each	l	n
1/4	9897-002		25	.08	1 55/64	39/64
3/8	9897-003		25	.12	1 57/64	25/64
1/2	9897-005*		25	.22	2 13/32	21/32
3/4	9897-007*		5	.30	2 9/16	9/16
1	9897-010*		5	.42	2 31/32	23/32
1 1/4	9897-012*		5	.64	3 1/8	5/8
1 1/2	9897-015*		5	.75	3 7/16	19/32
2	9897-020*		2	1.04	3 43/64	43/64
3	9897-030*		1	2.89	4 17/32	29/32

Union w/ O-Ring (FT x FT)

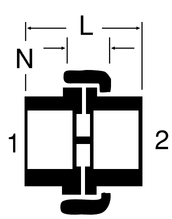
O-Ring Material: EPDM



Inch Size	Part Number		mp	lbs. each	l	n
3/8	9898-003		25	.10	1 57/64	
1/2	9898-005		25	.23	2 13/32	
3/4	9898-007		5	.30	2 1/8	
1	9898-010		5	.44	2 31/32	
1 1/4	9898-012		5	.60	3 1/8	
1 1/2	9898-015		5	.69	3 19/32	
2	9898-020		2	.97	3 3/4	
3	9898-030		1	2.89	4 17/32	

Union w/ O-Ring (S x S)

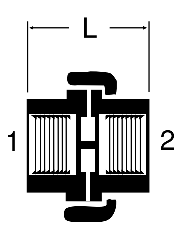
O-Ring Material: FPM



Inch Size	Part Number		mp	lbs. each	l	n
1/4	9857-002		25	.08	1 55/64	39/64
3/8	9857-003		25	.12	1 57/64	25/64
1/2	9857-005		25	.22	2 13/32	21/32
3/4	9857-007		5	.30	2 9/16	9/16
1	9857-010		5	.42	2 31/32	23/32
1 1/4	9857-012		5	.64	3 1/8	5/8
1 1/2	9857-015		5	.75	3 7/16	19/32
2	9857-020		2	1.04	3 43/64	43/64
3	9857-030		2	2.89	4 17/32	29/32

Union w/ O-Ring (FT x FT)

O-Ring Material: FPM

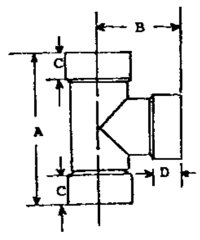


Inch Size	Part Number		mp	lbs. each	l	n
3/8	9858-003		25	.10	1 57/64	39/64
1/2	9858-005		25	.23	2 13/32	25/64
3/4	9858-007		5	.30	2 9/16	21/32
1	9858-010		5	.44	2 31/32	9/16
1 1/4	9858-012		5	.60	3 1/8	5/8
1 1/2	9858-015		5	.69	3 19/32	19/32
2	9858-020		2	.97	3 3/4	43/64
3	9858-030		2	2.89	4 17/32	29/32

Large Diameter CPVC Pressure Fittings

P/L 02: CPVC Schedule 80 (Large Diameter) Fittings
Material: CPVC Gray (Cell Classification 23447-B);
Fiberglass reinforced fittings are **red**.
Meets ASTM F-437 (Threaded) (up to 6") and ASTM F-439 (Socket) (up to 8")

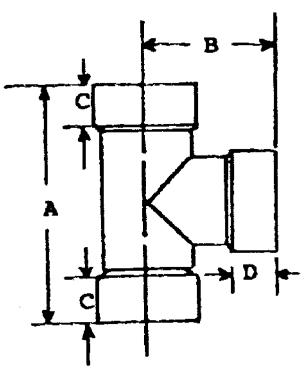
Non-Stocked Fabricated Fittings
Not all of the Fabricated Fittings are carried in our warehouse. Please check with our Customer Service Department for availability. All orders for non-stocked Fabricated Fittings are non-cancellable and non-returnable. Freight is paid by the customer (F.O.B. Plant).



Tee (S x S x S)

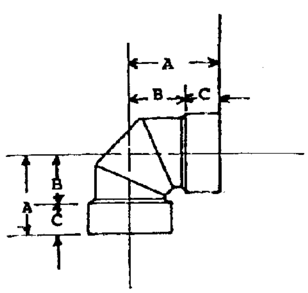
Inch Size	Part Number		mp	lbs. each	a	b	c	d
10*	9801-100		1	30	22 1/2	11 1/4	5 1/2	5 1/2
12*	9801-120		1	35	26 3/4	13 3/8	6 1/2	6 1/2

*Molded Fittings



Reducing Tee (S x S x S)

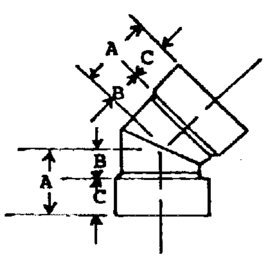
Inch Size	Part Number		mp	lbs. each	a	b	c	d
10 x 2	9801-619H		1	30	18 1/2	9	6	2
10 x 3	9801-621H		1	30	19 1/2	9 1/2	6	2 1/2
10 x 4	9801-623H		1	30	20 1/2	10 1/8	6	3 1/4
10 x 6	9801-626H		1	30	22 1/2	10 5/8	6	3 1/2
10 x 8	9801-628H		1	30	24 1/2	11 7/8	6	4 3/4
12 x 2	9801-659H		1	35	20	10	7	2
12 x 3	9801-661H		1	35	21	10	7	2 1/2
12 x 4	9801-663H		1	35	22 1/2	11 1/8	7	3 1/4
12 x 6	9801-666H		1	35	24 1/2	11 5/8	7	3 1/2
12 x 8	9801-668H		1	35	27	12 7/8	7	4 3/4
12 x 10	9801-670H		1	35	29 1/2	14 3/8	7	6



90° Ell (S x S)

Inch Size	Part Number		mp	lbs. each	a	b	c	
10*	9806-100		1	45	11 1/4	5 3/4	5 1/2	
12*	9806-120		1	50	13 3/8	6 7/8	6 1/2	

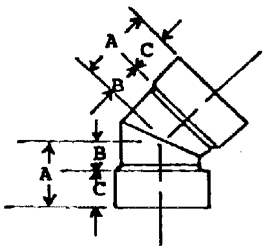
*Molded Fittings



11 1/4° Ell (S x S)

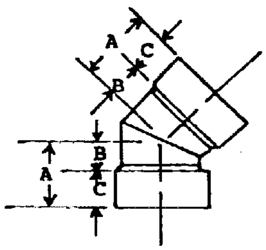
Inch Size	Part Number		mp	lbs. each	a	b	c	
10	9811-100H		1	20	8	2	6	
12	9811-120H		1	25	9	2	7	

30° Ell (S x S)



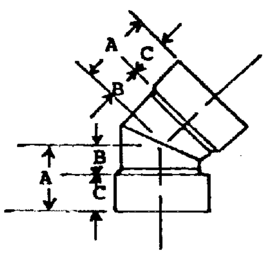
Inch Size	Part Number		mp	lbs. each	a	b	c	
10	9815-100H		1	20	8	2	6	
12	9815-120H		1	25	10	3	7	

22 1/2° Ell (S x S)



Inch Size	Part Number		mp	lbs. each	a	b	c	
10	9816-100H		1	20	8 1/2	2 1/2	6	
12	9816-120H		1	25	10	3	7	

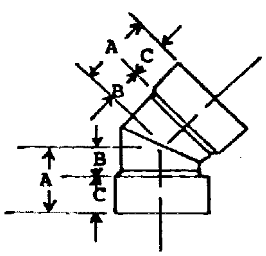
45° Ell (S x S)



Inch Size	Part Number		mp	lbs. each	a	b	c	
10*	9817-100		1	20	8 1/8	2 5/8	5 1/2	
12*	9817-120		1	25	9 5/8	3 1/8	6 1/2	

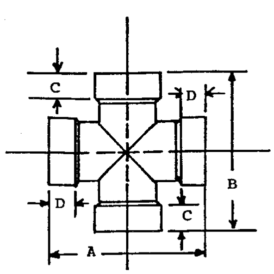
*Molded Fittings

15° Ell (S x S)



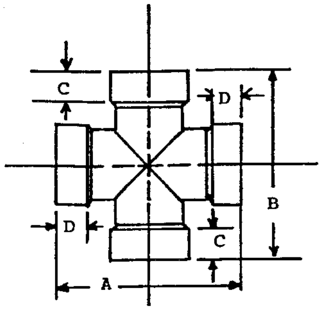
Inch Size	Part Number		mp	lbs. each	a	b	c	
10	9818-100H		1	20	8	2	6	
12	9818-120H		1	25	9	2	7	

Cross (S x S x S x S)



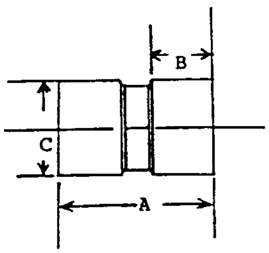
Inch Size	Part Number		mp	lbs. each	a	b	c	d
10	9820-100H		1	25	27 1/2	28	6	6
12	9820-120H		1	30	32	32	6 1/2	6 1/2

Reducing Cross (S x S x S x S)



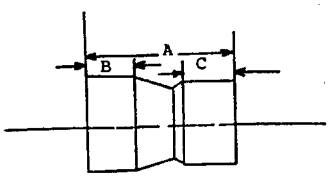
Inch Size	Part Number		mp	lbs. each	a	b	c	d
10 x 2	9820-619H		1	25	18	18 1/2	6	2
10 x 3	9820-621H		1	25	19	19 1/2	6	2 1/2
10 x 4	9820-623H		1	25	20 1/4	20 1/2	6	3 1/4
10 x 6	9820-626H		1	25	21 1/4	22 1/2	6	3 1/2
10 x 8	9820-628H		1	25	24	24 1/2	6	3 5/8
12 x 2	9820-659H		1	30	20	20	7	2
12 x 3	9820-661H		1	30	20	21	7	2 1/2
12 x 4	9820-663H		1	30	22 1/4	22 1/2	7	3 1/4
12 x 6	9820-666H		1	30	23 1/4	24 1/2	7	3 1/2
12 x 8	9820-668H		1	30	25 3/4	27	7	3 5/8
12 x 10	9820-670H		1	30	28 3/4	29 1/2	7	6

Coupling (S x S)



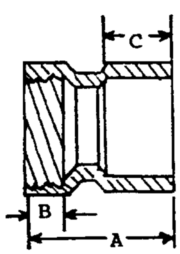
Inch Size	Part Number		mp	lbs. each	a	b	c
10	9829-100H		1	15	14	6	12
12	9829-120H		1	20	16	6 1/2	14

Reducer Coupling (S x S)



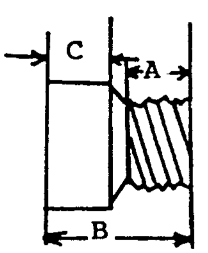
Inch Size	Part Number		mp	lbs. each	a	b	c
10 x 4	9829-623H		1	15	24	5 1/2	3 1/4
10 x 6	9829-626H		1	15	20	5 1/2	3 1/2
10 x 8	9829-628H		1	15	12 3/4	6	3 5/8
12 x 8	9829-668H		1	20	21	6 1/2	3 5/8
12 x 10	9829-670H		1	20	14 1/2	5 1/2	6

Female Adapter (S x FT)

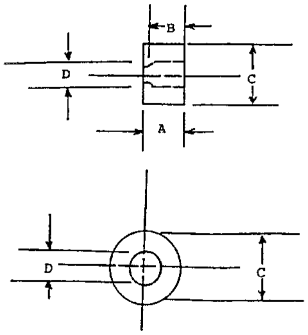


Inch Size	Part Number		mp	lbs. each	a	b	c
6	9835-060H		1	10	8	2	3 1/2
8	9835-080H		1	15	8 3/4	1 7/8	3 5/8
10	9835-100H		1	20	10 3/8	2	6
12	9835-120H		1	25	12	1 3/4	6 1/2

Male Adapter (S x MT)

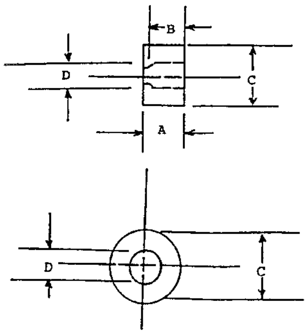


Inch Size	Part Number		mp	lbs. each	a	b	c
6	9836-060H		1	15	1 3/4	7 1/2	4 1/4
8	9836-080H		1	20	2	8 1/2	4 3/4
10	9836-100H		1	25	2	10	6
12	9836-120H		1	30	2	10 1/2	6 1/2



Reducer Bushing (flush) (Spg x S)

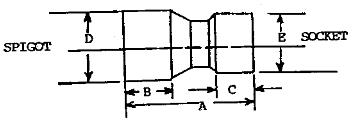
Inch Size	Part Number		mp	lbs. each	a	b	c	d
10 x 4	9837-623H		1	15	4 1/2	2 1/4	10 3/4	4 1/2
10 x 6	9837-626H		1	15	4 1/2	3 1/4	10 3/4	6 1/2
10 x 8	9837-628H		1	15	4 1/2	3 7/8	10 3/4	8 1/2
12 x 6	9837-666H		1	20	5 3/8	3 1/4	12 3/4	6 1/2
12 x 8	9837-668H		1	20	5 3/8	3 7/8	12 3/4	8 5/8
12 x 10	9837-670H		1	20	5 3/8	4 7/8	12 3/4	10 3/4



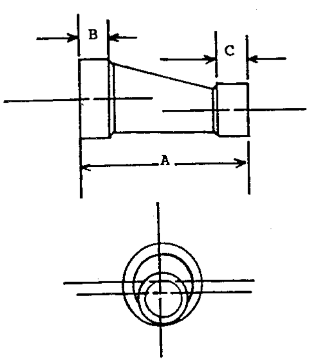
Reducer Bushing (flush) (Spg x FT)

Inch Size	Part Number		mp	lbs. each	a	b	c	d
10 x 6	9838-626H		1	15	4 1/2	2	10 3/4	6 1/2
10 x 8	9838-628H		1	15	4 1/2	2	10 3/4	8 1/2
12 x 8	9838-668H		1	20	5 3/8	2	12 3/4	8 5/8
12 x 10	9838-670H		1	20	5 3/8	2	12 3/4	10 3/4

Reducer Bushing Extended Style (Spg x S)

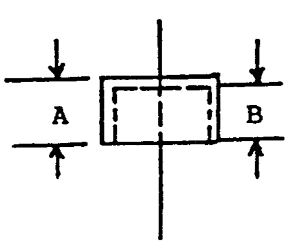


Inch Size	Part Number		mp	lbs. each	a	b	c	d	e
10 x 6	9840-626H		1	15	13	6	3 1/2	10 3/4	6 5/8
10 x 8	9840-628H		1	15	11 7/8	6	3 5/8	10 3/4	8 5/8
12 x 8	9840-668H		1	20	14 1/4	6 1/2	3 5/8	12 3/4	8 5/8
12 x 10	9840-670H		1	20	12	6 1/2	6	12 3/4	10 3/4



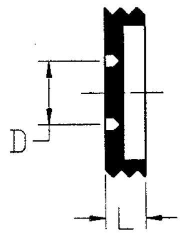
Eccentric Reducers (S x S)

Inch Size	Part Number		mp	lbs. each	a	b	c	
10 x 4	9841-623H		1	15	20 1/2	6	3 1/4	
10 x 6	9841-626H		1	15	21	6	3 1/2	
10 x 8	9841-628H		1	15	18	6	3 5/8	
12 x 6	9841-666H		1	20	24	6 1/2	3 1/2	
12 x 8	9841-668H		1	20	20	6 1/2	3 5/8	
12 x 10	9841-670H		1	20	23	6 1/2	6	



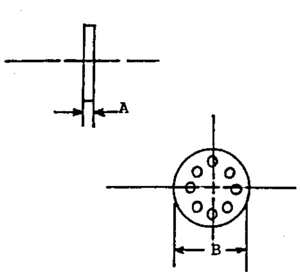
Caps (S)

Inch Size	Part Number		mp	lbs. each	a	b		
10	9847-100H		1	20	6 3/4	6		
12	9847-120H		1	25	8	7		



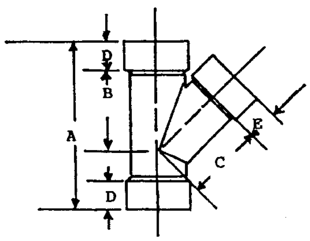
Plug (MT) (1" thick)

Inch Size	Part Number		mp	lbs. each	d	l		
6	9850-060H		1	10	4	1		
8	9850-080H		1	15	4	1		
10	9850-100H		1	20	4	1		
12	9850-120H		1	25	4	1		



Blind Flange (1" thick)

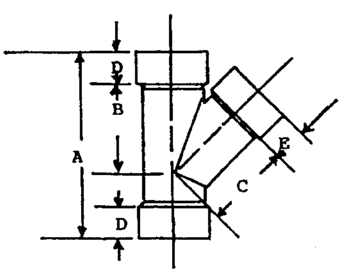
Inch Size	Part Number		mp	lbs. each	a	b		
10	9853-100H		1	20	1	16		
12	9853-120H		1	25	1	19		



Tee 45° (Wye) (S x S x S)

Inch Size	Part Number		mp	lbs. each	a	b	c	d	e
10	9875-100H		1	30	34	16	16	6	6
12	9875-120H		1	35	39	19	19	6 1/2	6 1/2

Tee 45° (Wye) Reducing (S x S x S)



Inch Size	Part Number		mp	lbs. each	a	b	c	d	e
10 x 2	9875-619H		1	30	21 1/2	12	12	6	2
10 x 3	9875-621H		1	30	22	12	13	6	2 1/2
10 x 4	9875-623H		1	30	24	13	13 3/4	6	3 1/4
10 x 6	9875-626H		1	30	26	13 1/2	14	6	4
10 x 8	9875-628H		1	30	29	15 1/4	15 3/4	6	4 3/4
12 x 2	9875-659H		1	35	24	12 1/2	12 1/2	7	2
12 x 3	9875-661H		1	35	24 1/2	13	13	7	2 1/2
12 x 4	9875-663H		1	35	26 1/2	13 1/4	13 1/2	7	3 1/4
12 x 6	9875-666H		1	35	29	14 1/4	16 1/6	7	4
12 x 8	9875-668H		1	35	32	16	16 1/2	7	4 3/4
12 x 10	9875-670H		1	35	38	18	15	7	6

Schedule 40 Fittings

Table of Contents

Glossary

SP = Standard Pack
FT = Female Thread
MT = Male Thread
MC = Master Carton
S = Slip Socket
L = UPC Bar Coded
SPG = Spigot End
*** = IAPMO (UPC Listed)**

Not for Use with Compressed Air or Gases

George Fischer, Inc. DOES NOT RECOMMEND the use of thermoplastic piping products for systems to transport or store compressed air or gases, or the testing of thermoplastic piping systems with compressed air or gases in above or below ground locations. The use of George Fischer, Inc. products in compressed air or gas systems automatically voids George Fischer, Inc. warranty for such products, and their use against our recommendation is entirely the responsibility and liability of the installer. George Fischer, Inc. will not accept responsibility for damage or impairment from its products, or other consequential or incidental damages caused by misapplication, incorrect assembly, and/or exposure to harmful substances or conditions.

For more information about any of our product lines, please call (800) 854-4090.

+GF+ Schedule 40 PVC Fittings

Material: PVC White Cell Classification 12454-B
Meets ASTM D-2466

Tee (S x S x S)

Inch Size	Part Number		sp	lbs. each
1/2	L401-005*		50	.07
3/4	L401-007*		50	.10
1	L401-010*		50	.14
1 1/4	L401-012*		25	.25
1 1/2	L401-015*		25	.34
2	L401-020		10	.52
2 1/2	401-025		10	1.31
3	401-030		10	1.76
4	401-040		6	2.76
5	401-050		5	2.60
6	401-060		4	7.68
8	401-080		1	12.71

Pressure Rating for PVC Schedule 40 Pipe

Nom. Size	Outside Dia. D	Wall t	DR= D/t	73°F f=1.00 S=2000 P	80°F f=0.88 S=1760 P	90°F f=0.75 S=1500 P	100°F f=0.62 S=1240 P	110°F f=0.50 S-1000 P	120°F f=0.40 S=800 P	130°F f=0.30 S=600 P	140°F f=0.22 S=440 P
1/8	.405	.068	5.956	810	713	607	502	405	324	243	178
1/4	.540	.088	6.136	780	686	585	484	390	312	234	172
3/8	.675	.091	7.418	620	516	465	384	310	248	186	136
1/2	.840	.109	7.706	600	528	450	372	300	240	180	132
3/4	1.050	.113	9.292	480	422	360	298	240	192	144	106
1	1.315	.133	9.887	450	396	338	279	225	180	135	90
1 1/4	1.660	.140	11.857	370	326	278	229	185	148	111	81
1 1/2	1.900	.145	13.103	330	290	248	205	165	132	99	73
2	2.375	.154	15.422	280	246	210	174	140	112	84	62
2 1/2	2.875	.203	14.162	300	264	225	186	150	120	90	66
3	3.500	.216	16.204	260	229	195	161	130	104	78	57
3 1/2	4.000	.225	17.699	240	211	180	149	120	96	72	53
4	4.500	.237	18.987	220	194	165	136	110	88	66	48
5	5.563	.258	21.560	190	167	143	118	95	76	57	42
6	6.625	.280	23.661	180	158	135	112	90	72	54	40
8	8.625	.322	26.785	160	141	120	99	80	64	48	35
10	10.750	.365	29.452	140	124	105	87	70	56	42	31
12	12.750	.406	31.404	130	116	99	82	66	53	39	29

1) Figures for Pressure Rating at 73°F are rounded off from actual calculated values, and are the same as found in ASTM D-1785. Pressure Ratings for other temperatures are calculated from 73°F values.

2) Pressure Rating values are for PVC I pipe, and for most sizes are calculated from the experimentally determined Long-Term Strength of PVC I extrusion compounds. Because molding compounds may differ in Long-Term Strength and elevated temperature properties from pipe compounds, piping systems consisting of extruded pipe and molded fittings may have lower pressure ratings from those shown here, particularly at the higher temperatures. Caution should be exercised in design of systems operating above 100°F.

3) The pressure ratings given are for solvent-cemented systems. When adding valves, or other components, the system must be derated to the rating of the lowest component. (Pressure ratings: molded or cut threads are rated at 50% of solvent-cemented systems; for valves, see manufacturer's recommendation.)

Reducing Tee (S x S x S)

Inch Size	Part Number		sp	lbs. each
1/2 x 1/2 x 3/4	L401-074		50	.09
1/2 x 1/2 x 1	L401-075		50	.11
3/4 x 1/2 x 1/2	L401-094*		50	.10
3/4 x 1/2 x 3/4	L401-095*		50	.11
3/4 x 3/4 x 1/2	L401-101*		50	.11
3/4 x 3/4 x 1	L401-102		50	.14
1 x 1/2 x 1	L401-122		50	.17
1 x 3/4 x 1/2	L401-124*		50	.15
1 x 3/4 x 3/4	L401-125*		50	.15
1 x 1 x 1/2	L401-130*		50	.16
1 x 1 x 3/4	L401-131*		50	.16
1 x 1 x 1 1/4	L401-132		25	.24
1 x 1 x 1 1/2	L401-133		25	.31
1 1/4 x 1 x 1/2	L401-156		25	.18
1 1/4 x 1 x 1	L401-158		25	.22
1 1/4 x 1 1/4 x 1/2	L401-166*		25	.25
1 1/4 x 1 1/4 x 3/4	L401-167*		25	.24
1 1/4 x 1 1/4 x 1	L401-168		25	.27
1 1/4 x 1 1/4 x 1 1/2	L401-169		25	.35
1 1/4 x 1 1/4 x 2	L401-170		25	.35
1 1/2 x 1 1/4 x 1/2	L401-199		25	.23
1 1/2 x 1 1/4 x 3/4	L401-201		25	.25
1 1/2 x 1 1/4 x 1	L401-202		25	.26
1 1/2 x 1 1/2 x 1/2	L401-209*		25	.26
1 1/2 x 1 1/2 x 3/4	L401-210*		25	.28
1 1/2 x 1 1/2 x 1	L401-211*		25	.32
1 1/2 x 1 1/2 x 1 1/4	L401-212*		25	.35
1 1/2 x 1 1/2 x 2	L401-213		25	.40
2 x 1 1/2 x 3/4	L401-238		10	.31
2 x 1 1/2 x 1	L401-239		10	.34
2 x 2 x 1/2	L401-247		10	.36
2 x 2 x 3/4	L401-248		10	.39
2 x 2 x 1	L401-249		10	.40
2 x 2 x 1 1/4	L401-250		10	.37
2 x 2 x 1 1/2	L401-251		10	.49
2 1/2 x 2 1/2 x 1/2	401-287		10	.79
2 1/2 x 2 1/2 x 3/4	401-288		10	.77
2 1/2 x 2 1/2 x 1	401-289		10	.81
3 x 3 x 1/2	401-333		10	1.01
3 x 3 x 3/4	401-334		10	.92
3 x 3 x 1	401-335		10	1.04
3 x 3 x 1 1/4	401-336		10	1.25
3 x 3 x 1 1/2	401-337		10	1.17
3 x 3 x 2	401-338		6	1.23
4 x 4 x 1/2	401-415		6	1.36
4 x 4 x 3/4	401-416		6	1.37
4 x 4 x 1	401-417		6	1.42
4 x 4 x 1 1/4	401-418		10	1.30
4 x 4 x 1 1/2	401-419		10	1.79
4 x 4 x 2	401-420		10	1.74
4 x 4 x 3	401-422		6	2.32
6 x 6 x 2	401-528		5	4.63
6 x 6 x 3	401-530		2	4.53
6 x 6 x 4	401-532		2	5.06
8 x 8 x 3	401-580		1	11.73
8 x 8 x 4	401-582		1	13.85

Tee (S x S x FT)

Inch Size	Part Number		sp	lbs. each
1/2	L402-005		50	.08
3/4	L402-007		50	.11
1	L402-010		50	.20
1 1/4	L402-012		25	.30
1 1/2	L402-015		25	.44
2	L402-020		10	.61

Reducing Tee (S x S x FT)

Inch Size	Part Number		sp	lbs. each
1/2 x 1/2 x 3/4	L402-074		50	.10
3/4 x 1/2 x 1/2	L402-094		50	.11
3/4 x 1/2 x 3/4	L402-095		50	.12
3/4 x 3/4 x 1/2	L402-101		50	.10
1 x 3/4 x 1/2	L402-124		50	.16
1 x 1 x 1/2	L402-130		50	.15
1 x 1 x 3/4	L402-131		50	.16
1 1/4 x 1 x 1/2	L402-156		25	.19
1 1/4 x 1 x 1	L402-158		25	.22
1 1/4 x 1 1/4 x 1/2	L401-166		25	.23
1 1/4 x 1 1/4 x 3/4	L402-167		25	.25
1 1/4 x 1 1/4 x 1	L402-168		25	.28
1 1/2 x 1 1/4 x 1/2	L402-199		25	.24
1 1/2 x 1 1/4 x 3/4	L402-201		25	.26
1 1/2 x 1 1/4 x 1	L402-202		25	.28
1 1/2 x 1 1/2 x 1/2	L402-209		25	.26
1 1/2 x 1 1/2 x 3/4	L402-210		25	.29
1 1/2 x 1 1/2 x 1	L402-211		25	.33
1 1/2 x 1 1/2 x 1 1/4	L402-212		25	.29
2 x 1 1/2 x 3/4	L402-238		10	.32
2 x 1 1/2 x 1	L402-239		10	.35
2 x 2 x 1/2	L402-247		10	.35
2 x 2 x 3/4	L402-248		10	.39
2 x 2 x 1	L402-249		10	.42
2 x 2 x 1 1/4	L402-250		10	.39
2 x 2 x 1 1/2	L402-251		10	.55
2 1/2 x 2 1/2 x 3/4	402-288		10	.77
2 1/2 x 2 1/2 x 1	402-289		20	.85
4 x 4 x 3	402-422		6	2.32
6 x 6 x 3	402-530		5	4.04

90° Ell (S x S)

Inch Size	Part Number		sp	lbs. each
1/2	L406-005*		50	.05
3/4	L406-007*		50	.08
1	L406-010*		50	.13
1 1/4	L406-012*		25	.19
1 1/2	L406-015*		25	.26
2	L406-020		25	.40
2 1/2	406-025		10	.90
3	406-030		10	1.31
4	406-040		8	1.98
5	406-050		5	3.43
6	406-060		5	5.64
8	406-080		2	10.00

90° Ell Reducing (S x S)

Inch Size	Part Number		sp	lbs. each
3/4 x 1/2	L406-101*		50	.08
1 x 1/2	L406-130*		50	.12
1 x 3/4	L406-131*		50	.12
1 1/4 x 1	L406-168		25	.18
1 1/2 x 1	L406-211		25	.22

90° Ell (S x FT)

Inch Size	Part Number		sp	lbs. each
1/2	L407-005		50	.06
3/4	L407-007		50	.09
1	L407-010		50	.15
1 1/4	L407-012		25	.25
1 1/2	L407-015		25	.34
2	L407-020		10	.48

90° Ell Reducing (S x FT)

Inch Size	Part Number		sp	lbs. each
1/2 x 3/4	L407-074		50	.09
3/4 x 1/2	L407-101		50	.07
1 x 1/2	L407-130		50	.13
1 x 3/4	L407-131		50	.13
1 1/4 x 1	L407-168		25	.21
1 1/2 x 1	L407-211		25	.22

90° Ell (FT x FT)

Inch Size	Part Number		sp	lbs. each
1/2	L408-005		50	.07
3/4	L408-007		50	.11
1	L408-010		50	.18
1 1/4	L408-012		25	.32

90° Street Ell (Spg x S)

Inch Size	Part Number		sp	lbs. each
1/2	L409-005*		50	.07
3/4	L409-007*		50	.09
1	L409-010*		50	.16
1 1/4	L409-012*		25	.26
1 1/2	L409-015*		25	.32
2	L409-020		10	.47

90° Street Ell (MT x S)

Inch Size	Part Number		sp	lbs. each
1/2	L410-005*		50	.07
3/4	L410-007*		50	.09
1	L410-010*		50	.16
1 1/4	L410-012*		25	.24
1 1/2	L410-015*		25	.28
2	L410-020		10	.42

90° Street Ell (MT x FT)

Inch Size	Part Number		sp	lbs. each
1/2	L412-005		50	.06
3/4	L412-007		50	.10
1	L412-010		50	.19
1 1/4	L412-012		25	.23
1 1/2	L412-015		25	.34
2	L412-020		10	.46

90° Street Ell (MT x FT) Polyethylene

Inch Size	Part Number		sp	lbs. each
1/2	6412-005		50	.04
3/4	6412-007		50	.05
1	6412-010		50	.13

Side Outlet Ell (S x S x FT)

Inch Size	Part Number		sp	lbs. each
1/2	L414-005		50	.10
3/4 x 3/4 x 1/2	L414-101		50	.12
1 x 1 x 1/2	L414-130		50	.18

45° Ell (S x S)

Inch Size	Part Number		sp	lbs. each
1/2	L417-005*		50	.05
3/4	L417-007*		50	.07
1	L417-010*		50	.12
1 1/4	L417-012*		25	.13
1 1/2	L417-015*		25	.20
2	L417-020		10	.28
2 1/2	417-025		10	.75
3	417-030		10	1.01
4	417-040		5	1.55
5	417-050		10	2.86
6	417-060		5	4.60
8	417-080		2	7.76

Cross (S x S x S x S)

Inch Size	Part Number		sp	lbs. each
1/2	L420-005*		50	.09
3/4	L420-007*		50	.13
1	L420-010*		50	.23
1 1/4	L420-012*		25	.36
1 1/2	L420-015*		25	.45
2	L420-020		10	.67

Reducing Cross (S x S x S x S)

Inch Size	Part Number		sp	lbs. each
2 1/2 x 2 1/2 x 1 1/2 x 1 1/2	420-291		25	.97
3 x 3 x 1 x 1	420-335		10	1.04
3 x 3 x 1 1/2 x1 1/2	420-337		10	1.20
3 x 3 x 2 x 2	420-338		10	1.32
4 x 4 x 1 x 1	420-417		6	1.44
4 x 4 x 1 1/2 x 1 1/2	420-419		6	1.66
4 x 4 x 2 x 2	420-420		6	1.79

Coupling (S x S)

Inch Size	Part Number		sp	lbs. each
1/2	L429-005*		50	.03
3/4	L429-007*		50	.04
1	L429-010*		50	.10
1 1/4	L429-012*		25	.15
1 1/2	L429-015*		25	.18
2	L429-020		10	.25
2 1/2	429-025		10	.60
3	429-030		10	.62
4	429-040		6	.85
5	429-050		10	2.10
6	429-060		10	3.32
8	429-080		4	5.36
3/4 x 1/2	L429-101		50	.04
1 x 3/4	L429-131		50	.05

Coupling (FT x FT)

(white)

Inch Size	Part Number		sp	lbs. each
1/2	L430-005		50	.05
3/4	L430-007		50	.05
1	L430-010		50	.10

Coupling (FT x FT), gray color

(gray)

Inch Size	Part Number		sp	lbs. each
1/2	L430-005G		50	.05

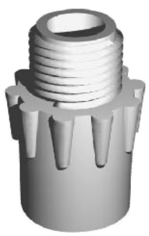
Female Adapter (S x FT)

Inch Size	Part Number		sp	lbs. each
1/2	L435-005		50	.04
3/4	L435-007		50	.05
1	L435-010		50	.09
1 1/4	L435-012		25	.13
1 1/2	L435-015		25	.16
2	L435-020		10	.22
2 1/2	435-025		10	.58
3	435-030		10	.68
4	435-040		6	.88
5	435-050		10	1.90
6	435-060		10	2.78
8	435-080		2	4.31

Female Adapter - Reducing (S x FT)

Inch Size	Part Number		sp	lbs. each
$^3/_4 \times {}^1/_2$	L435-101		50	.05
$^3/_4 \times 1$	L435-102		50	.07
$1 \times {}^3/_4$	L435-131		50	.09

Male Adapter (MT x S)

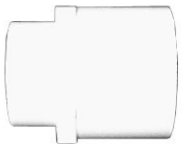


Inch Size	Part Number		sp	lbs. each
$^1/_2$	L436-005*		50	.03
$^3/_4$	L436-007*		50	.04
1	L436-010*		50	.07
$1\,^1/_4$	L436-012*		25	.09
$1\,^1/_2$	L436-015*		25	.13
2	L436-020		25	.18
$2\,^1/_2$	436-025		10	.48
3	436-030		10	.67
4	436-040		6	1.02
5	436-050		15	1.71
6	436-060		5	2.45

Male Adapter - Reducing (MT x S)

Inch Size	Part Number		sp	lbs. each
$^1/_2 \times {}^3/_4$	L436-074*		50	.05
$^3/_4 \times {}^1/_2$	L436-101*		50	.04
$^3/_4 \times 1$	L436-102*		50	.08
$1 \times {}^3/_4$	L436-131*		50	.06
$1 \times 1\,^1/_4$	L436-132*		50	.12
$1\,^1/_4 \times 1$	L436-168*		25	.10
$1\,^1/_4 \times 1\,^1/_2$	L436-169*		25	.16
$1\,^1/_2 \times 1\,^1/_4$	L436-212*		25	.14
$1\,^1/_2 \times 2$	L436-213		25	.22
$2 \times 1\,^1/_2$	L436-251		10	.13
3 x 4	436-341		10	.97

Reducer Bushing (Spg x S)



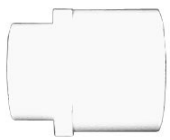
Style 1

Style 2

Style 3

Inch Size	Part Number		sp	lbs. each	style
3/4 x 1/2	L437-101*		50	.02	2
1 x 1/2	L437-130*		50	.06	2
1 x 3/4	L437-131*		50	.04	2
1 1/4 x 1/2	L437-166*		25	.09	2
1 1/4 x 3/4	L437-167*		25	.10	2
1 1/4 x 1	L437-168*		25	.07	2
1 1/2 x 1/2	L437-209*		25	.11	2
1 1/2 x 3/4	L437-210*		25	.14	2
1 1/2 x 1	L437-211*		25	.12	2
1 1/2 x 1 1/4	L437-212		25	.07	2
2 x 1/2	L437-247		10	.19	2
2 x 3/4	L437-248		10	.19	2
2 x 1	L437-249		10	.20	2
2 x 1 1/4	L437-250		10	.20	2
2 x 1 1/2	L437-251		10	.18	2
2 1/2 x 3/4	437-288		10	.32	1
2 1/2 x 1	437-289		10	.34	1
2 1/2 x 1 1/4	437-290		10	.35	1
2 1/2 x 1 1/2	437-291		10	.35	1
2 1/2 x 2	437-292		10	.28	2
3 x 1	437-335		10	.45	1
3 x 1 1/4	437-336		10	.45	1
3 x 1 1/2	437-337		10	.47	1
3 x 2	437-338		10	.50	1
3 x 2 1/2	437-339		10	.43	2
4 x 2	437-420		6	.78	1
4 x 2 1/2	437-421		6	.85	1
4 x 3	437-422		6	.91	1
5 x 4	437-490		1	1.36	1
6 x 4	437-532		1	2.20	1
6 x 5	437-534		1	2.42	1
8 x 2	437-578		1	4.44	3
8 x 4	437-582		1	5.03	3
8 x 6	437-585		1	5.56	3

Reducer Bushing (Spg x FT)



Style 1

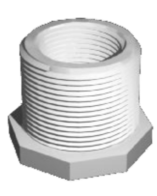
Style 2

Inch Size	Part Number		sp	lbs. each	style
1/2 x 1/4	L438-072		50	.02	2
1/2 x 3/8	L438-073		50	.02	2
3/4 x 1/4	L438-098		50	.04	2
3/4 x 1/2	L438-101		50	.03	2
1 x 1/2	L438-130		50	.06	2
1 x 3/4	L438-131		50	.05	2
1 1/4 x 1/2	L438-166		25	.10	2
1 1/4 x 3/4	L438-167		25	.10	2
1 1/4 x 1	L438-168		25	.08	2
1 1/2 x 1/2	L438-209		25	.12	2
1 1/2 x 3/4	L438-210		25	.12	2
1 1/2 x 1	L438-211		25	.12	2
1 1/2 x 1 1/4	L438-212		25	.08	2
2 x 1/2	L438-247		10	.19	2
2 x 3/4	L438-248		10	.19	2
2 x 1	L438-249		10	.20	2
2 x 1 1/4	L438-250		10	.21	2
2 x 1 1/2	L438-251		10	.17	2
2 1/2 x 1 1/2	438-291		10	.35	1
2 1/2 x 2	438-292		10	.34	2
3 x 3/4	438-334		20	.43	1
3 x 1	438-335		10	.47	1
3 x 2	438-338		10	.49	1
3 x 2 1/2	438-339		10	.54	2
4 x 2	438-420		6	.76	1
4 x 2 1/2	438-421		6	.88	1
4 x 3	438-422		6	.88	1
6 x 4	438-532		15	2.12	1

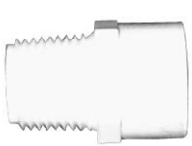
Riser Extension (MT x FT)

Inch Size	Part Number		sp	lbs. each	
1/2 x 1/2	L439-005		50	.04	

Reducer Bushing (MT x FT)



Style 1



Style 2

Inch Size	Part Number		sp	lbs. each	style
1/2 x 3/8	L439-073		50	.03	1
3/4 x 1/2	L439-101		50	.02	2
1 x 3/4	L439-131		50	.04	2
1 1/4 x 3/4	L439-167		25	.08	2
1 1/4 x 1	L439-168		25	.07	2
1 1/2 x 1/2	L439-209		25	.11	2
1 1/2 x 3/4	L439-210		25	.11	2
1 1/2 x 1	L439-211		25	.10	2
1 1/2 x 1 1/4	L439-212		25	.06	2
2 x 1	L439-249		10	.16	2
2 x 1 1/2	L439-251		10	.12	2

Cap (S)

Inch Size	Part Number		sp	lbs. each	
1/2	L447-005*		50	.02	
3/4	L447-007*		50	.03	
1	L447-010*		50	.07	
1 1/4	L447-012*		25	.11	
1 1/2	L447-015*		25	.14	
2	L447-020		10	.20	
2 1/2	447-025		10	.42	
3	447-030		10	.56	
4	447-040		6	.85	
5	447-050		15	1.65	
6	447-060		5	2.43	
8	447-080		4	4.56	

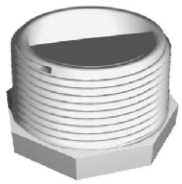
Cap (FT)

Inch Size	Part Number		sp	lbs. each	
1/2	L448-005		50	.03	
3/4	L448-007		50	.04	
1	L448-010		50	.08	
1 1/4	L448-012		25	.11	
1 1/2	L448-015		25	.13	
2	L448-020		10	.20	
2 1/2	448-025		10	.43	
3	448-030		10	.57	
4	448-040		6	.93	
5	448-050		10	1.37	
6	448-060		5	2.22	

Plug (Spg)

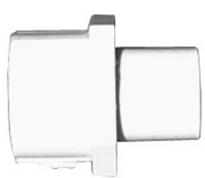
Inch Size	Part Number		sp	lbs. each	
1/2	L449-005*		50	.02	
3/4	L449-007*		50	.03	
1	L449-010*		50	.05	
1 1/4	L449-012*		25	.08	
1 1/2	L449-015*		25	.11	
2	L449-020		10	.17	
3	449-030		10	.41	
4	449-040		6	.77	

Plug (MT)



Inch Size	Part Number		sp	lbs. each
1/2	L450-005*		50	.02
3/4	L450-007*		50	.03
1	L450-010*		50	.05
1 1/4	L450-012*		25	.08
1 1/2	L450-015*		25	.11
2	L450-020		10	.17
2 1/2	450-025		10	.32
3	450-030		10	.44
4	450-040		6	.72

Male Adapter (Spg x FT)



Inch Size	Part Number		sp	lbs. each
1/2	L478-005		50	.05
3/4	L478-007		50	.07
1	L478-010		50	.10
1 1/2	L478-015		20	.18
2	L478-020		20	.24
4	478-040		6	1.05

Condensate Trap-Running Trap

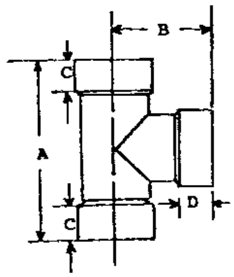
Inch Size	Part Number		sp	lbs. each
1/2	L488-005		50	.11
3/4	L488-007		50	.22

Condensate Trap-P Trap

Inch Size	Part Number		sp	lbs. each
1/2	L489-005		50	.11
3/4	L489-007		50	.22

Large Diameter Schedule 40 PVC Fittings

Material: PVC White (Cell Classification 12454-B)
Meets ASTM D-2466 (up to 12")

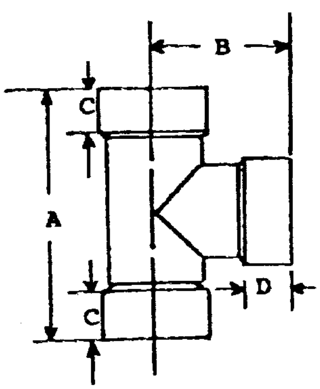


Tee (S x S x S)

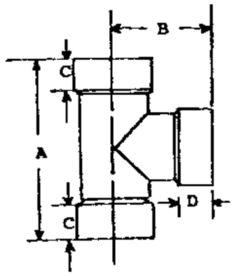
Inch Size	Part Number		sp	lbs. each	a	b	c	d
10*	401-100		1	25	22 1/2	11 1/4	5 1/2	5 1/2
12*	401-120		1	30	26 3/4	13 3/8	6 1/2	6 1/2
14	401-140H		1	35	30 1/2	15	6 1/2	6 1/2
16	401-160H		40	32 1/2	15	6 1/2	6 1/2	

*Molded Fittings

Reducing Tee (S x S x S)

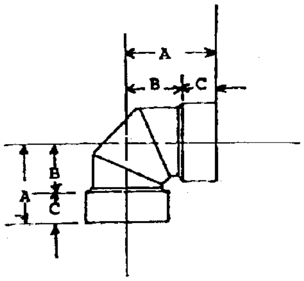


Inch Size	Part Number		sp	lbs. each	a	b	c	d
10 x 2	401-619H		1	25	16 1/2	7 1/2	5	2
10 x 3	401-621H		1	25	16 1/2	7 1/2	5	2 1/2
10 x 4	401-623H		1	25	16 1/2	9	5	2 1/2
10 x 6	401-626H		1	25	18 3/4	11 1/4	5	3 3/4
10 x 8	401-628H		1	25	21	10 1/2	5	3 1/2
12 x 2	401-659H		1	30	16 1/2	8 1/2	5 1/2	2
12 x 3	401-661H		1	30	18	8 1/2	5 1/2	2 1/2
12 x 4	401-663H		1	30	18 3/4	10	5 1/2	2 1/2
12 x 6	401-666H		1	30	19 3/4	11	5 1/2	3
12 x 8	401-668H		1	30	22 1/2	11	5 1/2	3 5/8
12 x 10	401-670H		1	30	25	12 7/8	5 1/2	4 1/2
14 x 2	401-692H		1	35	18	9 1/2	6 1/2	2
14 x 3	401-694H		1	35	20 1/2	9 1/2	6 1/2	2 1/2
14 x 4	401-696H		1	35	20 1/2	10	6 1/2	2 1/2
14 x 6	401-698H		1	35	22	11	6 1/2	3
14 x 8	401-700H		1	35	24 1/2	12	6 1/2	3 5/8
14 x 10	401-702H		1	35	26 1/2	13	6 1/2	4 1/2
14 x 12	401-704H		1	35	28 1/2	14	6 1/2	5 1/2
16 x 2	401-726H		1	40	18 1/2	10	6 1/2	2
16 x 3	401-728H		1	40	20	10	6 1/2	2 1/2
16 x 4	401-730H		1	40	20	10	6 1/2	2 1/2
16 x 6	401-732H		1	40	22	11	6 1/2	3
16 x 8	401-734H		1	40	24 1/2	12	6 1/2	3 5/8
16 x 10	401-736H		1	40	26 1/2	13	6 1/2	4 1/2
16 x 12	401-738H		1	40	28 1/2	14	6 1/2	5 1/2
16 x 14	401-740H		1	40	30 1/2	15	6 1/2	6 1/2



Reducing Tee (S x S x FT)

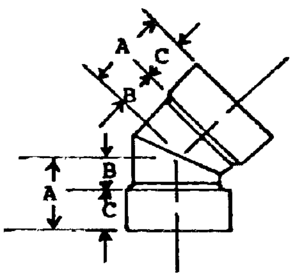
Inch Size	Part Number	sp	lbs. each	a	b	c	d
10 x 2	402-619H	1	25	16 1/2	7 1/2	5	2
10 x 3	402-621H	1	25	16 1/2	7 1/2	5	2
10 x 4	402-623H	1	25	16 1/2	9	5	2
12 x 2	402-659H	1	30	16 1/2	8 1/2	5 1/2	2
12 x 3	402-661H	1	30	18	8 1/2	5 1/2	2
12 x 4	402-663H	1	30	18 3/4	10	5 1/2	2



90° Ell (S x S)

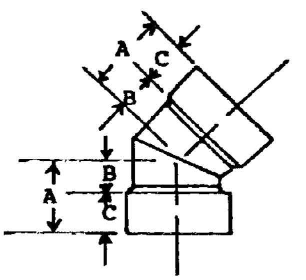
Inch Size	Part Number	sp	lbs. each	a	b	c
10*	406-100	1	25	11 1/4	5 3/4	5 1/2
12*	406-120	1	30	13 3/8	6 7/8	6 1/2
14	406-140H	1	35	21 1/4	14 3/4	6 1/2
16	406-160H	1	40	21 1/2	15	6 1/2

*Molded Fittings



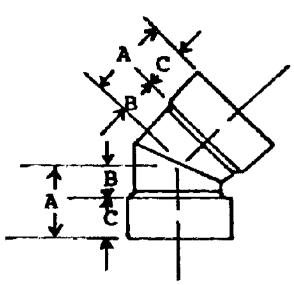
30° Ell (S x S)

Inch Size	Part Number	sp	lbs. each	a	b	c
10	415-100H	1	15	8	3	5
12	415-120H	1	20	8 3/4	3 1/4	5 1/2
14	415-140H	1	25	10 1/4	3 3/4	6 1/2
16	415-160H	1	30	10 3/4	4 1/4	6 1/2



22 1/2° Ell (S x S)

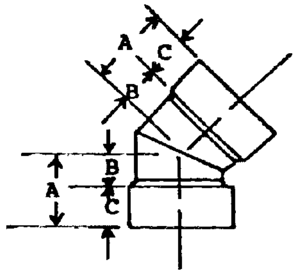
Inch Size	Part Number	sp	lbs. each	a	b	c
10	416-100H	1	15	8	3	5
12	416-120H	1	20	9 1/2	4	5 1/2
14	416-140H	1	25	10	3 1/2	6 1/2
16	416-160H	1	30	10 1/4	3 3/4	6 1/2



45° Ell (S x S)

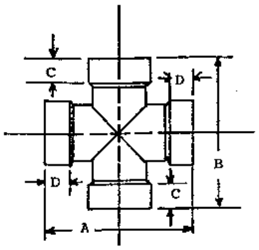
Inch Size	Part Number	sp	lbs. each	a	b	c
10*	417-100	1	15	8 1/8	2 5/8	5 1/2
12*	417-120	1	20	9 5/8	3 1/8	6 1/2
14	417-140H	1	25	12	6	5 1/4
16	417-160H	1	30	14	6	5 1/2

*Molded Fittings



15° Ell (S x S)

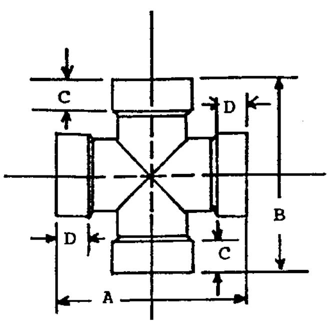
Inch Size	Part Number	sp	lbs. each	a	b	c
10	418-100H	1	15	8	3	5
12	418-120H	1	20	9 1/2	4	5 1/2
14	418-140H	1	25	10	3 1/2	6 1/2
16	418-160H	1	30	10 1/4	3 3/4	6 1/2



Cross (S x S x S x S)

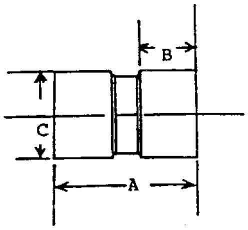
Inch Size	Part Number	sp	lbs. each	a	b	c	d
10	420-100H	1	25	24	24	4 1/2	4 1/2
12	420-120H	1	30	27 1/2	27 1/2	5	5
14	420-140H	1	35	15	30	6 1/2	6 1/2
16	420-160H	1	40	16	32 1/2	6 1/2	6 1/2

Reducing Cross (S x S x S x S)



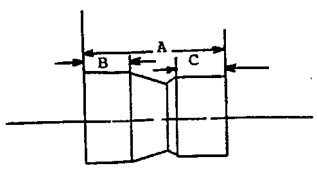
Inch Size	Part Number	sp	lbs. each	a	b	c	d
10 x 2	420-619H	1	25	15	16 1/2	5	2
10 x 3	420-621H	1	25	15	16 1/2	5	2 1/2
10 x 4	420-623H	1	25	18	16 1/2	5	2 1/2
10 x 6	420-626H	1	25	22 1/2	18 3/4	5	3
10 x 8	420-628H	1	25	21	21	5	3 5/8
12 x 2	420-659H	1	30	17	16 1/2	5 1/2	2
12 x 3	420-661H	1	30	17	18	5 1/2	2 1/2
12 x 4	420-663H	1	30	20	18 3/4	5 1/2	2 1/2
12 x 6	420-666H	1	30	21	19 3/4	5 1/2	3
12 x 8	420-668H	1	30	22	22 1/2	5 1/2	3 5/8
12 x 10	420-670H	1	30	27 1/2	25 1/2	5 1/2	4 1/2
14 x 2	420-692H	1	35	19	18	6 1/2	2
14 x 3	420-694H	1	35	10	20 1/2	6 1/2	2 1/2
14 x 4	420-696H	1	35	11	22	6 1/2	3
14 x 6	420-698H	1	35	24	24 1/2	6 1/2	3 5/8
14 x 8	420-700H	1	35	26	26 1/2	6 1/2	4 1/2
14 x 10	420-702H	1	35	28	28 1/2	6 1/2	5
14 x 12	420-704H	1	35	28	28 1/2	6 1/2	5 1/2
16 x 2	420-726H	1	40	20	18 1/2	6 1/2	2
16 x 3	420-728H	1	40	20	20	6 1/2	2 1/2
16 x 4	420-730H	1	40	20	20	6 1/2	2 1/2
16 x 6	420-732H	1	40	22	22	6 1/2	3
16 x 8	420-734H	1	40	24	24 1/2	6 1/2	3 5/8
16 x 10	420-736H	1	40	26	26 1/2	6 1/2	4 1/2
16 x 12	420-738H	1	40	28	28 1/2	6 1/2	5 1/2
16 x 14	420-740H	1	40	30	30 1/2	6 1/2	6 1/2

Coupling (S x S)



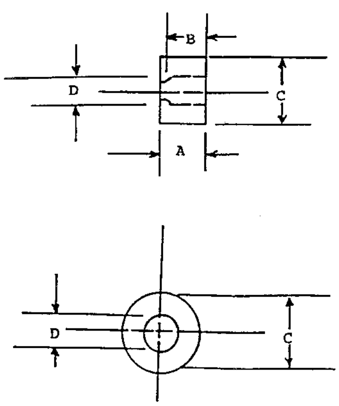
Inch Size	Part Number	sp	lbs. each	a	b	c
10	429-100H	1	15	7 1/2	5	11 1/2
12	429-120H	1	20	7 1/2	5 1/2	13 9/16
14	429-140H	1	25	7 1/2	6 1/2	14 7/8
16	429-160H	1	30	7 1/2	6 1/2	17

Reducer Coupling (S x S)



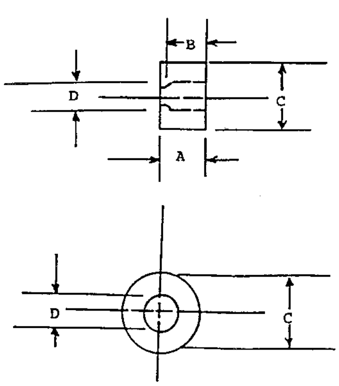
Inch Size	Part Number	sp	lbs. each	a	b	c
10 x 4	429-623H	1	15	16	5	3 1/2
10 x 6	429-626H	1	15	16	5	3 1/2
10 x 8	429-628H	1	15	10	5	3 5/8
12 x 8	429-668H	1	20	17	5 1/2	3 5/8
12 x 10	429-670H	1	20	12	5 1/2	5
14 x 10	429-702H	1	25	18	6 1/2	5
14 x 12	429-704H	1	25	10 1/2	6 1/2	5 1/2
16 x 12	429-738H	1	30	20 3/4	6 1/2	5 1/2
16 x 14	429-740H	1	30	13	6 1/2	6 1/2

Reducer Bushing (flush) (Spg x S)



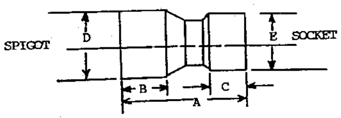
Inch Size	Part Number	sp	lbs. each	a	b	c	d
10 x 4	437-623H	1	15	4	2 1/4	10 3/4	4 1/2
10 x 6	437-626H	1	15	4	3	10 3/4	6 5/8
10 x 8	437-628H	1	15	4 3/4	4 1/2	10 3/4	8 1/2
12 x 6	437-666H	1	20	4 1/2	3	12 3/4	6 5/8
12 x 8	437-668H	1	20	4 1/2	4 1/2	12 3/4	8 5/8
12 x 10	437-670H	1	20	5 1/4	5	12 3/4	10 3/4
14 x 8	437-700H	1	25	5	4 1/2	14	8 5/8
14 x 10	437-702H	1	25	5	4	14	10 3/4
14 x 12	437-704H	1	25	6 1/2	5 1/2	14	12 3/4
16 x 10	437-736H	1	30	5 1/2	4	16	10 3/4
16 x 12	437-738H	1	30	5 1/2	5	16	12 3/4
16 x 14	437-740H	1	30	6 1/2	6	16	14

Reducer Bushing (flush) (Spg x FT)



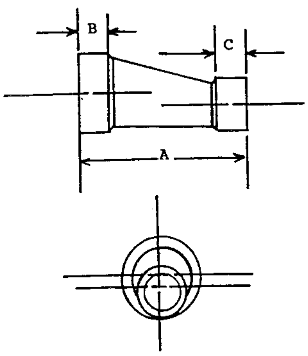
Inch Size	Part Number	sp	lbs. each	a	b	c	d
10 x 6	438-626H	1	15	4	2	10 3/4	6 5/8
10 x 8	438-628H	1	15	4	2	10 3/4	8 1/2
12 x 8	438-668H	1	20	4 1/2	2	12 3/4	8 5/8
12 x 10	438-670H	1	20	4 1/2	2	12 3/4	10 3/4

Reducer Bushing Extended Style (Spg x S)



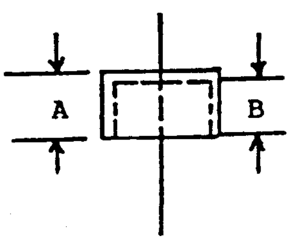
Inch Size	Part Number		sp	lbs. each	a	b	c	d	e
10 x 6	440-626H		1	15	16	5	4	10 3/4	6 5/8
10 x 8	440-628H		1	15	9	5	3 5/8	10 3/4	8 1/2
12 x 6	440-666H		1	20	19 1/2	5 1/2	3	12 3/4	6 5/8
12 x 8	440-668H		1	20	13	5 1/2	3 5/8	12 3/4	8 1/2
12 x 10	440-670H		1	20	10	5 1/2	5	12 3/4	10 3/4
14 x 8	440-700H		1	25	13	6 1/2	3 5/8	14	8 5/8
14 x 10	440-702H		1	25	10	6 1/2	5	14	10 3/4
14 x 12	440-704H		1	25	6 1/2	6 1/2	5 1/2	14	12 3/4
16 x 10	440-736H		1	30	19 1/2	6 1/2	5	16	10 3/4
16 x 12	440-738H		1	30	14 1/2	6 1/2	5 1/2	16	12 3/4
16 x 14	440-740H		1	30	13 1/2	6 1/2	6 1/2	16	14

Eccentric Reducers (S x S)



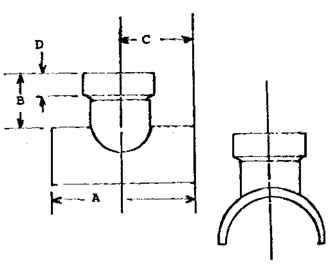
Inch Size	Part Number		sp	lbs. each	a	b	c	
10 x 4	441-623H		1	15	21 1/4	5	2 1/2	
10 x 6	441-626H		1	15	20	5	3	
10 x 8	441-628H		1	15	15 3/4	5	3 5/8	
12 x 4	441-663H		1	20	21 1/2	5 1/2	2 1/2	
12 x 6	441-666H		1	20	19	5 1/2	3	
12 x 8	441-668H		1	20	20	5 1/2	3 5/8	
12 x 10	441-670H		1	20	21 1/2	5 1/2	5	

Caps (S)



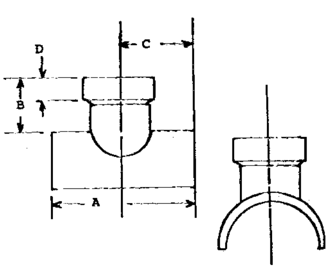
Inch Size	Part Number		sp	lbs. each	a	b		
10	447-100H		1	15	5	4 1/2		
12	447-120H		1	20	5 1/2	5		
14	447-140H		1	25	7	6 1/2		
16	447-160H		1	30	7	6 1/2		

Saddle IPS O.D. (S)



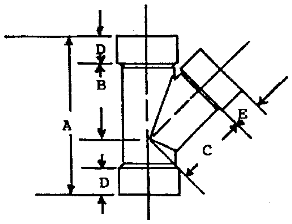
Inch Size	Part Number		sp	lbs. each	a	b	c	d
10 x 4	463-623H		1	15	10 1/2	5 1/2	5 1/4	2 1/2

Saddle IPS O.D. (FT)



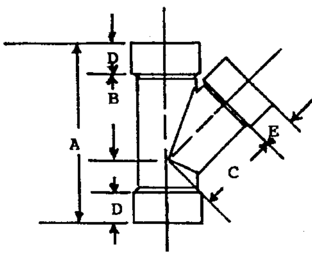
Inch Size	Part Number		sp	lbs. each	a	b	c	d
10 x 4	464-623H		1	15	10 1/2	5 1/2	5 1/4	2

Tee 45° (Wye) (S x S x S)



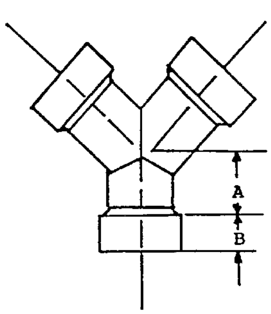
Inch Size	Part Number		sp	lbs. each	a	b	c	d	e
10	475-100H		1	25	30 1/2	16	16	5	5
12	475-120H		1	30	33 1/2	17 1/2	17 1/2	5 1/2	5 1/2
14	475-140H		1	35	37 1/2	20 3/4	20 3/4	6 1/2	6 1/2
16	475-160H		1	40	39 1/4	23 1/2	22 1/2	6 1/2	6 1/2

Tee 45° (Wye) Reducing (S x S x S)



Inch Size	Part Number		sp	lbs. each	a	b	c	d	e
10 x 2	475-619H		1	25	18	8	10	5 1/2	2
10 x 3	475-621H		1	25	18 1/2	8	11	5 1/2	2 1/2
10 x 4	475-623H		1	25	19 1/2	9 1/2	11 1/2	5 1/2	2 1/2
10 x 6	475-626H		1	25	22 1/4	11	12 1/2	5 1/2	3
10 x 8	475-628H		1	25	24 3/4	11 1/2	13 1/2	5 1/2	3 5/8
12 x 2	475-659H		1	30	19	13	11	5 1/2	2
12 x 3	475-661H		1	30	20	13	11 1/2	5 1/2	2 1/2
12 x 4	475-663H		1	30	20 1/2	14	12 3/4	5 1/2	2 1/2
12 x 6	475-666H		1	30	24 1/2	14 1/4	14	5 1/2	3
12 x 8	475-668H		1	30	26 1/2	14 3/4	14 3/4	5 1/2	3 5/8
12 x 10	475-670H		1	30	31	18	16 1/4	5 1/2	5
14 x 2	475-692H		1	35	21 1/2	11	12	6 1/2	2
14 x 3	475-694H		1	35	22	11	13	6 1/2	2 1/2
14 x 4	475-696H		1	35	22 1/2	11 1/2	13 3/4	6 1/2	2 1/2
14 x 6	475-698H		1	35	26	13 1/2	14 3/4	6 1/2	3
14 x 8	475-700H		1	35	28 1/2	14 1/2	15 3/4	6 1/2	3 5/8
14 x 10	475-702H		1	35	32 1/2	16	17 1/4	6 1/2	5
14 x 12	475-704H		1	35	35 1/2	18	18	6 1/2	5 1/2
16 x 2	475-726H		1	40	21	11 1/2	13	6 1/2	2
16 x 3	475-728H		1	40	22	11 1/2	14	6 1/2	2 1/2
16 x 4	475-730H		1	40	22 1/2	12 1/2	14 1/2	6 1/2	2 1/2
16 x 6	475-732H		1	40	26	14 1/2	16 1/4	6 1/2	3
16 x 8	475-734H		1	40	28 1/2	15 1/2	17 1/4	6 1/2	3 5/8
16 x 10	475-736H		1	40	32 1/2	18	18 1/2	6 1/2	4 1/2
16 x 12	475-738H		1	40	35 1/2	18 1/2	19 1/2	6 1/2	5 1/2
16 x 14	475-740H		1	40	37 1/2	19 1/2	21 3/8	6 1/2	6 1/2

True Wye (S x S x S)



Inch Size	Part Number		sp	lbs. each	a	b		
10	476-100H		1	25	4 1/4	4 1/2		
12	476-120H		1	30	5	5		
14	476-140H		1	35	5	6 1/2		
16	476-160H		1	40	7 1/2	6 1/2		